Section 7

Wildlife and Fisheries

Section 7. Wildlife and Fisheries

7.1 State Standards

Pursuant to the State's Site Law, Applicants for grid scale wind energy permits are required to demonstrate that the proposed project will adequately provide for the protection of wildlife and fisheries and will not cause unreasonable harm to any significant wildlife habitat; freshwater plant habitat; threatened or endangered plant habitat; aquatic or adjacent upland habitat; travel corridor; freshwater, estuarine or marine fisheries; or other aquatic life pursuant to the Site Law Rules, Chapter 375, § 15, and the NRPA, 38 M.R.S. § 480-D(3).

7.2 Agency Consultation

Throughout the Project's development, the Applicant and its experts have consulted with the Department, Maine Department of Inland Fisheries and Wildlife ("MDIFW"), Maine Natural Areas Program ("MNAP"), United States Fish and Wildlife Service ("USFWS") and United States Army Corp of Engineers ("ACOE").

Through surveys and discussions, the Project has been designed to minimize its overall impact while increasing clean energy generation in Maine. In particular, the Project proposes installing only 3 wind turbines, which minimizes the overall footprint of the Project, while generating over 18 MW of renewable energy. It has been designed to avoid approximately 87% of the individual wetlands surveyed in the Project area and to improve two existing stream crossings that were impacted from forestry practices prior to the Project's inception.

Section 9 of this application discusses MNAP consultation.

On September 17, 2021, Flycatcher, on behalf of the Applicant, met with MDIFW. During that meeting, Flycatcher described the proposed Project and received guidance from MDIFW with regard to habitat assessments for Roaring Brook Mayfly (*Epeorus frisoni*) ("RBM").

Flycatcher mobilized to site on September 21, 2021, to perform a habitat assessment and document on-site conditions to share with MDIFW.

Flycatcher shared the data they collected from the September 21 visit with MDIFW on September 24, 2021. MDIFW, after consulting with its RMB and Northern Spring Salamander (*Gyrinophilus porphyriticus*) ("NSS") specialists, responded to Flycatcher's documents on September 27, 2021, and provided guidance for which resources to include in Flycatcher's surveys for NSS and RBM. Flycatcher returned to site on September 29, 2021, to commence species specific surveys for RBM and NSS.

While working with MDIFW to design its RBM and NSS studies, Flycatcher also submitted an information request to MDIFW for the Project. MDIFW responded to that information request on November 1, 2021. A copy of MDIFW's response is Exhibit 7-1.

In MDIFW's November 1, 2021, response, MDIFW stated that it "*has not mapped any Essential Habitats that would be directly affected by your project.*" MDIFW did recommend the following for additional review or study:

- Bats
- Significant Wildlife Habitat (Significant Vernal Pools)
- Fisheries Habitat
- Raptors
- Great Blue Heron (*Ardea Herodias*) ("GBH")
- Bicknell's Thrush (*Catharus bicknelli*) ("BITH")
- Roaring Brook Mayfly
- Northern Spring Salamander ("NSS")
- Northern Bog Lemming (*Synaptomys borealis*) ("NBL")

USFWS consultation was commenced via USFWS's Information for Planning and Consultation ("IPaC"). An IPaC for the Project was completed both prior to and after the uplisting of the Northern long-eared bat (Myotis septentrionalis). The IPaC letters advised that the following species could be affected by the project:

- Canada Lynx (*Lynx canadensis*)
- Atlantic Salmon (*Salmo salar*)
- Monarch Butterfly (*Danaus plexippus*)
- Northern Long-Eared Bat ("NLEB")

The IPaC reviews are Exhibit 7-2.

Below is a representative list of consultations:

#	Date	Participants	Discussion
1	9/17/21	Flycatcher, MDIFW	Meeting to provide high-level project overview; MDIFW provided guidance on RBM, NSS, and NBL surveys; discussed rocky features/bat habitat
2	9/24/21	Flycatcher, MDIFW	Meeting with follow up submission of photos for MDIFW review
3	9/24/21	Flycatcher, MDIFW consultant	Meeting to discuss sampling protocols and logistics for NBL

4	9/27/21	Flycatcher, MDIFW	MDIFW provided recommendation for streams to survey for RBM and NSS
5	9/27/21	Flycatcher, MDIFW	Submitted formal information request
6	11/1/21	Flycatcher, MDIFW	MDIFW response to information request (Exhibit 7-1)
7	12/1/21	Twin, Flycatcher, MDIFW	Project update, submission of RTE report summary, photos of rocky features/potential bat habitat
8	1/5/22	Twin, Flycatcher, MDIFW	MDIFW provided guidance on raptor and GBH surveys
9	1/13/22	Twin, Flycatcher, MDIFW	Requested shapefiles from MDIFW database for GBH
10	1/14/22	Twin, Flycatcher, MDIFW	MDIFW responded to data request
11	1/18/22	Twin, Flycatcher, MDIFW	Discussed project, fall survey results, bats/curtailment/site visit, wetland and watercourse delineation, raptor/eagles existing data/timing for studies, GBH, BITH, Fisheries and BMPs.
12	1/20/22	Twin, Flycatcher, MDIFW	MDIFW shared post-construction monitoring data for nearby operating wind farm
13	1/24/22	Twin, Flycatcher, MDIFW	Continued follow up re raptors
14	2/9/22	Twin, Flycatcher, MDIFW, USFWS	Submitted spring raptor and eagle survey plan for review
15	2/10/22	Twin, Flycatcher, MDIFW	MDIFW not recommending BITH survey; follow up on rocky features/potential bat habitat
16	2/10/22	Twin, Flycatcher, MDIFW, USFWS	MDIFW approval for spring raptor and eagle survey plan
17	2/11/22	Twin, Flycatcher, MDIFW, USFWS	USFWS feedback on raptor and eagle survey plan
18	2/14/22	Twin, Flycatcher, MDIFW, USFWS	Revised raptor and eagle survey plan distributed
19	3/21/22	Twin, Flycatcher, MDIFW	MDIFW outreach to organize spring site visit

20	3/22/22	Twin, Flycatcher, MDIFW	Submitted plan depicting rocky features MDIFW had expressed interest in seeing
21	4/4/22	Flycatcher, MDIFW	Call to discuss rocky feature/bat site visit
22	4/5/22	Twin, Flycatcher, MDIFW	Follow up to schedule site visit
23	4/12/22	Twin, Flycatcher, MDIFW	Site visit
24	6/15/22	Twin, Flycatcher, MDIFW	Site visit
25	7/6/22	Flycatcher, MDIFW	Follow up from site visit
26	7/7/22	Twin, Flycatcher, MDIFW	Submitted RTE report (Exhibit 7-3); submitted spring 2022 raptor and eagle report (Exhibit 7-4)
27	7/28/22	Twin, Flycatcher, MDIFW	Call and follow up regarding fall raptor and eagle surveys
28	8/19/22	Twin, Flycatcher, MDIFW	MDIFW comments on RTE
29	8/26/22	Twin, Flycatcher, MDIFW	Discussed GBH fall survey
30	9/1/22	Twin, Flycatcher, Sewall, MDIFW, MDEP	Project pre-application meeting
31	9/16/22	Twin, Flycatcher, MDIFW	Submitted vernal pool assessment forms (Exhibit 7-5)
31	9/16/22	Twin, Flycatcher, MDIFW	Follow up from pre-application meeting; discuss GBH survey
32	9/19/22	Twin, Flycatcher, MDIFW	Follow up from pre-application meeting regarding NSS impact by project – only at stream with pre-existing impact
33	11/10/22	Twin, Flycatcher, Sewall, MDIFW	Discussed stream crossings
34	11/22/22	Flycatcher, MDIFW	Aerial nest survey
35	12/2/22	Twin, Flycatcher, Sewall, MDIFW	Follow up from stream crossing discussion; submitted drawings and photographs
36	1/25/23	Twin, Flycatcher, MDIFW	Submitted 2022 raptor and eagle surveys; submitted comparison of raptor usage at Project site to permitted projects (Exhibit 7-4)
37	3/8/23	Twin, Flycatcher, MDIFW	Submitted GBH nest survey memo (Exhibit 7-6)
38	4/24/23	Flycatcher, USFWS	Outreach about project and NLEB
39	5/5/23	Flycatcher, USFWS	Discussed wildlife surveys and upcoming meetings

40	6/1/23	Twin, MDIFW	Outreach to discuss stream crossing, spring 2023 raptor/eagle surveys, NLEB listing
41	6/26/23	Twin, Flycatcher, MDIFW	Distributed bat survey protocol for USFWS
42	6/28/23	Twin, Flycatcher, MDIFW	Updating MDIFW on revised protocol to incorporate USFWS guidance on bat survey protocol
43	6/28/23	Twin, Flycatcher, Sewall, ACOE, USFWS, US EPA	Project call
44	6/29/23	Twin, Flycatcher, MDIFW	MDIFW responded to bat survey protocol
45	6/30/23	Twin, Flycatcher, MDIFW	Requested clarification from MDIFW for bat survey
46	7/7/23	Twin, Flycatcher, MDIFW	Invited MDIFW to site visit with ACOE, USFWS, DEP
47	7/13/23	Twin, Flycatcher, MDIFW	MDIFW provided Maine 2022 report on bat surveys
48	8/11/23	Twin, Flycatcher, Sewall, ACOE, USFWS	Site walk (DEP invited but unable to attend)
49	9/26/23	Twin, Flycatcher, ACOE, USFWS	Submitted Bat Acoustic Study (Exhibit 7-7)
50	10/3/23	Twin, MDIFW	Submitted spring raptor/eagle surveys (Exhibit 7-4)
51	10/23/23	Twin, DEP, MDIFW	Invited DEP and MDIFW to upcoming USFWS and ACOE call.
52	10/27/23	Twin, Flycatcher, ACOE, USFWS	Discussed NLEB, tri-colored bats, Canada lynx, and federal consultation process

7.3 Significant Wildlife Habitat (Significant Vernal Pools)

MDIFW's November 1, 2021, letter (Exhibit 7-1) stated "*At this time MDIFW Significant Wildlife Habitat (SWH) maps indicate no known presence of SWHs subject to protection under the Natural Resources Protection Act (NRPA) within the project area, which include Waterfowl and Wading Bird Habitats, Seabird Nesting Islands, Shorebird Areas, and Significant Vernal Pools.*" That being said, MDIFW also acknowledged that a comprehensive statewide inventory for Significant Vernal Pools ("SVPs") has not been conducted. Per MDIFW's guidance, Flycatcher surveyed the Project area for SVPs in Spring 2022. The survey and its conclusions are included in the Memorandum of

Findings and Vernal Pool Assessment Forms (for potential vernal pools identified during the fall delineation effort) were submitted to MDIFW in September 2022 (Exhibit 7-5).

Flycatcher did not identify any vernal pools or SVPs in the Project area.

7.4 Fisheries Habitat

The Project is located within the watershed of the Swift River, a tributary of the Androscoggin River. MDIFW's November 1, 2021, letter provided guidance for stream crossings and stream work. MDIFW and ACOE provided additional input and review of stream crossings during site visits. The results of those discussions are reflected in the civil plans (Exhibit 1-3). In summary, the Project is sited and designed to avoid and reduce impacts on headwater streams present within the Project area.

The Project is proposing to cross the one perennial stream mapped within the survey area within an area that is impacted from forestry activities. This approach will reduce the amount of tree clearing required and utilize a space around the stream that has been previously impacted and maintain canopy cover in areas where it is well established.

Additionally, the Project proposes to re-align an intermittent stream channel that was diverted due to forestry activities to follow its original path. The Project will utilize best management practices during construction to avoid erosion and sedimentation within headwater streams. Examples of cross sections are included as Exhibit 7-10.

As discussed in Section 7.5, the Project is not proposed within the critical mapped habitat for Atlantic Salmon.

The measures described in this Section, along with the limited footprint of development within the watershed and the location of the Project outside of the critical mapped habitat for Atlantic Salmon, will protect cold water fisheries populations within the Swift River and tributary streams.

For more on wetlands and watercourses, see Section 7.6.

7.5 Species

a. Bats

There are 8 species of bats in Maine, 4 of which are listed under the Maine Endangered Species Act ("MESA") and the remainder of which are designated as Species of Special Concern. On the federal level, NLEB became classified as Endangered under the Endangered Species Act, effective as of March 31, 2023.

MDIFW's November 1, 2021, letter (Exhibit 7-1) provided guidance for reviewing potential impacts to bats. Other than assessing proximity to hibernacula, MDIFW suggested that the Project should document rocky features on-site as recent data MDIFW has collected indicates that various species of bats are utilizing rocky features for habitat. In the November 1, 2021, letter, MDIFW stated that "d*etailed photographs and coordinates should be submitted to MDIFW for review, and acoustic monitoring may be recommended to document occupancy*."

Applicant submitted 46 photos of rocky features to MDIFW in early December 2021. MDIFW confirmed receipt of the photos on December 8, 2021. Those photos were discussed during a meeting on January 18, 2022. In February 2022, MDIFW requested specific photos be depicted on a map. That map and corresponding photos are Exhibit 7-8.

MDIFW attended two site visits in Spring 2022 to review the potential bat habitat that Flycatcher had documented in Exhibit 7-8. After these visits, MDIFW concluded: "*Based on our observations and discussions from the two site visits to examine potential rock/talus bat hibernacula areas, we did not find compelling evidence of significant usage that warrants additional protective measures at the site. We believe that the proposed turbine locations are of sufficient distance from the rocky areas with the greatest potential for usage by bats.*"[1] For more information, see the Project's Rare, Threatened, and Endangered Species Report, Exhibit 7-3.

USFWS published Land-based Wind Energy Interim Voluntary Guidance for the NLEB on March 6, 2023.[2] The Guidance provides a path forward for developers to receive a technical assistance letter ("TAL") from USFWS if the data supports that such project can "operate in a manner in which incidental take of northern long-eared bat is not 'reasonably certain to occur' and describes standard post-construction monitoring needed to validate the effectiveness of the operational requirements described below at individual wind facilities." Pursuant to USFWS's Guidance, Flycatcher consulted with USFWS on the site and on the habitat assessment conducted by MDIFW, including the site visits with MDIFW's biologists. After this consultation, it was determined that the Project should collect acoustic bat data to complete a

[1] Exhibit 7-3, Page 102
[2] https://www.fws.gov/sites/default/files/documents/Interim%20Wind%20Guidance%20NLEB_6Mar23.pdf

presence/absence analysis for NLEB. As discussed in the Summer 2023: Bat Acoustic Survey Report ("Bat Survey Report", Exhibit 7-7), USFWS and MIDFW were provided copies of the survey protocol prior to the acoustic detectors being deployed. The Applicant followed MDIFW's more stringent survey recommendation of 14-detector nights per survey location.[3] Over the course of the acoustic survey, the Project collected 33-detector nights of data at each of the three locations, for a total of 99-detector nights of data. Over that 99-detector night period, 451 recordings were classified as bat calls through the Kaleidoscope Pro software ("KPro"). The recordings attributed to high-frequency bat calls were manually vetted. As discussed in the Bat Survey Report, no calls had suitable data to confirm probable presence of federally listed endangered or threatened species.

The four bat species listed under the MESA are: Little brown bat (endangered), Northern long-eared bat (endangered), Eastern small-footed bat (threatened), and Tri-colored bat (threatened).[4]

Over the 99-detector night survey, Little brown bats and Tri-colored bats were manually confirmed to have probable presence, matching four and one, respectively, of the total recordings. The other two MESA listed bat species were not confirmed to have probable presence on site.

The other four bat species present in Maine are listed as Species of Special Concern: Big brown bat, Red bat, Hoary bat, and Silver-haired bat. The autoclassification system in KPro listed Big brown bat, Eastern red bat, and Hoary bats as probably present on site (Table 3, Exhibit 7-7).

Overall, the occurrence of all bat species at the site was low despite the extended survey window. There were 451 calls initially categorized by KPro as from bats over the 99-detector night survey for an average of 4.51 calls per evening. Of those, only 117 were recorded at the monitoring location where turbines are proposed (representing a lower average of 3.5 calls per evening).

[3] USFWS guidance recommends 4-detector nights per survey location for linear projects. https://www.fws.gov/sites/default/files/documents/USFWS_Range-wide_IBat_%26_NLEB_Survey_Guidelines_2023.05.10_0.pdf

[4] MESA species list is available online at: https://www.maine.gov/ifw/fish-wildlife/wildlife/endangered-threatened-species/listed-species.html; Tricolored bats were added in 2023, effective 10/25/23: http://www.mainelegislature.org/legis/bills/getPDF.asp?paper=HP0032&item=3&snum=131

This reaffirms MDIFW's conclusion, achieved after two site visits, that the proposed turbine locations are a sufficient distance from the most suitable hibernacula for bats.

To supplement the Project's recent survey, the Applicant has reviewed post-construction monitoring from the nearby Record Hill project. According to Record Hill's 2016 Post-construction Monitoring Report: "*Tree-roosting bat species (hoary, silver-haired, and red bat) represent the only bat species found in 2016, as well as in 2012 and 2014.*"[5]

The Project will employ curtailment consistent with the most recent guidance from MDIFW to further ensure no adverse impacts to bat species. Both MDIFW[6] and USFWS[7] provide guidance to wind project developers regarding curtailing turbines below certain speeds during certain portions of the year. MDIFW's guidance was released in 2018.

This year, USFWS released their guidance for NLEB's, including data from as recently as 2022. According to USFWS, no NLEB fatalities have been recorded at wind farms since 2016, despite having collected survey data from 131 facilities during that time. In addition, USFWS, using data from as recently as 2021, cites that raising cut-in speeds to 5 m/s "*have been demonstrated to reduce total bat fatalities by an average of 62%*."[8]

Given MDIFW's higher curtailment recommendation, the sparse population recorded at site in 2023, the lack of significant habitat for the species observed by Applicant's biologists and MDIFW staff, and the historical data available for the area and USFWS's data on operating wind projects with respect to NLEB, the Applicant believes adhering to the 2018 guidance will be protective to the local bat population and constitutes best practical mitigation for minimizing impacts to bats.

In particular, the Applicant proposes:

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[5] Stantec Consulting Services Inc. (Stantec). 2017. Final Post-Construction Monitoring Report Year 3, Record Hill Wind Project. Stantec Consulting Services Inc., Topsham, Maine, USA. 15 March 2017.

[6] https://www.maine.gov/ifw/docs/Wind%20Power%20Preconstruction%20Recommendations%20to%20Avoid%20or%20Minimize%20Bat%20Mortality.pdf

[7] https://www.fws.gov/sites/default/files/documents/Interim%20Wind%20Guidance%20FAQs%20NLEB_6Mar23.pdf

[8] Land-based Wind Energy Interim Voluntary Guidance for the Northern Long-eared Bat (Myotis septentrionalis): FAQ Supplement

- Operating only at cut-in wind speeds exceeding 6.0 meters per second each night (from at least ½ hour before sunset to at least ½ hour after sunrise) during the period April 15 –September 30, whenever the ambient air temperature is at or above 32 degrees Fahrenheit, measured at both ground level and nacelle hub height.
- Following the same weather parameters as above, increasing the cut-in wind speeds to 6.5 meters per second from July 16 – September 15.
- Requiring facility staff to record all discovered mortalities of bats and birds in an annual log.

Given the extensive amount of time that the Bat Survey Report covers, the historical data for an operating wind project in the area, and the Project's commitment to employ MDIFW's most recent curtailment guidance for wind energy projects, no adverse impacts to bats are expected.

b. Raptors

MDIFW's November 1, 2021, letter noted that MDIFW's Maine Wind Power Guidance should be reviewed to determine if additional species studies were appropriate and included raptors in the list of potential species that may be recommended for further study. In addition, Flycatcher spoke with MDIFW about raptors and eagles during the January 18, 2022 meeting. During that meeting, MDIFW requested to know "*… if raptors [are] significantly using this area*." (Exhibit 7-9)

Flycatcher submitted a Raptor Survey Plan to study raptors and eagles to MDIFW and USFWS in February 2022. MDIFW reviewed the plan for conformance and approved the plan as submitted. USFWS provided comments on the plan and Flycatcher integrated those into the revised survey plan.

These surveys occurred:

- Spring 2022: Eagles - February 15 to June 15; Raptors - March 1 to June 15
- Fall 2022: Eagles – August 1 to December 15; Raptors- August 1 to November 30
- Spring 2023: Eagles - February 15 to June 15; Raptors- March 1 to June 15
- Fall 2023: Eagles – August 1 to December 15; Raptors- August 1 to November 30

Spring 2022 through Spring 2023 Eagle Use and Raptor Migration Surveys are included as Exhibit 7-4. The Fall 2023 Eagle Use and Raptor Migration

Survey will be submitted after the study window closes on December 15, 2023, and the data is processed.

In addition, Flycatcher reviewed the 2022 Raptor and Eagle data collected for Twin and compared it to recently permitted projects as well as the nearby Record Hill wind project. Through this analysis, Flycatcher compared the passage rate of raptors observed per survey hour. The passage rate for Twin was the lowest among the sites analyzed. Not only was the passage rate the lowest, but it was less than half that of the next lowest site (Western Maine Renewables). The review conducted by Flycatcher is included in Exhibit 7-4 and the summary table comparing South Twin to other wind projects is Table 1 and is included below.

Table 1. Summary of Results from Permitted Wind Projects in Maine.

Project	Year	Total survey hours	Total survey days	Total raptors	Raptors per hour	Endangered (E), threatened (T), or species of special concern (SSC)	Listed Species per hour
Record Hill[1]	2012	158.50	23	142	0.90	5 bald eagles (*Haliaeetus leucocephalus* (SSC))	0.03
Record Hill	2014	241.75	35	260	1.08	40 bald eagles	0.17
Record Hill	2016	245.00	35	235	0.96	1 golden eagle (*Aquila chrysaetos* (E)), 9 bald eagles	0.04
Spruce Mountain[2]	2012	132.00	22	147	1.11	2 peregrine falcons (*Falco peregrinus* (E)), 6 bald eagles, 1 unidentified eagle (presumed SSC)	0.07
Western Maine Renewables[3]	2020	479.00	67	347	0.72	29 northern harriers (*Circus cyaneus* (SSC))	0.06
South Twin Mountain	2022	509.52	66	176	0.35	13 bald eagles	0.03

1. Stantec Consulting Services Inc. (2016). Final Post-Construction Monitoring Report, Year 3: Record Hill Wind Project: Oxford County, Maines.
2. Tetra Tech (2013). Spruce Mountain Wind Project: Post-Construction Bird and Bat Fatality and Raptor Monitoring: Year 1 Annual Report.
3. Tetra Tech (2020). Comprehensive Wildlife Report: Western Maine Renewable Energy Project, Somerset County, Maine; MDEP Site Location of Development/ NRPA Combined Application.

As summarized above, the raptor and eagle data for South Twin indicates that activity on site is relatively low, 0.35 raptors per hour and 0.03 listed species per hour, and thus no adverse impacts on raptors or listed species are expected.

c. Great Blue Herons

MDIFW's November 1, 2021, letter noted that MDIFW's Maine Wind Power Guidance should be reviewed to determine if additional species studies were appropriate and included great blue heron ("GBH") in the list of potential species that may be recommended for further study. In September 2022, Flycatcher received guidance from MDIFW's GBH specialist, Danielle D'Auria, regarding an aerial survey for rookeries. Danielle joined Flycatcher for the GBH aerial survey on November 22, 2022. The Memorandum of Findings associated with that survey is Exhibit 7-6. As described in the Memorandum of Findings, a single GBH nest was observed east of the Swift River in the eastern portion of the survey area, over three miles from the closest proposed turbine location. The Memorandum of Findings was sent to MDIFW on March 8, 2023.

As MDIFW and Flycatcher did not observe any GBH nests within three miles of the proposed turbine, no adverse impacts on GBH are expected.

d. Bicknell's Thrush

MDIFW's November 1, 2021, letter noted that MDIFW's Maine Wind Power Guidance should be reviewed to determine if additional species studies were appropriate and included Bicknell's thrush ("BITH") in the list of potential species that may be recommended for further study. While noting that no portion of the Project area is above 2,700 feet, Flycatcher requested guidance from MDIFW on if a BITH survey was recommended. On February 10, 2022, MDIFW informed Flycatcher that MDIFW "*will not be recommending BITH surveys for this project*." See Exhibit 7-11.

Given the lack of preferred habitat for BITH, no adverse impacts on BITH are expected.

e. Roaring Brook Mayflies

As discussed in Section 7.3, Flycatcher coordinated with MDIFW to conduct RBM surveys. As further outlined in the RTE report, Exhibit 7-3, Flycatcher followed The Recommended Survey Protocol for Roaring Brook Mayfly provided by MDIFW, and consulted with MDIFW prior to conducting RBM surveys, during the surveys, and after the surveys were complete. In addition, MDIFW's RBM consultant, Marcia Siebenmann, joined Flycatcher on site during the survey to provide additional initial guidance and expertise.

As no RBM were observed during the surveys, no adverse impacts on RBM are expected.

f. Northern Spring Salamanders

As discussed in Section 7.3, Flycatcher coordinated with MDIFW to conduct NSS surveys. As further outlined in the RTE report, Exhibit 7-3, Flycatcher followed the Northern Spring Salamander Survey Protocols provided by MDIFW and consulted with MDIFW prior to conducting NSS surveys.

Five streams were surveyed for NSS between September 29 and October 1, 2021. NSS were observed in three of those streams, and a fourth stream has assumed presence due to its connectivity to a stream with NSS present.

Of those four streams, three will have the 250-foot buffer recommended in the Northern Spring Salamander Survey Protocols. A portion of the remaining stream (S-KMN-7) has been disturbed by forestry activities unrelated to the Project. As described in Section 7.4 and in the discussion section of the RTE Survey Report, Flycatcher consulted with MDIFW about a proposed crossing of this stream while on site on June 15, 2022. The Project plans to cross the stream in the location of the previous impact and will stabilize and improve this portion of the stream. Following MDIFW guidance, the final design should improve the habitat for NSS at S-KMN-7 and will avoid opening the canopy of surrounding trees in areas that are not currently impacted. The Applicant, through Sewall, submitted a cross section of this crossing to MDIFW on January 4, 2023 (Exhibit 7-10). The Construction Drawings (Exhibit 1-3) incorporate this guidance.

As the Project is providing a 250-foot buffer around three of the NSS habitats and improving the fourth NSS habitat, following guidance from MDIFW, no adverse impacts to NSS are expected.

g. Northern Bog Lemmings

MDIFW's November 1, 2021, letter noted that MDIFW's Maine Wind Power Guidance should be reviewed to determine if additional species studies were appropriate and included Northern bog lemmings ("NBL") in the list of potential species that may be recommended for further study.

As discussed in the RTE report, Exhibit 7-3, Flycatcher consulted with MDIFW and NBL subject matter expert, Dr. Zachary Olson, prior to conducting NBL surveys. Dr. Olson provided equipment for Flycatcher to utilize to collect fecal pellets during the NBL surveys and the collected pellets were sent to Dr. Olson's lab for analysis. A copy of the report from Dr. Olson's lab is included in the RTE report, which concludes that "*Northern bog lemming was not detected.*"

As no NBL were detected on site, no adverse impacts to NBL are expected.

h. Canada Lynx

The Project does not overlap with critical habitat for this species (Exhibit 7-2.)

Flycatcher has mapped suitable lynx habitat in the Project area (Exhibit 7-12). The suitable lynx habitat is isolated and fragmented. This information was shared prior to the site walk with USFWS and ACOE on August 11, 2023. The Project will continue to work with USFWS and ACOE as appropriate to minimize potential impacts to Canada Lynx during construction. Such minimization may include covering open trenches overnight to prevent Canada Lynx from being inadvertently detained. During operations, access to the Project will be via a locked gate. This will limit unauthorized access to the site that could impact the species.

Given the lack of suitable habitat and the construction and operating best practices that Applicant proposes, no adverse impacts on Canada Lynx are expected.

i. Atlantic Salmon

The Project is not within critical mapped habitat for Atlantic Salmon (Exhibit 7-2).

Given the Project's location outside of the critical mapped habitat for Atlantic Salmon, no adverse impacts on Atlantic Salmon are expected.

j. Monarch Butterflies

Monarch butterflies are a candidate for listing. Survey guidance has not been provided for this species. There is no critical habitat designated for this species (Exhibit 7-2).

No adverse impacts on Monarch Butterflies are expected.

k. Northern Long-Eared Bats

The federal listing for Northern long-eared bats ("NLEB") was changed during the Project's development and environmental studies. Twin and Flycatcher are working with USFWS to follow recent guidance put out by USFWS in 2023. For more information, see Section 7.5.a. and Section 32: Best Practical Mitigation.

7.6 Wetlands and Watercourses

Flycatcher performed wetland delineations in the fall of 2021 and returned to the Project area in spring 2022 to complete the vernal pool survey. As further described in the Wetland and Watercourse Survey (Exhibit 7-13), Flycatcher surveyed approximately 458 acres to delineate wetlands, watercourses, and potential vernal pools. There are no waterbodies within the Project area. These surveys informed the Project's design.

During the delineation efforts, Flycatcher identified 140 non-contiguous wetlands and 41 watercourses. The results of the survey altered the site access to originate from Roxbury rather than Rumford to decrease the overall impact of the Project. Of the 140 wetlands identified, only 18 are impacted by the proposed design with access originating in Roxbury, four of which are associated with streams. There are two additional streams that will be crossed.

In total, there are six stream crossings proposed. The Applicant designed the Project to comply with Stream Smart standards where feasible.

In particular, the six stream crossings have the following bankfull widths and proposed crossings:

Stream ID	Average bankfull width	Proposed Culvert	Notes
S-KMN-7	37"	Open bottom structure, minimum of 1.2 bankfull width (Exhibit 1-3, sheet 9)	Perennial
S-KMN-37	67"	84" culvert, 42" embedded (Exhibit 1-3, sheet 8)	Intermittent
S-KMN-38	68"	84" culvert, 42" embedded (Exhibit 1-3, sheet 8)	Intermittent stream begins at center of crossing.
S-KMN-40	33"	60" culvert, 30" embedded	Intermittent

		(Exhibit 1-3, sheet 7)	
S-KMN-41	53”	72” culvert, 36” embedded (Exhibit 1-3, sheet 7)	Intermittent
S-JLH-13	35”	48” culvert, 24” embedded (Exhibit 1-3, sheet 7)	Intermittent

Due to the steep elevation on site, Applicant submitted four of the stream crossings to MDIFW for their review prior to finalizing the civil design. These cross-sections are Exhibit 7-10. This includes two locations where the Applicant proposes to restore streams that were previously impacted from commercial forestry activities.

Stream S-KMN-40 appears to have been impacted by forestry activity, with its flow diverted from the original streambed. The Applicant proposes to re-align the flow to the assumed former drainage path. This design was done in consultation with MDIFW, via plan reviews and site visits.

Similarly, Stream S-KMN-7 was previously impacted by forestry activities. The Applicant proposes a large open box culvert and restoration in that area to improve habitat quality.

In addition, there are two other stream crossings where Applicant has consulted with MDIFW and MDIFW has reviewed and approved the stream crossings (S-KMN-41 and S-KMN-38)

The remaining two stream crossings will adhere to Stream Smart Crossing standards.

Flycatcher completed a Wetland Functional Assessment for the Project (Exhibit 7-14). As outlined in the Wetland Functional Assessment, Flycatcher followed ACOE’s Highway Methodology 2015 Supplement to determine the function of each wetland that will be impacted by the Project’s design. All of the 18 wetlands within the Project footprint are assessed to have the principal function of Wildlife Habitat. Four of those also provide Floodflow Alteration, and one of those four also has a principal value for Uniqueness and Heritage. The one wetland that is providing three principal functions (Wildlife Habitat, Floodflow Alteration Uniqueness and Heritage) has been disrupted by commercial forestry activity on-site. As described in Section 7.5.f., Flycatcher has consulted with MDIFW to improve and stabilize this location.

Flycatcher categorized the wetlands pursuant to the Cowardin Classification System. All of the wetlands within the Project footprint are Palustrine, broken down into Palustrine Forested (56%), Palustrine Emergent (22%), Palustrine Scrub Shrub (22%).

Of the 18 wetlands within the Project footprint, 12 of them were observed to have been impacted from forestry activity either through or adjacent to them, including all four that have associated resources. The Project design will stabilize the areas where appropriate and limit additional impact from unrelated activities.

The 18 wetlands include the following:

Approx. Station	Wetland ID	Total Wetland Area (SF)	Directly Impacted Area (SF)	Evidence of Forestry Impacts
1+00	143-WBL-RDK-33	3,610	1,294	Isolated depression adjacent to old logging road
2+00	141-WBL-KMN-80	10,887	1,529	Forestry impacts
3+00	142-WBL-KMN-81	813	336	Forestry impacts
13+00	139-WBL-KMN-77	346	281	
27+00	136-WBL-KMN-74	2,299	1,644	Wetland in skidder trail; groundwater seep; forestry impacts
57+00	130-WBL-KMN-67	10,137	1,114	Forested groundwater seep adjacent to stream and skid road
58+00	128-WBL-KMN-3	1,255	1,153	Small side slope seep crossing skid trail
63+00	125-WBL-KMN-4	1,098	903	Wetland in naturalized woods road on side slope
70+00	123-WBL-KMN-5	406	406	
110+50	121-WBL-KMN-7	666	666	Small wetland in skidder trail; site

				of previous timber harvest
114+00	42-W-KMN-37	309	118	
117+00	97-WBL-KMN-38	10,730	709	
118+50			205	
123+50	151-WBL-KMN-84	515	515	Forestry impacts
124+16	152-WBL-KMN-83	781	781	Forestry impacts
200+50	149-WBL-RDK-32	1,492	309	
202+00	95-WBL-KMN-44	1,781	953	
301+00	92-WBL-KMN-42	2,150	707	Toe slope wetland; forestry impacts; disturbed soils
303+00	96-WBL-KMN-40	1,321	1,321	Regenerating skid road at base of slope
	Total Square Feet	**50,595**	**14,943**	

The majority of the 14,943 square feet of wetland impact will be permanent as it is either directly filled by the road or by the stormwater and stabilization to support working on the steep slopes or will require ongoing maintenance to satisfy clearing needs for the collector system. Temporary clearing only contributes a small amount to the Project's already minimized impact.

As the Project design impacts only 18 of the 140 delineated wetlands (12 of which have noted forestry impacts) and six of the 41 delineated streams, avoids entirely or improves NSS habitat, consulted with MDIFW and ACOE to minimize wetland and watercourse impacts, the Project is designed to minimize its impact to wetland and watercourses.

7.7 Compensation

The Project footprint has been minimized to the extent feasible to avoid wetlands and work in wetlands that were previously impacted by forestry activities. As the Project design has less than 15,000 square feet of permanent wetland impact, the Project is not proposing a payment under the State's in lieu fee program.

As described in Section 7.6 and in 7.5 f, the Project has been thoughtfully designed to avoid adverse impacts to NSS either through appropriate buffers or by improving the habitat for the NSS at a previously impacted location (S-KMN-7). The Project is also restoring a stream to its original assumed streambed (S-KMN-40). Beyond the improvements being made to those two streams (S-KMN-40, S-KMN-7), the Project is not proposing additional compensation for stream crossings.

As discussed throughout this Section 7, the Applicant has consulted with ACOE on this Project and is working with ACOE and USFWS to formally review the Project. It is the Applicant's understanding from these discussions that ACOE has decreased its threshold for requiring compensatory mitigation from 15,000 square feet of wetland impact to 5,000 square feet. Assuming the lower, 5,000 square foot threshold, the Applicant shall make an in lieu fee[9] to the DEP in support of Maine's Natural Resource Conservation Program prior to commencing construction.[10]

[9] The current Resource Compensation Rate schedule is available online at: https://www.maine.gov/dep/land/nrpa/ILF_and_NRCP/ILF/fs-in-lieu-fee.pdf

[10] This assumes that the NE ACOE's review of the decreased threshold, announced in April 2023, becomes effective.

Exhibit 7-1
MDIFW November 1, 2021 Letter

STATE OF MAINE
DEPARTMENT OF
INLAND FISHERIES & WILDLIFE
353 WATER STREET
41 STATE HOUSE STATION
AUGUSTA ME 04333-0041

JANET T. MILLS
GOVERNOR

JUDITH CAMUSO
COMMISSIONER

November 1, 2021

Jessie Hutchinson
Flycatcher LLC
Lower Falls Landing, 106 Lafayette St.
Yarmouth, ME 04096

RE: Information Request – Proposed Twin Wind Project, Roxbury

Dear Jessie:

As a follow up to our meeting with representatives of the proposed Twin Wind Project on September 24, 2021 and per your request received on September 28, 2021, we have reviewed current Maine Department of Inland Fisheries and Wildlife (MDIFW) information sources for known locations of Endangered, Threatened, and Special Concern species; designated Essential and Significant Wildlife Habitats; and inland fisheries habitat concerns within the vicinity of the proposed Twin Wind project site in Roxbury. Note that, as project details are lacking at this time, our comments are non-specific and should be considered preliminary.

Our Department has not mapped any Essential Habitats that would be directly affected by your project. Essential Habitats are areas formally designated as essential to the conservation of a State Endangered or Threatened species and are protected pursuant to the Maine Endangered Species Act (MESA, 12 M.R.S §12801 et. seq.). Currently, Essential Habitats are only designated for three State Endangered coastal breeding bird species.

Endangered, Threatened, and Special Concern Species

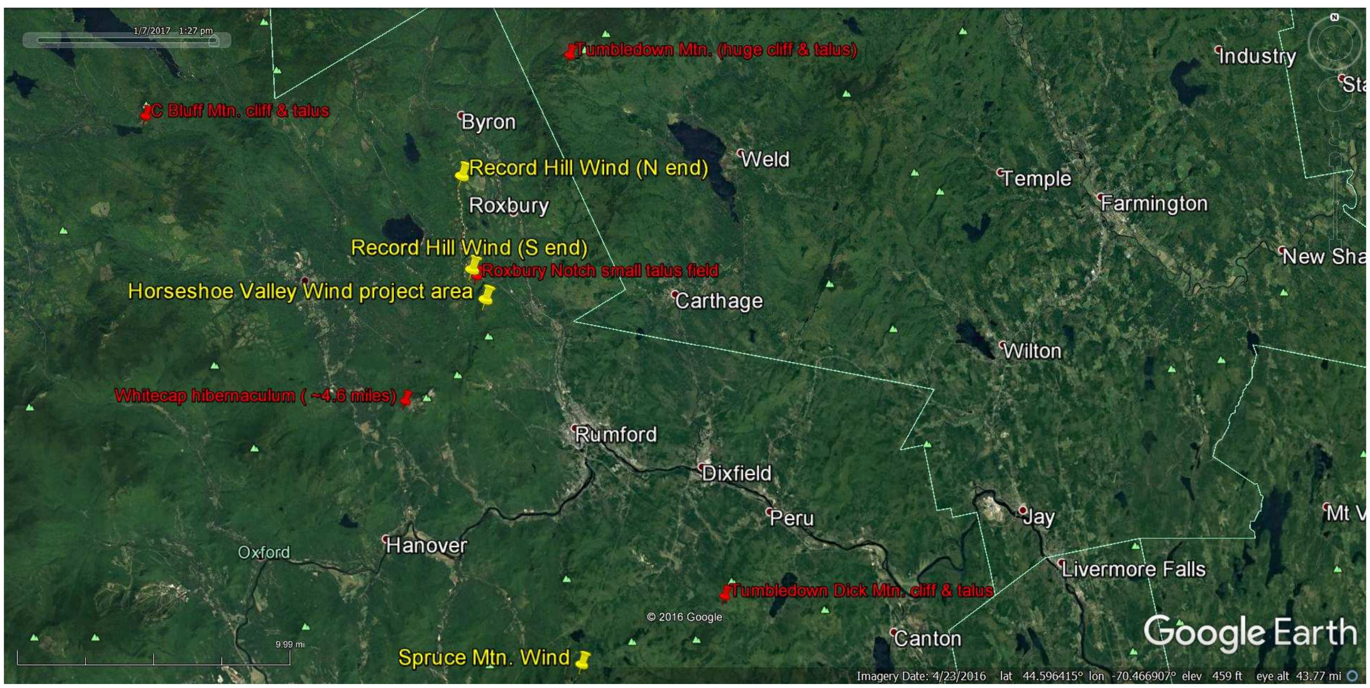
Bats - Of the eight species of bats that occur in Maine, the three *Myotis* species are afforded special protection under MESA: little brown bat (State Endangered), northern long-eared bat (State Endangered), and eastern small-footed bat (State Threatened). The five remaining bat species are designated as Species of Special Concern: big brown bat, red bat, hoary bat, silver-haired bat, and tri-colored bat. While a comprehensive statewide inventory for bats has not been completed, based on historical evidence, it is likely that several of these species occur within the project area during the fall/spring migration, the summer breeding season, and/or for overwintering. If the proposed project has a Federal nexus, either via funding or permitting, or if the project is not consistent with the USFWS "4(d) Rule", we recommend that you contact the U.S. Fish and Wildlife Service--Maine Fish and Wildlife Complex (Wende Mahaney, Wende_Mahaney@fws.gov, 207-902-1569) for further guidance on their perspective, as the northern long-eared bat is also listed as a Threatened Species under the Federal Endangered Species Act. The USFWS "4(d) Rule" provides guidance for protection of bat winter hibernacula and maternity roost trees for northern long-eared bats (see https://www.fws.gov/midwest/endangered/mammals/nleb/4drule.html). MDIFW Endangered Species Rules for bats (Chapter 8.06; see link at http://www.maine.gov/sos/cec/rules/09/137/137c008.docx) provide equivalent seasonal protection of maternity roost trees for any of the three state-listed bats, seasonally prohibits entry into subsurface winter hibernacula, and has additional protections for tree removal within ¼ mile of subsurface winter hibernacula. At present, no maternity roost trees have been designated for protection.

In addition to traditional hibernacula, like caves and old mines, recent findings indicate that *Myotis* and big brown bats may also overwinter in exposed rocky features. To date, Maine talus and rocky outcrop studies have focused on relatively exposed slopes with minimal canopy cover, although ongoing research has shown that bats use rocky

PHONE: (207) 287-8000 FISH AND WILDLIFE ON THE WEB: www.maine.gov/ifw EMAIL ADDRESS: IFWEnvironmentalReview@maine.gov

areas under the forest canopy. Occupied talus slopes in Maine have consisted of variable rock sizes, ranging in size from softball-sized to car-sized boulders. Rock piles, rock ledges, and small vertical cracks in rocks (>1/2-inch-wide) create crevices that allow bats to access deeper cavities that provide protection for predators and suitable temperature and humidity conditions. Some species of bat, like the eastern small-footed bat, use rocky features year-round. A desktop GIS analysis indicates the presence of such features in the vicinity of your project area. As not all talus and rocky features have been mapped statewide, we advise that all areas of talus and rocky features of approximately 1,000 square feet or greater in size be documented on and within 3 miles of your project area, including smaller areas of rock piles and tailings (i.e., quarry spoils). See attached photographs for representative features—these photographs are not all-inclusive and should be used for guidance purposes only. Detailed photographs and coordinates should be submitted to MDIFW for review, and acoustic monitoring may be recommended to document occupancy. Alternatively, these features should be appropriately buffered commensurate with the size and layout of the project.

The image below was prepared in 2017 for the adjacent RoxWind (Horseshoe Valley Wind) Project and provides a coarse-scale illustration of the proximity of known cliffs, talus fields, and hibernacula to that project site. As discussed, the Whitecap Mountain hibernaculum is located approximately 3.3 miles from the peak of South Twin Mountain.



As noted in the Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality (Maine Wind Power Guidance, March 5, 2018), "*It is MDIFW's position that the only adequate protection for bats at wind power facilities at this time is seasonal curtailment of turbines under appropriate conditions, though continuing research may lead to other avoidance measures in the future.*" "*MDIFW's curtailment recommendations are based on project-specific and site-specific considerations, recent recommendations for other similar facilities, seasonality, proximity to specific habitats important to bats, and ambient temperatures*." In most circumstances, "*MDIFW recommends that turbines operate only at cut-in wind speeds exceeding 6.0 meters per second each night (from at least ½ hour before sunset to at least ½ hour after sunrise) during the period April 15 –September 30, whenever the ambient air temperature is at or above 32 degrees Fahrenheit, measured at both ground level and nacelle hub height. Proximity to hibernacula, documented maternity sites, rocky features, the coastal mainland, and migration patterns, may increase risks and thus possibly* *necessitate additional safeguards, such as extended timeframes (earlier and/or later) and/or higher wind speeds*." *"Additionally, based on higher bat mortality during July – September demonstrated through post-construction project monitoring in Maine and research elsewhere, applicants can anticipate a need for increased curtailment wind speeds during this period."*

As discussed during our meeting, for three recent projects reviewed, we agreed to:

- RoxWind: 15April-30Sep, 6 m/s, with a bump to 6.9 m/s from 16July-15Sep. IFW agreed to an Incidental Take Permit (ITP) pursuant to MESA in consideration of these more protective measures and no post-construction mortality monitoring (PCMM).
- Weaver Wind: 15April-30Sep, 6 m/s, with a bump to 6.5 m/s from 16July-15Sep. IFW did not provide an ITP, but agreed to no PCMM.
- Silver Maple Wind (bat habitat nearby): 01April-31Oct, 6 m/s, with a bump to 6.5 m/s from 16July-15Sep. IFW did not provide an ITP, but agreed to no PCMM.

During the September 24, 2021 meeting, project representatives indicated that the applicant anticipates proposing equivalent protections as those agreed to for RoxWind, which abuts the Twin Wind project site to the north. MDIFW looks forward to further discussion of curtailment practices for avoiding and minimizing impacts to at-risk bats.

Significant Wildlife Habitat

Significant Vernal Pools - At this time MDIFW Significant Wildlife Habitat (SWH) maps indicate no known presence of SWHs subject to protection under the Natural Resources Protection Act (NRPA) within the project area, which include Waterfowl and Wading Bird Habitats, Seabird Nesting Islands, Shorebird Areas, and Significant Vernal Pools. However, a comprehensive statewide inventory for Significant Vernal Pools has not been completed. Therefore, we recommend that surveys for vernal pools be conducted within the project boundary by qualified wetland scientists prior to final project design to determine whether there are Significant Vernal Pools present in the area. These surveys should extend up to 250 feet beyond the anticipated project footprint because of potential performance standard requirements for off-site Significant Vernal Pools, assuming such pools are located on land owned or controlled by the applicant. Once surveys are completed, survey forms should be submitted to our Agency for review well before the submission of any necessary permits. Our Department will need to review and verify any vernal pool data prior to final determination of significance.

Fisheries Habitat

We generally recommend maintaining 100-foot undisturbed vegetated buffers from the upland edge of all intermittent and perennial streams and any contiguous wetlands. Maintaining and enhancing buffers along these resources is critical to the protection of water temperatures, water quality, natural inputs of coarse woody debris, and various forms of aquatic life necessary to support fish and other aquatic species. Riparian buffers also provide critical habitat and important travel corridors for a variety of wildlife species. Stream crossings should be avoided, but if a stream crossing is necessary, or an existing crossing needs to be modified, it should be designed to provide for full aquatic passage. Small streams, including intermittent streams, can provide crucial rearing habitat, cold water for thermal refugia, and abundant food for juvenile salmonids on a seasonal basis. Undersized crossings may inhibit these functions and become a frequent maintenance problem that causes reoccurring damage to the resource. Generally, MDIFW recommends that all new, modified, and replacement stream crossings be sized to span at least 1.2 times the bankfull width of the stream. In addition, we generally recommend that stream crossings be open bottomed (i.e. natural bottom), although embedded structures which are backfilled with representative streambed material have been shown to be effective in providing habitat connectivity for fish and other aquatic organisms. Construction Best Management Practices should be closely followed to avoid erosion, sedimentation, alteration of stream flow, and other impacts as eroding soils can travel significant distances as well as transport other pollutants resulting in direct impacts to fish, other aquatic life, and their habitats. In addition, we recommend that any necessary instream work occur between July 15 and October 1.

Other Possible Resources

As discussed during the September 24, 2021 meeting, MDIFW's Maine Wind Power Guidance should be consulted for the applicability of recommended studies and resource surveys including, but not limited to, such species as raptors, great blue heron, Bicknell's thrush, Roaring Brook mayflies, Northern spring salamanders, and Northern bog lemmings. It is noted that Beth Swartz (MDIFW Reptile, Amphibian, Invertebrate Group) has provided specific guidance related to Roaring Brook mayfly and Northern spring salamander surveys, which should be followed.

This consultation review has been conducted specifically for known MDIFW jurisdictional features and should not be interpreted as a comprehensive review for the presence of other regulated features that may occur in this area. Prior to the start of any future site disturbance we recommend additional consultation with the municipality, and other state resource agencies including the Maine Natural Areas Program and Maine Department of Environmental Protection in order to avoid unintended protected resource disturbance.

If you have any questions or concerns related to any of this information, please feel free to contact me at robert.d.stratton@maine.gov or (207) 287-5659. Thank you very much.

Sincerely,

Bob Stratton /FW

Robert D. Stratton
Environmental Program Manager
Maine Department of Inland Fisheries & Wildlife

cc: John Perry, Becca Settele (MDIFW)
Mark Stebbins (MDEP)
Katelin Nickerson (Flycatcher LLC)

Exhibit 7-2
USFWS IPaC

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Maine Ecological Services Field Office
P. O. Box A
East Orland, ME 04431
Phone: (207) 469-7300 Fax: (207) 902-1588

In Reply Refer To: February 06, 2023
Project Code: 2023-0042267
Project Name: Twin Energy

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Maine Ecological Services Field Office
P. O. Box A
East Orland, ME 04431
(207) 469-7300

Project Summary

Project Code: 2023-0042267
Project Name: Twin Energy
Project Type: Power Gen - Wind
Project Description: The Project is proposing the construction of a 3-turbine wind project on South Twin Mountain with access from North Twin Mountain in Roxbury, Maine.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@44.6137957,-70.61494190271256,14z

Counties: Oxford County, Maine

Endangered Species Act Species

There is a total of 4 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Canada Lynx *Lynx canadensis* Population: Wherever Found in Contiguous U.S. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3652	Threatened
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Fishes

NAME	STATUS
Atlantic Salmon *Salmo salar* Population: Gulf of Maine DPS There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/2097	Endangered

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

IPaC User Contact Information

Agency:	Flycatcher LLC
Name:	Jessie Hutchinson
Address:	106 Lafayette Street, Suite 2A
City:	Yarmouth, ME 04096
State:	ME
Zip:	04096
Email	jessie@flycatcherllc.com
Phone:	2074919029

Lead Agency Contact Information

Lead Agency: Army Corps of Engineers

Exhibit 7-3
Rare, Threatened, and Endangered Species Report

Rare, Threatened, & Endangered Species Survey Report

Twin Energy Project - Oxford County, Maine

June 2022

Prepared for:
Palmer/ Twin Energy LLC
13 Elm Street, Suite 200
Cohasset, MA 02025

Prepared by:
Flycatcher LLC
106 Lafayette Street, Suite 1C
Yarmouth, ME 04096
http://www.flycatcherllc.com

Contents

Figures

Tables

Attachments

Introduction

Between September 20 and October 22, 2021, Flycatcher LLC (Flycatcher) completed rare, threatened, and endangered (RTE) species surveys for the proposed Twin Energy Project (Project). A proposed wind energy generation facility in in Roxbury, Rumford, and Mexico, Maine. Surveys were focused on three species, Roaring Brook mayfly (*Epeorus frisoni*, RBM), northern spring salamander (*Gyrinophilus porphyriticus*, NSS), and northern bog lemming (*Synaptomys borealis*, NBL).

RTE surveys were performed to support Project planning to avoid and minimize impacts to these sensitive species, and to satisfy requirements for permitting wind projects in Maine. Consideration of the proposed Project scope, setting (e.g. bioregion, elevation), requirements for survey timing, and the Project team's prior experience with similar developments in the region were factors used to determine RTE survey scope and methods. In addition to direct consultation with agency staff, surveys were based on the guidelines detailed in the Maine Department of Inland Fisheries and Wildlife (MDIFW) *Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality* (MDIFW 2018).

Prior to deploying to the field, Flycatcher consulted with biologists from the MDIFW, the MDIFW consultant for RBM, Marcia Siebenmann, and Dr. Zachary Olson, Associate Professor of Animal Behavior at the University of New England (UNE). Ms. Siebenmann is a consulting biologist and mayfly expert who supports research for MDIFW and provided professional guidance in habitat identification and sampling for this survey effort. Dr. Olson studies NBL and provided Flycatcher with the most up to date information on habitat identification and field sampling protocols.

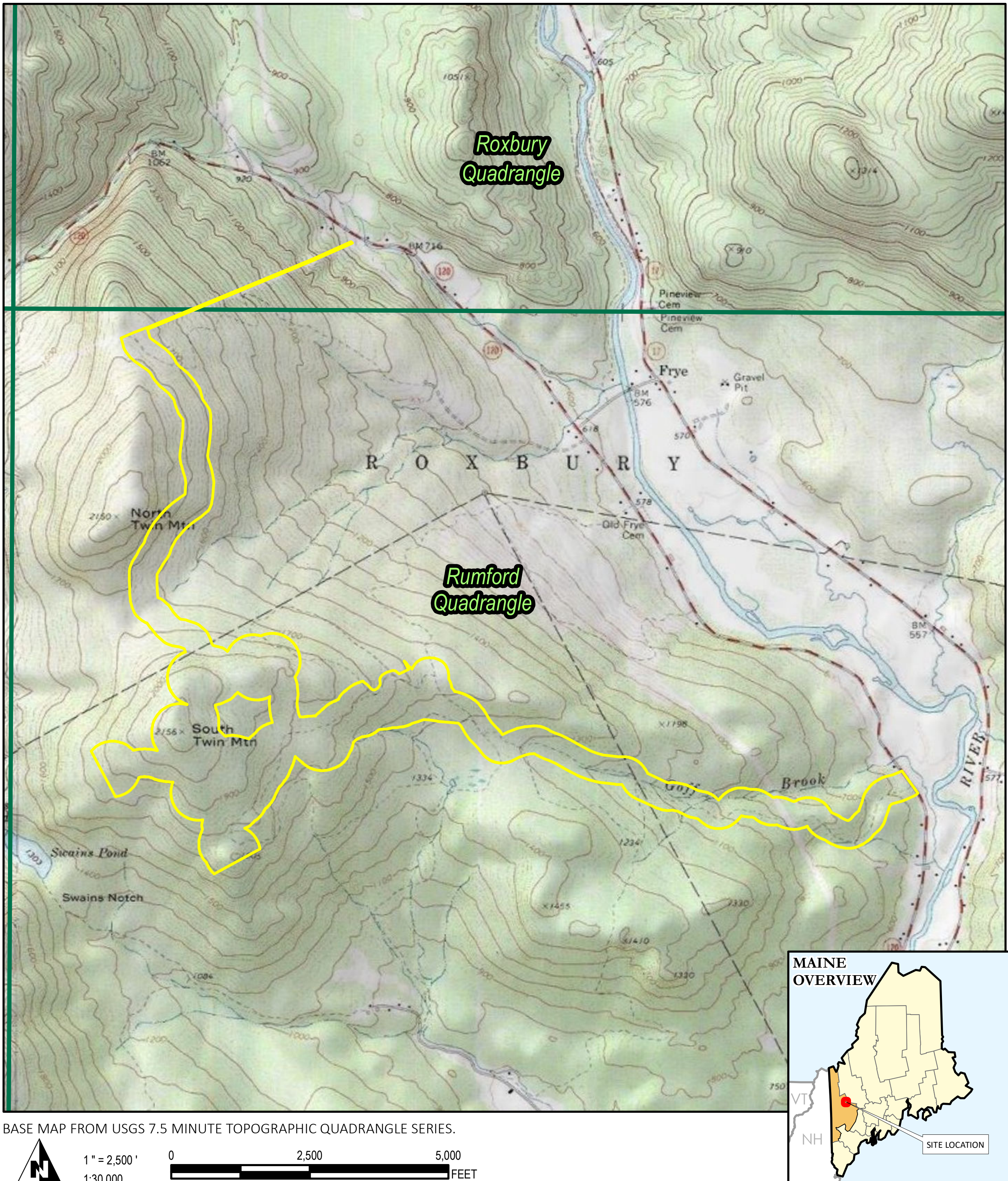
In addition to these specific RTE species surveys, Flycatcher biologists completed a wetland and watercourse delineation and a soil survey in the fall of 2021. During the RTE survey, wetland delineation and soil survey efforts, biologists recorded incidental observations of potential RTE habitat for other listed species and other species of special concern which commonly occur in high elevations or are of particular interest when siting and permitting wind energy projects. Specifically, Flycatcher documented the presence of observed habitat for Bicknell's thrush (*Catharus bicknelli*), great blue heron (*Ardea Herodias*), and bat hibernacula. The methods and results of this survey for potential RTE and species of special concern habitat is provided in this report to inform permitting requirements, siting of project infrastructure and decision making regarding potential future surveys, if required, for this Project.

Survey Area

The Survey Area is located on approximately 450 acres of undeveloped commercial timber land at the corners of Roxbury, Rumford, and Mexico, Maine. South Twin Mountain (2,150-foot elevation) is the main summit within the Survey Area (Figure 1).

Flycatcher completed a wetland and watercourse delineation within the Survey Area; the results of this survey are provided in the *Wetland and Watercourse Delineation and Potential Vernal Pool Survey Report* (Flycatcher 2022). Many of the wetlands within the Survey Area are associated with groundwater discharge seeps, surface drainages or streams. The results of the wetland delineation support Flycatcher's identification of potentially suitable habitat for listed species within the Survey Area. Attachment 1 provides a photographic log of the Survey Area and identified habitats

The primary access to the Survey Area is Yonder Way, a private road that extends northeast for approximately 2 miles from Swift River Road in Mexico. Various snowmobile and ATV trails occur within the eastern portion of the Survey Area. Additionally, a timber management haul road extends west from the northern terminus of Yonder Way and ends at log landing area just north of the southernmost summit area within the Survey Area. The Survey Area also can be accessed from the north through the forest between North and South Twin Mountains starting at the southern terminus of the Roxwind Project, located north and west of the Survey Area on North Twin Mountain. At the time of the fall 2021 survey, construction of the Roxwind project was nearly complete.



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

N

1 " = 2,500 '
1:30,000

0 2,500 5,000 FEET

PALMER
Flycatcher
LAND + SCIENCE + PEOPLE

PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

LEGEND:

PROJECT SURVEY AREA
USGS 7.5-MINUTE QUADRANGLE BOUNDARY

DRAWN BY:	D. KENWORTHY
CHECKED BY:	K. NICKERSON
MONTH:	JULY
YEAR:	2022
PROJ. NO.:	21ZP
CLIENT:	PALMER

FIGURE 1

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Survey Methods

Based on review of available data, extensive consultation with agencies and experts, the time of year that the Project work was contracted (late September), Project location within the State, elevation, and an understanding of field studies completed for the neighboring Roxwind project, the Flycatcher team developed a study plan to complete surveys for Roaring Brook mayfly, northern spring salamander, and northern bog lemming. The initial field effort was a walk over of the entire Survey Area to identify potential habitat for each species. During this two day walk over Flycatcher biologists geolocated and photo documented potential habitat, for review and preparation for field surveys. Following the initial walkover, species-specific surveys were completed to determine presence or probable absence of these species. Survey methods for each species is further described below.

Desktop Review and Agency Outreach

Flycatcher reviewed existing data sources to gather information on the Survey Area topography, elevation, dominant vegetative communities, and potential locations for wetland and stream resources that could provide habitat for RTE species. The available maps and data sources include:

- United States Geological Survey (USGS) topographic maps;
- USFWS National Wetlands Inventory (NWI) maps;
- Natural Resources Conservation Service (NRCS) medium-intensity soil survey maps;
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs);
- USGS National Hydrography Dataset (NHD); and
- Recent and historic aerial photography (via Google Earth).

Prior to commencing field surveys, Flycatcher biologists consulted with staff and subject matter experts at the MDIFW, the Maine Natural Areas Program (MNAP), and UNE for information on known or potential state-listed rare, threatened, endangered or special concern species within or proximal to the Survey Area. Flycatcher also requested an Official Species List from the United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation System (IPaC System) to determine whether there are known occurrences of species or critical habitats listed under the Federal Endangered Species Act (ESA) within the Survey Area. Attachment 2 includes responses from initial agency outreach regarding the Project.

This data review and agency outreach provided the baseline for determining which RTE surveys would be appropriate for this proposed Project. Understanding some RTE surveys are seasonally dependent, Flycatcher met with MDIFW on September 17, 2021 to introduce the Project and discuss the immediate surveys planned for fall 2021. Based on this discussion the team identified RBM, NSS and NBL as RTE species that should be surveyed in the fall of 2021. Follow up meetings were held with MDIFW on September 24, and with Dr. Olson on September 24, to discuss the results of the site walkover and to review more specific survey protocols. A follow up meeting was held with MDIFW on January 18, 2022, to discuss results of the fall survey effort, introduce the Project's preliminary civil design, and consult on additional surveys being considered. These meetings helped the Project team gain an understanding of MDIFW's expectations and receive feedback on survey approach and methodology.

Roaring Brook Mayfly

RBM, a Maine listed threatened species, prefers clean, cold, high elevation (above 1,000-feet), perennial streams with substrate that is primarily rocks, cobble, and boulders, and has limited organic substrate. *The Recommended Survey Protocol for Roaring Brook Mayfly* (MDIFW 2020) provided by MDIFW describes the known preferred habitats, site selection for sampling, and survey methodology. This protocol served as the baseline for survey timing and approach.

In addition to following the protocol provided by MDIFW, Flycatcher consulted with MDIFW's Beth Swartz at the onset of the Project, once prior to completing habitat surveys and again after habitat surveys were complete. Flycatcher obtained a scientific collection permit from MDIFW on September 28, 2021. Ms. Marcia Siebenmann aided Flycatcher biologists through the first few sampling locations. This consultation revealed that there is potentially suitable habitat in streams of differing size and flow regime than what is detailed in the protocol, and therefore habitat deemed suitable for surveys occurred in what might be considered marginal habitat according to the RBM protocol.

MDIFW recommends all surveys be completed during the month of September, during normal low and stable flow periods, and avoiding sampling after heavy rains or when water levels are high. The RBM sampling occurred within the recommended survey window, during the last week of September. Water levels were normal during the sampling period.

For surveys intended to support permitting for development projects, it is recommended that all potentially suitable streams within 250-feet of the final alignment be surveyed. According to the MDIFW protocol, if no *Epeorus* larvae or mayfly nymphs of any species are collected at the first two to three sites, surveyors should move upstream to the best available habitats. If *Epeorus* nymphs are absent or underdeveloped, surveys should be discontinued. If *Epeorus* larvae are present, survey effort is increased.

Samples were collected using a 30-centimeter-wide D-frame aquatic net with a 500-microgram mesh bag. Nets were placed in an area where water naturally funnels within the stream channel. Rocks and material upstream of the net were rubbed and manipulated to dislodge organisms within an approximately one-meter squared area immediately upstream of the net. The samples from each net were then placed into a white tray with water, and material leftover on the net was rinsed into the tray and inspected before being discarded. The samples were then visually inspected to identify organisms collected specifically looking for *Epeorus* nymphs.

Biologists recorded sampling effort in field books, photographs were taken at each sampling location, and sampling points were geolocated using a mapping grade global positioning system (GPS) unit (Juniper Systems' Geode GPS Antenna and ESRI's ArcGIS Collector software) capable of sub-meter accuracy.

Northern Spring Salamander

Northern spring salamander surveys were completed in accordance with the MDIFW guidance document, *Northern Spring Salamander Survey Protocols* (MDIFW 2019). NSS, a Maine listed species of special concern, are typically found in streams occurring between 500-2,000-foot elevation. Typical NSS streams range from moderate to high gradient first and second order streams and can occasionally occur in third order streams if habitat is available. Similar to the RBM surveys, the MDIFW guidance states that surveys should be completed within 250-feet of areas proposed for Project development.

Flycatcher biologists completed a habitat survey (concurrent with the RBM habitat survey) to identify potentially suitable habitat and areas that should be included in the sampling effort. Following the initial walkover, and in accordance with the recommended survey protocols, first to third order streams were identified at elevations above 500-feet. For each stream identified as suitable habitat, searches were completed for a minimum of 30 minutes within each targeted stream section.

Observations of northern spring salamander were photo-documented and locations of each finding geo-located. Additionally, MDIFW Maine Amphibian and Reptile Atlas Project (MARAP) forms were completed for each survey location. Completed MARAP forms were submitted to MDIFW on March 4, 2022.

Northern Bog Lemming

Prior to initiating surveys for NBL, a Maine listed threatened species, Flycatcher biologists consulted with Dr. Zachary Olson. Dr. Olson provided information on habitat identification, survey methodology, and sample collection protocols.

Field methods

Sites were targeted for sampling based vegetative features consistent with what is known about NBL habitats, such as dense sphagnum and sedge availability (Reichel and Beckstrom 1994). Dr. Olson's following recommendations were followed by Flycatcher biologists.

> *Four loosely defined transects be searched for small mammal sign within each site. Transects should be 100 meters long and spaced roughly 50 meters apart. If sites are smaller than 100 x 200 meters, the site should be searched to saturation. Transects should be visited one time only by a pair of researchers attempting to collect 50 pellets total with 10-20 pellets being collected from a 20-m-wide band overlaying each transect (i.e., researchers meander ~10-20 m from the transect during searches to visually search all likely habitat for small mammal sign). An effort should be made in the field to space pellet collections along the full length of transects in order to maximize the number of small mammal individuals that are sampled at each site. Ultimately, however, collection locations are determined by the presence of sign, which can be scarce and difficult to find at some sites. Sign of small mammal activity along transects include holes in the sphagnum, runways, and hummocks near grass or tree boles.*
>
> *Where sign is found, close-in searches were conducted (hands and knees) to find small mammal pellets. Pellets >5mm in length and not black in color will be collected. Scientists will record location, elevation, the presence of grass/sedge clippings in a runway (i.e., bog lemming sign), the color and relative freshness of the pellet, and then initiate collection. Up to 10 pellets will be placed in the same sample-collection tube, allowing for batch processing of pellets in the laboratory. The single pellet will be picked up with a gloved hand and placed into a numbered 2.0 mL sample tube filled with a lysis buffer. Pellets collected were able to withstand room temperature conditions until their arrival in the laboratory, where they will be stored at -20°C until processing.*

Collection tubes and surgical gloves were provided by Dr. Olson. During field surveys, pellets were collected in accordance with the protocol and placed in a collection tube with lysis buffer. Collection tubes were stored in a refrigerator (approximately -18°C) until delivered to Dr. Olson's laboratory at UNE for processing of the samples in the winter of 2022. Field and Laboratory methods for fecal pellet analysis, developed by Dr. Olson, are provided in Attachment 3

Other Species

During the fall 2021 field effort Flycatcher biologists recorded incidental observations of habitat that could support other listed species that are commonly encountered in high elevations or are of particular interest during the development and permitting of wind energy projects. This includes potentially suitable habitat for Bicknell's thrush, great blue heron, and bat hibernacula.

Bicknell's Thrush

Bicknell's thrush, a Maine listed species of special concern, prefer alpine and boreal upland forest habitats that are typically dense spruce (*Picea spp*) and fir (*Abies spp*) forests at elevations at or above 2,700 feet in Maine. Flycatcher took note of areas with habitat characteristics suitable for Bicknell's Thrush during the initial site walkover and the wetland delineation effort. These areas also are generally visible in the aerial photography available online. The summit of South Twin Mountain, the highest point in the Survey Area, is 2,150 feet which is below the 2,700-foot elevation typical for Bicknell's thrush habitat.

Great Blue Heron

Great blue heron, a Maine listed species of special concern, can occur in small colonies of a few mating pairs as well as larger colonies of one hundred or more mating pairs. Colonies occur in coastal and freshwater islands, beaver flowages, and in uplands. Nests are typically built in mature trees that are alive, dead or dying. Most of Maine's colonies occur in beaver flowages. Flycatcher completed a wetland delineation within the entire Survey Area and documented habitat available within the Survey Area.

Bats

There are eight species of bats in Maine that are listed as endangered, threatened, or special concern. Bat overwintering or hibernacula are of particular concern when planning and permitting wind energy projects. Suitable hibernacula can be caves, old mines, and exposed rocky features. These rocky features consist of talus slops with variable rock sizes, rock ledges, and piles, and small vertical cracks in rocks. Some species of bats may use these features year-round as well as for winter hibernacula.

During the fall 2021 field effort Flycatcher staff photographed and GPS-located areas that meet MDIFW's description of suitable habitat for hibernacula. Over the winter of 2022, Flycatcher utilized these photographic records to consult with biologists from the MDIFW and develop a survey plan. Based on this collaborative site screening effort between Flycatcher and MDIFW, field surveys were performed in the spring of 2022 by MDIFW biologists to determine the availability of bat hibernacula within the Survey Area.

Survey Results

The Survey Area is mainly comprised of hardwood stands and mixed forest in various stages of regeneration. Small pockets of softwoods occur in the highest elevations. Based on field observations, a significant timber harvest occurred within the last 5 years resulting in areas with canopy tree removal, strip cuts, skid roads, log landings, and a haul road. The watershed within the Survey Area mainly contributes to the Swift River. Attachment 1 provides a photographic log of the Survey Area and identified habitats, Attachment 2 includes responses from initial agency outreach and correspondence.

Desktop Survey and Agency Outreach

The USGS NHD data set depicts three intermittent and one perennial watercourses within the Survey Area. One intermittent stream starts 3,000 feet east-southeast of South Twin Mountain and flows south offsite. Two intermittent streams, Goff Brook, and a tributary to Goff Brook, start approximately 7,000 feet east-southeast of South Twin Mountain and flow east offsite. Goff Brook becomes a mapped perennial stream at approximately 1,200-feet in elevation. The NWI map depicts no freshwater wetlands within the Survey Area. One wetland is mapped just outside the Survey Area near the headwaters of Goff Brook.

The watershed on the north, east, and south aspects of the Survey Area flows generally east and south into the Middle Swift River Watershed (US Geological Survey (USGS) hydrologic unit code (HUC) 010400020404). A small portion of the western side of the Survey Area flows west into the Ellis Pond Watershed (HUC 010400020301). Both the Swift River and Ellis River are tributaries to the Androscoggin River and part of the Lower Androscoggin River Watershed. A USGS topography maps with the Survey Area overlaid is provided as Figure 1. Photographs of the Survey Area are provided in Attachment 1.

MNAP

MNAP indicated in their response letter that there are no rare botanical features documented specifically within the Survey Area. MNAP provided a list of rare plant species historically documented within four miles of the Survey Area. Many of the listed plants species are associated with forested uplands, dry barrens, rocky summits and outcrops. MNAP's response is included in Attachment 2. Flycatcher biologists reviewed the Survey Area for the species and habitats listed in MNAP's response concurrent with the wetland delineation effort. However, many of these species and habitats occur in non-forested, rocky summits. While rock outcrops are present within the Survey area, they are predominantly forested and lack the features that would indicate the potential presence of these species and communities.

USFWS

An Official Species List, identifying those species listed under the Federal ESA that may occur within the Survey Area, was requested from the USFWS. The Official Species List noted that the habitat of northern long-eared bat (*Myotis septentrionalis*), Atlantic salmon (*Salmo salar*) and monarch butterfly *(Danaus plexippus),* may occur within the Project area and should be considered as part of the Project effect analysis. The full response from USFWS is included in Attachment 2.

MDIFW

Due to surveys commencing prior to receiving the full preliminary review of the Survey Area, Flycatcher biologists relied on direct consultation with MDIFW staff at the onset of surveys. During initial correspondence, MDIFW noted that Maine Wind Power Preconstruction Recommendations (MDIFW 2018) should be consulted for the applicability of recommended studies. During this consultation, MDIFW mentioned they may request surveys be completed for bats (specifically bat hibernacula), great blue heron, and Bicknell's thrush. This served as the basis for many of the surveys completed during the fall 2021 field effort.

After the initial correspondence with MDIFW staff, and following a site walkover to collect watercourse information, Flycatcher consulted with MDIFW in a second meeting on September 24, 2021, to confirm field determinations of which watercourses identified onsite contain suitable habitat for RBM and/or NSS, and therefore should be surveyed.

