September 18, 2013

Charlie Todd
Maine Department of Inland Fisheries and Wildlife
650 State Street
Bangor, ME 04401

Subject: Bingham Wind Project, Response to Preliminary Review Comments from MDIFW Fisheries Division

Dear Charlie:

Thank you for providing Maine Department of Inland Fisheries and Wildlife (MDIFW) Fisheries Division's preliminary review comments regarding the Bingham Wind Project Site Law application, and for inviting participation by key MDIFW staff on the September 10, 2013 site visit. The site visit was well-attended, and MDIFW's comments were discussed at representative locations throughout the site over the course of several hours. Representatives from MDIFW included you, Bob Stratton, Bob VanRiper, and John Perry. Also participating were representatives from Maine Department of Environmental Protection (MDEP; Dan Courtemanch, Mike Mullen and Art McGlauflin, Stormwater Engineer), US Fish and Wildlife Service (USFWS; Wende Mahaney), Stantec (Dale Knapp), Fay, Spofford & Thorndike (formerly DeLuca-Hoffman Associates; Steve Blake, Stormwater Engineer), and First Wind (Dave Cowan, Josh Bagnato, and Chris Fullarton).

We appreciate MDIFW's willingness to provide these comments in preliminary form to allow the opportunity for them to be informally discussed and resolved. Indeed, we feel that based on the discussions that occurred in the field, all of the concerns expressed by MDIFW can be (or have been) addressed by a combination of technical clarifications and details, and minor modifications to the project design or monitoring plans.

We note that we began consultation with the Department for this project in March, 2010, and we have hosted four site visits and at least ten meetings with MDIFW biologists over the past four years (see Exhibit A for a Project Consultation Timeline). A variety of topics have been raised — most have been resolved, some are still under

discussion. However, until our meeting at MDEP's offices on July 11, 2013, we were unaware there were concerns related to aquatic impacts from this project. These concerns were specified in MDIFW's preliminary comments received by First Wind on September 5, 2013. Although coming relatively late in the process, we are confident that they can be addressed and that the project will be the better for having addressed them.

Following are our responses to the preliminary comments, which are based on our experts' technical review of the written comments, in conjunction with the discussions that occurred in the field. Where appropriate, our responses also indicate where certain of the comments are addressed in the application or in previous submissions to MDIFW. For reference, the original text of MDIFW letter is in *italics* and our response is indented in black.

RE: Blue Sky West LLC, Blue Sky West II LLC (First Wind) - Bingham Wind Project:
further concerns and preliminary review comments from MDIFW Fisheries Division

Biologists in this Department continue to have genuine concerns regarding potentially significant impacts to aquatic resources in headwater streams. The applicant has requested an opportunity for further review of these concerns and offered a site visit before MDIFW submits final review comments for the Bingham Wind Project. Fisheries personnel are available for a site visit with key parties on September 10, 11 or 13. Potential stormwater impacts and altered hydrology of headwater streams is a complex subject, and we hope that appropriate experts can join us. I am copying Art McGlauflin (Stormwater Engineer, MDEP) to expedite clear interpretations of stormwater impacts. Limited revegetation at some wind energy installations amplifies concerns.

Overview: Due to the extent of information included with the permit application, this evaluation is focused specifically at aquatic resources: primarily freshwater fisheries. General concerns are included, as well as specific comments as they pertain to permit application Sections 1, 1A, 7, 9, 10, 12, 15, 19, the proposed Compensatory Mitigation Package, Document C-3–5, and preliminary construction plans. Final review comments from the Wildlife Division are being drafted separately.

The Bingham Wind Project proposes to build and operate a 62-turbine facility in Bingham, Mayfield Township and Kingsbury Plantation. Access roads and the electrical corridor also intersect with the towns of Moscow, Abbott, and Parkman. To access the turbines, there will be approximately 17 miles of new 38-foot wide crane paths built along ridgelines. Another 5.3 miles of existing roads will be upgraded, although there are few specifics. A maintenance and operations building, an electrical substation and up to five meteorological towers are also being requested in the permit(s). Seventeen miles of 100-foot wide corridors are required as the generator lead line.

<u>General review comments:</u> The extent and scale of the Project are substantial. Ecologically, the region's marked interspersion of streams with mountainous terrain elevates concern for aquatic resources to a greater extent than many wind energy installations in Maine.

> <u>First Wind Response:</u> We do not agree with MDIFW's characterization of the project's extent and scale as "substantial" in the context of wind projects in Maine. The Bingham Wind Project is indeed large in terms of its generating capacity (MW) in comparison to other Maine wind projects. However when impacts to natural resources are compared, the project is squarely within the range of impacts of projects that have previously been permitted and constructed in Maine (see Exhibit B). ***As depicted in Exhibit B, when expressed on a per megawatt basis, the impacts are often less than or equal to projects currently operating in Maine. Coupled with the project's greater generating capacity, this represents a more efficient use of resources, and a greater benefit to impact ratio.***

The location of the Bingham Wind Project is particularly suitable for a wind project: elevations are modest (between 1,400 and 1,700 feet), the terrain is gentle to rolling with broad, rounded plateaus (not ridges), and several existing active logging roads provide access to the proposed turbine locations directly from State Highway 16. In addition, the five turbine strings are distributed across seven watersheds, thus minimizing the impacts to any one watershed. Several additional turbine strings, generator lead routes, and roads were considered and eliminated during a multi-year design process in order to minimize impacts as depicted in the Section 1A of the Application. First Wind has consulted extensively with MDIFW to identify sensitive resources in the vicinity, and with their constructive input has designed a project that promises to produce a significant contribution toward Maine's renewable clean energy goals, with minimal impacts to natural resources.

The information provided by various consultants to complete fieldwork is not standardized. Thus, it is difficult to associate the location of resources with the development footprint of the Project. For example, streams are identified with an S### coding, while plans are in standard stationing format (###+##). Stream locations are not evident on any Project plan. This made it very difficult to discern if impacts were being avoided, as is indicated in the Fish and Wildlife Report (Section 7). As a further complication, the stationing of the profile views do not line up (are offset) from the plan view above.

First Wind Response: The information requested was provided in the original Application, and additional detail was provided in follow-up submittals. The project plans included as Exhibit 1 and Exhibit 2 of the Joint MDEP SLODA/NRPA Application identify streams located within the Project area, as well as other natural resources (wetlands, vernal pools, buffers, etc.). Natural Resource maps are also provided in Section 7A and Section 7C-1 of the application to supplement the tables and narrative of Section 7 and include the project infrastructure overlaid on the resource maps (as requested by MDIFW in Bangor on December 10, 2012). A supplemental stream submission originally prepared for USFWS was also sent to MDIFW on August 9, 2013. That submission includes a two-page description for each perennial stream. The information for each stream includes general landscape information, stream characteristics, a description of any associated wetlands, and construction and maintenance practices, including detailed buffer information that was also provided in Section 10 of the MDEP application. A photo of each stream was included as well as an excerpt from the relevant design plan with a red arrow pointing to the location of that stream.

The paramount concern of the Fisheries Division is the magnitude and location of the Project and its potential for impacts to intermittent and perennial streams on or downslope of developments. In short, the cumulative impact of clearing vegetation and subsequent development of the Project site will alter the hydrology and hydraulics of the highest elevations in all the watersheds adjacent to the Project. This will result in increased discharge volumes, changes in flow patterns, increased potential for erosion and sedimentation, and net modification of downslope stream channels and aquatic habitats.

First Wind Response: As explained above, the magnitude of the project's impacts are well within the range of previously approved projects in Maine, and the location and landscape setting on gentle terrain are such that the potential for adverse impacts is very low. With respect to potential impacts to intermittent and perennial streams on or downslope of developments, the project has been designed to avoid all in-stream work (i.e., there are *no new stream crossings* proposed), and water quality leaving the site is expected to stay the same or improve due to the higher design standards of project roads versus typical logging roads. The Bingham Wind Project has been designed to meet or exceed the requirements of the Chapter 500 MDEP Stormwater Management Standards. The purpose of the Chapter 500 standards is to, "…prevent and control the release of pollutants to waterbodies, wetlands, and groundwater, and reduce impacts associated with increases and changes in flow." (Chapter 500 Maine

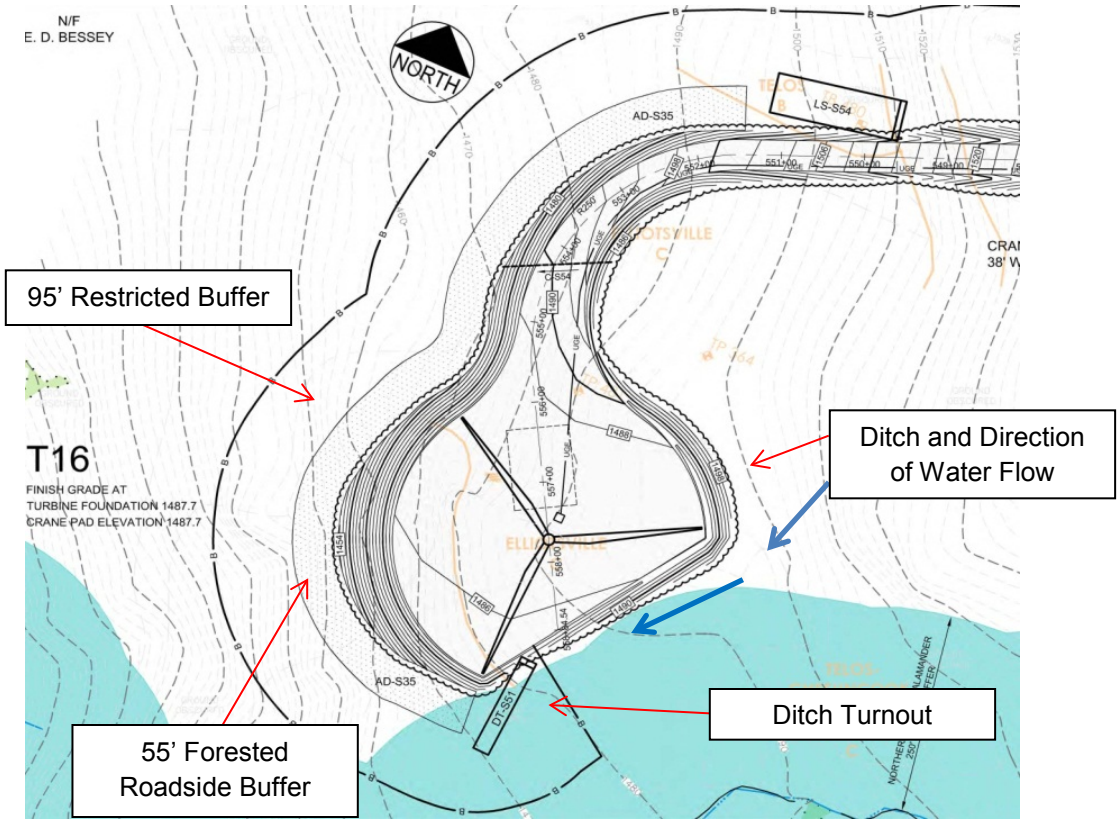
Department of Environmental Protection Stormwater Management Standards 06-096, p. 1). In short, the standards were developed with the express purpose of addressing the very concerns expressed in the above comments.

The project's stormwater analysis and design were prepared by stormwater engineers at Fay, Spofford & Thorndike ("F, S &T") with extensive consultation and input from MDEP stormwater experts. Representatives from F, S & T met with MDEP on three separate occasions to address comments, fine-tune the design, and ensure the project would meet or exceed MDEP's rigorous Chapter 500 standards. These standards are well established and are the same standards used in the design and construction of five operating wind projects owned by First Wind in Maine. The State Stormwater Standards have been developed to protect the State's natural resources by controlling stormwater discharges and requiring developers to mitigate for pollutant removal, cooling, channel protection, and flood control. There is no evidence to suggest that these standards are not working at these wind projects and we are confident they will also be protective of water quality at the Bingham Wind Project. MDIFW has not provided evidence that the design is in any way deficient, or otherwise not in keeping with the letter and spirit of the Chapter 500 Standards.

At the very minimum, all stream channels in proximity to the Project provide the habitat value of being high quality sources of cold water to downstream reaches. Stream surveys focused only on waters in the Project footprint without apparent regard to nearby, downslope streams potentially vulnerable to stormwater or altered hydrology. Each of the five watersheds in the Project area contain brook trout, while two contain unique populations of wild reproducing rainbow trout (Gulf Stream, Austin Stream). Northern spring salamanders and several rare mayflies are Wildlife Division concerns that also frequent clear, cool, high-gradient streams.

First Wind Response: Per guidance from MDIFW, First Wind conducted resource surveys at least 500' from all proposed impact areas on all non generator lead portions of the project. These surveys included stream assessments for Northern Spring Salamanders and Roaring Brook Mayflies. On August 21, 2013, Stantec provided a summary of the buffers and vegetation management plans that addressed resource concerns around these streams and detailed compliance with MDIFW's Management Guidelines related to Northern Spring Salamanders. As noted in that memo, extensive surveys concluded that Roaring Brook Mayfly is not present within the project area. All streams mapped by MDIFW as "Wild Brook Trout Habitat" are more than 500 feet from the nearest edge of project impacts, with two exceptions noted below. The generator lead for the project does not cross any streams identified as "Wild Brook Trout Habitat."

1. An unnamed tributary to Rift Brook (S021) is located more than 250' from the edge of grading for turbine 16. Several stormwater controls have been incorporated to ensure this stream is protected, including a ditch turnout and vegetated buffer which will capture concentrated flows and spread the flow through a restricted vegetated area to promote infiltration and trap sediment. In addition, a 55' forested roadside buffer and 95' restricted buffer are proposed along the downslope side of the road and portions of the turbine pad. The 95' restricted buffer is not required by the Chapter 500 standards and the stormwater controls exceed the standards in this location. During the design phase of the project the turbine pad was reduced (as shown below) to provide a 250' buffer from the stream in accordance with MDIFW's *Recommended Management Guidelines for Land Use in or Adjacent to Roaring Brook Mayfly and Spring Salamander Habitat (MDIFW, Draft January 5, 2012).*



2. A tributary to Bigelow Brook (S031) is an intermittent stream located 390' from turbine 29. No alterations are proposed to the existing 24" culvert at this location, and a 100' restricted buffer is proposed that will remain for the life of the project.