MDIFW's preliminary review was received on November 1, 2021. In this review, MDIFW indicated that there are no mapped Essential Habitats that would be directly affected by the Project. Additionally, MDIFW listed several species of bats that have the potential to occur within the Survey Area including several species listed under the Maine Endangered Species Act. MDIFW recommended identifying rocky features within the Survey Area that could be used as hibernacula or roosting habitat. Furthermore, MDIFW outlined recent wind project's curtailment agreements and indicated that project developers can anticipate a need for increased curtailment during July – September, when there is higher potential for bat mortality.

In addition to bats, MIDFW provided guidance regarding significant wildlife and fisheries habitats. MDIFW indicated there are no known significant wildlife habitats within the Survey Area. Significant Wildlife Habitats include waterfowl and wading bird habitats, seabird nesting islands, shorebird areas, and significant vernal pools. MDIFW recommended a vernal pool survey be completed within 250 feet beyond the anticipated project footprint. This survey was completed by Flycatcher in the Spring of 2022, no vernal pools were identified. The methods and results of this survey are covered in a separate report.

Regarding fisheries habitat, MDIFW recommends maintaining a 100-foot undisturbed vegetated buffer from the upland edge of all intermittent and perennial streams and any contiguous wetlands. Further, MDIFW recommends avoiding stream crossings, but if needed, crossings should be designed to provide for full aquatic passage.

MDIFW indicated there are other possible resources that may require surveys to support their review of the Project, including surveys for species such as raptors, great blue heron, Bicknell's Thrush, Roaring Brook mayflies, northern spring salamanders, and norther bog lemmings. MDIFW's preliminary review of the Survey Area is provided in Attachment 2. Follow up correspondence from MDIFW in January 2022 indicated there is one known great blue heron nest mapped approximately 5.5 miles west of the Survey Area. This correspondence and associated figure also are provided in Attachment 2.

Fieldwork Survey Results

Roaring Brook Mayfly

There is limited suitable habitat for RBM within the Survey Area. Surveys were completed in areas where the best available habitat was identified; however, the best habitat on-site is typically may be considered moderate to low quality for RBM. Many streams surveyed have long sections of unsuitable suitable habitat, for example, organic or mossy substrate present, bedrock substrate with no cobbles or rocks present, or the stream section occurs at a lower gradient and lower elevation than where RBM are typically found. Observed stream channel disturbance includes road crossings and timber harvest activity, however, the surrounding habitat is generally undeveloped and streams have good canopy cover from the predominantly deciduous forest within the Survey Area.

Flycatcher identified four perennial streams that occur over 1,000-foot elevation, and had several segments that met the substrate, gradient, canopy cover and temperature criteria to be considered suitable RBM habitat. This includes areas above 1,000-foot elevation with relatively undisturbed mixed forest, ample shade and canopy cover, steep gradients with coarse substrates, minimal aquatic vegetation, and cold-water temperatures. Each stream identified as potentially suitable habitat for RBM also contained sections that deviate from the suitable habitat criteria listed above. The portions of these streams that do not contain suitable habitat are lower gradient areas with sand and/or bedrock as the dominate substrate and some disturbance to the channel and canopy cover from roads or commercial forestry activities.

Goff Brook (stream S-JLH-4), stream S-JLH-2, stream S-MFT-2 and stream S-KMN-7 were surveyed for RBM on September 29 and 30, 2021. Ms. Siebenmann joined Flycatcher's team on site for the first day of the sampling effort to confirm the presence of suitable habitat and work alongside Flycatcher biologists for the initial sampling locations of streams S-JLH-4 and S-JLH-2. Approximate survey locations are depicted in Figure 2.

Stream S-JLH-4

Goff Brook flows southeast through the Survey Area for approximately 4,860-feet. The stream flows parallel to Yonder Way and crosses the road before flowing off-site toward the Swift River. Based on availability of suitable habitat, two sampling locations were surveyed for RBM for a total of approximately 200 feet sampled. No *Epeorus* species were found in either sampling effort.

Stream S-JLH-2

Stream S-JLH-2 occurs upslope from S-JLH-4 and similarly flows southeast through the Survey Area. Approximately 2,836-feet of this stream occurs within the Survey Area. Based on availability of suitable habitat two sampling locations were surveyed for RBM for a total of 180-feet sampled. No *Epeorus* species were found in either sampling effort.

Stream S-MFT-2

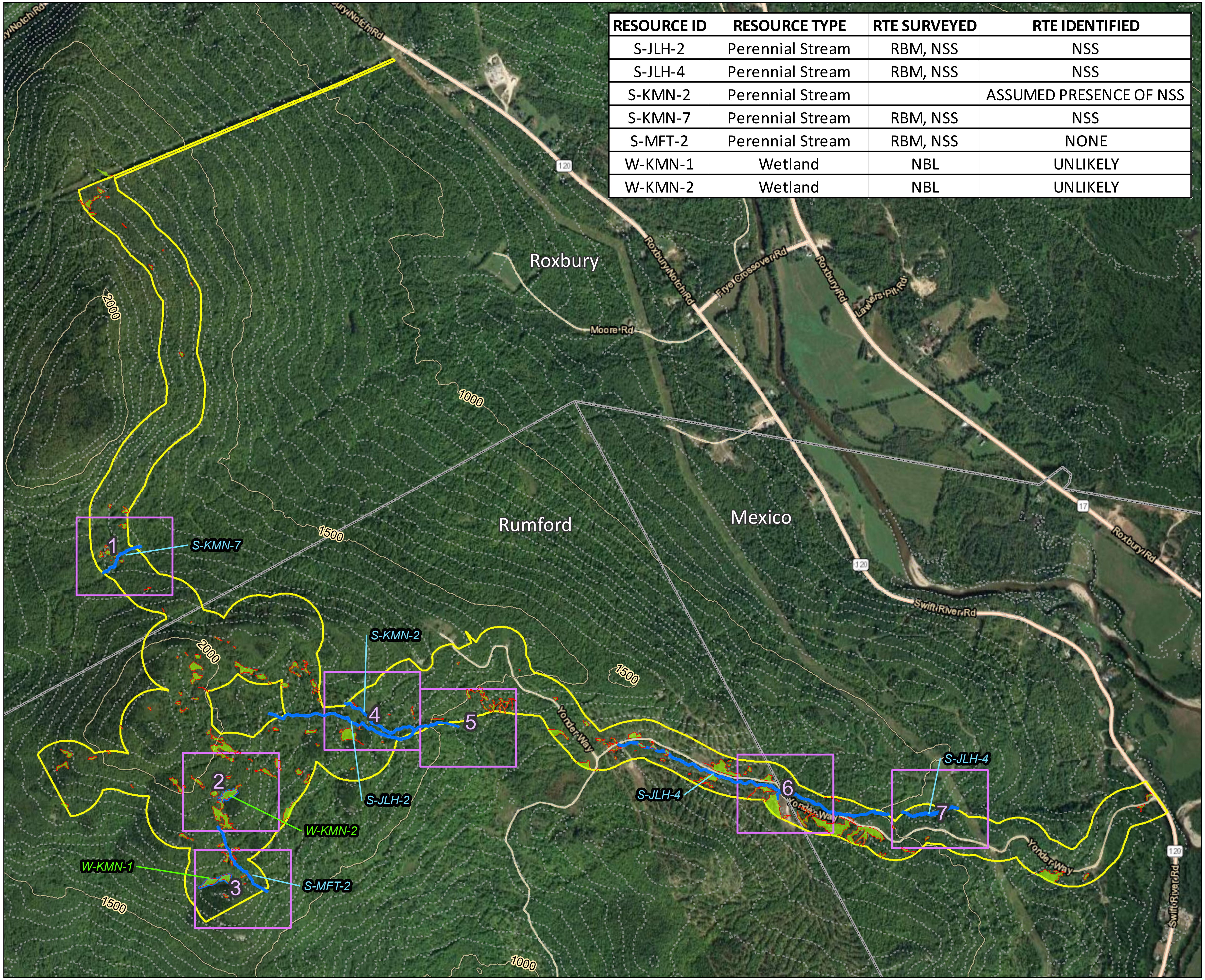
Stream S-MFT-2 flows southeast along the southern ridge of the Survey Area. Approximately 1,174-feet of this stream occurs within the Survey Area. This stream contains a steep drop off near the southern Survey Area boundary. RBM sample locations were completed above and below the cascade. Based on available habitat, two sampling locations were surveyed for RBM for a total of approximately 170 feet sampled. This stream contained the least amount of diversity and abundance of macroinvertebrates, and no *Epeorus* species were found in either sampling effort. Following the conclusion of the survey effort, it was determined, the first sweep occurred outside they survey area and off the property; therefore, it is not depicted on the figure.

Stream S-KMN-7

This perennial stream flows northwest within the notch between North and South Twin Mountains. Approximately 681-feet of this stream occurs within the Survey Area. Based on availability of suitable habitat, two sampling locations were surveyed for RBM for a total of 130-feet sampled. While this stream contained the most diversity and abundance of macroinvertebrates, no *Epeorus* species were found in either sampling effort.

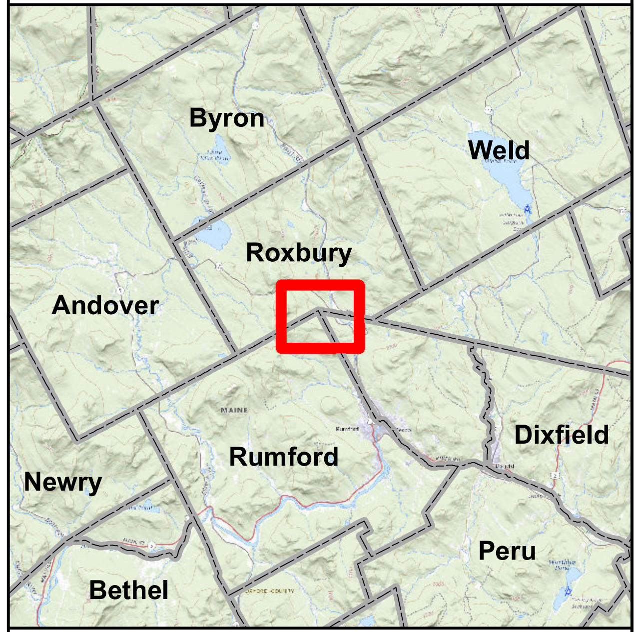
In summary, no *Epeorus* specimens were identified within the Survey Area. Due to the lack of *Epeorus* in sampling, and the intermittent availability of suitable habitat, the presence of RBM within the Survey Area is considered unlikely. Macroinvertebrate species observed during surveys included stoneflies, mayflies of the family *Ephemerellidae,* caddisflies of the families *Hydropsychidae* and *Philopotamidae,* and diptera of the family *Tipulidae*. Approximate survey locations are depicted in Figure 2, and a summary of the survey effort and results are detailed in Table 1. Photographic records of sampling locations are provided in Attachment 1.

RESOURCE ID	RESOURCE TYPE	RTE SURVEYED	RTE IDENTIFIED
S-JLH-2	Perennial Stream	RBM, NSS	NSS
S-JLH-4	Perennial Stream	RBM, NSS	NSS
S-KMN-2	Perennial Stream		ASSUMED PRESENCE OF NSS
S-KMN-7	Perennial Stream	RBM, NSS	NSS
S-MFT-2	Perennial Stream	RBM, NSS	NONE
W-KMN-1	Wetland	NBL	UNLIKELY
W-KMN-2	Wetland	NBL	UNLIKELY



LEGEND

- PROJECT SURVEY AREA
- PERENNIAL STREAM
- WETLAND BOUNDARY LINE
- DELINEATED WETLAND
- RTE SURVEY DETAIL INDEX
- 500' CONTOUR INTERVAL
- CONTOUR LINE (50' INTERVAL)
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM ESRI/NAIP, "WORLD IMAGERY" WEB BASEMAP SERVICE LAYER, 2021.

2 RTE SURVEYS WERE CONDUCTED BY FLYCATCHER IN SEPTEMBER AND OCTOBER 2021.

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Feet
1 " = 1,250 '
1:15,000

PROJECT:
TWIN ENERGY LLC
TWIN WIND PROJECT
OXFORD COUNTY, MAINE

TITLE:
RARE, THREATENED, & ENDANGERED
WILDLIFE SURVEY LOCATIONS & RESULTS

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON	FIGURE 2	
MONTH:	MAY	Overview	
YEAR:	2022		

Flycatcher LAND + SCIENCE + PEOPLE
PALMER

FILE NO.: Palmer_TwinEnergy_RTE_Overview_11x17L.mxd

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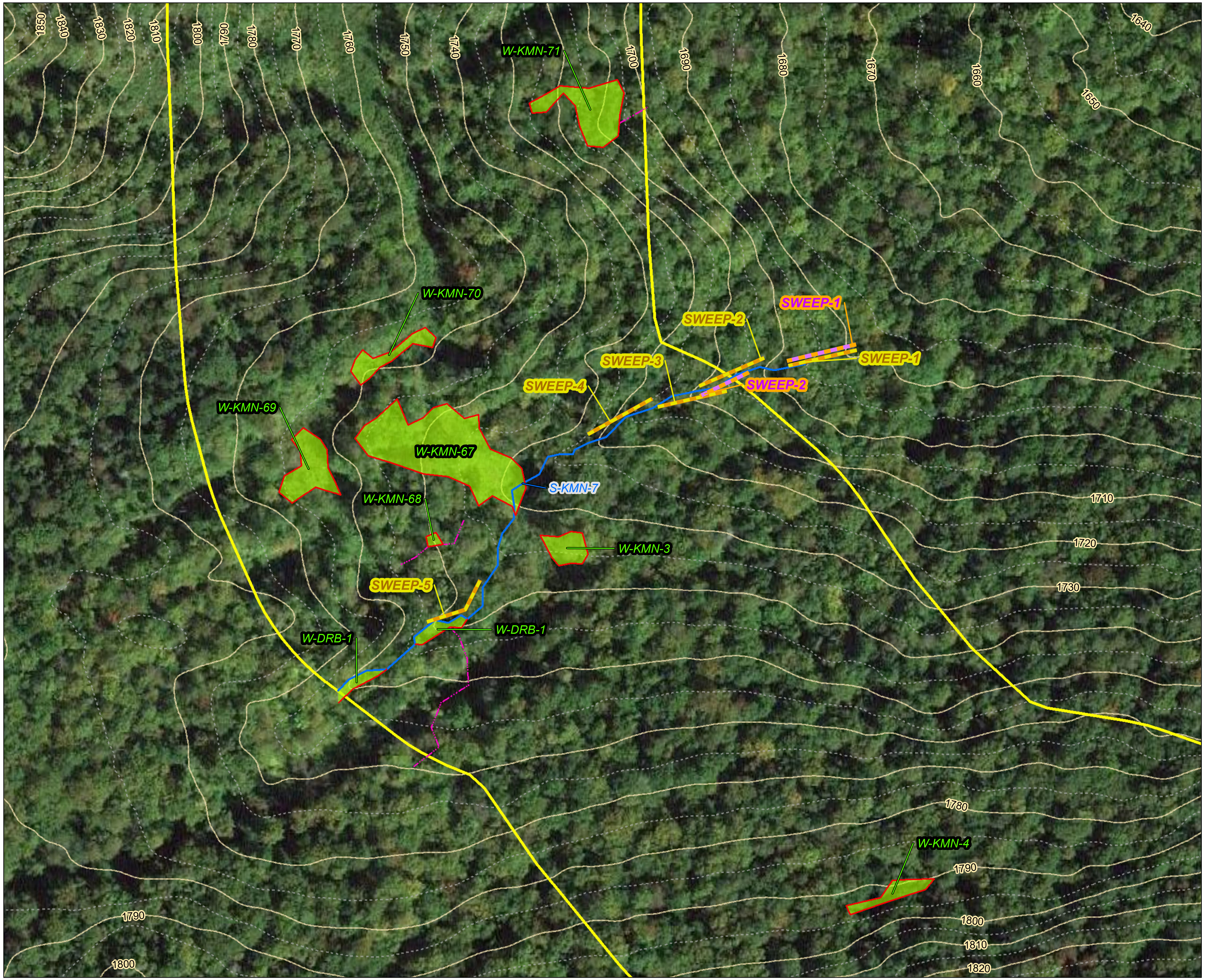
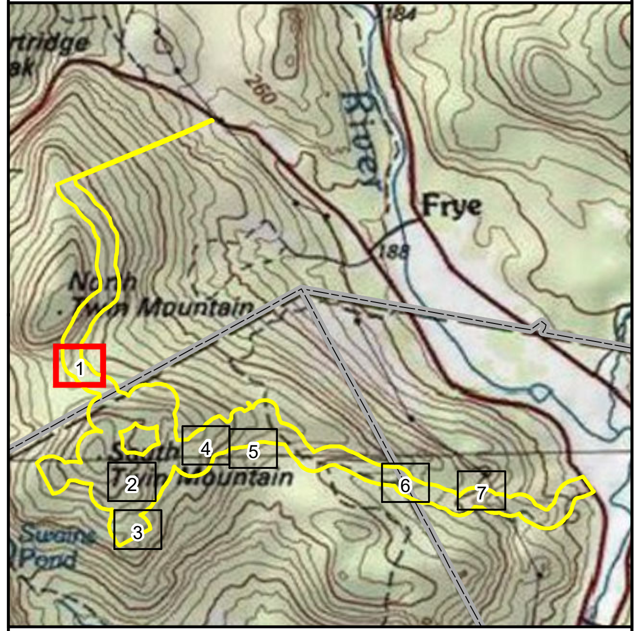


LEGEND

- PROJECT SURVEY AREA
- NSS SWEEP
- RBM SWEEP
- UPLAND DRAINAGE
- DELINEATED PERENNIAL STREAM
- DELINEATED WETLAND BOUNDARY
- DELINEATED WETLAND
- CONTOUR LINE (10' INTERVAL)
- CONTOUR LINE (5' INTERVAL)



NOTES:

1 BASEMAP IMAGERY FROM ESRI/NAIP, "WORLD IMAGERY" WEB BASEMAP SERVICE LAYER, 2021.

2 RESOURCES WERE DELINEATED BY FLYCATCHER FROM SEPTEMBER THROUGH NOVEMBER 2021.

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Feet

1 " = 100 '

1:1,200

PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:

RARE, THREATENED, & ENDANGERED SPECIES SURVEY RESULTS

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON	FIGURE 2	
MONTH:	JUNE	Page 1 of 7	
YEAR:	2022		

Flycatcher LAND + SCIENCE + PEOPLE

PALMER

FILE NO.: Palmer_TwinEnergy_RTE_Detail_11x17L.mxd

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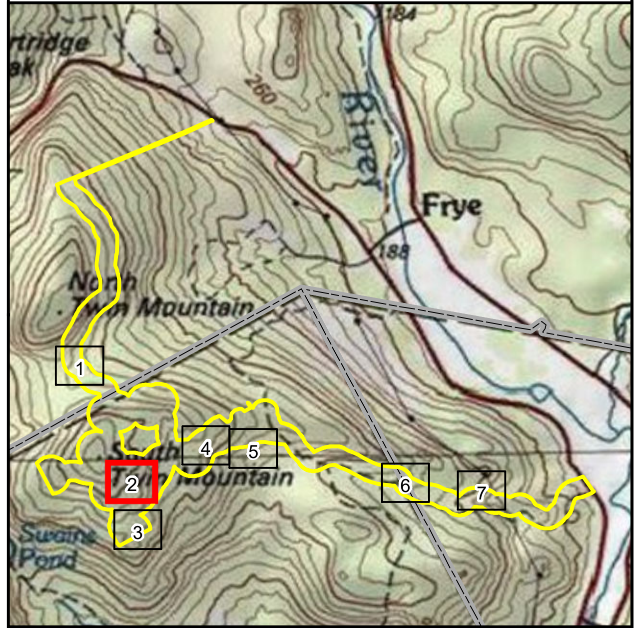
LEGEND

- PROJECT SURVEY AREA
- NBL PELLET COLLECTION AREA
- UPLAND DRAINAGE
- DELINEATED INTERMITTENT STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED WETLAND BOUNDARY
- DELINEATED WETLAND
- CONTOUR LINE (10' INTERVAL)
- CONTOUR LINE (5' INTERVAL)



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PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:

RARE, THREATENED, & ENDANGERED SPECIES SURVEY RESULTS

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON		
MONTH:	JUNE	**FIGURE 2**	
YEAR:	2022	Page 2 of 7	

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PALMER

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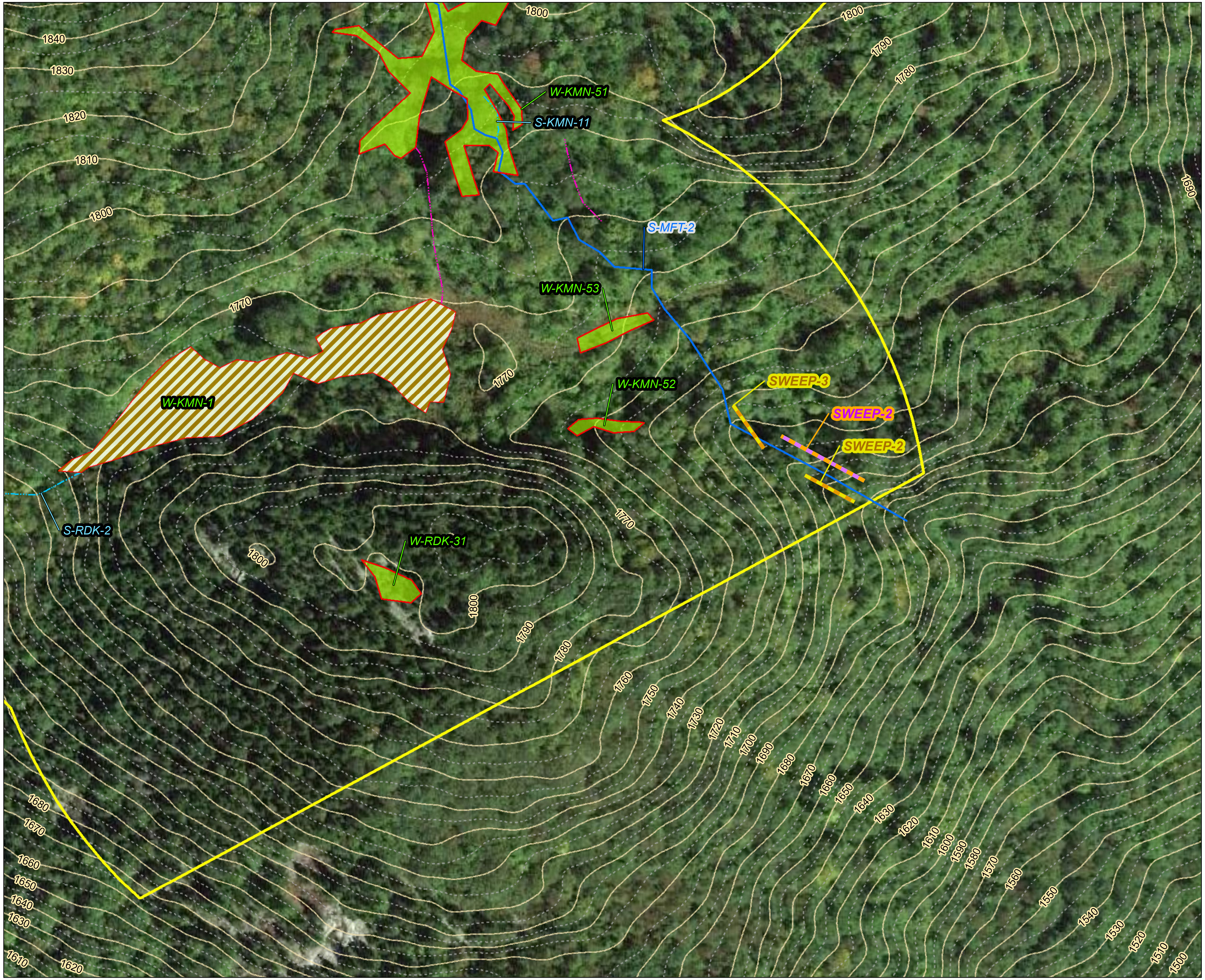

LEGEND

- PROJECT SURVEY AREA
- NSS SWEEP
- RBM SWEEP
- NBL PELLET COLLECTION AREA
- UPLAND DRAINAGE
- DELINEATED INTERMITTENT STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED WETLAND BOUNDARY
- DELINEATED WETLAND
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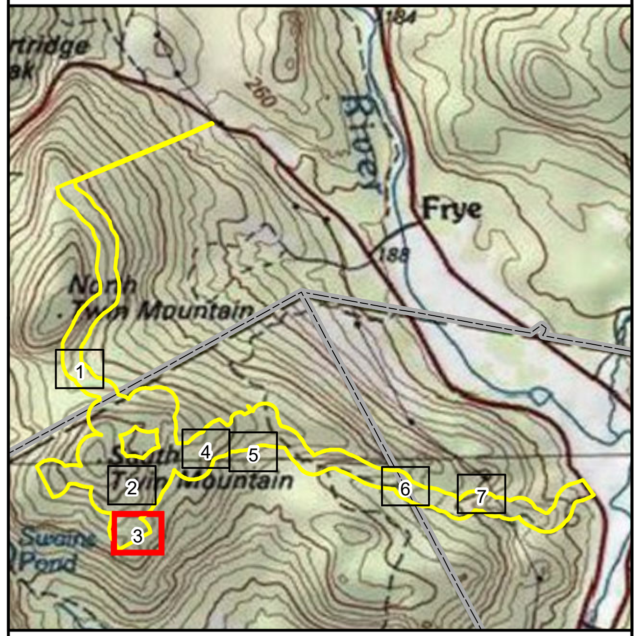

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Feet
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1:1,200

PROJECT:
TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
RARE, THREATENED, & ENDANGERED SPECIES SURVEY RESULTS

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON	**FIGURE 2**	
MONTH:	JUNE	Page 3 of 7	
YEAR:	2022		

Flycatcher
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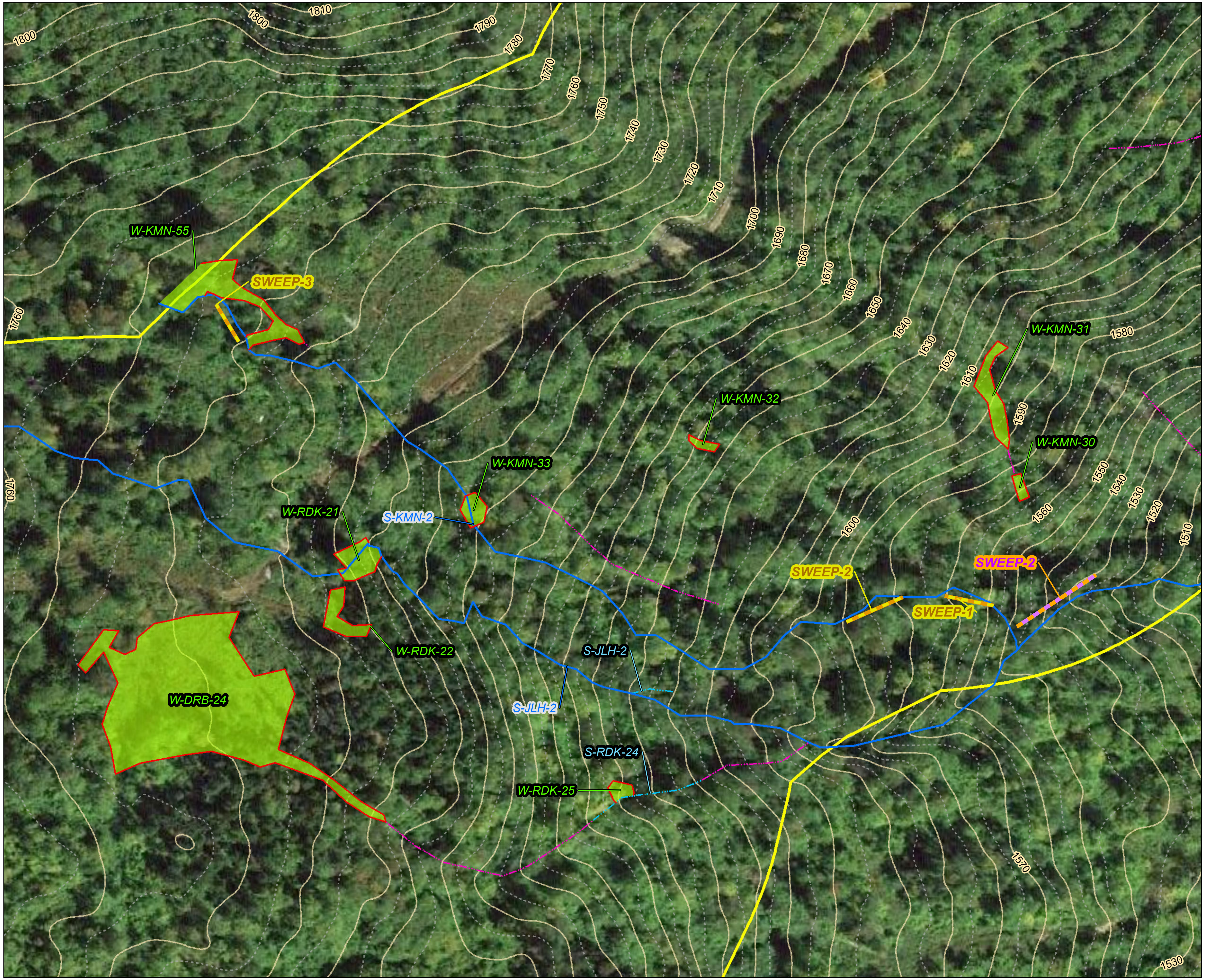
PALMER

FILE NO.: Palmer_TwinEnergy_RTE_Detail_11x17L.mxd



LEGEND

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- RBM SWEEP
- UPLAND DRAINAGE
- DELINEATED INTERMITTENT STREAM
- DELINEATED PERENNIAL STREAM
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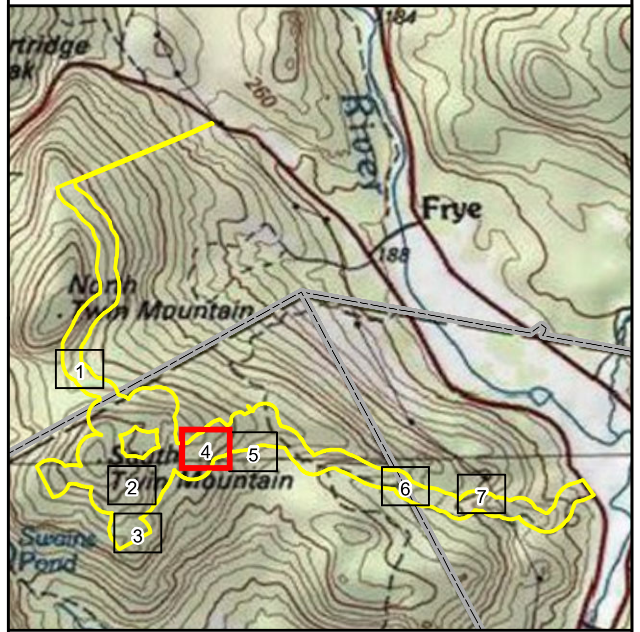
- DELINEATED WETLAND
- CONTOUR LINE (10' INTERVAL)
- CONTOUR LINE (5' INTERVAL)



NOTES:

1 BASEMAP IMAGERY FROM ESRI/NAIP, "WORLD IMAGERY" WEB BASEMAP SERVICE LAYER, 2021.

2 RESOURCES WERE DELINEATED BY FLYCATCHER FROM SEPTEMBER THROUGH NOVEMBER 2021.

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Feet

1 " = 100 '

1:1,200

PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:

RARE, THREATENED, & ENDANGERED SPECIES SURVEY RESULTS

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON	**FIGURE 2**	
MONTH:	JUNE	Page 4 of 7	
YEAR:	2022		

Flycatcher LAND + SCIENCE + PEOPLE

PALMER

FILE NO.: Palmer_TwinEnergy_RTE_Detail_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

Plot Date: 6/6/2022, 18:21:53 PM by JAKEN -- LAYOUT: ANSI B(11"x17")
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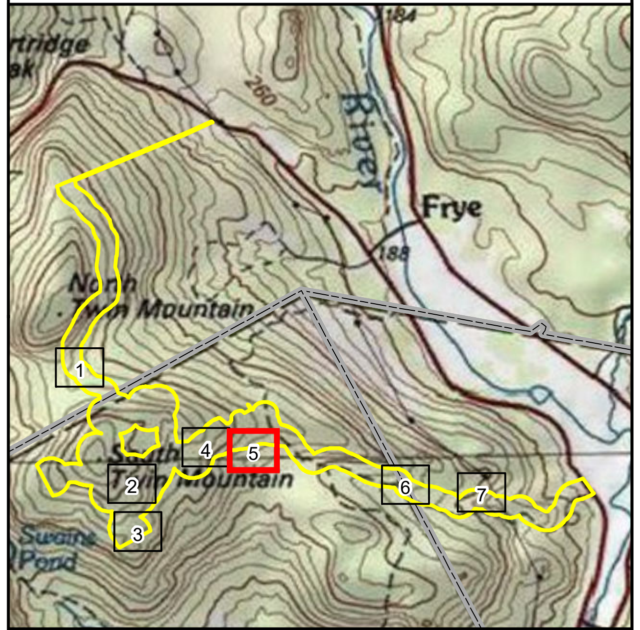
LEGEND

- PROJECT SURVEY AREA
- NSS SWEEP
- RBM SWEEP
- UPLAND DRAINAGE
- DELINEATED INTERMITTENT STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED WETLAND BOUNDARY
- DELINEATED WETLAND
- CONTOUR LINE (10' INTERVAL)
- CONTOUR LINE (5' INTERVAL)



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Flycatcher LAND + SCIENCE + PEOPLE

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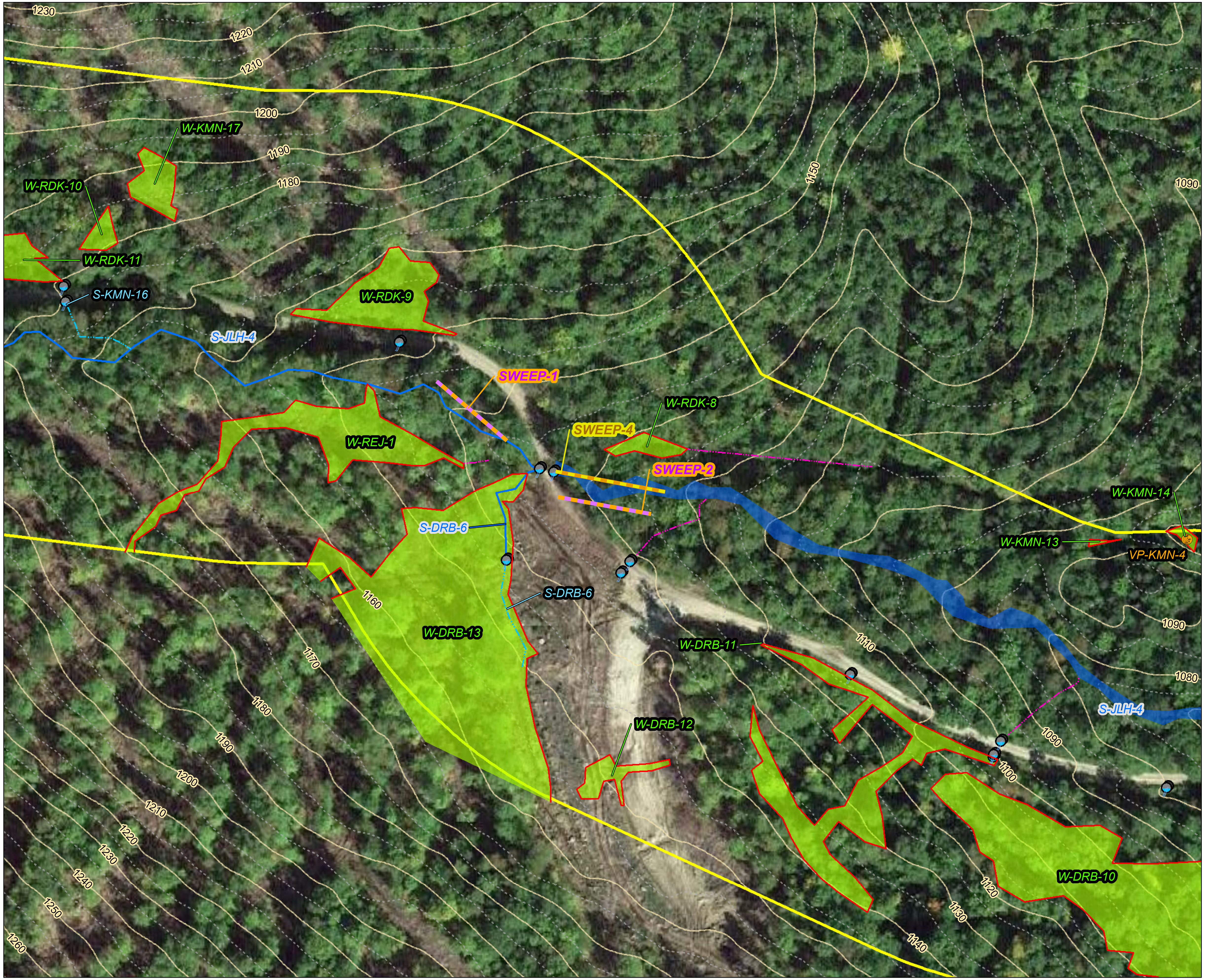

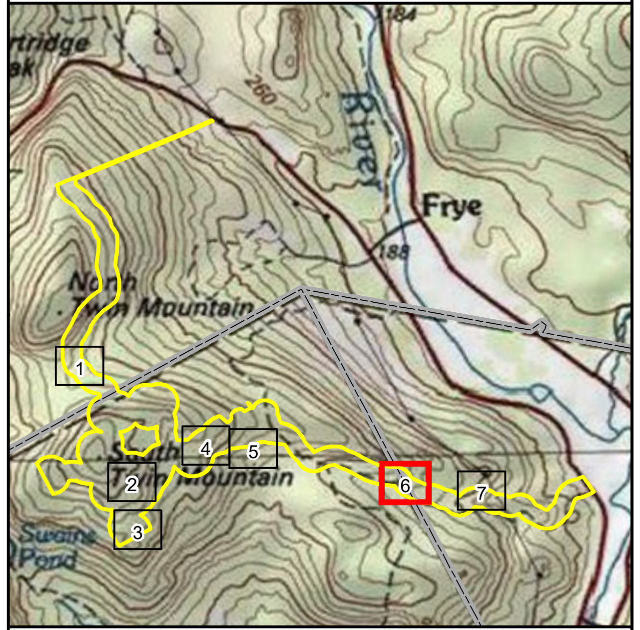

LEGEND

- PROJECT SURVEY AREA
- NSS SWEEP
- RBM SWEEP
- CULVERT
- POTENTIALLY SIGNIFICANT VERNAL POOL
- UPLAND DRAINAGE
- DELINEATED INTERMITTENT STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED WETLAND BOUNDARY
- DELINEATED WETLAND
- CONTOUR LINE (10' INTERVAL)

NOTES:

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MONTH:	JUNE	Page 6 of 7	
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PALMER

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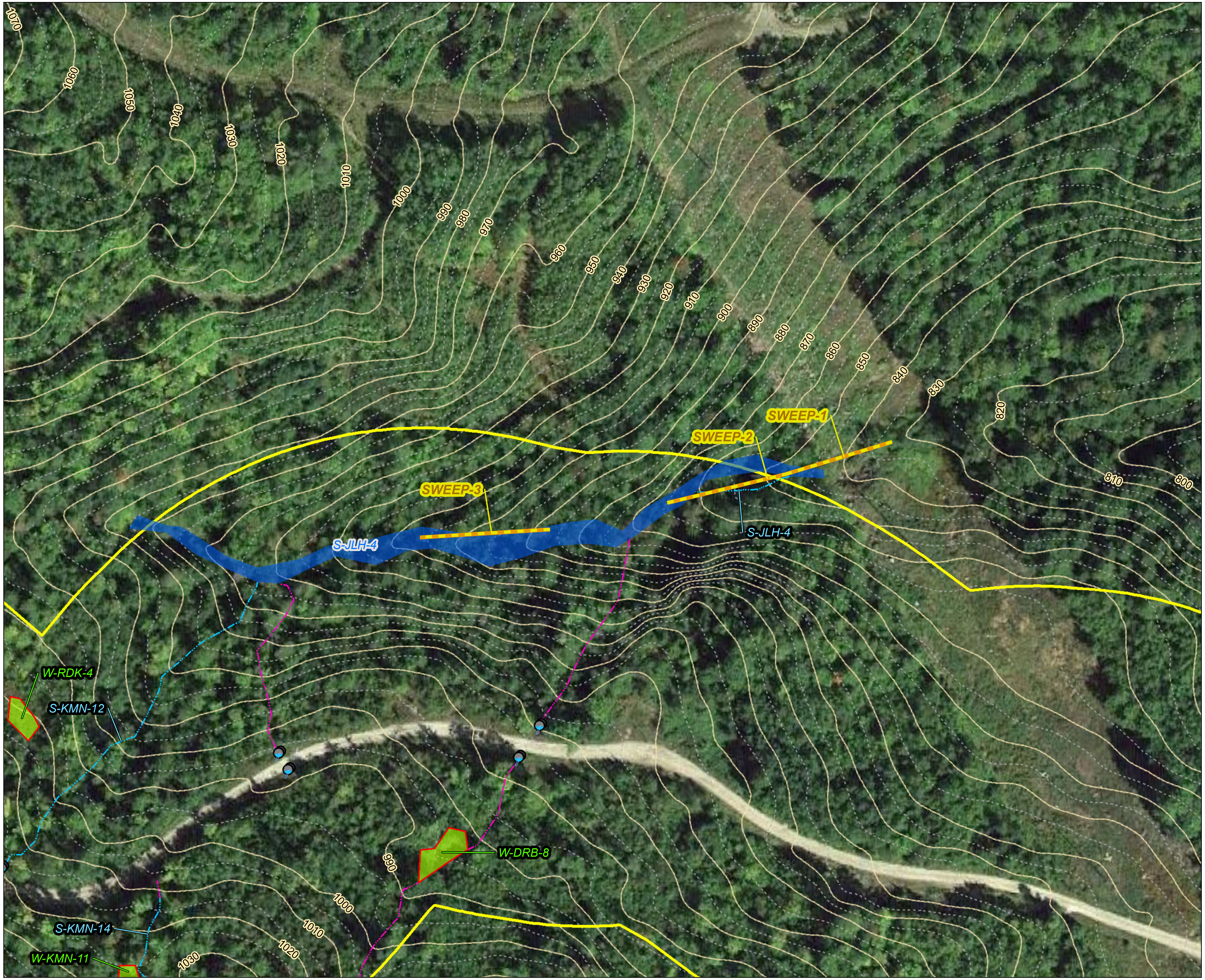
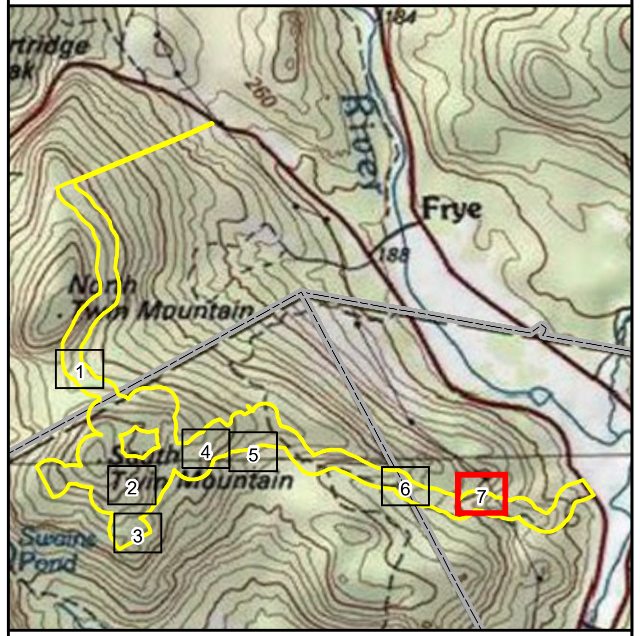


LEGEND

- PROJECT SURVEY AREA
- NSS SWEEP
- CULVERT
- UPLAND DRAINAGE
- DELINEATED INTERMITTENT STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED WETLAND BOUNDARY
- DELINEATED WETLAND
- CONTOUR LINE (10' INTERVAL)
- CONTOUR LINE (5' INTERVAL)



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DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
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MONTH:	JUNE	Page 7 of 7	
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Flycatcher LAND + SCIENCE + PEOPLE
PALMER

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Table 1. Roaring Brook mayfly survey results

Date	Town	Survey sweep ID	Start Time	End Time	Latitude/ Longitude	Elevation (ft)	Stream Description	Substrate	Canopy	Species Observed
9/29/2021	Mexico	S-JLH-4, Sweep 1	13:00	13:25	44.60198, -70.581919	1,151	Small, 2-3 ft wide; Areas of trickling water and pools 5ft deep; Water temp: 12 degrees C; Moderate gradient	Primarily boulders and rocks with some cobble and gravel; exposed rocks and boulders covered with moss	Mostly open; upland primarily hardwood	Caddisfly (1), Mayfly- *Ephemerellidae (1)*
9/29/2021	Mexico	S-JLH-4, Sweep 2	13:30	13:40	44.601892, -70.581674	1,127	Goff Brook; Few pools and flowing water; low gradient; Water temp: 12 degrees C	Primarily rocks and cobble, some gravel; rocks are moss covered	Mostly open; upland primarily hardwood	Stonefly (1), Caddisfly (1)
9/29/2021	Rumford	S-JLH-2, Sweep 1	14:20	15:00	44.604325, -70.5987338	1,477	Small, 2-5ft wide; Areas of standing pools and flowing water; Moderate gradient; Water temp 11 degrees C	Primarily boulders and rocks with some cobble and gravel; exposed rocks and boulders covered with moss	Semi-open; upland primarily hardwood	Stoneflies (5), Mayfly - *Ephemerellidae* (1), Diptera - *Tipulidae* (1), Caddisflies - *Hydropsychidae, Philopotamidae* (2), Northern dusky salamander (1)
9/29/2021	Rumford	S-JLH-2, Sweep 2	15:30	15:40	44.604055, -70.600345	1,555	Small, 2-5ft wide; Areas of standing pools and flowing water; Moderate gradient; Water temp 10 degrees C	Primarily boulders and rocks with some cobble and gravel; exposed rocks and boulders covered with moss	Semi-open; upland primarily hardwood	Caddisflies - *Hydropsychidae* (2), Northern dusky salamander (1), Northern two-lined salamander (1)
9/30/2021	Rumford	S-MFT-2, Sweep 2	10:40	11:05	44.5982411, -70.6079583	1,729	Small, 4ft wide with pools 3ft deep; Water temp. 10 degrees C; Moderate gradient; upstream origin in skidder ruts	Primarily boulder, cobble, sand; some leaf litter	Mostly closed	Caddisflies - *Hydropsychidae* (8), Water scavanger beetle - *Hydrophilidae* (1)
9/30/2021	Roxbury	S-KMN-7, Sweep 1	15:00	15:20	44.6107342705556, -70.6140678177778	1,705	Small, 3-6ft wide with pools 6 in deep; Low gradient; Water temp 13.9 degrees C	Primarily cobble, gravel, sand; Moderate/high leaf litter	Mostly closed	Caddisflies (4), Mayflies (9), Stoneflies (2)
9/30/2021	Roxbury	S-KMN-7, Sweep 2	15:20	15:40	44.610656, -70.614499	1,718	Small, 3-6ft wide with pools 6 in deep; Low gradient; Water temp 11.1 degrees C	Primarily cobble, gravel, silt; Moderate/high leaf litter	Mostly closed	Caddisflies (12), Mayflies (3), Stoneflies (2), Northern dusky salamander (2)

Northern Spring Salamander

NSS habitat is similar to RBM habitat, however also includes lower gradient and lower elevation streams down to 500 feet. Within the Survey Area, biologists found the streams with potentially suitable habitat for NSS to be coincident with streams identified as potentially suitable for RBM.

Five streams were surveyed for NSS on September 29 and 30 and October 1, 2021. Four of these five streams also were surveyed for RBM. Common species observed during the sampling effort included northern dusky salamanders *(Desmognathus fuscus)* and northern two-lined salamanders *(Eurycea bislineata).*

Stream S-JLH-2

Two surveys were performed in stream S-JLH-2 for a total length of approximately 68-feet. An adult NSS was identified during the second sweep so, in accordance with the survey protocol, once presence was determined, no further surveys were required.

Stream S-JLH-4

Four surveys were performed in stream S-JLH-4, for a total length of approximately 502 feet. Larval NSS were observed in sweeps 2 and 3, however a fourth sweep was completed in an effort to record definitive observations of adult spring salamanders, however no NSS were observed during the final sweep.

Stream S-KMN-2

Three surveys were performed in stream S-KMN-2, for a total survey length of 164-feet. Approximately 1,160 feet of this stream occurs within the Survey Area. While NSS was not observed during the survey effort, due to its connectivity to stream S-JLH-2, where NSS were observed, presence of NSS is assumed for this stream.

Stream S-MFT-2

Three surveys were performed in stream S-MFT-2, for a total length of 184-feet. Approximately 1,174 feet of stream occurs within the Survey Area, however much of it does not contain suitable habitat for NSS. Following the conclusion of the survey effort, it was determined, the first sweep occurred outside the survey area and off the property; therefore, it is not shown in the figure, NSS were not observed in this sweep.

Stream S-KMN-7

Five surveys were performed in stream S-KMN-7 for a total length of approximately 380-feet. Larval NSS were observed in early sweeps, however further survey was completed in an effort to record definitive observations of adult NSS. NSS were not observed in later sweeps upstream of initial observations.

The field studies resulted in identification of three streams with presence of NSS, and one stream with assumed presence of NSS. Streams S-KMN-7, S-JLH-2, and S-JLH-4 were observed to contain adult and larval NSS. Stream S-KMN-2 a perennial tributary to stream S-JLH-2, has assumed presence of NSS based on connectivity to a stream with observed NSS. Approximate survey locations are depicted on Figure 2. Detailed results of the survey effort including stream descriptions are included in Table 2. Photographic records of sampling locations are provided in Attachment 1.

*Table 2. Northern spring salamander survey results**

Stream ID	***Sweep Number***	***Date***	***Town***	***Start Time***	***End Time***	***Latitude/Longitude***	***Habitat Description***	***Species Name (and # observed)***
S-JLH-2	Sweep 1	9/29/2021	Rumford	15:20	16:20	44.60417489, -70.59784662	Perennial; cobble, boulder, gravel substrate; riffles with small pools	Northern dusky salamander (5)
S-JLH-2	**Sweep 2**	**9/30/2021**	**Rumford**	**9:25**	**9:40**	**44.60420438, -70.5981251**	**Perennial; cobble, boulder, gravel substrate; riffles with small pools**	**Northern two-lined salamander *(1)*** ***Northern spring salamander (1)***
S-JLH-4	Sweep 1	9/30/2021	Mexico	13:00	13:30	44.601389, -70.5725	Perennial; large boulder, sand substrate, mosses on rocks; riffles and pools	Northern pickerel frog *(Lithobates palustris)* (1), Northern dusky salamander (4), Northern two-lined salamander (2)
S-JLH-4	**Sweep 2**	**9/30/2021**	**Mexico**	**13:30**	**14:00**	**44.601111, -70.573333**	**Perennial; large boulder, sand substrate, mosses on rocks; riffles and pools**	**Northern spring salamander *(1)***
S-JLH-4	**Sweep 3**	**9/30/2021**	**Mexico**	**14:15**	**15:15**	**44.601111, -70.573889**	**Perennial; large boulder, rock, sand substrate, mosses on rocks; riffles and pools with less water flow**	**Northern dusky salamander (5), Northern two-lined salamander (3), Northern spring salamander (2)**
S-JLH-4	Sweep 4	9/30/2021	Mexico	16:32	16:59	44.601667, -70.581667	Perennial; boulder, cobble, sand substrate, mosses on rocks; riffles and pools with less water flow; just below culvert	Northern dusky salamander (5), Northern two-lined salamander (2)
S-KMN-2	Sweep 1	9/30/2021	Rumford	9:45	10:15	44.604219 , -70.600605	Perennial, bedrock substrate in areas with boulders and sand in others, becomes intermittent upslope	Northern-dusky salamander (3)

Stream ID	***Sweep Number***	***Date***	***Town***	***Start Time***	***End Time***	***Latitude/Longitude***	***Habitat Description***	***Species Name (and # observed)***
S-KMN-2	Sweep 2	9/30/2021	Rumford	10:15	1038	44.604067, -70.601334	Perennial, bedrock substrate in areas with boulders and sand in others, becomes intermittent upslope	Northern-dusky salamander (4) Northern two-lined salamander (5)
S-KMN-2	Sweep 3	9/30/2021	Rumford	10:40	11:15	44.604949, -70.603545	Perennial, bedrock substrate in areas with boulders and sand in others, becomes intermittent upslope	Northern-dusky salamander (20) Northern two-lined salamander (5)
S-MFT-2	Sweep 2	9/29/2021	Rumford	12:40	13:05	44.598368, -70.608173	Perennial, high gradient, survey above falls, rock and sand substrate	None observed
S-MFT-2	Sweep 3	9/29/2021	Rumford	13:05	13:25	44.598708, -70.608634	Perennial, high gradient, survey above falls, rock and sand substrate	Northern dusky salamander (1)
S-KMN-7	**Sweep 1**	**9/30/2021**	**Roxbury**	**15:48**	**16:03**	**44.610556, -70.613889**	**Perennial; cobble, gravel, sand substrate; some leaf litter/sticks in channel; gently sloping channel in notch**	**Northern two-lined salamander (2), Northern spring salamander (1), Northern dusky salamander (6)**
S-KMN-7	**Sweep 2**	**9/30/2021**	**Roxbury**	**16:45**	**17:00**	**44.610556, -70.614444**	**Perennial; cobble, gravel, sand substrate; some leaf litter/sticks in channel; gently sloping channel in notch**	**Northern dusky salamander - 4, Northern spring salamander - 1**

Stream ID	*Sweep Number*	*Date*	*Town*	*Start Time*	*End Time*	*Latitude/Longitude*	*Habitat Description*	*Species Name (and # observed)*
S-KMN-7	Sweep 3	9/30/2021	Roxbury	17:10	17:25	44.610556, -70.615	Perennial; cobble, gravel, sand substrate; some leaf litter/sticks in channel; gently sloping channel in notch	Northern dusky salamander - 3, Northern two-lined salamander - 1
S-KMN-7	**Sweep 4**	**10/1/2021**	**Roxbury**	**9:32**	**10:15**	**44.610556, -70.614722**	**Perennial; cobble, gravel, sand substrate; some leaf litter/sticks in channel; gently sloping channel in notch**	**Northern dusky salamander - 21, Northern two-lined salamander - 5, Northern spring salamander - 1**
S-KMN-7	Sweep 5	10/1/2021	Roxbury	10:25	11:18	44.609722, -70.615556	Perennial; cobble, gravel, sand substrate; some leaf litter/sticks in channel; gently sloping channel in notch	Northern dusky salamander - 28, Northern two-lined salamander - 3

***Bold text indicates observed presence of NSS**

Northern Bog Lemming

Two wetlands with potential northern bog lemming habitat were identified during the initial site walkover and subsequently surveyed on October 6, 2021.

Wetland W-KMN-1

Wetland (W-KMN-1) is in the southernmost limit of the Survey Area, situated in a saddle between two ridgelines. It contains pockets of sphagnum (*Sphagnum spp*) with cinnamon fern *(Osmundastrum cinnamomeum)*, black spruce *(Picea mariana)*, melic manna grass *(Glyceria melicaria)*, cottongrass bulrush *(Scirpus cyperinus)* and three-seed sedge *(Carex trisperma)*; which is a known food item of bog lemmings. Deep organic substrate was observed within the wetland. At the downslope wetland terminus it constricts and forms a steep intermittent watercourse that flows west and outside the Survey Area.

Two surveyors walked east along a single transect and searched the wetland up to 20m from the transect. Due to the small area of available habitat within the wetland, only a single transect was necessary to survey the entirety of the habitat. Signs of small mammal activity such as runways and holes in sphagnum, particularly in hummocks, were observed and were examined for further signs of presence including pellets and sedge or grass clippings. There were four locations within wetland W-KMN-1 where sign was discovered and up to 10 brown pellets <5mm in size were collected into sample tubes with lysis buffer. The four pellet collection locations were within tunnels or holes in sphagnum hummocks or along logs. Photos of wetland W-KMN-1 are included in Attachment 2.

Wetland W-KMN-2

Wetland W-KMN-2 is a high-elevation bog that was observed to have recent impacts from timber harvest. The wetland is characterized by sphagnum ground cover with sparce black spruce, American elm *(Ulmus americana)* and gray birch *(Betula populifolia)* canopy cover. Emergent vegetation such as cinnamon fern, cottongrass bulrush and three-seed sedge are also present. Photos of wetland W-KMN-2 are included in Attachment 2.

Based on observations of suitable habitat available within the wetland, a single transect was walked by surveyors running east-west within the northern portion of the wetland. Few signs of small mammal activity were observed, with only a single pellet collection location in a sphagnum hole.

The samples collected were processed by Dr. Olson over the winter of 2022. A report from Dr. Olson's explaining the results of his analysis are provided in Attachment 3. In summary, none of the pellets collected within the Survey Area were determined to be those of northern bog lemming. Based on the limited habitat availability, and the extent of known occurrences of NBL within Maine, it is unlikely NBL are present within the Survey Area.

Table 3. Northern bog lemming survey results

Date	*Town*	*Wetland*	*Sample Number*	*Pellet Collection Point Latitude/ Longitude*	*Location Description*	*Sample Color*	*Number of Pellets*	*Likely Species Detected*
10/6/2021	Rumford	W-KMN-1	1	44.598449, -70.610898	Hole in sphagnum	Brown	6	Meadow vole (*Microtus pennsylvanicus*)
10/6/2021	Rumford	W-KMN-1	2	44.598508, -70.610831	Tunnel opening under log with *Carex* seeds	Brown	7	Meadow vole, DNA from deer mouse (*Peromyscus spp*) also detected
10/6/2021	Rumford	W-KMN-1	3	44.598529, -70.610675	Small tunnel/run under log	Brown	7	Meadow vole, DNA from Southern bog lemming (*Synaptomys cooperi*) also detected
10/6/2021	Rumford	W-KMN-1	4	44.598556, -70.61071	Hole in hummock/ latrine	Brown	10	Unknown; determined to not be NBL
10/6/2021	Rumford	W-KMN-2	1	44.601633, -70.609895	Hole/tunnel in sphagnum	Brown	10	Unknown; determined to not be NBL

Other Species

Bicknell's Thrush

No portions of the Survey Area occur above an elevation of 2,700 feet that is typical of Bicknell's Thrush habitat. Flycatcher biologists documented variable small patches of dense softwoods that could be suitable for Bicknell's thrush. However, the patches were relatively small, and did not occur in proximity to one another or in high frequencies throughout the site. The majority of the land within the Survey Area is second growth forest and recently harvested mixed forest. The tree species distribution is dominantly hardwood versus the more suitable softwood. Based on this information, the likelihood of Bicknell's thrush utilizing the site is low. Additionally, Flycatcher received correspondence from MDIFW on February 10, 2022. In this email MDIFW stated that based on the maximum elevation of the Survey area, and reports of absence of habitat detected, they are not recommending Bicknell's thrush surveys for this project.

Great Blue Heron

The wetlands mapped during the wetland delineation did not consist of habitat typically occupied by great blue heron colonies. These forested wetlands occur on side slopes and are generally formed from groundwater seeps and disturbance from timber harvest. No beaver flowages or other wetlands typical of great blue heron nesting habitat were mapped within the Survey Area. Additionally, no great blue heron nests were observed within or directly adjacent to the Survey Area during this effort[1].

Bat Hibernacula

During the fall 2021 field effort, Flycatcher biologists documented the presence of rocky and talus slopes, and areas of exposed rocks and cliffs with vertical cracks, and other areas that could potentially support hibernacula for Maine's listed species of bats in accordance with MDIFW guidance (November 1, 2021). Photographs of these features were provided to MDIFW over the winter of 2022. Based on a review of these photographs, MDIFW identified six locations of potentially suitable habitat to be further investigated.

During the Spring of 2022, two site visits with MDIFW biologists took place to evaluate these features for their potential to function as bat hibernacula. The first visit on April 12, and the second on June 15, 2022. During these visits, biologists from MDIFW evaluated the six features identified by Flycatcher in the fall of 2021. Figure 3 depicts the locations investigated for bat hibernacula within the Survey Area. The corresponding photographs identified in the figure are provided in Attachment 1. Table 4 summarizes the results of the bat hibernacula survey.

In summary, one feature was determined to be potentially suitable hibernacula. Identified as feature number 3 in Figure 3, this area consists of a large rocky feature with several hollow spaces that could potentially provide thermal refuge for hibernating bats. It is located along the northeastern slope of South Twin Mountain, approximately 770-feet from the proposed location of turbine T-1 and approximately 750-feet from the proposed location of turbine T-2.

The remaining features identified by Flycatcher in the fall of 2021 have the potential to serve as roosting habitat for species such as eastern small footed bat (*Myotis leibii*), but do not have the physical

[1] Based on follow up correspondence between Flycatcher and MDIFW, there is a mapped great blue heron nest approximately 5.5 miles west of the Project Survey Area along the Ellis River (Attachment 2).

characteristics to provide the thermal refuge that is a consistent feature of areas known to support overwintering bats.

In follow up correspondence from the two site visits, on July 6, 2022, MDIFW stated that "*Based on our observations and discussions from the two site visits to examine potential rock/talus bat hibernacula areas, we did not find compelling evidence of significant usage that warrants additional protective measures at the site. We believe that the proposed turbine locations are of sufficient distance from the rocky areas with the greatest potential for usage by bats.*" This correspondence with attached photos of the June 15 site visit is provided in Attachment 2.

Table 4 Bat hibernacula survey summary

Feature ID	Description	Potential hibernacula
1	Forested talus slope on the east side of North Twin Mountain. Rock outcrops with cracks and crevices mixed into the talus.	Unlikely
2	Forested, boulder, steep slope on the east side of North Twin Mountain. Some areas of boulders stacked on top of each other creating small caves and pockets between rocks	Unlikely
3	Large rocky feature on the northeast side of South Twin mountain. Deep cracks and hollow areas observed throughout the feature.	Potential hibernacula
4	Steep rock cliff bisected by stream S-JLH-2 on the southern edge of the Survey Area.	Unlikely
5	South facing rock cliff on the western edge of the survey area, occurs in mature mixed woods.	Unlikely

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

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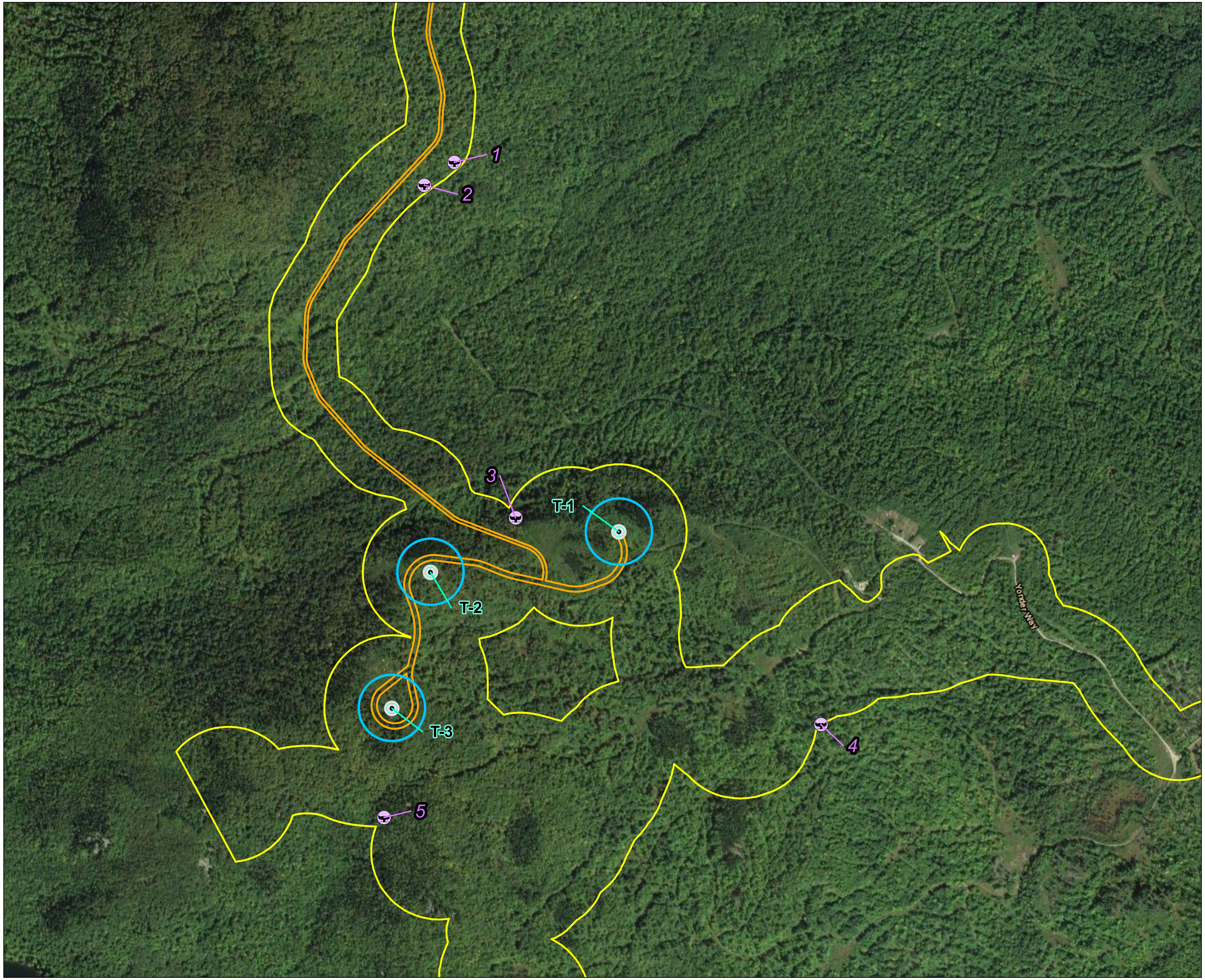
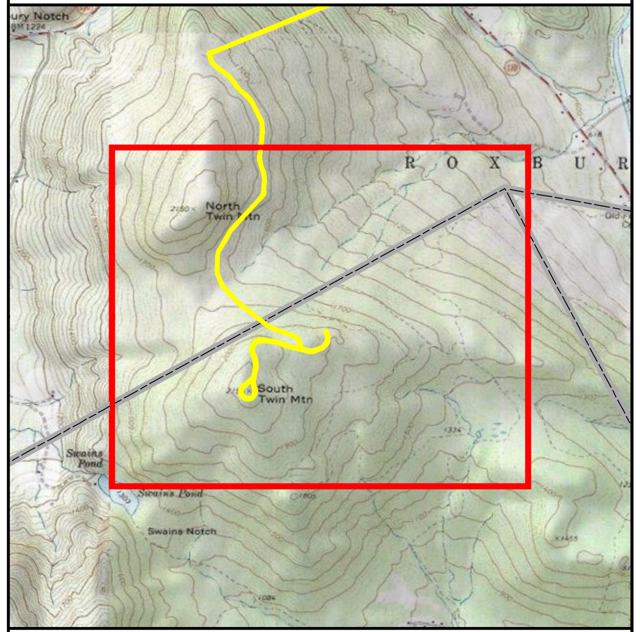


LEGEND

- PROJECT SURVEY AREA
- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- ROTOR SWEPT AREA
- BAT HIBERNACULA SURVEY LOCATION



NOTES:

1 BASEMAP IMAGERY FROM ESRI/NAIP "WORLD IMAGERY" SERVICE LAYER.

N

0 700 1,400
Feet
1 " = 700 '
1:8,400

PROJECT:
TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
BAT HIBERNACULA SURVEY LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	J. HUTCHINSON		
MONTH:	JUNE	**FIGURE 3**	
YEAR:	2022		

Flycatcher LAND + SCIENCE + PEOPLE
PALMER

FILE NO.: Palmer_TwinEnergy_PotentialBat_Aerial_11x17L.mxd

Discussion and Recommendations

Flycatcher biologists consulted with technical experts, followed survey protocols, carefully identified habitat in the field and accurately recorded our findings. As with any ecological study, there are variables that are beyond the control of the biologist completing the survey. This section considers these variables and provides recommendations for protecting RTE species during Project development.

Roaring Brook Mayfly

Epeorus were not observed during the surveys, so the conclusion is that it is unlikely that RBM are present within the Survey Area. No further action is recommended.

Northern Spring Salamander

It is recommended in the *Northern Spring Salamander Survey Protocols* (MDIFW 2019) to include a 250-ft buffer surrounding confirmed NSS habitat in project design. Based on-the current proposed design, we understand one documented NSS stream crossing (S-KMN-7) is proposed for site access and installation of the Project collector line. Flycatcher staff consulted with MDIFW during a site visit on June 15, 2022 regarding this proposed crossing and to identify a location that will utilize existing disturbance and maintain canopy cover along the stream as much as possible.

For this new watercourse crossing we recommend constructing the crossing to meet the stream smart standards including 1.2 times the bankfull width of the watercourse (Maine Audubon 2021). We suggest the Project utilize the existing disturbed area identified in the field with MDIFW and cross the stream at a 90-degree angle. Additionally, we recommend that the Project follow the *Recommend Management Guidelines for Land use in or Adjacent to Streams Providing Habitat for Roaring Brook Mayfly and Northern Spring Salamander* (MDIFW 2020). This includes minimizing crossings to a narrow trail with forest canopy cover maintained to the greatest extent possible. Developing a robust stormwater management program and following best management practices for reducing erosion and sedimentation is recommended.

Northern Bog Lemming

Results from DNA analysis of the collected scat samples (Attachment 3) identified southern bog lemming, meadow vole and deer mouse within the survey area. Since NBL was not detected there are no additional recommendations for minimization and avoidance of the resources surveyed due to the apparent absence of this species.

Bats

Out of the approximately 20 preliminary features identified by Flycatcher during the fall of 2021, MDIFW was interested in five features as potential bat hibernacula. Following multiple site visits with Department during the spring of 2022, one feature was of interest to MDIFW biologists (Feature 3, Figure 3). Feature 3 is located over 700 feet northwest of the nearest proposed turbine location.

Based on MDIFW's correspondence, Flycatcher does not recommend any further studies regarding bat habitat or bat hibernacula at the Project site. Additionally Flycatcher recommends that the Project continues to discuss with MDIFW what level of curtailment it will implement during operations.

Additional Surveys and Consultation

Due to the lack of suitable habitat observed for Bicknell's thrush, and the Survey Area being below 2,700 feet in elevation, and correspondence from MDIFW, there is a low likelihood of this species occurring within the Survey Area. Flycatcher does not recommend additional surveys for Bicknell's thrush.

Great blue heron are mobile and sensitive species that could be impacted by wind power development projects, even if their habitat or presence is not documented within the Survey Area.

Flycatcher consulted MDIFW on January 18, 2022 to discuss the findings of the fall 2021 surveys and the potential need for additional RTE surveys. MDIFW suggested conducting vernal pool surveys and raptor migration surveys starting in the spring of 2022. A vernal pool survey was completed by Flycatcher in the spring of 2022 and no significant vernal pools were observed. Full results of this survey are provided in an amendment to the wetland delineation report. Additionally, the results of the spring 2022 raptor migration survey will be provided in a separate report.

Literature Cited

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Reichel JD, Beckstrom SG (1994). Northern bog lemming survey: 1993. Montana Natural Heritage Program, Helena, MT, 87 pp.

Taberlet P, Waits LP, Luikart G (1999) Noninvasive genetic sampling: look before you leap. Trends in Ecology and Evolution 14(8):323-7.

Attachment 1 Photographic Log

Stream S-JLH-4 (Goff Brook) – *RBM Surveys*

1. S-JLH-4, RBM Sweep 1, September 29, 2021

2. Conducting RBM surveys, S-JLH-4, Sweep 1, September 29, 2021

3. RBM survey collection tray, S-JLH-4, Sweep 1, September 29, 2021

4. S-JLH-4, within RBM sweep 2, September 29, 2021

Stream S-JLH-4 (Goff Brook) – *NSS Surveys*

5. S-JLH-4, Sweep 1, September 30, 2021

6. Northern pickerel frog, S-JLH-4, Sweep 1, September 30, 2021

7. Northern dusky salamander, S-JLH-4, Sweep 1, September 30, 2021

8. S-JLH-4, Sweep 2, September 30, 2021

9. S-JLH-4, NSS Sweep 2, September 30, 2021

10. Northern spring salamander, S-JLH-4, Sweep 2, September 30, 2021

11. S-JLH-4, NSS Sweep 3, September 30, 2021

12. Northern spring salamander, S-JLH-4, Sweep 3, September 30, 2021

13. Macro view of NSS, S-JLH-4, Sweep 3, September 30, 2021

14. Northern dusky salamander, S-JLH-4, Sweep 3, September 30, 2021

15. Two lined salamander, S-JLH-4, Sweep 3, September 30, 2021

16. Two NSS, S-JLH-4, Sweep 3, September 30, 2021

17. Northern dusky salamander, S-JLH-4, Sweep 4, September 30, 2021

Stream S-JLH-2 – *RBM Surveys*

18. S-JLH-2, RBM Sweep 1, September 29, 2021

19. RBM collection tray, S-JLH-2, Sweep 1, September 29, 2021

20. RBM collection tray, S-JLH-2, Sweep 2, September 29, 2021

21. S-JLH-2, Sweep 2, September 29, 2021

Stream S-JLH-2 – *NSS Surveys*

22. S-JLH-2, NSS Sweep 1, September 29, 2021

23. Northern dusky salamander, S-JLH-2, Sweep 1, September 29, 2021

24. Northern spring salamander, S-JLH-2, Sweep 2, September 30, 2021

25. NSS, S-JLH-2, Sweep 2, September 30, 2021

Stream S-MFT-2 – *RBM Surveys*

26. S-MFT-2, RBM Sweep 2, September 30, 2021

27. Sweeping for RBM, S-MFT-2, Sweep 2, September 30, 2021

Stream S-KMN-2 – NSS surveys

28. Stream S-KMN-2, Sweep 3, September 30, 2021

Stream S-KMN-7 – *RBM Surveys*

29. S-KMN-7, Sweep 1, September 30, 2021

30. RBM collection tray, S-KMN-7, Sweep 1, September 30, 2021

31. S-KMN-7, Sweep 2, September 30, 2021

32. RBM collection tray, S-KMN-7, Sweep 2, September 30, 2021

Stream S-KMN-7 – *NSS Surveys*

33. S-KMN-7, Sweep 1, September 30, 2021

34. Northern dusky salamander, S-KMN-7, Sweep 1, September 30, 2021

35. NSS, S-KMN-7, Sweep 1, October 1, 2021

36. Northern two-lined salamander, S-KMN-7, Sweep 1, September 30, 2021

37. NSS, S-KMN-7, Sweep 2, September 30, 2021

38. NSS survey, S-KMN-7, Sweep 3, September 30, 2021

39. S-KMN-7, Sweep 3, September 30, 2021

40. Northern two-lined salamander, S-KMN-7, Sweep 4, October 1, 2021

41. Northern dusky salamander, S-KMN-7, Sweep 4, October 1, 2021

42. Northern spring salamander, S-KMN-7, Sweep 4, October 1, 2021

43. S-KMN-7, Sweep 5, October 1, 2021

44. Northern dusky salamander, S-KMN-7, Sweep 5, October 1, 2021

45. Northern two-lined salamander, S-KMN-7, Sweep 5, October 1, 2021

Wetland W-KMN-1 – *Northern Bog Lemming Surveys*

46. NBL survey location, W-KMN-1, September 30, 2021

47. NBL survey location, W-KMN-1, September 22, 2021

48. Small mammal hole in sphagnum, collection site, W-KMN-1, October 6, 2021

Wetland W-KMN-2 – *NBL Surveys*

49. Northern bog lemming survey location, W-KMN-2, September 30, 2021

50. NBL survey location, W-KMN-2, October 6, 2021

51. Sphagnum mats within W-KMN-2, October 6, 2021

Bat Hibernacula Survey Photos – *Photograph numbers correspond to survey locations identified on Figure 3*

Feature 1 - Facing north toward a forested talus slope on the eastern side of North Twin Mountain.

Feature 2 - Facing north toward a forested talus slope on the eastern side of North Twin Mountain.

Feature 2 – Facing south during the spring 2022 site visit with MDIFW, June 16, 2022.

Feature 3 - Facing southeast toward a rocky slope on the north side of South Twin Mountain.

Feature 3 – Facing southwest during the spring 2022 site visit with MDIFW, April 12, 2022.

Feature 4 - Facing west within a ravine containing stream S-JLH-2.

Feature 4 – During MDIFW Site Visit, April 12, 2022.

Feature 5 - Facing northeast toward a large rock cliff on South Twin Mountain.

Attachment 2 Agency Correspondence

STATE OF MAINE
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY
177 STATE HOUSE STATION
AUGUSTA, MAINE 04333

JANET T. MILLS
GOVERNOR

AMANDA E. BEAL
COMMISSIONER

September 29, 2021

Jessie Hutchinson
Flycatcher LLC
106 Lafayette Street, Suite 1C
Yarmouth, ME 04096

Via email: jessie@flycatcherllc.com

Re: Rare and exemplary botanical features in proximity to: Solaya Twin Wind Project, Roxbury, Rumford, and Mexico, Oxford County, Maine

Dear Ms. Hutchinson:

I have searched the Maine Natural Areas Program's Biological and Conservation Data System files in response to your request received September 27, 2021 for information on the presence of rare or unique botanical features documented from the vicinity of the project in Roxbury, Rumford, and Mexico, Oxford County, Maine. Rare and unique botanical features include the habitat of rare, threatened, or endangered plant species and unique or exemplary natural communities. Our review involves examining maps, manual and computerized records, other sources of information such as scientific articles or published references, and the personal knowledge of staff or cooperating experts.

Our official response covers only botanical features. For authoritative information and official response for zoological features you must make a similar request to the Maine Department of Inland Fisheries and Wildlife, 284 State Street, Augusta, Maine 04333.

According to the information currently in our Biological and Conservation Data System files, there are no rare botanical features documented specifically within the project area. This lack of data may indicate minimal survey efforts rather than confirm the absence of rare botanical features. You may want to have the site inventoried by a qualified field biologist to ensure that no undocumented rare features are inadvertently harmed.

If a field survey of the project area is conducted, please refer to the enclosed supplemental information regarding rare and exemplary botanical features documented to occur in the vicinity of the project site. The list may include information on features that have been known to occur historically in the area as well as recently field-verified information. While historic records have not been documented in several years, they may persist in the area if suitable habitat exists. The enclosed list identifies features with potential to occur in the area, and it should be considered if you choose to conduct field surveys.

This finding is available and appropriate for preparation and review of environmental assessments, but it is not a substitute for on-site surveys. Comprehensive field surveys do not exist for all natural areas in Maine, and in the absence of a specific field investigation, the Maine Natural Areas Program cannot provide a definitive statement on the presence or absence of unusual natural features at this site.

MOLLY DOCHERTY, DIRECTOR
MAINE NATURAL AREAS PROGRAM
BLOSSOM LANE, DEERING BUILDING

DEPARTMENT OF Agriculture Conservation & Forestry

PHONE: (207) 287-804490
WWW.MAINE.GOV/DACF/MNAP

The Maine Natural Areas Program (MNAP) is continuously working to achieve a more comprehensive database of exemplary natural features in Maine. We would appreciate the contribution of any information obtained should you decide to do field work. MNAP welcomes coordination with individuals or organizations proposing environmental alteration or conducting environmental assessments. If, however, data provided by MNAP are to be published in any form, the Program should be informed at the outset and credited as the source.

The Maine Natural Areas Program has instituted a fee structure of $75.00 an hour to recover the actual cost of processing your request for information. You will receive an invoice for $150.00 for two hours of our services.

Thank you for using MNAP in the environmental review process. Please do not hesitate to contact me if you have further questions about the Natural Areas Program or about rare or unique botanical features on this site.

Sincerely,

Kristen Puryear | Ecologist | Maine Natural Areas Program
207-287-8043 | kristen.puryear@maine.gov

Rare and Exemplary Botanical Features within 4 miles of
Project: Solaya Twin Wind Project, Roxbury, RUmford, and Mexico, Oxford County, Maine

Common Name	State Status	State Rank	Global Rank	Date Last Observed	Occurrence Number	Habitat
Canada Mountain-ricegrass						
	SC	S2	G4G5	1959-09-01	6	Dry barrens (partly forested, upland)
	SC	S2	G4G5	1924-06-27	7	Dry barrens (partly forested, upland)
Fragrant Wood Fern						
	SC	S3	G5	1885-07	25	Rocky summits and outcrops (non-forested, upland),Alpine or subalpine (non-forested, upland)
Mid-elevation Bald						
	<null>	S3	G2G3	2019-07-01	10	Rocky summits and outcrops (non-forested, upland),Alpine or subalpine (non-forested, upland)
Mountain Sandwort						
	SC	S3	G5	2019-07-01	2	Rocky summits and outcrops (non-forested, upland),Alpine or subalpine (non-forested, upland)
Red Pine Woodland						
	<null>	S3	G3G5	2019-07-01	12	Dry barrens (partly forested, upland)
Sandbar Willow						
	E	S1	G5	2003-09-17	3	Non-tidal rivershore (non-forested, seasonally wet)
Showy Orchis						
	E	S1	G5	1974-07-21	9	Hardwood to mixed forest (forest, upland)
Silverling						
	T	S1	G4	2019-07-01	3	Alpine or subalpine (non-forested, upland),Non-tidal rivershore (non-forested, seasonally wet)
Smooth Sandwort						
	SC	S3	G4	1926	8	Rocky summits and outcrops (non-forested, upland)

Conservation Status Ranks

State and Global Ranks: This ranking system facilitates a quick assessment of a species' or habitat type's rarity and is the primary tool used to develop conservation, protection, and restoration priorities for individual species and natural habitat types. Each species or habitat is assigned both a state (S) and global (G) rank on a scale of 1 to 5. Factors such as range extent, the number of occurrences, intensity of threats, etc., contribute to the assignment of state and global ranks. The definitions for state and global ranks are comparable but applied at different geographic scales; something that is state imperiled may be globally secure.

The information supporting these ranks is developed and maintained by the Maine Natural Areas Program (state ranks) and NatureServe (global ranks).

Rank	Definition
S1 **G1**	**Critically Imperiled** – At very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.
S2 **G2**	**Imperiled** – At high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
S3 **G3**	**Vulnerable** – At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
S4 **G4**	**Apparently Secure** – At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
S5 **G5**	**Secure** – At very low risk or extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.
SX **GX**	**Presumed Extinct** – Not located despite intensive searches and virtually no likelihood of rediscovery.
SH **GH**	**Possibly Extinct** – Known from only historical occurrences but still some hope of rediscovery.
S#S# **G#G#**	**Range Rank** – A numeric range rank (e.g., S2S3 or S1S3) is used to indicate any range of uncertainty about the status of the species or ecosystem.
SU **GU**	**Unrankable** – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
GNR **SNR**	**Unranked** – Global or subnational conservation status not yet assessed.
SNA **GNA**	**Not Applicable** – A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities (e.g., non-native species or ecosystems.
Qualifier	**Definition**
S#? **G#?**	**Inexact Numeric Rank** – Denotes inexact numeric rank.
Q	**Questionable taxonomy that may reduce conservation priority** – Distinctiveness of this entity as a taxon or ecosystem type at the current level is questionable. The "Q" modifier is only used at a global level.
T#	**Infraspecific Taxon (trinomial)** – The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank.

State Status: Endangered and Threatened are legal status designations authorized by statute. Please refer to MRSA Title 12, §544 and §544-B.

Status	Definition
E	**Endangered** – Any native plant species in danger of extinction throughout all or a significant portion of its range within the State or Federally listed as Endangered.
T	**Threatened** – Any native plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range in the State or Federally listed as Threatened.
SC	**Special Concern** – A native plant species that is rare in the State, but not rare enough to be considered Threatened or Endangered.
PE	**Potentially Extirpated** – A native plant species that has not been documented in the State in over 20 years, or loss of the last known occurrence.

Element Occurrence (EO) Ranks: Quality assessments that designate viability of a population or integrity of habitat. These ranks are based on size, condition, and landscape context. Range ranks (e.g., AB, BC) and uncertainty ranks (e.g., B?) are allowed. The Maine Natural Areas Program tracks all occurrences of rare plants and natural communities/ecosystems (S1-S3) as well as exemplary common natural community types (S4-S5 with EO ranks A/B).

Rank	Definition
A	**Excellent** – Excellent estimated viability/ecological integrity.
B	**Good** – Good estimated viability/ecological integrity.
C	**Fair** – Fair estimated viability/ecological integrity.
D	**Poor** – Poor estimated viability/ecological integrity.
E	**Extant** – Verified extant, but viability/ecological integrity not assessed.
H	**Historical** – Lack of field information within past 20 years verifying continued existence of the occurrence, but not enough to document extirpation.
X	**Extirpated** – Documented loss of population/destruction of habitat.
U	**Unrankable** – Occurrence unable to be ranked due to lack of sufficient information (e.g., possible mistaken identification).
NR	**Not Ranked** – An occurrence rank has not been assigned.

Visit the Maine Natural Areas Program website for more information
http://www.maine.gov/dacf/mnap

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Maine Ecological Services Field Office
P. O. Box A
East Orland, ME 04431
Phone: (207) 469-7300 Fax: (207) 902-1588
http://www.fws.gov/mainefieldoffice/index.html

In Reply Refer To: December 30, 2021
Consultation Code: 05E1ME00-2022-SLI-0434
Event Code: 05E1ME00-2022-E-01587
Project Name: Twin Wind

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies the threatened, endangered, candidate, and proposed species and designated or proposed critical habitat that may occur within the boundary of your proposed project or may be affected by your proposed project. This species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC Web site at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the Endangered Species Consultation Handbook at: http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

This species list also identifies candidate species under review for listing and those species that the Service considers species of concern. Candidate species have no protection under the Act but are included for consideration because they could be listed prior to completion of your project. Species of concern are those taxa whose conservation status is of concern to the Service (i.e., species previously known as Category 2 candidates), but for which further information is needed.

If a proposed project may affect only candidate species or species of concern, you are not required to prepare a Biological Assessment or biological evaluation or to consult with the Service. However, the Service recommends minimizing effects to these species to prevent future conflicts. Therefore, if early evaluation indicates that a project will affect a candidate species or species of concern, you may wish to request technical assistance from this office to identify appropriate minimization measures.

Please be aware that bald and golden eagles are not protected under the Endangered Species Act but are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.). Projects affecting these species may require development of an eagle conservation plan: http://www.fws.gov/windenergy/eagle_guidance.html Information on the location of bald eagle nests in Maine can be found on the Maine Field Office Web site: http://www.fws.gov/mainefieldoffice/Project%20review4.html

Additionally, wind energy projects should follow the wind energy guidelines: http://www.fws.gov/windenergy/ for minimizing impacts to migratory birds and bats. Projects may require development of an avian and bat protection plan.

Migratory birds are also a Service trust resource. Under the Migratory Bird Treaty Act, construction activities in grassland, wetland, stream, woodland, and other habitats that would result in the take of migratory birds, eggs, young, or active nests should be avoided. Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm and at:

http://www.towerkill.com; and at:
http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Maine Ecological Services Field Office
P. O. Box A
East Orland, ME 04431
(207) 469-7300

Project Summary

Consultation Code: 05E1ME00-2022-SLI-0434
Event Code: Some(05E1ME00-2022-E-01587)
Project Name: Twin Wind
Project Type: POWER GENERATION
Project Description: Utility scale wind project
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@44.61273715,-70.61534124819367,14z

Counties: Oxford County, Maine

Endangered Species Act Species

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Fishes

NAME	STATUS
Atlantic Salmon *Salmo salar* Population: Gulf of Maine DPS There is **final** critical habitat for this species. The location of the critical habitat is not available. Species profile: https://ecos.fws.gov/ecp/species/2097	Endangered

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

STATE OF MAINE
DEPARTMENT OF
INLAND FISHERIES & WILDLIFE
353 WATER STREET
41 STATE HOUSE STATION
AUGUSTA ME 04333-0041

JANET T. MILLS
GOVERNOR

JUDITH CAMUSO
COMMISSIONER

November 1, 2021

Jessie Hutchinson
Flycatcher LLC
Lower Falls Landing, 106 Lafayette St.
Yarmouth, ME 04096

RE: Information Request – Proposed Twin Wind Project, Roxbury

Dear Jessie:

As a follow up to our meeting with representatives of the proposed Twin Wind Project on September 24, 2021 and per your request received on September 28, 2021, we have reviewed current Maine Department of Inland Fisheries and Wildlife (MDIFW) information sources for known locations of Endangered, Threatened, and Special Concern species; designated Essential and Significant Wildlife Habitats; and inland fisheries habitat concerns within the vicinity of the proposed Twin Wind project site in Roxbury. Note that, as project details are lacking at this time, our comments are non-specific and should be considered preliminary.

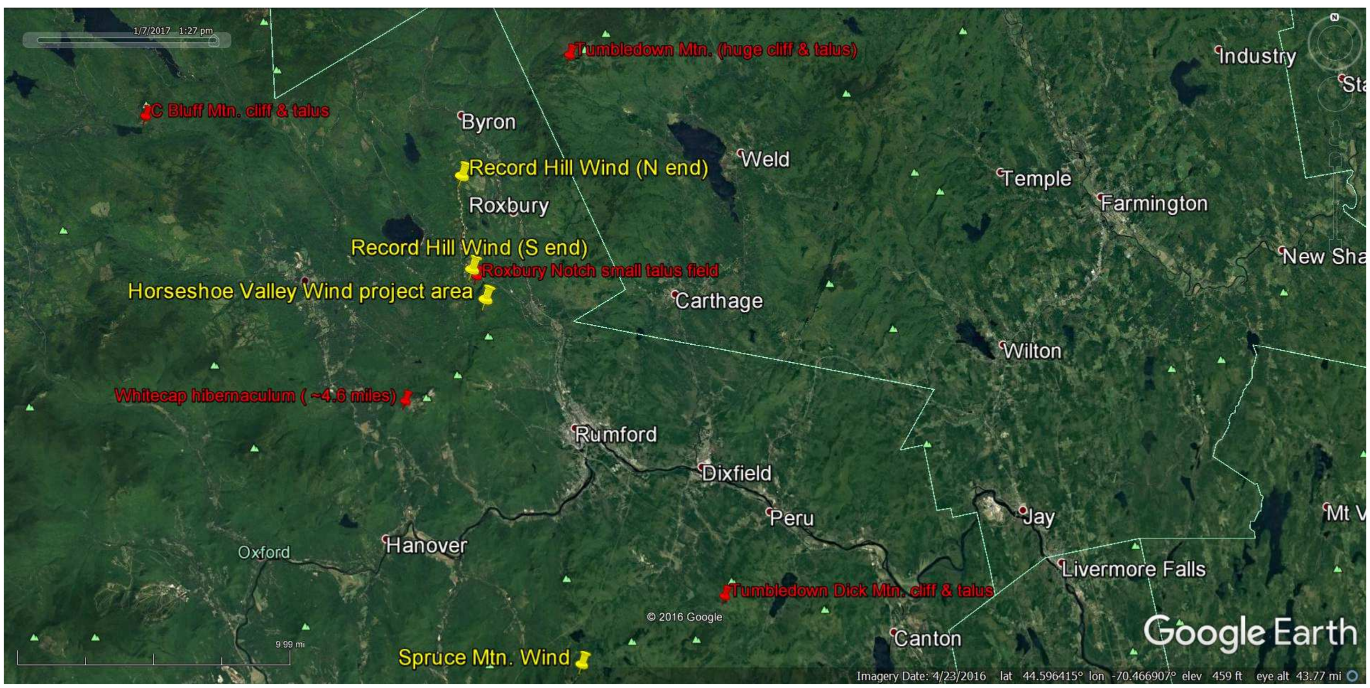
Our Department has not mapped any Essential Habitats that would be directly affected by your project. Essential Habitats are areas formally designated as essential to the conservation of a State Endangered or Threatened species and are protected pursuant to the Maine Endangered Species Act (MESA, 12 M.R.S §12801 et. seq.). Currently, Essential Habitats are only designated for three State Endangered coastal breeding bird species.

Endangered, Threatened, and Special Concern Species

Bats - Of the eight species of bats that occur in Maine, the three *Myotis* species are afforded special protection under MESA: little brown bat (State Endangered), northern long-eared bat (State Endangered), and eastern small-footed bat (State Threatened). The five remaining bat species are designated as Species of Special Concern: big brown bat, red bat, hoary bat, silver-haired bat, and tri-colored bat. While a comprehensive statewide inventory for bats has not been completed, based on historical evidence, it is likely that several of these species occur within the project area during the fall/spring migration, the summer breeding season, and/or for overwintering. If the proposed project has a Federal nexus, either via funding or permitting, or if the project is not consistent with the USFWS "4(d) Rule", we recommend that you contact the U.S. Fish and Wildlife Service--Maine Fish and Wildlife Complex (Wende Mahaney, Wende_Mahaney@fws.gov, 207-902-1569) for further guidance on their perspective, as the northern long-eared bat is also listed as a Threatened Species under the Federal Endangered Species Act. The USFWS "4(d) Rule" provides guidance for protection of bat winter hibernacula and maternity roost trees for northern long-eared bats (see https://www.fws.gov/midwest/endangered/mammals/nleb/4drule.html). MDIFW Endangered Species Rules for bats (Chapter 8.06; see link at http://www.maine.gov/sos/cec/rules/09/137/137c008.docx) provide equivalent seasonal protection of maternity roost trees for any of the three state-listed bats, seasonally prohibits entry into subsurface winter hibernacula, and has additional protections for tree removal within ¼ mile of subsurface winter hibernacula. At present, no maternity roost trees have been designated for protection.

In addition to traditional hibernacula, like caves and old mines, recent findings indicate that *Myotis* and big brown bats may also overwinter in exposed rocky features. To date, Maine talus and rocky outcrop studies have focused on relatively exposed slopes with minimal canopy cover, although ongoing research has shown that bats use rocky areas under the forest canopy. Occupied talus slopes in Maine have consisted of variable rock sizes, ranging in size from softball-sized to car-sized boulders. Rock piles, rock ledges, and small vertical cracks in rocks (>1/2-inch-wide) create crevices that allow bats to access deeper cavities that provide protection for predators and suitable temperature and humidity conditions. Some species of bat, like the eastern small-footed bat, use rocky features year-round. A desktop GIS analysis indicates the presence of such features in the vicinity of your project area. As not all talus and rocky features have been mapped statewide, we advise that all areas of talus and rocky features of approximately 1,000 square feet or greater in size be documented on and within 3 miles of your project area, including smaller areas of rock piles and tailings (i.e., quarry spoils). See attached photographs for representative features—these photographs are not all-inclusive and should be used for guidance purposes only. Detailed photographs and coordinates should be submitted to MDIFW for review, and acoustic monitoring may be recommended to document occupancy. Alternatively, these features should be appropriately buffered commensurate with the size and layout of the project.

The image below was prepared in 2017 for the adjacent RoxWind (Horseshoe Valley Wind) Project and provides a coarse-scale illustration of the proximity of known cliffs, talus fields, and hibernacula to that project site. As discussed, the Whitecap Mountain hibernaculum is located approximately 3.3 miles from the peak of South Twin Mountain.



As noted in the Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality (Maine Wind Power Guidance, March 5, 2018), "*It is MDIFW's position that the only adequate protection for bats at wind power facilities at this time is seasonal curtailment of turbines under appropriate conditions, though continuing research may lead to other avoidance measures in the future.*" "*MDIFW's curtailment recommendations are based on project-specific and site-specific considerations, recent recommendations for other similar facilities, seasonality, proximity to specific habitats important to bats, and ambient temperatures*." In most circumstances, "*MDIFW recommends that turbines operate only at cut-in wind speeds exceeding 6.0 meters per second each night (from at least ½ hour before sunset to at least ½ hour after sunrise) during the period April 15 –September 30, whenever the ambient air temperature is at or above 32 degrees Fahrenheit, measured at both ground level and nacelle hub height. Proximity to hibernacula, documented maternity sites, rocky features, the coastal mainland, and migration patterns, may increase risks and thus possibly* *necessitate additional safeguards, such as extended timeframes (earlier and/or later) and/or higher wind speeds*." *"Additionally, based on higher bat mortality during July – September demonstrated through post-construction project monitoring in Maine and research elsewhere, applicants can anticipate a need for increased curtailment wind speeds during this period."*

As discussed during our meeting, for three recent projects reviewed, we agreed to:

- RoxWind: 15April-30Sep, 6 m/s, with a bump to 6.9 m/s from 16July-15Sep. IFW agreed to an Incidental Take Permit (ITP) pursuant to MESA in consideration of these more protective measures and no post-construction mortality monitoring (PCMM).
- Weaver Wind: 15April-30Sep, 6 m/s, with a bump to 6.5 m/s from 16July-15Sep. IFW did not provide an ITP, but agreed to no PCMM.
- Silver Maple Wind (bat habitat nearby): 01April-31Oct, 6 m/s, with a bump to 6.5 m/s from 16July-15Sep. IFW did not provide an ITP, but agreed to no PCMM.

During the September 24, 2021 meeting, project representatives indicated that the applicant anticipates proposing equivalent protections as those agreed to for RoxWind, which abuts the Twin Wind project site to the north. MDIFW looks forward to further discussion of curtailment practices for avoiding and minimizing impacts to at-risk bats.

Significant Wildlife Habitat

Significant Vernal Pools - At this time MDIFW Significant Wildlife Habitat (SWH) maps indicate no known presence of SWHs subject to protection under the Natural Resources Protection Act (NRPA) within the project area, which include Waterfowl and Wading Bird Habitats, Seabird Nesting Islands, Shorebird Areas, and Significant Vernal Pools. However, a comprehensive statewide inventory for Significant Vernal Pools has not been completed. Therefore, we recommend that surveys for vernal pools be conducted within the project boundary by qualified wetland scientists prior to final project design to determine whether there are Significant Vernal Pools present in the area. These surveys should extend up to 250 feet beyond the anticipated project footprint because of potential performance standard requirements for off-site Significant Vernal Pools, assuming such pools are located on land owned or controlled by the applicant. Once surveys are completed, survey forms should be submitted to our Agency for review well before the submission of any necessary permits. Our Department will need to review and verify any vernal pool data prior to final determination of significance.

Fisheries Habitat

We generally recommend maintaining 100-foot undisturbed vegetated buffers from the upland edge of all intermittent and perennial streams and any contiguous wetlands. Maintaining and enhancing buffers along these resources is critical to the protection of water temperatures, water quality, natural inputs of coarse woody debris, and various forms of aquatic life necessary to support fish and other aquatic species. Riparian buffers also provide critical habitat and important travel corridors for a variety of wildlife species. Stream crossings should be avoided, but if a stream crossing is necessary, or an existing crossing needs to be modified, it should be designed to provide for full aquatic passage. Small streams, including intermittent streams, can provide crucial rearing habitat, cold water for thermal refugia, and abundant food for juvenile salmonids on a seasonal basis. Undersized crossings may inhibit these functions and become a frequent maintenance problem that causes reoccurring damage to the resource. Generally, MDIFW recommends that all new, modified, and replacement stream crossings be sized to span at least 1.2 times the bankfull width of the stream. In addition, we generally recommend that stream crossings be open bottomed (i.e. natural bottom), although embedded structures which are backfilled with representative streambed material have been shown to be effective in providing habitat connectivity for fish and other aquatic organisms. Construction Best Management Practices should be closely followed to avoid erosion, sedimentation, alteration of stream flow, and other impacts as eroding soils can travel significant distances as well as transport other pollutants resulting in direct impacts to fish, other aquatic life, and their habitats. In addition, we recommend that any necessary instream work occur between July 15 and October 1.

Other Possible Resources

As discussed during the September 24, 2021 meeting, MDIFW's Maine Wind Power Guidance should be consulted for the applicability of recommended studies and resource surveys including, but not limited to, such species as raptors, great blue heron, Bicknell's thrush, Roaring Brook mayflies, Northern spring salamanders, and Northern bog lemmings. It is noted that Beth Swartz (MDIFW Reptile, Amphibian, Invertebrate Group) has provided specific guidance related to Roaring Brook mayfly and Northern spring salamander surveys, which should be followed.

This consultation review has been conducted specifically for known MDIFW jurisdictional features and should not be interpreted as a comprehensive review for the presence of other regulated features that may occur in this area. Prior to the start of any future site disturbance we recommend additional consultation with the municipality, and other state resource agencies including the Maine Natural Areas Program and Maine Department of Environmental Protection in order to avoid unintended protected resource disturbance.

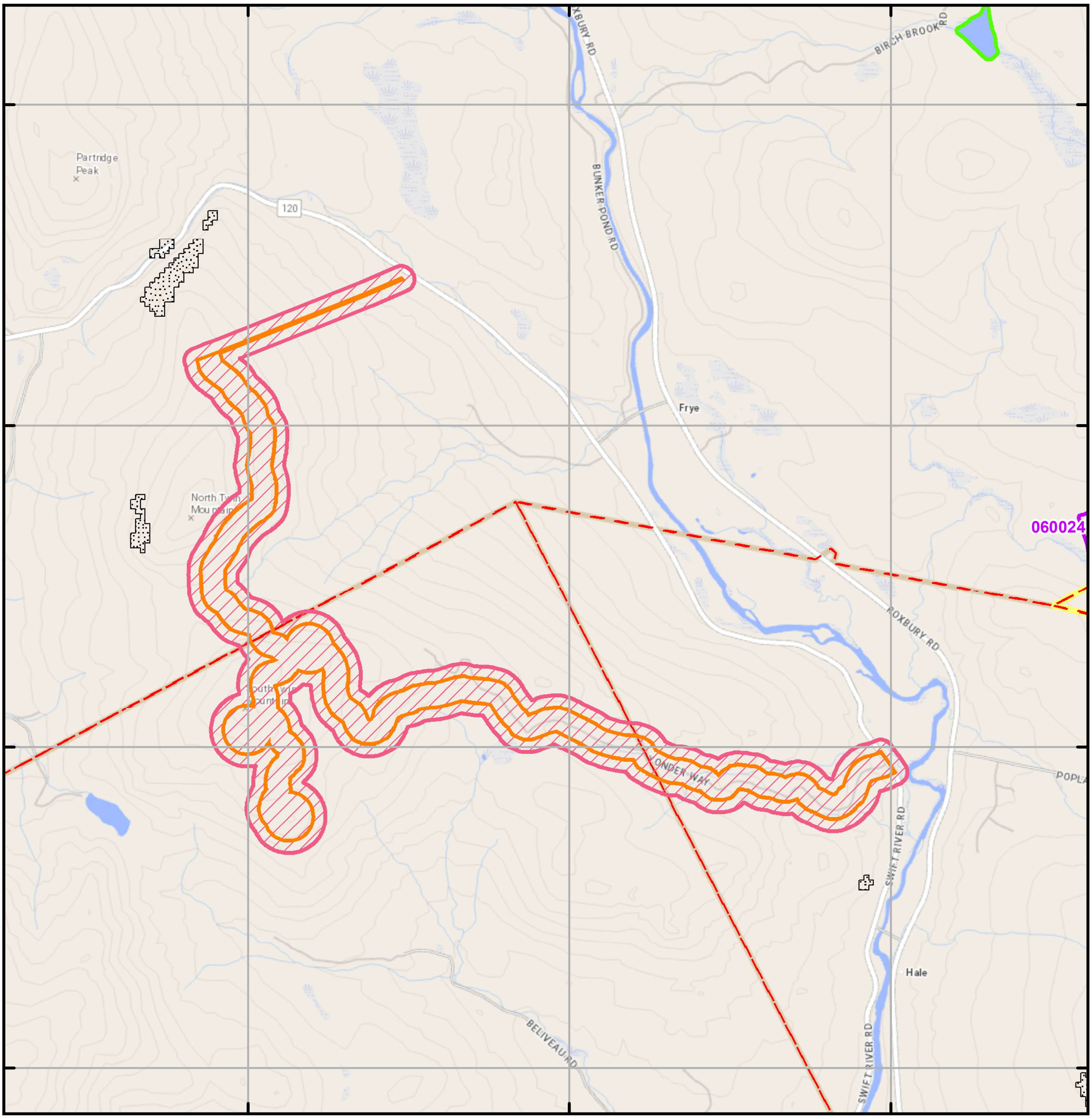
If you have any questions or concerns related to any of this information, please feel free to contact me at robert.d.stratton@maine.gov or (207) 287-5659. Thank you very much.

Sincerely,

Bob Stratton /FW

Robert D. Stratton
Environmental Program Manager
Maine Department of Inland Fisheries & Wildlife

cc: John Perry, Becca Settele (MDIFW)
Mark Stebbins (MDEP)
Katelin Nickerson (Flycatcher LLC)



Environmental Review of Fish and Wildlife Observations and Priority Habitats

Project Name: Twin Wind, Roxbury (Version 1)

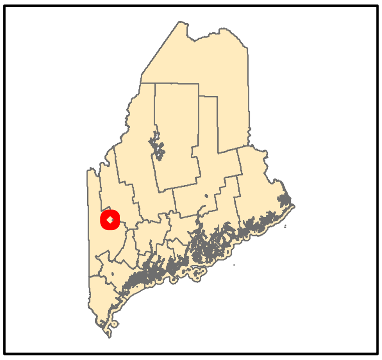
Maine Department of Inland Fisheries and Wildlife

Miles: 0 0.2 0.4 0.8 1.2 1.6

Projection: UTM, NAD83, Zone 19N

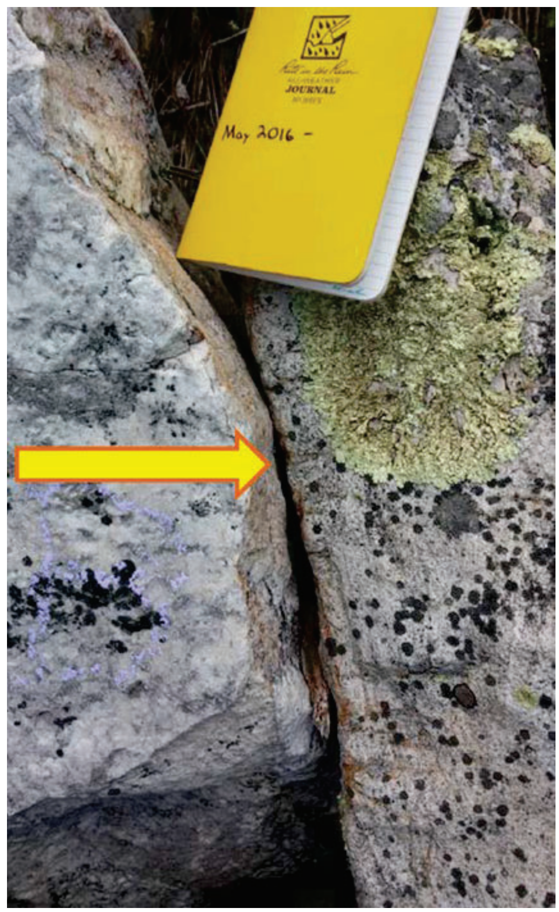
Date: 10/7/2021

- ProjectSearchAreas - All Versions
- Maine Cliff and Talus Areas
- Deer Winter Area
- LUPC p-fw
- Cooperative DWAs
- Seabird Nesting Islands
- Shorebird Areas
- Inland Waterfowl and Wading Bird
- 2008 Iwwh - Shoreland Zoning
- Tidal Waterfowl and Wading Bird
- Significant Vernal Pools
- Environmental Review Polygons
- Roseate Tern
- Piping Plover and Least Tern
- Aquatic ETSc - 2.5 mi review
- Rare Mussels - 5 mi review
- Maine Heritage Fish Waters
- Arctic Charr Habitat
- Redfin Pickerel and Swamp Darter Habitats - buffer100ft
- Special Concern occupied habitats - 100ft buffer
- Wild Lake Trout Habitats



<u>Representative Photographs of Suitable Bat Rock-Roosting Sites</u>
Prepared by the Maine Department of Inland Fisheries and Wildlife
Photographs are for guidance only and should not be considered all-inclusive.
Arrows indicate sites of rock-roosting bats.

Photographs used by permission: Paul R. Moosman, Jr., Department of Biology, Virginia Military Institute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May 2016 -

MAINE
DEPT OF INLAND FISHERIES AND WILDLIFE

Maine Department of Inland Fisheries and Wildlife

Maine Wind Power Preconstruction Recommendations
and
Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality

Updated March 5, 2018

PURPOSE AND SCOPE

The Maine Department of Inland Fisheries and Wildlife (MDIFW) has developed this document to assist wind energy project applicants in identifying sensitive wildlife and fisheries species and habitats, and incorporating measures to eliminate or reduce the potential for adverse impacts to them, as early as possible in project design and development processes. A dual benefit is provided in that, by being aware of and avoiding adverse impacts to resources, the applicant experiences a more streamlined, efficient, and predictable review process. MDIFW wishes to provide guidance that will help identify ways to avoid or minimize project impacts through site-specific considerations; to help inform siting parameters for turbine strings, transmission lines, access roads, etc.; to help determine resource-friendly facility operational practices; to help identify other measures to protect species and habitats of concern; and, when these measures have been conducted to the extent practicable, to allow for mitigation of remaining reasonable project impacts.

As a preliminary step, applicants are encouraged to contact MDIFW's Environmental Review Coordinator, John Perry (john.perry@maine.gov; 207-287-5254) for records of known occurrences of species or habitats of concern on potential project sites. This will help determine the extent of additional information that needs to be collected. MDIFW envisions a hierarchy in which project sites will fall into one of four categories: 1) sites with available wildlife and fisheries resource data and with minimal anticipated issues of concern, where pre-siting evaluations could be completed in less than one year; 2) sites with little existing information but no initial indicators of high potential wildlife or fisheries resource impacts, where pre-permitting surveys may last one or more years; 3) sites with high or uncertain potential for wildlife or fisheries resource impacts, where surveys of multiple years may be needed; and 4) project sites with significant anticipated impacts to wildlife or fisheries resources where surveys of multiple years may also be needed. The extent and significance of anticipated impacts to wildlife and fisheries resources will directly determine MDIFW's recommendations.

This document provides information on identifying important wildlife and fisheries resources to facilitate development of project-specific measures to avoid or minimize significant adverse impacts where possible. Information on siting considerations, general preconstruction study recommendations, and descriptions of important mammalian, avian, and aquatic resources are provided. The need for such surveys is not static over time. Updates of this document may change guidance on certain topics depending on cumulative information, changes in species status, etc. Also provided are MDIFW's general minimum turbine curtailment recommendations and information on Incidental Take Permits for State Endangered and Threatened species.

BACKGROUND

MDIFW envisions the following relationship between pre-construction studies, facility design and operational practices, and post-construction monitoring for wind power projects. Valuable knowledge has been gained in recent years from review of historical species and habitat information, recent patterns and trends, and the results of studies at project sites in Maine and elsewhere. This has allowed us to refine study recommendations in many areas and focus efforts in areas where information is not as well known or is known to be of concern.

Pre-construction studies and preliminary resource reviews are designed and conducted to identify habitats and species of concern for use in facility siting and design, as well as development of facility operational measures to avoid/minimize impacts to resources of concern.

Facility design and operational practices, such as areas of development, stream crossing designs, physical layout, turbine placement, minimum curtailment procedures, etc., are developed and implemented from pre-construction studies, as well as from MDIFW's recommendations based on site specific, statewide, and regional concerns.

Post-construction monitoring is designed to verify recommendations and assumptions, detect mortality and risks, address data gaps, provide for long-term monitoring of issues of concern, and inform an iterative process in which operational practices are reviewed and modified if necessary (MDIFW guidelines to be revised).

SITING CONSIDERATIONS

MDIFW recommends that applicants factor in known resource data and the information in this document when considering siting of a proposed wind energy facility. Locating in or in proximity to certain habitats can be anticipated to result in adverse impacts to those habitats and/or the species that utilize them, and MDIFW will likely recommend increased design considerations, operational measures, monitoring practices, and mitigation efforts in attempt to avoid or minimize such impacts. For example, applicants should consider the presence of bat hibernacula, talus slopes, etc., where greater seasonal activity of these imperiled species must be accounted for. Also, significant bird migration routes through Maine's coastal plain and major river corridors are factors of concern. And, the presence of habitat-dependent species, such as northern bog lemmings, upland sandpipers, whimbrels, Bicknell thrush, great blue heron, and other Rare, Threatened, or Endangered species, as well as unique habitats such as Significant Wildlife Habitats (designated under the Natural Resources Protection Act, 38 M.R.S., §480-A et. seq.), Essential Habitats (designated under the Maine Endangered Species Act or MESA, 12 M.R.S., §12801 et. seq.), wetlands, high elevation streams, etc. must be considered. Greater details on these resources are provided within and through consultation with MDIFW.

As noted in the New York Department of Environmental Conservation's Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects (June 2016), "*One of the most effective means of reducing direct and indirect impacts to birds and bats is to site turbines* *in a location that will avoid disturbance to migrating, breeding, wintering, roosting, and feeding birds and bats. In addition to direct and indirect mortality caused by turbines, other negative effects from factors such as habitat loss or fragmentation, introduction or spread of invasive species, avoidance of otherwise potentially suitable habitat, increased human activity and development, and increased predator and parasite presence can result from the construction and operation of a wind energy project and should also be considered.*" MDIFW hopes to assist applicants in avoiding such adverse impacts.

PRECONSTRUCTION STUDY RECOMMENDATIONS

The following recommendations are intended to convey the type and extent of information typically necessary for MDIFW to make determinations on potential project-specific impacts on fisheries and wildlife resources. The results of these studies are intended to inform discussions on possible means to avoid or minimize adverse impacts to species and habitats of concern to the extent practicable. Each proposed project will be reviewed individually and site-specific recommendations provided. Applicants are strongly encouraged to meet with MDIFW staff to discuss site-specific issues, concerns, and monitoring needs as early as possible in their project development processes, to help inform project designs, schedules, etc. in as timely a manner as possible. MDIFW's Environmental Review program operates under an adaptive management framework, where recommendations are evaluated and revised based on the best available science as well as lessons learned from other projects.

Please note that additional study recommendations, species concerns, details of recommended studies (i.e. seasonality, timing and duration of studies, elevation guidelines), etc. may vary and need to be addressed depending on the location of the project site. Therefore, please contact MDIFW to verify that you are working with the most recent and site-specific recommendations. Failure to collect appropriate and accurate data, or collecting data that are not consistent with current MDIFW methodologies, can limit and/or delay MDIFW's assessment of the project. All project review requests should be sent to MDIFW's Environmental Review Coordinator, John Perry (john.perry@maine.gov; 207-287-5254). Additional contacts are listed below for specific subject areas, but the Environmental Review Coordinator should be included on all correspondences.

Project monitoring reports, including data from studies described below, need to be submitted to MDIFW by December 31 of that year to provide for adequate review of information and enable MDIFW to provide appropriate feedback and recommendations for subsequent study seasons.

Mammalian Resources

Acoustic Bat monitoring: Historical evidence indicates that, prior to the spread of white nose syndrome beginning in approximately 2010, Maine enjoyed statewide distributions of little brown bats (*Myotis lucifugus*) and northern long-eared bats (*M. septentrionalis*), as well as frequent occurrences and sizable distributions of the six other bat species that are indigenous to Maine. Both of these *Myotis* bats are listed as Endangered and the eastern small-footed bat (*M. leibii*) is listed as Threatened, pursuant to MESA. All five of Maine's other bats are considered Species of Special Concern. Special Concern species are defined by

MDIFW as species that do not meet the criteria as Endangered or Threatened, but are particularly vulnerable and could easily become Endangered, Threatened, or Extirpated due to restricted distribution, low or declining numbers, specialized habitat needs or limits, or other factors. Today bats are still detected statewide, though in low numbers, as validated by wind energy project monitoring studies and work by MDIFW and others. Based on this established presence, instead of ongoing widespread acoustic bat monitoring to confirm presence and distribution, which has been the practice in recent years, MDIFW recommends siting away from key habitats where bats aggregate and seasonal operational curtailment measures that will be protective and provide the best opportunity for reestablishment of Maine's imperiled bats (see curtailment recommendations later in this document). MDIFW will typically only recommend acoustic bat monitoring in those areas where necessary to determine whether talus slopes, rocky outcrops, or similar features are in use as hibernacula or maternity roost sites by *Myotis* bats.

If the site contains $\geq$ ½-acre talus fields or rocky outcrops, or cliffs visible from remote imagery, MDIFW recommends ***at least*** 2 years of acoustic monitoring during the periods when cave-dwelling bats swarm during arrival at winter hibernacula (mid-November through December) and/or emerge the following spring (especially March). If any sites containing talus fields, rocky outcrops, or cliffs as specified above are identified, a minimum of one detector should be placed at each feature and acoustic monitoring should be conducted for a three-week period during one of the time frames listed above. Due to the lower activity of bats during these time periods, this data needs to be analyzed in a manner different from conventional activity monitoring data. This data should be scrubbed at the most liberal setting (allowing poorer quality calls) and files identified as potential bat calls by the scrubbing process should be manually vetted and identified to species when possible or at a minimum species guild (i.e. Myotis, EPFU/LANO). Due to discrepancies of what may constitute a talus field, rocky outcrop, or cliff, applicants are strongly encouraged to contact the MDIFW Small Mammal Biologist (contact information listed below) to discuss if any potentially valuable features exist in the project area.

MDIFW recommends that the latest, state of the art acoustic detectors be utilized to enable monitoring of the largest range possible. It is essential that all raw acoustic monitoring data be provided to MDIFW. Please contact the MDIFW Small Mammal Biologist (207-941-4473) to discuss the details of your monitoring plan.

Northern Bog Lemming: Northern bog lemmings (NBL) are a State Threatened Species, whose preferred habitats have the potential to intersect with, and be impacted by, certain wind energy development proposals. The habitats of interest for NBLs are alpine sedge meadows, krummholz, spruce-fir forest with dense herbaceous and mossy understories, wet meadows, and mossy stream-sides, that are $\geq$ 1,000 feet MSL (above Mean Sea Level) in western mountain and northern areas of Maine. Northern bog lemmings are presumed to be present in these habitats and, to protect this species, MDIFW recommends that these areas be avoided. Alternatively, if an applicant wishes to verify presence, MDIFW recommends as part of project wetland delineation work that the applicant note any potential habitats that meet these criteria, and that they perform surveys to document presence/probable absence. Surveys can be conducted in one of two ways.

1) Transects can be walked through NBL habitat and document any presence of run-ways, latrines, and green scat; or

2) If a more definitive method of NBL identification is desired on the part of the applicant, scats can be collected and genetically analyzed to identify if they are NBL, or other species of rodents. For a full description of the methods to conduct this level of genetic work please contact the MDIFW Small Mammal Biologist (207-941-4473). If evidence of lemmings is present either in the form of green scats, latrines, runways, and/or genetic confirmation, MDIFW will consider the area as occupied and recommendations will be to avoid these wetlands.

Canada lynx: Canada lynx are listed as a Species of Special Concern in Maine. If an applicant wishes to determine if lynx are currently present, MDIFW recommends conducting two or more snow track surveys on the project area each winter following MDIFW guidelines. For further guidance, please contact MDIFW Black Bear and Canada Lynx Biologist, Jennifer Vashon (jennifer.vashon@maine.gov; 207-941-4238).

Avian Resources

Nocturnal radar: Nocturnal radar has historically been used to assess potential risk to migratory birds (songbirds, waterfowl, shorebirds) and bats by providing data on their relative numbers and flight patterns in areas of proposed wind turbines. With the detrimental effects of white nose syndrome on bat populations in recent years, radar data has become much more indicative of bird activity. The best available science on bird migration patterns across Maine, data from recent radar studies, information on predominant weather conditions that cause lower migration flight heights, and knowledge of migratory stopovers / staging areas used by bird guilds have helped determine regions of greater risk. These factors and post-construction project fatality monitoring data have demonstrated that Maine's coastal plain is principal among them, and thus an area of significant concern to the Department.

MDIFW believes that sufficient data has been collected through radar and fatality studies for proposed and active facilities in Maine's coastal plain to indicate significant use patterns and adverse risks for migrating birds in this region. As the factors above have been well demonstrated, the Department does not require additional radar data in the coastal plain as revalidation at this time. In the Department's view, based on seasonal and daily migratory patterns (numbers of migrants, flight heights, behaviors), predominant weather conditions, and the results of area studies (Downeast Wind, Weaver Wind, Bull Hill Wind), the "coastal plain" area of concern generally corresponds with the U.S. Environmental Protection Agency Ecoregions labeled as "Gulf of Maine Coastal Plain (59h)", Gulf of Maine Coastal Lowland (59f)", "Midcoast (82f)", "Downeast Coast (82g)", and a transitional area in the southern region of "Eastern Maine-Southern New Brunswick Plains (82c)", roughly represented as below Route 9 in eastern Maine (see accompanying map also found at: https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-epa-region). For further information on the basis of these concerns and references, see MDIFW's Avian Resources in Maine's Coastal Plain (March 2018).

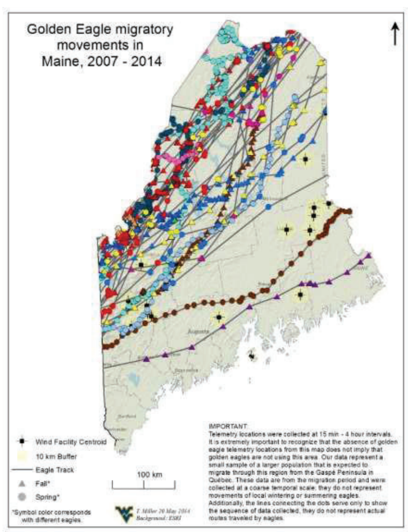
The Department recommends, however, that nocturnal radar studies continue to be conducted for wind energy projects proposed along Maine's major river corridors based on the habits of migrating birds for following topographic features and limited data in such areas. For projects proposed within one mile of one of Maine's major rivers including, but not limited to, the Androscoggin, Kennebec, Penobscot, Allagash, Aroostook, and St. Croix Rivers, MDIFW recommends ***at least*** 2 years including ***at least*** 4 seasons (2 spring: April 15-June 1 and 2 fall: August 15-November 30) of 20 well distributed nights per season of data collection per project, if the data indicates consistent patterns of migration, passage rates, and flight heights. Migration patterns may be expected to vary to some degree due to changes in climate, weather, etc. If, after consideration of factors that naturally cause variability, the data are not consistent, an additional year (1 spring, 1 fall) will likely be recommended.

Note that additional nights or seasons of monitoring may be recommended depending on site specific conditions, the project location, species present, etc. Also, large projects may need multiple radar monitoring locations to ensure adequate coverage of geographically larger project sites. To ensure that applicants sample nights with representative migration activity, we recommend comparisons to other studies or to Nexrad data. MDIFW also recommends the use of X-Band radar systems to ensure consistency and comparability between study results, preferably with dual arm radar technology. If radar units are placed at sites with more than 15% ground clutter, site selection should be pre-approved by MDIFW staff often following a site visit. For verification purposes, it is essential that an image of the radar screen during a high migration event and a series of photos showing surrounding landscape/ground clutter be submitted with any report. For further guidance on radar methodologies, settings, and marine applications, please contact MDIFW Avian Biologist, Adrienne Leppold (adrienne.j.leppold@maine.gov; 207-941-4482).

Bird migration patterns in other regions of the state typically indicate higher flight heights and/or lower passage rates, suggesting that migrating birds do not appear to be placed at unreasonable risks in these areas at this time. Therefore, nocturnal radar studies are likely unnecessary in those areas. However, applicants are strongly encouraged to contact MDIFW as early as possible in their project development process for verification.

Raptor Migration[1]: Mountainous regions and areas along Maine's major river corridors may serve to funnel raptor movements. Also, accipiters and falcons are both known to focus their movements along the coastal plain, with accipiters tending on the inland side and falcons tending on the seaward side of the coast. Raptor migration surveys provide data to indicate how raptors are using the terrain for activities such as migration, lift, stopover, refueling, foraging, etc., allowing MDIFW to recommend minor project modifications to avoid/minimize impacts based on documented raptor activity. In mountainous regions, along major river corridors[2], and in coastal plains[2], MDIFW recommends ***at least*** 2 years including ***at least*** 4 seasons (2 spring and 2 fall) of pre-construction monitoring because of high year-to-year variability in the numbers of migrants (Strickland et al. 2011). Where data suggest that concentrations of raptors are possible, the Hawk Migration Association of America (HMANA) asserts that three years of pre-construction study data are important for projects (HMANA Industrial Wind Turbine Siting and Monitoring Policy 2013). Surveys are conducted in the spring (March 1 - June 15) and fall (August 1 - November 30), two or more times per week in weather conducive to migratory activity, from 9 a.m. until 2 hours before sunset, or later if birds are moving through the area, from one or more prominent locations within the project area. Information on the species, number of individuals, behavior (especially foraging or other stopover/staging activity), flight height (especially abrupt changes owing to orographic lift) and direction, time of sighting, and location / direction of travel of each bird relative to the project area should be recorded. For further guidance, please contact MDIFW Avian Biologist, Erynn Call (erynn.call@maine.gov; 207-941-4481).

Golden and Bald Eagle[1] : Golden eagles are listed as Endangered under MESA. While most documented golden eagle sightings have occurred in northwestern Maine, smaller numbers of transients have been documented elsewhere in the State at various times of the year. In Maine, golden eagle activity typically peaks during fall and spring migrations, although a few golden eagles have been documented to overwinter in Maine. Reports of sightings during the spring/summer breeding season occur, but are rarely validated. The difficulties include the immense home range (approximately 2,000 square miles) of breeding eagles, the highly mobile nature of subadult eagles, widespread misidentification of juvenile bald eagles, and the certainty of observers that golden eagles are a very rare bird in Maine. If golden eagles have been documented within the project vicinity based on telemetry or MDIFW-verified observation data, the raptor migration surveys described above should be modified so that spring surveys are conducted between February 15 – June 15 and fall surveys are conducted between August 1 - December 15. The map below is provided as general guidance for areas of concern for Golden eagles. For further guidance, please contact MDIFW Avian Biologist, Erynn Call (erynn.call@maine.gov; 207-941-4481).



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[1] We request that contractors contact MDIFW to select survey sites, sampling methods, sample size prior to collecting any data in the field. Contractors should partner with MDIFW to establish an appropriate study design and deliverables based on site-specific conditions (e.g. project size, proximity to an existing wind farm, topography, and presence of species or habitat of interest) prior to initiating preconstruction surveys. To facilitate MDIFW review, work plans should include a proposed study design, including detailed methods, data sheets, and how the data will be summarized.
[2] Major river corridors and coastal plains are both intended as described in "Nocturnal Radar" above.

Bald eagles have gone through a remarkable recovery in Maine and, as such, the formal status of the population has changed. Until recently, bald eagles were classified as Species of Special Concern, but no longer. Based on its current State status, MDIFW does not specifically request bald eagle surveys at this time. However, they continue to be protected under the federal Bald Eagle and Golden Eagle Protection Act (Eagle Act), as well as other federal laws. It is recommended that applicants contact the US Fish and Wildlife Service (Maine Field Office, Orland) for guidance.

Great Blue Heron: The Great Blue Heron is categorized in Maine as a Species of Special Concern. MDIFW recommends an aerial survey area within 4-miles of proposed project boundaries to look for new and existing colonies and level of use, and to include ridgeline sightings of herons during raptor survey work. Surveys should be conducted between May 1 and June 15 for projects in northern and Downeast Maine. Earlier timing may be warranted in central and southern regions of the state. Note, heron survey periods overlap with surveys conducted pursuant to the Federal Eagle Act noted above. Please contact MDIFW Avian Biologist, Danielle D'Auria (danielle.dauria@maine.gov; 207-941-4478) for further guidance.

Bicknell's Thrush: The Bicknell's Thrush is categorized in Maine as a Species of Special Concern. This species is known to occupy sub-alpine forests usually dominated by balsam fir and red spruce at elevations ≥2,700 feet, with recent evidence of some lower elevations, typically where a history of disturbance has resulted in a stunted dense understory. Title 35-A M.R.S., Section 3452-A, establishes a rebuttable presumption that "*any portion of the generating facilities or associated facilities of a wind energy development*" proposed in documented Bicknell's Thrush habitat would "*constitute a significant adverse effect on natural resources*". Thus, these areas should be avoided. If an applicant wishes to verify presence, a series of surveys should be conducted to assess the abundance and distribution of the population at that site. Surveys are to be conducted pursuant to the Mountain Birdwatch Program methodologies as outlined in the Program manual (http://vtecostudies.org/wp-content/uploads/2017/03/MBW-Volunteer-Manual_2017.pdf). For further guidance, please contact MDIFW Avian Biologist Adrienne Leppold (adrienne.j.leppold@maine.gov; 207-941-4482).

Breeding Birds: Applicants have historically submitted more incidental bird observations than requested. It should be noted that anecdotal information that is not part of a formal survey is of limited value. If, however, there is evidence of MESA listed Endangered or Threatened species or select species of Special Concern using the project vicinity, MDIFW may request breeding bird surveys be conducted. Assuming proposed wind energy projects will not be located in proximity to wetlands, beaches, or coastal islands, the primary concerns will involve grassland bird species such as upland sandpipers, grasshopper sparrows, eastern meadowlark, and horned lark. In addition to the grassland bird species, MDIFW is also concerned with American pipit, rusty blackbird, and Bicknell's thrush (see previous section). Known information on the presence of these species in a proposed area will be provided during preliminary review of project sites or upon request. As general guidance, the following describes the habitat preferences of these species.

Habitats of concern for grassland bird species include large grasslands or agricultural lands exceeding 15 acres in size. This includes, but is not limited to, hayfields, crop fields, pastures, upland and wet meadows, as well as airports and landfills over 30 acres. American pipits nest in rocky, alpine habitat above tree line. Rusty blackbirds are associated with extensive tracts (10 to 400 acres) of early successional softwood dominated forest stands in close proximity to wetlands or low-gradient streams.

If requested, one year of surveys will typically be adequate, but MDIFW may recommend additional years of sampling in some cases, namely if there is 1) limited or no relevant data regarding breeding season use of the project site (e.g., data from nearby areas of similar habitat type) or 2) significantly diverse species and habitats present.

In these limited situations primarily involving the species highlighted above, surveys should consist of point counts, designed to document singing males, though the observer should record all birds seen and heard. Survey locations should cover the entire project area and be representative of all habitat types. Point count locations should be a minimum of 200 meters apart, and, when possible, should be located at the anticipated turbine sites. In some cases, we may request control sites be established to complete Before-After-Control-Impact (BACI) assessments. Once points have been identified, a map of the project area and point count locations should be included in the work plan presented to MDIFW prior to commencing data collection. Points should be visited for surveys three times; once in May and twice in June, spaced at least seven days apart. Point counts should be conducted between sunrise and 10:00 am with detections limited to 100-meter distance radius and 10-minute sampling periods. Birds outside the 100-meter radius or sampling period should be recorded as incidental observations.

Point Count Data Analysis: Data should be analyzed and summarized seasonally to report species' relative abundance (i.e., mean number of observations in a 10-minute sampling period), frequency of occurrence (i.e., % of surveys a species is observed), and community richness. For further guidance, please contact MDIFW Avian Biologist, Adrienne Leppold (adrienne.j.leppold@maine.gov; 207-941-4482).

Aquatic Resources

Rivers, streams, and brooks within proposed remote wind energy project sites are often in or near headwaters, providing high water quality and habitat values for fish and other aquatic and wetland species. MDIFW recommends maintaining 100-foot vegetated buffers from the upland edge of streams and any contiguous wetlands. Maintaining and enhancing buffers along these resources is critical to the protection of water temperatures, water quality, natural inputs of coarse woody debris, and various forms of aquatic life necessary to support conditions required by coldwater fish and other aquatic species. Stream crossings should be avoided, but if a stream crossing is necessary, or an existing crossing needs to be modified, it should be designed to provide full fish passage. Small streams, including intermittent streams, can provide crucial rearing habitat, cold water for thermal refugia, and abundant food for juvenile salmonids on a seasonal basis. Undersized crossings may inhibit these functions. Generally, MDIFW recommends that all new, modified, and replacement stream crossings be sized to span at least 1.2 times the bank-full width of the stream. In addition, we generally recommend that stream crossings be open bottomed (i.e. natural bottom), although embedded structures which are backfilled with representative streambed material have been shown to be effective in not only providing habitat connectivity for fish but also for other aquatic organisms. MDIFW encourages consideration of these factors during initial design of the project and its position in the landscape, site preparation, and installation of infrastructure to ensure continuation of these important habitats.

Roaring Brook Mayfly: The Roaring Brook Mayfly is listed as Threatened under MESA. This species is known to inhabit clean, cold, high elevation perennial streams in central and western mountainous regions of the state. All known occurrences of this species are in streams draining off slopes above 1,000 feet elevation MSL with coarse substrates (rocks, cobble, boulders) and bordered by relatively undisturbed mixed or hardwood forest. To protect this species, MDIFW recommends a 250-foot riparian management zone for streams meeting these location preferences, extending from each bank. Alternatively, if an applicant wishes to verify presence, potentially suitable habitat should be identified during stream delineations and surveyed during the appropriate timing window (September). Please contact MDIFW Wildlife Biologist Beth Swartz (beth.swartz@maine.gov) for further details on riparian management zones, survey protocol, etc.

Spring Salamander: The Northern Spring Salamander is categorized in Maine as a Species of Special Concern. This species is known to inhabit clear, cold, mountain streams in the central and western regions of the state, with scattered records in York and Cumberland counties. Most occurrences in Maine are known from elevations ranging between 500 and 2,000 feet MSL in relatively steep gradient, first or second order streams underlain by coarse substrates (rock, cobble, gravel) and bordered by hardwood or mixed forest. This species can also be found in larger third-order streams and rivers if the habitat is appropriate as described above. To protect this species, MDIFW recommends a 250-foot riparian management zone for streams meeting these location preferences, extending from each bank. Alternatively, if an applicant wishes to verify presence, potentially suitable habitat should be identified during stream delineations and surveyed during the appropriate timing window (mid-May to mid-September). Please contact MDIFW Wildlife Biologist Beth Swartz (beth.swartz@maine.gov) for further details on riparian management zones, survey protocol, etc.

Vernal Pools: The "significance" of vernal pools and their associated buffers is dependent upon several factors, including the presence or use by state Rare, Threatened, or Endangered Species, or the presence and reproductive success of certain pool-breeding amphibians. The optimal time for assessing the latter criteria coincides with a 2-3-week spring breeding period that varies slightly with geography, elevation, and weather. Vernal Pools are designated as "Potentially Significant" until such time that a seasonally valid survey is conducted and the true value determined. Because of the limited survey period, some developers may choose to initially consider their pools as Significant and reassess them in the future under viable conditions. Alternatively, a developer may choose to consider them as Significant Vernal Pools (SVPs), not formally survey them, and design the proposed project accordingly to avoid (recommended), minimize, and mitigate for any impacts to these resources.

When performed, vernal pool surveys should be conducted within 250 feet of any proposed project impact and during the recommended egg mass periods. These surveys should extend out to 250 feet beyond the anticipated project footprint because of potential impacts to off-site Significant Vernal Pools, assuming such pools are located on land owned or controlled by the applicant. A MDEP Maine State Vernal Pool Assessment Form should be completed for each pool and submitted to MDIFW for pool status determination as soon as possible and **well before the project application is submitted to MDEP**. Please contact MDIFW Wildlife Biologist Beth Swartz (beth.swartz@maine.gov) for further details.

Additional Surveys and Rare Animal Forms: In addition to those noted above, surveys may be recommended for other Endangered, Threatened, and Special Concern species based on the project location and site specific conditions. Any additional surveys warranted will largely be identified by MDIFW during early project consultations.

In many regions of the State, formal surveys for Rare, Threatened, and Endangered species have not been conducted, so it is possible that other rare species may be resident or transient in the project area based on location, habitats present, and life history requirements, including one or more rare species of migratory birds during spring and fall migrations. MDIFW requests that the applicant/consultants voluntarily document any Rare, Threatened, or Endangered Species encountered during project surveys by completing and submitting a *Rare Animal Form* for each observation. For forms, please contact MDIFW's Environmental Review Coordinator, John Perry (john.perry@maine.gov; 207-287-5254).

MINIMUM TURBINE CURTAILMENT RECOMMENDATIONS

Of the eight species of bats that occur in Maine, three *Myotis* species are afforded special protection under Maine's Endangered Species Act: the little brown bat (*M. lucifugus,* State Endangered); northern long-eared bat (*M. septentrionalis,* State Endangered); and eastern small-footed bat (*M. leibii,* State Threatened). The five remaining bat species are designated as Species of Special Concern: red bat (*Lasiurus borealis*), hoary bat (*L. cinereus*), silver-haired bat (*Lasionycteris noctivagans*), tri-colored bat (*Perimyotis subflavus*), and big brown bat (*Eptesicus fuscus*). It is MDIFW's position that the only adequate protection for bats at wind power facilities at this time is seasonal curtailment of turbines under appropriate conditions, though continuing research may lead to other avoidance measures in the future.

MDIFW's curtailment recommendations are based on project and site specific considerations, recent recommendations for other similar facilities, seasonality, proximity to specific habitats important to bats, and ambient temperatures. MDIFW's recommendations will be updated in the event of new conservation measures with demonstrated efficacy, status updates on listed bat populations, insights on cumulative impact, etc.

For planning purposes, in most circumstances based on current research[3] and recent project reviews, MDIFW recommends that turbines operate only at cut-in wind speeds exceeding 6.0 meters per second each night (from at least ½ hour before sunset to at least ½ hour after sunrise) during the period April 15 –September 30, whenever the ambient air temperature is at or above 32 degrees Fahrenheit, measured at both ground level and nacelle hub height. Proximity to hibernacula, documented maternity sites, rocky features, the coastal mainland, and migration patterns, may increase risks and thus possibly necessitate additional safeguards, such as extended timeframes (earlier and/or later) and/or higher wind speeds. At this time, MDIFW considers proximity to be within three miles, subject to revision with ongoing research. Additionally, based on higher bat mortality during July – September demonstrated through post-construction project monitoring in Maine and research elsewhere, applicants can anticipate a need for increased curtailment wind speeds during this period. Cut-in speeds are determined based on mean wind speeds measured at nacelle hub heights of a turbine over a 10-minute interval. MDIFW advises that turbines be feathered during curtailment and allowed to turn at <u>no more than one revolution per minute</u> to minimize risks of bat mortality. MDIFW urges applicants to discuss site specific curtailment recommendations in early stages of project design.

INCIDENTAL TAKE PLANS

Under MESA, MDIFW has the authority to approve project-specific Incidental Take Plans (ITPs) when such plans minimize the incidental "taking" (death) of Endangered or Threatened species and demonstrate that the "taking" will not impair the recovery of the species. For projects that incorporate appropriate siting, design, and operational practices to ensure

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[3] At the 355-turbine Fowler Ridge Wind Farm in Indiana in 2010, "A*n approximate 50% reduction in overall bat mortality was observe*[d] *by raising the cut-in speed from 3.5-5.0 mg/s, while an approximate 78% reduction in overall bat mortality was realized by raising the cut-in speed from 3.5-6.5 m/s*". "*The Fowler Ridge study is the first to demonstrate that bat fatality rates were not only significantly different between control and treatment turbines, but that bat fatality rates were significantly different between cut-in speeds raised to 5.0 m/s versus turbines with cut-in speeds raised to 6.5 m/s.*"

At the 16-turbine Sheffield Wind Facility in Vermont in 2012, "*Total fatalities at fully operational turbines were estimated to be 2.6…times greater than at* [6.0 m/s] *curtailed turbines, resulting in an estimated 60%...reduction in bat fatalities* [when curtailed at this level]."

At the 67-turbine Beech Ridge Wind Farm in West Virginia in 2013, "*The cut-in speed for all turbines was raised* [from the nominal cut-in speed of 3.5 m/s] *to 6.9 m/s all night long throughout the entire study period. Turbines were feathered so that they did not rotate at wind speeds below 6.9 m/s.*" "*The bat fatality rate at the Project was approximately 89% less than the average for other annualized West Virginia projects.*"

"*Indeed, several previous or concurrent studies have shown that raising turbine cut-in speeds…from the manufactured speed (usually 3.5-4.0 m/s for modern turbines) by 1.5-3.0 m/s* [total 6.5-7.0 m/s] *results in significant reductions in bat fatalities compared to normally operating turbines (Baerwald et al. 2009, Arnett et al. 2011),*"

"*Currently, only operational mitigation (stopping turbine blades from spinning) during predictable high risk periods has demonstrated effective reductions of fatalities of bats.*" "*We conclude that increasing cut-in speed between 1.5 and 3.0 m/s* [above manufacturer cut-in speeds of 3.5-4.0 m/s for a total of 6.5-7.0 m/s] *or feathering blades and slowing rotor speed up to the turbine manufacturer's cut-in speed yields substantial reductions in fatality of bats.*"

All from Arnett et al., 2013

avoidance/minimization of bat mortality, this provides legal protection against liability for incidental take, benefitting applicants seeking permits to build and operate wind energy projects into the future. Developers have the option to prepare ITPs in advance of the normal review conducted by permitting agencies. However, it should be noted that ITPs are developed and approved for specific Endangered or Threatened species. As such, an approved ITP for bat mortality does not address, nor provide protection against liability for, adverse impacts to other species or resources. Such other impacts must be addressed independently. For more information on ITPs, please contact MDIFW's Endangered and Threatened Species Coordinator, Charlie Todd (charlie.todd@maine.gov; 207-941-4468).

Updated March 5, 2018

For more information, please contact Bob Stratton (robert.d.stratton@maine.gov; 207-287-5659), MDIFW's Environmental Program Manager; Supervisor of Fisheries and Wildlife Program Support.

From:	Settele, Rebecca
To:	Katelin Nickerson
Cc:	Lindsay Deane-Mayer; Perry, John; Stratton, Robert D
Subject:	RE: Twin Wind - Data request
Date:	Wednesday, January 19, 2022 1:48:44 PM
Attachments:	image003.png Topo_Heron_ERid5508_ERVerID6649.pdf

Hi Katelin,

I don't believe I will be of much help either. I zoomed out a bit further for this project area, and I'm only seeing one mapped great blue heron nest 5.5 miles to the west. I've attached the topo map indicating that to this email. Let me know if you want any additional information.

Becca Settele
Wildlife Biologist
Maine Dept of Inland Fisheries & Wildlife
Wildlife Division
106 Hogan Road, Suite 1
Bangor ME 04401
Office (207)941-4438
Cell (207) 592-3846 *Please use this number as I am working remotely
mefishwildlife.com | facebook | twitter

From: Stratton, Robert D <Robert.D.Stratton@maine.gov>
Sent: Friday, January 14, 2022 4:01 PM
To: Katelin Nickerson <katelin@flycatcherllc.com>; Settele, Rebecca <Rebecca.Settele@maine.gov>
Cc: Lindsay Deane-Mayer <lindsay@palmcap.com>; Perry, John <John.Perry@maine.gov>
Subject: RE: Twin Wind - Data request

Good afternoon Katelin,

I'm afraid there isn't a lot currently known in the immediate vicinity, as evidenced on the attached map that we provided with our 11/01/21 preliminary review.

Becca, would you please take a wider view and provide known info/shapefiles from a greater perimeter?

Thank you, Bob.