Gulf Stream is 1,120' from the edge of grading at the nearest turbine. Austin Stream is 3.25 miles away and across Route 16 from the nearest turbine. Based on their distance from the project area and stormwater controls that will be employed, no impacts to the trout populations in these streams are expected from the development of the project.

As described in the application, there are no direct impacts to any perennial or intermittent streams proposed.

The Project proposes to clear large areas of locally high elevation land for placement of turbines and to access infrastructure. Clearing will also be necessary for 17 miles of generator lead at various elevations. Concerns for the turbine corridor, access roads, and the generator feed line are discussed separately.

<u>Turbine corridors:</u> The application identifies 17 miles of 38-foot wide crane path roadways that will be constructed to access 62 turbine installations and a 375-foot diameter circular construction area at each turbine. Thus, removal of vegetation for the crane path totals 63 acres of clearing; additional clearing for the turbines will amount to 160 acres, for a total clearing of 223 acres. It should be noted that these calculations include only the surface area of the developments (38-foot wide and 375-foot diameters, respectively) and do not include any constructed side slopes, which will considerably increase the clearing footprint due to existing terrain conditions. The collector line could is mostly underground along the edge of crane paths.

Most of the proposed clearing for the Project occurs at or near the highest local elevations in local watersheds. The area is currently forested and commercially harvested. Normal forest operations and cutting cycles have a moderate, but relatively temporary impact on local hydrology and hydraulics. Interception of precipitation by leaf and stem cover moderates the timing, volume and immediate vector of precipitation from an event. In typical forest operations, the trees grow back and resume their function of interception of precipitation; the permanent removal of 250 acres of tree cover from the proposed Project area will significantly alter all of these functions.

Of the 250 acres of total Project clearing, it is stated that 173 acres of those areas cleared for construction are temporary impacts and will be modified and allowed to revegetate. However, in reviewing plan notes, reclamation of construction areas will replace former woody vegetation (mature trees) with forbs and shrubs. Techniques to restore the vegetation include scarifying, loaming and seeding compacted soils, as well as loaming and seeding over blast rock areas.

MDIFW contends that these areas are prolonged impacts since proposed reclamation measures do not replace woody vegetation similar to pre-Project conditions. Forbs and shrubs have a reduced capacity to intercept precipitation, greater evapotranspiration rates, and lessened ability to stabilize soil movements compared to woody vegetation. Also, increased temperatures due to loss of shade from canopy cover can heat up high quality sources of cold water, directly impacting resident and downstream coldwater fisheries. Finally, trees will have difficulty taking root in compacted soils and on blast rock, especially where soil depth and the sub-layer of rock already hinder establishment of woody vegetation.

Reclaimed areas will also have significantly altered capacities for infiltration. Areas of compacted soils will resist water movements to soil depths and runoff volumes will increase as will the potential for shear slope failures. Areas of loamed blast rock may unnaturally increase infiltration. The net effect of rehabilitation will <u>not</u> restore the pre-development potential of forested cover in terms of its hydrological role. Therefore, the Department feels that these efforts must be considered changes to current hydrological conditions at the Project site.

<u>First Wind Response:</u> MDIFW has not provided any evidence to support the claim that the proposed clearing, when coupled with the proposed stormwater Best Management Practices (BMPs), will result in adverse hydrological impacts. The majority of the project area has been commercially harvested within the last 0-15 years. Recent clear-cuts, some greater than 30 acres and one greater than 200 acres, are scattered throughout the project area. The extensive harvesting has resulted in large areas of small, regenerating trees, and cleared strips and skidder trails are abundant throughout the landscape. As detailed by MDIFW above, the majority of the areas cleared for construction (many of which are already treeless), will be re-vegetated. Areas that are cut but not graded (e.g., outside grading limits) will be allowed to regenerate to forest cover, and designated forested buffers will be taken out of rotation and not be subject to future harvest. In addition, as discussed during the field visit, First Wind is willing to allow the turbine pads and portions of the crane roads to revert to forbs and shrubs (i.e., not mowed), if requested by MDEP, after initial loam and seed are established. During the September 10, 2013 site visit, Art McGlauflin from MDEP noted that forbs and shrubs can be more effective than forested cover at infiltrating and treating stormwater. Given the above considerations it is possible – even likely – that the proposed stormwater system will result in net improvements in water quality within the project areas because the Chapter 500 Standards are more rigorous than what is typically required for logging operations.

In support of this, First Wind is providing as Exhibit C a multi-year water quality study conducted by the Vermont Agency of Natural Resources which concludes that the water quality of local cold water trout streams was the same or better after construction of the Sheffield Wind Project in Vermont. First Wind

would be willing to conduct a similar study in cooperation with MDIFW at the Bingham Wind Project. The preliminary design of this study was discussed during the September 10 visit and First Wind will follow-up with MDIFW to finalize.

Photo of a post-construction crane road with re-vegetated shoulders at the Sheffield Wind Project after two growing seasons.

Generator lead line: The Project proposes to clear a 17-mile, 100-foot wide path of vegetation from the east end of the Project to a substation in Parkman. Total clearing for this generator lead is approximately 206 acres. The lead will pass over 34 streams. Vegetative buffers (Table 10-1) proposed for stream crossings stipulate that non-capable vegetation will be retained to within 250 feet from each shore of 24 streams with documented / presumed occurrence of northern spring salamanders, 100 feet from 28 streams designated as Atlantic salmon critical habitat, and 25 feet from 20 "other" streams.

First Wind Response: The proposed generator lead spans 33 perennial/intermittent streams along the route proposed for the project. First Wind has agreed to a minimum 100-foot buffer on all streams. Streams that contain Northern Spring Salamander or potential habitat will receive a 250-foot buffer. In September 2013, additional surveys were performed to document the potential presence of Northern Spring Salamanders along the generator lead (Exhibit D). Five of the 33 streams along the generator lead were found to contain the species. A memo describing these field efforts and the supplemental data forms are appended to this response. Buffer information can be found in Table 10-1 (see Section 10 of the application), which identifies buffers for the entire project. Additional information regarding the 100-foot buffers can be found on page 9 of this response.

In Section 10.5, the application states that ephemeral stream channels are "disconnected" from larger systems. This is rarely the case in natural drainage patterns. Headwaters (including springs, drainages, and intermittent, first- or second-order streams) are abundant and unique components of a river network, flowing into other first-order streams or into ones that are much larger. The presence of water in ephemeral channels may be seasonal, but there is connectivity evidenced by topographic changes: i.e., the lowest local elevation. Ephemeral streams also provide important seasonal habitat for fish and other aquatic organisms like crayfish and aquatic insects. Moreover, land uses may disrupt and diminish material transport to downstream reaches headwater streams, including ephemeral streams, by removing sources of organic material (e.g., through forest operations), by

affecting transport and decomposition processes (e.g., through changes in biotic communities), and by altering mechanisms of storage within headwaters (e.g., through channelization).

First Wind Response: Streams were defined as "ephemeral" when they did not meet MDEP's definition of a stream but did meet LUPC's definition[1]. In most cases, these are drainage ways created by the action of surface water but lacking aquatic animals and vegetation. Although they would not be considered jurisdictional streams per the MDEP criteria, they were identified and mapped to ensure they would be recognized as hydrologic features and accounted for in the design of the project. They are often small (a foot or two across and a few inches deep), and occur where anthropogenic activity (e.g., skidder ruts) has caused erosion, or in locations where exposed bedrock or dense soil conditions prevent water from infiltrating. Such drainage ways typically connect with wetland resources, albeit intermittently, during spring runoff or high flow events at other times during the year. Where these ephemeral drainage ways need to be crossed by the project, they typically have a "rock sandwich" proposed, as recommended during design consultation on other projects with MDEP and LUPC, which allows for hydrological connectivity to be maintained while minimizing the potential for further channelization. As discussed during the field visit, First Wind is open to suggestions if culverts or other alternative structures would be preferred by MDEP or MDIFW for habitat connectivity purposes.

Representative photos of ephemeral streams within the project area.

[1] **MDEP Definition of Stream**: "River, stream or brook" means a channel between defined banks. A channel is created by the action of surface water and has 2 or more of the following characteristics. A. It is depicted as a solid or broken blue line on the most recent edition of the U.S. Geological Survey 7.5-minute series topographic map or, if that is not available, a 15-minute series topographic map. [1995, c. 92, §2 (NEW).] B. It contains or is known to contain flowing water continuously for a period of at least 6 months of the year in most years. [2001, c. 618, §1 (AMD).] C. The channel bed is primarily composed of mineral material such as sand and gravel, parent material or bedrock that has been deposited or scoured by water. [1995, c. 92, §2 (NEW).] D. The channel contains aquatic animals such as fish, aquatic insects or mollusks in the water or, if no surface water is present, within the stream bed. [1995, c. 92, §2 (NEW). E. The channel contains aquatic vegetation and is essentially devoid of upland vegetation. [1995, c. 92, §2 (NEW).] **LURC (LUPC) Definition of Stream**: A channel between defined banks created by the action of surface water and characterized by the lack of terrestrial vegetation or by the presence of a bed, devoid of topsoil, containing waterborne deposits or exposed soil parent material or bedrock.

A 25-foot buffer width has been proven through numerous studies and MDIFW case experience that this distance results in a strip of vegetation that is insufficient in protecting water quality, even if all capable vegetation were to remain. This is especially true when gradients exceed 3%, as is the case for many of the streams crossed by the generator lead. MDIFW recommends a minimum 100-foot buffer for all streams crossed by the generator lead. Maintenance of capable vegetation should be accomplished by mechanical means within the buffers. Any herbicide applications must be completed by licensed applicators following all state requirements for use. Use of MDIFW's Performance Standards for Buffers in ROW Projects should be utilized.

First Wind Response: As described in the application, the project already includes a minimum 100-foot buffer for all perennial/intermittent streams spanned by the generator lead (33 streams). These streams are those that occur within the GOM DPS (Atlantic salmon habitat). Additionally, a 250-foot stream buffer has been applied to Northern Spring Salamander streams. At the meeting with MDIFW on July 11, 2013, First Wind further agreed to a 100-foot post-construction buffer for all streams (intermittent and perennial) throughout the project. During construction, vegetation would be cleared to within 25 feet of these streams. Only capable tree species would be selectively removed within the 25-foot buffer. For the operational life of the project, a 100-foot buffer would be applied to these locations and follow the maintenance protocols of the other stream buffers. Selective cutting and the promotion of a vegetative cover dominated by forbs and shrubs would be maintained for all stream buffers throughout the project. Where required, a 16-foot-wide access route would pass through some of these buffers for maintenance purposes. Any herbicide application would be conducted by licensed applicators. The project was designed following MDIFW's *Recommended Management Guidelines for Land Use in or Adjacent to Roaring Brook Mayfly and Spring Salamander Habitat (MDIFW, Draft January 5, 2012)*.

Section 7.5 Wetlands, Fisheries and Wildlife indicates '"no instream work" for any waterway within the Project footprint. On review of the preliminary construction plans, however, two areas appear to have culverts proposed for streams and rock sandwich layers proposed for riparian wetlands. These sites are:

page C-S1.10, Sta. 208 + 00, (30"X 50' culvert) and
page C-N1-27, Sta. 1407 + 50 approx., (30"X 50' culvert).

Clarification in regards to potential impacts at these sites is requested. Also, there is significant concern with how bankfull widths were determined at these streams, and in all streams in Table C-2 in the Wetland and Waterbody Report (Section 7A). The average bankfull width for most streams appears to be the simple average of the two numbers delineating the width of the stream.

First Wind Response: The project does not cross an MDEP jurisdictional stream at either of the referenced locations based on Stantec's professional interpretation of MDEP's stream definition. The project was deliberately designed to avoid any direct impacts to jurisdictional streams. The design currently calls for rock sandwiches with overflow culverts to be installed at both of these locations. This was based on previous project experience and guidance provided by MDEP with the intention of maintaining the existing non-channelized hydrology.

Based on the discussion during the September 10, 2013 site visit, the design is currently being modified at STA 208+00. The proposed rock sandwich will be eliminated and replaced with a culvert to promote habitat connectivity as recommended by MDIFW in concurrence with MDEP and USFWS. The revised design will be provided to MDIFW once it is available. A representative photo showing existing site conditions at ST 208+00 is shown below as observed during the initial field surveys.

Representative photo of site conditions above S003 at proposed crossing.

Bankfull widths were determined based on US Forest Service methodology. This methodology has been used by Stantec in many previously approved developments in Maine and has been accepted without comment by MDEP and MDIFW[2]. We understand that MDIFW may use a different method, however in this case the differences in methodology would not result in any material difference in the project design.

Stormwater management: MDIFW has many concerns related to stormwater analyses. Section 12 consists of two reports: the first concerning the construction and maintenance of crane paths and turbine pads, while the second is in reference to the road system and buildings. In Section 12.6, there is a statement that existing drainage patterns will remain. While it is true in that water will still run downhill, there will be significant changes in land cover and modifications that are likely to alter existing drainage patterns. Current drainage consists of diffuse hydraulic patterns, dictated by vegetative cover, soil type, slopes, terrain variability, and a myriad of other factors. After the Project is built, hydraulic patterns in the upper elevation watersheds will be channelized by Project structures with culverts to form point outlets. In short, these upper watersheds will convert from diffuse hydraulic patterns to channelized patterns.

[2] *Identifying Bankfull Stage in Forested Streams in the Eastern United States available from* the USDA Forest Service's Stream Systems Technology Center at: http://www.stream.fs.fed.us/publications/

First Wind Response: The project's Stormwater Management System has been designed to, at a minimum, adhere to the standards set forth in the MDEP Chapter 500 – Stormwater Management. Chapter 500 describes the stormwater standards for activities licensed under the Stormwater Management Law and the Site Location of Development Law. The purpose of the Chapter 500 standards is to, "…prevent and control the release of pollutants to waterbodies, wetlands, and groundwater, and reduce impacts associated with increases and changes in flow." (Chapter 500 Maine Department of Environmental Protection Stormwater Management Standards 06-096, p. 1). In short, the standards were developed with the express purpose of addressing the very concerns expressed in the above comment.