Bob Stratton
Wildlife Biologist
Environmental Program Manager

Maine Department of Inland Fisheries & Wildlife
353 Water Street; 41 State House Station
Augusta, Maine 04333-0041
(207) 287-5659 office; (207) 592-5446 cell
mefishwildlife.com

From: Katelin Nickerson <katelin@flycatcherllc.com>
Sent: Thursday, January 13, 2022 4:10 PM
To: Stratton, Robert D <Robert.D.Stratton@maine.gov>; Perry, John <John.Perry@maine.gov>
Cc: Lindsay Deane-Mayer <lindsay@palmcap.com>
Subject: Twin Wind - Data request

Hello, Bob.

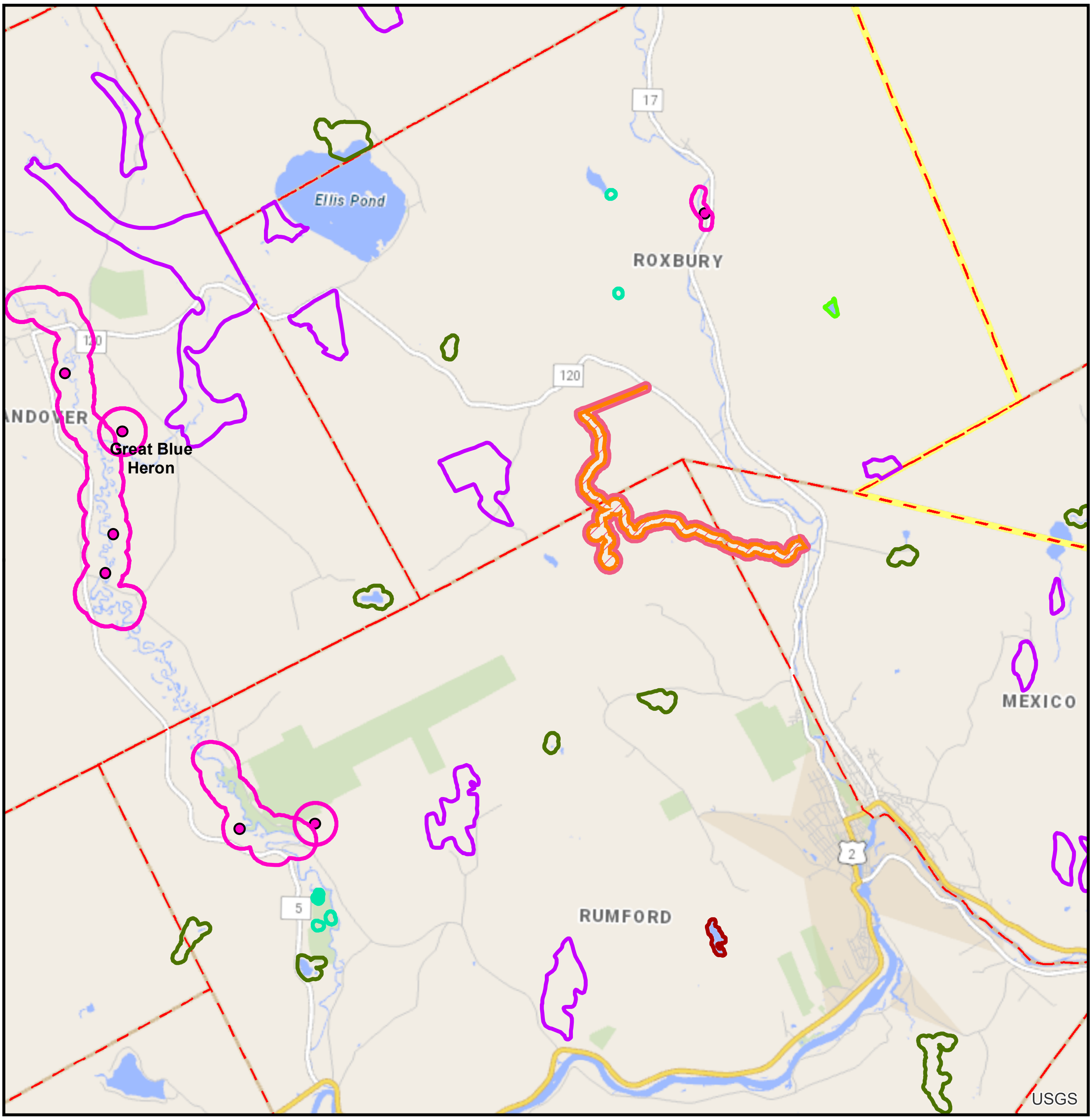
I just left you a voicemail but figured I would follow up with an email. We are wondering if you could share shapefiles from the MDIFW database for mapped great blue heron rookeries and eagle nests.

Feel free to call if you want to discuss. Looking forward to meeting with you next week.

Best,
Katelin

signature_1969060483

Katelin Nickerson, Project Director
Lower Falls Landing, 106 Lafayette Street, Suite 1C
Yarmouth, ME 04096
C: (207) 233-6175
https://flycatcherllc.com/



Environmental Review of Fish and Wildlife Observations and Priority Habitats

Project Name: Twin Wind, Roxbury (Version 1)

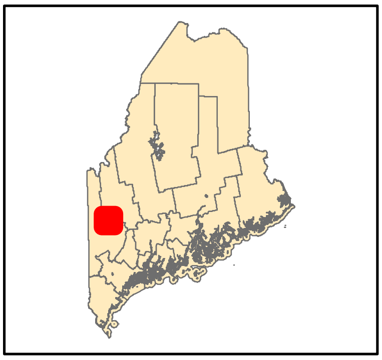
Maine Department of Inland Fisheries and Wildlife

0 0.5 1 2 3 4 Miles

Projection: UTM, NAD83, Zone 19N

Date: 1/19/2022

ProjectSearchAreas - All Versions
Maine Cliff and Talus Areas
Deer Winter Area
LUPC p-fw
Cooperative DWAs
Seabird Nesting Islands
Shorebird Areas
Inland Waterfowl and Wading Bird
2008 Iwwh - Shoreland Zoning
Tidal Waterfowl and Wading Bird
Significant Vernal Pools
Environmental Review Polygons
Roseate Tern
Piping Plover and Least Tern
Aquatic ETSc - 2.5 mi review
Rare Mussels - 5 mi review
Maine Heritage Fish Waters
Arctic Charr Habitat
Redfin Pickerel and Swamp Darter Habitats - buffer100ft
Special Concern occupied habitats - 100ft buffer
Wild Lake Trout Habitats



From:	Stratton, Robert D
To:	Katelin Nickerson
Cc:	Boyden, Sarah; Stearns, Cory R; Perry, John; Settele, Rebecca
Subject:	RE: Twin site visit follow up
Date:	Wednesday, July 6, 2022 8:34:21 AM
Attachments:	image002.png Photos 15June2022.docx

Good morning Katelin,

Attached are photos and notes from our 6/15/22 visit. Thank you again for taking us. Based on our observations and discussions from the two site visits to examine potential rock/talus bat hibernacula areas, we did not find compelling evidence of significant usage that warrants additional protective measures at the site. We believe that the proposed turbine locations are of sufficient distance from the rocky areas with the greatest potential for usage by bats. And, Twin Wind's proposed curtailment scenario, which will mirror that of the adjacent RoxWind Project, is anticipated to be sufficiently protective of bats.

To review, the RoxWind curtailment procedure entails that turbines operate only at cut-in wind speeds exceeding 6.0 meters per second (m/s) each night (from at least ½ hour before sunset to at least ½ hour after sunrise) during the periods of April 15 – July 15 and from September 16 - September 30, and at cut-in wind speeds exceeding 6.9 m/s from July 16 – September 15, all whenever the ambient air temperature is at or above 32 degrees Fahrenheit, measured at both ground level and nacelle hub height. For RoxWind, MDIFW agreed to an Incidental Take Permit pursuant to the Maine Endangered Species Act in consideration of these more protective measures and no postconstruction mortality monitoring.

Please let me know if you have any further questions or concerns. Thank you, Bob.

Bob Stratton
Wildlife Biologist
Environmental Program Manager
Maine Department of Inland Fisheries & Wildlife
353 Water Street; 41 State House Station
Augusta, Maine 04333-0041
(207) 287-5659 office; (207) 592-5446 cell
mefishwildlife.com

From: Katelin Nickerson <katelin@flycatcherllc.com>
Sent: Tuesday, July 5, 2022 12:59 PM
To: Stratton, Robert D <Robert.D.Stratton@maine.gov>
Subject: Twin site visit follow up

EXTERNAL: This email originated from outside of the State of Maine Mail System. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi, Bob. Hope you had a good holiday weekend.

I am in the putting the final touches on the Twin Energy RTE report and am wondering if we will get something from MDIFW about our site visits to survey bat hibernacula. I want to make sure I incorporate all recommendations from MDIFW before finalizing the report.

Let me know what you think.

Thanks,
Katelin

Katelin Nickerson, Project Director
Lower Falls Landing, 106 Lafayette Street, Suite 1C
Yarmouth, ME 04096
C: (207) 233-6175
https://flycatcherllc.com/

Proposed Twin Wind Project, Roxbury/Rumford 15June2022. Bob Stratton, Sarah Boyden
Potential bat rock hibernacula survey.

Photo 1. Flycatcher site photo #5647. Large boulders/rock faces with large crevices between and beneath. Site #5647 appears to offer potential use for winter thermal refugia, but no definitive indicators as to whether it is actually used or the extent.

Photo 2. Flycatcher site photo #5647. In some sections, we observered noticeable temperature and moisture changes just by reaching an arm into the deep crevices, indicating deeper recesses.

Photo 3. Flycatcher site photo #5647. Smaller crack.

Photo 4. Flycatcher site photo #5647. Another section with apparent deeper recess.

Photo 5. Flycatcher site photo #5647. Same spot as photo 4.

Photo 6. Flycatcher site photo #5647. Section downgradient from prior photos. Noticeable temperature and moisture changes within. Rod Kelshaw (Flycatcher) shown.

Photo 7. Flycatcher site photo #5647. Same spot as photo 6.

Photo 8. Flycatcher site photo #5647. The foot of the slope, less promising section. Sarah Boyden (MDIFW) shown.

Photo 9. Stream pool under forest canopy with spotted salamander egg masses. Other portions of stream dry. Downgradient of existing clearing/crossing for forest harvests planned for project road crossing.

Photo 10. Representative photo of linear rocky slope/faces on site. No observed deep crevices or recesses to provide thermal refugia.

Photo 11. Same area as photo 10. Lindsay Deane-Mayer (Palmer Capital) shown.

Flycatcher site photo #8704 contained 2-3 boulders, some crevices, and noticeable temperature changes within. S.Boyden theorized possible use for overnight stopovers, but not for longterm use. No photo.

Flycatcher site photo #3735. Some rocks, no apparent potential for refugia. No photo.

Also present: Rod Kelshaw and Katelyn Nickerson (Flycatcher), Lindsay Deane-Mayer (Palmer Capital), an associate (name unknown).

RD Stratton

1.

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3.

4.

5.

6.

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8.

9.

10.

11.

Attachment 3 Northern Bog Lemming Fecal Pellet Analysis Methods and Results

Twin Energy Project - Northern Bog Lemming Survey

Proposed Methods

Provided to Flycatcher LLC from Dr. Zachary Olson Ph.D. Associate Professor of Animal Behavior, University of New England

September 24, 2021

Field methods

Sites will be targeted for sampling based vegetative features consistent with what is known about Northern bog lemming habitats, such as dense sphagnum and sedge availability (Clough and Albright 1987, Reichel and Beckstrom 1994). Four loosely-defined transects will be searched for small mammal sign within each site. Transects will be 100 m long, and will be spaced roughly 50m apart. If sites are smaller than 100 x 200m, the site will be searched to saturation. Transects will be visited one time only by a pair of researchers attempting to collect 50 pellets total with 10-20 pellets being collected from a 20-m-wide band overlaying each transect (i.e., researchers meander ~10-20 m from the transect during searches to visually search all likely habitat for small mammal sign). An effort will be made in the field to space pellet collections along the full length of transects in order to maximize the number of small mammal individuals that are sampled at each site. Ultimately, however, collection locations will be determined by the presence of sign, which can be scarce and difficult to find at some sites. Small mammal sign visible while walking includes holes in the sphagnum, runways, and hummocks near grass or tree boles.

Where sign is found, close-in searches will be conducted (hands and knees) to find small mammal pellets. Pellets >5mm in length and not black in color will be collected. Scientists will record location, elevation, the presence of grass/sedge clippings in a runway (i.e., bog lemming sign), the color and relative freshness of the pellet, and then initiate collection. Up to 10 pellets will be placed in the same sample-collection tube, allowing for batch processing of pellets in the laboratory. The single pellet will be picked up with a gloved hand, and placed into a numbered 2.0 mL sample tube filled with a lysis buffer. Pellets thus collected can withstand room temperature conditions until their arrival in the laboratory, where they will be stored at -20°C until processing.

Laboratory methods

DNA will be extracted from each tube of pellets using QiAmp Fast DNA Stool mini kits (Qiagen). Pellets will be homogenized in their preservation tubes using a benchtop vortexer prior to entering the extraction process, which will proceed according to manufacturer instructions. DNA will be eluted using 50 uL of elution buffer, and stored at -20°C until amplification. All laboratory steps will include frequent glove changes, the use of filtered pipette tips, and pre- and post- work bleach sterilization of hard surfaces. Extraction batches will include blanks (i.e., no pellets added) to serve as negative controls, and extractions will take place in a laboratory and building separate from all amplification steps to reduce contamination (Taberlet et al. 1999). Personnel will only be allowed to enter the extraction space after having showered and changed clothes to reduce the risk of contamination. Amplification steps will also include positive and negative template controls.

The Olson lab developed and iteratively tested primers that would work across a wide variety of small mammals and still contain enough variation to differentiate among species. Primers ME-Mamm_eDNA_4F (adapter + primer) 5′ -- TCG TCG GCA GCG TCA GAT GTG TAT AAG AGA CAG + ATR GCA ACA GCA TTY ATA GG, and ME-Mamm_eDNA_4R 5′ -- GTC TCG TGG GCT CGG AGA TGT GTA TAA GAG ACA G + AAR TGG AAK GCG AAG AAT C, will be used to amplify a 178 bp fragment of the cytochrome b gene in duplicate for each sample.

Standard PCR conditions will be used to produce target fragments in a separate amplification laboratory, and the two PCR-products will be combined for cleanup to maximize NBL detection potential. Column cleanup kits (NEB Monarch) will be used to isolate the putative DNA fragments for submission to the sequencing facility. Cleaned DNA will then be submitted to the Hubbard Center for Genome Studies at the University of New Hampshire for indexing then sequencing on an Illumina HiSeq machine using 2 x 250 bp chemistry.

We will use Qiime2 (Bolyen et al. 2019) to trim primer sequences, denoise, and merge forward and reverse reads from the sequencing facility. This step also enforces measures of sequence quality and removes chimeras. We will use the phyloseq package (McMurdie and Holmes 2013) in R (R Core Team 2020) to remove all sequences that occurred a single time in the dataset, as these will be presumed sequencing errors. Remaining sequences will be compared against a docker image of the NCBI nucleotide database using Blast+ in the Cloud using the following parameters: word size (28; i.e., highly similar search), max target sequences (5), and max hsps (3). Blast output will include scientific and common names of sequence matches. We will manually select the ‘best’ taxonomic assignment for each query sequence based on the following criteria: we will retain lower e-value matches unless those matches are geographically incongruent, and, over all, matches with e-values greater than $1x10^{-20}$ will be discarded (Thompsen et al. 2016). Identical taxonomies will be merged using phyloseq to create a final table containing the number of reads for each sample of pellets and its taxa combinations. Read counts will be standardized to present relative read abundance (RRA) per sample after removing bacterial and human contaminants.

Literature Cited

Bolyen E, Rideout JR, Dillon MR, et al. (2019) Reproducible, interactive, scalable and extensible microbiome data science using QIIME 2. Nature Biotechnology 37: 852–857.

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REPORT

DATE:
24 May 2022

TO:
Katelin Nickerson
Flycatcher LLC
Lower Falls Landing
106 Lafayette Street, Suite 1C
Yarmouth, ME 04096

REPORT NARRATIVE:

Flycatcher LLC personnel were provided with 1.7 mL sample tubes containing 1 mL lysis buffer. The sample tubes were to be used for storage of small mammal fecal pellets collected from the field, with instructions to place 10 fecal pellets into each of five (5) tubes to achieve 50 total pellets in order to sample a site for the purpose of detecting Northern bog lemmings (*Synaptomys borealis*).

Five (5) sample tubes of small mammal pellets were received from Flycatcher LLC in the lab of Zach Olson at the University of New England on 20 January 2022. The tubes were stored at room temperature until DNA extraction on 11 March 2022. Polymerase Chain Reaction (PCR) was conducted on 22 March 2022 in triplicate for each sample extract. The PCR was designed to amplify a 178 base-pair fragment of the mitochondrial cytochrome b gene for use in identifying the species of small mammal who's DNA might be present in the batch-collected samples, using a process called metabarcoding.

PCR resulted in strong amplification of target fragments (as determined by gel electrophoresis) across replicate reactions from tubes 1-3, with no obvious amplification across replicate reactions from tubes 4 and 5. All sample amplification products were cleaned prior to submission for sequencing. The sequencing submission included appropriate positive and negative controls, which yielded expected results.

Metabarcoding of the submitted samples resulted in four out of the five tubes yielding detectable DNA, with three of the five providing sequences that cleared quality checks. DNA sequences from three (3) small mammal species were identified: Southern bog lemming, Meadow vole, and Deer mouse (Table 1). **Northern bog lemming was not detected (Table 1).**

Table 1. Detection (1 = detected, 0 = not detected) and relative read abundance (%) of small mammal species identified from sample tubes containing batch-collected fecal pellets. Pellets were collected along walked transects during 2021 by Flycatcher LLC. DNA was extracted from batches of pellets, metabarcoding used PCR primers targeting a region of the cytB mitochonrdrial gene, and species identities were determined using the NCBI nucleotide database.

Species name	Common name	RDK1-1	RDK1-2	RKD1-3
Synaptomys borealis	Northern bog lemming	0 (0%)	0 (0%)	0 (0%)
Synaptomys cooperi	Southern bog lemming	0 (0%)	0 (0%)	1 (2.69%)
Microtus pennsylvanicus	Meadow vole	1 (100%)	1 (99.99%)	1 (97.31%)
Peromyscus spp.	Deer mouse	0 (0%)	1 (0.01%)	0 (0%)

Report authored by:

Zach Olson, Ph.D.
University of New England
11 Hills Beach Rd.
Biddeford, ME 04005

Exhibit 7-4
Eagle Use and Raptor Migration Surveys
Raptor Survey Review for the Twin Energy, Project Roxbury and Rumford, Maine

MEMO

Date:	January 20, 2023
To:	Lindsay Deane-Mayer (Palmer Capital Corporation)
From:	Katelin Nickerson (Flycatcher LLC)
CC:	Meg Thurrell (Flycatcher LLC)
Subject:	Raptor Survey Review for the Twin Energy, Project Roxbury and Rumford, Maine

Hello Lindsay,

As requested by Twin Energy LLC (a subsidiary of Palmer Capital Corporation), Flycatcher LLC (Flycatcher) is pleased to provide the following review of raptor data and potential permit implications for the proposed Twin Energy Project (Twin Energy, or the Project). The proposed Project includes three turbines, with elevations ranging between 1,950 and 2,155 feet, to be constructed on South Twin Mountain in Rumford, Maine.

Following Project consultation with the Maine Department of Inland Fisheries and Wildlife (MDIFW) and the United States Fish and Wildlife Service (USFWS), Flycatcher performed two seasons of raptor migration and eagle use surveys for the Project in 2022. At the conclusion of the 2022 season, Twin Energy asked whether the data collected at South Twin, along with other available data, are sufficient to ascertain the Project's potential risk for migrating and or resident raptors. To help answer this question, Flycatcher compared records collected for the Project with other Maine permitted projects as well as publicly available hawk count data. These data and the comparative analysis are presented herein.

Methods

During the 2022 Spring and Fall field seasons, observation data for the Twin Energy Project was collected in accordance with the *MDIFW 2018 Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality* (2018 Recommendations, MDIFW, 2018), and the *USFWS Eagle Conservation Plan Guidance (ECPG), Module 1 – Land-based Wind Energy, Version 2, 2013* (USFWS, 2013).

Flycatcher also gathered readily available data from Maine Department of Environmental Protection (MDEP) permits and publicly accessible online resources for other wind projects permitted in Maine in the last several years. Other Projects for which data was analyzed includes Record Hill, Spruce Mountain, and Western Maine Renewables. Flycatcher standardized hours from those data to make an accurate comparison between these projects and Twin Energy raptor observations.

Flycatcher also collected data from seasonal hawk count sites along known raptor migration routes. Bradbury Mountain, Cadillac Mountain, Clary Hill, and Cooper Ridge were chosen as these are sites that performed surveys for multiple months in 2022. We standardized raptor observations by hour and by day. As Bradbury and Cadillac mountains had the most available data, Flycatcher was able to use these data to compare days within the same year. Data for hawk count sites are generally only available for one season, such as spring or fall.

Bradbury and Cadillac mountains, Clarry Hill and Cooper Ridge provide examples of known robust hawk migration sites in Maine, but they are located in different topography and ecoregions, and they are lower in elevation (470, 1,530, 643, and 500 ft, respectively) and closer to the coast than South Twin. Record Hill provides perhaps the most similar comparison, as its location (5.9 miles from South Twin), elevation (2,418 feet), and distance from major waterbodies are similar to South Twin.

Findings

Passage Rates at South Twin Mountain and Other Permitted Projects

A common procedure for analyzing diurnal raptor survey data is calculating the number of raptors observed per hour of survey effort. This analysis provides an average of the observed raptor passage rates over the observation period (i.e., raptors per hour).

For 2022, the average passage rate at South Twin Mountain was determined to be 0.35 raptors/hour. Comparatively, the other projects in this analysis recorded two- to three-times higher raptor passage rates than South Twin. For example, the Record Hill project, located approximately six miles north of South Twin, completed three years of post-construction monitoring (2012, 2014, 2016). The Record Hill study indicates raptor passage rates ranged from 0.90 to 1.08 raptors/hour (Table 1).

Table 1. Summary of Results from Permitted Wind Projects in Maine.

Project	*Year*	*Total survey hours*	*Total survey days*	*Total raptors*	*Raptors per hour*	*Endangered (E), threatened (T), or species of special concern (SSC)*	*Listed Species per hour*
Record Hill[1]	2012	158.50	23	142	0.90	5 bald eagles *(Haliaeetus leucocephalus* (SSC))	0.03
Record Hill	2014	241.75	35	260	1.08	40 bald eagles	0.17
Record Hill	2016	245.00	35	235	0.96	1 golden eagle *(Aquila chrysaetos* (E)), 9 bald eagles	0.04
Spruce Mountain[2]	2012	132.00	22	147	1.11	2 peregrine falcons *(Falco peregrinus* (E)), 6 bald eagles, 1 unidentified eagle (presumed SSC)	0.07
Western Maine Renewables[3]	2020	479.00	67	347	0.72	29 northern harriers *(Circus cyaneus* (SSC))	0.06
South Twin Mountain	2022	509.52	66	176	0.35	13 bald eagles	0.03

1. Stantec Consulting Services Inc. (2016). Final Post-Construction Monitoring Report, Year 3: Record Hill Wind Project: Oxford County, Maines.
2. Tetra Tech (2013). Spruce Mountain Wind Project: Post-Construction Bird and Bat Fatality and Raptor Monitoring: Year 1 Annual Report.
3. Tetra Tech (2020). Comprehensive Wildlife Report: Western Maine Renewable Energy Project, Somerset County, Maine; MDEP Site Location of Development/ NRPA Combined Application.

Passage Rates at Hawk Count Sites

The hawk count sites that were analyzed also recorded higher passage rates in 2022 than those recorded at South Twin (Table 2). During the 2022 spring season, Bradbury Mountain had the highest rate at 8.94, whereas South Twin had the lowest rate at 0.23. During the fall 2022 survey season, Clarry Hill had the highest rate of raptors per hour at of 59.9, whereas South Twin had the lowest rate at 0.46.

When comparing the same day within the same year, then calculating the average passage rate per day, rates were much higher at Bradbury and Cadillac Mountains than at South Twin (Table 3). In spring 2022, Bradbury had the highest passage rate (26 raptors per day) and South Twin Mountain had the lowest rate of (two raptors per day). In the fall of 2022, Cadillac had the highest rate (39 raptors per day), and South Twin had the lowest (four raptors per day).

Table 2. Summary of Observations at Hawk Count Sites and South Twin Mountain, Fall and Spring, 2022.

Site	Total survey hours	Total survey days	Total raptors	Raptors per hour	Endangered (E), threatened (T), or species of special concern (SSC)	Listed species per hour
Spring						
Bradbury Mountain[1]	450.60	60	4,030	8.94	6 peregrine falcons, 98 bald eagles, 96 northern harriers	0.44
Cooper Ridge[1]	49.25	9	44	0.89	10 bald eagles, 1 northern harrier	0.22
South Twin Mountain	250.52	30	57	0.23	5 bald eagles	0.02
Fall						
Cadillac Mountain[1]	253.75	77	3,003	11.83	14 peregrine falcons, 133 bald eagles, 80 northern harriers	0.89
Clarry Hill[1]	240.00	37	14,137	58.90	407 bald eagles, 2 golden eagles, 15 peregrine falcons	1.77
Cooper Ridge[1]	101.50	20	126	1.24	23 bald eagles	0.23
South Twin Mountain	259.00	36	119	0.46	8 bald eagles	0.03
1. Data for Cadillac and Bradbury Mountain, Clarry Hill and Cooper Ridge hawk count comes from hawkcount.org						

Table 3. Summary of Observations at Nearby Raptor Migration Routes and Twin, Standardized for day, 2022.

Site	Total survey hours*	Total survey days	Total raptors	Total bald eagles	Raptors per day
Spring					
Bradbury	118.33	15	390	22	26
Twin Wind	125.10	15	30	2	2
Fall					
Cadillac	81.75	21	818	58	39
Twin Wind	155.33	21	92	6	4
*Survey hour effort per day is higher at South Twin for both seasons as it would not be reasonable to adjust for observation hours between sites.					

Discussion

Based on the 2022 data, raptor passage rates are lower at South Twin Mountain than at other permitted wind projects and at regularly surveyed Maine hawk count sites.

The Record Hill post construction data are likely the most relevant to this analysis, given the geographic similarities and proximity to South Twin Mountain. Those data indicate a nearly three times higher passage rate than observed at South Twin. In addition, Western Maine Renewables, a project permitted in 2022, is one of the more recently permitted projects in the state. Western Maine Renewables has more than four times the number of turbines proposed by Twin Energy. Higher raptor passage rates at this project, nearly twice as high as those recorded at South Twin Mountain, were permitted by MDEP.

Research indicates raptor passage rates are tied to mortality rates at wind energy sites. Strickland *et al.* (2011) note a significant correlation between preconstruction raptor observations and post-construction raptor mortality. The comparatively low number of raptor and eagle observations at South Twin Mountain indicate that the collision risk to raptors is low at this site.

We understand that MDIFW's 2018 pre-construction recommendations are based on the best available science and experience from other projects. Given the low passage rate and a lack of observations of rare or endangered species, in comparison to other permitted wind projects, Twin Energy's 2022 raptor migration survey data suggest there would be minimal anticipated risk for migrating raptors from the proposed Project.

We hope these data and the accompanying discussion help answer your question, as discussed in the opening section of this review. Please let me know if you have any questions or would like more information.

Respectfully,

Katelin Nickerson

Katelin M. Nickerson

Project Director
Flycatcher LLC
katelin@flycatcherllc.com

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Spring 2022: Pre-Construction Eagle Use and Raptor Migration Survey Report

Twin Energy Project - Oxford County, Maine

PALMER

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Cohasset, MA 02025

Flycatcher
LAND + SCIENCE + PEOPLE

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June 2022

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INTRODUCTION

PROJECT DESCRIPTION

The Twin Energy Project (Project) is a proposed wind electric generation facility located on South Twin Mountain in Rumford and Roxbury, Maine. Twin Energy LLC (Twin Energy) is proposing to install three wind energy turbines, each with a nameplate capacity of six-megawatts. The access road and collector line are proposed to extend from the existing RoxWind project in Roxbury southerly to South Twin Mountain in Rumford.

The turbines are proposed to generally run west to east along the northern ridge of South Twin Mountain. Turbine 3 is proposed to be located near the summit of South Twin Mountain, at an elevation of 2,155-feet. Turbines 1 and 2 are proposed to be located to the east and north of Turbine 3 at slightly lower elevations; around 1,950-feet and 2,050-feet respectively (Figures 1 and 2). The proposed turbines will each have a hub height of approximately 384-feet (117 meters), blade tip height of approximately 645-feet (196 meters), and total blade swing diameter of approximately 490-feet (149 meters).

Flycatcher LLC (Flycatcher) was contracted by Twin Energy to complete eagle use and raptor migration surveys to aid in Project siting and to support permitting requirements for the Project. Flycatcher biologists consulted with the Maine Department of Inland Fisheries and Wildlife (MDIFW), and the United States Fish and Wildlife Service (USFWS) to develop a site-specific survey plan that will collect sufficient data to support these two agencies in making a determination about the Project during their respective review processes.

SURVEY BACKGROUND

During pre-survey consultations, MDIFW and USFWS recommended that eagle and raptor surveys be completed to support their review and meet the Project's obligations for permitting under the Maine Department of Environmental Protection (MDEP) Site Location of Development Act (Site Law: MDEP, 2019), and the US Army Corps of Engineers (USACE) Maine General Permits (GP: USACE, 2020).

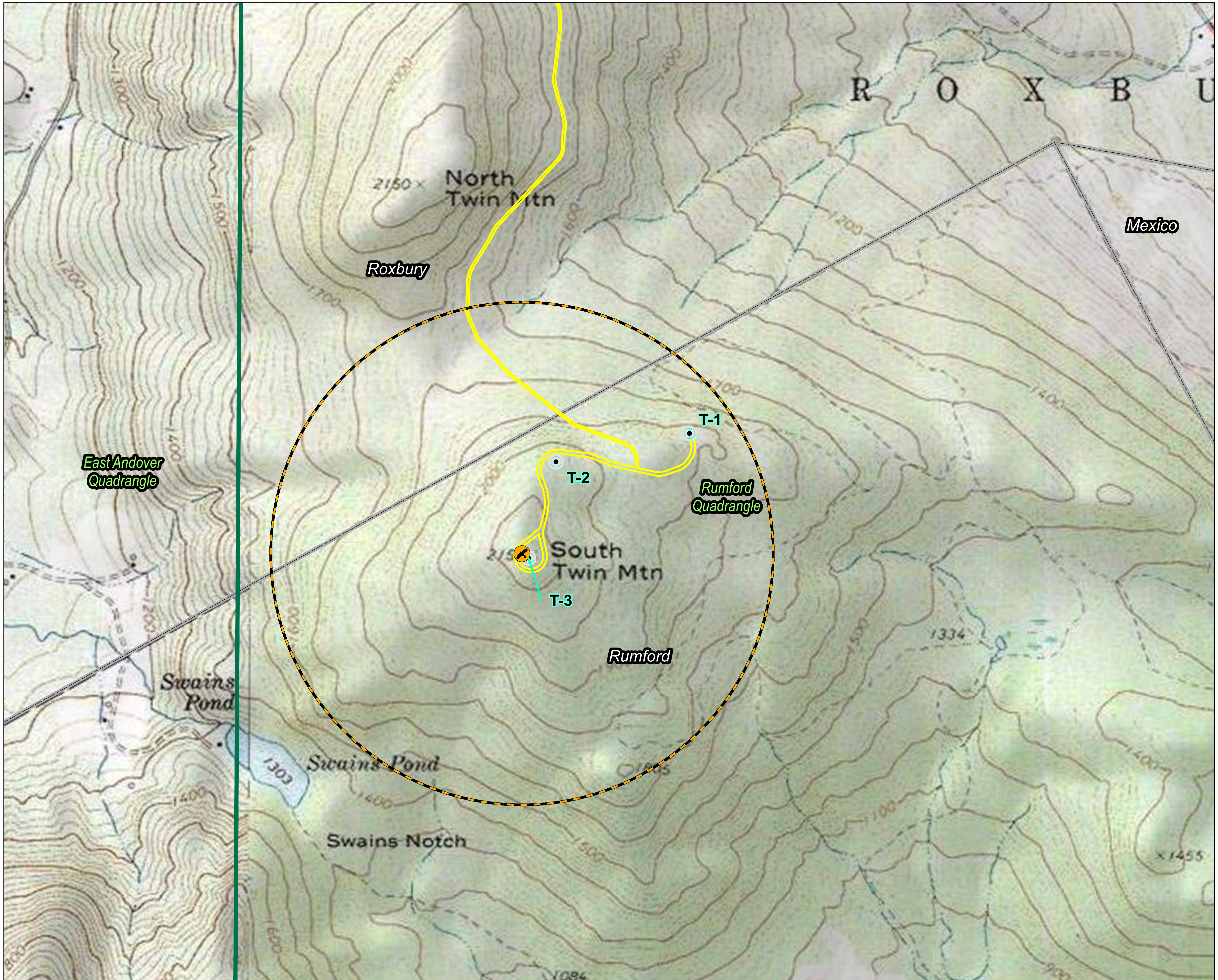
Flycatcher developed a draft survey plan that was provided to both MDIFW and USFWS for comment and review during the winter of 2022. Following this review, slight modifications were made to the survey plan to collect data that could be used in USFWS's collision risk model. The survey plan was approved by both MDIFW and USFWS in early February 2022. Twice weekly surveys commenced on February 15 and extended through June 15, 2022. Figures 1 and 2, depict the Project area and raptor survey location.

In addition to direct consultation with the MDIFW and USFWS, Flycatcher's survey methods were informed by the protocols detailed in the MDIFW 2018 Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality (2018 Recommendations: MDIFW, 2018), and the USFWS Eagle Conservation Plan Guidance (ECPG), Module 1 – Land-based Wind Energy, Version 2, 2013 (ECPG: USFWS, 2013).

SURVEY OBJECTIVES

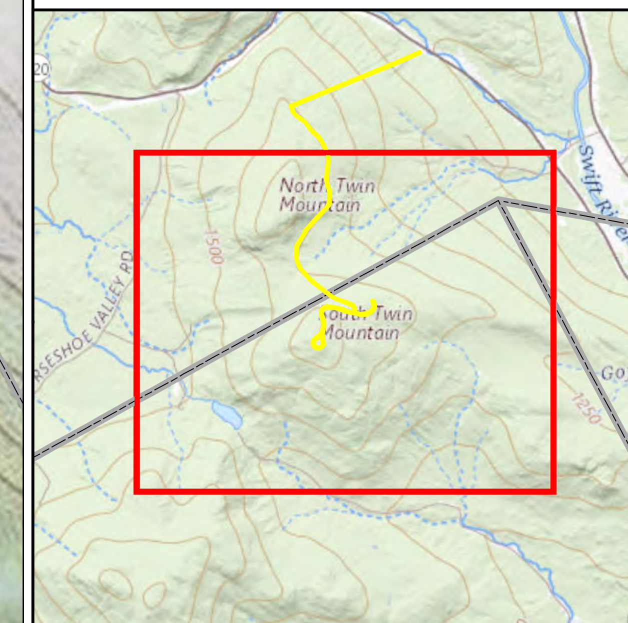
Eagle and raptor migration data collected during the spring 2022 survey are presented in this report to provide developers and reviewing agencies with site-specific information to inform decision making during the planning and permitting processes, including review by MDIFW and USFWS. The information presented in this report is intended to support avoidance and minimization of potential Project impacts to eagles and migrating raptor species. Gaining an understanding of how eagles and raptors use the proposed Project and surrounding area supports turbine siting parameters, operational practices, and the development of best practices to protect species.

Surveys were completed to collect site-specific information typically necessary for MDIFW to make a determination on the Projects' potential impacts to raptors. Additionally, data was collected in a way that will allow USFWS to use their collision-risk model to determine the potential risk the proposed Project has to negatively impact eagles. This model supports decision making regarding the potential need for a wind project to apply for a take permit. Evaluating the data collected from this survey is a key part of the take permitting process.



LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- RAPTOR SURVEY LOCATION
- 800M RADIUS SAMPLE AREA
- USGS 7.5-MINUTE QUADRANGLE BOUNDARY
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM USGS 7.5' QUADRANGLE SERIES.

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TITLE:	USGS RAPTOR SURVEY LOCATION MAP
DRAWN BY: D. KENWORTHY	PROJ NO.: 21ZP
CHECKED BY: R. KELSHAW	
MONTH: JUNE	FIGURE 1
YEAR: 2022	
Flycatcher LAND + SCIENCE + PEOPLE	PALMER
FILE NO.:	Palmer_TwinEnergy_RaptorMethods_Fig1_USGS_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

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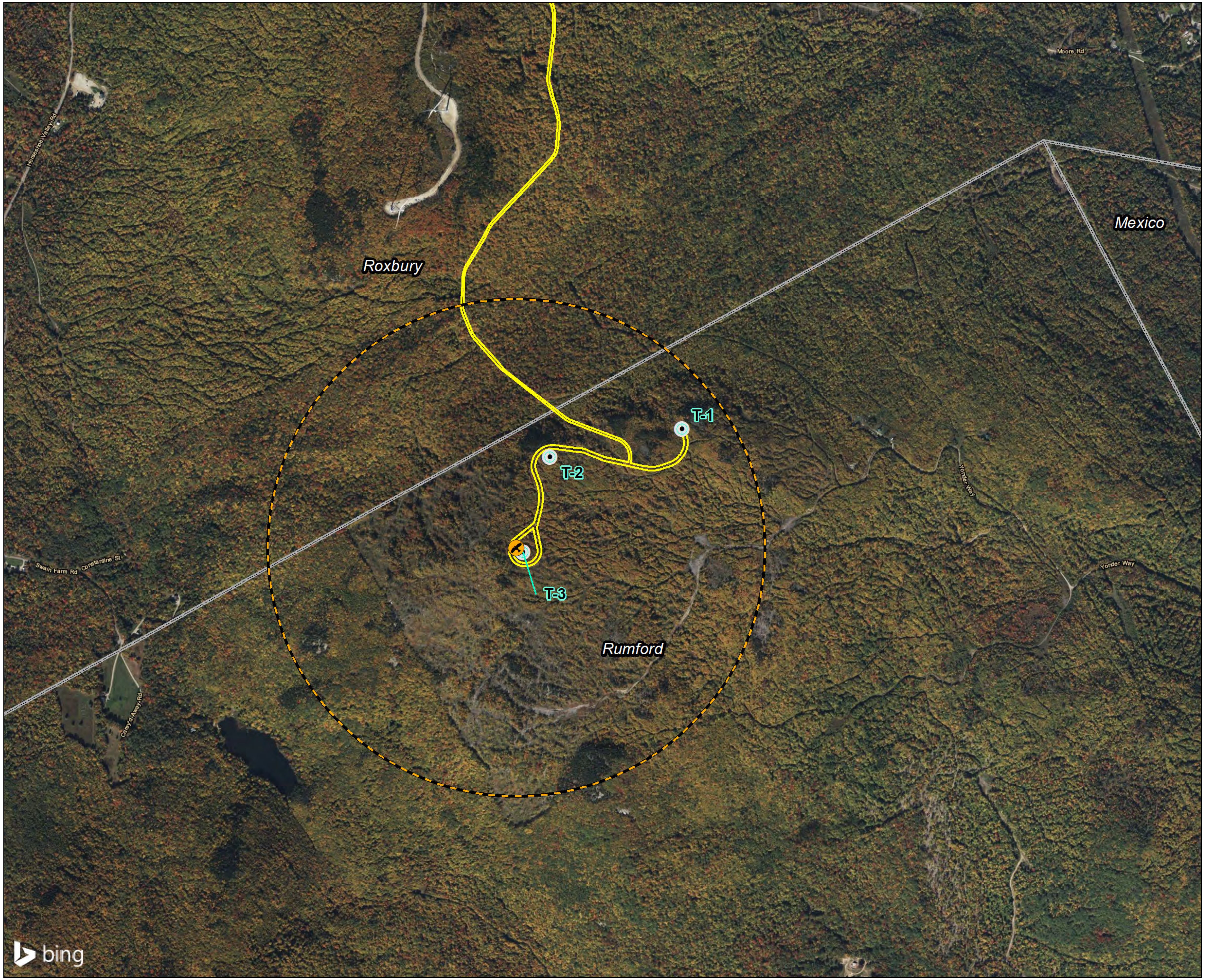
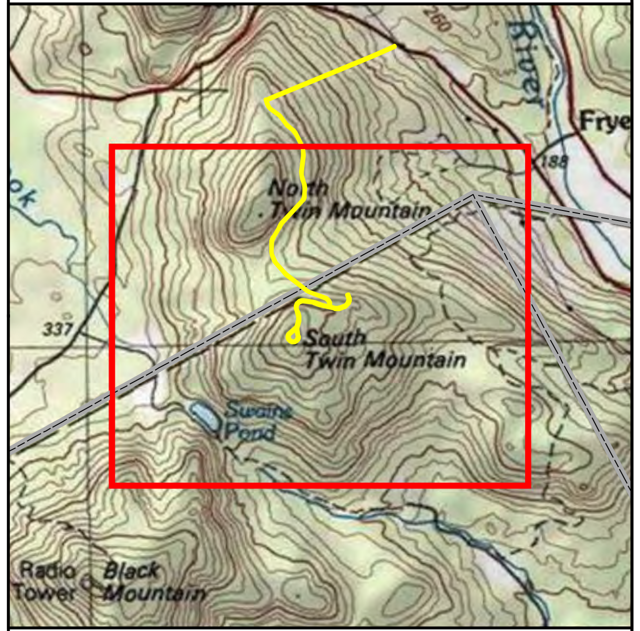


LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- RAPTOR SURVEY LOCATION
- 800M RADIUS SAMPLE AREA
- TOWN BOUNDARY



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1 BASEMAP IMAGERY FROM BING AERIAL IMAGERY.

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PROJECT:
TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
AERIAL RAPTOR SURVEY LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	R. KELSHAW		
MONTH:	JUNE	FIGURE 2	
YEAR:	2022		

Flycatcher LAND + SCIENCE + PEOPLE
PALMER

FILE NO.: Palmer_TwinEnergy_RaptorMethods_Fig2_Aerial_11x17L.mxd

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Map Rotation: 0

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EAGLE USE AND RAPTOR MIGRATION SURVEYS

SURVEY SUMMARY

In this summary, the term "raptor" includes eagle and raptor species. A total of 67 raptors were observed during the spring 2022 surveys, 57 raptors were observed during raptor surveys (March 1 – June 15), two raptors during eagle use surveys (February 15 – March 1), and eight while travelling from the parking lot at the intersection of Swift River Road and Yonder Way located in Mexico, Maine, to the raptor survey location (Figures 1 and 2) at the top of South Twin Mountain in Rumford, Maine (the Survey Location).

Of the 57 raptors observed during raptor surveys, a majority (n=38, 67%) occurred within an 800-meter radius of the Survey Location and below the maximum survey height of 221 meters (n=36, 63%) (Table 3). The springtime observation rate for raptors observed during raptor surveys was 0.23 raptors/hour. The seasonal observation rate for raptors seen within 800 meters of the Survey Location during raptor surveys was 0.15 raptors/hour.

A total of five bald eagles (*Haliaeetus leucocephalus*) were documented during eagle surveys resulting in an observation rate of 0.02 eagles/ hour (Table 4). Four out of five (80%) of these eagle observations occurred within 800 meters of the Survey Location. Of those, three (60%) were below the maximum survey height of 221 meters (Table 4). The observation rate for eagles within 800 meters of the Survey Location was 0.01 eagles/ hour.

SURVEY METHODS

Survey Description and Location

The Survey Area encompasses a three-dimensional cylindrical plot with a radius of 2,625-feet (800 meters) from the Survey Location (Figures 1 and 2), and a distance above the ground of 725-feet (221-meters), which is 82-feet (25 meters) above maximum turbine blade height of 196 meters. The Survey Location was selected during a site visit in early February 2022 and is situated on a prominent location at the top of South Twin Mountain, near proposed Turbine 3. A recent clearing for the installation of a temporary met tower created an ideal location for viewing raptor movements within the proposed turbine array (Figures 1 and 2). The viewshed from this point has nearly unobstructed views to the northwest beyond Ellis Pond and the RoxWind project, and to the east beyond Swift River and Roxbury Mountain. The viewshed encompasses the entire proposed Project area. There is also a view south toward the mill in Rumford and Black Mountain and unobstructed overhead views. Photos of the Survey Location are included in Appendix A.

The Survey Location and Survey Area meet the standards described in the ECPG (USFWS 2013). For this survey, the Project footprint, or the minimum convex polygon around the turbines, is a 1-kilometer radius from the three proposed turbine locations (4.58 square kilometers). The 800-meter radius (2.01 square kilometers) Survey Area covers 44% of the total Project footprint (USFWS 2013). This exceeds the recommendation outlined in the ECPG (USFWS 2013) to cover a minimum of 30% of the area within 1 km of proposed turbines. Additionally, this encompasses 100% of the three proposed turbine locations (Figures 1 and 2).

Surveys consisted of point-based recordings of raptor and eagle flight activity (minutes and direction of flight) in proximity to the three-dimensional cylindrical sample plot or Survey Area. The buffer of 25 meters above the maximum blade reach

was included in the Survey Area based on guidance from USFWS and per recommendations outlined in Title 50 of the Code of Federal Regulations (50 CFR 22.80(d)(3)(ii)(A)).

Note that in the following "Survey Area" references the entire cylindrical plot, "800-meter plot" references the horizontal limit of the Survey Area, which is 800 meters from the central Survey Location, and "Survey Area height" references the area 221 meters above the ground, which is a buffer of 25 meters beyond the proposed turbine height of 196 meters.

Data Collection

Flycatcher conducted eagle use surveys from February 15 to June 15. Raptor migration surveys were conducted from March 1 to June 15. Survey days were scheduled on days with forecasted good visibility and fair weather, however, as weather changes rapidly in mountainous regions, surveys included days with variable weather conditions. Surveys were conducted from 0900 hours to 2-hours before sunset to target peak hours of raptor movement.

Stationed at the survey location, observers scanned the surrounding area using binoculars and a spotting scope. Data collected included the observer's name, the date of the survey, the survey start and end time, and hourly weather details including temperature, wind speed and direction, visibility, sky conditions, and cloud type. Observed raptors were recorded on the data sheet and the flight path was sketched on a map. The following was recorded for each observation:

1. Time of observation;
2. Total observation time seen;
3. Species;
4. Number of individuals;
5. Sex (when possible);
6. Age (when possible);
7. If the bird occurred within 800-meter plot;
8. Time above and below Survey Area height (221 meters);
9. If the bird crossed a ridge;
10. The flight height above ground level inside and outside the 800-meter plot, and flight height if it crossed a ridge;
11. Flight azimuth or direction; and
12. Description of general flight behavior and activity.

Non-raptor avian species were also documented as incidental wildlife observations during surveys.

Data Summary and Analysis

Raptor observation data were evaluated by the following metrics:

1. Seasonal observation rates (number of raptor observations per hour);
2. Number of species and individuals;
3. Hourly observation totals (and survey hour totals);
4. Percentage of birds observed within 800-meter plot;
5. The percentage of birds seen below Survey Area height (221 meters);
6. Percentage of birds observed crossing ridges inside 800-meter plot; and
7. Mean minimal and mean overall flight height of birds inside, crossing a ridge inside, and outside the 800-meter plot.

SURVEY RESULTS

Survey Effort and Weather

Eagle use surveys were conducted for a total of 34 days and 276 survey hours and raptor surveys were conducted concurrently for a total of 30 days and 250.5 hours. A total of 59 raptors were observed during the survey period from February 15 to June 15, 2022.

Wind direction was variable throughout the survey period; however, winds most often blew from the NW. Wind speeds ranged from calm, 0 miles per hour (mph), to strong, 19-24 mph. Sky conditions ranged from clear to cloudy and overcast and were most frequently partly cloudy. Seasonal temperatures ranged from a low of 4°F on February 15 to a high of 88°F on May 12. Table 1 summarizes the weather conditions throughout the survey period.

Table 1. Daily Weather Conditions, Twin Wind Energy Project, Spring 2022.

Date	Daily min temp °F	Daily max temp °F	Mean daily cloud cover %	Wind code	Daily wind direction	Range of daily sky conditions
15-Feb	4	15	41	2	N, NW	Clear, cloudy overcast, snow
16-Feb	12	25	81	2	S, SW	Partly cloudy, cloudy overcast
21-Feb	36	46	58	1	W	Partly cloudy, cloudy overcast
24-Feb	7	23	21	2	N, NW, NNW	Clear, partly cloudy
2-Mar	14	25	53	3	NW	Clear, partly cloudy, cloudy overcast
3-Mar	12	19	42	4	NW	Clear, partly cloudy
9-Mar	29	33	100	2	S, SW	Cloudy overcast
11-Mar	33	39	92	2	S, SW	Partly cloudy, cloudy overcast
16-Mar	34	47	49	1	W	Clear, partly cloudy, cloudy overcast, fog or mist
18-Mar	47	62	44	1	NW	Clear, partly cloudy, cloudy overcast
23-Mar	30	43	20	1	N	Clear, partly cloudy, cloudy overcast
29-Mar	14	21	82	5	NW	Cloudy overcast, snow
30-Mar	26	43	21	3	NW	Clear, partly cloudy, cloudy overcast
5-Apr	41	49	17	2	NW	Clear, partly cloudy
6-Apr	46	57	9	1	E, SE	Clear
12-Apr	40	54	72	3	NW	Partly cloudy, cloudy overcast, fog or mist
13-Apr	43	52	100	1	E, S, SW, W	Cloudy overcast, drizzle, showers
21-Apr	38	46	90	3	S	Partly cloudy, cloudy overcast, drizzle
22-Apr	40	45	81	4	NW	Partly cloudy, cloudy overcast, drizzle, snow
25-Apr	45	56	86	2	S, SE, SW	Partly cloudy, cloudy overcast
29-Apr	30	38	82	4	N, NW	Partly cloudy, cloudy overcast
3-May	45	60	77	1	S, SW	Partly cloudy, cloudy overcast
5-May	41	55	8	2	NW	Clear
10-May	57	73	2	2	E, SE	Clear
12-May	73	88	0	1	SE	Clear
18-May	44	55	7	3	NW	Clear, partly cloudy
19-May	44	52	96	2	S, SE	Partly cloudy, cloudy overcast, drizzle, showers
24-May	54	64	30	1	E	Clear, partly cloudy
25-May	59	69	24	1	NW, S, W	Clear, partly cloudy
1-Jun	52	60	84	1	SE, SW, W	Partly cloudy, cloudy overcast, drizzle
2-Jun	60	65	88	1	E, S, SE, SW	Partly cloudy, cloudy overcast
6-Jun	63	72	46	2	N, NW	Partly cloudy, cloudy overcast
14-Jun	64	69	86	4	N, NW	Cloudy overcast
Wind Speed codes 1 = 1-3 mph; 2 = 4-8 mph; 3 = 9-12 mph; 4 = 13-18 mph; 5 = 19-24 mph						

Raptor Migration Survey Results

Raptor surveys were conducted for a total of 30 days and 250.5 survey hours. Raptor survey results include eagles observed during this period. Incidental raptors were documented during eagle surveys and while traveling to and from the survey location, however these data are not included in the following analysis.

A total of 57 raptors were observed during raptor surveys (Table 2). The most frequently observed raptor was turkey vulture (n=44), and the least frequently seen raptor was broad-winged hawk (n=2). The springtime observation rate for raptors seen during raptor surveys was 0.23 raptors/hour. Daily observation rates ranged from 0 raptors/day to 9 raptors/day and from 0 raptors/hour to 1.06 raptors/hour (Figure 3; Appendix C).

Table 2. Raptor Survey Species List, Twin Wind Energy Project, Spring 2022.

Raptor species observed	*Scientific name*	*Total*
Bald eagle	*Haliaeetus leucocephalus*	4
Broad-winged hawk	*Buteo platypterus*	2
Red-tailed hawk	*Buteo jamaicensis*	4
Sharp-shinned hawk	*Accipiter striatus*	3
Turkey vulture	*Cathartes aura*	44
	Total raptors observed	57

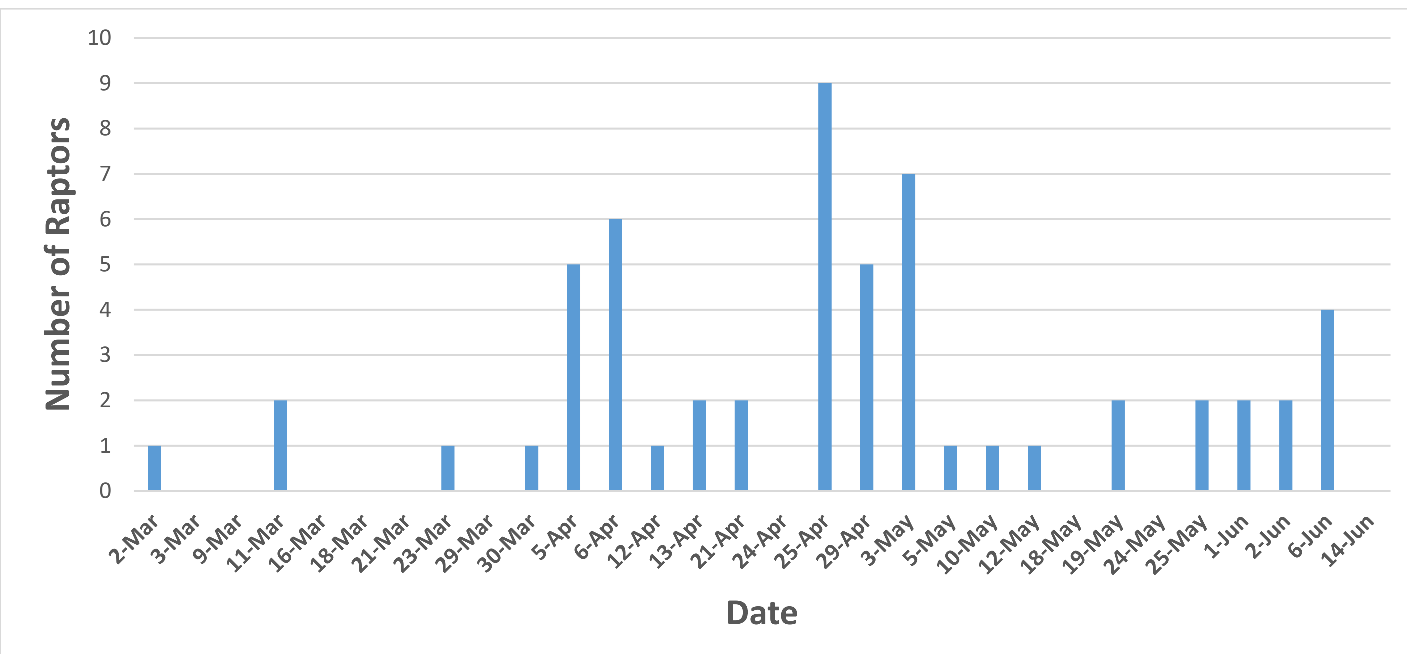

Figure 3. Daily Raptor Observations, Twin Wind Energy Project, Spring 2022.

Over the 16 weeks of springtime raptor surveys, there were a total of 5 raptor species identified (Figure 4, Table 2). The two most frequently observed species were turkey vulture (n = 44, 77%) and bald eagle (n = 4, 7%) and the least frequently observed species were broad-winged hawk (n=2, 4%) (Figure 4, Table 2).

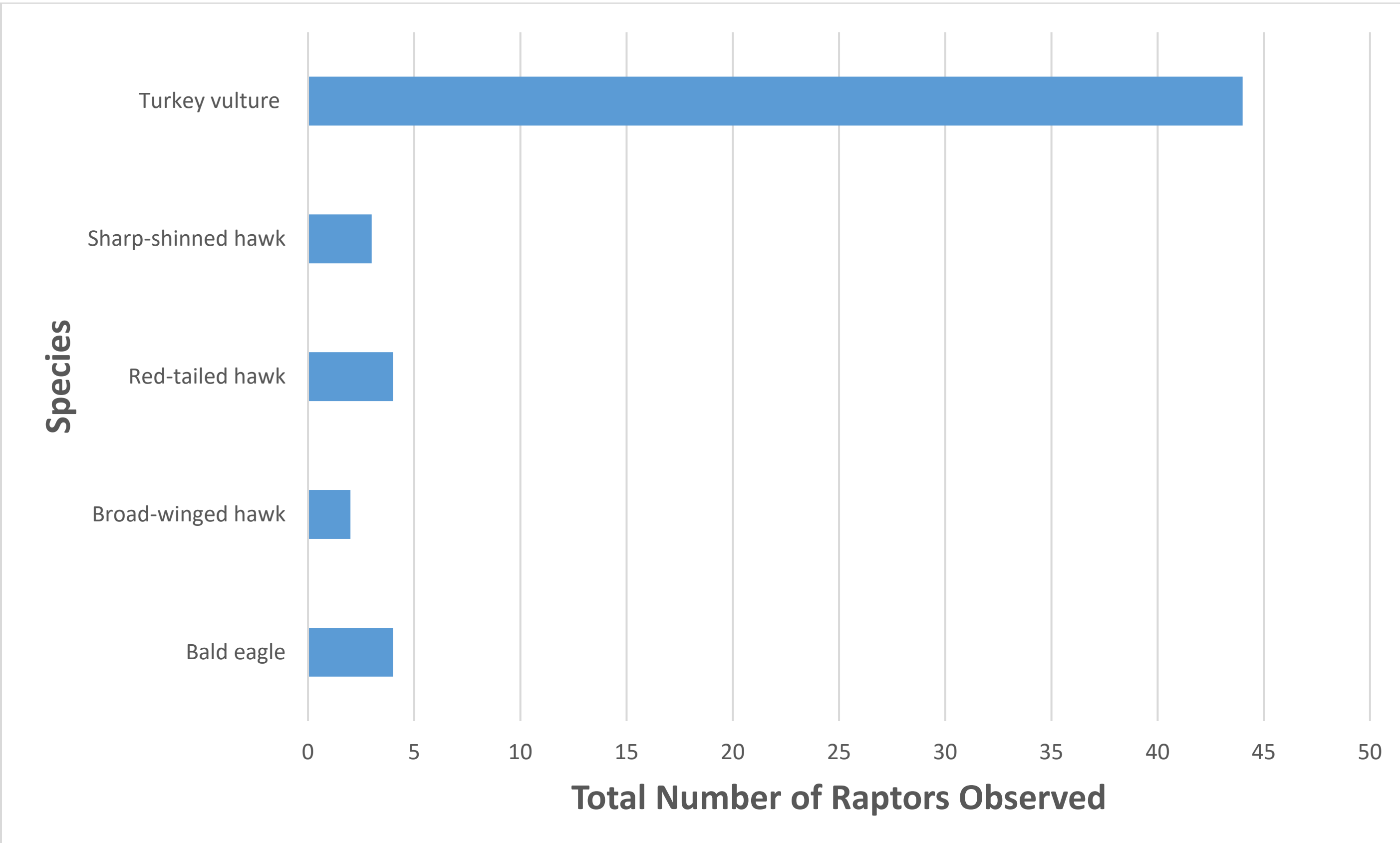

Figure 4. Number of Raptor Observations by Species, Twin Wind Energy, Spring 2022.

Peak hourly raptor observations occurred from 1100 hours to 1200 hours (14 raptors), followed closely by 1500 hours to 1600 hours (11 raptors) and from 1200 hours to 1300 hours (10 raptors) (Figure 5; Appendix C). Note, hourly survey effort varied daily as surveys started daily at 0900 hours and ended daily 2 hours before sunset. As such, there is a lower hourly survey effort for hour blocks later in the day, as shown in Figure 5.

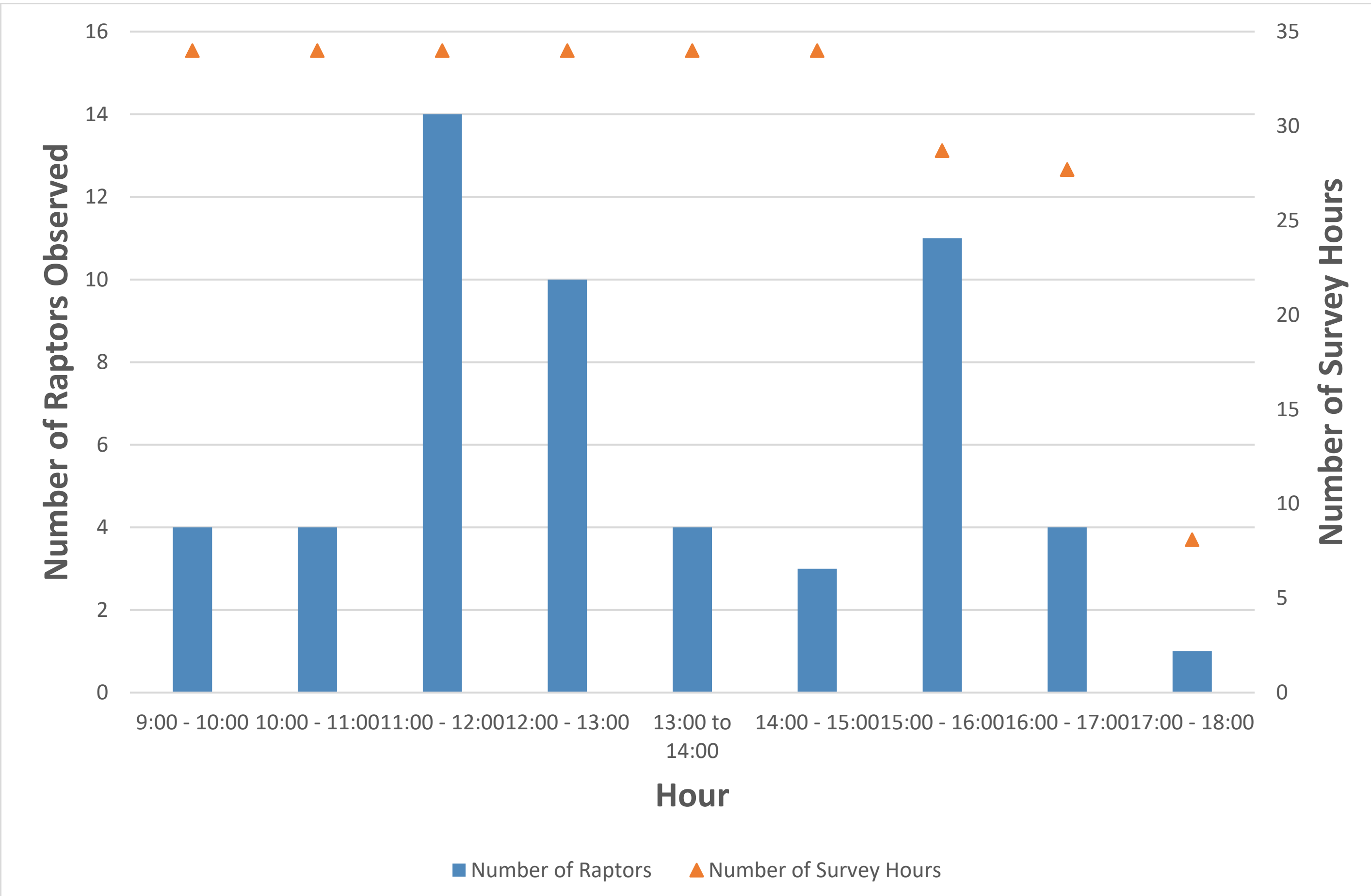

Figure 5. Number of Observations of Raptors per Survey Hour, Twin Wind Energy Project, Spring 2022.

Spring Flight Paths and Flight Heights

Of the 57 raptors observed during Spring 2022 surveys, 38 (67%) occurred within the 800-meter plot of the Survey Area and 36 (63%) occurred both within the 800-meter plot and at flight heights below the Survey Area height (221 meters) for at least a portion of their flight (Table 3; Figure 6; Appendix C). The seasonal observation rate for raptors within the 800-meter plot was 0.15 raptors/hour. The mean minimum flight height of those observed within the 800-meter plot was 71 meters (233 feet) (Table 3). Of the 57 raptors observed, 30 (52%) crossed a ridge within the 800-meter plot (Table 3). The average minimum flight height of those raptors that crossed a ridge inside the Survey Area is 59 meters (194 feet).

Table 3. Summary of Raptor Locations and Mean Flight Heights, Twin Wind Energy Project, Spring 2022.

Species	*Number inside 800m plot*[1]	*Number outside 800m plot*[2]	*Number crossed a ridge*[3]	*Number inside Survey Area*[4]	*Total*
Bald eagle	3	1	1	2	4
Broad-winged hawk	2	0	1	2	2
Red-tailed hawk	0	4	0	0	4
Sharp-shinned hawk	2	1	2	2	3
Turkey vulture	31	13	26	30	44
Total	38	19	30	36	57
Percent of total observations	67%	33%	53%	63%	100%
Mean minimum flight height (meters)	71	144	59	57	na
Mean flight height (meters)	111	211	88	99	na

1. Observations inside the 800-meter plot may also have been seen outside the 800-meter plot.
2. Observations outside 800-meter plot only.
3. Ridges inside 800-meter plot only.
4. Survey Area as defined (within 800-meter plot and below the Survey Area height).

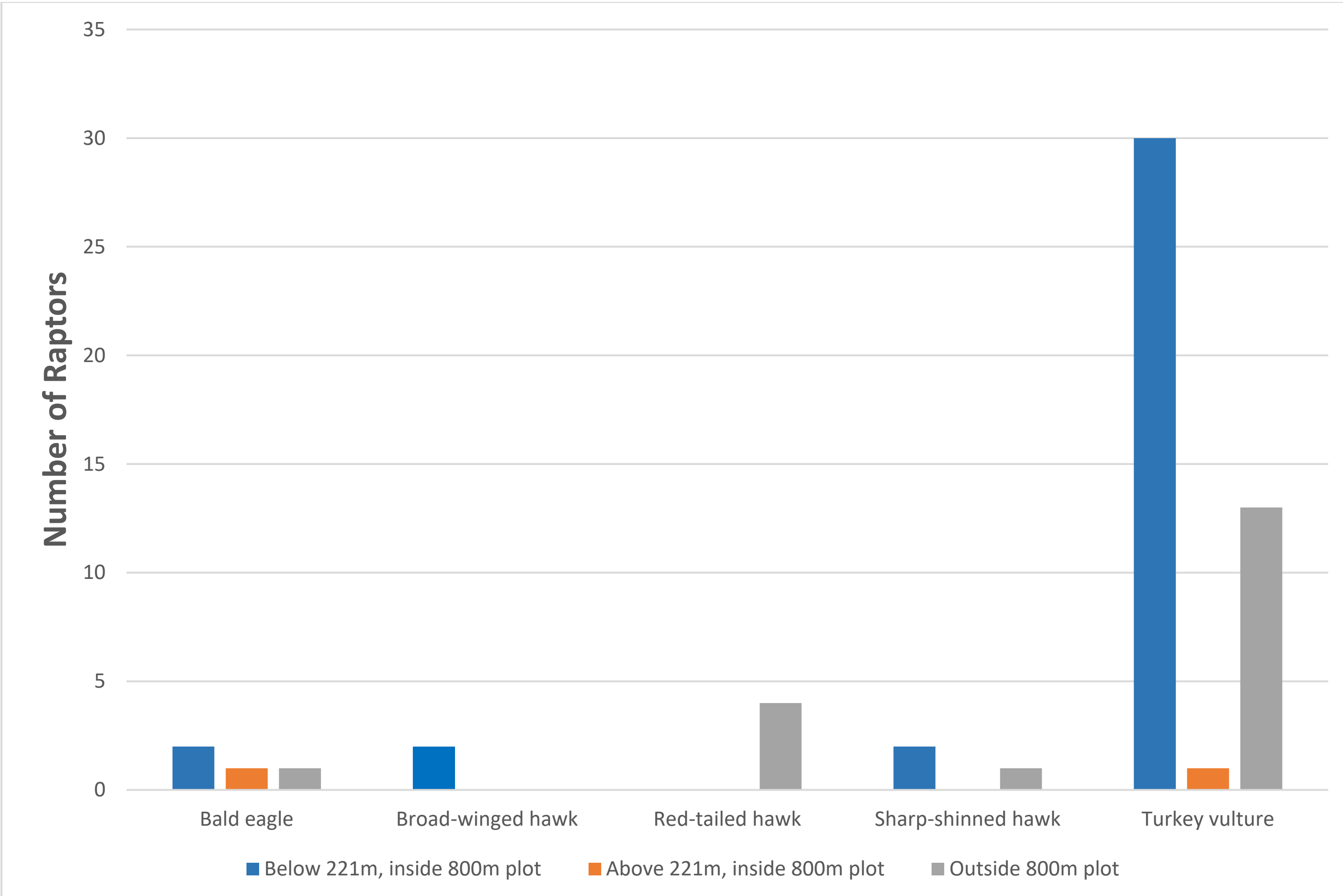

Figure 6. Number of Raptor Observations within 800-meter Radius Plot at Heights Above and Below 221 meters, Twin Wind Energy Project, Spring 2022.

Eagle Use Survey Results

Eagle use surveys were conducted from February 15 to June 15 for a total of 34 days and 276 survey hours. During 276 survey hours, there were five bald eagle observations, resulting in an observation rate of 0.02 eagles/hour. Of the five observations, four occurred within the 800-meter plot (80%). The observation rate for eagles within the 800-meter plot was 0.01 eagles/hour. Of the four eagles observed within the 800-meter plot, three occurred below the Survey Area height of 221 meters (75%) (Table 4). Out of the five eagles observed during surveys, four were adults and one was a juvenile. Table 5 provides details regarding each observed eagle throughout the survey period.

Table 4. Summary of Eagle Locations and Mean Flight Heights, Twin Wind Energy Project, Spring 2022.

Observation	*Inside 800m plot[1]*	*Outside 800m plot[2]*	*Crossed a ridge[3]*	*Number inside survey area[4]*
Bald eagle	4	1	1	3
Percent of total observations	80%	20%	20%	60%
Mean minimum flight height (meters)	133	169	55	62
Mean flight height (meters)	137	297	78	89

1. Observations inside the 800-meter plot may also have been seen outside the 800-meter plot.
2. Observations outside 800-meter plot only.
3. Ridges inside 800-meter plot only.
4. Survey Area as defined (within 800-meter plot and below the Survey Area height).

Table 5. Eagle Use Observations, Twin Wind Energy Project, Spring 2022.

Date	Time First Seen	Time Last Seen	Species	No. Indiv[1]	Age (A, J, unk)	INSIDE 800m plot: (Y/N)	Inside Height Min (m)	Inside Height Max (m)	Outside Height Min (m)	Outside Height Max (m)	Cross A Ridge: (Y/N)	Crossed Ridge Min Height (m)	Crossed Ridge Max Height (m)	Behavior Code* Inside 800m	Behavior Code* Outside 800m	Flight Azimuth (general)	Time Above Survey Area Height w/in 800m (sec)	Time Below Survey Area Height w/in 800m (sec)	Behavior Notes
2/21/2022	12:38:00	12:40:00	BAEA	1	A	Y	20	25	25	100	N	n/a	n/a	SO	SO	350	n/a	20	Bald eagle soared to the north along western side of the Twins
3/2/2022	11:20:01	11:20:33	BAEA	1	A	Y	345	350	345	800	N	n/a	n/a	FG	FG	73	22	10	Bald eagle cruised through survey area quickly (bent wrists).
3/11/2022	14:57:00	14:58:30	BAEA	1	A	Y	110	130	n/a	n/a	N	n/a	n/a	SO, FO	n/a	210	n/a	90	Had food in beak
3/23/2022	11:23:05	11:24:15	BAEA	1	A	Y	55	195	75	300	Y	55	100	FG, SO	FG	100	n/a	50	Flew east between the Twins, circled before continuing east
4/6/2022	11:37:20	11:38:40	BAEA	1	J	N	n/a	n/a	230	500	Y	230	240	n/a	SO, FG	315	n/a	n/a	Crossed ridge and circled in valley west of N Twin

*Flight Behavior Codes: SO: soaring, PE: perched, FG: flap or glide, KH: kiting or hovering, MB: being mobbed, UT: undulating, territorial flight< SB: stooping or diving in response to another bird, SP: stooping or diving on prey, FO: foraging.