The stormwater management system employed with this project is detailed in Exhibit 1 of the Site Location of Development Law Application. The stormwater management system incorporates a variety of well-accepted BMPs including rip rap outlet aprons, ditch turnouts, stone bermed level spreaders, rock sandwiches, vegetated buffers, a wet pond, and vegetated underdrain filters to meet or exceed the requirements of Chapter 500. The application of these BMPs is based on guidance from the Maine Department of Environmental Protection as discussed in several pre-application meetings with Department Technical Review Staff, and Design Manuals provided by MDEP for Stormwater and Erosion Control BMPs. The stormwater management system has been designed under these guidelines to ensure erosion control, pollutant control, phosphorus control, attenuation of peak flows, as well as energy dissipation and flow dispersion to restore or otherwise maintain pre-development hydrologic patterns to the maximum extent practicable

In addition to meeting the Chapter 500 Standards the engineers and MDEP have incorporated numerous design elements that exceed the Standards based on their professional judgment and experience with other developments in Maine. For example, the frequent placement of cross culverts and flow dispersion devices exceeds what would be considered common practice for similar remote access road uses. Similarly, in many locations the width of the restricted buffer exceeds the standards to allow for a wider vegetated area for infiltration and filtering of water. In sum, the stormwater analysis overall tends to be conservative and in many respects exceeds the Chapter 500 Standards.

Paramount among stormwater concerns is the question of analysis and its results. Why were more suitable pre- and post-Project peak flow analysis not performed (Section 12.8)? The applicant's rationale for not completing peak flow analyses was due to the size of the Project. The Department strongly feels that the size of the Project is precisely the reason to do peak flow analysis, since it would provide a better estimate of changes in runoff volumes. The process for developing this permit application (Section 1) spanned 5years from 2009 to 2013. MDIFW contends that there was ample time to complete peak flow studies during that time period.

The alternative chosen to evaluate changes in stormwater was TR-20 and TR-55 modeling software. While the report states that terrain gradients varied from 5 to 25%, a single CN number of 77 was used for all watersheds. Ultimately, the overall model results appear generalized and potentially do not represent a close approximation of the actual changes in discharges resulting from the Project. The results of the analysis are confusing and require explanation. For example(s):

Gulf Stream:
Pre-Project cfs = 508 cfs
Post Project cfs = 162 cfs
Rift Brook:
Pre-Project cfs = 433 cfs
Post Project cfs = 139.5 cfs

From the above examples, it is unclear if post-Project quantities are the net result of treatments or are additive to pre-Project numbers. If they are additive, post-Project volumes at Gulf Stream and Rift Brook are 24% greater than pre-Project volumes. If water volumes are reduced (to or by), the resulting post-Project volumes in these two watersheds are 68 % less than existing (reduced from pre- condition to post condition) or 32% less than existing (reduced by pre- condition minus post-condition). Ultimately, no matter how these numbers are compared, there will be a significant change as these numbers indicate. The summary table does not reflect the changes as shown in the calculations. These need to be clarified to defend the no-net change claim from the applicant.

First Wind Response: The Pre-Development and Post-Developed peak runoff values discussed for Gulf Stream and Rift Brook should not be compared to one another. In both cases the "Pre-Project" peak flow rates cited by the reviewer are specific to a 25 year rainfall event while the "Post Project" peak flow rates cited are specific to a 2 year rainfall event, thus reflecting an inaccurate comparison. Exhibit 12A – Appendix 12-1 illustrates Pre-Development and Post-Development runoff calculations utilizing a curve number comparison for a 2 year, 10 year, and 25 year rainfall event. The curve number comparison method was discussed and agreed upon with MDEP technical staff at two pre-project meetings (10-25-2012 and 3-12-2013) and has been used as an approved method on past projects. Exhibit 12A – Section 12.12 includes a narrative describing the curve number methodology and summarizes the results of the Post-Development weighted curve number.

Section 12.22 shows Project TMDL phosphorus loading for Mayfield, Kingsbury, Hilton, Withee and Smith Ponds. The summary compares 'allowable' P Loading for the ponds to P 'export' from the Project. There is no estimate of existing P load from the watershed and in many cases P export generated by the Project is over 90% of the allowable budget. It is unclear what effect P export from the Project will have on these waters. That is, if P exported from the Project is added to the pre-Project P load entering the ponds, is that sum more or less than the allowable P budget? Will additional P loading generated by the Project place these waters at risk?

First Wind Response: Portions of the project that are tributary to nearby lakes and ponds have been designed to meet the "Phosphorus Standard" which is outlined in Chapter 500 – Stormwater Management Rules. Technical guidance for how a project's phosphorus budget is developed can be found in Volume II of the "Maine Stormwater Best Management Practices Manual." MDEP's method for defining Watershed Per Acre Phosphorus Allocations is outlined in Appendix B and C of Volume II. The standards in Volume II focus on limiting additional phosphorus contributions from new developments that could cause a risk to the lakes' water quality. Each lake is assigned a Per Acre Allocation (lbs/acre/year) by the MDEP which is calculated using several variables such as direct watershed area, area available for development, area not available for development, expected development, and the water quality category of the subject lake. This is also referred to as the "Phosphorus Budget."

When the "Phosphorus Standard" is applicable a project must employ approved BMPs to mitigate for increased phosphorus export and reduce the phosphorus export to meet the project's phosphorus budget. The proposed project includes a series of stormwater buffers that are designed within the guidelines established by the MDEP to effectively remove phosphorus export to levels below the phosphorus budget. Design guidelines for these buffers can be found in the "Maine Stormwater Best Management Practices Manual", Volume III, Chapter 5. Each BMP has a "Treatment Factor" associated with it. Treatment factors generally range from 60% to 90% removal efficiency dependent on the type of BMP. The vegetated buffers used for this project generally have a removal efficiency of 60% to 70%. The project is tributary to five lakes and each lake has been analyzed separately to treat runoff and

reduce the phosphorus export to the levels established by the phosphorus budget calculations.

The MDEP has performed an extensive review of the project's stormwater design. Computations associated with the project's phosphorus budget and the post-project phosphorus export have not been called into question during this review.

In Section 12.25, the application notes that there will be no thermal impact to downstream fisheries. No further clarification is offered. The statement needs to be explained and justified. The extent of vegetative clearing and modification of terrain indicate that not only will volumes of runoff increase, but that the quality of that water, including temperature of that water, will change. As stated above, increased temperatures due to loss of shade from canopy cover will heat up the high quality sources of cold water, directly impacting resident and downstream coldwater fisheries. The assumption that stormwater BMP's will address water temperatures is true only when the BMP structures provide adequate shading and\or methods of reducing solar exposure to runoff. If the BMP structure needs to be "built," then some method of shading should be part of the construction plan. Forbs and shrubs do not provide the same temperature modification that is provided by mature woody vegetation.

First Wind Response: MDEP's method for mitigating thermal impacts is to provide either filtration or infiltration. Most structural BMP's are designed with a filter media and a restricted outlet to slowly filter and release runoff. The wet pond and vegetated underdrain filters that are proposed for the O&M, DRD, and substation are designed to accommodate this, under the guidance of the BMP Manual. The stormwater buffers that treat the vast majority of this project are restricted to limit clearing and maintain a forested or meadow cover. Additionally, they are designed (from guidance within the BMP Manual) for site specific conditions (i.e., type of vegetated cover, % slope, hydrologic soil group, and tributary drainage area) to promote infiltration thus aiding in the cooling of runoff. These BMPs in combination with the stream buffers and distance between cleared areas and streams make thermal impacts unlikely.

The stormwater report pertaining to generator lead construction roads construction (Section 12-1) depicts 2 miles of existing corridors as "winter-only" roads with travelways from 8 to 12-feet in width. The application indicates that these roads will need to be improved to 24-foot travelways. The report also states that roadway drainage on these roads is "maintained by an inadequate number of cross culverts and overland flow" (Section 12 – page 176). The preliminary construction plans do not show the work necessary to improve these roadways, including any necessary lengthening of culverts, although a general list of replacement culverts for the improvements is provided. It is also unclear if any of these cross culverts convey ephemeral or perennial streams.

First Wind Response: The narrative as described in Section 1.0 (page 12-3) of the Gen Lead Construction Access Road Stormwater Management Report indicates that the roads will be improved as necessary to a consistent 12' width. This description is consistent with what is depicted on Sheets AR-01 to AR-08 and per the proposed road cross section detailed on Sheet DET-03 of the Gen Lead Access Road Plans and Details. Road improvements as proposed are shown on the plan and profile sheets AR-01 to AR-08 and culvert sizing details are provided on Sheet SW-01. None of the culverts that require replacement for these access road upgrades convey jurisdictional streams.

Both stormwater reports detail culvert prescriptions, each for their areas of Project coverage. Seven culverts are proposed to improve the existing roads and 143 culverts are proposed for all other Project components. While most of the roadway culverts appear to be replacement upgrades, the 143 pipes proposed for crane paths and turbine accesses are new culverts. The "rational" method of culvert sizing was utilized to determine specific pipes; HDPE pipes are proposed. The rational method determines a design discharge (Q, in cfs) for a storm of particular intensity where the culvert is at 100% of its capacity. For the Project, designers chose a storm event with a 25 year recurrence probability. That is, culverts on the Project will carry 100% of their volumes during a storm event of 25-year intensity.

The rational method is commonly used by designers for drainage structures. It is appropriate where this "drainage" is not associated with habitat since the design only considers carrying water volumes, and does not address energy transfer in channels, channel geomorphology, or ecological considerations of any kind. Since recent climatological events have well exceeded return periods traditionally used in culvert sizing methods, it may be useful to utilize a return period of greater duration, if only to check the Q25 design.

> First Wind Response: The return period and associated rainfall intensities selected for culvert design are consistent with the requirements of Chapter 500 and the "Maine Stormwater Best Management Practices Manual". The numerous culverts proposed are specifically designed in consultation with MDEP to dissipate flows and are only used for cross-drainage purposes at new or existing roads. No new culverts are proposed at regulated streams. Further, the proposed culverts have been designed conservatively to allow for additional freeboard on the inlet end to accommodate higher storm intensities beyond the 25 year event. As indicated previously, the frequent placement of cross culverts and flow dispersion devices exceeds what would be considered common practice for similar remote access road uses.

Of the 143 culverts proposed for high elevation Project components, 25 are of 24-inch diameter or larger. Other culvert pipes range from 12 to 18 inches in diameter. A 12-inch diameter pipe flowing 100% full can carry a volume of water that will expend considerable energy at the outlet of the pipe. A 24-inch pipe will have twice the outlet energy. All of the culverts will have the potential to generate channel development in currently ephemeral drainages adjacent to the Project, a significant change from the existing site conditions that will have effects that will manifest in downstream reaches of perennial streams. The slopes where the energy from these outlet velocities will be expended are from 5 to 25%. There is no information to determine if the BMPs proposed will withstand the energy expended by these volumes of water.

The applicant indicates that there will be no significant change in runoff volumes or quantity and has met Maine's Stormwater Law requirements by placing approved BMPs for treatment of stormwater. However, the Department finds that the information provided does not clearly indicate the proposed actions will not impact fisheries resources downstream.

HDPE pipes proposed for all culverts are smoothbore by design. The lack of roughness compared to corrugated culverts impairs the ability for aquatic organisms, including fish, as well as some semi-aquatic and terrestrial species to effectively utilize these structures for passage. Moreover, limited openness ratios of these culverts, some of which are 100 feet or more in length, can impact habitat connectivity for certain organisms such as small mammals and herptiles on a landscape scale. The use of corrugated pipes, sized to an openness ratio of at least "0.75" will more effectively slow water velocity and minimize the barrier to certain animals that are dependent on more light for passage, particularly through the longest culverts.

Finally, it is apparent that use of existing roads and culverts built during previous forestry operations are now arguably a partial responsibility to the Project applicant. The current infrastructure of roads and culverts should be scrutinized to determine potential changes in stormwater. The extent and condition of critical stream buffers require attention to minimize potential cumulative impacts downslope.

> First Wind Response: All proposed culverts will receive reinforced outlet treatments designed specifically for energy dissipation and dispersion of flow to restore or otherwise maintain Pre-Development hydrologic patterns to the maximum extent practicable. Details of these devices can be found on Drawings C-9.0 and C-9.1 of Exhibit 1 of the Site Location of Development Permit Application. Best Management Practices (BMP's) include rip rap outlet aprons, ditch turnouts, and stone bermed level lip spreaders. These BMP's have been designed in consultation with MDEP and in accordance with the

"Maine Stormwater Best Management Practices Manual" and the "Maine Erosion and Sediment Control BMP Manual." No new stream crossings are required to construct the project, but it is expected that replacement of existing drainage culverts and the installation of outlet treatments will improve water quality compared to the existing conditions. Further, because these are all cross-drainage culverts they will not provide habitat for fish. However, as part of the final design process First Wind is willing to consider corrugated pipe and greater openness ratios at specific locations where they would be appropriate to address habitat considerations for wildlife.

Stream surveys – general comments: The following remarks are based on review of the US Army Corps of Engineers Application provided by the applicant.

Most of the streams along the Project are considered headwater streams. Regardless of whether they are perennial or ephemeral in nature, these waters provide critical linkages to downstream resources for many species. Headwater species include permanent residents as well as migrants that travel to headwaters at particular seasons or life stages. Movement by migrants links headwaters with downstream and terrestrial ecosystems, as do exports such as emerging and drifting insects. Evidence suggests that headwater streams are critically important to downstream ecosystems. They dominate channel networks in terms of stream length and watershed area, they transport matter to navigable waterways, and they have intimate and direct connections to these waterways. These ecological values are a stark contrast to the statement in the MDEP application (Section 10.5) that ephemeral stream channels are "disconnected" from larger systems.

As noted above, it is extremely difficult to match up the stream #s in the Perennial Stream Summary Table to the station #s in the plans. A tabular compilation with stream # and the corresponding station # should be provided since many streams were not clearly depicted on the plans available for review.

As stated above, under each stream description the bankfull widths are given as a range, with the average also listed; however, in most cases the average given is simply the average of the range of widths listed. For example, Stream S045 lists the bankfull width range as 15-20 feet, with the average as 17.5 feet. The number "17.5" is simply the average of 15 and 20 and is not the accepted method to gauge bankfull width. Methodology similar to the US Forest Service should be used to make these determinations.

First Wind Response: Methodology consistent with the US Forest Service was used by Stantec to make these determinations and has been accepted without comment by MDEP and MDIFW previously. We understand that MDIFW may use a different method, however in this case the differences in methodology would not result in any material difference in the project design.

At each temporary crossing, there is concern that a build-up of dirt and mud on the crossings will discharge into the streams: a direct impact. Specific safeguards were not found in this review. Also, timber mats or other crossing structures can compress stream banks and /or stream substrate. Details of crossing structures are requested to assure no direct impacts to streams.

First Wind Response: Temporary bridges will cross streams at right angles to the channel at a location with firm banks and level approaches whenever possible and as site conditions dictate. At each crossing location, the ends of the stringers will extend at least two feet onto firm banks or several feet into the upland edge of a wetland to ensure a dry, firm approach onto the bridge. Mats or a stone pad installed on top of geotextile fabric will provide a smooth transition for equipment travel from the adjacent ground or temporary road onto the bridge. In addition, rough stone areas will be installed at both ends of the bridge to promote cleaning of vehicle tires.

Temporary bridges will be monitored during construction by professional Environmental Inspectors to ensure their correct functioning. Construction details and specifications dictate that any bridges must be kept clean and any accumulated soil material removed must be spread out and stabilized in an upland location. Under no circumstances would the material be deposited into the water resource. The Contractor will replace timbers or decking in poor condition as soon as deterioration is observed. At a minimum, the Environmental Inspector will be responsible for inspecting all bridges regularly and will keep a log of all changes, improvements and other maintenance performed. The temporary bridges will be removed as soon as they are no longer required.

A schematic of the proposed temporary crossings is appended to this response and can be found in Exhibit 2 on Drawing DET-03.

Perennial stream crossings:

Stream S027: The applicant is proposing to cross this stream using the existing logging road and culvert; no upgrades are planned. A photo of this culvert, and any existing stream-bearing culvert, would be very helpful in determining present and possible construction-related impacts to passage of aquatic organisms.

First Wind Response: This location was visited during the 9/10/13 site visit, and based on field discussions, MDIFW indicated there are no concerns with the existing crossing or the use proposed associated with this project.

Stream S045: Average bankfull is given as 17.5 feet. This is pushing the limits of a standard crane mat. Additional details of any approach work adjacent to the crossing (e.g., abutments, piers for larger streams, etc.) and consideration of alternative stream crossings are advised.

First Wind Response: This stream will be accessed from the east and the west. No crossing will be necessary for the construction of the project.

Stream S050: same comments as Stream S045, only this is a larger stream.

First Wind Response: This stream will be accessed from the east and the west. No crossing will be necessary for the construction of the project.

Stream S060: The Construction and Maintenance narrative states "It is likely that construction of the generator lead will not involve a temporary crossing of this stream…" Based on this statement, it is possible that a stream crossing may be necessary at this location, which would be considered a direct impact to the resource. Given the width of this stream and its associated emergent wetland, a detailed description and plans of a possible crossing is needed for review to ensure connectivity be maintained.

First Wind Response: This stream will be accessed from the east and the west. No crossing will be necessary for the construction of the project.

Intermittent streams: As stated above, ephemeral streams are important components of a river network. Some of these streams may seasonally bear brook trout and / or juvenile Atlantic salmon. Therefore a 100-foot buffer should apply to these streams rather than 25-foot buffer prescribed for most.

First Wind Response: As described earlier, First Wind has agreed to a 100-foot buffer for all regulated streams. During the operational life of the project, a 100-foot buffer primarily composed of forbs and

shrubs will be maintained near all streams throughout the project area. Where required, a 16' wide access route will would pass through these buffers for maintenance activities.

Our review could not find specifications on when (or how) ephemeral streams will be crossed. Given their significance in the headwaters, these streams also warrant suitable protection.

Stream S003: the photo shows what appears to be a perennial stream—how was intermittency determined? A photo of it in the dry would be very helpful, especially since there will be work within 10-feet of it.

First Wind Response: Based on 9/10/13 site visit, MDIFW agreed that this was a higher-order intermittent stream and would not be considered perennial based on lack of biological indicators. In addition the field team performing the delineation observed this location and no evidence of surface hydrology was present.

At the request of John Perry, below is a representative photograph of wetland MAY076.

Representative photograph of wetland MAY076

Summary: MDIFW has continuing unresolved concerns for aquatic resources from the Bingham Wind proposal. Major construction projects invariably are challenged to avoid impacts to downstream aquatic resources. Risks are much greater on an extensive network of ridgelines with significant slopes and stream interspersion. MDIFW welcomes …

1. ***Review and feedback from the applicant:*** *I applaud the willingness of the applicant to continue efforts to reconcile concerns and conduct a site visit with key staff of appropriate agencies. Urgency for these review comments is the sole reason that our staff have been not yet participate in a special site visit focused on aquatic issues. We remain willing to meet on site.*
2. ***Review of MDIFW comments by MDEP's Stormwater Engineer:*** *Cumulative impacts on aquatic resources hinge on a clear understanding of stormwater management. Art McGlauflin is well-versed in the subject and applicable standards. The many unresolved concerns in his initial review parallel questions from this agency. Review of the applicant's response (posted on-line August 12) is ongoing. The evaluation of increased*

> *discharge volumes, changes in flow patterns, increased potential for erosion / sedimentation, and modification of downslope stream channels is crucial to our determination of potential impacts to aquatic habitats. Any reclamation deficiencies on site amplify the risks of increased runoff, altered hydrology, and potential impacts to sensitive headwater streams.*

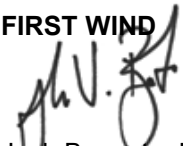
Thank you for the opportunity to resolve and clarify our concerns for aquatic habitats at the proposed Bingham Wind Project. The July 22 public meeting in Moscow certainly demonstrated that Maine citizens are also concerned with potential risks to aquatic resources near the proposal.

First Wind and its consultants have been in regular consultation with MDEP, MDIFW, and USFWS over the last four years in order to provide regular updates on the project's status, and ensure the project is designed to avoid and minimize impacts to natural resources. While the stormwater plan as proposed meets or exceeds the minimum standards of MDEP's Chapter 500 Stormwater Law, First Wind is willing to consider modifications to the plan at specific locations where connectivity of aquatic habitats may be of interest. In addition, based on comments from MDIFW, First Wind has reduced the number of temporary stream crossings along the generator lead route, and made other modifications to the project design. Importantly, First Wind is prepared to partner with the State to conduct a pre- and post-construction water quality study, if MDIFW desires.

We hope these responses address MDIFW's preliminary comments regarding aquatic resources relative to the proposed Bingham Wind Project. We greatly appreciate the collaborative nature of MDIFW's review of our Site Law application and we look forward to continued positive discussions.

Sincerely,

FIRST WIND



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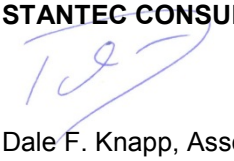

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Attachments: Exhibit A – Bingham Consultation Timeline
Exhibit B – Project Comparison – Maine Wind Projects
Exhibit C – Agency of Natural Resources: Biological Sampling Results for Sheffield Wind Project Site for 2006-2012
Exhibit D – Northern Spring Salamander Surveys, September 2013

Appendix A
Bingham Consultation Timeline

Bingham Consultation Timeline (Maine DEP and Maine IFW)

March, 2010: Develop work plan with IFW/USFWS

Summer, 2010: Tour of Project Area with IFW/USFWS

June, 2011: Tour of Project Area with IFW/USFWS

February, 2012: Meeting with IFW in Bangor

May, 2012: Meeting with IFW/FW in Skowhegan

September, 2012: Meeting with IFW in Bangor

October, 2012: Meeting with MDEP (Ken Libby) on Stormwater Design

November, 2012: Pre-Application Meeting with MDEP

March, 2013: Meeting with MDEP (Art McGlauflin) on Stormwater Design

April, 2013: Pre-Submission Meeting MDEP in Augusta

April, 2013: Submit Application

April, 2013: Page Turn Meeting MDEP/IFW in Augusta

May, 2013: Submit ACOE Application

May, 2013: Meeting with MDEP/IFW on application

July, 2013: Meeting with MDEP on Art Mcglauflin's Stormwater Review

July, 2013: Meeting with MDEP/IFW on wildlife issues

July, 2013: Tour with MDEP of project site

August, 2013: Meeting with MDEP/IFW on wildlife issues

September, 2013: Full day tour with IFW/DEP/USFWS

Appendix B
Project Comparison – Maine Wind Projects

PROJECT COMPARISON – MAINE WIND PROJECTS

	Bingham	**Oakfield**	**Kibby**	**Rollins**	**Stetson/Line 56**
Status	permitting	permitted	operational	operational	operational
Turbines	62	50	44	40	38
Total MWs	191	150	132	60	82.5
Length of Gen-Lead (mile)	17	59	28	9	38
Elevation range	1400' to 1700'	730' to 1450'	2500'' to 3200'	600' to 1,000'	1150' to 1450'
Lynx Critical Habitat	no	no	partial	no	no
Salmon Critical Habitat	partial	yes	no	yes	partial
Perm Fill (acres)	1.3	1.9	0.4	0.1	0.1
Perm Fill by MW	0.01	0.02	0	0	0
Wetland Clearing (acres)	34.4	137.4	37	35	81.9
Wetland clearing by MW	0.18	0.92	0.28	0.58	0.99
Stream Impacts (l.f.)	0	72	unknown	157	789
Stream Impact by MW	0	0.48	unknown	2.6	13.8
Impervious / Permanent Clearing (*)	80	86	130	28	39.2
Impervious/ Permanent by MW	0.42	0.57	0.98	0.47	0.48
Developed Area	424	1017	733	530	286
Developed Area by MW	2.22	6.78	5.55	8.83	3.47
Total miles of road to be used	22	24	17.4	12	16
Miles of road by MW	0.12	0.16	0.13	0.20	0.20
Miles of existing road to be used	5.3	unknown	unknown	unknown	6.7
IWWH impacts (acres)	3.1	39	unknown	5.8	74
IWWH impacts by MW	0.02	0.26	unknown	0.10	1.30
DWA Impacts (acres)	21.5	70	0	28.3	9
DWA impacts by MW	0.11	0.47	unknown	0.47	0.16

* LUPC permitted Stetson and Kibby and use the term permanent clearing instead of impervious surface.

Appendix C

Agency of Natural Resources: Biological Sampling Results for Sheffield Wind Project Site for 2006-2012

Agency of Natural Resources
Department of Environmental Conservation
Watershed Management Division
Monitoring and Assessment Program
Biomonitoring and Aquatic Studies Section

To: Kevin Burke, Environmental Analyst V, Stormwater Program
From: Richard Langdon, Environmental Scientist VI, Biomonitoring and Aquatic Studies Section
Date: February 22, 2013
Subject: Biological sampling results for Sheffield Wind Project site for 2006-2012

This is the second memo that reports the biological status of streams draining the Sheffield Wind Project. This summary includes results from non VTDEC data for macroinvertebrate communities collected during 2006 and 2009. VTDEC data included in this discussion was collected in 2010, 2011 and 2012 and included fish community samples as well as macroinvertebrates.

Construction on the Sheffield Wind Project site began on 9/13/2010, with work being initiated on the main entrance road located in the Nation Brook tributary watershed. The 2006, 2009 and 2010 biological samples represent the pre-construction stream biological condition and therefore act as a control with which the 2011 and 2012 data can be compared.

Macroinvertebrate Community Summary

Four of the five stream reaches sampled during the two post-construction years (2011 and 2012) maintained an e*xcellent* to v*ery good* level of biological integrity in the primary biometrics with the exception of the Annis Brook 0.7 site, which scored a *Fair* in 2011 (Table 1). This site was sampled two weeks after TS Irene and suffered a loss in density due to scour from high flows - not unexpected for such a high gradient stream. Numbers of macroinvertebrates rebounded in 2012, as did the community assessment, which was v*ery good*. A minor increase in the percent Oligochaeta (aquatic worms) compared to reference condition kept the assessment from being excellent in 2012. Annis Brook has exhibited this same pattern of low density and slightly elevated percent Oligochaeta during the pre-construction years of 2006 and 2009 as well. The high gradient of Annis Brook probably renders the macroinvertebrate community vulnerable to more frequent scour from runoff events.

Community assessments from Nation Brook tributary, Clark Brook and Calendar Brook tributary 22 were all e*xcellent* to e*xcellent-to-very good* in 2012. Macroinvertebrate community integrity of the Calendar Brook site dropped from e*xcellent-to-very good* in 2011, to *good* in *2012*. Preconstruction assessments (2006 and 2009) were v*ery good* and *good*. The lower assessment in 2012 was due to a shift in the functional group composition which resulted in a lower measure of similarity to the reference expectation. The shift in numbers from the expected proportion of predators and shredder-detritivoures (leaf shredders) to an increase in collector-gatherers, and scrappers was probably due to the development of a beaver dam constructed at a road culvert and the resultant stream ponding above the sample site. The culvert, once dammed, forced runoff from rain events to overtop the gravel road and deposit sand, gravel and fine material from the pond bottom on to the stream substrate below the road crossing. The impact on the biology downstream from this would vary year to year depending on the degree and location of beaver dam ponding in the watershed above the sampling reach, and the severity and frequency of runoff events. The 2012 sample observations noted a silt covering

over the substrate and 15% coverage from a combination of sand and silt. The embeddedness also rated only as good for the second year in a row. Because of beaver activity in the area, and the number of logging road crossings, and transmission line clearing between the current sample location and the project site, this monitoring location should be moved upstream if possible next year, so as to more clearly detect any stormwater effects on stream biota.

Fish Community Summary

The fish communities of the streams draining the project continued to show no significant impact from the project (Table 2). Clarke and the Calendar Brook Tributary showed *excellent* biological integrity of the fish assemblages post construction (2011 and 2012). While the Annis Brook community Coldwater Index of Biotic Integrity (CWIBI) could not be scored due to too few native species, annual total trout densities (numbers/100 m^2 from one electrofishing run) were higher during 2011 and 2012 than for the 2010 preconstruction control. In 2012 an additional Annis Brook site was sampled approximately 0.4 miles upstream from the existing 0.1 site. No CWIBI could be scored for this site but a brook trout population with a relatively high population density (both population estimate and one run density) coupled with a good distribution of size classes indicated excellent conditions.