2022 Incidental Non-Raptor Species

In spring of 2022, 38 non-raptor avian species were recorded during surveys and while travelling to or from the parking area to the survey location (Table 6). Of the avian species observed, none were federally or state-listed threatened or endangered species (MDIFW 2015). There were five species listed as Species of Special Concern by the State of Maine including black-and-white warbler (*Mniotilta varia)*, chestnut-sided warbler (*Setophaga pensylvanica)*, eastern towhee (*Pipilo erythrophthalmus)*, and white-throated sparrow (*Zonotrichia albicolli)* (MDIFW 2011).

Table 6. Incidental Observations of Non-Raptor Avian Species, Twin Wind Energy Project, Spring 2022.

Common Name	Scientific Name	Common Name	Scientific Name
Alder flycatcher	*Empidonax alnorum*	Magnolia warbler	*Setophaga magnolia*
American crow	*Corvus brachyrhynchos*	Mourning dove	*Zenaida macroura*
American goldfinch	*Spinus tristis*	Northern flicker	*Colaptes auratus*
American robin	*Turdus migratorius*	Ovenbird	*Seiurus aurocapilla*
Black-and-white warbler	*Mniotilta varia*	Pileated woodpecker	*Dryocopus pileatus*
Black-capped chickadee	*Poecile atricapillus*	Red crossbill	*Loxia curvirostra*
Black-throated blue warbler	*Setophaga caerulescens*	Red-breasted nuthatch	*Sitta canadensis*
Blackburnian warbler	*Setophaga fusca*	Red-throated hummingbird	*Archilochus colubris*
Blue-headed vireo	*Vireo solitarius*	Red-eyed vireo	*Vireo olivaceus*
Blue jay	*Cyanocitta cristata*	Rose-breasted grosbeak	*Pheucticus ludovicianus*
Brown creeper	*Certhia americana*	Ruby-crowned kinglet	*Corthylio calendula*
Cedar waxwing	*Bombycilla cedrorum*	Ruffed grouse	*Bonasa umbellus*
Chestnut-sided warbler	*Setophaga pensylvanica*	White-breasted nuthatch	*Sitta carolinensis*
Chipping sparrow	*Spizella passerina*	white-throated sparrow	*Zonotrichia albicollis*
Common raven	*Corvus corax*	Yellow-rumped warbler	*Setophaga coronata*
Common yellowthroat	*Geothlypis trichas*		
Dark-eyed junco	*Junco hyemalis*		
Downy woodpecker	*Picoides pubescens*		
Double-crested cormorant	*Nannopterum auritum*		
Eastern towhee	*Pipilo erythrophthalmus*		
Golden-crowned kinglet	*Regulus satrapa*		
Hairy woodpecker	*Picoides villosus*		
Hermit thrush	*Catharus guttatus*		

DISCUSSION

Considering the potential risk of the proposed Project to raptors and eagles is an important step in the permitting and development process. Migration corridors provide important travel and forage areas for raptors and eagles during a time when these species are moving over long distances and are vulnerable. Data collected from this survey is intended to inform possible means to avoid or minimize adverse impacts to migrating eagle and raptor species.

During the spring 2022 survey season, the majority of raptors observed were within the 800-meter plot (67%) and below the Survey Area height of 221 meters (63%). The mean minimum flight height within the 800-meter plot was 71 meters, 50 meters below the Survey Area height.

Of the bald eagles observed, the majority were within the 800-meter plot (80%) and below the Survey Area height (75%). The mean of the minimum flight heights within 800-meter plot was 133 meters, 12 meters above the Survey Area height.

Of all raptors observed, only the bald eagle is listed by the State of Maine as Species of Special Concern (MDIFW 2011). No other listed raptor species were observed during surveys.

The data presented in this document was collected in a way to support USFWS in using their collision risk model to determine the potential risk the proposed Project has to negatively impacting eagles, and aid in decision making regarding the need for take permits.

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Appendix A Photographs of the Survey Location

View north from Location 1, June 14, 2022.

View northeast from Location 1, June 14, 2022.

View east from Location 1, June 14, 2022.

View southeast from Location 1, June 14, 2022.

View south from Location 1, June 14, 2022.

View southwest from Location 1, June 14, 2022.

View west from Location 1, June 14, 2022.

View northwest from Location 1, June 14, 2022.

Appendix B Twin Energy Spring 2022 Raptor and Eagle Survey Plan

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SURVEY PLAN

Date:	February 9, 2022(Revised February 12, 2022)
To:	Bob Stratton (Maine Department of Inland Fisheries and Wildlife)
From:	Katelin Nickerson – Flycatcher LLC
CC:	Lindsay Deane-Mayer & Sumul Shah (Twin Energy LLC) Rodney Kelshaw, Rich Jordan (Flycatcher)
Subject:	Proposed Twin Energy Wind Electric Power Generation Facility – Spring 2022 Raptor and Eagle Survey Plan (Rev 1)

Dear Bob,

On behalf of Twin Energy LLC, Flycatcher is submitting this Revised Spring 2022 eagle and raptor migration survey plan for your approval. This survey plan was developed based on our recent conversations with you, protocols detailed in the Maine Department of Inland Fisheries and Wildlife (MDIFW) 2018 Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality (2018 Recommendations), and U.S. Fish and Wildlife Service Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2, 2013 (ECPG 2013). The revisions are based on feedback from the USFWS (via email, February 11, 2022). Effectively the methods described herein are the same methods as described in the Survey Plan submitted on February 9, with minor changes to collect data to support input into USFWS's collision risk model.

GENERAL PROJECT DESCRIPTION

The proposed Twin Energy Project (Project) is a small wind electric generation facility located on South Twin Mountain in Rumford and Roxbury, Maine. The current plan is to erect three turbines with a six-megawatt capacity each, that have a hub height of approximately 384-feet (117-meters), blade tip height of approximately 645-feet (196-meters), and total blade swing diameter of approximately 490-feet (149-meters). The proposed access road and collector line will extend from the existing RoxWind project southerly to South Twin Mountain in Rumford. The proposed turbine locations are in close proximity to each other, clustered on the northern edge of South Twin Mountain.

Turbine 3 is proposed to be located near the summit of South Twin Mountain, at an elevation of 2,155-feet. Turbines 1 and 2 are located to the north and east of turbine 3 at lower elevations; around 2,050-feet and 1,950-feet respectively (figures 1 and 2, attached).

METHODS AND SURVEY LOCATION DESCRIPTION

In accordance with the 2018 Recommendations, Flycatcher plans to begin surveys the week of February 15, 2022. We understand that one golden eagle was (*Aquila chrysaetos*) observed in the fall of 2016, at the Record Hill project site (approximately 2.5-miles north), during the four-year post construction monitoring effort. The spring raptor and eagle survey will occur from February 15 through June 15, 2022. We will conduct two surveys per week during weather that is conducive to observe migratory activity. Surveys will start at 9 a.m. and last until 2 hours before sunset (or later if birds are moving through the area during the completion of the "normal survey window").

The number of standard survey locations (point counts) was determined using the standards described in the ECPG 2013. For this survey, the Project footprint, or the minimum convex polygon around the turbines, is a 1-kilometer radius from the three proposed turbine locations (4.58 square kilometers). Using one 800-meter

radius (2.01 square kilometers) point count survey plot size, 44 percent of the total Project footprint is covered. This also encompasses 100 percent of the three proposed turbine locations (figures 1 and 2, attached).

Surveys will consist of point-based recordings of raptor, bald eagle (*Haliaeetus leucocephalus*) and golden eagle flight activity (minutes of flight) within a three-dimensional cylindrical plot (the sample plot). The radius of the sample plot is 2,625 feet (800-meters), and the height above ground level of 82-feet (25-meters) above the maximum blade reach, which is 725-feet (221-meters).

Data will be collected on the attached "*Raptor Pre-construction Datasheet*" and will include the observed raptor/eagle behavior inside and outside the proposed turbine area. Observers will sketch the raptor/eagle path either on aerial photographs or using a web-based GIS mapping service.

The survey effort will be completed substantially in accordance with the 2018 Recommendations and ECPG 2013. Surveys will be conducted during suitable weather conditions; surveys will not be conducted when visibility is less than 800-meters horizontally and 200-meters vertically. However, there may be factors including weather and road conditions that limit access to this remote site. This will be assessed weekly, and efforts will be made to complete the surveys if practicable and safe.

RAPTOR SURVEY POINT LOCATION

The survey point is located on the summit of South Twin Mountain, in the same location as proposed turbine 3. This location was selected because it provides a vantage point that has clear views across the Project area. The viewshed from the point has excellent views to the northwest beyond Ellis Pond and the RoxWind project, and to the east beyond Swift River and Roxbury Mountain. This viewshed encompasses the entire proposed Project area. Good views are also available to the south to the mill in Rumford and Black Mountain; with unobstructed view overhead. The attached photographs taken on February 7, 2022 show current views from the proposed survey location. If additional photographs are required, Flycatcher will save them to our file share folder for external access.

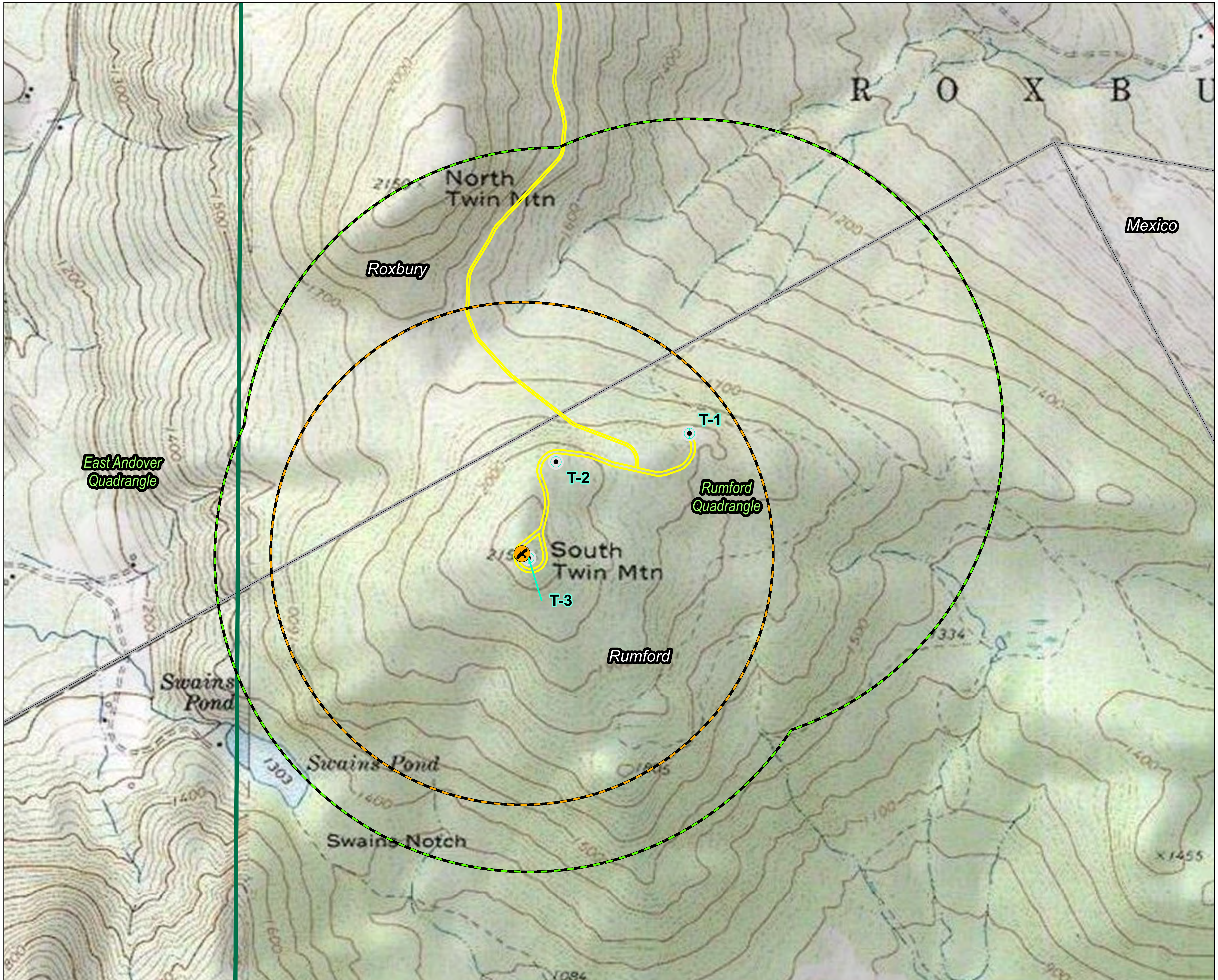
We are seeking your feedback and approval of this Survey Plan.

Respectfully,

Katelin M. Nickerson

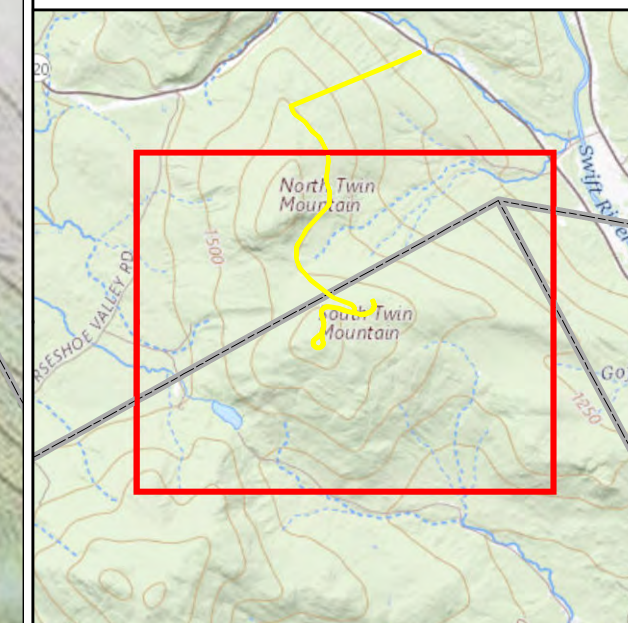
Katelin Nickerson
Project Director
Flycatcher, LLC
207.233.6175

Att (4): Figure 1.(revised)
Figure 2. (revised)
Raptor Pre-construction Datasheet (revised)
Photographs



LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- RAPTOR SURVEY LOCATION POINT
- USFWS EAGLE SURVEY AREA
- 800M DIAMETER SAMPLE AREA
- USGS 7.5-MINUTE QUADRANGLE BOUNDARY
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM USGS 7.5' QUADRANGLE SERIES.

0 1,000 2,000
Feet
1 " = 1,000 '
1:12,000

PROJECT:
TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
USGS RAPTOR SURVEY LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	R. KELSHAW		**FIGURE 1**
MONTH:	FEBRUARY		
YEAR:	2022		

Flycatcher LAND + SCIENCE + PEOPLE
PALMER

FILE NO.: Palmer_TwinEnergy_RaptorMethods_Fig1_USGS_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

Plot Date: 2/11/2022, 16:15:57 PM by JAKEN -- LAYOUT: ANSI B(11"x17")
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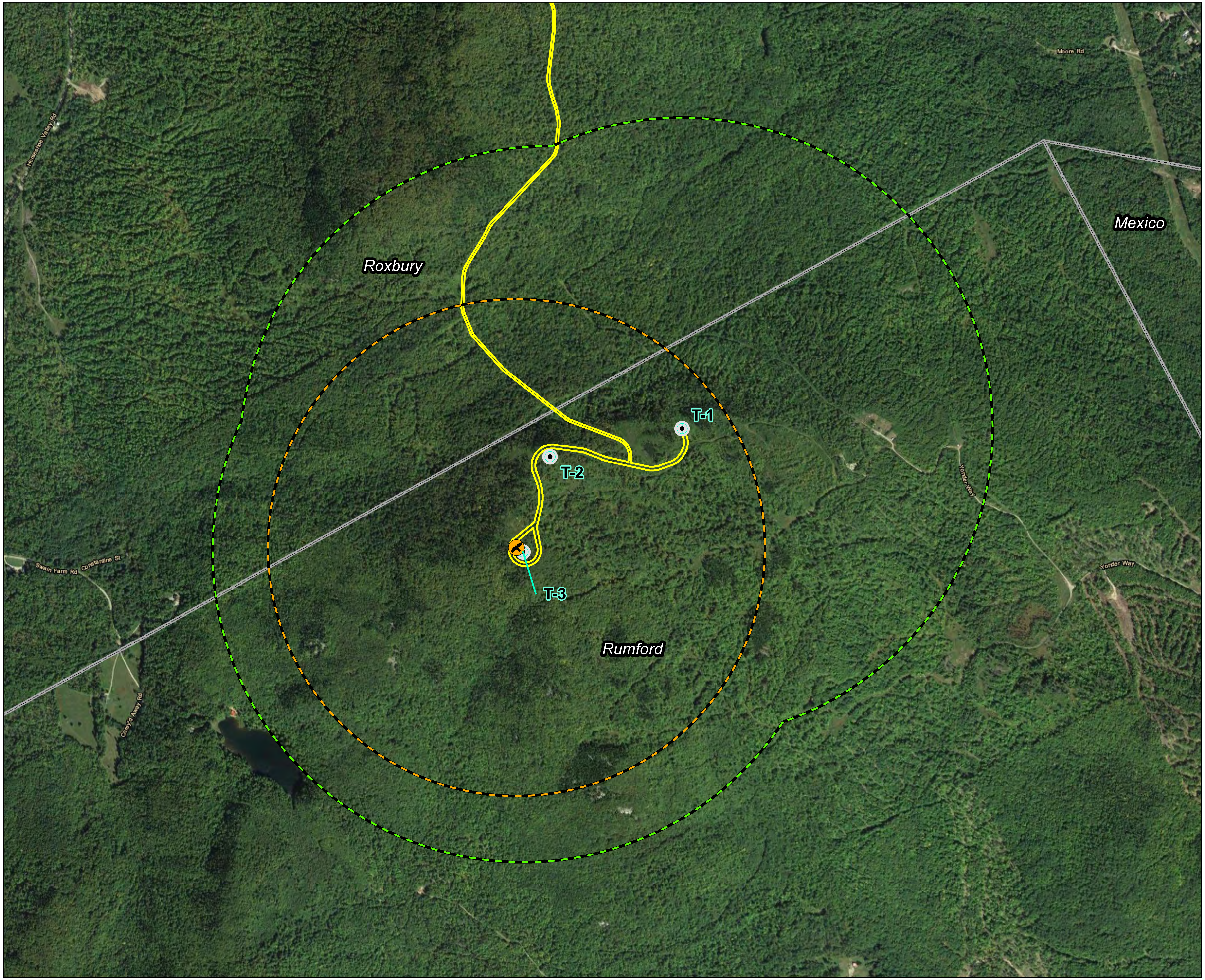
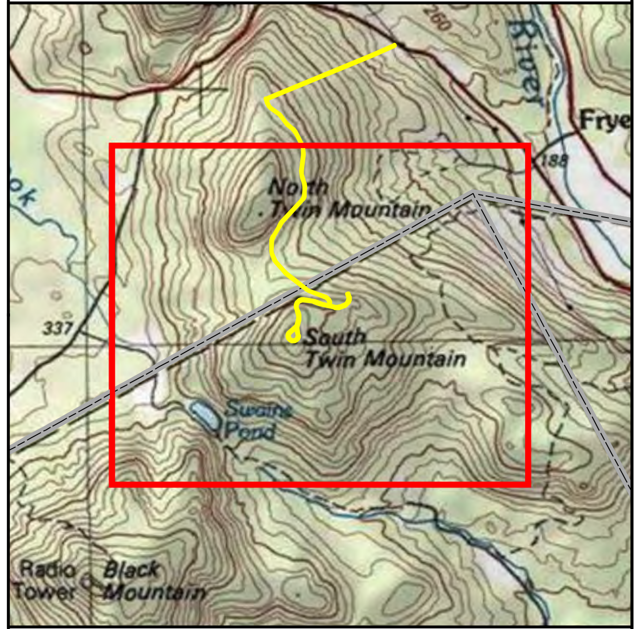


LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- RAPTOR SURVEY LOCATION POINT
- USFWS EAGLE SURVEY AREA
- 800M DIAMETER SAMPLE AREA
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM ESRI/NAIP "WORLD IMAEGRY" SERVICE LAYER.

0 1,000 2,000
Feet
1 " = 1,000 '
1:12,000

PROJECT:
TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
AERIAL RAPTOR SURVEY LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	R. KELSHAW		
MONTH:	FEBRUARY	**FIGURE 2**	
YEAR:	2022		

Flycatcher LAND + SCIENCE + PEOPLE
PALMER

FILE NO.: Palmer_TwinEnergy_RaptorMethods_Fig2_Aerial_11x17L.mxd

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Raptor Survey Pre-construction Datasheet

Date:

Project Name/Location: Twin Energy Project in Rumford and Roxbury

Proposed Turbine Height: 645ft (blade tip) | **Pg** 1

Observer:

Survey Point Number: 1

Survey Start Time:

Survey End time:

Survey notes (migration flights, weather fronts, etc.):

Describe distractions to observer, or disturbances to birds that may have impacted survey:

Weather Conditions

Hour of Survey	Temp (F)	Sky Code	% Cloud Cover	Cloud Code	Wind Direction	Wind Speed Code	Visibility Code
Hour l							
Hour 2							
Hour 3							
Hour 4							
Hour 5							
Hour 6							
Hour 7							
Hour 8							
Hour 9							
Hour l0							

Obs. No.	Time first seen	Time last seen	Species	No. Indiv[1]	Sex (M,F, unkn)	Age (A, J, unkn)	INSIDE 1/4 mile (402m) of turbine: (Y/N)	Inside Height Min & Max (m)2	Outside Height Min & Max (m)2	Cross A Ridge: (Y/N)	Crossed Ridge Min & Max Heights (m)2	Behavior Code Inside	Behavior Code Outside	Flight Azimuth (general)	Time Above Turbine Height w/in Array	Time Below Turbine Height w/in Array	Behavior Notes

1. For groups of birds, create a separate entry for a different species and birds at different flight heights or locations.
2. Record bird's flight height above ground level to the nearest 5-m (16-ft) interval.

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Raptor Survey Pre-construction Datasheet

Project Name/Location: Twin Energy in Rumford and Roxbury | Survey Point Number: 1 | Date: | Pg

Obs. No.	Time first seen	Time last seen	Species	No. Indiv[1]	Sex (M,F, unkn)	Age (A, J, unkn)	INSIDE 1/4 mile (402m) of turbine: (Y/N)	Inside Height Min & Max (m)[2]	Outside Height Min & Max (m)[2]	Cross A Ridge: (Y/N)	Crossed Ridge Min & Max Heights (m)[2]	Behavior Code Inside	Behavior Code Outside	Flight Azimuth (general)	Time Above Turbine Height w/in Array	Time Below Turbine Height w/in Array	Behavior Notes

1. For groups of birds, create a separate entry for a different species and birds at different flight heights or locations.
2. Record bird's flight height above ground level to the nearest 5-m (16-ft) interval.

Incidental Wildlife Datasheet

Observer:	Project Name/Location: Twin Energy in Rumford and Roxbury						Pg____of____
Date:	Notes:	Temp (F)	Code	Wind Direction	Sky Code	Cover %	Cloud Code / Visibility Code

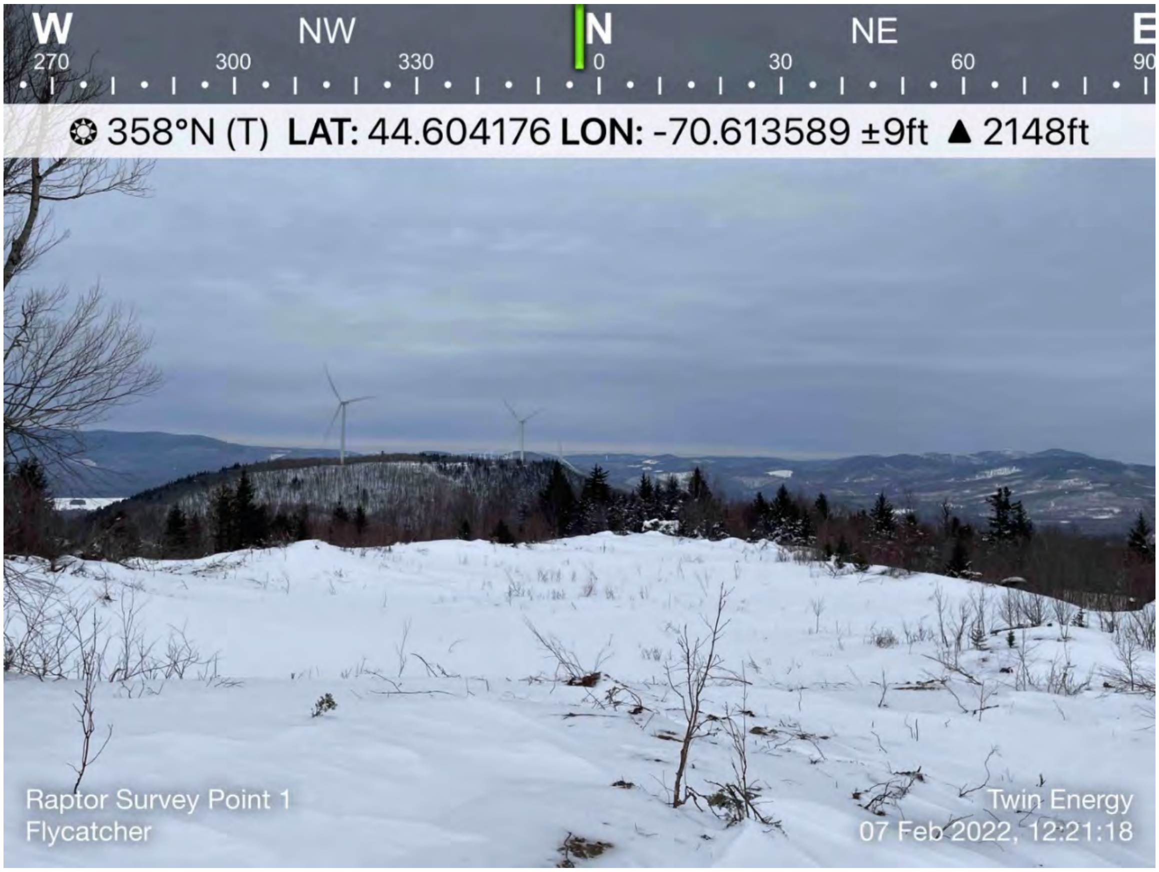
Location (Point number, GPS point, etc.)	Observed in Survey (S) or Traveling (T)	Time first observed	Mode of Detection (V: Visual, A: Auditory)	# of Individual	Species Code[1]	Sex (M, F, unk)	Age (A, J, unk)	Distance from observer first observed (m)[2]	Closest distance from observer (m)[2]	Flight height first observed (m)[2]	Min & Max heights (m)[2]	Flight direction	Activity (FL: flying, PE: perched)	Other notes (behaviors)

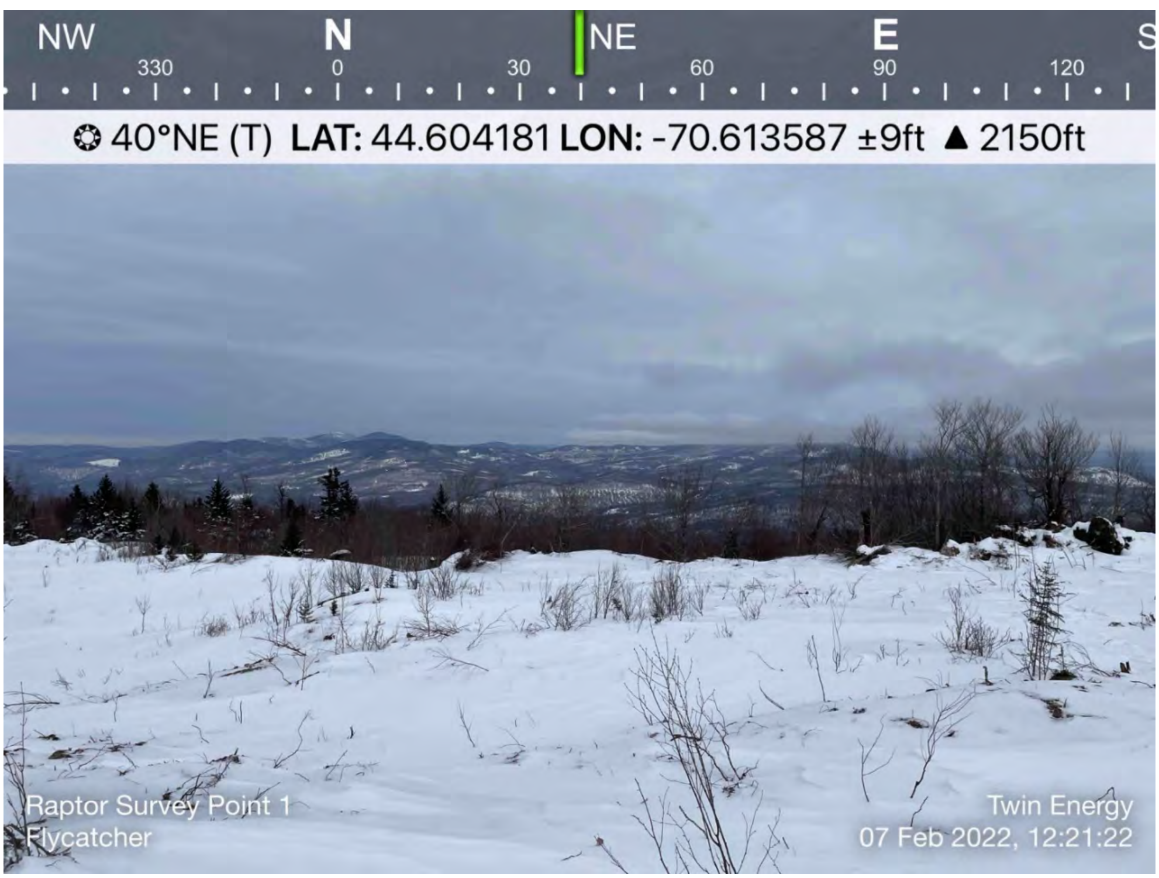
1. Document any non-raptor birds and other unusual or listed wildlife seen during surveys, and any unusual or listed wildlife species seen while traveling between survey locations.
2. Record flight heights (above ground level) and distances to the nearest 5-m (16-ft) Interval.

Panoramic from Raptor Survey Point Location across the northwest to northeast (left to right).

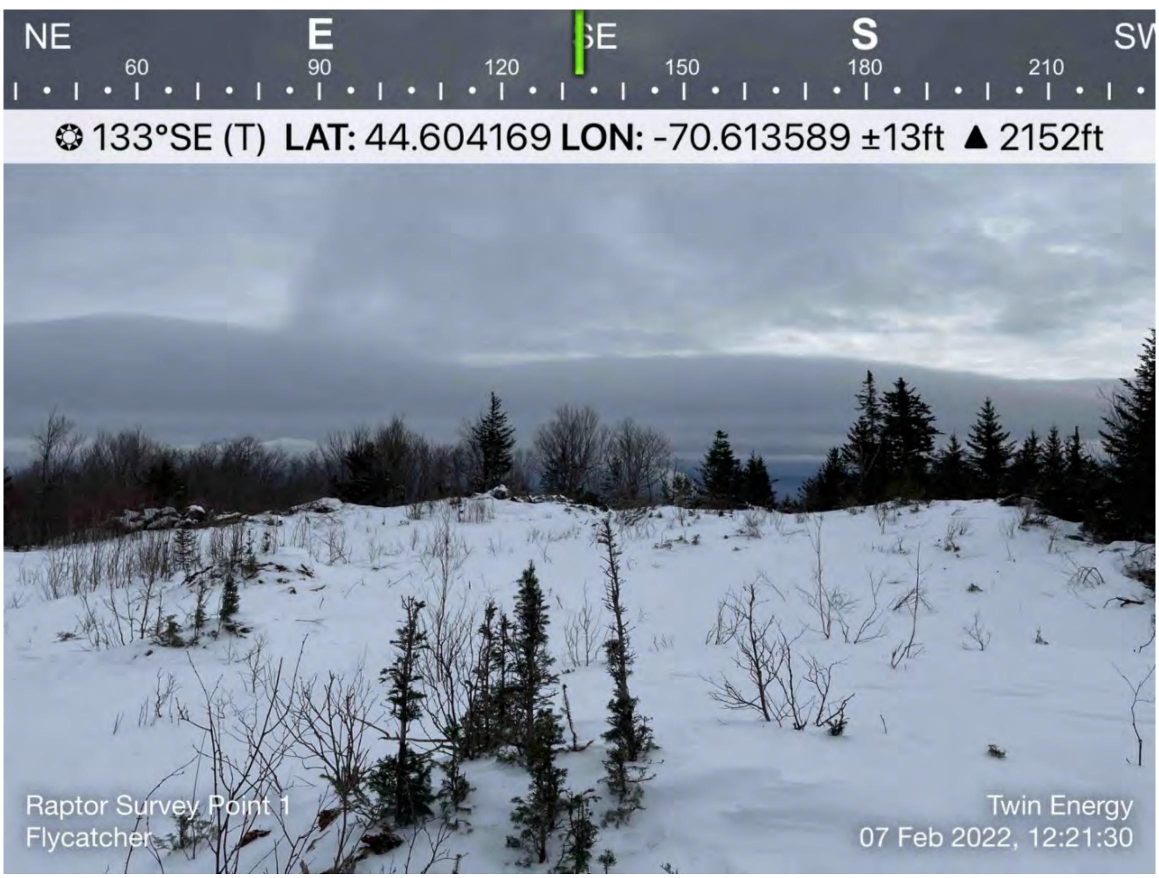
Panoramic from Raptor Survey Point Location across the northwest to northeast (left to right).

Red Stars denote approximate locations of Turbines 1 and 2.


W
NW
N
NE
E
270
300
330
0
30
60
90
358°N (T) LAT: 44.604176 LON: -70.613589 ±9ft ▲ 2148ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:18


NW
N
NE
E
S
330
0
30
60
90
120
40°NE (T) LAT: 44.604181 LON: -70.613587 ±9ft ▲ 2150ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:22


N
NE
E
SE
0
30
60
90
120
150
85°E (T) LAT: 44.604180 LON: -70.613587 ±9ft ▲ 2153ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:26


NE
E
S
60
90
120
150
180
210
133°SE (T) LAT: 44.604169 LON: -70.613589 ±13ft ▲ 2152ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:30


SE
S
SW
W
120
150
180
210
240
270
190°S (T) LAT: 44.604152 LON: -70.613594 ±13ft ▲ 2149ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:35


S
SW
W
NW
180
210
240
270
300
330
262°W (T) LAT: 44.604153 LON: -70.613581 ±13ft ▲ 2151ft
Raptor Survey Point 1
Flycatcher
Twin Energy
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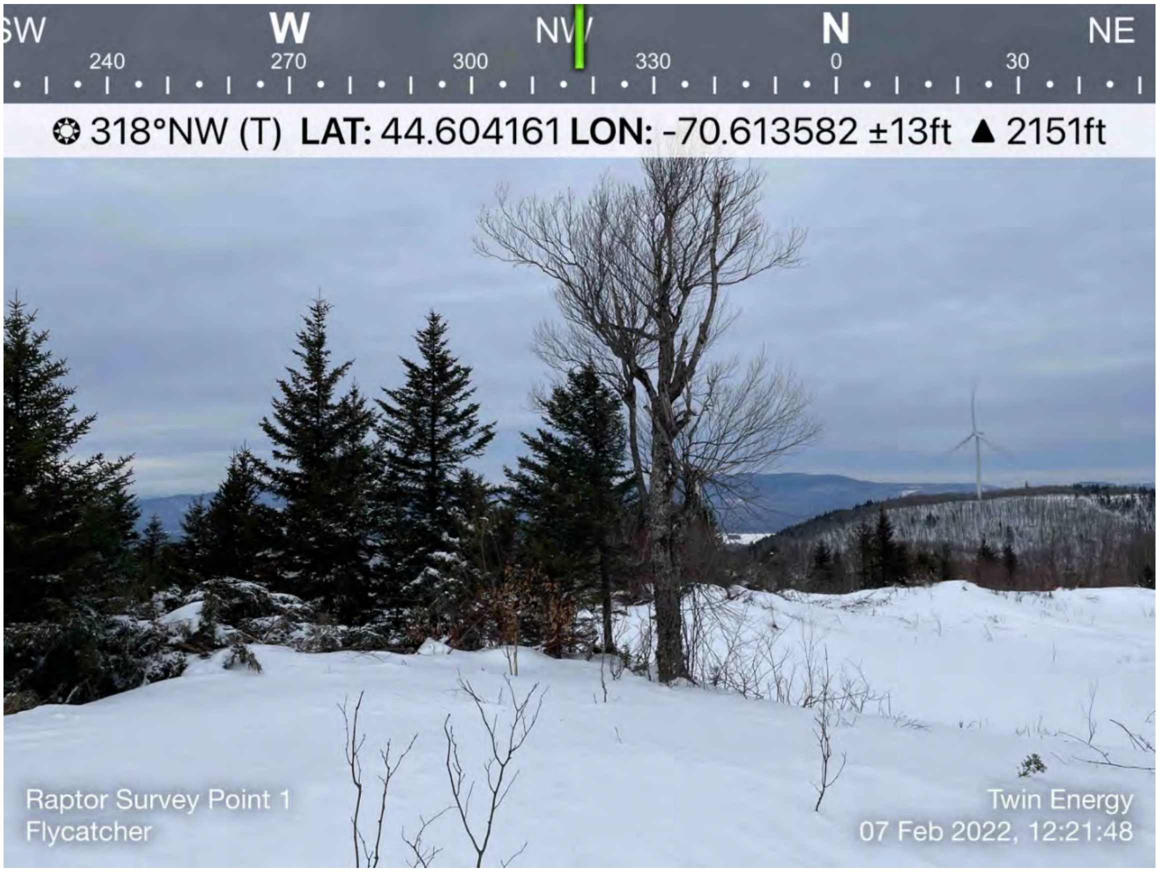
SW
W
NW
N
NE
240 270 300 330 0 30
318°NW (T) LAT: 44.604161 LON: -70.613582 ±13ft ▲ 2151ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:48


NE
E
SE
S
SW
60 90 120 150 180 210
137°SE (T) LAT: 44.603776 LON: -70.613203 ±13ft ▲ 2142ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:29:59

Appendix C Raptor Observation Data

Date	Time First Seen	Time Last Seen	Species	No. Indiv	Sex (M,F, unkn)	Age (A, J, unkn)	INSIDE 800 m radius plot: (Y/N)	Inside Height Min (m)	Inside Height Max (m)	Outside Height Min (m)	Outside Height Max (m)	Cross A Ridge: (Y/N)	Crossed Ridge Min Height (m)	Crossed Ridge Max Height (m)	Behavior Code* Inside	Behavior Code* Outside	Flight Azimuth (general)	Time Above Turbine Height w/in Array (sec)	Time Below Turbine Height w/in Array (sec)	Behavior Notes
2/15/2022																				
2/16/2022																				
2/21/2022	11:21:10	11:21:30	TUVU	1	unkn	A	Y	20	30	n/a	n/a	N	n/a	n/a	SO	n/a	200	n/a	20	
2/21/2022	12:38:00	12:40:00	BAEA	1	unkn	A	Y	20	25	25	100	N	n/a	n/a	SO	SO	350	n/a	20	
2/24/2022																				
3/2/2022	11:20:01	11:20:33	BAEA	1	unkn	A	Y	345	350	345	800	N	n/a	n/a	FG	FG	73	22	0	Bald eagle bombed/glided through survey area quickly.
3/3/2022																				
3/9/2022																				
3/11/2022	12:53:20	12:55:13	RTHA	1	unkn	A	N	n/a	n/a	320	440	Y	320	325	n/a	SO, FG	190	n/a	n/a	AMCR flying along with RTHA
3/11/2022	14:57:00	14:58:30	BAEA	1	unkn	A	Y	110	130	n/a	n/a	N	n/a	n/a	SO, FO	n/a	210		90	Had food in beak
3/16/2022																				
3/18/2022																				
3/21/2022																				
3/23/2022	11:23:05	11:24:15	BAEA	1	unkn	A	Y	55	195	75	300	Y	55	100	FG,SO	FG	100	n/a	50	
3/29/2022																				
3/30/2022	15:18:20	15:18:35	TUVU	1	unkn	A	Y	35	221	221	300	N	n/a	n/a	FG	SO	163	n/a	15	Flew in from N, soaring and gliding west of ridge
4/5/2022	9:34:45	9:35:00	TUVU	1	unkn	A	Y	25	90	n/a	n/a	Y	25	90	SO	SO	150	n/a	15	Flew around South Twin heading towards the South
4/5/2022	12:10:40	12:13:45	TUVU	1	unkn	A	Y	10	100	n/a	n/a	Y	10	100	SO, KH	SO	210	n/a	185	Flew between Twins from the east, circled on to the west
4/5/2022	12:10:50	12:11:15	TUVU	1	unkn	A	Y	110	150	150	320	N	n/a	n/a	SO	SO	204	n/a	12	Came from valley west of N Twin along ridge soaring
4/5/2022	15:19:30	15:19:55	TUVU	1	unkn	A	Y	25	130	n/a	n/a	Y	25	35	SO	SO	100	n/a	25	Soaring between N and S Twin
4/5/2022	16:27:10 PM	16:28:00 PM	TUVU	1	unkn	A	Y	25	60	n/a	n/a	Y	25	50	SO, KH	n/a	220	n/a	50	Flew between N and S Twin and circled before going SW
4/6/2022	11:37:20	11:38:40	BAEA	1	unkn	J	N	n/a	n/a	230	500	Y	230	240	n/a	SO,FG	315	n/a	n/a	Crossed ridge and circled in valley west of N Twin
4/6/2022	11:39:00	11:41:10	TUVU	2	unkn	A	N	n/a	n/a	195	310	N	n/a	n/a	n/a	SO	350	n/a	n/a	Circled west of Twins and flew north
4/6/2022	11:39:00	11:42:30	TUVU	1	unkn	A	Y	130	180	180	300	N	n/a	n/a	SO	SO	235	n/a	18	Separated from observation 2 and circled before going south
4/6/2022	16:27:40	16:28:15	RTHA	1	unkn	A	N	n/a	n/a	225	240	Y	225	230	n/a	SO,FG	295	n/a	n/a	Flew over N Twin into northwest valley
4/6/2022	16:31:00	16:34:00	TUVU	1	unkn	A	N	n/a	n/a	160	250	N	n/a	n/a	n/a	SO	300	n/a	n/a	Soaring in valley to the northwest
4/12/2022	12:29:10	12:29:20	TUVU	1	unkn	A	N	n/a	n/a	200	260	N	n/a	n/a	n/a	SO	305	n/a	n/a	Circling in the valley to the northwest
4/13/2022	11:06:50	11:09:00	SSHA	1	unkn	A	Y	150	160	160	230	Y	160	200	FG	FG	26	n/a	10	Flap/glides from west over N Twin
4/13/2022	11:45:44	11:49:05	TUVU	1	unkn	A	Y	15	80	n/a	n/a	Y	15	70	SO	n/a	116	n/a	201	From east over S Twin, circled in west and flew east again
4/21/2022	10:48:40	10:50:39	TUVU	2	unkn	A	N	n/a	n/a	30	145	Y	30	145	n/a	SO	79	n/a	n/a	Flew over Rox wind and then into valley between N and S Twin
4/24/2022																				
4/25/2022	11:43:00	11:46:15	TUVU	1	unkn	A	Y	15	160	95	180	Y	15	160	SO	SO	66	n/a	110	Flew over both N Twin and S Twin
4/25/2022	12:16:25	12:34:10	TUVU	2	unkn	A	Y	65	70	65	350	Y	60	120	SO	SO	32	n/a	10	Circled over N Twin into valley E, met with obs #4 to NE
4/25/2022	12:17:35	12:17:45	SSHA	1	unkn	A	N	n/a	n/a	80	200	Y	80	110	FG	FG	50	n/a	n/a	Flew near TUVU over ridge of ROX and back east
4/25/2022	12:29:20	12:34:10	TUVU	1	unkn	A	N	n/a	n/a	70	350	Y	70	170	n/a	SO	32	n/a	n/a	Flying over N Twin, joins obs 2 in NE
4/25/2022	15:29:21	15:41:50	TUVU	3	unkn	A	N	n/a	n/a	50	75	Y	50	75	n/a	SO	26	n/a	n/a	Flew over N Twin and into NW valley

Date	Time First Seen	Time Last Seen	Species	No. Indiv	Sex (M,F, unkn)	Age (A, J, unkn)	INSIDE 800 m radius plot: (Y/N)	Inside Height Min (m)	Inside Height Max (m)	Outside Height Min (m)	Outside Height Max (m)	Cross A Ridge: (Y/N)	Crossed Ridge Min Height (m)	Crossed Ridge Max Height (m)	Behavior Code* Inside	Behavior Code* Outside	Flight Azimuth (general)	Time Above Turbine Height w/in Array (sec)	Time Below Turbine Height w/in Array (sec)	Behavior Notes
4/25/2022	15:59:50 PM	16:03:18 PM	RTHA	1	unkn	A	N	n/a	n/a	200	650	N	n/a	n/a	n/a	SO	128	n/a	n/a	Soared near S Twin and into valley to southeast
4/29/2022	10:01:01	10:02:00	RTHA	1	unkn	A	N	n/a	n/a	30	250	N	n/a	n/a	n/a	KH/SP	330	n/a	n/a	Hovering for some time, then bombed down towards earth/ prey
4/29/2022	10:02:05	10:02:25	TUVU	1	unkn	A	Y	225	230	230	320	Y	225	230	FG	FG	270	10	n/a	Crossed ridge following the side of S Twin
4/29/2022	12:46:15	12:46:35	TUVU	1	unkn	A	Y	200	215	215	315	Y	205	215	FG	FG	270	6	n/a	Crossed ridge low down in between mountains
4/29/2022	13:11:01	13:11:23	TUVU	1	unkn	A	Y	205	230	230	300	Y	205	230	FG	FG	225	3	4	Crossed ridge rising then decreased altitude
4/29/2022	15:01:05	15:02:00	TUVU	1	unkn	A	N	n/a	n/a	175	350	N	n/a	n/a	n/a	FG	180	n/a	n/a	Flew south just to east of N and S Twin
5/3/2022	13:16:48	13:21:01	TUVU	4	unkn	A	Y	12	145	145	350	Y	12	35	SO	SO	22	n/a	205	Flew over S Twin, circled before going NE
5/3/2022	15:06:18	15:06:50	TUVU	1	unkn	A	Y	15	40	n/a	n/a	Y	15	40	SO	n/a	319	n/a	32	Flew over array into valley
5/3/2022	15:15:13	15:17:58	TUVU	2	unkn	A	Y	7	40	n/a	n/a	Y	7	30	SO	n/a	300	n/a	45	Circling around S Twin
5/5/2022	12:00:33	12:01:05	TUVU	1	unkn	A	N	n/a	n/a	200	325	N	n/a	n/a	n/a	FG	180	n/a	n/a	Flew south just to west of N and S Twin
5/10/2022	9:21:01	9:21:22	BWHA	1	unkn	A	Y	5	15	15	30	Y	5	10	FG	FG	270	5	17	Flew almost directly over observation point on S Twin, flying W
5/12/2022	13:11:01	13:11:21	TUVU	1	unkn	A	Y	170	200	200	225	N	n/a	n/a	n/a	FG	180	n/a	6	Flew north just to west of N and S Twin
5/18/2022																				
5/19/2022	9:30:35	9:30:43	BWHA	1	unkn	J	Y	12	35	n/a	n/a	N	n/a	n/a	FG	n/a	98	n/a	8	Flap/glide on S side of S Twin
5/19/2022	9:36:11	9:36:24	SSHA	1	unkn	A	Y	16	40	n/a	n/a	Y	16	25	FG	n/a	53	n/a	13	Crossed over S Twin into E valley
5/24/2022																				
5/25/2022	11:16:10	11:17:01	TUVU	1	unkn	A	Y	20	145	n/a	n/a	Y	20	112	SO	n/a	170	n/a	51	Soaring over S Twin, turned around to S
5/25/2022	16:07:03	16:21:10	TUVU	1	unkn	A	Y	70	435	190	450	Y	70	400	SO	SO	158	15	80	Over S Twin to to NW valley, again over N Twin before goes S
6/1/2022	11:09:20	11:09:31	TUVU	1	unkn	A	Y	20	50	n/a	n/a	Y	25	50	SO	n/a	308	n/a	11	Flew over S Twin to NW valley
6/1/2022	11:45:10	11:47:45	TUVU	1	unkn	A	Y	25	290	290	310	Y	25	70	SO	SO	218	n/a	90	Over S Twin to SW soaring
6/2/2022	11:09:42	11:11:26	TUVU	1	unkn	A	N	n/a	n/a	280	320	N	n/a	n/a	n/a	SO	13	n/a	n/a	Soaring with obs. 2 and split back N
6/2/2022	11:09:42	11:11:22	TUVU	1	unkn	A	Y	20	220	220	300	Y	20	35	SO	SO	212	n/a	60	Soaring with obs. 1 and countinued over S twin
6/6/2022	14:49:25	14:54:00	TUVU	1	unkn	A	Y	15	220	220	405	Y	15	225	SO	SO	215	n/a	275	Soaring, joined with obs. 2 over S Twin to S
6/6/2022	14:51:10	14:54:00	TUVU	1	unkn	A	Y	150	220	220	405	Y	210	225	SO	SO	215	n/a	170	Soaring, joined with obs. 2 over S Twin to S
6/6/2022	15:23:08	15:23:36	TUVU	1	unkn	A	Y	40	50	n/a	n/a	N	n/a	n/a	SO	n/a	130	n/a	28	Soaring over S Twin to S
6/6/2022	17:26:20	17:27:30	TUVU	1	unkn	A	Y	10	55	n/a	n/a	Y	10	45	SO	n/a	170	n/a	70	Soaring over S Twin to S
6/14/2022																				

*Flight Behavior Codes: SO: soaring, PE: perched, FG: flap or glide, KH: kiting or hovering, MB: being mobbed, UT: undulating, territorial flight< SB: stooping or diving in response to another bird, SP: stooping or diving on prey, FO: foraging.

Fall 2022: Pre-Construction Eagle Use and Raptor Migration Survey Report

Twin Energy Project - Oxford County, Maine

Prepared for:
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13 Elm Street, Suite 200
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Prepared by:
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January 2023

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INTRODUCTION

PROJECT DESCRIPTION

The Twin Energy Project (Project) is a proposed wind electric generation facility located on South Twin Mountain in Rumford and Roxbury, Maine. Twin Energy LLC (Twin Energy) is proposing to install three wind energy turbines, each with a nameplate capacity of approximately six-megawatts. The access road and collector line are proposed to extend from the existing RoxWind project in Roxbury southerly to South Twin Mountain in Rumford.

The proposed Project includes three turbines that generally are aligned from west to east, with elevations ranging between 1,950 and 2,155 feet, along the northern ridge of South Twin Mountain. The proposed turbines will each have a hub height of approximately 384-feet (117 meters), blade tip height of approximately 645-feet (196 meters), and total blade swing diameter of approximately 490-feet (149 meters). The access road and collector line are proposed to extend from the existing RoxWind project in Roxbury southerly to South Twin Mountain in Rumford.

Flycatcher LLC (Flycatcher) was contracted by Twin Energy to complete eagle use and raptor migration surveys to aid in Project siting and to support permitting requirements for the Project. Flycatcher biologists consulted with the Maine Department of Inland Fisheries and Wildlife (MDIFW), and the United States Fish and Wildlife Service (USFWS) to develop a site-specific survey plan that will collect sufficient data to support these two agencies in making a determination about the Project during their respective review processes.

SURVEY BACKGROUND

During pre-survey consultations, MDIFW and USFWS recommended that eagle and raptor surveys be completed to support their review and meet the Project's obligations for permitting under the Maine Department of Environmental Protection (MDEP) Site Location of Development Act (Site Law: MDEP, 2019), and the US Army Corps of Engineers (USACE) Maine General Permits (GP: USACE, 2020).

Flycatcher developed a draft survey plan that was provided to both MDIFW and USFWS for comment and review during the winter of 2022. Following this review, slight modifications were made to the survey plan to collect data that could be used in USFWS's collision risk model. The survey plan was approved by both MDIFW and USFWS in early February 2022. The first round of twice weekly surveys commenced on February 15 and extended through June 15, 2022. The second round of surveys (Fall 2022) began on August 3 and extended through December 15, 2022. Figures 1 and 2, depict the Project area and raptor survey location.

In addition to direct consultation with the MDIFW and USFWS, Flycatcher's survey methods were informed by the protocols detailed in the MDIFW 2018 Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality (2018 Recommendations: MDIFW, 2018), and the USFWS Eagle Conservation Plan Guidance (ECPG), Module 1 – Land-based Wind Energy, Version 2, 2013 (ECPG: USFWS, 2013).

SURVEY OBJECTIVES

Eagle and raptor migration data collected during the fall 2022 survey are presented in this report to provide developers and reviewing agencies with site-specific data to inform decision making during the planning and permitting processes, including review by MDIFW and USFWS. The information presented in this report is intended to support avoidance and minimization of potential Project impacts to eagles and migrating raptor species. Gaining an understanding of how eagles and raptors use the proposed Project site and surrounding area supports turbine siting parameters, operational practices, and the development of best practices to protect species.

Surveys were completed to collect site-specific information typically necessary for MDIFW to make a determination on the Projects' potential impacts to raptors. Additionally, data was collected in a way that will allow USFWS to use their collision-risk model to determine the potential risk the proposed Project has to negatively impact eagles. This model supports decision making regarding the potential need for a wind project to apply for a take permit. Evaluating the data collected from this survey is a key part of the take permitting process.

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
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Plot Date: 6/27/2022, 14:15:05 PM by JAKEN -- LAYOUT: ANSI B(11"x17")
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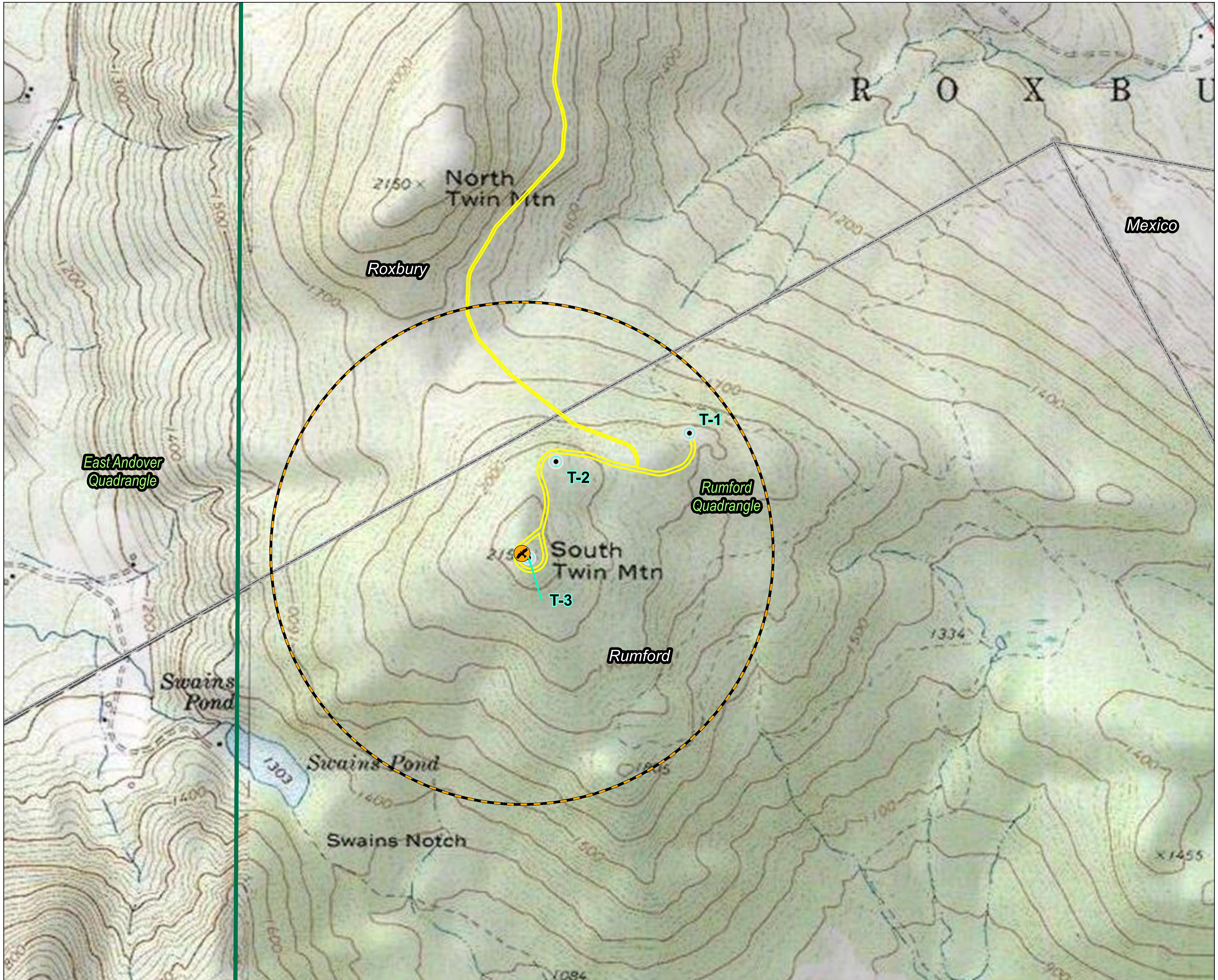
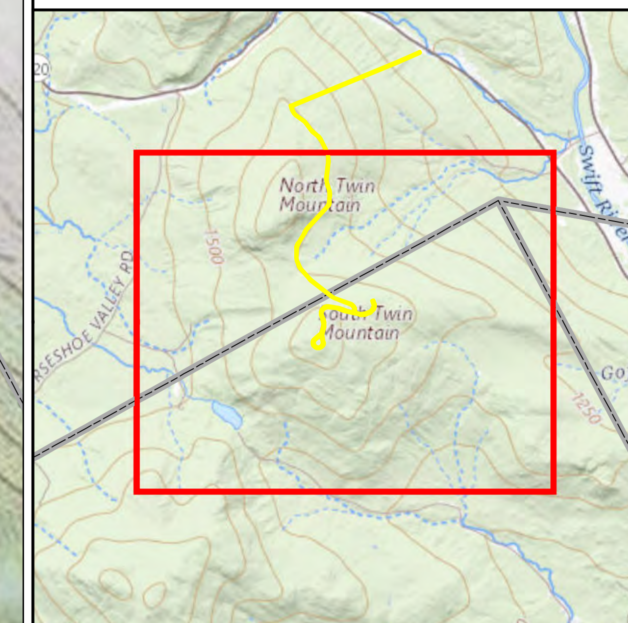


LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- RAPTOR SURVEY LOCATION
- 800M RADIUS SAMPLE AREA
- USGS 7.5-MINUTE QUADRANGLE BOUNDARY
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM USGS 7.5' QUADRANGLE SERIES.

0 1,000 2,000
Feet
1 " = 1,000 '
1:12,000

PROJECT:
TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
USGS RAPTOR SURVEY LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	R. KELSHAW		
MONTH:	JUNE	FIGURE 1	
YEAR:	2022		

Flycatcher
LAND + SCIENCE + PEOPLE

PALMER

FILE NO.: Palmer_TwinEnergy_RaptorMethods_Fig1_USGS_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

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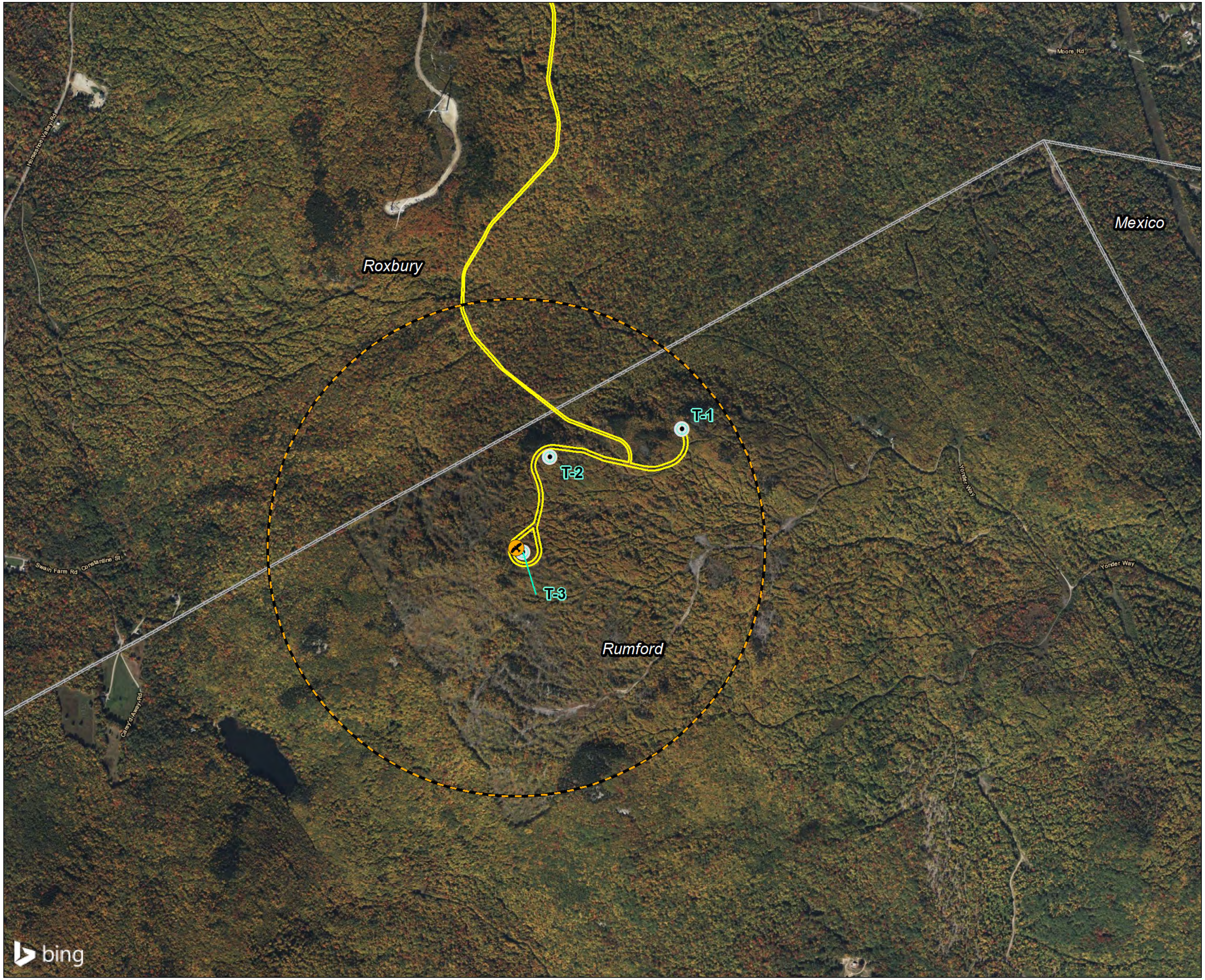
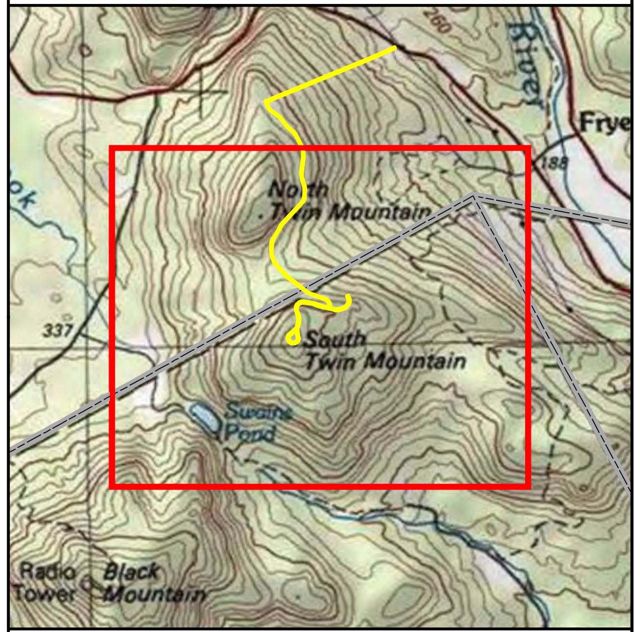


LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- RAPTOR SURVEY LOCATION
- 800M RADIUS SAMPLE AREA
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM BING AERIAL IMAGERY.

0 1,000 2,000
Feet
1 " = 1,000 '
1:12,000

PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:

AERIAL RAPTOR SURVEY LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	R. KELSHAW	**FIGURE 2**	
MONTH:	JUNE		
YEAR:	2022		

Flycatcher LAND • SCIENCE • PEOPLE

PALMER

FILE NO.: Palmer_TwinEnergy_RaptorMethods_Fig2_Aerial_11x17L.mxd

EAGLE USE AND RAPTOR MIGRATION SURVEYS

SURVEY SUMMARY

In this summary, the term "raptor" includes eagle and raptor species. A total of 131 raptors were observed during the fall 2022 surveys, 119 raptors were observed during raptor surveys (August 3 – November 30) and twelve (12) raptors were observed while travelling from the parking area at the intersection of Swift River Road and Yonder Way located in Mexico, Maine, to the raptor survey location (Figures 1 and 2) at the top of South Twin Mountain in Rumford, Maine (the Survey Location). No additional raptors were observed during eagle use surveys that extended to December 15, 2022.

Of the 119 raptors observed during Fall 2022 surveys, 95 (80%) occurred within the 800-meter plot of the Survey Area and 91 (76%) occurred both within the 800-meter plot and at flight heights below the Survey Area height (221 meters) for at least a portion of their flight. The fall seasonal observation rate for raptors observed during raptor surveys was 0.46 raptors/hour. The seasonal observation rate for raptors seen within 800 meters of the Survey Location during raptor surveys was 0.37 raptors/hour.

A total of eight (8) bald eagles (*Haliaeetus leucocephalus*) were documented resulting in an observation rate of 0.03 eagles/hour (Table 4). Six (6) out of eight (8) (75%) of these eagle observations occurred within 800 meters of the Survey Location and were also below the maximum survey height of 221 meters (Table 4). The observation rate for eagles within 800 meters of the Survey Location was 0.02 eagles/ hour.

SURVEY METHODS

Survey Description and Location

The Survey Area encompasses a three-dimensional cylindrical plot with a radius of 2,625-feet (800 meters) from the Survey Location (Figures 1 and 2), and a distance above the ground of 725-feet (221-meters), which is 82-feet (25 meters) above maximum turbine blade height of 196 meters. The Survey Location was selected during a site visit in early February 2022 and is situated on a prominent location at the top of South Twin Mountain, near proposed Turbine 3. A recent clearing for the installation of a temporary metrological tower created an ideal location for viewing raptor movements within the proposed turbine array (Figures 1 and 2). The viewshed from this point has nearly unobstructed views to the northwest beyond Ellis Pond and the RoxWind project, and to the east beyond Swift River and Roxbury Mountain. The viewshed encompasses the entire proposed Project area. There is also a view south toward the mill in Rumford and Black Mountain and unobstructed overhead views. Photos of the Survey Location are included in Appendix A.

The Survey Location and Survey Area meet the standards described in the ECPG (USFWS 2013). For this survey, the Project footprint, or the minimum convex polygon around the turbines, is a one kilometer radius from the three proposed turbine locations (4.58 square kilometers). The 800-meter radius (2.01 square kilometers) Survey Area covers 44% of the total Project footprint (USFWS 2013). This exceeds the recommendation outlined in the ECPG (USFWS 2013) to cover a minimum of 30% of the area within one kilometer of proposed turbines. Additionally, this encompasses 100% of the three proposed turbine locations (Figures 1 and 2).

Surveys consisted of point-based recordings of raptor and eagle flight activity (minutes and direction of flight) in proximity to the three-dimensional cylindrical sample plot or Survey Area. The buffer of 25 meters above the maximum blade reach

was included in the Survey Area based on guidance from USFWS and per recommendations outlined in Title 50 of the Code of Federal Regulations (50 CFR 22.80(d)(3)(ii)(A)).

Note that in the following "Survey Area" references the entire cylindrical plot, "800-meter plot" references the horizontal limit of the Survey Area, which is 800 meters from the central Survey Location, and "Survey Area height" references the area 221 meters above the ground, which is a buffer of 25 meters beyond the proposed turbine height of 196 meters.

Data Collection

Flycatcher conducted eagle use surveys from August 3 to December 15 for a total of 279 hours. Raptor migration surveys were conducted from August 3 to November 30 for a total of 259 hours. Survey days were scheduled on days with forecasted good visibility and fair weather, however, as weather changes rapidly in mountainous regions, surveys included days with variable weather conditions. Surveys were conducted from 0900 hours to 2-hours before sunset to target peak hours of raptor movement.

Stationed at the survey location, observers scanned the surrounding area using binoculars and a spotting scope. Data collected included the observer's name, the date of the survey, the survey start and end time, and hourly weather details including temperature, wind speed and direction, visibility, sky conditions, and cloud type. Observed raptors were recorded on the data sheet and the flight path was sketched on a map. The following was recorded for each observation:

1. Time of observation;
2. Total observation time seen;
3. Species;
4. Number of individuals;
5. Sex (when possible);
6. Age (when possible);
7. If the bird occurred within 800-meter plot;
8. Time above and below Survey Area height (221 meters);
9. If the bird crossed a ridge;
10. The flight height above ground level inside and outside the 800-meter plot, and flight height if it crossed a ridge;
11. Flight azimuth or direction; and
12. Description of general flight behavior and activity.

Non-raptor avian species were also documented as incidental wildlife observations during surveys.

Data Summary and Analysis

Raptor observation data were evaluated by the following metrics:

1. Seasonal observation rates (number of raptor observations per hour);
2. Number of species and individuals;
3. Hourly observation totals (and survey hour totals);
4. Percentage of birds observed within 800-meter plot;
5. The percentage of birds seen below Survey Area height (221 meters);
6. Percentage of birds observed crossing ridges inside 800-meter plot; and
7. Mean minimal and mean overall flight height of birds inside, crossing a ridge inside, and outside the 800-meter plot.

SURVEY RESULTS

Survey Effort and Weather

Eagle use surveys were conducted for a total of 40 days and 279 survey hours, and raptor surveys were conducted concurrently, for a total of 36 days and 259 hours.

Wind direction was variable throughout the survey period; however, winds most often blew from the NW. Wind speeds ranged from calm, zero miles per hour (mph), to strong, 19-24 mph. Sky conditions ranged from clear, to cloudy and overcast, and were most frequently partly cloudy or variable. Seasonal temperatures ranged from a high of 88°F on August 4 to a low of 20°F on December 12. Table 1 summarizes the weather conditions throughout the survey period.

Table 1. Daily Weather Conditions, Twin Wind Energy Project, Fall 2022.