The Nation Brook Tributary Three fish community scored a CWIBI of 36 out of a possible 45 points (v*ery good*). This was lower than the previous year's *excellent* and was due to higher number of creek chub, a tolerant species, recorded in the sample. Numbers of brook trout were slightly lower but still within acceptable levels. Although substrate embeddedness was rated excellent, as was the overall macroinvertebrate community assessment, the proportion of sand in the substrate increased from 0 in 2011 to 7% in 2012. The source may have been excessive runoff from the access road to the wind farm project caused by a nonfunctioning settling pond. Rather than being directed into Basin 55P, runoff water instead flowed across the road, into the wooded area, eventually reaching the brook upstream of the sample site. Following the fish sampling in the fall of 2012, this issue was addressed by First Wind by resetting the culvert and providing additional stabilization to the drainage ditch on the north side of the access road.

Small coldwater streams, such as the ones here under study, mostly function as nursery areas and habitat for smaller brook trout, with larger individuals preferring the greater habitat volume (mostly pools) of larger streams. Predictably then, numbers of 6-10" brook trout in these small streams did not form a significant portion of the samples, which were dominated by smaller brook trout.

Distribution of brook trout lengths are only available, pre-and post-construction, for Annis Brook 0.1 and Clark Brook. Both showed the expected dominance of young-of-year (YOY) fish, with numbers increasing in Clark Brook during 2011 and 2012 and in Annis Brook 0.1 in 2012. The 2010 length data for Nation Brook Tributary, stored in Waterbury, was lost during TS Irene in 2011. Numbers of non YOY individuals at the Nation Brook Tributary 3 site dropped slightly in 2012. The Annis Brook 0.5 site was first sampled during 2012 and showed the characteristic dominance by smaller fish while retaining representation of <6" and 6"+ fish. Calendar Brook Tributary 22 was sampled in 2010 and 2011. Brook trout YOY there increased dramatically between 2011 and 2012. The stream hydrology of 2011 was characterized by two unusually intense precipitation events: a rapid snowmelt runoff in the spring and then Tropical Storm Irene in August. In contrast, the spring snow melt of 2012 was relatively benign (see Figure 1). The severity of spring runoff can affect numbers of surviving YOY trout. All four sites that were sampled during 2011 and 2012 showed higher numbers of YOY brook trout in 2012.

DEC will conduct biological sampling of these sites for one more year. A detailed report of all DEC data collected near this project will be completed in 2014.

Table 1. Macroinvertebrate community metrics from six stream reaches immediately below the Sheffield Wind farm project. The years 2006, 2009, and 2010 represent preconstruction baseline biological conditions. Construction and post construction samples were taken during 2011 and 2012.

Location	Site RM	Date	Score	Density	Richness	EPT	PMA-o	B.I.	Oligo%	Ept/ EptC	PPCS-F
Annis Brook	0.1	2006	**Fair**	159.0	42.5	26.0	83.5	2.08	2.9	0.97	0.73
	0.7	2009	**Fair-Good**	268.5	32.0	22.0	85.1	1.58	2.6	0.95	0.64
	0.7	2010	**Excellent.-Very Good**	1093.7	32.0	20.0	74.0	1.99	0.9	0.98	0.60
	0.7	2011	**Fair**	198.5	37.0	22.0	75.3	2.74	1.4	0.96	0.76
	0.5	2012	**Very Good**	1342.0	41.0	24.0	89.1	2.29	3.9	0.90	0.66
Nation Brook Tributary 3	0.8	2009	**Very Good**	543.5	33.0	22.0	75.4	1.60	0.3	0.88	0.65
	0.8	2010	**Excellent**	907.2	50.0	31.0	80.5	2.44	0.0	0.98	0.73
	0.8	2011	**Excellent**	981.0	44.5	29.5	74.0	1.78	0.8	0.99	0.60
	0.8	2012	**Excellent**	1498.0	43.5	27.5	84.9	2.03	0.4	0.93	0.68
Calendar Brook	11.2	2006	**Very Good**	417.5	37.5	22.5	77.4	2.27	1.0	0.96	0.60
	11.2	2009	**Good**	321.0	42.0	29.5	81.1	1.76	1.2	0.93	0.75
	11.2	2011	**Excellent-Very Good**	1258.0	38.5	26.5	56.0	2.53	0.7	0.98	0.46
	11.2	2012	**Good**	1167.3	46.0	26.0	62.6	3.04	0.3	0.91	0.43
Clark Brook	0.1	2006	**Good-Fair**	248.5	32.5	20.5	75.0	2.62	6.1	0.94	0.59
	0.2	2009	**Very Good**	452.0	31.0	23.0	65.9	2.07	3.4	0.96	0.51
	0.2	2010	**Very Good**	1504.0	42.0	27.0	56.7	3.08	0.5	0.98	0.40
	0.2	2011	**Excellent-Very Good**	688.0	41.0	25.5	58.5	3.15	1.4	0.99	0.49
	0.2	2012	**Excellent-Very good**	1431.5	43.0	27.0	61.1	2.91	1.1	0.97	0.46
Calendar Brook Tributary 22	0.4	2006	**Excellent**	553.5	36.0	23.0	80.4	1.83	2.1	0.96	0.60
	0.4	2009	**Excellent**	490.5	36.0	23.5	86.4	1.62	1.7	0.95	0.66
	0.4	2010	**Very Good**	1280.0	40.0	21.0	60.8	2.69	1.3	0.97	0.45
	0.4	2011	**Excellent**	878.2	43.0	28.0	69.0	2.64	1.4	0.98	0.61
	0.4	2012	**Excellent**	980.0	48.0	26.5	77.2	2.43	1.7	0.93	0.59
ANR Biocriteria for Small High Gradient Streams			***Excellent***	*>500*	*> 35*	*> 21*	*>65*	<	< 2	> 0.65	> 0.50
			Very Good	*>400*	*> 31*	*>19*	*> 55*	<	< 5	> 0.55	> 0.45
			Good	*>300*	*> 27*	*> 16*	*> 45*	<	< 12	> 0.45	> 0.40

Table 2. Density for fish species in #s/100m² for one electrofishing run and population estimates (numbers/100m² - in italics) at five sites in four streams within Sheffield Wind farm drainages. Pre-construction condition is represented by 2010 data, and during and post-construction by 2011and 2012 data (pre and post separated by double vertical line. All data was collected in the month of September.

	Annis Brook RM.01			**Annis Brook RM 0.5**			**Nation Brook Tributary 3**		
	2010	*2011*	*2012*	*2010*	*2011*	*2012*	*2010*	*2011*	*2012*
Brook Trout	6.5 -	7.0 -	15.7 *17.9* *(14.3-27.1)*	Not sampled		17.9 *22.2* *(21.7-24)*	13.0	11.4	9.2 *17.9* *(14.3-26.3)*
Rainbow Trout	8.4 -	18.1 -	7.5 *7.5* *(7.5)*			0	0	0	0
Creek Chub	0	0	0			0	0	0.3	3.1 *3.6* *(3.6-4.0)*
Slimy Sculpin	0	0	0			0	0	0	0
Coldwater IBI	-	-	-			-	-	**42* Excellent**	**36 Very Good**

	Clark Brook			**Calendar Brook Tributary 22**		
	2010	2011	2012	2010	2011	2012
Brook Trout	5.0	4.8 *10.3* *(7.9-16.7)*	8.2 *13.3* *(11.7-17.0)*	Not Sampled	17.8 *19.7* *(19.7-20.5)*	26.7 *29.4* *(29.4-30.2)*
Rainbow Trout	0	0	0		0	0
Creek Chub	0	0	0		0	0
Slimy Sculpin	3.6	4.4 *20.2* *(9.6-56.3)*	8.2 *13.3* *(11.7-17.0)*		2.0 *15.8* *(15.8-52.3)*	5.0 *5.6* *(5.6-6.0)*
Coldwater IBI	**45 Excellent**	**45 Excellent**	**45 Excellent**		**45 Excellent**	**45 Excellent**

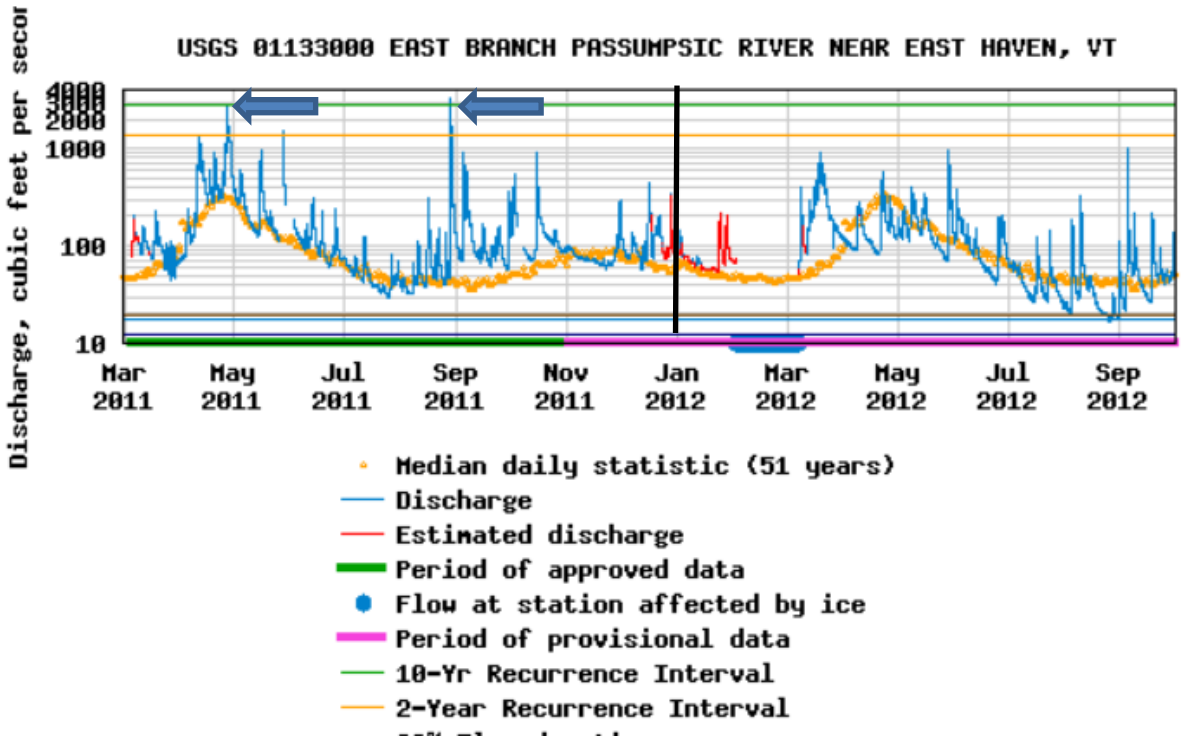
* CWIBI range= 9 -poor to 45-excellent

Table 3. Number of brook trout sampled by length categories from preconstruction (2010) to during and after construction (2011 and 2012). YOY - young-of-year. DNS – did not sample.

	Annis Brook RM.01			**Annis Brook RM 0.5**		**Nation Brook Tributary 3**			**Clark Brook**			**Calendar Brook Tributary 22**		
	2010	2011	2012	DNS	2012	2010*	2011	2012	2010	2011	2012	DNS	2011	2012
electrofishing runs	1	1	2		2		1	2	1	2	2		2	2
YOY	6	3	27		24		22	23	5	10	17		13	44
4-6"	7	8	8		13		9	5	9	11	10		16	3
Over 6"	1	3	2		3		2	0	0	2	2		1	1

*data lost in T.S. Irene flood- 2011

Figure 1. USGS Discharge data from station 01133000 East Branch of the Passumpsic River, East Haven VT. Comparison between the spring snow melt and other high runoff events between the years 2011 (arrows) and 2012.



C: Judith Dillon

Jon Groveman

Appendix D

Northern Spring Salamander Surveys, September 2013

Stantec

Memo

To:	Dale Knapp, Stantec Consulting Services Inc. 30 Park Drive Topsham, Maine 04086	From:	Charles Ferris, Stantec Consulting Services Inc. 30 Park Drive Topsham, Maine 04086
File:	195600539	Date:	September 17, 2013

Reference: Northern Spring Salamander Surveys, September 2013
Bingham Wind Project

On September 10, 11, and 12, 2013, Stantec Consulting Services Inc. completed seasonally appropriate northern spring salamander (*Gyrinophilus porphyriticus*) surveys along the proposed generator lead corridor for the Bingham Wind Project (project) in Somerset and Piscataquis Counties, Maine. This memo summarizes the results of those surveys.

Survey Methods

Northern Spring Salamander Survey Methodology

Prior to conducting field surveys within the proposed generator lead corridor, Stantec reviewed stream data and photographs that had been compiled during the stream delineations in 2012 and 2013 within the expanded portions of the project area in order to identify potentially suitable stream habitats that may support northern spring salamanders. Based on Stantec's past experience with this species, northern spring salamanders prefer well-oxygenated perennial streams with a moderate to swift gradient, a rock-cobble-gravel-dominated substrate with low to moderate embeddedness of larger substrate materials, and generally with a source above 800 feet in elevation. A list of streams containing potentially suitable northern spring habitat was generated to target field surveys. Stantec ecologists surveyed the entire generator lead during delineations to assess streams that may be suitable for northern spring salamanders.

Seasonally-appropriate field surveys were conducted on September 10-12, 2013, along the proposed generator lead corridor. During the surveys, Stantec visited each stream that was identified as providing potentially suitable habitat. If the stream contained apparently suitable habitat, the stream was surveyed for northern spring salamanders. This effort included turning over rocks and logs of various sizes within and adjacent to the stream, targeting habitat areas for both adults and larvae throughout the section of the stream located within and immediately adjacent (i.e., within 250 feet) of the project area limits. Captured individuals were promptly identified, photographed, and returned to the stream at the capture location. Once a northern spring salamander was documented within a stream reach, survey efforts in that reach were considered complete.

Survey Results

Based upon the survey of the proposed transmission line corridor, 17 streams were initially identified as having habitat potentially suitable for the northern spring salamander (Figure 1). Targeted field surveys were conducted between September 10 and September 12, 2013, along the proposed generator lead. In summary, northern spring salamanders were documented in five of the seventeen streams surveyed along the proposed transmission line corridor (Figure 1). Table 1 summarizes the results of the stream surveys. Representative photographs are included in Appendix A. Completed rare animal field forms are included in Appendix B.

Table 1: Summary of Northern Spring Salamander Surveys

Stream ID	Date Surveyed	Spring Salamander Documented?	Figure	Comments
SO43	9/10/2013	N	1	Small stream, with moderate gradient and boulder-cobble-gravel substrate. Dry at time of survey. Stream appears to be extremely flashy. Evidence of washed out culvert and steep, eroded banks.
SO45	9/10/2013	Y	1	**Bottle Brook.** Large, undisturbed, perennial stream with a low-to-moderate gradiant, and a rock-cobble-gravel-sand substrate, with little organic material in the stream channel. At time of survey, wetted width was approximately 15 feet with a bankfull width of approximately 20 feet. Water depth averaged about 6 inches. A two-lined salamander was also observed.
SO46	9/10/2013	Y	1	Unnamed tributary to Kingsbury Stream. Small, undisturbed, perennial stream with low-to-moderate gradient and rock-cobble-gravel-sand substrate with little organic material in stream channel. At time of survey, wetted width ranged from 3 to 6 feet with a bankfull width ranging from 6 to 8 feet. Water depth averaged about 6 inches.
SO47	9/10/2013	N	1	Small stream, with low gradient and boulder-cobble-gravel substrate. Dry at time of survey. Southern end of survey area is more wetland than stream.
SO48	9/10/2013	N	1	Small perennial stream with low gradient and boulder-cobble-gravel substrate with organic matter and algae growing on rocks. One adult dusky salamander and a small brook trout observed.
SO49	9/10/2013	Y	1	**Bear Brook.** Undisturbed perennial stream with low-to-moderate gradient and a rock-cobble-gravel-sand substrate. At time of survey, wetted width was approximately 10 feet and bankfull width ranged from 10 to 12 feet. Very little organic material observed in channel. Water depth averaged about 6 to 8 inches.
SO50	9/10/2013	N	1	Large perennial stream, with moderate gradient and a substrate consisting of mostly large rocks covered with moss and some vegetation. At time of survey, water was flowing underneath rocky substrate.
SO51	9/10/2013	N	1	Small perennial stream with low gradient and gravel substrate with mud and organic material. One adult dusky salamander and a two-lined salamander observed.
SO52	9/10/2013	N	1	**Kingsbury Stream.** Large, perennial stream with low-to-moderate gradient and boulder-cobble-gravel substrate. Brook trout fishery. Abundance of fish may limit potential of spring salamanders.
SO57	9/11/2013	N	1	Small perennial stream with low gradient and cobble-gravel-sand-muck substrate. Watercourse has a braided channel within forested wetland complex. Two dusky salamanders and one two-lined salamander observed.
SO58	9/11/2013	N	1	Small perennial stream with moderate gradient and rock-cobble-gravel substrate with mud and organic material. Twelve dusky salamanders observed.

SO62	9/11/2013	N	1	**Carltron Stream.** Large, perennial stream with gradual gradient and boulder-cobble substrate. Likely contains an abundance of fish. One adult two-lined salamander observed.
SO63	9/11/2013	N	1	Perennial stream with moderate gradient and boulder-cobble-gravel substrate. Stream is bisected by road and adjacent to development which may make the stream flashy. Three dusky salamanders and seven two-lined salamanders observed.
SO65	9/11/2013	N	1	Perennial stream with moderate gradient and rock-cobble-gravel substrate with some organic material. Stream is bisected by road. Eight two-lined salamanders observed.
SO66	9/11/2013	N	1	Perennial stream with moderate gradient and rock-cobble substrate. Stream originates from a wetland system south of road and is diverted to flow into a ditch parallel to the road. The ditch then flows through a culvert under the road.
SO70	9/11/2013	Y	1	Unnamed tributary to Gales Brook. Small, undisturbed, perennial stream with low-to-moderate gradient and rock-cobble-gravel-sand-silt substrate with organic material in portion of stream channel running through a wetland complex. At time of survey, wetted width was approximately 3 feet. The stream lacks well defined banks in most places within wetland. Water depth averaged 6 to 8 inches with pools up to 12 inches.
SO71	9/11/2013	Y	1	Unnamed tributary to Gales Brook. Small, undisturbed, perennial stream with low-to-moderate gradient and rock-cobble-gravel-sand substrate. The stream has many flat stones and several areas of exposed ledge. At time of survey, wetted width ranged from 3 to 15 feet with bankfull width ranging from 10 to 15 feet. Water depth averaged about 3 to 6 inches. Three northern dusky salamanders were observed.

A northern spring salamander was observed in stream SO45 on September 10, 2013 (Figure1). The stream (Bottle Brook) is a large, undisturbed, perennial stream with a low-to-moderate gradient, and a rock-cobble-gravel-sand substrate, with little organic material in the stream channel. At the time of the survey, wetted width was approximately 15 feet with a bank full width of approximately 20 feet. Water depth averaged about 6 inches. A two-lined salamander was also observed.

A northern spring salamander was observed in stream SO46 on September 10, 2013 (Figure 1). The stream (unnamed tributary to Kingsbury Stream) is a small, undisturbed, perennial stream with low-to-moderate gradient and rock-cobble-gravel-sand substrate with little organic material in stream channel. At time of survey, wetted width ranged from 3 to 6 feet with a bank full width ranging from 6 to 8 feet. Water depth averaged about 6 inches.

A northern spring salamander was observed in stream SO49 on September 10, 2013 (Figure 1). The stream (Bear Brook) is an undisturbed perennial stream with low-to-moderate gradient and a rock-cobble-gravel-sand substrate. At the time of the survey, wetted width was approximately 10 feet and bank full width ranged from 10 to 12 feet. Very little organic material observed in channel. Water depth averaged about 6 to 8 inches.

A northern spring salamander was observed in stream SO70 on September 11, 2013 (Figure 1). The stream (unnamed tributary to Gales Brook) is a small, undisturbed, perennial stream with low-to-moderate gradient and rock-cobble-gravel-sand-silt substrate with organic material in portion of stream channel running through a wetland complex. At the time of the survey, wetted width was approximately 3 feet. The stream lacks well defined banks in most places within wetland. Water depth averaged 6 to 8 inches with pools up to 12 inches.

September 17, 2013

A northern spring salamander was observed in stream SO71 on September 11, 2013 (Figure 1). The stream (unnamed tributary to Gales Brook) is a small, undisturbed, perennial stream with low-to-moderate gradient and rock-cobble-gravel-sand substrate. The stream has many flat stones and several areas of exposed ledge. At the time of the survey, wetted width ranged from 3 to 15 feet with bank full width ranging from 10 to 15 feet. Water depth averaged about 3 to 6 inches. Three northern dusky salamanders were also observed.

The remaining streams originally identified (Table 1) as potential habitat for northern spring salamanders are generally low gradient streams with organic material present in the channel, or are large streams with abundant populations of fish. Several of the streams do support dusky salamanders and two-lined salamanders. However, no northern spring salamanders were observed at the time of the survey in these streams.

Please contact me if you have any questions regarding the information presented in this report or if I can be of further assistance.

Figure 1

Stantec Consulting Services Inc.
30 Park Drive
Topsham, ME USA
04086
Phone (207) 729-1199
Fax: (207) 729-2715
www.stantec.com

00539_001_SpringSalamanderMap.mxd

Legend

- Delineated Vernal Pool
- Delineated Significant Vernal Pool
- Vernal Pool 250ft Buffer
- Delineated Stream
- Delineated Wetland
- Spring Salamander Location
- Northern Spring Salmander 250ft Survey Area
- Proposed Turbine
- Electrical Generator Lead
- Site Plan
- Clearing Limits
- Edge of Gravel
- Deer Wintering Area
- Inland Waterfowl / Wading Bird Habitat

Notes

Client/Project
Bingham Wind Project

195600539

Figure No.
1

Title
Spring Salamander Map

9/17/2013

Appendix A

Representative Photographs

Photo 1: Northern spring salamander documented in Stream SO45 on September 10, 2013.

Photo 2: Stream SO45 looking south downstream on September 10, 2013.

Photo 3: Larvae northern spring salamander documented in Stream SO46 on September 10, 2013.

Photo 4: Stream SO46 surveyed habitat.

Photo 5: Adult northern spring salamander in Stream SO49 on September 10, 2013.

Photo 6: Stream SO49 surveyed habitat.

Photo 7: Adult northern spring salamander documented in Stream SO70 on September 11, 2013.

Photo 8: Stream SO70 surveyed habitat.

Photo 9: Adult northern spring salamander documented in Stream SO71 on September 11, 2013.

Photo 10: Stream SO71 surveyed habitat.

Appendix B

Rare Animal Field Forms

INSTRUCTIONS: Complete 1 form per visit. **Grayed sections are for Heritage office use only**. rev. 02/06/2008

RARE ANIMAL SURVEY FORM

MDIFW
650 State St.
Bangor, ME 04401

Completed By: Kevin J. Ryan **Date**: 09/12/13 Review by (MDIFW): Date:

SURVEYSITE: Stream SO70 (Unnamed tributary to Gales Brook)			**TOWNSHIP**: Abbot
NEW EO (check):	UPDATE (check):	(EO NUM:)	**DELORME PAGE & GRID (e.g. 04B2): 31C4**

ELEMENT INFORMATION

Common Name: Northern spring salamander **Scientific Name**: *Gyrinophilus porphyriticus*

SURVEYOR INFORMATION

Survey date (2013 – 09 – 11): Time from: 2:20 to: 2:50 pm Sourcecode: F_ _ _ _ _ _ _

Surveyors (principal surveyor first, include first & last name and contact information): Kevin J. Ryan – FB Environmental under the auspices of Stantec Consulting, 30 Park Drive Topsham, ME 04086 (207) 729-1199, kevinr@fbenvironmental.com

IDENTIFICATION

Photograph/slide taken? Yes X No Notes & repository: On file with Stantec

Specimen collected? Yes No X Specimen # and repository:

Identification problems? Yes No X Explain:

ELEMENT OCCURRENCE INFORMATION

1. Type of Observation: sight X vocalization handled X collected other (explain):

2. Observed Abundance (incl. age and sex): 1 adult, sex not determined

3. Estimated Abundance (and basis for estimate): unknown

4. Evidence of Reproduction and/or Other Behaviors:

5. Misc. Notes:

HABITAT DESCRIPTION

Describe the specific habitat or micro-habitats where this animal occurs. Convey a mental image of the habitat and its features including: land forms, aquatic features, vegetation, slope, aspect, soils, associated plant and animal species, natural disturbances.

Most of the section of stream surveyed is within a forested wetland complex. The portion of stream running through this wetland has a gravel-sand-silt substrate with areas of mud and muck. The area where the spring salamander was found is just upstream from the wetland complex and has a rock-cobble-gravel substrate and with little accumulation of organic matter in the stream channel. Overall the stream is an undisturbed perennial stream with a low- to moderate-gradient. At the time of the field survey, the wetted width of the stream was approximately 3 feet. The stream lacks a well-defined bank in most places as it is bordered by wetland. Water depth averaged about 6 to 8 inches with small pools up to 1 foot deep.

Salamander was found under partially exposed rock in the stream channel.

THREATS AND/OR MANAGEMENT CONCERNS:

DIRECTIONS

Provide detailed directions to this element occurrence (versus the survey site) using a readily locatable and relatively permanent landmark as a starting point. Refer to nearby landmarks, roads and villages. Include distances, compass directions (North, South etc.).

Use aerial photos/gazetteer to navigate. In the town of Abbot, park on Gales road 0.35 miles west from intersection with Monument Road (shown as Back Parkman road in Google Earth) Walk south/southwest in woods for 0.25 miles to stream.

OWNER: (If known, indicate name of owner(s), address and phone number):

LOCATION of OBSERVATION

Source 1: _____0463994_____ UTM-E _____5000176_____ UTM-N **NAD** 83

Source 2: _____ UTM-E / Lat _____ UTM-N / Long **NAD** 83 **/** 27 (circle one)

Coordinates / polygon provide location of:

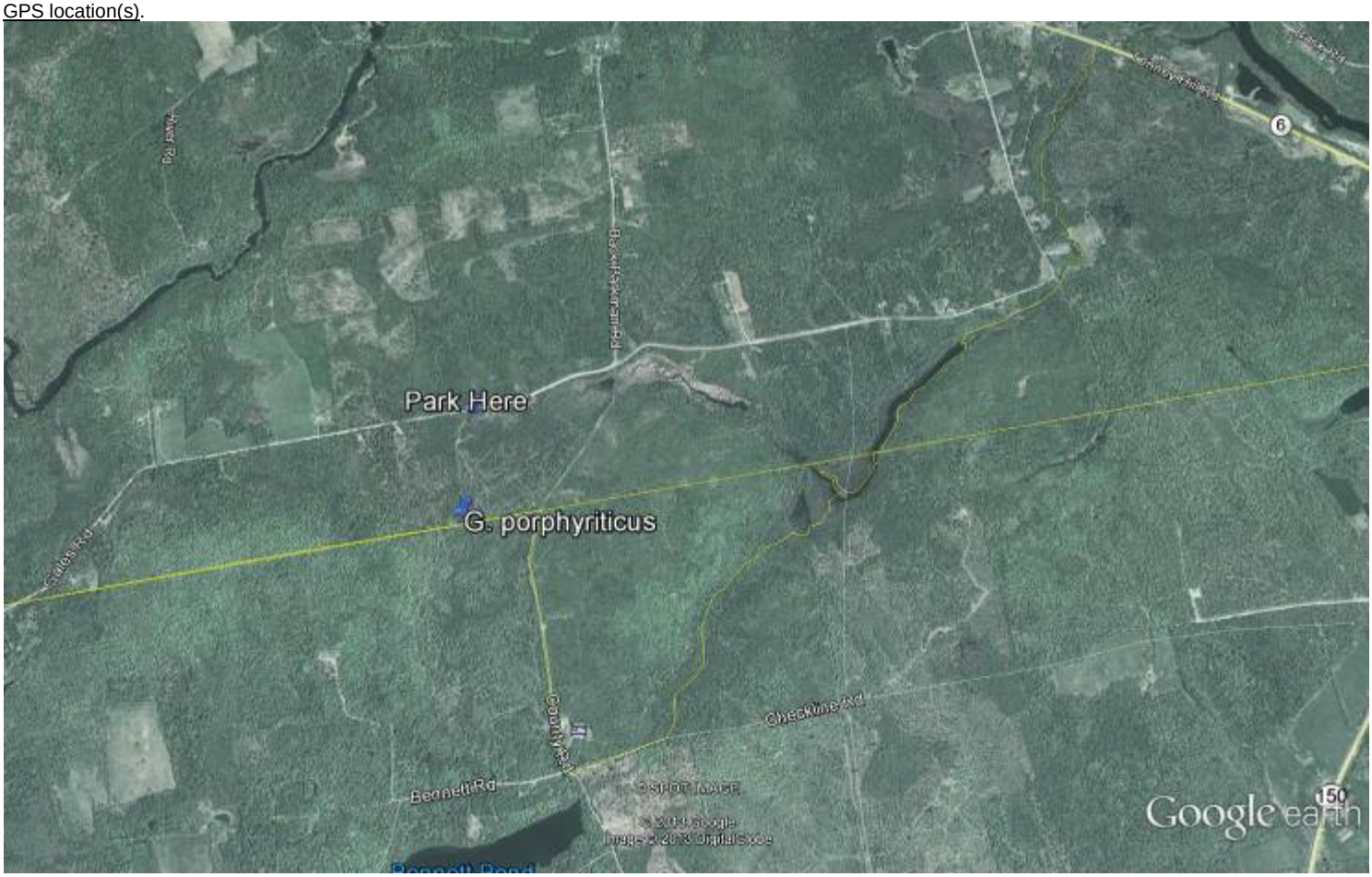
X Animal/habitat feature(s) **OR** ☐ Observer--DISTANCE / DIRECTION to animal/habitat feature: _____ meters / feet at _____°