Date	Daily min temp ºF	Daily max temp ºF	Mean daily cloud cover %	Mean wind code	Daily wind direction	Range of daily sky conditions
3-Aug	72	86	35	1	NW, WNW	Clear, cloudy overcast
4-Aug	75	88	67	1	NW, SW, W	Clear, partly cloudy, cloudy overcast
10-Aug	65	71	100	1	SE, W	Clear, partly cloudy
11-Aug	75	86	62	1	NW, S, SE, SW	Partly cloudy, cloudy overcast
15-Aug	71	77	48	1	E, SE	Partly cloudy or variable sky
16-Aug	69	76	62	3	E, NE	Partly cloudy, cloudy overcast, showers
22-Aug	68	75	97	1	S, SE	Cloudy overcast, fog or mist
25-Aug	68	77	67	2	NW	Partly cloudy, cloudy overcast
30-Aug	73	85	38	2	S	Partly cloudy or variable sky
2-Sep	60	77	8	1	NW, W	Clear or few clouds
8-Sep	65	70	61	1	SE	Partly cloudy, cloudy overcast
9-Sep	66	83	22	1	NW	Clear, cloudy overcast
12-Sep	62	74	100	1	N	Cloudy overcast, fog or mist
15-Sep	47	57	20	3	NW	Partly cloudy or variable sky
21-Sep	55	63	82	1	NW	Partly cloudy, cloudy overcast
23-Sep	39	43	85	3	NW	Cloudy overcast
28-Sep	50	58	55	2	NW	Cloudy overcast, fog or mist, showers
30-Sep	47	58	35	1	NW, S	Partly cloudy or variable sky
6-Oct	54	71	15	1	N	Partly cloudy or variable sky
7-Oct	57	71	61	1	NW, SW, W	Partly cloudy, cloudy overcast, drizzle
11-Oct	37	56	13	1	NW, W	Partly cloudy or variable sky
12-Oct	63	73	21	2	NW, S	Clear, partly cloudy
19-Oct	48	53	55	2	S, SW, W	Partly cloudy, cloudy overcast
20-Oct	40	47	40	2	S, SW	Partly cloudy or variable sky
25-Oct	56	63	100	1	S	Fog or mist
28-Oct	36	49	39	1	NW, SW, W	Partly cloudy or variable sky
2-Nov	47	55	19	3	NW	Partly cloudy or variable sky
3-Nov	38	58	14	1	SW, W	Partly cloudy or variable sky
9-Nov	35	46	1	1	NW, SW	Partly cloudy or variable sky
10-Nov	48	69	17	2	NW	Clear, partly cloudy
14-Nov	26	28	88	4	NW, W	Cloudy overcast, snow
18-Nov	27	30	68	2	SW	Partly cloudy, cloudy overcast, snow
22-Nov	28	32	2	2	NW, W	Clear or few clouds
23-Nov	29	32	98	3	NW	Cloudy overcast, snow
28-Nov	31	35	90	3	NW	Cloudy overcast
29-Nov	29	35	16	1	NW, S, SW, W	Clear, partly cloudy
5-Dec	30	36	10	2	S	Clear or few clouds
8-Dec	32	38	81	4	NW	Partly cloudy, cloudy overcast
12-Dec	20	27	0	2	NW	Cloudy overcast
15-Dec	32	35	98	3	NE, E	Cloudy overcast, snow
Wind Speed codes 1 = 1-3 mph; 2 = 4-8 mph; 3 = 9-12 mph; 4 = 13-18 mph; 5 = 19-24 mph						

Raptor Migration Survey Results

Raptor surveys were conducted for a total of 36 days and 259 survey hours. Raptor survey results include eagles observed during this period. Incidental raptors were documented during eagle surveys and while traveling to and from the survey location, however these data are not included in the following analysis. A total of 119 raptors were observed during the survey period from August 3 to November 30, 2022, Table 2.

Table 2. Raptor Survey Species List, Twin Wind Energy Project, Fall 2022.

Raptor species observed	***Scientific name***	***Total Number of Observations***
American kestrel	*Falco sparverius*	9
Bald eagle	*Haliaeetus leucocephalus*	8
Broad-winged hawk	*Buteo platypterus*	27
Cooper's hawk	*Accipiter cooperii*	3
Northern goshawk	*Accipiter gentilis*	1
Osprey	*Pandion haliaetus*	1
Rough-legged hawk	*Buteo lagopus*	1
Red-tailed hawk	*Buteo jamaicensis*	23
Sharp-shinned hawk	*Accipiter striatus*	6
Turkey vulture	*Cathartes aura*	40
Total raptors observed during fall raptor surveys		119

Total Number of Raptors Observed

Of the 119 raptors observed during raptor surveys (Table 2), the species most frequently observed were turkey vulture (n=40) and broad-winged hawk (n=27); the species least frequently observed were northern goshawk (n=1), osprey (n=1), and rough-legged hawk (n=1) (Figure 3).

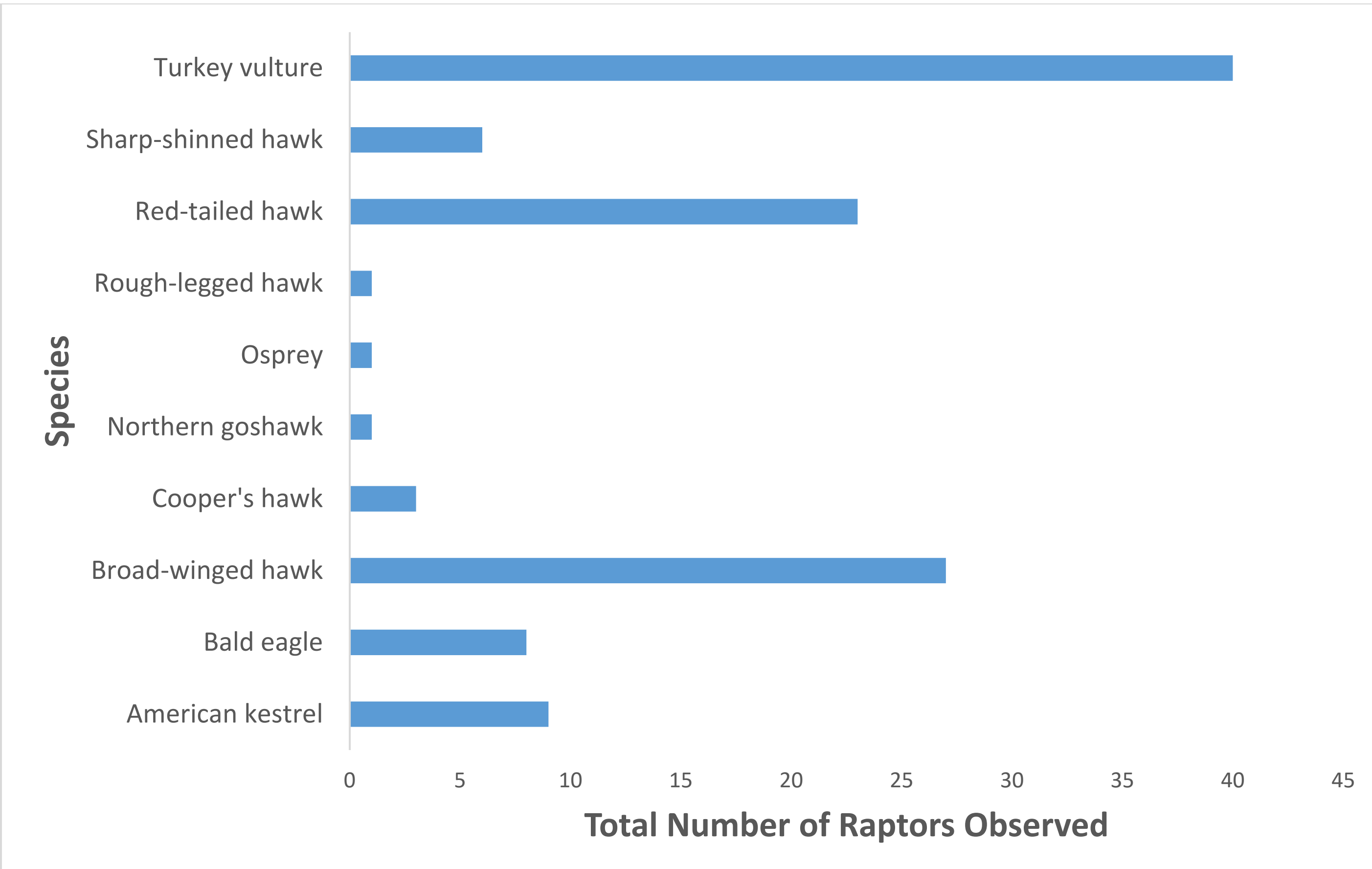


Figure 3. Number of Raptor Observations by Species, Twin Wind Energy, Fall 2022.

Daily Observations

During fall raptor surveys, daily observation rates ranged from 0 raptors/day to 15 raptors/day and from 0 raptors/hour to 1.88 raptors/hour (Figure 4; Appendix C). The fall observation rate for raptors seen during raptor surveys was 0.46 raptors/hour.

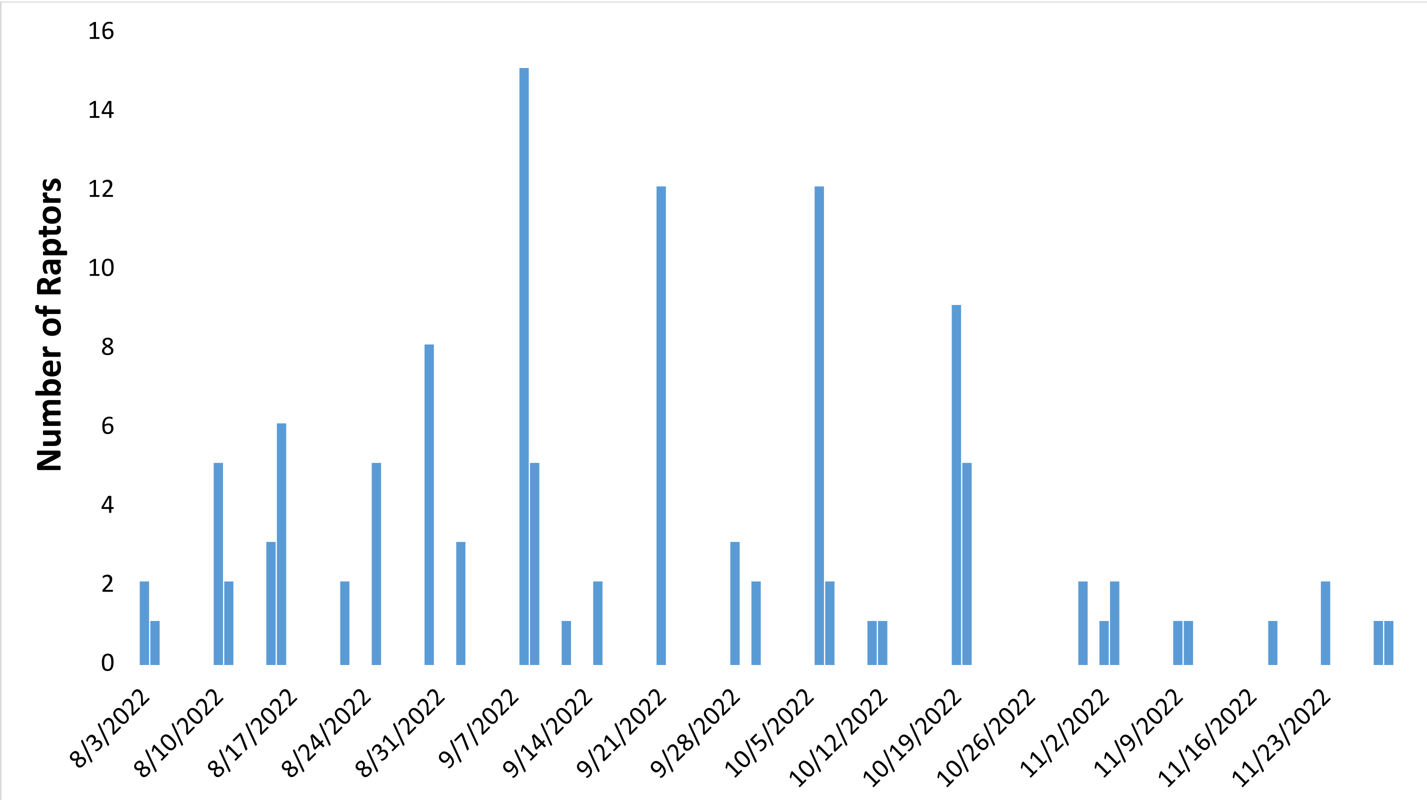


Figure 4. Daily Raptor Observations, Twin Wind Energy Project, Fall 2022.

Peak Hourly Observations

Peak hourly raptor observations occurred from 1200 hours to 1300 hours (27 raptors), followed closely by 1300 hours to 1400 hours (26 raptors) and from 1100 hours to 1200 hours (22 raptors) (Figure 5; Appendix C). Note, hourly survey effort varied daily as surveys started daily at 0900 hours and ended daily 2 hours before sunset. As such, there is a lower hourly survey effort for hour blocks later in the day, as shown in Figure 5.

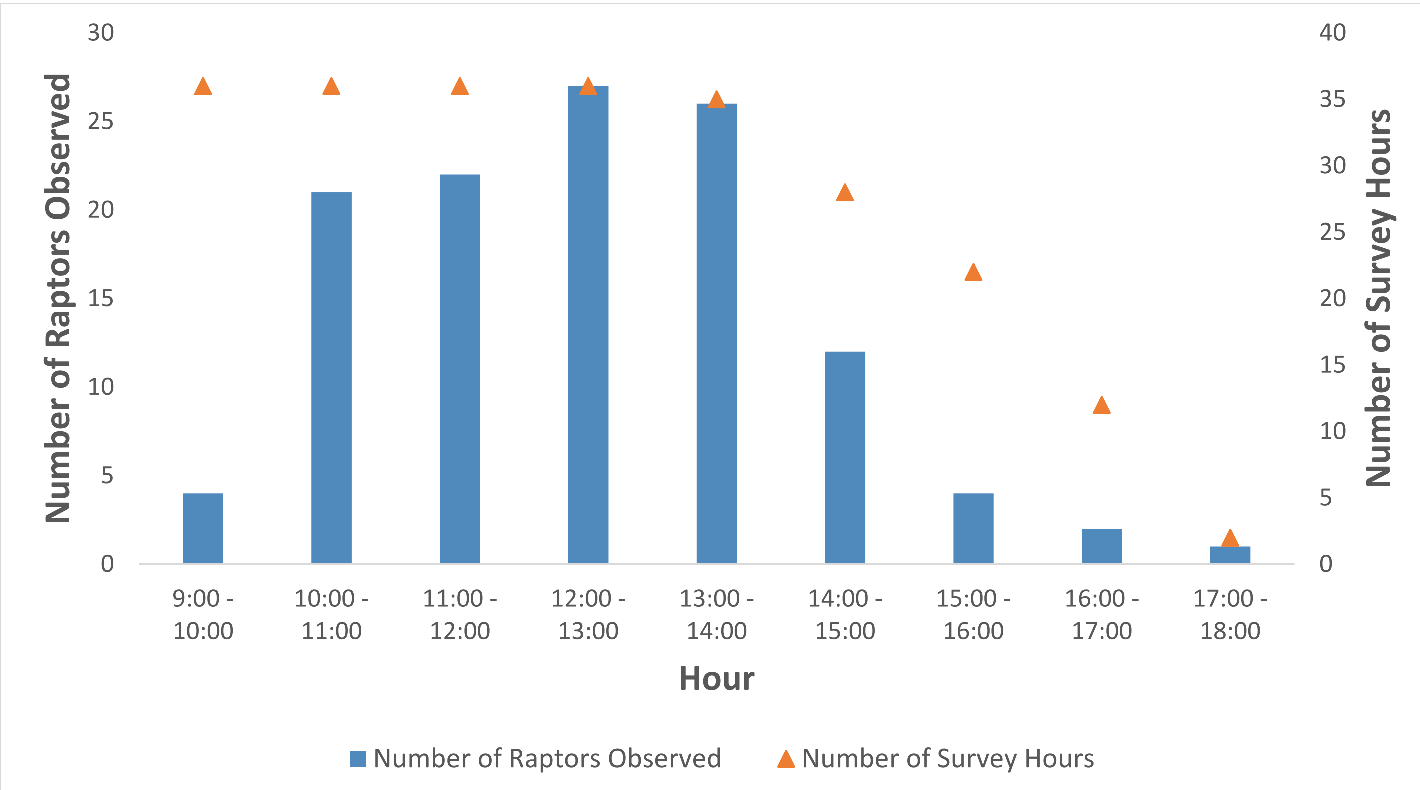


Figure 5. Number of Observations of Raptors per Survey Hour, Twin Wind Energy Project, Fall 2022.

Fall Flight Paths and Flight Heights

Of the 119 raptors observed during Fall 2022 surveys, 95 (80%) occurred within the 800-meter plot of the Survey Area and 91 (76%) occurred both within the 800-meter plot and at flight heights below the Survey Area height (221 meters) for at least a portion of their flight (Table 3; Figure 6; Appendix C). The seasonal observation rate for raptors within the 800-meter plot was 0.37 raptors/hour. The mean minimum flight height of those observed within the 800-meter plot was 59 meters (193 feet). Of the 119 raptors observed, 60 (50%) crossed a ridge and 51 (43%) crossed a ridge within the 800-meter plot (Table 3). The average minimum flight height of those raptors that crossed a ridge was 72 meters (236 feet).

Table 3. Summary of Raptor Locations and Mean Flight Heights, Twin Wind Energy Project, Fall 2022.

Raptor species	*Number inside 800m plot[1]*	*Number outside 800m plot[2]*	*Number crossed a ridge[3]*	*Number inside Survey Area[4]*	*Total*
American kestrel	9	0	6	9	9
Bald eagle	6	2	2	6	8
Broad-winged hawk	22	5	12	20	27
Cooper's hawk	3	0	2	3	3
Northern goshawk	1	0	1	1	1
Osprey	1	0	1	0	1
Rough-legged hawk	0	1	0	0	1
Red-tailed hawk	19	4	5	19	23
Sharp-shinned hawk	6	0	4	5	6
Turkey vulture	28	12	18	28	40
TOTAL	**95**	**24**	**51**	**91**	**119**

1. Observations inside the 800-meter plot may also have been seen outside the 800-meter plot.
2. Observations outside 800-meter plot only.
3. Ridges inside 800-meter plot only.
4. Survey Area as defined (within 800-meter plot and below the Survey Area height).

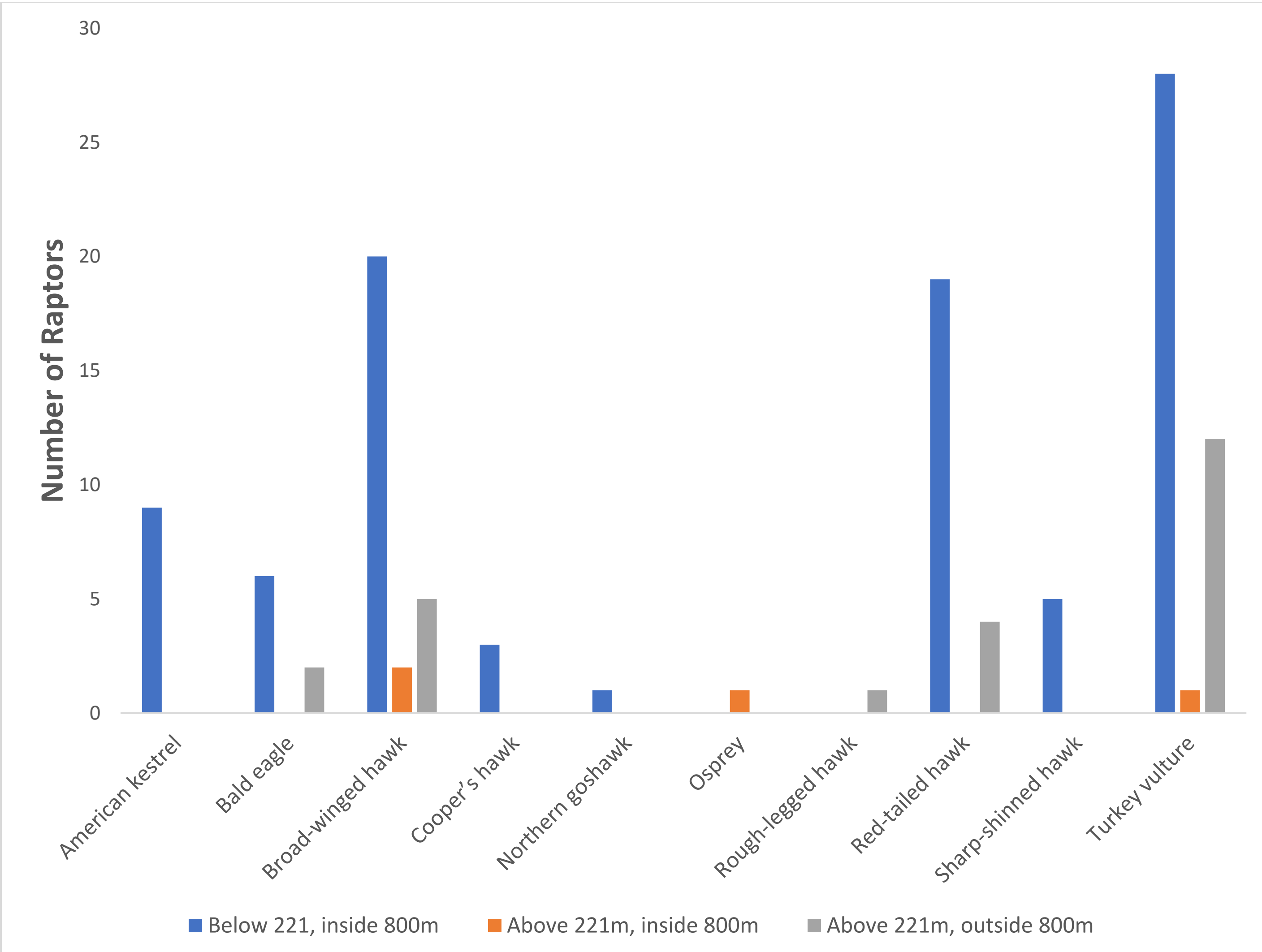


Figure 6. Number of Raptor Observations Within 800-meter Radius Plot at Heights Above and Below 221 Meters, and Outside 800-meter Radius Plot Above 221 Meters, Twin Wind Energy Project, Fall 2022.

Eagle Use Survey Results

Eagle use surveys were conducted from August 3 to December 15 for a total of 40 days and 279 survey hours. During 279 survey hours, there were eight (8) bald eagle observations, resulting in an observation rate of 0.03 eagles/hour (Table 4). Of the eight (8) observations, six (6) occurred within the 800-meter plot (75%) (Table 4). The observation rate for eagles within the 800-meter plot was 0.02 eagles/hour. All six eagles observed within the 800-meter plot also occurred below the Survey Area height of 221 meters (Table 4). Out of the eight (8) eagles observed during surveys, four (4) were adults and four (4) were juvenile. Table 5 provides details regarding each observed eagle throughout the survey period.

Table 4. Summary of Eagle Locations and Mean Flight Heights, Twin Wind Energy Project, Fall 2022.

Observation	*Inside 800m plot[1]*	*Outside 800m plot[2]*	*Crossed a ridge[3]*	*Number inside survey area[4]*
Bald eagle	6	2	2	6
Percent of total observations	75%	25%	25%	75%
Mean minimum flight height (meters)	114	228	45	114
Mean flight height (meters)	166	321	53	153

1. Observations inside the 800-meter plot may also have been seen outside the 800-meter plot.
2. Observations outside 800-meter plot only.
3. Ridges inside 800-meter plot only.
4. Survey Area as defined (within 800-meter plot and below the Survey Area height).

Table 5. Eagle Use Observations, Twin Wind Energy Project, Fall 2022.

Date	Time First Seen	Time Last Seen	Species	No. individuals	Age (A, J, unknown)	Inside 800m radius plot: (Y/N)	Inside Height Min (m)	Inside Height Max (m)	Outside Height Min (m)	Outside Height Max (m)	Cross A Ridge: (Y/N)	Crossed Ridge Min Heights (m)	Crossed Ridge Max Heights (m)	Behavior Code Inside	Behavior Code Outside	Flight Azimuth (general)	Time Above Turbine Height (221m) w/in Array (sec)	Time Below Turbine Height (221m) w/in Array (sec)	Behavior Notes
10/6/2022	11:49:10	11:50:08	BAEA	1	J	Y	40	60	n/a	n/a	N	n/a	n/a	FG, SO	n/a	172	n/a	58	Flap/glide S along S Twin
10/20/2022	14:39:47	14:47:09	BAEA	2	J	Y	45	280	280	400	Y	45	60	SO, KH	SO	106	15	40	Soaring and kiting in high wind S of S Twin, ravens around
11/28/2022	11:17:00	11:19:00	BAEA	1	A	Y	170	180	180	220	N	n/a	n/a	FG	FG	0 to 180	n/a	50	Flew north, just west of survey location, buffeted by winds, flew south.
9/8/2022	13:30:15	13:34:07	BAEA	2	A	Y	200	350	350	450	N	n/a	n/a	SO	SO	205	20	10	Adult pair soaring and circling high in SW valley
11/10/2022	11:37:00	11:37:30	BAEA	1	A	N	n/a	n/a	30	200	Y	20	30	n/a	FG, SO	90	n/a	n/a	Mainly soaring east with 2 flaps quickly b/t north and south twin
9/2/2022	13:50:00	13:50:32	BAEA	1	J	N	n/a	n/a	300	800	N	n/a	n/a	n/a	GL	225	n/a	n/a	Flew quickly S to the E of N and S Twin.

*Flight Behavior Codes: SO: soaring, PE: perched, FG: flap or glide, KH: kiting or hovering, MB: being mobbed, UT: undulating, territorial flight< SB: stooping or diving in response to another bird, SP: stooping or diving on prey, FO: foraging.

2022 Incidental Non-Raptor Species

In the fall of 2022, 34 non-raptor avian species were recorded during surveys and while travelling to or from the parking area to the survey location (Table 6). Of the avian species observed, none were federally or state-listed threatened or endangered species (MDIFW 2015). There were two (2) species listed as Species of Special Concern by the State of Maine; the eastern wood-pewee *(Contopus virens)* and white-throated sparrow (*Zonotrichia albicolli)* (MDIFW 2011).

Table 6. Incidental Observations of Non-Raptor Avian Species, Twin Wind Energy Project, Fall 2022.

Common Name	*Scientific Name*
Alder flycatcher	*Empidonax alnorum*
American crow	*Corvus brachyrhynchos*
American goldfinch	*Spinus tristis*
American redstart	*Setophaga ruticilla*
American robin	*Turdus migratorius*
Blackburnian warbler	*Setophaga fusca*
Black-capped chickadee	*Poecile atricapillus*
Blue jay	*Cyanocitta cristata*
Cedar waxwing	*Bombycilla cedrorum*
Chipping sparrow	*Spizella passerina*
Common raven	*Corvus corax*
Common yellowthroat	*Geothlypis trichas*
Dark-eyed junco	*Junco hyemalis*
Downy woodpecker	*Picoides pubescens*
Eastern phoebe	*Sayornis phoebe*
Eastern wood-pewee	*Contopus virens*
Golden-crowned kinglet	*Regulus satrapa*
Hairy woodpecker	*Picoides villosus*
Hermit thrush	*Catharus guttatus*
Magnolia warbler	*Setophaga magnolia*
Mourning dove	*Zenaida macroura*
Northern flicker	*Colaptes auratus*
Pine warbler	*Setophaga pinus*
Red Crossbill	*Loxia curvirostra*
Red-breasted nuthatch	*Sitta canadensis*
Red-eyed vireo	*Vireo olivaceus*
Ruby-crowned Kinglet	*Corthylio calendula*
Ruby-throated hummingbird	*Archilochus colubris*
Ruffed grouse	*Bonasa umbellus*
Tufted titmouse	*Baeolophus bicolor*
White-breasted nuthatch	*Sitta carolinensis*
White-throated sparrow	*Zonotrichia albicollis*
Winter wren	*Troglodytes hiemalis*
Yellow-rumped warbler	*Setophaga coronata*

DISCUSSION

During the fall 2022 survey season, the majority (80%) of raptors observed were within the 800-meter plot for at least part of their flight. Additionally, 76% were both within the 800-meter plot and below the Survey Area height of 221 meters. The mean minimum flight height within the 800-meter plot was 59 meters, 162 meters below the Survey Area height.

Of the bald eagles observed, the majority (75%) were within the 800-meter plot for part at least a portion of their flight. Additionally, 75% were both within the 800-meter plot and below the Survey Area height of 221 meters. The mean of eagle minimum flight heights within the 800-meter plot was 114 meters, 7 meters below the Survey Area height.

Of the raptors observed, the bald eagle is listed by the State of Maine as a Species of Special Concern (MDIFW 2011). The American kestrel is considered a species of greatest conservation need.

Considering the potential risk of the proposed Project to raptors and eagles is an important step in the permitting and development process. Migration corridors provide important travel and forage areas for raptors and eagles during a time when these species are moving over long distances and are vulnerable. The data presented in this document was collected with the intent to support USFWS in using their collision risk model to determine the potential risk the proposed Project has to negatively impacting eagles, and aid in decision making regarding the need for take permits. Data collected from this survey are also intended to inform project planning to avoid or minimize adverse impacts to migrating eagle and raptor species.

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Appendix A. Photographs of the Survey Location

View north from Location 1, June 14, 2022.

View northeast from Location 1, June 14, 2022.

View east from Location 1, June 14, 2022.

View southeast from Location 1, June 14, 2022.

View south from Location 1, June 14, 2022.

View southwest from Location 1, June 14, 2022.

View west from Location 1, June 14, 2022.

View northwest from Location 1, June 14, 2022.

Appendix B. Twin Energy Spring 2022 Raptor and Eagle Survey Plan

SURVEY PLAN

Date:	February 9, 2022(Revised February 12, 2022)
To:	Bob Stratton (Maine Department of Inland Fisheries and Wildlife)
From:	Katelin Nickerson – Flycatcher LLC
CC:	Lindsay Deane-Mayer & Sumul Shah (Twin Energy LLC) Rodney Kelshaw, Rich Jordan (Flycatcher)
Subject:	Proposed Twin Energy Wind Electric Power Generation Facility – Spring 2022 Raptor and Eagle Survey Plan (Rev 1)

Dear Bob,

On behalf of Twin Energy LLC, Flycatcher is submitting this Revised Spring 2022 eagle and raptor migration survey plan for your approval. This survey plan was developed based on our recent conversations with you, protocols detailed in the Maine Department of Inland Fisheries and Wildlife (MDIFW) 2018 Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality (2018 Recommendations), and U.S. Fish and Wildlife Service Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2, 2013 (ECPG 2013). The revisions are based on feedback from the USFWS (via email, February 11, 2022). Effectively the methods described herein are the same methods as described in the Survey Plan submitted on February 9, with minor changes to collect data to support input into USFWS's collision risk model.

GENERAL PROJECT DESCRIPTION

The proposed Twin Energy Project (Project) is a small wind electric generation facility located on South Twin Mountain in Rumford and Roxbury, Maine. The current plan is to erect three turbines with a six-megawatt capacity each, that have a hub height of approximately 384-feet (117-meters), blade tip height of approximately 645-feet (196-meters), and total blade swing diameter of approximately 490-feet (149-meters). The proposed access road and collector line will extend from the existing RoxWind project southerly to South Twin Mountain in Rumford. The proposed turbine locations are in close proximity to each other, clustered on the northern edge of South Twin Mountain.

Turbine 3 is proposed to be located near the summit of South Twin Mountain, at an elevation of 2,155-feet. Turbines 1 and 2 are located to the north and east of turbine 3 at lower elevations; around 2,050-feet and 1,950-feet respectively (figures 1 and 2, attached).

METHODS AND SURVEY LOCATION DESCRIPTION

In accordance with the 2018 Recommendations, Flycatcher plans to begin surveys the week of February 15, 2022. We understand that one golden eagle was (*Aquila chrysaetos*) observed in the fall of 2016, at the Record Hill project site (approximately 2.5-miles north), during the four-year post construction monitoring effort. The spring raptor and eagle survey will occur from February 15 through June 15, 2022. We will conduct two surveys per week during weather that is conducive to observe migratory activity. Surveys will start at 9 a.m. and last until 2 hours before sunset (or later if birds are moving through the area during the completion of the "normal survey window").

The number of standard survey locations (point counts) was determined using the standards described in the ECPG 2013. For this survey, the Project footprint, or the minimum convex polygon around the turbines, is a 1-kilometer radius from the three proposed turbine locations (4.58 square kilometers). Using one 800-meter

radius (2.01 square kilometers) point count survey plot size, 44 percent of the total Project footprint is covered. This also encompasses 100 percent of the three proposed turbine locations (figures 1 and 2, attached).

Surveys will consist of point-based recordings of raptor, bald eagle (*Haliaeetus leucocephalus*) and golden eagle flight activity (minutes of flight) within a three-dimensional cylindrical plot (the sample plot). The radius of the sample plot is 2,625 feet (800-meters), and the height above ground level of 82-feet (25-meters) above the maximum blade reach, which is 725-feet (221-meters).

Data will be collected on the attached "*Raptor Pre-construction Datasheet*" and will include the observed raptor/eagle behavior inside and outside the proposed turbine area. Observers will sketch the raptor/eagle path either on aerial photographs or using a web-based GIS mapping service.

The survey effort will be completed substantially in accordance with the 2018 Recommendations and ECPG 2013. Surveys will be conducted during suitable weather conditions; surveys will not be conducted when visibility is less than 800-meters horizontally and 200-meters vertically. However, there may be factors including weather and road conditions that limit access to this remote site. This will be assessed weekly, and efforts will be made to complete the surveys if practicable and safe.

RAPTOR SURVEY POINT LOCATION

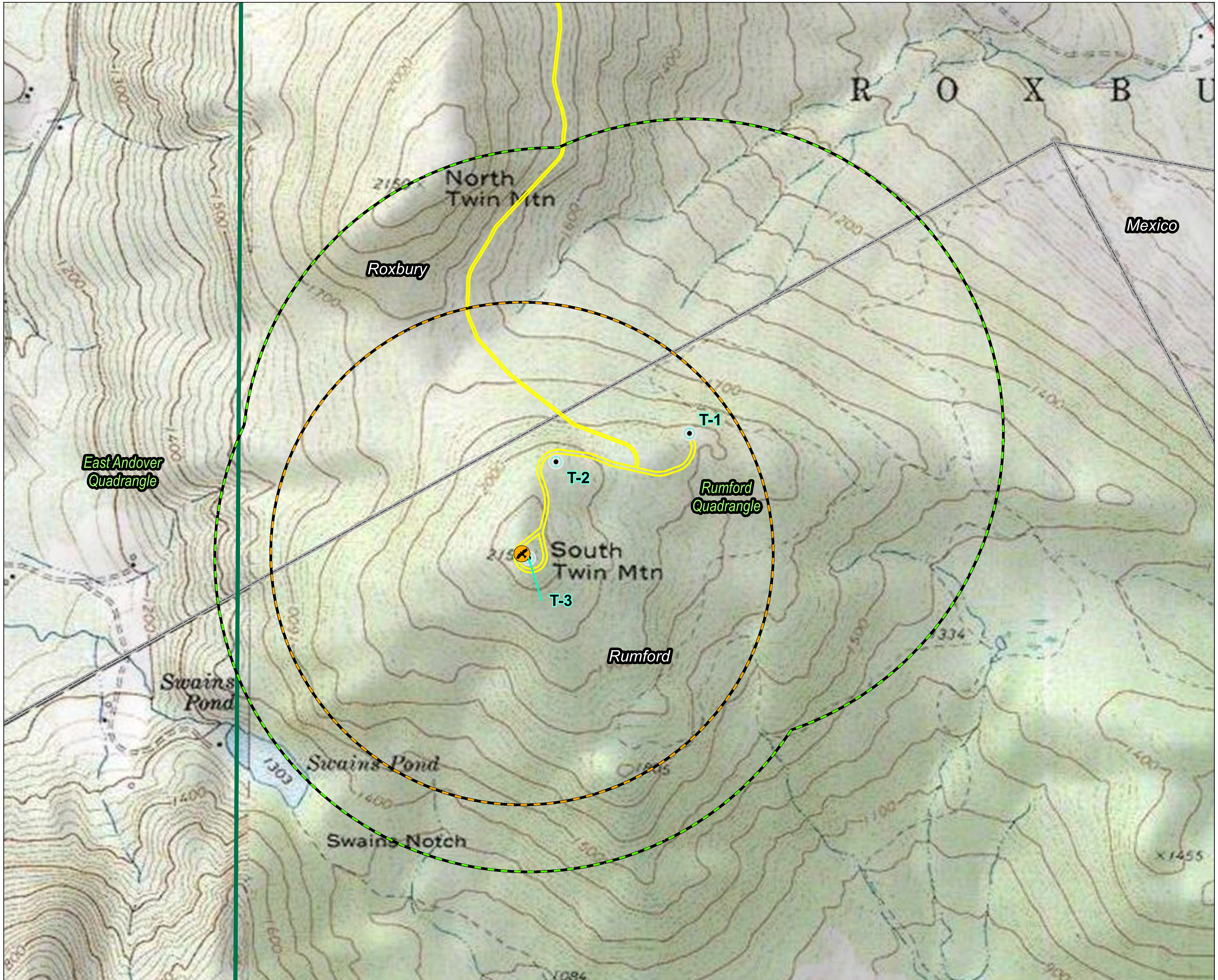
The survey point is located on the summit of South Twin Mountain, in the same location as proposed turbine 3. This location was selected because it provides a vantage point that has clear views across the Project area. The viewshed from the point has excellent views to the northwest beyond Ellis Pond and the RoxWind project, and to the east beyond Swift River and Roxbury Mountain. This viewshed encompasses the entire proposed Project area. Good views are also available to the south to the mill in Rumford and Black Mountain; with unobstructed view overhead. The attached photographs taken on February 7, 2022 show current views from the proposed survey location. If additional photographs are required, Flycatcher will save them to our file share folder for external access.

We are seeking your feedback and approval of this Survey Plan.

Respectfully,

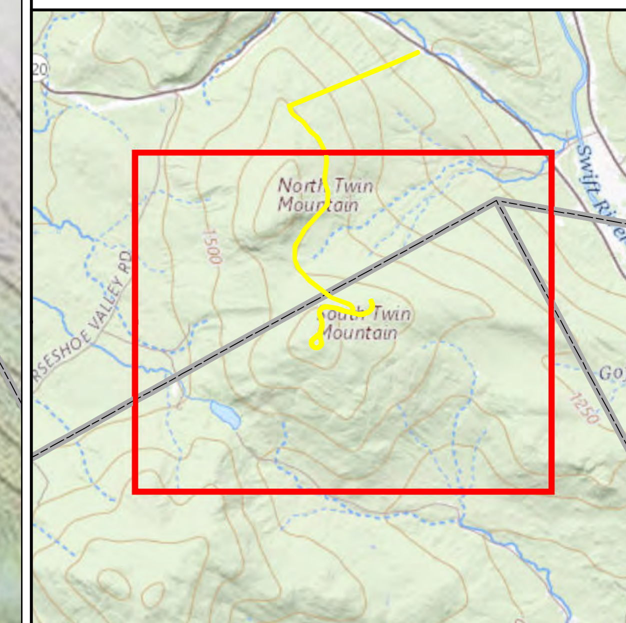
Katelin Nickerson
Project Director
Flycatcher, LLC
207.233.6175

Att (4): Figure 1.(revised)
Figure 2. (revised)
Raptor Pre-construction Datasheet (revised)
Photographs



LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- RAPTOR SURVEY LOCATION POINT
- USFWS EAGLE SURVEY AREA
- 800M DIAMETER SAMPLE AREA
- USGS 7.5-MINUTE QUADRANGLE BOUNDARY
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM USGS 7.5' QUADRANGLE SERIES.

0 1,000 2,000
Feet
1 " = 1,000 '
1:12,000

PROJECT:
TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
USGS RAPTOR SURVEY LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	R. KELSHAW		**FIGURE 1**
MONTH:	FEBRUARY		
YEAR:	2022		

Flycatcher LAND + SCIENCE + PEOPLE
PALMER

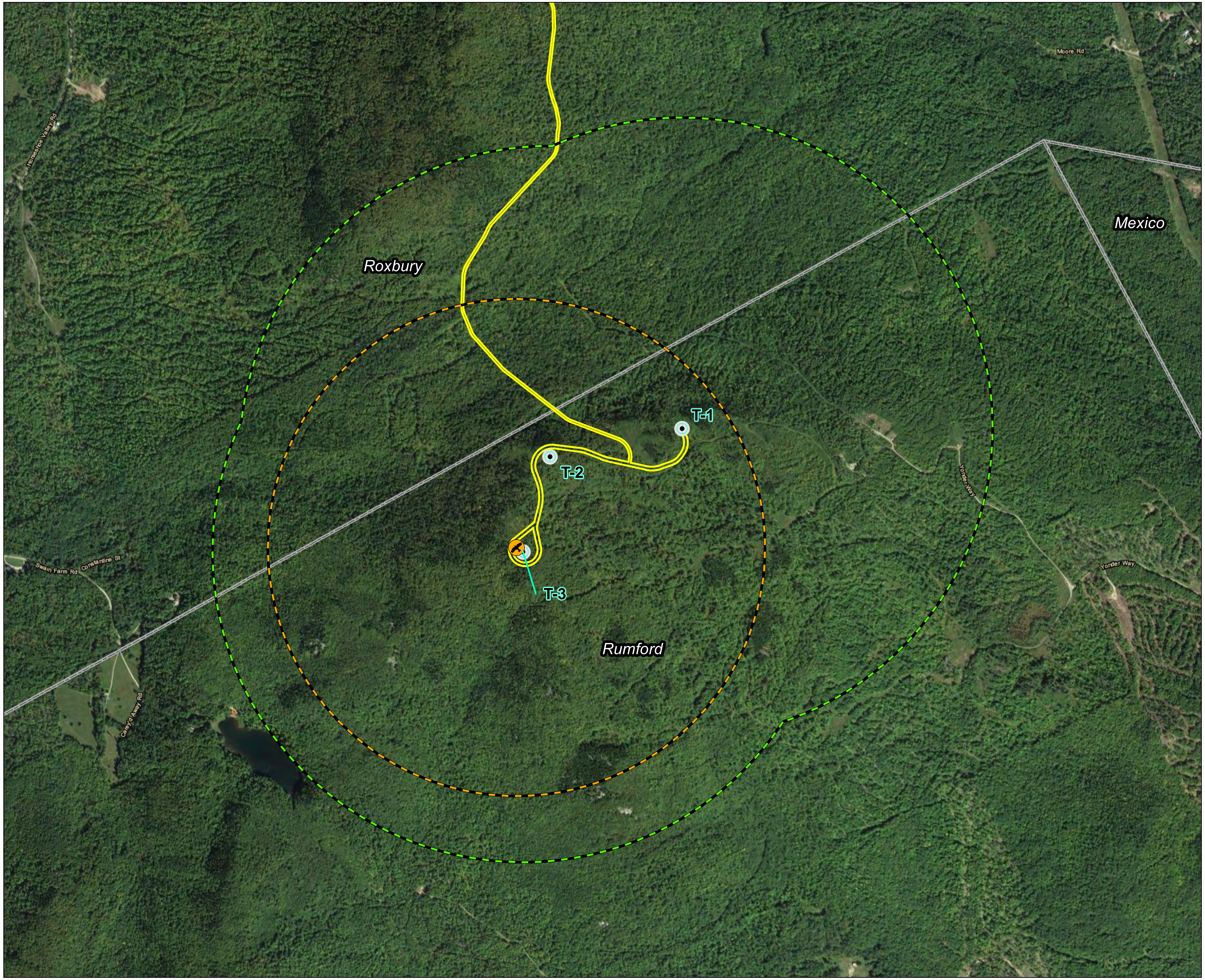
FILE NO.: Palmer_TwinEnergy_RaptorMethods_Fig1_USGS_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

Plot Date: 2/11/2022, 16:15:57 PM by JAKEN -- LAYOUT: ANSI B(11"x17")
Path: D:\Flycatcher\Projects\Solaya\Palmer_TwinEnergy_RaptorMethods_Fig1_USGS_11x17L.mxd

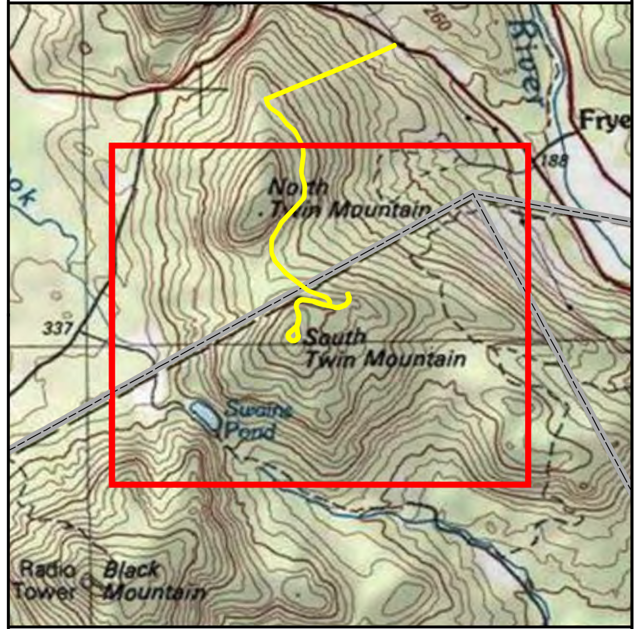
Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

Plot Date: 2/11/2022, 16:24:48 PM by JAKEN -- LAYOUT: ANSI B(11"x17")
Path: D:\Flycatcher\Projects\Solaya\Palmer_TwinEnergy_RaptorMethods_Fig2_Aerial_11x17L.mxd



LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- RAPTOR SURVEY LOCATION POINT
- USFWS EAGLE SURVEY AREA
- 800M DIAMETER SAMPLE AREA
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM ESRI/NAIP "WORLD IMAEGRY" SERVICE LAYER.

N

0 1,000 2,000
Feet
1 " = 1,000 '
1:12,000

PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:

AERIAL RAPTOR SURVEY LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	R. KELSHAW		
MONTH:	FEBRUARY	**FIGURE 2**	
YEAR:	2022		

Flycatcher LAND + SCIENCE + PEOPLE
PALMER

FILE NO.: Palmer_TwinEnergy_RaptorMethods_Fig2_Aerial_11x17L.mxd

Flycatcher
LAND + SCIENCE + PEOPLE

Raptor Survey Pre-construction Datasheet

Date:

Project Name/Location: Twin Energy Project in Rumford and Roxbury

Proposed Turbine Height: 645ft (blade tip)

Pg 1

Observer:

Survey Point Number: 1

Survey Start Time:

Survey End time:

Survey notes (migration flights, weather fronts, etc.):

Describe distractions to observer, or disturbances to birds that may have impacted survey:

Weather Conditions

Hour of Survey	Temp (F)	Sky Code	% Cloud Cover	Cloud Code	Wind Direction	Wind Speed Code	Visibility Code
Hour l							
Hour 2							
Hour 3							
Hour 4							
Hour 5							
Hour 6							
Hour 7							
Hour 8							
Hour 9							
Hour l0							

Obs. No.	Time first seen	Time last seen	Species	No. Indiv[1]	Sex (M,F, unkn)	Age (A, J, unkn)	INSIDE 1/4 mile (402m) of turbine: (Y/N)	Inside Height Min & Max (m)2	Outside Height Min & Max (m)2	Cross A Ridge: (Y/N)	Crossed Ridge Min & Max Heights (m)2	Behavior Code Inside	Behavior Code Outside	Flight Azimuth (general)	Time Above Turbine Height w/in Array	Time Below Turbine Height w/in Array	Behavior Notes

1. For groups of birds, create a separate entry for a different species and birds at different flight heights or locations.
2. Record bird's flight height above ground level to the nearest 5-m (16-ft) interval.

Flycatcher
LAND + SCIENCE + PEOPLE

Raptor Survey Pre-construction Datasheet

Project Name/Location: Twin Energy in Rumford and Roxbury | Survey Point Number: 1 | Date: | Pg

Obs. No.	Time first seen	Time last seen	Species	No. Indiv[1]	Sex (M,F, unkn)	Age (A, J, unkn)	INSIDE 1/4 mile (402m) of turbine: (Y/N)	Inside Height Min & Max (m)2	Outside Height Min & Max (m)2	Cross A Ridge: (Y/N)	Crossed Ridge Min & Max Heights (m)2	Behavior Code Inside	Behavior Code Outside	Flight Azimuth (general)	Time Above Turbine Height w/in Array	Time Below Turbine Height w/in Array	Behavior Notes

1. For groups of birds, create a separate entry for a different species and birds at different flight heights or locations.
2. Record bird's flight height above ground level to the nearest 5-m (16-ft) interval.

Flycatcher
LAND + SCIENCE + PEOPLE

Incidental Wildlife Datasheet

Observer:	Project Name/Location: Twin Energy in Rumford and Roxbury	Pg____of____

Date:	Notes:	Temp (F)	Code	Wind Direction	Sky Code	Cover %	Cloud Code	Visibility Code

Location (Point number, GPS point, etc.)	Observed in Survey (S) or Traveling (T)	Time first observed	Mode of Detection (V: Visual, A: Auditory)	# of Individual	Species Code[1]	Sex (M, F, unk)	Age (A, J, unk)	Distance from observer first observed (m)[2]	Closest distance from observer (m)[2]	Flight height first observed (m)[2]	Min & Max heights (m)[2]	Flight direction	Activity (FL: flying, PE: perched)	Other notes (behaviors)

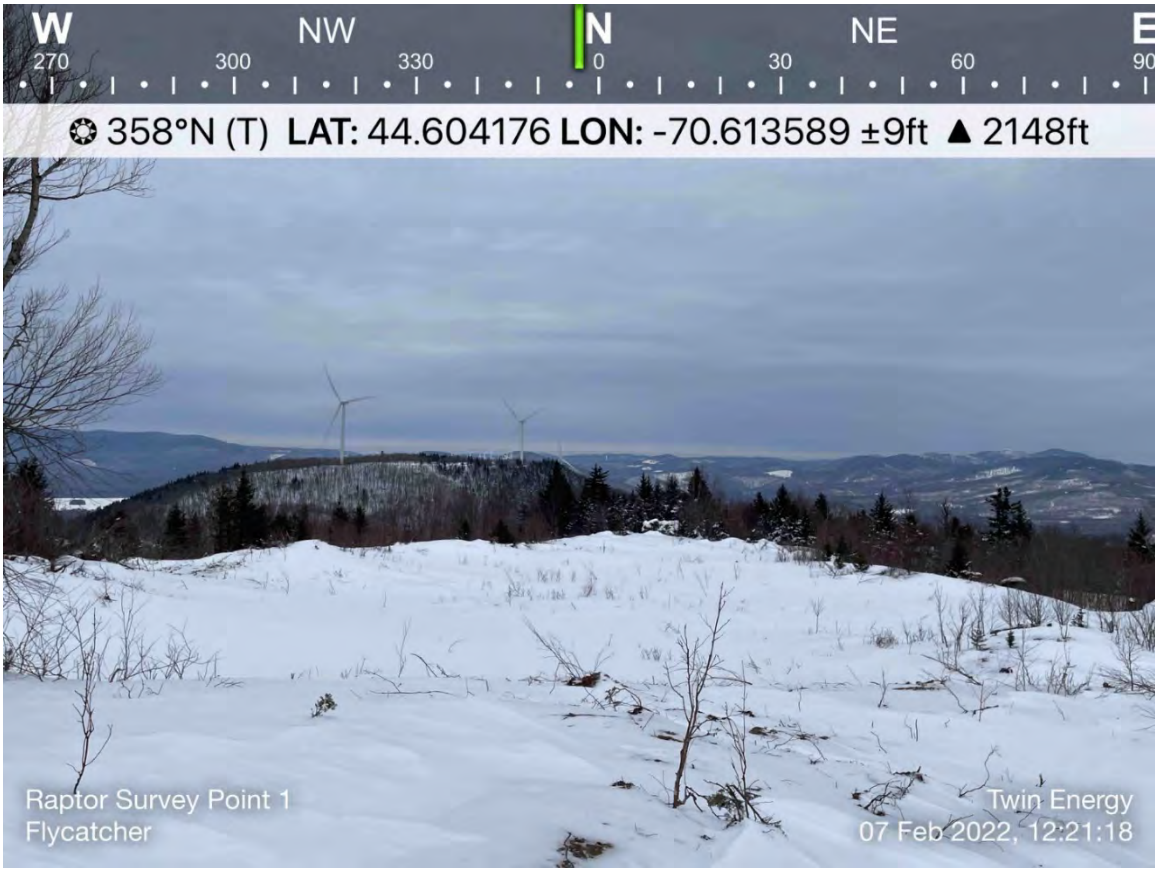
1. Document any non-raptor birds and other unusual or listed wildlife seen during surveys, and any unusual or listed wildlife species seen while traveling between survey locations.

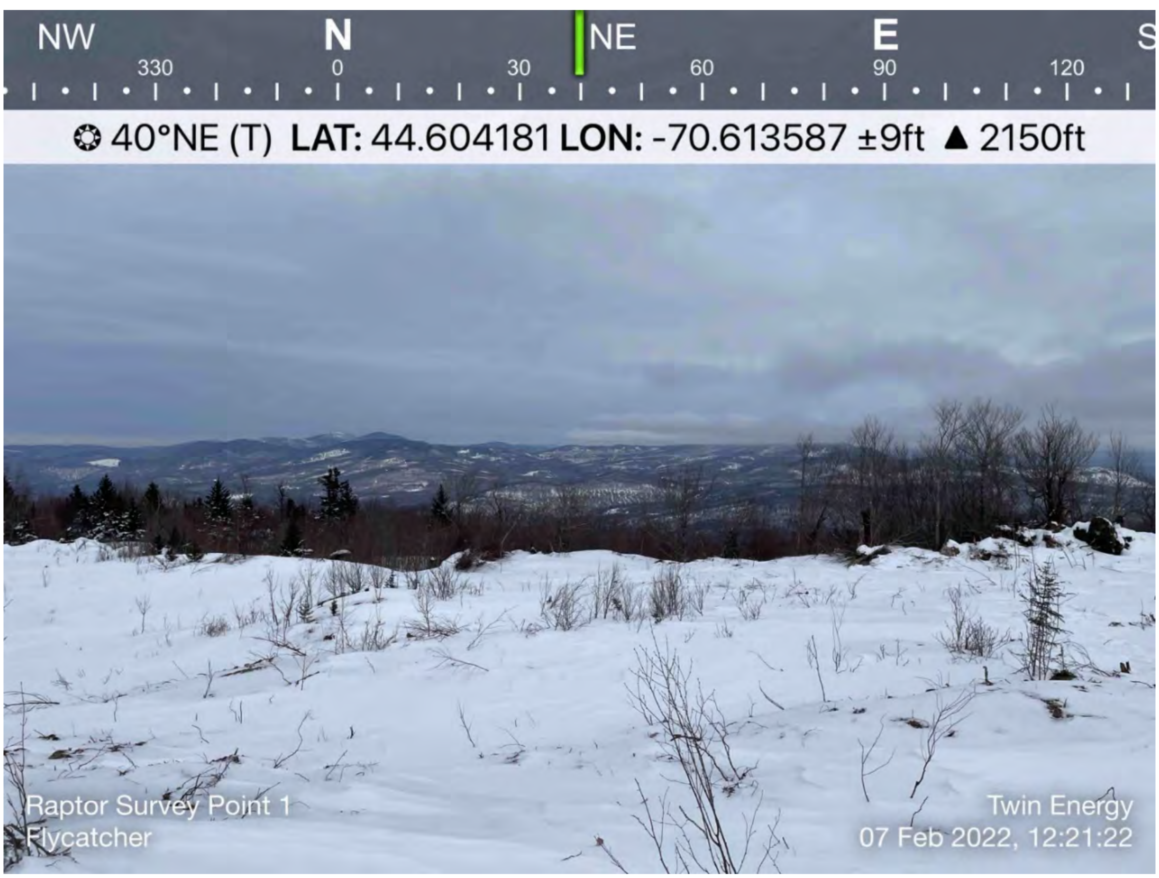
2. Record flight heights (above ground level) and distances to the nearest 5-m (16-ft) Interval.

Panoramic from Raptor Survey Point Location across the northwest to northeast (left to right).

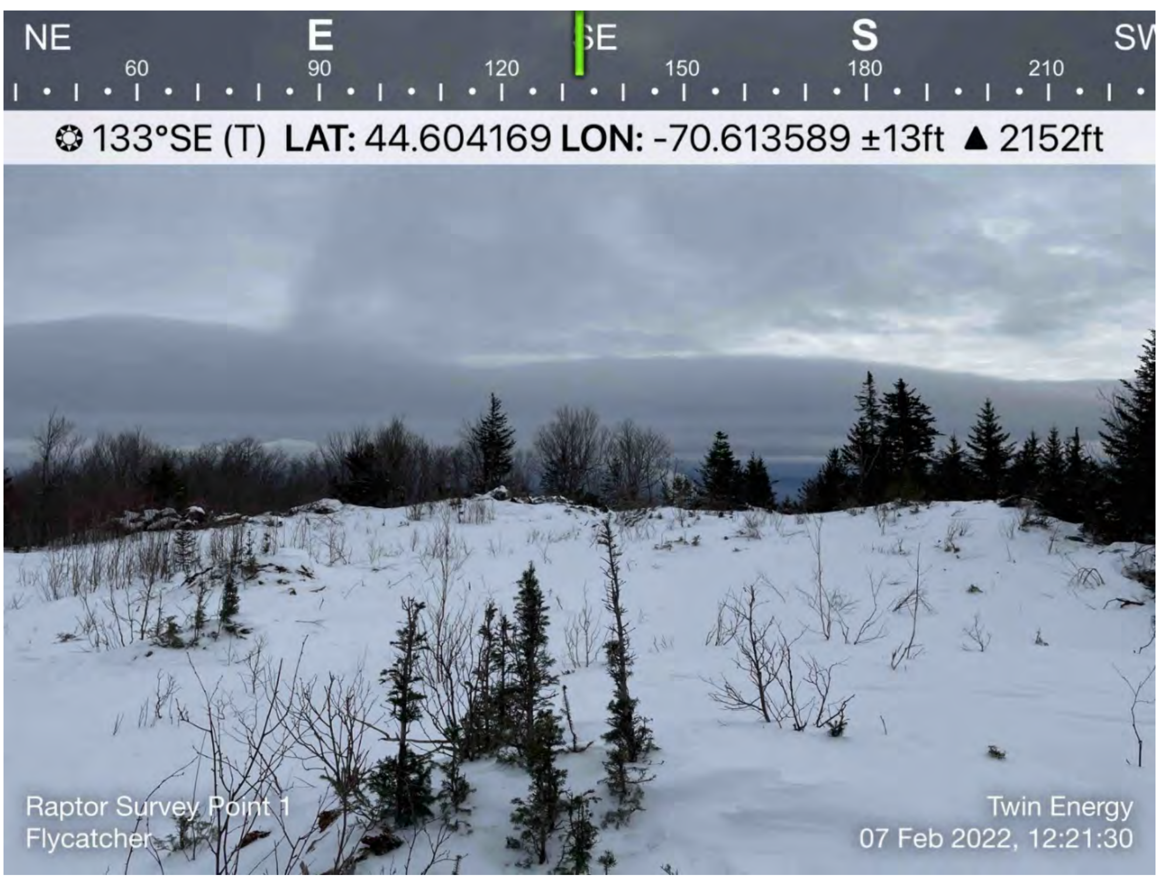
Panoramic from Raptor Survey Point Location across the northwest to northeast (left to right).

Red Stars denote approximate locations of Turbines 1 and 2.


W
NW
N
NE
E
270
300
330
0
30
60
90
358°N (T) LAT: 44.604176 LON: -70.613589 ±9ft ▲ 2148ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:18

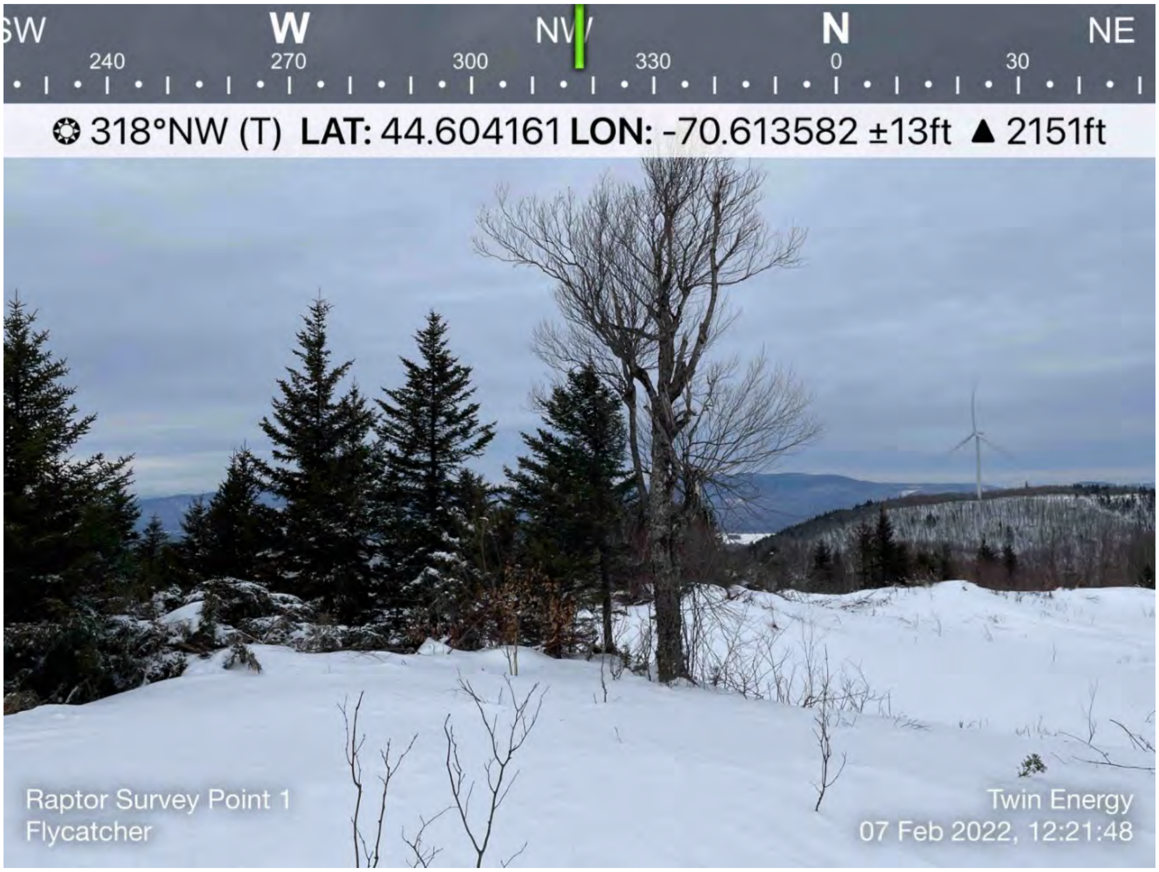

NW
N
NE
E
S
330
0
30
60
90
120
40°NE (T) LAT: 44.604181 LON: -70.613587 ±9ft ▲ 2150ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:22


N
NE
E
SE
0
30
60
90
120
150
85°E (T) LAT: 44.604180 LON: -70.613587 ±9ft ▲ 2153ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:26


NE
E
S
60
90
120
150
180
210
133°SE (T) LAT: 44.604169 LON: -70.613589 ±13ft ▲ 2152ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:30


SE
S
SW
W
120
150
180
210
240
270
190°S (T) LAT: 44.604152 LON: -70.613594 ±13ft ▲ 2149ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:35


S
SW
W
NW
180
210
240
270
300
330
262°W (T) LAT: 44.604153 LON: -70.613581 ±13ft ▲ 2151ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:40


SW
W
NW
N
NE
240
270
300
330
0
30
318°NW (T) LAT: 44.604161 LON: -70.613582 ±13ft ▲ 2151ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:48


NE
E
SE
S
SW
60
90
120
150
180
210
137°SE (T) LAT: 44.603776 LON: -70.613203 ±13ft ▲ 2142ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:29:59

Appendix C. Raptor Observation Data

Date	Time First Seen	Time Last Seen	Species	No. Indiv	Sex (M,F, unkn)	Age (A, J, unkn)	INSIDE 800m radius plot: (Y/N)	Inside Height Min (m)[2]	Inside Height Max (m)	Outside Height Min (m)	Outside Height Max (m)	Cross A Ridge: (Y/N)	Crossed Ridge Min Height (m)	Crossed Ridge Max Height (m)	Behavior Code Inside*	Behavior Code Outside*	Flight Azimuth (general)	Time Above Turbine Height (221m) w/in Array (sec)	Time Below Turbine Height (221m) w/in Array (sec)	Behavior Notes
9/8/2022	13:42:01	13:42:43	AMKE	1	unkn	A	Y	7	11	n/a	n/a	Y	7	11	FG, PE	n/a	190	n/a	42	Flap/glide over S Twin, perches in tree, flew S
9/12/2022	12:01:50	12:04:05	AMKE	1	unkn	A	Y	7	80	n/a	n/a	N	n/a	n/a	FG, PE	n/a	16	n/a	135	Flew from N to perch on guide wire for tower and then atop a spruce tree, flew below treeline to N
8/15/2022	9:29:55	9:30:12	AMKE	1	unkn	A	Y	10	20	n/a	n/a	Y	10	20	PE,FG	n/a	165	n/a	17	Perched on met tower line, flew South
8/25/2022	10:53:02	10:53:16	AMKE	1	unkn	A	Y	10	35	n/a	n/a	Y	10	18	FG	n/a	133	n/a	14	Flap/glide around S Twin peak and to SE
10/31/2022	14:08:42	14:08:55	AMKE	1	unkn	unkn	Y	12	60	n/a	n/a	Y	12	18	FG	n/a	185	n/a	13	Flap/glide over S Twin to S
11/9/2022	9:17:05	9:17:28	AMKE	1	unkn	unkn	Y	15	25	n/a	n/a	Y	15	25	FG	n/a	194	n/a	23	Flapping from NW to SW
9/21/2022	13:45:44	13:47:42	AMKE	1	unkn	A	Y	15	30	n/a	n/a	N	n/a	n/a	FG, PE	n/a	45	n/a	118	Flew to perch on wire and then to tree before going NE
9/8/2022	13:06:55	13:06:59	AMKE	1	unkn	unkn	Y	20	25	n/a	n/a	Y	20	25	FG	n/a	205	n/a	4	Glide over S Twin behind treeline
9/30/2022	13:59:10	13:59:37	AMKE	1	unkn	unkn	Y	20	35	n/a	n/a	N	n/a	n/a	FG	n/a	204	n/a	27	Flap/glide along W side of S Twin
10/6/2022	11:49:10	11:50:08	BAEA	1	unkn	J	Y	40	60	n/a	n/a	N	n/a	n/a	FG,SO	n/a	172	n/a	58	Flap/glide S along S Twin
10/20/2022	14:39:47	14:47:09	BAEA	2	unkn	J	Y	45	280	280	400	Y	45	60	SO,KH	SO	106	15	40	Soaring and kiting in high wind S of S Twin, ravens around
11/28/2022	11:17:00	11:19:00	BAEA	1	unkn	A	Y	170	180	180	220	N	n/a	n/a	FG	FG	0 to 180	n/a	50	Flew north, just west of survey location, buffeted by winds, flew south.
9/8/2022	13:30:15	13:34:07	BAEA	2	unkn	A	Y	200	350	350	450	N	n/a	n/a	SO	SO	205	20	10	Adult pair soaring and circling high in SW valley
11/10/2022	11:37:00	11:37:30	BAEA	1	unkn	A	N	n/a	n/a	30	200	Y	20	30	n/a	FG, SO	90	n/a	n/a	Mainly soaring east with 2 flaps quickly b/t north and south twin
9/2/2022	13:50:00	13:50:32	BAEA	1	unkn	J	N	n/a	n/a	300	800	N	n/a	n/a	n/a	GL	225	n/a	n/a	Bombed S to the E of N and S Twin.
8/16/2022	10:42:45	10:45:10	BWHA	1	unkn	J	Y	6	40	n/a	n/a	Y	6	40	SO	n/a	190	n/a	145	Soared from NE over S Twin to the South
8/25/2022	12:28:40	12:30:55	BWHA	1	unkn	J	Y	15	230	230	260	N	n/a	n/a	SO	SO	180	5	120	Soaring SW of S Twin
8/30/2022	11:08:23	11:10:45	BWHA	2	unkn	A,J	Y	15	105	n/a	n/a	N	n/a	n/a	SO,FG	n/a	266	n/a	142	Flew from NW w/obs#2, circled and flew SW
8/30/2022	11:41:30	11:44:55	BWHA	2	unkn	unkn	Y	20	300	300	320	Y	20	30	SO,FG	SO	290	120	60	Likely obs#2 or #1, soaring high, flew over to NW
8/30/2022	11:08:23	11:11:50	BWHA	2	unkn	A,J	Y	25	180	180	205	N	n/a	n/a	SO,SB	FG	202	n/a	200	Split from obs#1, cicles and dove at obs #1, flew W
8/10/2022	12:41:20	12:44:13	BWHA	2	unkn	J	Y	25	60	n/a	n/a	Y	25	30	SO	n/a	185	n/a	173	From East, soaring and circling west of S Twin
9/9/2022	10:35:20	10:37:00	BWHA	2	unkn	A	Y	40	100	40	400	N	n/a	n/a	SO, FG	SO, FG	270	20	20	Circled to W of S Twin, rising higher and higher, then left flying W.
8/30/2022	13:08:05	13:11:35	BWHA	1	unkn	A	Y	40	200	200	220	N	n/a	n/a	SO,FG	FG	135	n/a	95	Split from RTHA after showing mobbing behavior, went SE
9/21/2022	12:44:20	14:47:05	BWHA	1	unkn	J	Y	70	220	220	300	Y	70	85	SO	SO	120	n/a	125	Soaring over S Twin to SW
9/8/2022	12:31:15	12:32:29	BWHA	3	unkn	unkn	Y	90	160	160	280	Y	90	100	SO	SO	210	46	30	Soaring in SE valley belows obs#6
9/21/2022	15:09:35	15:11:48	BWHA	1	unkn	A	Y	100	230	n/a	n/a	Y	100	130	SO	SO	250	15	118	Soaring over S Twin to W
8/15/2022	10:25:50	10:28:35	BWHA	1	unkn	J	Y	120	310	200	260	N	n/a	n/a	SO	SO	260	30	5	Circled SE w/obs#3 and split towards NW
8/15/2022	10:25:50	10:31:10	BWHA	1	unkn	A	Y	120	310	260	560	N	n/a	n/a	SO	SO	130	35	5	Circled w/obs#2 and soared off to SE
9/8/2022	12:31:10	12:36:04	BWHA	2	unkn	unkn	Y	300	350	300	450	Y	300	310	SO	SO	240	200	n/a	Soaring high over S Twin and SE valley
9/8/2022	10:45:00	10:47:30	BWHA	1	unkn	unkn	N	n/a	n/a	20	110	Y	20	30	n/a	SO	5	n/a	n/a	Circling in NW valley, flew N
9/8/2022	10:45:00	10:46:28	BWHA	1	unkn	unkn	N	n/a	n/a	50	180	N	n/a	n/a	n/a	SO	315	n/a	n/a	circling in NW valley, flew NW
8/22/2022	10:41:05	10:41:10	BWHA	1	unkn	A	N	n/a	n/a	200	800	N	n/a	n/a	n/a	SO/FG	0	n/a	n/a	Flew in from east soaring higher and higher, then glided north.
9/21/2022	11:16:56	11:18:32	BWHA	1	unkn	J	N	n/a	n/a	280	320	N	n/a	n/a	n/a	FG	316	n/a	n/a	Flap/glide in NE valley
8/11/2022	12:20:00	12:24:00	BWHA	1	unkn	A	N	n/a	n/a	430	820	Y	430	440	n/a	SO/FG	270	n/a	n/a	Flew in from east soaring higher and higher over North Twin Mtn, then bombed/ glided swiftly to the northwest
10/19/2022	12:35:39	12:36:09	COHA	1	unkn	unkn	Y	40	65	n/a	n/a	N	n/a	n/a	FG,KH	n/a	235	n/a	30	Flap/glide and kiting to the W
8/10/2022	13:21:10	13:24:26	COHA	1	unkn	J	Y	50	220	200	230	Y	50	120	FG	FG	154	n/a	135	Split from obs#4 and circled over S Twin to the south
10/11/2022	12:58:34	13:11:30	COHA	1	unkn	A	Y	120	140	140	270	Y	120	140	SO	FG	215	n/a	35	Flew in valley between Twins to NW and then eventually circled back along S Twin
11/29/2022	11:27:58	11:28:20	NOGO	1	unkn	A	Y	25	75	n/a	n/a	Y	25	75	FG	n/a	7	n/a	22	Flap/glide into valley between Twins
9/15/2022	13:52:05	13:52:23	OSPR	1	unkn	unkn	Y	290	300	285	290	Y	290	300	FG	FG	270	n/a	14	
8/3/2022	10:48:15	10:51:15	RLHA	1	unkn	A	N	n/a	n/a	440	800	Y	290	300	n/a	SO/FG	90	n/a	n/a	Soaring higher and higher over North Twin Mtn, then bombed/ glided swiftly east
10/6/2022	10:01:46	10:04:32	RTHA	1	unkn	A	Y	8	15	n/a	n/a	Y	8	15	PE,FG	n/a	8	n/a	166	Perched on top of spruce on S Twin, dropped into valley
10/20/2022	10:34:08	10:34:30	RTHA	1	unkn	A	Y	18	30	n/a	n/a	N	n/a	n/a	MB	n/a	190	n/a	22	Being mobbed by ravens
10/6/2022	13:44:30	13:44:37	RTHA	1	unkn	J	Y	18	35	n/a	n/a	N	n/a	n/a	FG,SB	n/a	295	n/a	7	Glide and dove over S Twin to NW
10/6/2022	13:21:11	13:21:50	RTHA	1	unkn	J	Y	20	80	n/a	n/a	N	n/a	n/a	FG	n/a	172	n/a	39	Soaring S next to S Twin
10/20/2022	11:08:05	11:08:45	RTHA	1	unkn	A	Y	20	100	n/a	n/a	N	n/a	n/a	MB	n/a	265	n/a	40	Being mobbed by ravens
11/23/2022	10:05:38	10:08:50	RTHA	1	unkn	unkn	Y	40	180	180	380	N	n/a	n/a	KH, FG	KH,FG	340	n/a	110	Kiting beside Twins, flew NW
10/19/2022	12:53:58	12:55:00	RTHA	1	unkn	J	Y	50	120	n/a	n/a	Y	50	60	FG	n/a	220	n/a	62	Flap glide from valley btwn Twins, lots of ravens around
10/19/2022	12:04:07	12:07:03	RTHA	1	unkn	A	Y	60	220	220	350	N	n/a	n/a	FG,KH	FG,SO	230	n/a	65	Flap/glide and kiting to the W of N Twin
8/30/2022	13:08:05	13:11:35	RTHA	1	unkn	unkn	Y	60	250	250	260	N	n/a	n/a	SO,MB	KH,SO	210	5	195	Flew S of S Twin w/obs#5, kiting and circling to the S
11/23/2022	11:13:05	11:13:30	RTHA	1	unkn	unkn	Y	60	260	260	340	N	n/a	n/a	KH,FG	FG	275	25	90	Kiting to the W of S Twin
11/3/2022	13:02:40	13:05:05	RTHA	1	unkn	unkn	Y	65	260	250	260	N	n/a	n/a	SO, SB	SO	280	20	120	Soaring, diving around ravens
10/6/2022	12:16:24	12:18:23	RTHA	2	unkn	A,J	Y	65	150	n/a	n/a	N	n/a	n/a	SO	n/a	210	n/a	119	Adult and Juvenile circling on W side of S Twin
10/19/2022	15:46:43	15:47:03	RTHA	1	unkn	J	Y	80	160	160	140	Y	80	100	SO	SO	90	n/a	18	Direct soar to E over S Twin
10/19/2022	13:38:08	13:40:31	RTHA	1	unkn	J	Y	100	120	80	230	Y	100	120	FG	FG	270	n/a	11	Flap glide between Twins to W
10/31/2022	13:06:04	13:06:28	RTHA	1	unkn	unkn	Y	105	165	150	265	N	n/a	n/a	FG	FG	290	n/a	22	Flap/glide above treeline to NW
11/3/2022	14:54:09	14:57:51	RTHA	1	unkn	A	Y	120	240	240	270	N	n/a	n/a	SO, MB	MB	235	33	180	Being mobbed by 9 ravens
10/6/2022	13:49:17	13:51:30	RTHA	1	unkn	A	Y	200	220	100	200	N	n/a	n/a	SO	SO	350	n/a	73	Soaring w/obs#9 over valley and flew N
10/6/2022	13:49:17	13:57:35	RTHA	1	unkn	J	Y	200	220	200	270	Y	120	200	SO	SO,MB	348	n/a	73	Soaring w/obs#8 circling high over N Twin, mobbed by raven
10/19/2022	13:09:07	13:11:02	RTHA	1	unkn	unkn	N	n/a	n/a	106	230	N	n/a	n/a	n/a	KH,FG	346	n/a	n/a	Kiting over N Twin and flew to NW
10/19/2022	13:29:32	13:30:50	RTHA	1	unkn	unkn	N	n/a	n/a	130	280	Y	130	160	n/a	FG	77	n/a	n/a	Flap glide over N Twin ridge to NE