GPS Unit Information

☐ Differentially corrected X Unit accuracy for location: ±___10_____m ☐ # of Satellites = _____ ☐ 2D / 3D

Unit Model _____Garmin GPSmap 76Cx_____

LOCATION SKETCH (or attach aerial photograph/photocopied topo) Sketch fine details of an overhead view of this observation that may not be apparent on a topo map. Indicate landmarks, important features, route taken, animal/habitat observed, disturbances & threats, scale, and north. Include GPS location(s).



DIGITIZED IN GIS

Scale digitized at = 1:_____

☐ 1:24,000 topographic maps

☐ Orthophoto (pixel size = _____ m / ft), date = _____

☐ Other: _____

HAND-DRAWN

Scale drawn at = 1:_____

☐ Topographic map (scale = 1:_____)

☐ Aerial imagery ☐ Other: _____

scale = 1: _____

date = _____

OVERALL LOCATION ACCURACY: including uncertainty about where the animal/habitat feature was and mapping accuracy related to the GPS unit used, resolution of reference information like topographic maps or aerial photos used, etc.:

± ___1_____ meters

INSTRUCTIONS: Complete 1 form per visit. **Grayed sections are for Heritage office use only**. rev. 02/06/2008

RARE ANIMAL SURVEY FORM

MDIFW
650 State St.
Bangor, ME 04401

Completed By: Kevin J. Ryan **Date**: 09/12/13 Review by (MDIFW): Date:

SURVEYSITE: Stream SO49 (Bear Brook)			**TOWNSHIP**: Kingsbury Plantation
NEW EO (check):	UPDATE (check):	(EO NUM:)	**DELORME PAGE & GRID (e.g. 04B2):** **31C2**

ELEMENT INFORMATION

Common Name: Northern spring salamander **Scientific Name**: *Gyrinophilus porphyriticus*

SURVEYOR INFORMATION

Survey date (2013 – 09 – 10): Time from: 11:35 to: 12:00 **noon** Sourcecode: F_ _ _ _ _ _ _

Surveyors (principal surveyor first, include first & last name and contact information): Kevin J. Ryan – FB Environmental under the auspices of Stantec Consulting, 30 Park Drive Topsham, ME 04086 (207) 729-1199, kevinr@fbenvironmental.com

IDENTIFICATION

Photograph/slide taken? Yes X No Notes & repository: On file with Stantec

Specimen collected? Yes No X Specimen # and repository:

Identification problems? Yes No X Explain:

ELEMENT OCCURRENCE INFORMATION

1. Type of Observation: sight X vocalization handled X collected other (explain):

2. Observed Abundance (incl. age and sex): 1 adult, sex not determined

3. Estimated Abundance (and basis for estimate): unknown

4. Evidence of Reproduction and/or Other Behaviors:

5. Misc. Notes:

HABITAT DESCRIPTION

Describe the specific habitat or micro-habitats where this animal occurs. Convey a mental image of the habitat and its features including: land forms, aquatic features, vegetation, slope, aspect, soils, associated plant and animal species, natural disturbances.

The stream is an undisturbed perennial stream with a low- to moderate-gradient and a rock-cobble-gravel-sand substrate. At the time of the field survey, the wetted width of the stream was approximately 10 feet with a bankfull width ranging from approximately 10 to 12 feet. There was very little organic matter in the stream channel. Water depth averaged about 6 to 8 inches.

Salamander was found under partially exposed rock in the stream channel.

THREATS AND/OR MANAGEMENT CONCERNS:

DIRECTIONS

Provide detailed directions to this element occurrence (versus the survey site) using a readily locatable and relatively permanent landmark as a starting point. Refer to nearby landmarks, roads and villages. Include distances, compass directions (North, South etc.).

Use aerial photos/gazetteer to navigate. From intersection of Route 16 and 151 in Mayfield, travel East on Rt. 16 up for approx. 6.2 miles and turn left on to logging road. Road is passable with an SUV or truck. Travel North on logging for 0.15 miles, park vehicle and then walk west/southwest through woods for 0.2 miles to reach stream.

OWNER: (If known, indicate name of owner(s), address and phone number):

LOCATION of OBSERVATION

Source 1: _____0452192_____ UTM-E _____5000631_____ UTM-N **NAD** 83

Source 2: _____ UTM-E / Lat _____ UTM-N / Long **NAD** 83 **/** 27 (circle one)

Coordinates / polygon provide location of:

X Animal/habitat feature(s) **OR** ☐ Observer--DISTANCE / DIRECTION to animal/habitat feature: _____ meters / feet at _____°

GPS Unit Information

☐ Differentially corrected X Unit accuracy for location: ±___10_____m ☐ # of Satellites = _____ ☐ 2D / 3D

Unit Model _____Garmin GPSmap 76Cx_____

LOCATION SKETCH (or attach aerial photograph/photocopied topo) Sketch fine details of an overhead view of this observation that may not be apparent on a topo map. Indicate landmarks, important features, route taken, animal/habitat observed, disturbances & threats, scale, and north. Include GPS location(s).

DIGITIZED IN GIS

Scale digitized at = 1:_____

☐ 1:24,000 topographic maps

☐ Orthophoto (pixel size = _____ m / ft), date = _____

☐ Other: _____

HAND-DRAWN

Scale drawn at = 1:_____

☐ Topographic map (scale = 1:_____)

☐ Aerial imagery ☐ Other:

_____

scale = 1: _____

OVERALL LOCATION ACCURACY: including uncertainty about where the animal/habitat feature was and mapping accuracy related to the GPS unit used, resolution of reference information like topographic maps or aerial photos used, etc.:

± ___1_____ meters

INSTRUCTIONS: Complete 1 form per visit. **Grayed sections are for Heritage office use only**. rev. 02/06/2008

RARE ANIMAL SURVEY FORM

MDIFW
650 State St.
Bangor, ME 04401

Completed By: Kevin J. Ryan **Date**: 09/12/13 Review by (MDIFW): Date:

SURVEYSITE: Stream SO46 (Unnamed tributary to Kingsbury Stream)			**TOWNSHIP**: Kingsbury Plantation
NEW EO (check):	UPDATE (check):	(EO NUM:)	**DELORME PAGE & GRID (e.g. 04B2):** 31C2

ELEMENT INFORMATION

Common Name: Northern spring salamander **Scientific Name**: *Gyrinophilus porphyriticus*

SURVEYOR INFORMATION

Survey date (2013 – 09 – 10):	Time from: 8:30 to: 9:00 **am**	Sourcecode: F_ _ _ _ _ _ _

Surveyors (principal surveyor first, include first & last name and contact information): Kevin J. Ryan – FB Environmental under the auspices of Stantec Consulting, 30 Park Drive Topsham, ME 04086 (207) 729-1199, kevinr@fbenvironmental.com

IDENTIFICATION

Photograph/slide taken?	Yes X No	Notes & repository:	On file with Stantec
Specimen collected?	Yes No X	Specimen # and repository:	
Identification problems?	Yes No X	Explain:	

ELEMENT OCCURRENCE INFORMATION

1. Type of Observation: sight X vocalization handled X collected other (explain):
2. Observed Abundance (incl. age and sex): 1 larva and 1 adult, sex not determined
3. Estimated Abundance (and basis for estimate): unknown
4. Evidence of Reproduction and/or Other Behaviors:
5. Misc. Notes:

HABITAT DESCRIPTION

Describe the specific habitat or micro-habitats where this animal occurs. Convey a mental image of the habitat and its features including: land forms, aquatic features, vegetation, slope, aspect, soils, associated plant and animal species, natural disturbances.

The stream is a very small undisturbed, perennial stream with a low- to moderate-gradient and a rock-cobble-gravel-sand substrate with little organic material in the stream channel. At the time of the field survey, the wetted width of the stream ranged from approximately 3 to 6 feet with a bankfull width ranging from approximately 6 to 8 feet. Water depth averaged about six inches.

Salamanders were found under partially exposed rocks in the stream channel.

THREATS AND/OR MANAGEMENT CONCERNS:

DIRECTIONS

Provide detailed directions to this element occurrence (versus the survey site) using a readily locatable and relatively permanent landmark as a starting point. Refer to nearby landmarks, roads and villages. Include distances, compass directions (North, South etc.).

Use aerial photos/gazetteer to navigate. From intersection of Route 16 and 151 in Mayfield, travel East on Rt. 16 up for approx. 5 miles and turn left on to logging road and park vehicle (or drive if vehicle is deemed capable). Head northwest on logging road for 0.4 miles then head east through woods for 0.1 mile to stream.

OWNER: (If known, indicate name of owner(s), address and phone number):

LOCATION of OBSERVATION

Source 1: _____0450732_____ UTM-E _____4999904_____ UTM-N **NAD** 83

Source 2: _____ UTM-E / Lat _____ UTM-N / Long **NAD** 83 **/** 27 (circle one)

Coordinates / polygon provide location of:

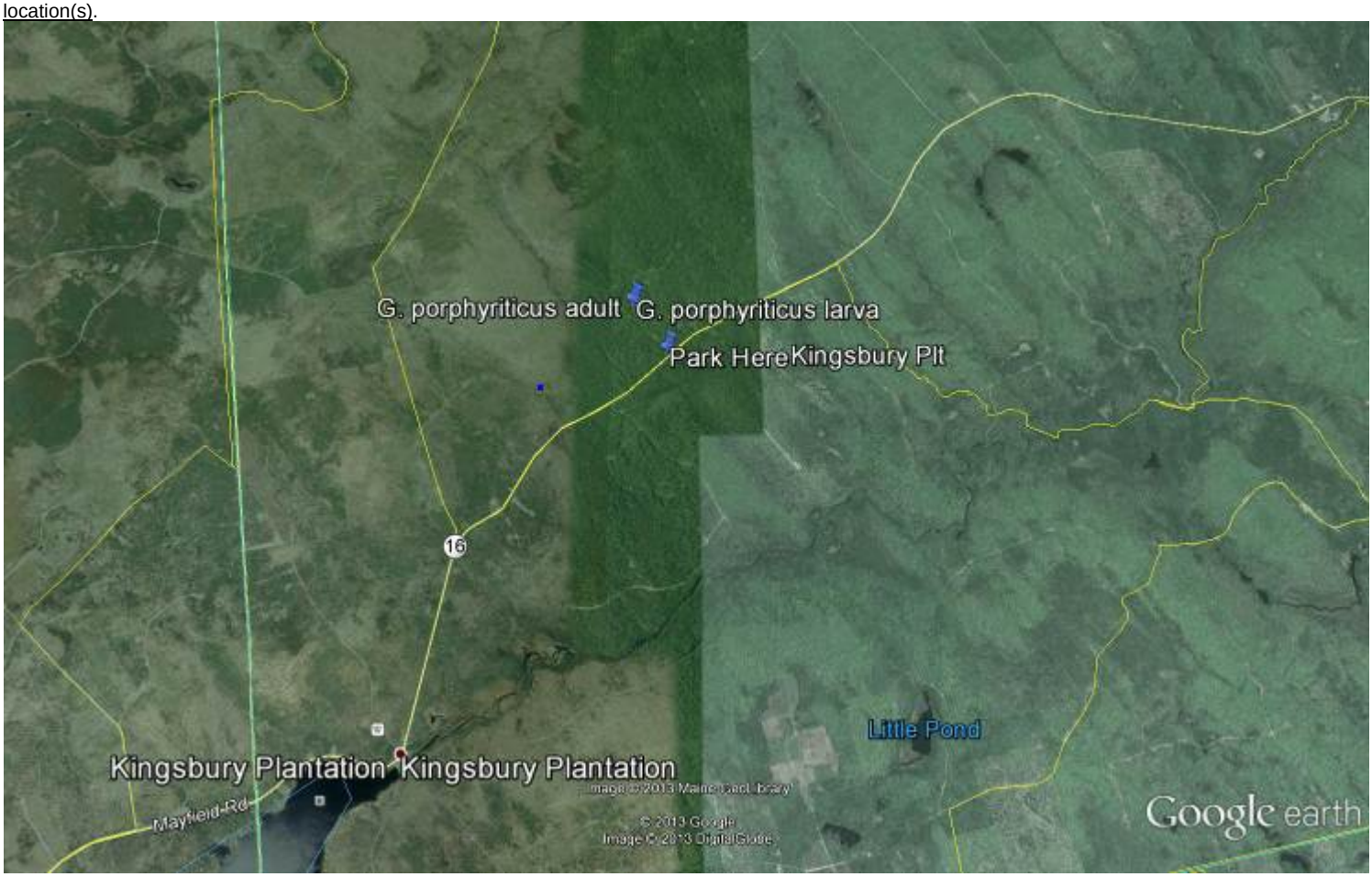
X Animal/habitat feature(s) **OR** ☐ Observer--DISTANCE / DIRECTION to animal/habitat feature: _____ meters / feet at _____°

GPS Unit Information

☐ Differentially corrected X Unit accuracy for location: ±___10_____m ☐ # of Satellites = _____ ☐ 2D / 3D

Unit Model _____Garmin GPSmap 76Cx_____

LOCATION SKETCH (or attach aerial photograph/photocopied topo) Sketch fine details of an overhead view of this observation that may not be apparent on a topo map. Indicate landmarks, important features, route taken, animal/habitat observed, disturbances & threats, scale, and north. Include GPS location(s).



DIGITIZED IN GIS

Scale digitized at = 1:_____

☐ 1:24,000 topographic maps

☐ Orthophoto (pixel size = _____ m / ft), date = _____

☐ Other: _____

HAND-DRAWN

Scale drawn at = 1:_____

☐ Topographic map (scale = 1:_____)

☐ Aerial imagery ☐ Other:

_____

scale = 1: _____

OVERALL LOCATION ACCURACY: including uncertainty about where the animal/habitat feature was and mapping accuracy related to the GPS unit used, resolution of reference information like topographic maps or aerial photos used, etc.:

± ___1_____ meters

INSTRUCTIONS: Complete 1 form per visit. **Grayed sections are for Heritage office use only**. rev. 02/06/2008

RARE ANIMAL SURVEY FORM

MDIFW
650 State St.
Bangor, ME 04401

Completed By: Kevin J. Ryan **Date**: 09/12/13 Review by (MDIFW): Date:

SURVEYSITE: Stream SO45 (Bottle Brook)			**TOWNSHIP**: Kingsbury Plantation
NEW EO (check):	UPDATE (check):	(EO NUM:)	**DELORME PAGE & GRID (e.g. 04B2):** 31C2

ELEMENT INFORMATION

Common Name: Northern spring salamander **Scientific Name**: *Gyrinophilus porphyriticus*

SURVEYOR INFORMATION

Survey date (2013 – 09 – 10): Time from: 7:20 to: 7:50 **am** Sourcecode: F_ _ _ _ _ _ _

Surveyors (principal surveyor first, include first & last name and contact information): Kevin J. Ryan – FB Environmental under the auspices of Stantec Consulting, 30 Park Drive Topsham, ME 04086 (207) 729-1199, kevinr@fbenvironmental.com

IDENTIFICATION

Photograph/slide taken? Yes X No Notes & repository: On file with Stantec

Specimen collected? Yes No X Specimen # and repository:

Identification problems? Yes No X Explain:

ELEMENT OCCURRENCE INFORMATION

1. Type of Observation: sight X vocalization handled X collected other (explain):

2. Observed Abundance (incl. age and sex): 1 adult, sex not determined

3. Estimated Abundance (and basis for estimate): unknown

4. Evidence of Reproduction and/or Other Behaviors:

5. Misc. Notes:

HABITAT DESCRIPTION

Describe the specific habitat or micro-habitats where this animal occurs. Convey a mental image of the habitat and its features including: land forms, aquatic features, vegetation, slope, aspect, soils, associated plant and animal species, natural disturbances.

The stream is an undisturbed, perennial stream with a low- to moderate-gradient and a rock-cobble-gravel-sand substrate and little organic matter in the stream channel. At the time of the field survey, the wetted width of the stream was approximately 15 feet with a bankfull width of approximately 20 feet. Water depth averaged about six inches.

Salamander was found under partially exposed rock at edge of stream.

THREATS AND/OR MANAGEMENT CONCERNS:

DIRECTIONS

Provide detailed directions to this element occurrence (versus the survey site) using a readily locatable and relatively permanent landmark as a starting point. Refer to nearby landmarks, roads and villages. Include distances, compass directions (North, South etc.).

Use aerial photos to navigate. From intersection of Route 16 and 151 in Mayfield, travel East on Rt. 16 up for approx. 4.75 miles and turn left on to logging road. Road is passable with an SUV or truck. Travel North on logging for 0.3 miles and park vehicle. Walk NW in woods for 0.18 miles to stream.

OWNER: (If known, indicate name of owner(s), address and phone number):

LOCATION of OBSERVATION

Source 1: _____0450243_____ UTM-E _____4999673_____ UTM-N **NAD** 83

Source 2: _____ UTM-E / Lat _____ UTM-N / Long **NAD** 83 **/** 27 (circle one)

Coordinates / polygon provide location of:

X Animal/habitat feature(s) **OR** ☐ Observer--DISTANCE / DIRECTION to animal/habitat feature: _____ meters / feet at _____°

GPS Unit Information

☐ Differentially corrected X Unit accuracy for location: ±___10_____m ☐ # of Satellites = _____ ☐ 2D / 3D

Unit Model _____Garmin GPSmap 76Cx_____

LOCATION SKETCH (or attach aerial photograph/photocopied topo) Sketch fine details of an overhead view of this observation that may not be apparent on a topo map. Indicate landmarks, important features, route taken, animal/habitat observed, disturbances & threats, scale, and north. Include GPS location(s).

DIGITIZED IN GIS

Scale digitized at = 1:_____

☐ 1:24,000 topographic maps

☐ Orthophoto (pixel size = _____ m / ft), date = _____

☐ Other: _____

HAND-DRAWN

Scale drawn at = 1:_____

☐ Topographic map (scale = 1:_____)

☐ Aerial imagery ☐ Other: _____
scale = 1: _____
date = _____

OVERALL LOCATION ACCURACY: including uncertainty about where the animal/habitat feature was and mapping accuracy related to the GPS unit used, resolution of reference information like topographic maps or aerial photos used, etc.:

± ___1_____ meters

INSTRUCTIONS: Complete 1 form per visit. **Grayed sections are for Heritage office use only**. rev. 02/06/2008

RARE ANIMAL SURVEY FORM

MDIFW
650 State St.
Bangor, ME 04401

Completed By: Kevin J. Ryan **Date**: 09/12/13 Review by (MDIFW): Date:

SURVEYSITE: Stream SO71 (Unnamed tributary to Gales Brook)			**TOWNSHIP**: Parkman
NEW EO (check):	UPDATE (check):	(EO NUM:)	**DELORME PAGE & GRID (e.g. 04B2):** 31C4

ELEMENT INFORMATION

Common Name: Northern spring salamander **Scientific Name**: *Gyrinophilus porphyriticus*

SURVEYOR INFORMATION

Survey date (2013 – 09 – 11): Time from: 4:35 to: 5:00 Pm Sourcecode: F_ _ _ _ _ _ _

Surveyors (principal surveyor first, include first & last name and contact information): Kevin J. Ryan – FB Environmental under the auspices of Stantec Consulting, 30 Park Drive Topsham, ME 04086 (207) 729-1199, kevinr@fbenvironmental.com

IDENTIFICATION

Photograph/slide taken? Yes X No Notes & repository: On file with Stantec

Specimen collected? Yes No X Specimen # and repository:

Identification problems? Yes No X Explain:

ELEMENT OCCURRENCE INFORMATION

1. Type of Observation: sight X vocalization handled X collected other (explain):

2. Observed Abundance (incl. age and sex): 1 adult, sex not determined

3. Estimated Abundance (and basis for estimate): unknown

4. Evidence of Reproduction and/or Other Behaviors:

5. Misc. Notes:

HABITAT DESCRIPTION

Describe the specific habitat or micro-habitats where this animal occurs. Convey a mental image of the habitat and its features including: land forms, aquatic features, vegetation, slope, aspect, soils, associated plant and animal species, natural disturbances.

The stream is a small undisturbed, perennial stream with a low- to moderate-gradient and a rock-cobble-gravel-sand substrate. The stream has many flat stones and several areas of exposed ledge. At the time of the field survey, the wetted width of the stream ranged from approximately 3 to 15 feet with a bankfull width ranging from approximately 10 to 15 feet. Water depth averaged about 3 to 6 inches.

Salamander was found under partially exposed rock in the stream channel.

THREATS AND/OR MANAGEMENT CONCERNS:

DIRECTIONS

Provide detailed directions to this element occurrence (versus the survey site) using a readily locatable and relatively permanent landmark as a starting point. Refer to nearby landmarks, roads and villages. Include distances, compass directions (North, South etc.).

Use aerial photos/gazetteer to navigate. Access to stream was difficult due to site permissions – followed proposed powerline right-of-way to stream. In the town of Abbot, park on Gales road at intersection with Monument Road (shown as Back Parkman road in Google Earth) Walk south on atv trail (shown as County Road in Google Earth) south of above intersection for 0.4 miles (just into the town of Parkman). Walk east through woods for 0.75 miles to stream.

OWNER: (If known, indicate name of owner(s), address and phone number):

LOCATION of OBSERVATION

Source 1: _____0463994_____ UTM-E _____5000176_____ UTM-N **NAD** 83

Source 2: _____ UTM-E / Lat _____ UTM-N / Long **NAD** 83 **/** 27 (circle one)

Coordinates / polygon provide location of:

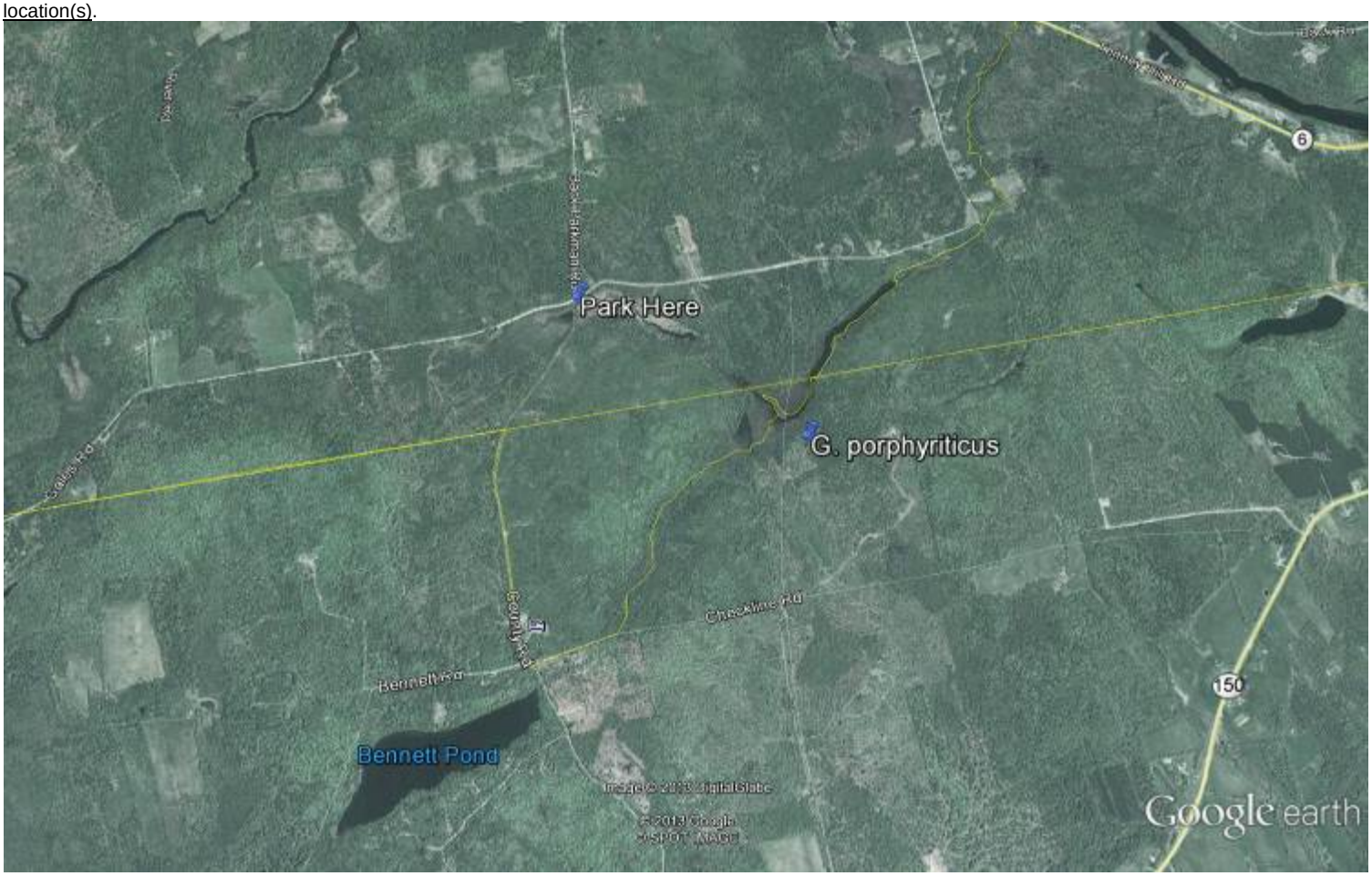
X Animal/habitat feature(s) **OR** ☐ Observer--DISTANCE / DIRECTION to animal/habitat feature: _____ meters / feet at _____°

GPS Unit Information

☐ Differentially corrected X Unit accuracy for location: ±___10_____m ☐ # of Satellites = _____ ☐ 2D / 3D

Unit Model _____Garmin GPSmap 76Cx_____

LOCATION SKETCH (or attach aerial photograph/photocopied topo) Sketch fine details of an overhead view of this observation that may not be apparent on a topo map. Indicate landmarks, important features, route taken, animal/habitat observed, disturbances & threats, scale, and north. Include GPS location(s).



DIGITIZED IN GIS

Scale digitized at = 1:_____

☐ 1:24,000 topographic maps

☐ Orthophoto (pixel size = _____ m / ft), date = _____

☐ Other: _____

HAND-DRAWN

Scale drawn at = 1:_____

☐ Topographic map (scale = 1:_____)

☐ Aerial imagery ☐ Other:

_____

scale = 1: _____

OVERALL LOCATION ACCURACY: including uncertainty about where the animal/habitat feature was and mapping accuracy related to the GPS unit used, resolution of reference information like topographic maps or aerial photos used, etc.:

± ___1_____ meters