9/28/2022	12:05:05	12:05:20	RTHA	1	unkn	unkn	N	n/a	n/a	200	500	N	n/a	n/a	n/a	SO, FG	225	n/a	n/a	Bombed souheast and out of sight. Identified by call.
9/21/2022	11:03:58	11:05:59	RTHA	1	unkn	J	N	n/a	n/a	320	350	N	n/a	n/a	n/a	SO, KH	270	n/a	n/a	Soaring and kiting the the E near TUVU
11/18/2022	10:16:15	10:16:31	SSHA	1	unkn	J	Y	3	8	n/a	n/a	Y	3	8	FG	n/a	76	n/a	16	Female adult or juvenile: Gliding low from N, ducked into treeline
9/15/2022	9:25:01	9:25:11	SSHA	1	unkn	unkn	Y	10	15	n/a	n/a	N	n/a	n/a	FG	n/a	270	n/a	10	Flew west just above treeline just north of S. Twin, then dipped down into trees.
10/12/2022	12:20:00	12:20:20	SSHA	1	unkn	A	Y	15	20	n/a	n/a	Y	15	10	FG	n/a	135	n/a	20	Appeared overhead flying quickly, low, and dissapeared below mountain.
8/4/2022	16:35:27	16:35:36	SSHA	1	unkn	unkn	Y	40	55	n/a	n/a	Y	40	55	FG	n/a	240	n/a	9	Flap/glide just north of S Twin to the west
11/2/2022	12:30:39	12:30:52	SSHA	1	unkn	unkn	Y	40	90	n/a	n/a	N	n/a	n/a	FG	n/a	290	n/a	13	Flap/glide strong wind to W
10/19/2022	13:18:36	13:20:19	SSHA	1	unkn	A	Y	230	350	230	250	Y	230	250	FG	FG	95	84	n/a	Soaring E high over S Twin
9/21/2022	11:03:58	11:18:30	TUVU	3	unkn	unkn	Y	3	180	180	220	Y	3	20	SO	SO	0	n/a	780	Soaring and circling all over S Twin to W
9/21/2022	11:14:33	11:20:56	TUVU	1	unkn	unkn	Y	5	60	n/a	n/a	Y	5	20	SO	n/a	15	n/a	383	Soared with obs#3 circling over S Twin split E
8/16/2022	10:57:50	10:58:01	TUVU	1	unkn	A	Y	8	30	n/a	n/a	N	n/a	n/a	SO	n/a	65	n/a	11	Soared from NE, turned East at S Twin
8/25/2022	11:24:39	11:25:52	TUVU	1	unkn	A	Y	8	130	n/a	n/a	N	n/a	n/a	SO	n/a	260	n/a	63	Soared west of S Twin
9/9/2022	14:30:20	14:31:10	TUVU	2	unkn	A	Y	10	20	20	100	N	n/a	n/a	SO, FG	SO, FG	180	n/a	40	Flew in from W, circled directly over S Twin twice, then left flying south.
8/16/2022	13:28:14	13:28:24	TUVU	1	unkn	unkn	Y	12	30	n/a	n/a	Y	12	30	SO	n/a	130	n/a	10	Soaring over S Twin to SE
8/25/2022	16:04:00	16:04:13	TUVU	1	unkn	A	Y	12	40	n/a	n/a	N	n/a	n/a	SO	SO	270	n/a	13	Soaring SW along S Twin
8/10/2022	13:18:28	13:21:10	TUVU	1	unkn	A	Y	15	120	120	260	Y	15	20	SO	SO	97	n/a	90	Crossed S Twin, soaring East
10/20/2022	12:06:46	12:07:33	TUVU	1	unkn	A	Y	15	150	150	170	Y	15	30	SO	SO	340	n/a	27	Soaring over S Twin to NW valley
9/8/2022	12:26:26	12:36:00	TUVU	1	unkn	A	Y	20	180	170	200	Y	20	30	FG	n/a	300	n/a	180	Flew above treeline to S, circled with BWHA and obs#7
10/6/2022	12:47:52	12:48:14	TUVU	1	unkn	unkn	Y	25	100	n/a	n/a	N	n/a	n/a	SO	n/a	178	n/a	22	Soaring from N Twin over S Twin
8/25/2022	17:16:35	17:17:04	TUVU	1	unkn	A	Y	30	150	140	150	Y	30	140	FG	FG	105	n/a	21	Flap/glide between Twin Mtns to E
10/6/2022	13:27:36	13:30:43	TUVU	1	unkn	A	Y	30	175	175	185	Y	30	65	SO,FG	FG	264	n/a	183	Soaring over S Twin and off to W
8/10/2022	13:21:10	13:23:50	TUVU	1	unkn	A	Y	40	180	160	220	Y	40	50	SO	SO	114	n/a	65	Crossed S Twin w/obs#3, split and circled in the East
9/28/2022	14:14:50	14:15:20	TUVU	1	unkn	A	Y	50	60	60	100	N	n/a	n/a	SO	SO	180	5	20	Glided south almost directly overhead.
10/6/2022	15:26:05	15:27:11	TUVU	1	unkn	A	Y	55	80	n/a	n/a	Y	55	60	SO	n/a	138	n/a	66	Soar over S Twin from the NW valley to SE
10/6/2022	14:56:44	14:57:05	TUVU	1	unkn	A	Y	60	70	n/a	n/a	N	n/a	n/a	SO	n/a	270	n/a	21	Soar across S side of S Twin
10/7/2022	14:55:00	14:56:00	TUVU	1	unkn	A	Y	80	100	100	400	Y	80	90	SO,FG	SO, FG	270	n/a	20	Soared west with few flaps between N and S Twin.
9/21/2022	10:33:47	10:55:14	TUVU	2	unkn	unkn	Y	90	100	100	340	Y	30	45	SO	SO	360	n/a	10	Did not see from 10:34:00-10:41:01. Soar NE in valley, crossed valley to N.
9/8/2022	10:27:20	10:40:30	TUVU	2	unkn	unkn	Y	95	105	20	100	Y	95	105	SO	SO	90	n/a	10	Circling along N Twin ridge, flew in valley
9/2/2022	13:24:20	13:24:38	TUVU	1	unkn	A	Y	95	100	95	160	Y	95	100	GL	GL	135	n/a	8	Flew between N and S Twin and then banked and flew S
9/8/2022	12:33:33	12:36:00	TUVU	1	unkn	A	Y	100	110	110	160	N	n/a	n/a	SO	SO	300	n/a	120	Joins obs#4
8/22/2022	12:21:10	12:21:50	TUVU	1	unkn	A	Y	100	130	130	300	N	n/a	n/a	SO/FG	SO/FG	345	10	n/a	Flew north, to the west of North and South Twin Mtns.
8/16/2022	15:18:53	15:20:05	TUVU	1	unkn	A	N	n/a	n/a	40	280	Y	40	45	n/a	SO	0	n/a	n/a	Soaring in NE valley to NE
10/19/2022	10:43:50	10:45:25	TUVU	1	unkn	unkn	N	n/a	n/a	40	230	Y	40	50	n/a	SO	330	n/a	n/a	Soaring in the N, flew to ridge line
8/16/2022	11:54:25	11:54:30	TUVU	2	unkn	unkn	N	n/a	n/a	60	110	N	n/a	n/a	n/a	SO	310	n/a	n/a	Soaring low in NE valley
9/21/2022	14:45:20	14:50:36	TUVU	1	unkn	unkn	N	n/a	n/a	100	310	Y	100	120	n/a	FG, SO	90	n/a	n/a	Gliding and soaring over N Twin ridge with ravens, soared E
10/7/2022	14:55:50	14:56:30	TUVU	1	unkn	A	N	n/a	n/a	100	500	N	n/a	n/a	n/a	SO,FG	0	n/a	n/a	Soared north, west of Twin mountains.
9/30/2022	11:19:39	11:20:47	TUVU	1	unkn	A	N	n/a	n/a	120	200	Y	120	150	n/a	SO	280	n/a	n/a	Soaring between Twin to W
9/2/2022	12:54:30	12:54:50	TUVU	1	unkn	unkn	N	n/a	n/a	200	300	N	n/a	n/a	n/a	SO, FG	90	n/a	n/a	Flew NE to the NW of N Twin, appearing brifefly and then out of sight
9/9/2022	10:35:05	10:35:25	TUVU	1	unkn	A	N	n/a	n/a	200	400	N	n/a	n/a	n/a	SO, FG	90	n/a	n/a	Flew E beyond N Twin Mtn out of sight.
9/28/2022	12:24:07	12:25:00	TUVU	1	unkn	A	N	n/a	n/a	200	300	N	n/a	n/a	n/a	SO/ FG	135	n/a	n/a	Glided, hovering southwest and then out of sight.
8/3/2022	9:45:00	9:43:35	TUVU	1	unkn	A	N	n/a	n/a	220	440	N	n/a	n/a	n/a	FG	180	n/a	n/a	Gliding south, to the east of North and South Twin Mtns
8/11/2022	14:12:00	14:12:40	TUVU	1	unkn	A	N	n/a	n/a	300	500	N	n/a	n/a	n/a	SO/FG	180	n/a	n/a	Flew south, to the east of North and South Twin Mtns
9/23/2022																				Really windy cold day. No raptors seen. Only raven and crow.
10/25/2022																				
11/14/2022																				
11/22/2022																				
12/5/2022																				
12/8/2022																				
12/12/2022																				
12/15/2022																				
*Flight Behavior Codes: SO: soaring, PE: perched, FG: flap or glide, KH: kiting or hovering, MB: being mobbed, UT: undulating, territorial flight< SB: stooping or diving in response to another bird, SP: stooping or diving on prey, FO: foraging.																				

Spring 2023: Pre-Construction Eagle Use and Raptor Migration Survey Report

Twin Energy Project - Oxford County, Maine

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July 2023

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INTRODUCTION

PROJECT DESCRIPTION

The Twin Energy Project (Project) is a proposed wind electric generation facility located on South Twin Mountain in Rumford and Roxbury, Maine. Twin Energy LLC (Twin Energy) is proposing to install three wind energy turbines, each with a nameplate capacity of approximately six-megawatts. The access road and collector line are proposed to extend from the existing RoxWind project in Roxbury southerly to South Twin Mountain in Rumford.

The proposed Project includes three turbines that generally are aligned from west to east, with elevations ranging between 1,950 and 2,155 feet, along the northern ridge of South Twin Mountain. The proposed turbines will each have a hub height of approximately 384-feet (117 meters), blade tip height of approximately 645-feet (196 meters), and total blade swing diameter of approximately 490-feet (149 meters). The access road and collector line are proposed to extend from the existing RoxWind project in Roxbury southerly to South Twin Mountain in Rumford.

Flycatcher LLC (Flycatcher) was contracted by Twin Energy to complete eagle use and raptor migration surveys to aid in Project siting and to support permitting requirements for the Project. Flycatcher biologists consulted with the Maine Department of Inland Fisheries and Wildlife (MDIFW), and the United States Fish and Wildlife Service (USFWS) to develop a site-specific survey plan that will collect sufficient data to support these two agencies in making a determination about the Project during their respective review processes.

SURVEY BACKGROUND

During pre-survey consultations, MDIFW and USFWS recommended that eagle and raptor surveys be completed to support their review and meet the Project's obligations for permitting under the Maine Department of Environmental Protection (MDEP) Site Location of Development Act (Site Law: MDEP, 2019), and the US Army Corps of Engineers (USACE) Maine General Permits (GP: USACE, 2020).

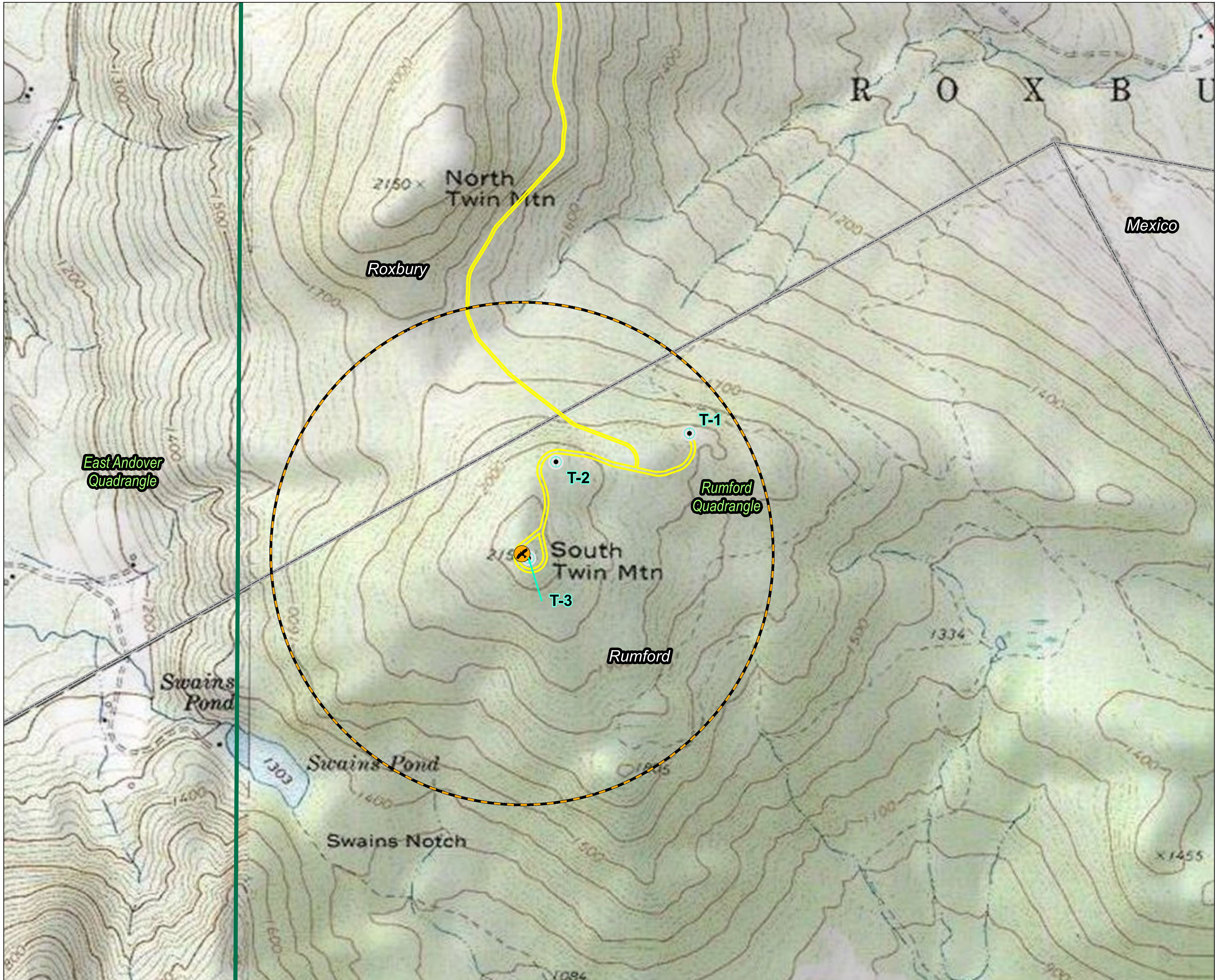
Flycatcher developed a draft survey plan that was provided to both MDIFW and USFWS for comment and review during the winter of 2022. Following this review, slight modifications were made to the survey plan to collect data that could be used in USFWS's collision risk model. The survey plan was approved by both MDIFW and USFWS in early February 2022. The first round of twice weekly surveys commenced on February 15 and extended through June 15, 2022. The second round of surveys (Fall 2022) began on August 3 and extended through December 15, 2022. Figures 1 and 2, depict the Project area and raptor survey location.

In addition to direct consultation with the MDIFW and USFWS, Flycatcher's survey methods were informed by the protocols detailed in the MDIFW 2018 Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality (2018 Recommendations: MDIFW, 2018), and the USFWS Eagle Conservation Plan Guidance (ECPG), Module 1 – Land-based Wind Energy, Version 2, 2013 (ECPG: USFWS, 2013).

SURVEY OBJECTIVES

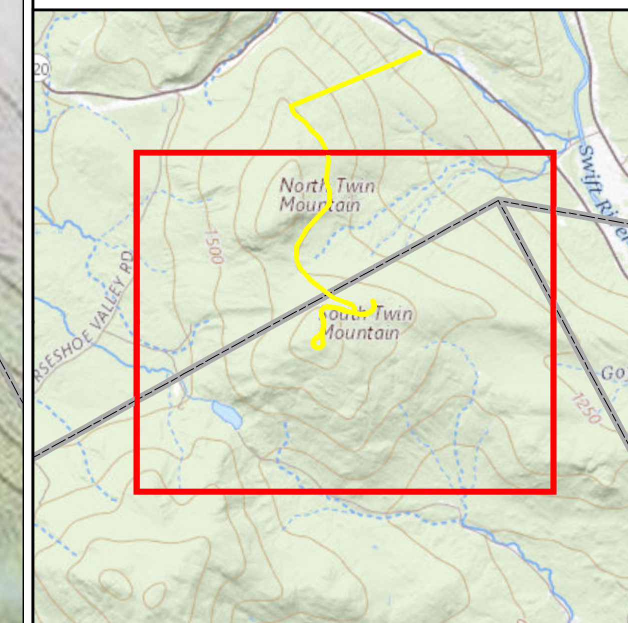
Eagle and raptor migration data collected during the spring 2023 survey are presented in this report to provide developers and reviewing agencies with site-specific data to inform decision making during the planning and permitting processes, including review by MDIFW and USFWS. The information presented in this report is intended to support avoidance and minimization of potential Project impacts to eagles and migrating raptor species. Gaining an understanding of how eagles and raptors use the proposed Project site and surrounding area supports turbine siting parameters, operational practices, and the development of best practices to protect species.

Surveys were completed to collect site-specific information typically necessary for MDIFW to make a determination on the Projects’ potential impacts to raptors. Additionally, data was collected in a way that will allow USFWS to use their collision-risk model to determine the potential risk the proposed Project has to negatively impact eagles. This model supports decision making regarding the potential need for a wind project to apply for a take permit. Evaluating the data collected from this survey is a key part of the take permitting process.



LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- RAPTOR SURVEY LOCATION
- 800M RADIUS SAMPLE AREA
- USGS 7.5-MINUTE QUADRANGLE BOUNDARY
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM USGS 7.5' QUADRANGLE SERIES.

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Feet
1 " = 1,000 '
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PROJECT:
TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
USGS RAPTOR SURVEY LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	R. KELSHAW	**FIGURE 1**	
MONTH:	JUNE		
YEAR:	2022		

Flycatcher LAND • SCIENCE • PEOPLE
PALMER

FILE NO.: Palmer_TwinEnergy_RaptorMethods_Fig1_USGS_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

Plot Date: 6/27/2022, 14:15:05 PM by JAKEN -- LAYOUT: ANSI B(11"x17")
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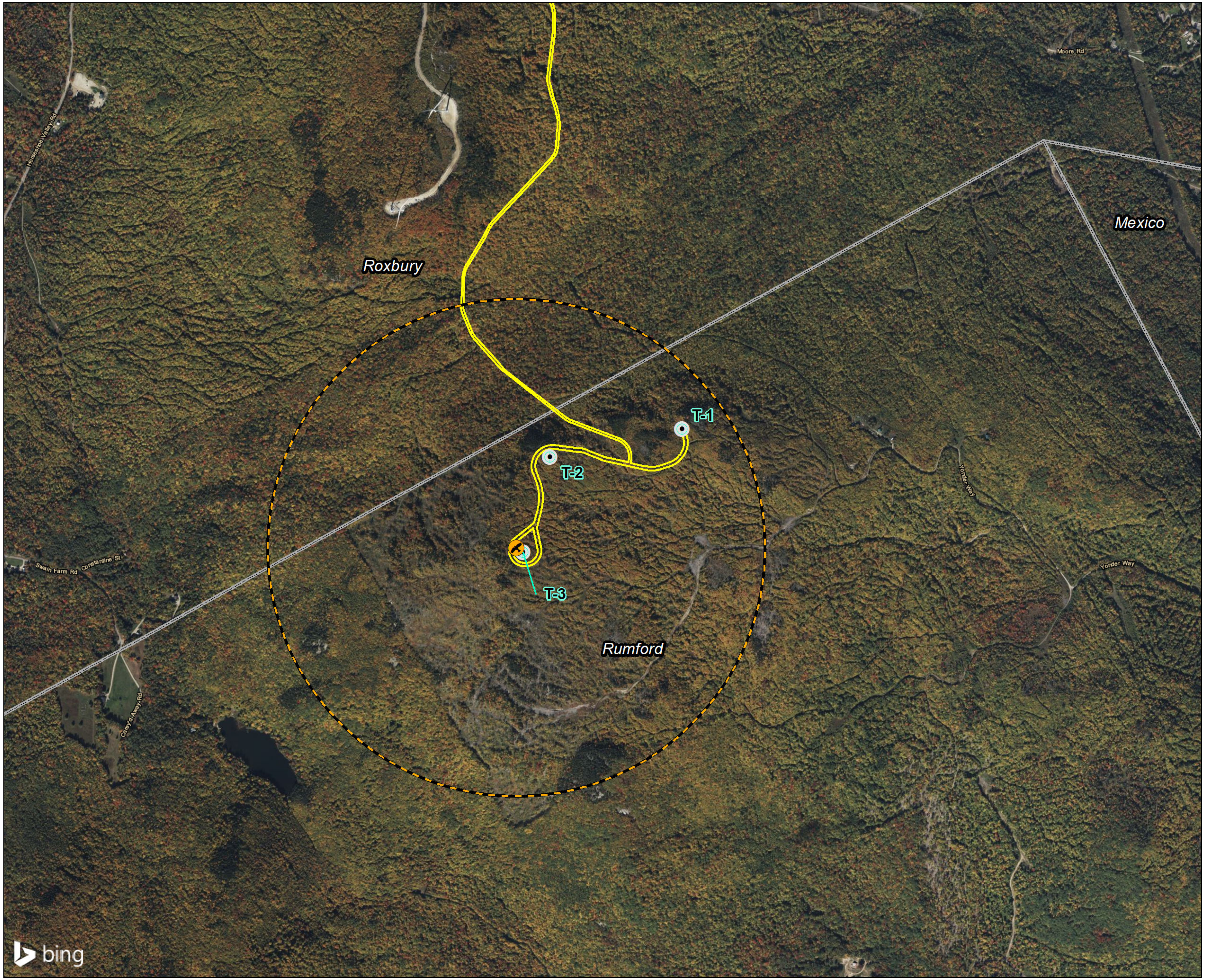
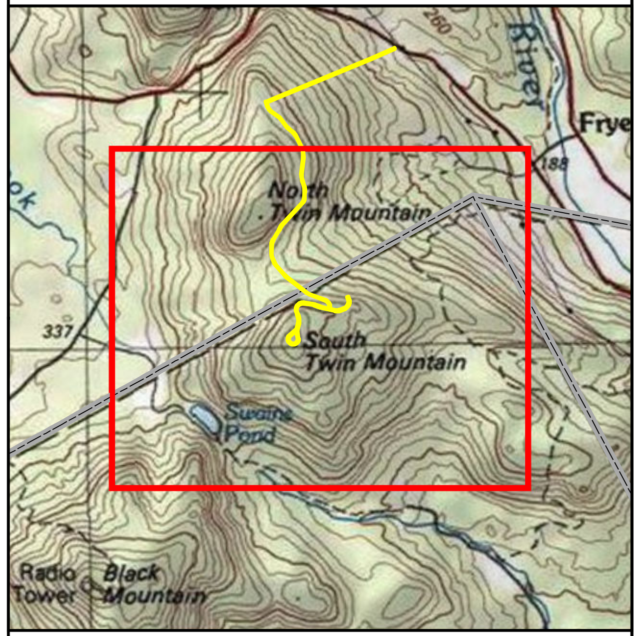
Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0



LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- RAPTOR SURVEY LOCATION
- 800M RADIUS SAMPLE AREA
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM BING AERIAL IMAGERY.

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Feet
1 " = 1,000 '
1:12,000

PROJECT:
TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
AERIAL RAPTOR SURVEY LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	R. KELSHAW	**FIGURE 2**	
MONTH:	JUNE		
YEAR:	2022		

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FILE NO.: Palmer_TwinEnergy_RaptorMethods_Fig2_Aerial_11x17L.mxd

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EAGLE USE AND RAPTOR MIGRATION SURVEYS

SURVEY SUMMARY

In this summary, the term “raptor” includes eagle and raptor species. A total of 92 raptors were observed during the spring 2023 surveys, 86 raptors were observed during raptor surveys (March 1 – June 15) and six (6)raptors were observed while travelling from the parking area at the intersection of Swift River Road and Yonder Way located in Mexico, Maine, to the raptor survey location (Figures 1 and 2) at the top of South Twin Mountain in Rumford, Maine (the Survey Location). No additional raptors were observed during eagle use surveys, which started February 21, 2023.

Of the 86 raptors observed during spring 2023 surveys, 50 (58%) occurred within the 800-meter plot of the Survey Area and 46 (53%) occurred both within the 800-meter plot and at flight heights below the Survey Area height (221 meters) for at least a portion of their flight. The spring seasonal observation rate for raptors observed during raptor surveys was 0.33 raptors/hour. The spring seasonal observation rate for raptors seen within 800 meters of the Survey Location during raptor surveys was 0.19 raptors/hour.

A total of eight (8) bald eagles (*Haliaeetus leucocephalus*) were documented resulting in an observation rate of 0.03 eagles/hour (Table 4). Five (5) out of eight (8) (62%) of these eagle observations occurred within 800 meters of the Survey Location and four (4) out eight (8) (50%) were both within 800m and below the maximum survey height of 221 meters (Table 4). The observation rate for eagles within 800 meters of the Survey Location was 0.02 eagles/ hour.

SURVEY METHODS

Survey Description and Location

The Survey Area encompasses a three-dimensional cylindrical plot with a radius of 2,625-feet (800 meters) from the Survey Location (Figures 1 and 2), and a distance above the ground of 725-feet (221-meters), which is 82-feet (25 meters) above maximum turbine blade height of 196 meters. The Survey Location was selected during a site visit in early February 2022 and is situated on a prominent location at the top of South Twin Mountain, near proposed Turbine 3. A recent clearing for the installation of a temporary metrological tower created an ideal location for viewing raptor movements within the proposed turbine array (Figures 1 and 2). The viewshed from this point has nearly unobstructed views to the northwest beyond Ellis Pond and the RoxWind project, and to the east beyond Swift River and Roxbury Mountain. The viewshed encompasses the entire proposed Project area. There is also a view south toward the mill in Rumford and Black Mountain and unobstructed overhead views. Photos of the Survey Location are included in Appendix A.

The Survey Location and Survey Area meet the standards described in the ECPG (USFWS 2013). For this survey, the Project footprint, or the minimum convex polygon around the turbines, is a one-kilometer radius from the three proposed turbine locations (4.58 square kilometers). The 800-meter radius (2.01 square kilometers) Survey Area covers 44% of the total Project footprint (USFWS 2013). This exceeds the recommendation outlined in the ECPG (USFWS 2013) to cover a minimum of 30% of the area within one kilometer of proposed turbines. Additionally, this encompasses 100% of the three proposed turbine locations (Figures 1 and 2).

Surveys consisted of point-based recordings of raptor and eagle flight activity (minutes and direction of flight) in proximity to the three-dimensional cylindrical sample plot or Survey Area. The buffer of 25 meters above the maximum blade reach

was included in the Survey Area based on guidance from USFWS and per recommendations outlined in Title 50 of the Code of Federal Regulations (50 CFR 22.80(d)(3)(ii)(A)).

Note that in the following "Survey Area" references the entire cylindrical plot, "800-meter plot" references the horizontal limit of the Survey Area, which is 800 meters from the central Survey Location, and "Survey Area height" references the area 221 meters above the ground, which is a buffer of 25 meters beyond the proposed turbine height of 196 meters.

Data Collection

Flycatcher conducted eagle use surveys from February 15 to June 15 for a total of 279 hours. Raptor migration surveys were conducted from March 1 to June 15 for a total of 260 hours. Survey days were scheduled on days with forecasted good visibility and fair weather, however, as weather changes rapidly in mountainous regions, surveys included days with variable weather conditions. Surveys were conducted from 0900 hours to 2-hours before sunset to target peak hours of raptor movement, unless conditions impeded access or hazardous weather dictated ending surveys early.

Stationed at the survey location, observers scanned the surrounding area using binoculars and a spotting scope. Data collected included the observer's name, the date of the survey, the survey start and end time, and hourly weather details including temperature, wind speed and direction, visibility, sky conditions, and cloud type. Observed raptors were recorded on the data sheet and the flight path was sketched on a map. The following was recorded for each observation:

1. Time of observation;
2. Total observation time seen;
3. Species;
4. Number of individuals;
5. Sex (when possible);
6. Age (when possible);
7. If the bird occurred within 800-meter plot;
8. Time above and below Survey Area height (221 meters);
9. If the bird crossed a ridge;
10. The flight height above ground level inside and outside the 800-meter plot, and flight height if it crossed a ridge;
11. Flight azimuth or direction; and
12. Description of general flight behavior and activity.

Non-raptor avian species were also documented as incidental wildlife observations during surveys.

Data Summary and Analysis

Raptor observation data were evaluated by the following metrics:

1. Seasonal observation rates (number of raptor observations per hour);
2. Number of species and individuals;
3. Hourly observation totals (and survey hour totals);
4. Percentage of birds observed within 800-meter plot;
5. The percentage of birds seen below Survey Area height (221 meters);
6. Percentage of birds observed crossing ridges inside 800-meter plot; and
7. Mean minimal and mean overall flight height of birds inside, crossing a ridge inside, and outside the 800-meter plot.

Survey Results

Survey Effort and Weather

Eagle use surveys were conducted for a total of 33 days and 279 survey hours, and raptor surveys were conducted concurrently, for a total of 30 days and 260 hours.

Wind direction was variable throughout the survey period; however, winds most often blew from the NW. Wind speeds ranged from calm, zero miles per hour (mph), to strong, 19-24 mph, but were most often 4 to 8mph. Sky conditions ranged from clear, to cloudy and overcast, and were most frequently cloudy or overcast, or partly cloudy. Seasonal temperatures ranged from a low of 9ºF on February 27 to a high of 86ºF on June 1. Table 1 summarizes the weather conditions throughout the survey period.

Table 1. Daily Weather Conditions, Twin Wind Energy Project, Spring 2023.

Date	*Daily min temp ºF*	*Daily max temp ºF*	*Mean daily cloud cover %*	*Mean wind code*	*Daily wind direction*	*Range of daily sky conditions*
21-Feb	28	33	21	1	SE	Partly cloudy
22-Feb	21	28	51	3	NW	Partly cloudy, cloudy overcast
27-Feb	9	30	49	2	NW, W	clear, cloudy overcast
1-Mar	32	36	82	1	NW, W	Partly cloudy, cloudy overcast
3-Mar	17	35	3	2	NW	Clear
9-Mar	29	31	91	2	NW	Partly cloudy, cloudy overcast
10-Mar	17	25	100	3	NW	cloudy overcast, snow
13-Mar	30	36	99	2	SE	Partly cloudy, cloudy overcast
16-Mar	28	37	20	3	NW	Clear, partly cloudy
22-Mar	21	50	10	2	NW, S, W	Clear
24-Mar	31	34	85	3	NW	Cloudy overcast
29-Mar	32	44	11	1	NW, SW, W	Clear, partly cloudy
30-Mar	15	24	24	3	NW	Clear, partly cloudy
4-Apr	44	50	86	1	NW	Partly cloudy
7-Apr	30	40	59	4	NW, W	Partly cloudy, cloudy overcast
11-Apr	47	57	99	2	SW, W	Cloudy overcast
14-Apr	61	74	10	2	NW	clear, partly cloudy, cloudy overcast
27-Apr	45	50	91	1	NW, W	Cloudy overcast, drizzle
28-Apr	51	66	18	2	S, SW	Clear, partly cloudy
5-May	50	57	72	2	N, NE	Partly cloudy, cloudy overcast
6-May	57	68	17	3	N, NW	Clear, partly cloudy
10-May	51	65	10	3	NW	Clear
11-May	63	73	8	3	NW	Clear
15-May	51	65	93	3	NW, W	Partly cloudy, cloudy overcast
18-May	42	67	5	2	NW	Clear
25-May	49	53	87	3	NW	Partly cloudy, cloudy overcast
26-May	45	60	32	3	N	Partly cloudy
30-May	68	84	0	1	S	Clear
1-Jun	74	86	28	1	NW	Clear, partly cloudy
5-Jun	49	54	100	2	E, NW, SE	Cloudy overcast, drizzle, showers
7-Jun	45	62	100	2	NW	Cloudy overcast, drizzle
12-Jun	65	77	83	1	E, NW, SE	Cloudy overcast, drizzle
15-Jun	63	71	74	2	NW	Cloudy overcast, drizzle, rain
Wind Speed codes 1 = 1-3 mph; 2 = 4-8 mph; 3 = 9-12 mph; 4 = 13-18 mph; 5 = 19-24 mph						

Raptor Migration Survey Results

Raptor surveys were conducted for a total of 30 days and 260 survey hours. Raptor survey results include eagles observed during this period. Incidental raptors were documented during eagle surveys and while traveling to and from the survey location during raptor surveys, however these data are not included in the following analysis. A total of 86 raptors were observed during the survey period from March 1 to June 15, 2023, Table 2.

Table 2. Raptor Survey Species List, Twin Wind Energy Project, Spring 2023.

Raptor species observed	***Scientific name***	***Total number of observations***
American kestrel	*Falco sparverius*	3
Bald eagle	*Haliaeetus leucocephalus*	8
Broad-winged hawk	*Buteo platypterus*	8
Red-tailed hawk	*Buteo jamaicensis*	10
Turkey vulture	*Cathartes aura*	57
Total raptors observed during spring raptor surveys		86

Total Number of Raptors Observed

Of the 86 raptors observed during raptor surveys (Table 2), the species most frequently observed were turkey vulture (n=57) and red-tailed hawk (n=10); the species least frequently observed were American kestrel (n=3) (Figure 3).

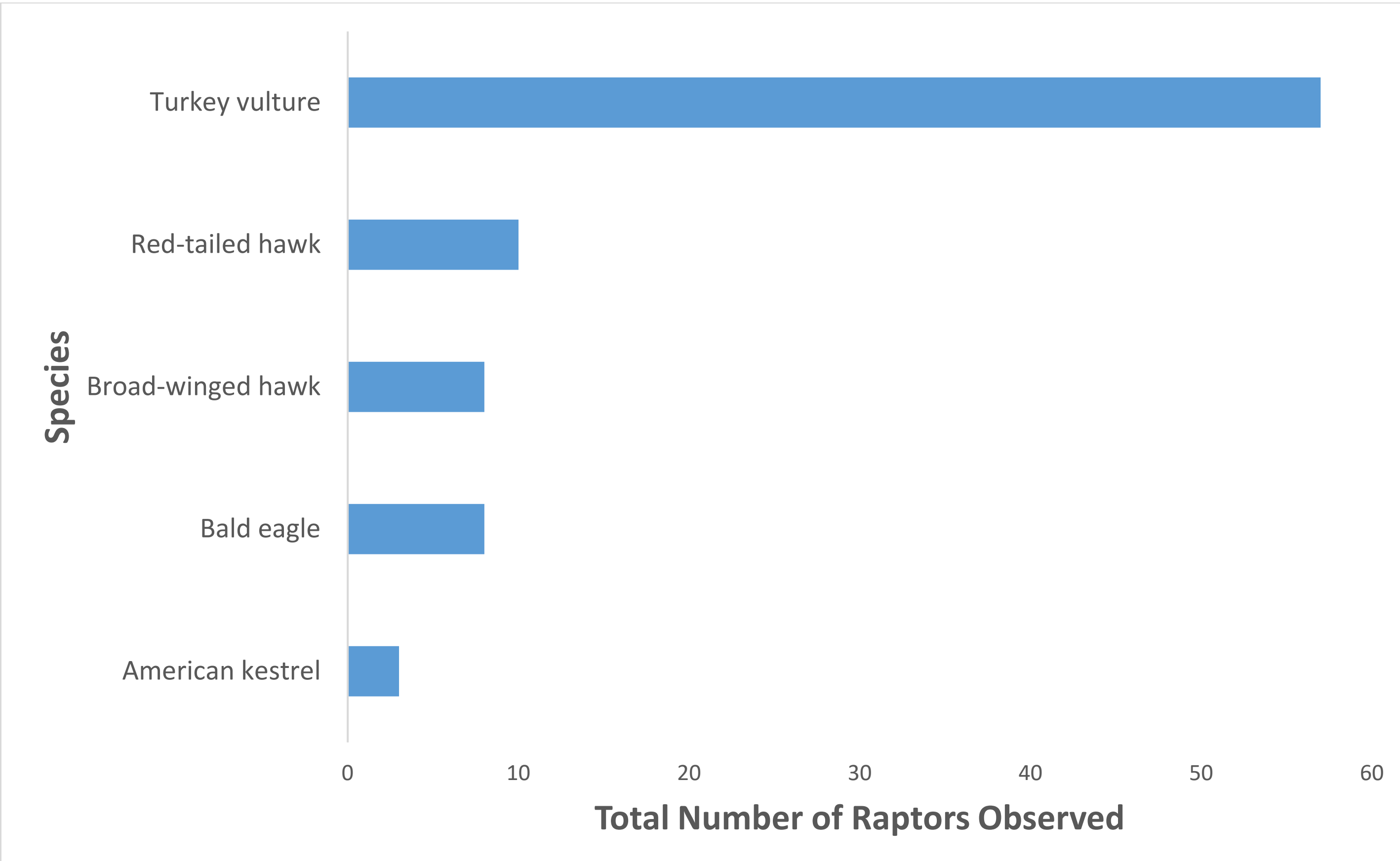

Figure 3. Number of Raptors Observed by Species, Twin Wind Energy, Spring 2023.

Daily Observations

During spring raptor surveys, daily observation rates ranged from 0 raptors/day to 11 raptors/day and from 0 raptors/hour to 1.25 raptors/hour on April 28 (Figure 4; Appendix C). The spring observation rate for raptors seen during raptor surveys was 0.33 raptors/hour.

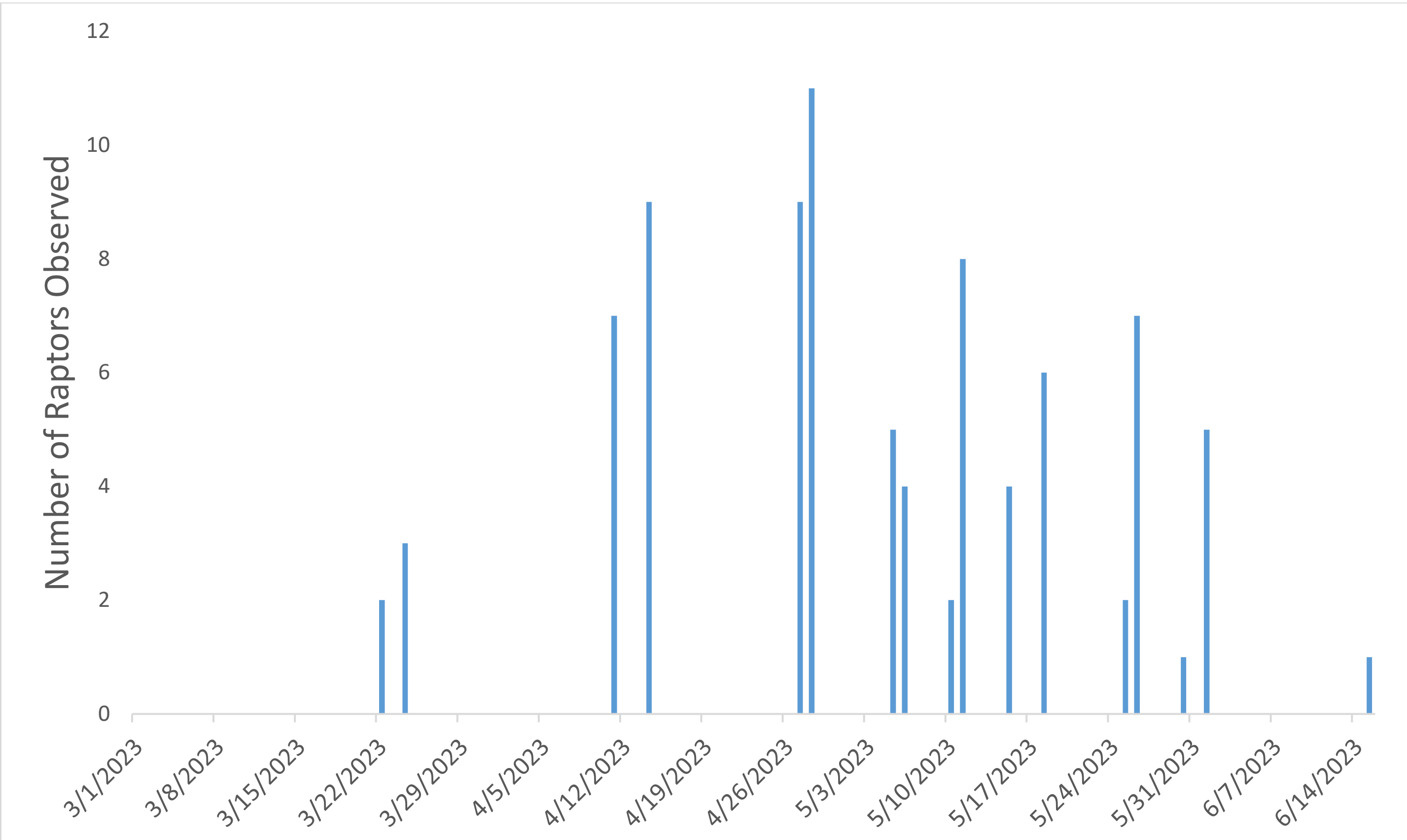

Figure 4. Daily Raptor Observations, Twin Wind Energy Project, Spring 2023.

Peak Hourly Observations

Peak hourly raptor observations occurred from 1200 hours to 1300 hours (21 raptors), followed closely by 1100 hours to 1200 hours (16 raptors) (Figure 5; Appendix C). Note, hourly survey effort varied daily as surveys started daily at 0900 hours and ended daily 2 hours before sunset, unless delayed by trail or weather conditions. As such, there is a lower hourly survey effort for hour blocks later in the day, and slightly lower hourly survey effort for 900 to 1000, as shown in Figure 5.

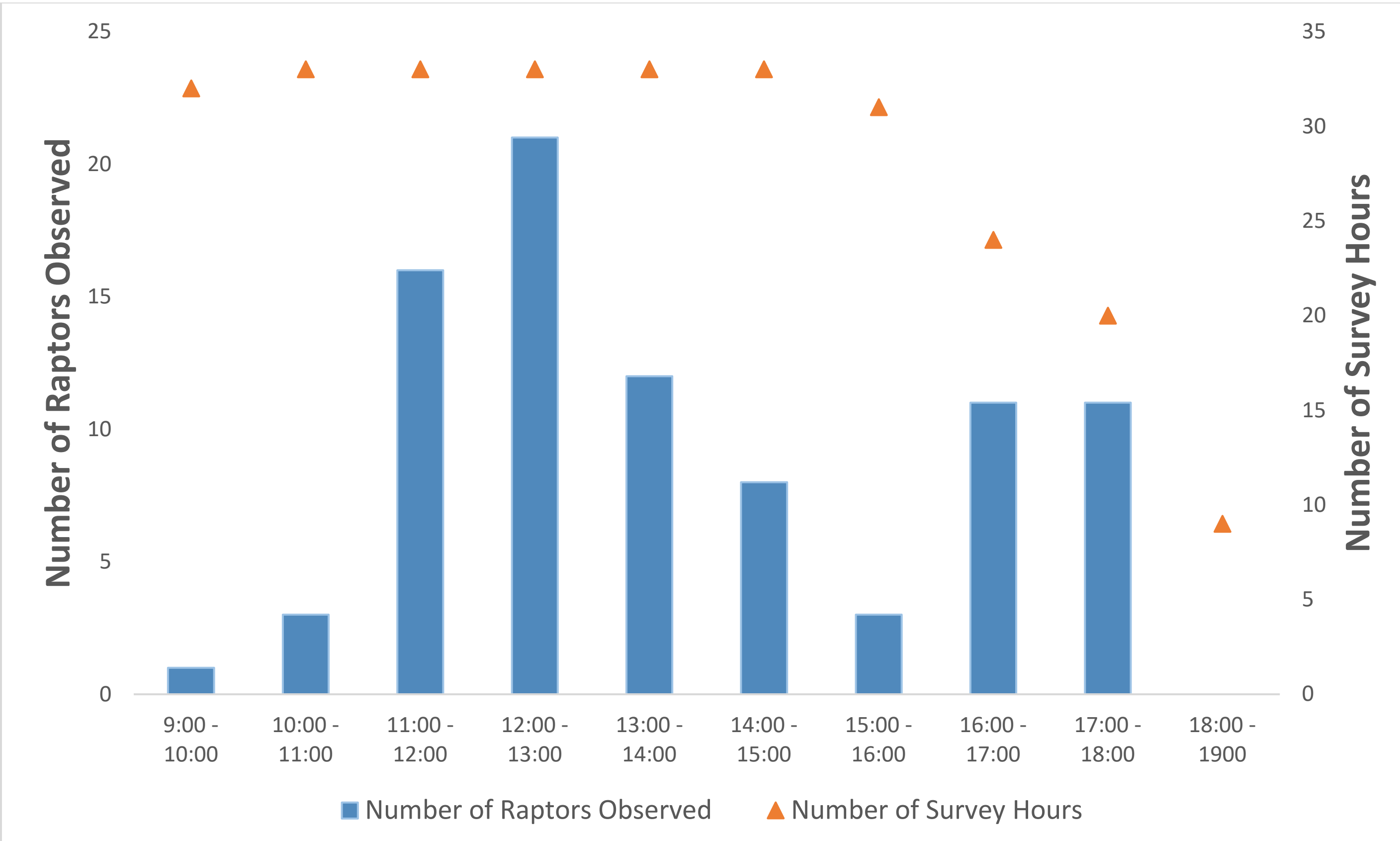

Figure 5. Number of Observations of Raptors per Survey Hour, Twin Wind Energy Project, Spring 2023.

Spring Flight Paths and Flight Heights

Of the 86 raptors observed during Spring 2023 surveys, 50 (58%) occurred within the 800-meter plot of the Survey Area and 46 (53%) occurred both within the 800-meter plot and at flight heights below the Survey Area height (221 meters) for at least a portion of their flight (Table 3; Figure 6; Appendix C). The seasonal observation rate for raptors within the 800-meter plot was 0.19 raptors/hour. The mean minimum flight height of those observed within the 800-meter plot was 69 meters (226 feet). Of the 86 raptors observed, 53 (62%) crossed a ridge and 37 (43%) crossed a ridge within the 800-meter plot (Table 3). The average minimum flight height of those raptors that crossed a ridge was 75 meters (246 feet).

Table 3. Summary of Raptor Locations, Twin Wind Energy Project, Spring 2023.

Raptor species	*Number inside 800m plot*[1]	*Number outside 800m plot*[2]	*Number crossed a ridge*[3]	*Number inside Survey Area*[4]	*Total*
American kestrel	3	0	2	3	3
Bald eagle	5	3	4	4	8
Broad-winged hawk	7	1	6	7	8
Red-tailed hawk	9	1	9	8	10
Turkey vulture	26	31	16	24	57
Total	**50**	**36**	**37**	**46**	**86**

1. Observations inside the 800-meter plot may also have been seen outside the 800-meter plot.
2. Observations outside 800-meter plot only.
3. Ridges inside 800-meter plot only.
4. Survey Area as defined (within 800-meter plot and below the Survey Area height).

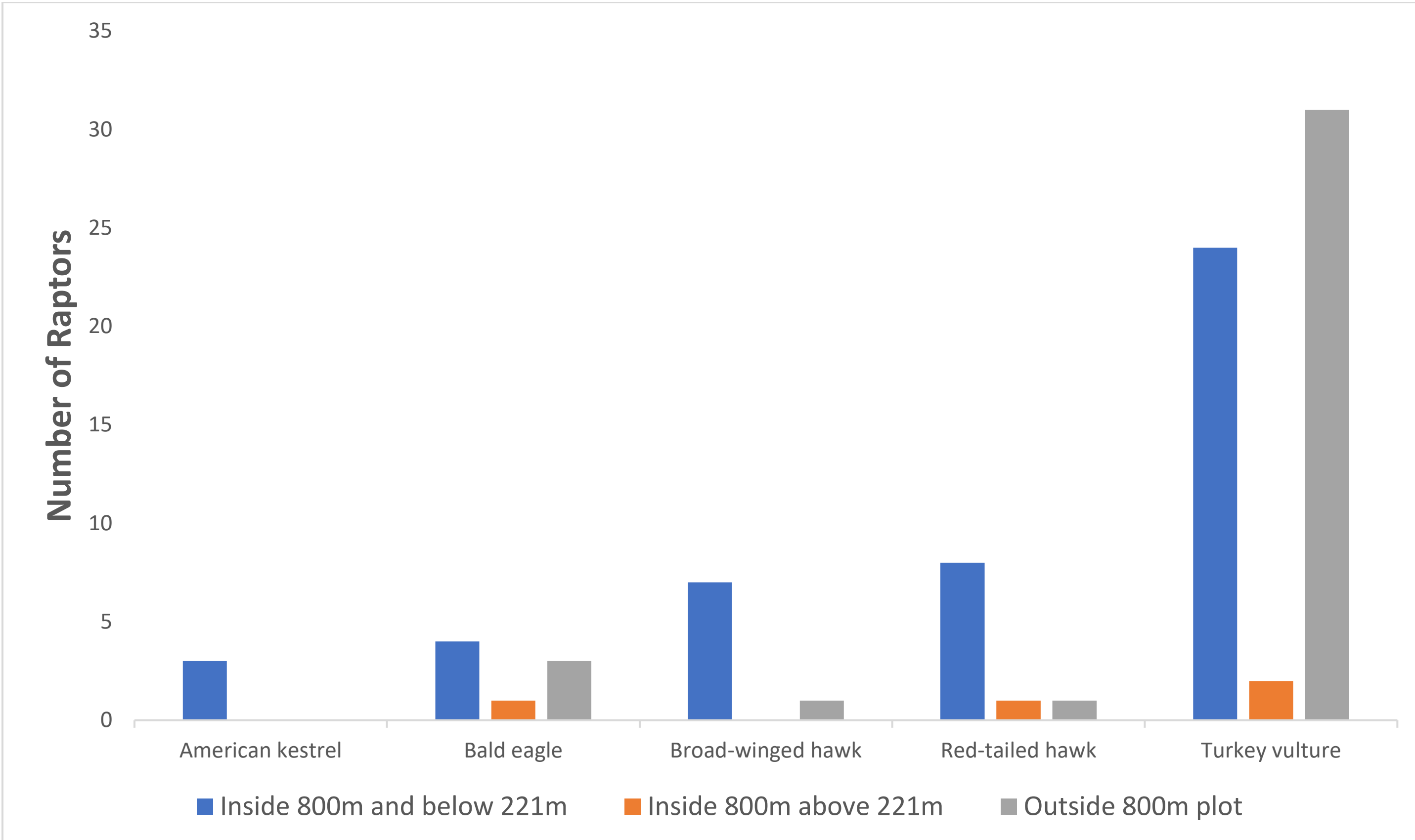

Figure 6. Number of Raptor Observations Within 800-meter Radius Plot at Heights Above and Below 221 Meters, and Outside 800-meter Radius Plot, Twin Wind Energy Project, Spring 2023.

Eagle Use Survey Results

Eagle use surveys were conducted from February 15 to June 15 for a total of 33 days and 279 survey hours. During 279 survey hours, there were eight (8) bald eagle observations, resulting in an observation rate of 0.03 eagles/hour (Table 4). Of the eight (8) observations, five (5) occurred within the 800-meter plot (62%) (Table 4). The observation rate for eagles within the 800-meter plot was 0.02 eagles/hour. Four (4) eagles observed within the 800-meter plot also occurred below the Survey Area height of 221 meters (50% of all observed eagles) (Table 4). Out of the eight (8) eagles observed during surveys, five (5) were adults and three (3) were juvenile. Table 5 provides details regarding each observed eagle throughout the survey period.

Table 4. Summary of Eagle Locations and Mean Flight Heights, Twin Wind Energy Project, Spring 2023.

Observation	***Inside 800m plot[1]***	***Outside 800m plot[2]***	***Crossed a ridge[3]***	***Number inside Survey Area[4]***
Bald eagle	5	3	4	4
Percent of total observations	62%	37%	50%	50%
Mean minimum flight height (meters)	103	325	47	47
Mean maximum flight height (meters)	233	650	157	210

1. Observations inside the 800-meter plot may also have been seen outside the 800-meter plot.
2. Observations outside 800-meter plot only.
3. Ridges inside 800-meter plot only.
4. Survey Area as defined (within 800-meter plot and below the Survey Area height).

Table 5. Eagle Use Observations, Twin Wind Energy Project, Spring 2023.

Date	Time First Seen	Time Last Seen	Species	No. Indiv[1]	Age (A, J, unk)	Inside 800m radius plot: (Y/N)	Inside Height Min (m)	Inside Height Max (m)	Outside Height Min (m)	Outside Height Max (m)	Cross A Ridge: (Y/N)	Crossed Ridge Min Heights (m)	Crossed Ridge Max Heights (m)	Behavior Code Inside	Behavior Code Outside	Flight Azimuth (general)	Time Above Turbine Height (221m) w/in Array (sec)	Time Below Turbine Height (221m) w/in Array (sec)	Within 800m plot AND under 221m?	Behavior Notes
3/22/2023	15:42:00	15:44:00	BAEA	1	J	Y	270	300	300	1000	N	NA	NA	SO	FG, SO	180	10	NA	N	Flew in circles higher and higher NW of Survey Area, then flew S through Survey Area.
3/24/2023	13:39:40	13:43:00	BAEA	2	A	Y	45	200	200	250	Y	45	200	SO	SO, FG	330	NA	90	Y	SO/KH between N and S Twins, calling to each other, before FG/SO to the NW.
3/24/2023	13:39:46	13:48:32	BAEA	1	J	Y	45	220	220	340	Y	45	200	SO	SO, FG	355	NA	95	Y	SO/KH between N and S Twins, calling to each other, before splitting off and FG/SO high to the N.
4/11/2023	11:27:00	11:31:37	BAEA	1	J	N	NA	NA	50	500	Y	50	85	NA	SO	64	NA	NA	N	Soaring over N Twin and then to northeast.
4/14/2023	13:02:02	13:02:40	BAEA	1	A	Y	50	210	210	300	Y	50	70	SO	SO	260	NA	37	Y	Soaring between twins and to the southwest.
5/26/2023	10:41:00	10:41:00	BAEA	2	A	N	NA	NA	600	800	N	NA	NA	NA	SO, FG	N	NA	NA	N	Soared N together to the east of Twins.

*Flight Behavior Codes: SO: soaring, PE: perched, FG: flap or glide, KH: kiting or hovering, MB: being mobbed, UT: undulating, territorial flight< SB: stooping or diving in response to another bird, SP: stooping or diving on prey, FO: foraging.

2023 Incidental Non-Raptor Species

In the spring of 2023, 33 non-raptor avian species were recorded during surveys and while travelling to or from the parking area to the survey location (Table 6). Of the avian species observed, none were federally or state-listed threatened or endangered species (MDIFW 2015).

Table 6. Incidental Observations of Non-Raptor Avian Species, Twin Wind Energy Project, Spring 2023.

Common Name	Scientific Name
American crow	*Corvus brachyrhynchos*
American robin	*Turdus migratorius*
Black-and-white warbler	*Mniotilta varia*
Black-capped chickadee	*Poecile atricapillus*
Black-throated blue warbler	*Setophaga caerulescens*
Black-throated green warbler	*Setophaga virens*
Blue jay	*Cyanocitta cristata*
Blue-headed vireo	*Vireo solitarius*
Cedar waxwing	*Bombycilla cedrorum*
Chestnut-sided warbler	*Setophaga pensylvanica*
Chipping sparrow	*Spizella passerina*
Common raven	*Corvus corax*
Common yellowthroat	*Geothlypis trichas*
Dark-eyed junco	*Junco hyemalis*
Eastern phoebe	*Sayornis phoebe*
Hairy woodpecker	*Picoides villosus*
Hermit thrush	*Catharus guttatus*
Indigo bunting	*Passerina cyanea*
Magnolia warbler	*Zenaida macroura*
Mourning dove	*Zenaida macroura*
Nashville warbler	*Leiothlypis ruficapilla*
Northern flicker	*Colaptes auratus*
Northern parula	*Setophaga americana*
Ovenbird	*Seiurus aurocapilla*
Pileated woodpecker	*Dryocopus pileatus*
Red crossbill	*Loxia curvirostra*
Red-breasted nuthatch	*Sitta canadensis*
Red-eyed vireo	*Vireo olivaceus*
Rose-breasted grosbeak	*Pheucticus ludovicianus*
Ruffed grouse	*Bonasa umbellus*
White-throated sparrow	*Zonotrichia albicollis*
Winter wren	*Troglodytes hiemalis*
Yellow-rumped warbler	*Setophaga coronata*

DISCUSSION

During the spring 2023 survey season, the majority (58%) of raptors observed were within the 800-meter plot for at least part of their flight. Additionally, 53% were both within the 800-meter plot and below the Survey Area height of 221 meters. The mean minimum flight height within the 800-meter plot was 69 meters, 152 meters below the Survey Area height.

Of the bald eagles observed, the majority (62%) were within the 800-meter plot for part at least a portion of their flight. Additionally, 50% were both within the 800-meter plot and below the Survey Area height of 221 meters. The mean of eagle minimum flight heights within the 800-meter plot was 103 meters, 18 meters below the Survey Area height.

Of the raptors observed, the bald eagle is listed by the State of Maine as a Species of Special Concern and the American kestrel is considered a species of greatest conservation need (MDIFW 2011).

Considering the potential risk of the proposed Project to raptors and eagles is an important step in the permitting and development process. Migration corridors provide important travel and forage areas for raptors and eagles during a time when these species are moving over long distances and are vulnerable. The data presented in this document was collected with the intent to support USFWS in using their collision risk model to determine the potential risk the proposed Project has to negatively impacting eagles, and aid in decision making regarding the need for take permits. Data collected from this survey are also intended to inform project planning to avoid or minimize adverse impacts to migrating eagle and raptor species.

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Appendix A. Photographs of the Survey Location

View north from Location 1, June 14, 2022.

View northeast from Location 1, June 14, 2022.

View east from Location 1, June 14, 2022.

View southeast from Location 1, June 14, 2022.

View south from Location 1, June 14, 2022.

View southwest from Location 1, June 14, 2022.

View west from Location 1, June 14, 2022.

View northwest from Location 1, June 14, 2022.

Appendix B. Twin Energy Spring 2022 Raptor and Eagle Survey Plan

SURVEY PLAN

Date:	February 9, 2022(Revised February 12, 2022)
To:	Bob Stratton (Maine Department of Inland Fisheries and Wildlife)
From:	Katelin Nickerson – Flycatcher LLC
CC:	Lindsay Deane-Mayer & Sumul Shah (Twin Energy LLC) Rodney Kelshaw, Rich Jordan (Flycatcher)
Subject:	Proposed Twin Energy Wind Electric Power Generation Facility – Spring 2022 Raptor and Eagle Survey Plan (Rev 1)

Dear Bob,

On behalf of Twin Energy LLC, Flycatcher is submitting this Revised Spring 2022 eagle and raptor migration survey plan for your approval. This survey plan was developed based on our recent conversations with you, protocols detailed in the Maine Department of Inland Fisheries and Wildlife (MDIFW) 2018 Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality (2018 Recommendations), and U.S. Fish and Wildlife Service Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2, 2013 (ECPG 2013). The revisions are based on feedback from the USFWS (via email, February 11, 2022). Effectively the methods described herein are the same methods as described in the Survey Plan submitted on February 9, with minor changes to collect data to support input into USFWS's collision risk model.

GENERAL PROJECT DESCRIPTION

The proposed Twin Energy Project (Project) is a small wind electric generation facility located on South Twin Mountain in Rumford and Roxbury, Maine. The current plan is to erect three turbines with a six-megawatt capacity each, that have a hub height of approximately 384-feet (117-meters), blade tip height of approximately 645-feet (196-meters), and total blade swing diameter of approximately 490-feet (149-meters). The proposed access road and collector line will extend from the existing RoxWind project southerly to South Twin Mountain in Rumford. The proposed turbine locations are in close proximity to each other, clustered on the northern edge of South Twin Mountain.

Turbine 3 is proposed to be located near the summit of South Twin Mountain, at an elevation of 2,155-feet. Turbines 1 and 2 are located to the north and east of turbine 3 at lower elevations; around 2,050-feet and 1,950-feet respectively (figures 1 and 2, attached).

METHODS AND SURVEY LOCATION DESCRIPTION

In accordance with the 2018 Recommendations, Flycatcher plans to begin surveys the week of February 15, 2022. We understand that one golden eagle was (*Aquila chrysaetos*) observed in the fall of 2016, at the Record Hill project site (approximately 2.5-miles north), during the four-year post construction monitoring effort. The spring raptor and eagle survey will occur from February 15 through June 15, 2022. We will conduct two surveys per week during weather that is conducive to observe migratory activity. Surveys will start at 9 a.m. and last until 2 hours before sunset (or later if birds are moving through the area during the completion of the "normal survey window").

The number of standard survey locations (point counts) was determined using the standards described in the ECPG 2013. For this survey, the Project footprint, or the minimum convex polygon around the turbines, is a 1-kilometer radius from the three proposed turbine locations (4.58 square kilometers). Using one 800-meter

radius (2.01 square kilometers) point count survey plot size, 44 percent of the total Project footprint is covered. This also encompasses 100 percent of the three proposed turbine locations (figures 1 and 2, attached).

Surveys will consist of point-based recordings of raptor, bald eagle (*Haliaeetus leucocephalus*) and golden eagle flight activity (minutes of flight) within a three-dimensional cylindrical plot (the sample plot). The radius of the sample plot is 2,625 feet (800-meters), and the height above ground level of 82-feet (25-meters) above the maximum blade reach, which is 725-feet (221-meters).

Data will be collected on the attached "*Raptor Pre-construction Datasheet*" and will include the observed raptor/eagle behavior inside and outside the proposed turbine area. Observers will sketch the raptor/eagle path either on aerial photographs or using a web-based GIS mapping service.

The survey effort will be completed substantially in accordance with the 2018 Recommendations and ECPG 2013. Surveys will be conducted during suitable weather conditions; surveys will not be conducted when visibility is less than 800-meters horizontally and 200-meters vertically. However, there may be factors including weather and road conditions that limit access to this remote site. This will be assessed weekly, and efforts will be made to complete the surveys if practicable and safe.

RAPTOR SURVEY POINT LOCATION

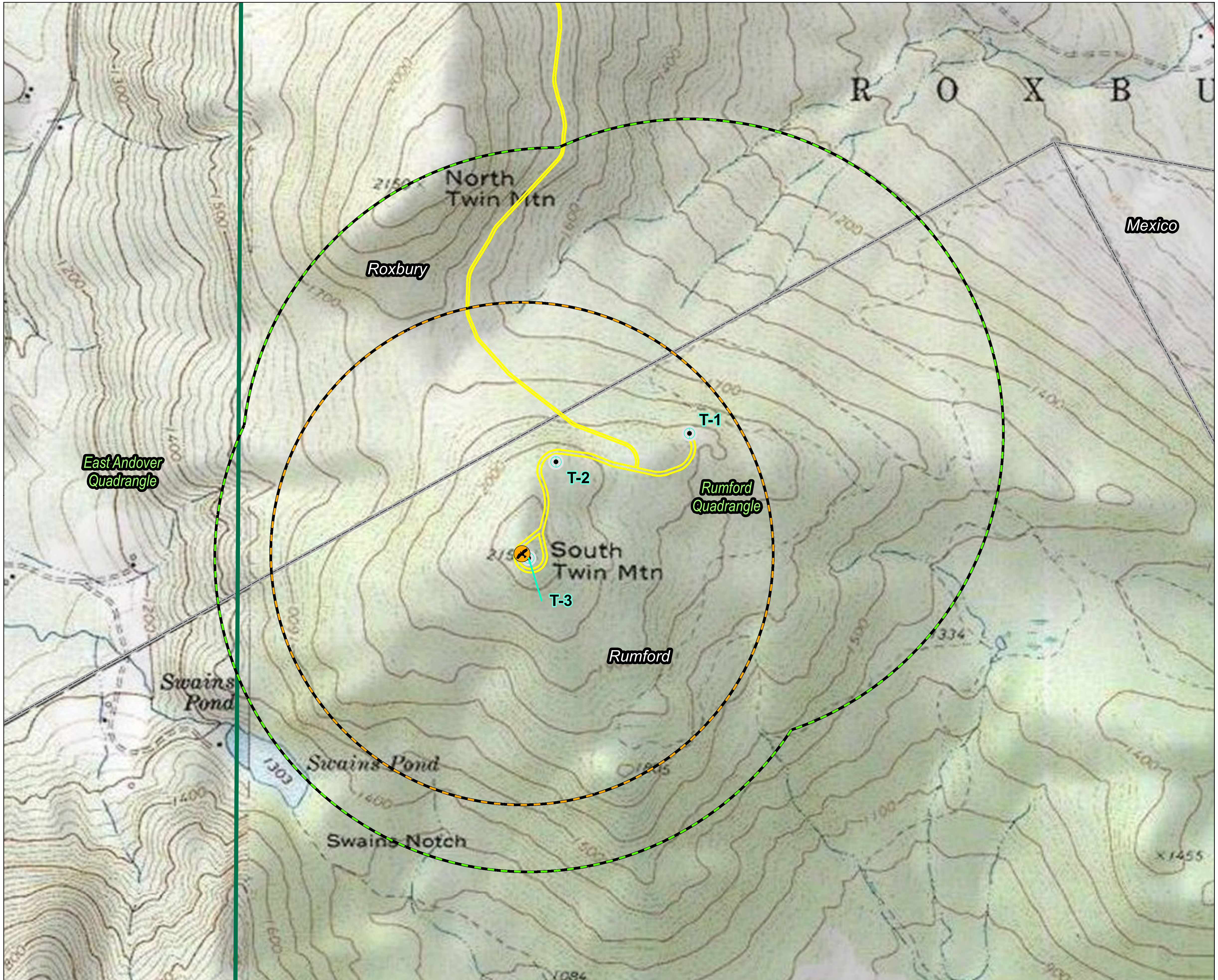
The survey point is located on the summit of South Twin Mountain, in the same location as proposed turbine 3. This location was selected because it provides a vantage point that has clear views across the Project area. The viewshed from the point has excellent views to the northwest beyond Ellis Pond and the RoxWind project, and to the east beyond Swift River and Roxbury Mountain. This viewshed encompasses the entire proposed Project area. Good views are also available to the south to the mill in Rumford and Black Mountain; with unobstructed view overhead. The attached photographs taken on February 7, 2022 show current views from the proposed survey location. If additional photographs are required, Flycatcher will save them to our file share folder for external access.

We are seeking your feedback and approval of this Survey Plan.

Respectfully,

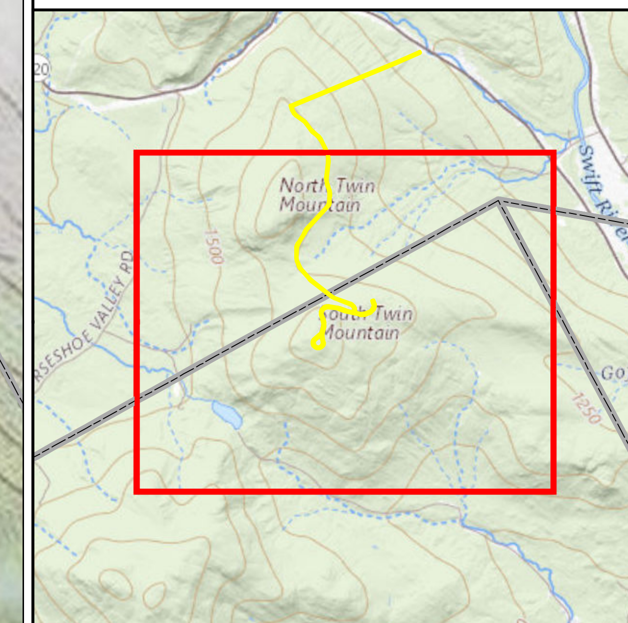
Katelin Nickerson
Project Director
Flycatcher, LLC
207.233.6175

Att (4): Figure 1.(revised)
Figure 2. (revised)
Raptor Pre-construction Datasheet (revised)
Photographs



LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- RAPTOR SURVEY LOCATION POINT
- USFWS EAGLE SURVEY AREA
- 800M DIAMETER SAMPLE AREA
- USGS 7.5-MINUTE QUADRANGLE BOUNDARY
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM USGS 7.5' QUADRANGLE SERIES.

0 1,000 2,000
Feet
1 " = 1,000 '
1:12,000

PROJECT:
TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
USGS RAPTOR SURVEY LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	R. KELSHAW		
MONTH:	FEBRUARY	**FIGURE 1**	
YEAR:	2022		

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PALMER

FILE NO.: Palmer_TwinEnergy_RaptorMethods_Fig1_USGS_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
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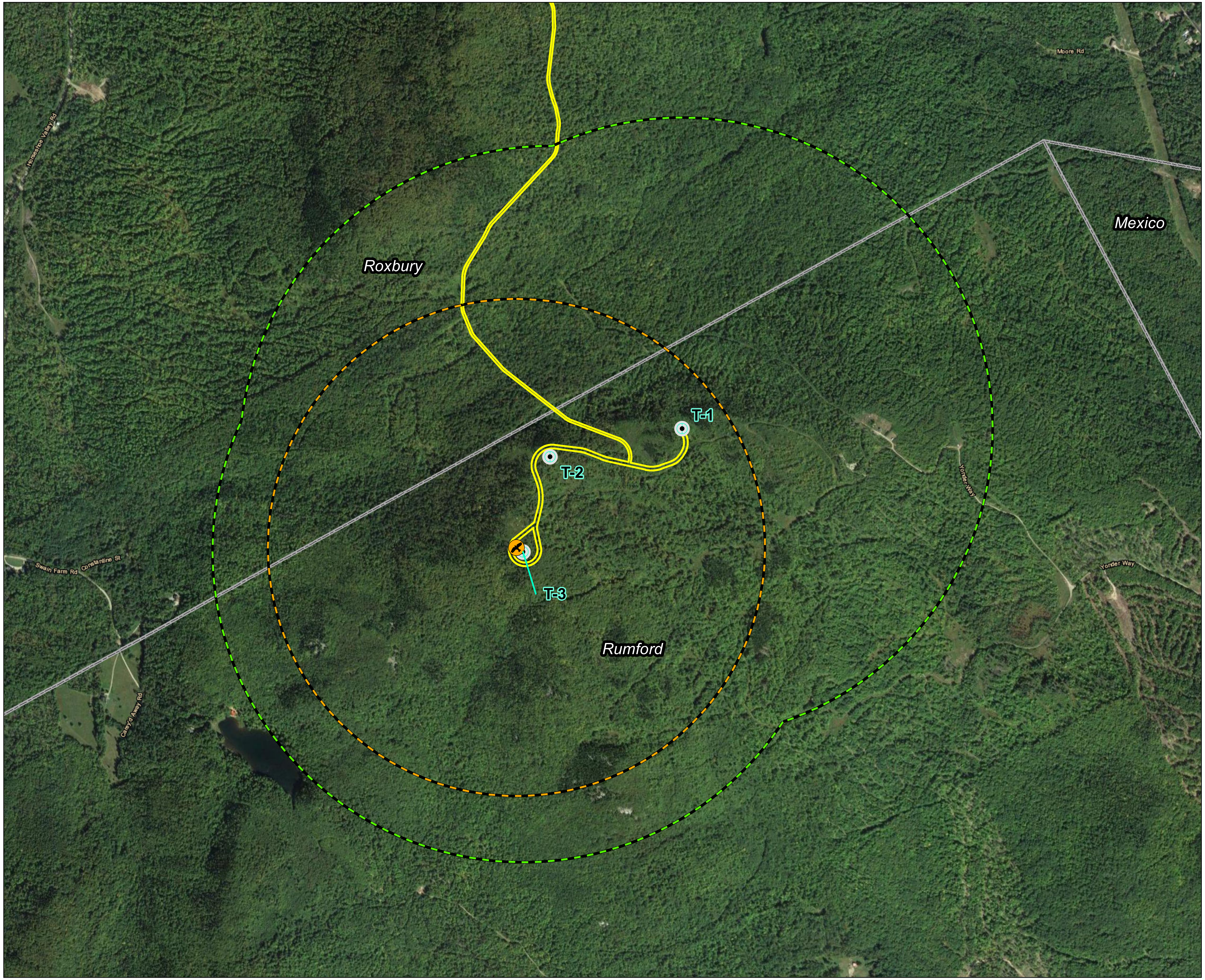
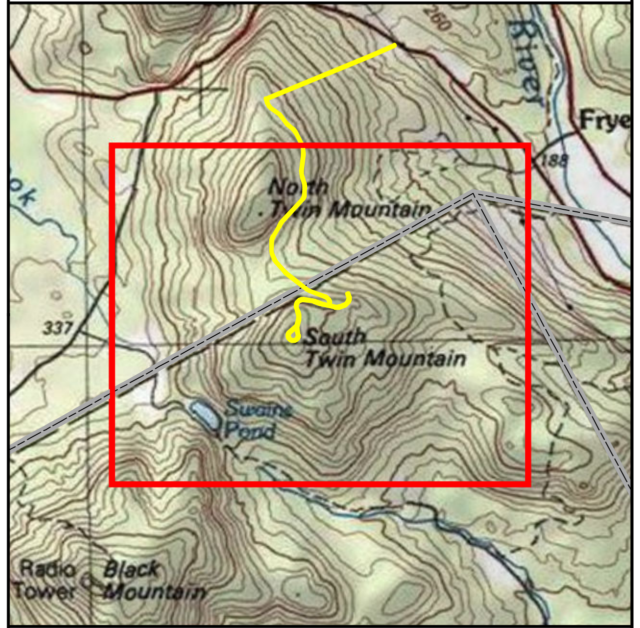


LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- RAPTOR SURVEY LOCATION POINT
- USFWS EAGLE SURVEY AREA
- 800M DIAMETER SAMPLE AREA
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM ESRI/NAIP "WORLD IMAEGRY" SERVICE LAYER.

0 1,000 2,000
Feet
1 " = 1,000 '
1:12,000

PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:

AERIAL RAPTOR SURVEY LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	R. KELSHAW	**FIGURE 2**	
MONTH:	FEBRUARY		
YEAR:	2022		

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PALMER

FILE NO.: Palmer_TwinEnergy_RaptorMethods_Fig2_Aerial_11x17L.mxd

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Raptor Survey Pre-construction Datasheet		Date:	
Project Name/Location: Twin Energy Project in Rumford and Roxbury		Proposed Turbine Height: 645ft (blade tip)	Pg 1
Observer:	Survey Point Number: 1	Survey Start Time:	Survey End time:

Survey notes (migration flights, weather fronts, etc.):

Describe distractions to observer, or disturbances to birds that may have impacted survey:

Weather Conditions

Hour of Survey	Temp (F)	Sky Code	% Cloud Cover	Cloud Code	Wind Direction	Wind Speed Code	Visibility Code
Hour l							
Hour 2							
Hour 3							
Hour 4							
Hour 5							
Hour 6							
Hour 7							
Hour 8							
Hour 9							
Hour l0							

Obs. No.	Time first seen	Time last seen	Species	No. Indiv[1]	Sex (M,F, unkn)	Age (A, J, unkn)	INSIDE 1/4 mile (402m) of turbine: (Y/N)	Inside Height Min & Max (m)2	Outside Height Min & Max (m)2	Cross A Ridge: (Y/N)	Crossed Ridge Min & Max Heights (m)2	Behavior Code Inside	Behavior Code Outside	Flight Azimuth (general)	Time Above Turbine Height w/in Array	Time Below Turbine Height w/in Array	Behavior Notes

1. For groups of birds, create a separate entry for a different species and birds at different flight heights or locations.
2. Record bird's flight height above ground level to the nearest 5-m (16-ft) interval.

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Raptor Survey Pre-construction Datasheet

Project Name/Location: Twin Energy in Rumford and Roxbury	Survey Point Number: 1	Date:	Pg

Obs. No.	Time first seen	Time last seen	Species	No. Indiv[1]	Sex (M,F, unkn)	Age (A, J, unkn)	INSIDE 1/4 mile (402m) of turbine: (Y/N)	Inside Height Min & Max (m)2	Outside Height Min & Max (m)2	Cross A Ridge: (Y/N)	Crossed Ridge Min & Max Heights (m)2	Behavior Code Inside	Behavior Code Outside	Flight Azimuth (general)	Time Above Turbine Height w/in Array	Time Below Turbine Height w/in Array	Behavior Notes

1. For groups of birds, create a separate entry for a different species and birds at different flight heights or locations.
2. Record bird's flight height above ground level to the nearest 5-m (16-ft) interval.

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Incidental Wildlife Datasheet

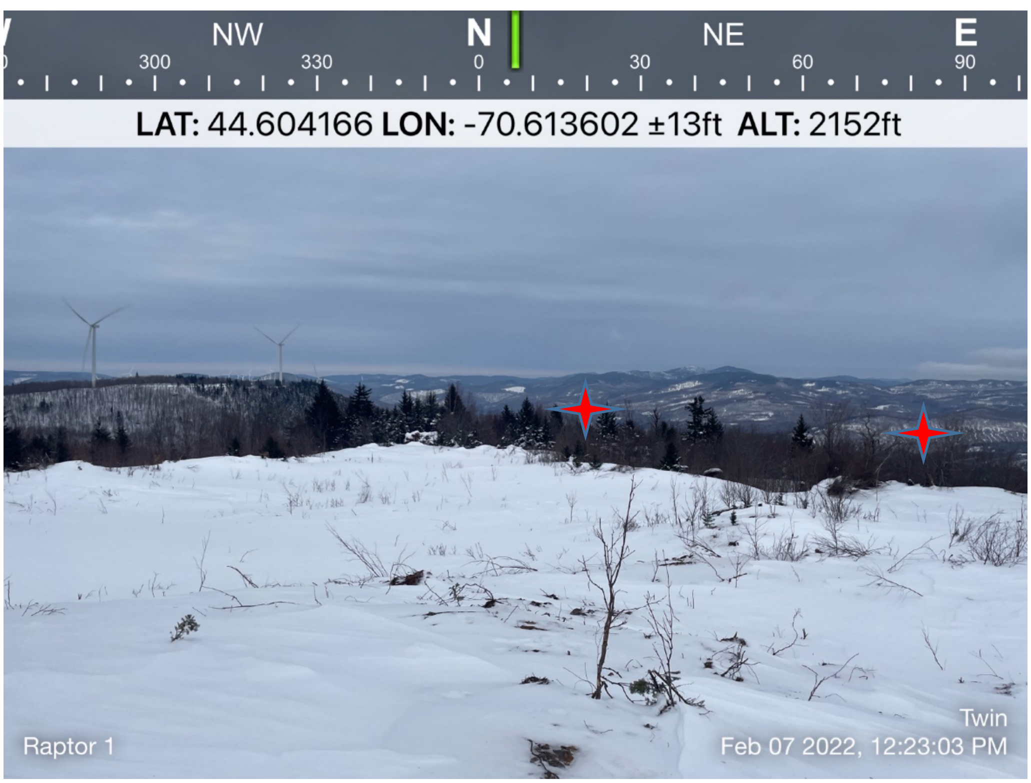
Observer:		Project Name/Location: Twin Energy in Rumford and Roxbury						Pg____of____
Date:	Notes:	Temp (F)	Code	Wind Direction	Sky Code	Cover %	Cloud Code	Visibility Code

Location (Point number, GPS point, etc.)	Observed in Survey (S) or Traveling (T)	Time first observed	Mode of Detection (V: Visual, A: Auditory)	# of Individual	Species Code[1]	Sex (M, F, unk)	Age (A, J, unk)	Distance from observer first observed (m)[2]	Closest distance from observer (m)[2]	Flight height first observed (m)[2]	Min & Max heights (m)[2]	Flight direction	Activity (FL: flying, PE: perched)	Other notes (behaviors)

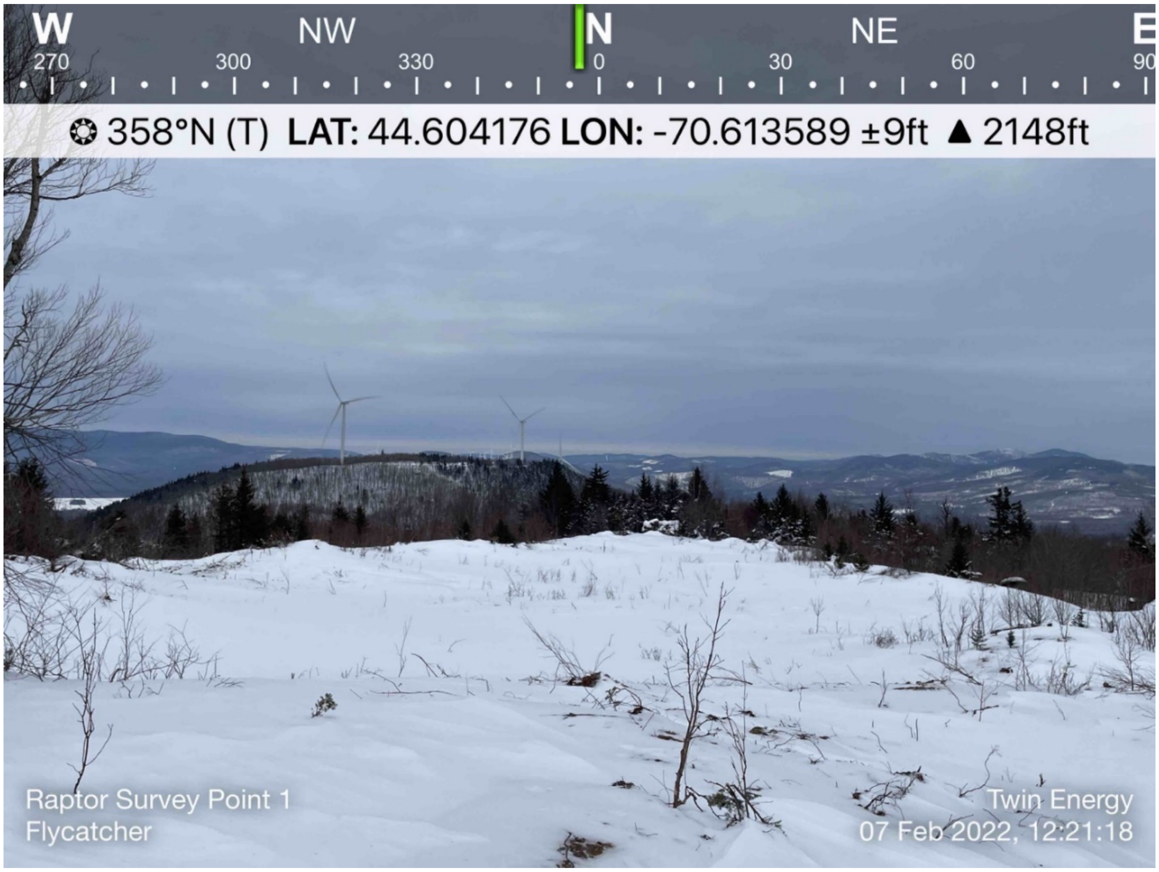
1. Document any non-raptor birds and other unusual or listed wildlife seen during surveys, and any unusual or listed wildlife species seen while traveling between survey locations.
2. Record flight heights (above ground level) and distances to the nearest 5-m (16-ft) Interval.

Panoramic from Raptor Survey Point Location across the northwest to northeast (left to right).

Panoramic from Raptor Survey Point Location across the northwest to northeast (left to right).



Red Stars denote approximate locations of Turbines 1 and 2.


W
NW
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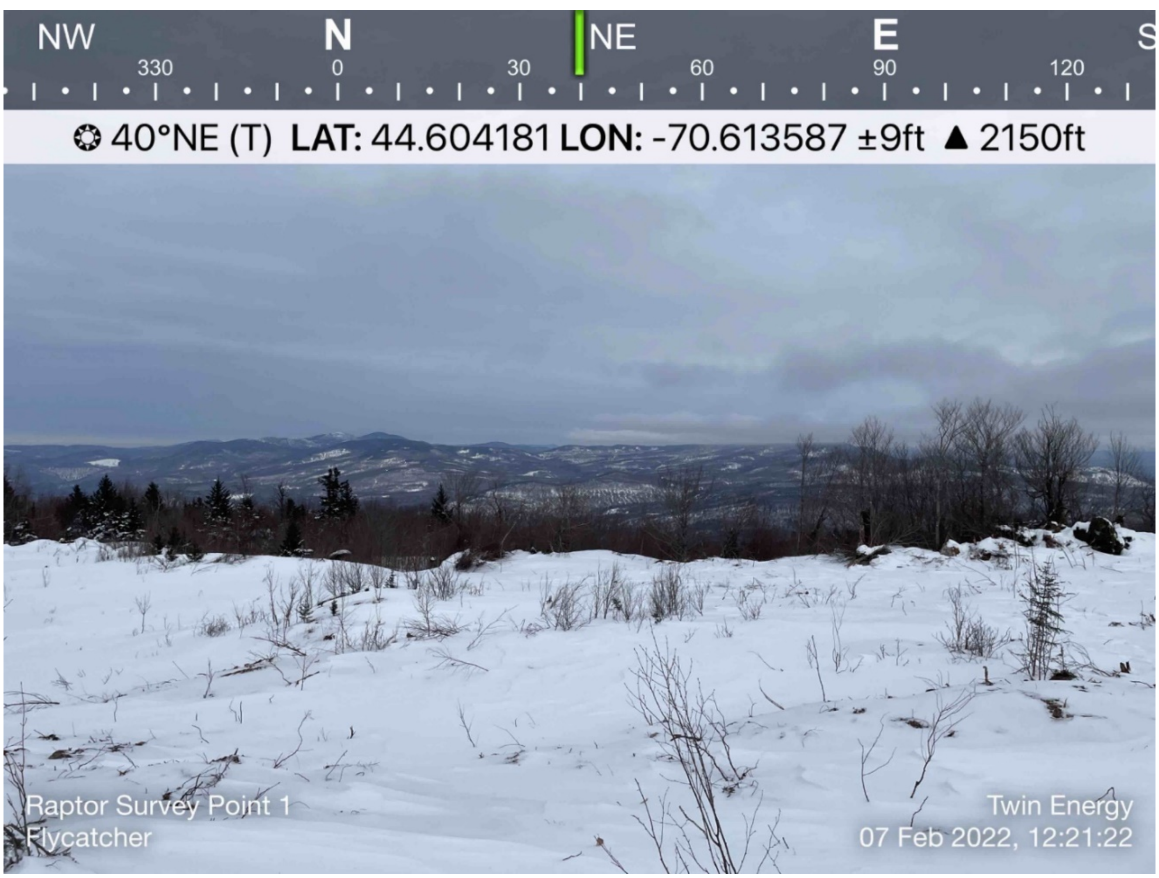
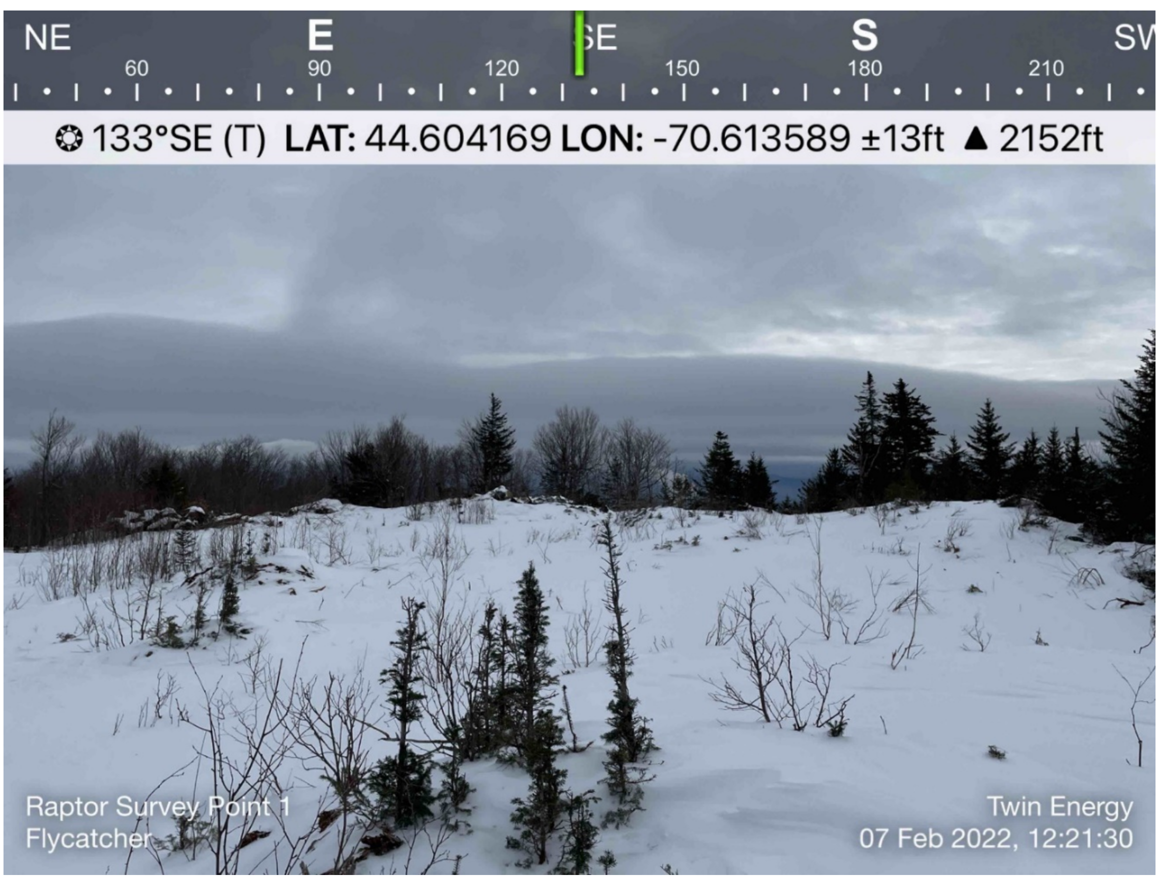
E
270
300
330
0
30
60
90
358°N (T) LAT: 44.604176 LON: -70.613589 ±9ft ▲ 2148ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:18

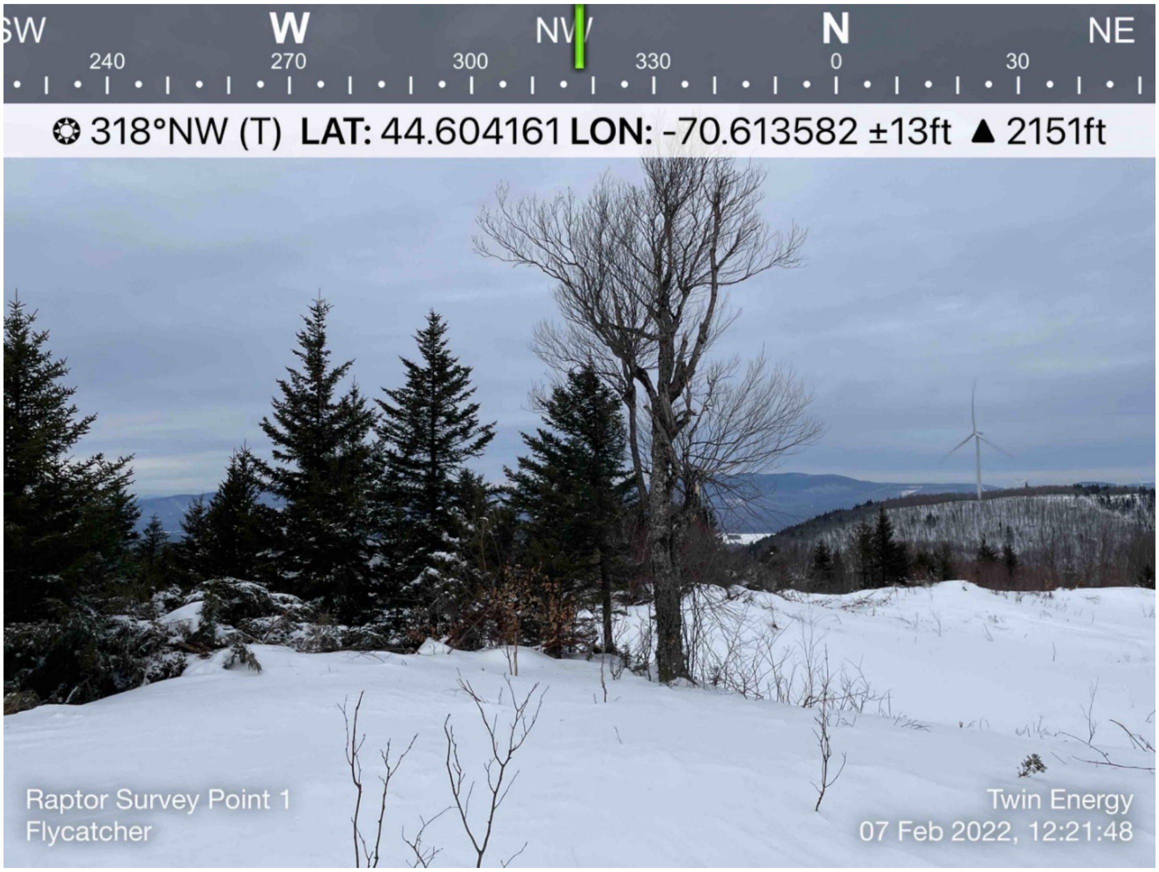

NW
N
NE
E
S
330
0
30
60
90
120
40°NE (T) LAT: 44.604181 LON: -70.613587 ±9ft ▲ 2150ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:22


N
NE
E
SE
0
30
60
90
120
150
85°E (T) LAT: 44.604180 LON: -70.613587 ±9ft ▲ 2153ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:26


NE
E
S
60
90
120
150
180
210
133°SE (T) LAT: 44.604169 LON: -70.613589 ±13ft ▲ 2152ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:30


SE
S
SW
W
120
150
180
210
240
270
190°S (T) LAT: 44.604152 LON: -70.613594 ±13ft ▲ 2149ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:35


S
SW
W
NW
180
210
240
270
300
330
262°W (T) LAT: 44.604153 LON: -70.613581 ±13ft ▲ 2151ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:40


SW
W
NW
N
NE
240
270
300
330
0
30
318°NW (T) LAT: 44.604161 LON: -70.613582 ±13ft ▲ 2151ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:21:48


NE
E
SE
S
SW
60
90
120
150
180
210
137°SE (T) LAT: 44.603776 LON: -70.613203 ±13ft ▲ 2142ft
Raptor Survey Point 1
Flycatcher
Twin Energy
07 Feb 2022, 12:29:59

Appendix C. Raptor Observation Data

Date	Time First Seen	Time Last Seen	Species	No. Indiv	Sex (M, F, unk)	Age (A, J, unk)	INSIDE 800m radius plot: (Y/N)	Inside Height Min (m)	Inside Height Max (m)	Outside Height Min (m)	Outside Height Max (m)	Cross A Ridge: (Y/N)	Crossed Ridge Min Heights (m)	Crossed Ridge Max Heights (m)	Behavior Code Inside*	Behavior Code Outside*	Flight Azimuth (general)	Time Above Turbine Height (221m) w/in Array (sec)	Time Below Turbine Height (221m) w/in Array (sec)	Within 800m plot AND under 221m?	Behavior Notes*
2/21/2023																					
2/22/2023																					
2/27/2023																					
3/1/2023																					
3/3/2023																					
3/9/2023																					
3/10/2023																					
3/13/2023																					
3/16/2023																					
3/22/2023	15:40:00 PM	15:42:00 PM	TUVU	1	UNK	A	N	NA	NA	300	1000	N	NA	NA	NA	FG, SO	NW	NA	NA	N	
3/22/2023	15:42:00 PM	15:44:00 PM	BAEA	1	UNK	J	Y	270	300	300	1000	N	NA	NA	SO	FG, SO	S	10	NA	N	
3/24/2023	13:39:40	13:43:00	BAEA	2	UNK	A	Y	45	200	200	250	Y	45	200	SO	SO, FG	NW	NA	90	Y	SO/KH with BAEA between N and S Twins, calling to each other, before FG/SO to the NW.
3/24/2023	13:39:46	13:48:32	BAEA	1	UNK	J	Y	45	220	220	340	Y	45	200	SO	SO, FG	N	NA	95	Y	SO/KH with TUVU between N and S Twins, calling to each other, before splitting off and FG/SO high to the N.
3/29/2023																					
3/30/2023																					
4/4/2023																					
4/7/2023																					
4/11/2023	11:27:00	11:31:37 AM	BAEA	1	UNK	J	N	NA	NA	50	500	Y	50	85	NA	SO	NE	NA	NA	N	Soaring over N Twin and then out of sight to NE.
4/11/2023	11:38:04	11:42:36 AM	TUVU	5	UNK	A	N	NA	NA	20	285	Y	20	40	NA	SO	N	NA	NA	N	Soaring over N Twin and then to NE.
4/11/2023	13:57:18	13:57:38 PM	TUVU	1	UNK	A	Y	20	55	NA	NA	Y	20	45	FG	NA	SE	NA	28	Y	Soaring over Twins across valley and SE of S Twin.
4/14/2023	10:29:04	10:29:15 AM	AMKE	1	UNK	UNK	Y	25	40	NA	NA	Y	25	40	FG	NA	N	NA	11	Y	FG between the Twins.
4/14/2023	11:46:32	11:47:04 AM	TUVU	1	UNK	A	Y	30	45	NA	NA	Y	30	40	SO	NA	SW	NA	32	Y	Soaring between Twins to SW.
4/14/2023	12:23:16	12:25:40 PM	TUVU	2	UNK	A	N	NA	NA	15	200	Y	15	30	NA	SO	N	NA	NA	N	Soaring low over N then around turbine .
4/14/2023	12:51:03	12:54:40 PM	AMKE	1	M	A	Y	15	120	NA	NA	N	NA	NA	KH	NA	SW	NA	230	Y	KH looking for prey on side of S Twin, flew SW.
4/14/2023	13:02:02	13:02:40 PM	BAEA	1	UNK	A	Y	50	210	210	300	Y	50	70	SO	SO	W	NA	37	Y	Soaring between Twins and to the SW.
4/14/2023	15:14:38	15:15:20 PM	AMKE	1	M	A	Y	12	25	NA	NA	Y	12	25	PE	NA	NW	NA	42	Y	Perched in tree, kiting and then glided into valley between Twins.
4/14/2023	17:04:04	17:06:18 PM	TUVU	2	UNK	A	Y	45	180	12	220	Y	NA	NA	SO	SO	N	NA	60	Y	Soaring low to the N over N Twin.
4/27/2023	12:55:40	12:56:02 PM	RTHA	1	UNK	A	Y	140	200	200	260	Y	100	140	SO	FG	NW	5	5	Y	With 2nd RTHA but split and FG to NW.
4/27/2023	12:55:40	12:58:34 PM	RTHA	1	UNK	A	Y	100	240	240	420	Y	100	160	SO	FG	NW	20	30	Y	With 1st RTHA but stopped and was kiting between Twins before flying NW.
4/27/2023	13:10:01	13:10:25 PM	RTHA	1	UNK	A	N	NA	NA	100	160	N	NA	NA	NA	SP, KH, FG	SW	NA	NA	N	Think it was 1st RTHA seen again, KH and dove W of S Twin.
4/27/2023	16:21:38	16:22:11 PM	TUVU	2	UNK	A	Y	40	60	NA	NA	N	NA	NA	SO	NA	SE	NA	33	Y	Soaring E of S Twin.
4/27/2023	16:27:27	16:32:20 PM	TUVU	3	UNK	A	Y	20	100	100	180	Y	20	85	SO	SO	NW	NA	210	Y	Soaring a large circle around S Twin.
4/27/2023	16:42:35	16:43:40 PM	TUVU	1	UNK	A	N	NA	NA	150	200	N	NA	NA	NA	SO	N	NA	NA	N	Flying N of Twins.
4/28/2023	12:50:00	12:52:00 PM	TUVU	8	UNK	A	N	NA	NA	100	300	N	NA	NA	NA	SO	SW	NA	NA	N	Circling far E of survey flew SE out of sight.
4/28/2023	13:27:00	1:27:30 PM	TUVU	1	UNK	A	N	NA	NA	50	200	N	NA	NA	NA	SO	S	NA	NA	N	Gliding S just above tree line to the E.
4/28/2023	16:01:00	4:02:00 PM	TUVU	2	UNK	A	Y	50	100	100	500	Y	50	100	SO, FG	SO, FG	W	50	10	Y	Flew W directly overhead.
5/5/2023	9:46:00	9:47:41 AM	TUVU	1	UNK	A	N	NA	NA	70	200	Y	70	80	NA	SO	NE	NA	NA	N	Soaring over N Twin.
5/5/2023	11:59:00	12:01:13 PM	TUVU	2	UNK	A	Y	15	40	40	110	N	NA	NA	SO	SO	SW	NA	40	Y	Pair soaring low S of S Twin.
5/5/2023	12:10:00	12:10:49 PM	TUVU	1	UNK	A	N	NA	NA	45	70	Y	40	70	NA	SO	N	NA	NA	N	Soaring low over N Twin.
5/5/2023	13:17:00	13:19:04 PM	RTHA	1	UNK	A	Y	50	80	70	80	Y	50	70	KH, FG	FG	NW	NA	112	Y	KH and FG between Twins.

Date	Time First Seen	Time Last Seen	Species	No. Indiv	Sex (M, F, unkn)	Age (A, J, unkn)	INSIDE 800m radius plot: (Y/N)	Inside Height Min (m)	Inside Height Max (m)	Outside Height Min (m)	Outside Height Max (m)	Cross A Ridge: (Y/N)	Crossed Ridge Min Heights (m)	Crossed Ridge Max Heights (m)	Behavior Code Inside*	Behavior Code Outside*	Flight Azimuth (general)	Time Above Turbine Height (221m) w/in Array (sec)	Time Below Turbine Height (221m) w/in Array (sec)	Within 800m plot AND under 221m?	Behavior Notes*
5/6/2023	13:28:00	13:28:32	TUVU	1	UNK	A	Y	30	60	NA	NA	Y	30	60	SO, FG	NA	SE	NA	32	Y	Flew SE between Twins, soaring, gliding.
5/6/2023	14:53:00	14:53:27	TUVU	1	UNK	A	Y	50	100	100	300	Y	50	100	SO, FG	SO, FG	W	NA	20	Y	Flew W between Twins, soaring, gliding.
5/6/2023	17:05:00	17:10:00	TUVU	2	UNK	A	Y	20	70	50	300	Y	20	50	SO, FG	SO, FG	W	NA	15	Y	Flew N to the E of S Twin, then W between Twins, then S, SO/FG, circled then went out of sight.
5/10/2023	12:05:00	12:05:50 PM	TUVU	2	UNK	A	N	NA	NA	100	500	Y	200	300	NA	SO, FG	W	NA	NA	N	Flew W, N of Twins.
5/11/2023	11:18:43	11:18:43 AM	BWHA	1	UNK	A	Y	60	180	NA	NA	Y	60	120	SO	NA	E	NA	51	Y	SO/ KH N of S Twin.
5/11/2023	11:32:56	11:33:06 AM	BWHA	2	UNK	A	Y	45	100	NA	NA	Y	45	80	SO	NA	E	NA	10	Y	Pair soaring E of S Twin.
5/11/2023	12:37:50	12:38:30 PM	BWHA	1	UNK	A	Y	40	80	NA	NA	Y	40	80	SO	NA	SW	NA	40	Y	Soaring W between Twins.
5/11/2023	14:08:32	14:10:08 PM	TUVU	1	UNK	A	Y	25	110	110	120	Y	25	110	SO	SO	E	NA	25	Y	Soaring NE of Twins.
5/11/2023	16:47:13	16:47:24 PM	TUVU	1	UNK	A	Y	30	60	NA	NA	Y	30	60	SO	NA	NW	NA	11	Y	Soaring NW in valley between Twins.
5/11/2023	17:05:56	17:07:48 PM	BWHA	1	UNK	A	Y	100	110	110	230	Y	100	110	SO	SO	NW	NA	15	Y	Soaring NW between Twins.
5/11/2023	17:46:11	17:48:45 PM	RTHA	1	UNK	A	Y	120	210	200	240	Y	120	180	KH, FG	FG	W	NA	25	Y	Soaring in valley between Twins.
5/15/2023	14:35:00	14:35:12 PM	TUVU	1	UNK	A	Y	55	80	NA	NA	N	NA	NA	FG	NA	SE	NA	12	Y	FG on S side of S Twin.
5/15/2023	16:28:00	16:28:08 PM	RTHA	2	UNK	A	Y	40	100	NA	NA	Y	40	65	SO	NA	W	NA	8	Y	Soaring up from valley briefly to W.
5/15/2023	17:21:00	17:30:14 PM	RTHA	1	UNK	A	Y	35	250	200	300	Y	180	200	SO, KH	SO, KH	NW	40	320	Y	KH/ SO high W of Twins and in valley.
5/18/2023	11:32:00	11:32:15 AM	TUVU	2	UNK	A	N	NA	NA	100	150	N	NA	NA	NA	FG	S	NA	NA	N	Flew S, just out of survey area to E.
5/18/2023	13:58:00	1:58:20 PM	TUVU	1	UNK	A	N	NA	NA	200	400	N	NA	NA	NA	FG	W	NA	NA	N	Flew W, to the far nw of survey area.
5/18/2023	14:30:00	2:32:00 PM	TUVU	1	UNK	A	N	NA	NA	100	400	Y	100	130	SO, FG	FG	W	NA	NA	N	Flew W, then circled to the far NW of survey area, then back E N of N Twin, then back W out of sight.
5/18/2023	17:05:00	5:06:00 PM	TUVU	1	UNK	A	Y	240	300	250	400	Y	240	250	SO, FG	SO, FG	W	20	NA	N	Flew W between N and S Twin.
5/18/2023	17:21:00	5:21:45 PM	TUVU	1	UNK	A	Y	150	250	150	300	N	NA	NA	SO, FG	SO, FG	S	10	10	Y	Flew S just to the W of S Twin.
5/25/2023	13:15:54 PM	13:16:38 PM	BWHA	1	UNK	A	Y	65	90	NA	NA	N	NA	NA	SO, FG	NA	SE	NA	44	Y	Flying in strong winds E of S Twin
5/25/2023	17:18:40 PM	17:18:40 PM	BWHA	1	UNK	A	Y	45	150	150	230	Y	45	55	SO, FG	SO, FG	SE	NA	38	Y	Flying in strong winds over S Twin
5/26/2023	10:41:00	10:41:00	BAEA	2	UNK	A	N	NA	NA	600	800	N	NA	NA	NA	SO, FG	N	NA	NA	N	Soared N together to the E of Twins.
5/26/2023	23:57:00	23:57:00	RTHA	1	UNK	A	Y	100	200	200	250	Y	100	200	FG	FG	W	NA	14	Y	Glided W with incredible speed between Twins.
5/26/2023	12:00:00	12:00:00	RTHA	1	UNK	A	Y	100	200	100	400	Y	100	150	SO, FG	SO, SB, MB, FG	W	NA	25	N	RTHA flew N, BWHA flew up when RTHA was just NE of survey area and began MB RTHA. RTHA FG upside down claws up to thwart of BWHA, then flew W between Twins.
5/26/2023	12:00:00	12:00:00	BWHA	1	UNK	A	N	NA	NA	100	390	N	NA	NA	NA	SO, SB, UT, FG	NA	NA	0	N	BWHA defended territory/ potential nesting site from RTHA.
5/26/2023	13:17:00	13:17:00	TUVU	1	UNK	A	N	NA	NA	500	525	N	NA	NA	NA	SO, FG	SE	NA	0	N	Flew SE way off to E of survey area.
5/26/2023	17:46:00	17:46:00	TUVU	1	UNK	A	Y	60	100	100	200	N	NA	NA	FG	FG	S	NA	NA	Y	Flew S nearly directly overhead.
5/30/2023	12:04:00	12:04:50 PM	TUVU	1	UNK	A	N	NA	NA	400	600	N	NA	NA	NA	FG	S	NA	NA	N	Flew S to the E of survey area.
6/1/2023	12:53:00	12:53:20	TUVU	1	UNK	A	Y	50	100	NA	NA	Y	50	70	FG	NA	W	NA	20	Y	Flew W directly overhead.
6/1/2023	14:26:00	14:28:00	TUVU	1	UNK	A	Y	240	260	260	400	Y	240	250	SO, FG	SO, FG	N	30	NA	N	Flew N, to E of survey area, then flew W between Twins.
6/1/2023	14:26:00	14:26:20	TUVU	1	UNK	A	N	NA	NA	350	450	N	NA	NA	NA	SO, FG	N	NA	NA	N	Flew N next to 2nd TUVU then dipped out of sight.
6/1/2023	14:28:00	14:31:00	TUVU	1	UNK	A	N	NA	NA	300	500	Y	300	310	NA	SO, FG	N	NA	NA	N	Flew N to the E of survey area, then crossed ridge to N of N Twin, flying W.
6/1/2023	14:33:00	14:33:20	TUVU	1	UNK	A	N	NA	NA	300	500	N	NA	NA	NA	SO, FG	N	NA	NA	N	Flew N, to the W of Twins.
6/5/2023																					
6/7/2023																					
6/12/2023																					
6/15/2023	11:30:00	11:31:13 AM	TUVU	1	UNK	A	Y	100	180	180	310	N	NA	NA	SO	SO	N	NA	12	Y	Soaring E of Twins to the N
*Flight Behavior Codes: SO: soaring, PE: perched, FG: flap or glide, KH: kiting or hovering, MB: being mobbed, UT: undulating, territorial flight< SB: stooping or diving in response to another bird, SP: stooping or diving on prey, FO: foraging.																					

Exhibit 7-5
Memorandum of Findings: Significant Vernal Pools
State of Maine Vernal Pool Assessment Forms (PVP-KMN-1; PVP-KMN-5; PVP-KMN-6)

MEMORANDUM OF FINDINGS

Date:	May 9, 2022
To:	Lindsay Deane-Mayer (Palmer Capital)
From:	Katelin Nickerson (Flycatcher LLC)
cc	Sumul Shah (Palmer), Rich Jordan (Flycatcher)
Subject:	Spring 2022 Vernal Pool Survey Results – Twin Energy, Oxford County, Maine

In the fall of 2021 Flycatcher LLC (Flycatcher) completed wetland delineations and potential vernal pool surveys at the site of the proposed Twin Energy Project (Project). Due to the timing of this survey occurring outside of the spring amphibian breeding period, Flycatcher returned to the site to complete in-season surveys on April 26, 2022. The following summarizes Flycatcher's spring 2022 vernal pool survey effort methods and results.

METHODS

Survey Area

The fall 2021 Survey Area included approximately 402 acres. This initial Survey Area covered two potential access routes, and several potential turbine locations. Based on the results of the fall 2021 field effort, the Project's Survey Area was paired down to include the proposed development footprint and areas within 250-feet of the proposed footprint and encompasses approximately 160 acres. Of the four potential vernal pools identified during the fall of 2021, three occur within the 160-acre Survey Area and were surveyed in the spring of 2022.

Vernal Pool Survey

Vernal pools are temporary/seasonally flooded wetlands that provide the primary breeding habitat for vernal pool indicator species, and a host of secondary faunal species. Wood frog (*Lithobates sylvaticus*) spotted salamander (*Ambystoma maculatum*), blue spotted salamander (*Ambystoma laterale*), and fairy shrimp (*Eubranchipus* spp.) are vernal pool indicator species that depend on vernal pools to complete their life cycle. Vernal pool habitats are defined in Chapter 335 of the Maine Natural Resources Protection Act (NRPA) and in the United States Army Corps of Engineers (USACE) Maine General Permit.

Productivity of breeding vernal pool species is the primary metric used by regulatory authorities to assess vernal pool quality; thus, vernal pools must be assessed during the breeding season (generally mid-April to late-May). Due to the phenology of indicator species, two site visits to pools typically take place to accurately assess breeding productivity.

Flycatcher followed The Maine Association of Wetland Scientists (MAWS) Vernal Pool Technical Committee Vernal Pool Survey Protocol (April 2014) methods for vernal pool (PVP) surveys. Survey timing was planned in accordance with the protocol and with our observations of spring amphibian breeding activity in the vicinity of the Project.

RESULTS

Vernal Pool Survey Results

Two of the three potential vernal pools are naturally occurring, and the third is mapped as natural-modified due to the observed impacts from timber harvest around the pool. All three pools occur at higher elevations within the Survey Area (above 1,900-feet) near the summit of South Twin Mountain.

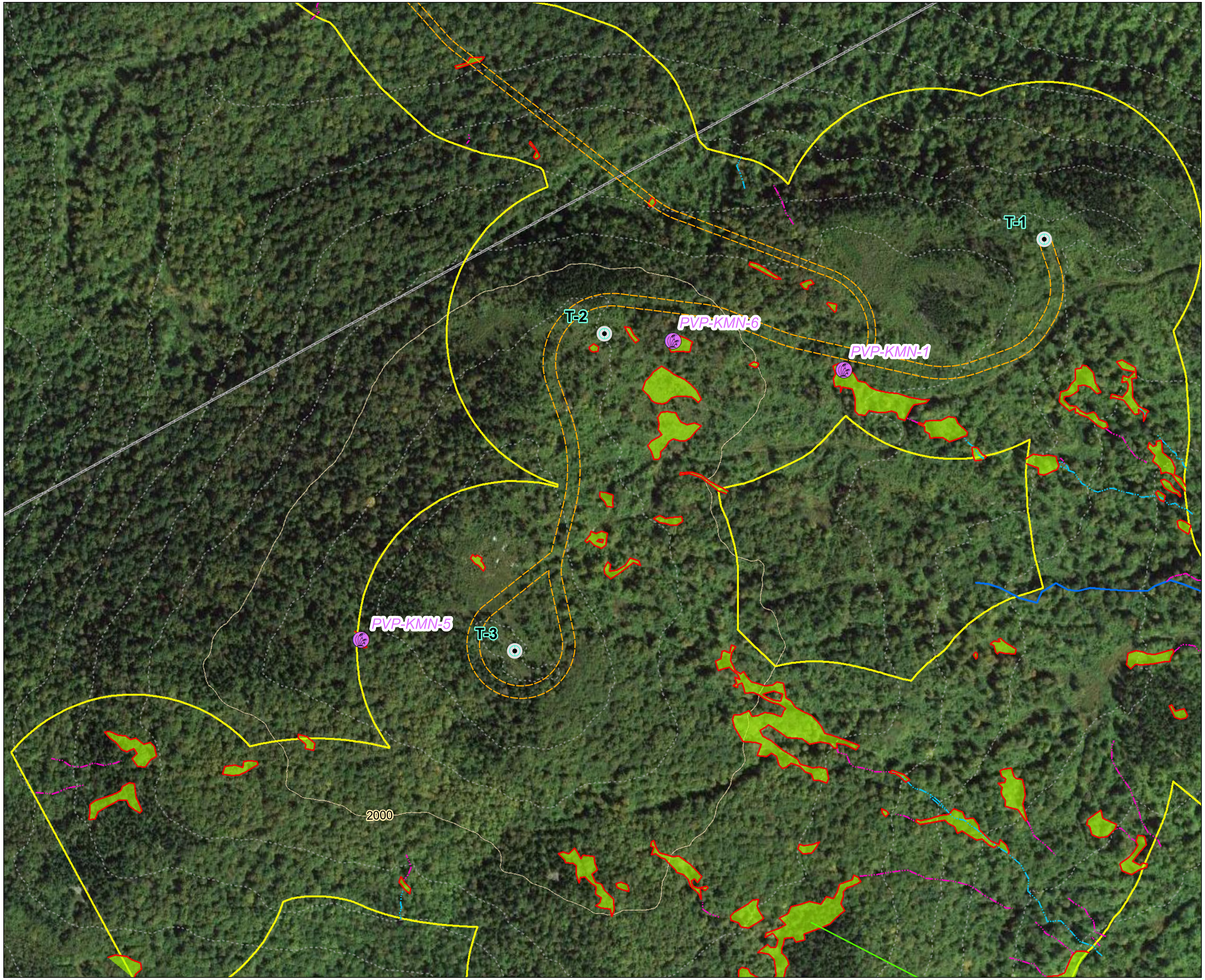
- Potential vernal pool VP-KMN-1 is a small, natural depression at the north end of wetland W-KMN-8. This pool was found to have no standing water at the time of our visit.
- Potential vernal Pool VP-KMN-6 is a natural-modified depression within wetland W-KMN-82. This pool had several isolated pockets of water less than one inch deep. No breeding activity was observed during our visit.
- Potential vernal pool VP-KMN-5 is a naturally occurring pool located on the western edge of the survey area. This depression occurs between the base of a steep slope and a large rock outcrop. This area does not appear to hold enough water to support pool breeding amphibians or other vernal pool indicator species.

Due to the lack of water in these three pools, and no observed evidence of vernal pool indicator species, we did not complete a second visit for any of the three pools. None of the potential vernal pools identified meet the criteria to be considered significant vernal pools as described in Chapter 335 9(B) of the NRPA.

The locations of the three potential vernal pools surveyed are provided in Attachment 1, Figure 1, and photographs from the spring 2022 survey are provided in Attachment 2.

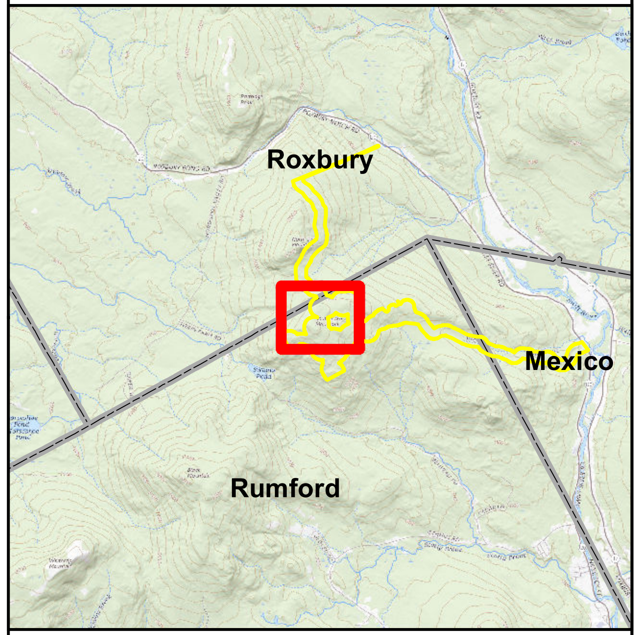
ATTACHMENT 1

Figure 1: Potential Vernal Pool Survey Locations



LEGEND

- PROJECT SURVEY AREA
- PROPOSED TURBINE LOCATION
- PROPOSED ACCESS ROAD
- VERNAL POOL SURVEY LOCATION
- DELINEATED WETLAND BOUNDARY
- UPLAND DRAINAGE
- DELINEATED INTERMITTENT STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED WETLAND
- 500' CONTOUR INTERVAL
- CONTOUR LINE (50' INTERVAL)
- TOWN BOUNDARY



NOTES:

1 BASEMAP IMAGERY FROM ESRI/NAIP, "WORLD IMAGERY" WEB BASEMAP SERVICE LAYER.

2 VERNAL POOL SURVEYS WERE CONDUCTED BY FLYCATCHER IN APRIL 2022.

0 300 600
Feet
1 " = 300 '
1:3,600

PROJECT:
TWIN ENERGY LLC
TWIN WIND PROJECT
OXFORD COUNTY, MAINE

TITLE:
SPRING 2022 VERNAL POOL SURVEY RESULTS

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON		**FIGURE 1**
MONTH:	MAY		
YEAR:	2022		

Flycatcher LAND • SCIENCE • PEOPLE

PALMER

FILE NO.: Palmer_TwinEnergy_VPoolResults_2022_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

Plot Date: 5/8/2022, 18:59:37 PM by JAKEN -- LAYOUT: ANSI B(11"x17")
Path: D:\Flycatcher\Projects\Solaya\Palmer_TwinEnergy_VPoolResults_2022_11x17L.mxd

ATTACHMENT 2

Photographs

Potential vernal pool VP-KMN-1

Potential vernal pool VP-KMN-6

Potential vernal pool VP-KMN-5

Potential vernal pool VP-KMN-5

Maine State Vernal Pool Assessment Form

INSTRUCTIONS:

- **Complete all 3 pages of form thoroughly. Most fields are required for pool registration.**
- **Clear photographs of a) the pool AND b) the indicators (one example of each species egg mass) are required for all observers.**

Observer's Pool ID: PVP-KMN-1 **MDIFW Pool ID:** ______

1. PRIMARY OBSERVER INFORMATION

a. Observer name: Katelin Nickerson

b. Contact and credentials previously provided? ○ No (submit Addendum 1) ⦿ Yes

2. PROJECT CONTACT INFORMATION

a. Contact name: ⦿ same as observer ○ other ______

b. Contact and credentials previously provided? ○ No (submit Addendum 1) ○ Yes

c. Project Name: Twin Energy LLC

3. LANDOWNER CONTACT INFORMATION

a. Are you the landowner? ○ Yes ⦿ No If no, was landowner permission obtained for survey? ⦿ Yes ○ No

b. Landowner's contact information (required)

Name: Adam Gammon (AMB Forestry Inc.) Phone: ______

Street Address: 6 Jed Martin Road City: Rumford State: ME Zip: 04276

c. ☐ Large Projects: check if separate project landowner data file submitted

4. VERNAL POOL LOCATION INFORMATION

a. Location Township: Rumford

Brief site directions to the pool (using mapped landmarks):

From Rumford center, drive ~ 3.5 miles N on 120 W (Swift River Road) to 299-353 (44.6017649, -70.562831). Head NW on Yonder Way for ~ 2 miles. Then hike ~ 0.55 miles W to arrive at PVP-KMN-1.

b. Mapping Requirements

i. USGS topographic map OR aerial photograph with pool clearly marked.

ii. GPS location of vernal pool (use Datum NAD83 / WGS84)

Longitude/Easting: -70.609341 Latitude/Northing: 44.606486

Coordinate system: ______

Check one:

○ GIS shapefile
- send to Jason.Czapiga@maine.gov; observer has reviewed shape accuracy (Best)

○ The pool perimeter is delineated by multiple GPS points. (Excellent)
- Include map or spreadsheet with coordinates.

⦿ The above GPS point is at the center of the pool. (Good)

○ The center of the pool is approximately _____ m ○ ft ○ in the compass direction of _____ degrees from the above GPS point. (Acceptable)

5. VERNAL POOL HABITAT INFORMATION

a. Habitat survey date (only if different from indicator survey dates on page 3): ______

b. Wetland habitat characterization

- Choose the best descriptor for the landscape setting:
  - ○ Isolated depression
  - ○ Floodplain depression
  - ◉ Pool associated with larger wetland complex
  - ○ Other: ______
- Check all wetland types that best apply to this pool:
  - ☐ Forested swamp
  - ☑ Shrub swamp
  - ☐ Peatland (fen or bog)
  - ☑ Emergent marsh
  - ☐ Wet meadow
  - ☐ Lake or pond cove
  - ☐ Abandoned beaver flowage
  - ☐ Active beaver flowage
  - ☐ Slow stream
  - ☐ Floodplain
  - ☐ Mostly unvegetated pool
  - ☐ ATV or skidder rut
  - ☐ Dug pond or borrow pit
  - ☐ Roadside ditch
  - ☐ Other: ______

c. Vernal pool status under the Natural Resources Protection Act (NRPA)

i. Pool Origin: ◉ Natural ○ Natural-Modified ○ Unnatural ○ Unknown

If modified, unnatural or unknown, describe any modern or historic human impacts to the pool (**required**):

ii. Pool Hydrology

- Select the pool's estimated hydroperiod AND provide rationale in box (**required**):
  - ○ Permanent
  - ○ Semi-permanent (drying partially in all years and completely in drought years)
  - ◉ Ephemeral (drying out completely in most years)
  - ○ Unknown

Explain:

Pool was dry during spring visit (2022-04-26).

- Maximum depth at survey: ◉ 0-12" (0-1 ft.) ○ 12-36" (1-3 ft.) ○ 36-60" (3-5 ft.) ○ >60" (>5 ft.)
- Approximate size of pool (at spring highwater): Width: ______ ○ m ◉ ft Length: ______ ○ m ◉ ft
- Predominate substrate in order of increasing hydroperiod:
  - ○ Mineral soil (bare, leaf-litter bottom, or upland mosses present)
  - ○ Mineral soil (sphagnum moss present)
  - ○ Organic matter (peat/muck) shallow or restricted to deepest portion
  - ◉ Organic matter (peat/muck) deep and widespread
- Pool vegetation indicators in order of increasing hydroperiod (check all that apply):
  - ☐ Terrestrial nonvascular spp. (e.g. haircap moss, lycopodium spp.)
  - ☐ Dry site ferns (e.g. spinulose wood fern, lady fern, bracken fern)
  - ☑ Moist site ferns (e.g. sensitive fern, cinnamon fern, interrupted fern, New York fern)
  - ☐ Moist site vasculars (e.g. skunk cabbage, jewelweed, blue flag iris, swamp candle)
  - ☐ Sphagnum moss (anchored or suspended)
  - ☐ Wet site ferns (e.g. royal fern, marsh fern)
  - ☐ Wet site shrubs (e.g. highbush blueberry, maleberry, winterberry, mountain holly)
  - ☐ Wet site graminoids (e.g. blue-joint grass, tussock sedge, cattail, bulrushes)
  - ☐ Aquatic vascular spp. (e.g. pickerelweed, arrowhead)
  - ☐ Floating or submerged aquatics (e.g. water lily, water shield, pond weed, bladderwort)
  - ☐ No vegetation in pool
- Faunal indicators (check all that apply):
  - ☐ Fish
  - ☐ Bullfrog or Green Frog tadpoles
  - ☐ Other: ______

iii. Inlet/Outlet Flow Permanency

Type of inlet or outlet (a seasonal or permanent channel providing water flowing into or out of the pool):

- ◉ No inlet or outlet
- ○ Intermittent inlet or outlet
- ○ Permanent inlet or outlet (channel with well-defined banks and permanent flow)
- ○ Other or Unknown (explain): ______

6. VERNAL POOL INDICATOR INFORMATION

a. Indicator survey dates: 2022-04-26

b. Indicator abundance criteria and pool survey effort

- Is pool depression bisected by 2 ownerships (straddler pool)? ○ Yes ◉ No
- Was the entire pool surveyed for egg masses? ◉ Yes ○ No; what % of entire pool surveyed? _____
- For each indicator species, indicate the exact number of egg masses, confidence level for species determination, and egg mass maturity. Separate cells are provided for separate survey dates.

INDICATOR SPECIES	Egg Masses (or adult Fairy Shrimp)									Tadpoles/Larvae[4]					
	Visit #1	Visit #2	Visit #3	Confidence Level[1]			Egg Mass Maturity[2]			Observed			Confidence Level[1]		
Wood Frog	0			3											
Spotted Salamander	0			3											
Blue-spotted Salamander	0			3											
Fairy Shrimp[3]	0			3											

1-Confidence level: 1 = <60%, 2 = 60-95%, 3 = >95%
2-Egg mass maturity: F= Fresh (<24 hrs), M= Mature (round embryos), A= Advanced (loose matrix, curved embryos), H= Hatched or Hatching
3-Fairy shrimp: X = present
4-Tadpoles/larvae: X = present

c. Rarity criteria

- Note any rare species associated with vernal pools. Observations should be accompanied by photographs.

SPECIES	Method of Verification*			CL**	SPECIES	Method of Verification*			CL**
	P	H	S			P	H	S	
Blanding's Turtle	☐	☐	☐		Wood Turtle	☐	☐	☐	
Spotted Turtle	☐	☐	☐		Ribbon Snake	☐	☐	☐	
Ringed Boghaunter	☐	☐	☐		Other:	☐	☐	☐	

*Method of verification: P = Photographed, H = Handled, S = Seen
**CL - Confidence level in species determination: 1= <60%, 2= 60-95%, 3= >95%

d. Optional observer recommendation:

☐ SVP ☐ Potential SVP ☐ Non Significant VP ☐ Indicator Breeding Area

e. General vernal pool comments and/or observations of other wildlife:

Small natural depression associated with a small scrub shrub and emergent wetland located on South Twin Mountain (above 1,900 feet). The depression was dry at the time of spring surveys.

Send completed form and supporting documentation to: Jason.Czapiga@maine.gov

NOTE: Digital submissions are preferred but if not possible, please mail to: Maine Department of Inland Fisheries and Wildlife
Attn: Vernal Pools
650 State Street
Bangor, ME 04401

For MDIFW use only Reviewed by MDIFW Date:______ Initials:______

This pool is: ☐ **Significant** ☐ **Potentially Significant** but lacking critical data ☐ **Not Significant** due to: ○ does not meet biological criteria. ○ does not meet MDEP vernal pool criteria.

Comments:

Potential vernal pool VP-KMN-6
Flycatcher April 26, 2022

Maine State Vernal Pool Assessment Form

INSTRUCTIONS:

- **Complete all 3 pages of form thoroughly. Most fields are required for pool registration.**
- **Clear photographs of a) the pool AND b) the indicators (one example of each species egg mass) are required for all observers.**

Observer's Pool ID: PVP-KMN-5 **MDIFW Pool ID:** ____

1. PRIMARY OBSERVER INFORMATION

a. Observer name: Katelin Nickerson

b. Contact and credentials previously provided? ○ No (submit Addendum 1) ◉ Yes

2. PROJECT CONTACT INFORMATION

a. Contact name: ◉ same as observer ○ other ____

b. Contact and credentials previously provided? ○ No (submit Addendum 1) ○ Yes

c. Project Name: Twin Energy LLC

3. LANDOWNER CONTACT INFORMATION

a. Are you the landowner? ○ Yes ◉ No If no, was landowner permission obtained for survey? ◉ Yes ○ No

b. Landowner's contact information (required)

Name: Adam Gammon (AMB Forestry Inc.) Phone: ____

Street Address: 6 Jed Martin Road City: Rumford State: ME Zip: 04276

c. ☐ Large Projects: check if separate project landowner data file submitted

4. VERNAL POOL LOCATION INFORMATION

a. Location Township: Rumford

Brief site directions to the pool (using mapped landmarks):

From Rumford center, drive ~ 3.5 miles N on 120 W (Swift River Road) to 299-353 (44.6017649, -70.562831). Head NW on Yonder Way for ~ 2 miles. Then hike ~ 0.85 miles SW to arrive at PVP.

b. Mapping Requirements

i. USGS topographic map OR aerial photograph with pool clearly marked.

ii. GPS location of vernal pool (use Datum NAD83 / WGS84)

Longitude/Easting: -70.615197 Latitude/Northing: 44.604119

Coordinate system: ____

Check one:

○ GIS shapefile
- send to Jason.Czapiga@maine.gov; observer has reviewed shape accuracy (Best)

○ The pool perimeter is delineated by multiple GPS points. (Excellent)
- Include map or spreadsheet with coordinates.

◉ The above GPS point is at the center of the pool. (Good)

○ The center of the pool is approximately ____ m ○ ft ○ in the compass direction of ____ degrees from the above GPS point. (Acceptable)

5. VERNAL POOL HABITAT INFORMATION

a. Habitat survey date (only if different from indicator survey dates on page 3): ____________

b. Wetland habitat characterization

- Choose the best descriptor for the landscape setting:
  - ○ Isolated depression
  - ○ Floodplain depression
  - ⦿ Pool associated with larger wetland complex
  - ○ Other: ____________
- Check all wetland types that best apply to this pool:
  - ☐ Forested swamp
  - ☐ Shrub swamp
  - ☐ Peatland (fen or bog)
  - ☑ Emergent marsh
  - ☐ Wet meadow
  - ☐ Lake or pond cove
  - ☐ Abandoned beaver flowage
  - ☐ Active beaver flowage
  - ☐ Slow stream
  - ☐ Floodplain
  - ☐ Mostly unvegetated pool
  - ☐ ATV or skidder rut
  - ☐ Dug pond or borrow pit
  - ☐ Roadside ditch
  - ☐ Other: ____________

c. Vernal pool status under the Natural Resources Protection Act (NRPA)

i. Pool Origin: ⦿ Natural ○ Natural-Modified ○ Unnatural ○ Unknown

If modified, unnatural or unknown, describe any modern or historic human impacts to the pool (**required**):

ii. Pool Hydrology

- Select the pool's estimated hydroperiod AND provide rationale in box (**required**):
  - ○ Permanent
  - ○ Semi-permanent (drying partially in all years and completely in drought years)
  - ⦿ Ephemeral (drying out completely in most years)
  - ○ Unknown

Explain:

Pool is fairly shallow and exposed. Observed to be dry during spring visit.

- Maximum depth at survey: ⦿ 0-12" (0-1 ft.) ○ 12-36" (1-3 ft.) ○ 36-60" (3-5 ft.) ○ >60" (>5 ft.)
- Approximate size of pool (at spring highwater): Width: _____ ○ m ⦿ ft Length: _____ ○ m ⦿ ft
- Predominate substrate in order of increasing hydroperiod:
  - ○ Mineral soil (bare, leaf-litter bottom, or upland mosses present)
  - ○ Mineral soil (sphagnum moss present)
  - ○ Organic matter (peat/muck) shallow or restricted to deepest portion
  - ⦿ Organic matter (peat/muck) deep and widespread
- Pool vegetation indicators in order of increasing hydroperiod (check all that apply):
  - ☐ Terrestrial nonvascular spp. (e.g. haircap moss, lycopodium spp.)
  - ☐ Dry site ferns (e.g. spinulose wood fern, lady fern, bracken fern)
  - ☑ Moist site ferns (e.g. sensitive fern, cinnamon fern, interrupted fern, New York fern)
  - ☐ Moist site vasculars (e.g. skunk cabbage, jewelweed, blue flag iris, swamp candle)
  - ☐ Sphagnum moss (anchored or suspended)
  - ☐ Wet site ferns (e.g. royal fern, marsh fern)
  - ☐ Wet site shrubs (e.g. highbush blueberry, maleberry, winterberry, mountain holly)
  - ☐ Wet site graminoids (e.g. blue-joint grass, tussock sedge, cattail, bulrushes)
  - ☐ Aquatic vascular spp. (e.g. pickerelweed, arrowhead)
  - ☐ Floating or submerged aquatics (e.g. water lily, water shield, pond weed, bladderwort)
  - ☐ No vegetation in pool
- Faunal indicators (check all that apply):
  - ☐ Fish
  - ☐ Bullfrog or Green Frog tadpoles
  - ☐ Other: ____________

iii. Inlet/Outlet Flow Permanency

Type of inlet or outlet (a seasonal or permanent channel providing water flowing into or out of the pool):

- ⦿ No inlet or outlet
- ○ Intermittent inlet or outlet
- ○ Permanent inlet or outlet (channel with well-defined banks and permanent flow)
- ○ Other or Unknown (explain): ____________

6. VERNAL POOL INDICATOR INFORMATION

a. Indicator survey dates: 2022-04-26

b. Indicator abundance criteria and pool survey effort

- Is pool depression bisected by 2 ownerships (straddler pool)? ○ Yes ◉ No
- Was the entire pool surveyed for egg masses? ◉ Yes ○ No; what % of entire pool surveyed? ____
- For each indicator species, indicate the exact number of egg masses, confidence level for species determination, and egg mass maturity. Separate cells are provided for separate survey dates.

INDICATOR SPECIES	Egg Masses (or adult Fairy Shrimp)									Tadpoles/Larvae[4]					
	Visit #1	Visit #2	Visit #3	Confidence Level[1]			Egg Mass Maturity[2]			Observed			Confidence Level[1]		
Wood Frog	0			3											
Spotted Salamander	0			3											
Blue-spotted Salamander	0			3											
Fairy Shrimp[3]	0			3											

1-Confidence level: 1 = <60%, 2 = 60-95%, 3 = >95%
2-Egg mass maturity: F= Fresh (<24 hrs), M= Mature (round embryos), A= Advanced (loose matrix, curved embryos), H= Hatched or Hatching
3-Fairy shrimp: X = present
4-Tadpoles/larvae: X = present

c. Rarity criteria

- Note any rare species associated with vernal pools. Observations should be accompanied by photographs.

SPECIES	Method of Verification*			CL**	SPECIES	Method of Verification*			CL**
	P	H	S			P	H	S	
Blanding's Turtle	☐	☐	☐		Wood Turtle	☐	☐	☐	
Spotted Turtle	☐	☐	☐		Ribbon Snake	☐	☐	☐	
Ringed Boghaunter	☐	☐	☐		Other:	☐	☐	☐	

*Method of verification: P = Photographed, H = Handled, S = Seen
**CL - Confidence level in species determination: 1= <60%, 2= 60-95%, 3= >95%

d. Optional observer recommendation:

☐ SVP ☐ Potential SVP ☐ Non Significant VP ☐ Indicator Breeding Area

e. General vernal pool comments and/or observations of other wildlife:

Natural pool near the summit of South Twin Mountain that does not appear deep enough to support vernal pool specific amphibians.

Send completed form and supporting documentation to: Jason.Czapiga@maine.gov

NOTE: Digital submissions are preferred but if not possible, please mail to: Maine Department of Inland Fisheries and Wildlife
Attn: Vernal Pools
650 State Street
Bangor, ME 04401

For MDIFW use only Reviewed by MDIFW Date:_____ Initials:_____

This pool is: ☐ **Significant** ☐ **Potentially Significant** but lacking critical data ☐ **Not Significant** due to: ○ does not meet biological criteria. ○ does not meet MDEP vernal pool criteria.

Comments:

Potential vernal pool VP-KMN-5
Flycatcher April 26, 2022

Potential vernal pool VP-KMN-5
Flycatcher April 26, 2022

Maine State Vernal Pool Assessment Form

INSTRUCTIONS:

- **Complete all 3 pages of form thoroughly. Most fields are required for pool registration.**
- **Clear photographs of a) the pool AND b) the indicators (one example of each species egg mass) are required for all observers.**

Observer's Pool ID: PVP-KMN-6 **MDIFW Pool ID:** ____________

1. PRIMARY OBSERVER INFORMATION

a. Observer name: Katelin Nickerson

b. Contact and credentials previously provided? ( ) No (submit Addendum 1) (•) Yes

2. PROJECT CONTACT INFORMATION

a. Contact name: (•) same as observer ( ) other ____________

b. Contact and credentials previously provided? ( ) No (submit Addendum 1) ( ) Yes

c. Project Name: Twin Wind LLC

3. LANDOWNER CONTACT INFORMATION

a. Are you the landowner? ( ) Yes (•) No If no, was landowner permission obtained for survey? (•) Yes ( ) No

b. Landowner's contact information (required)

Name: Adam Gammon (AMB Forestry Inc.) Phone: ____________

Street Address: 6 Jed Martin Road City: Rumford State: ME Zip: 04276

c. ☐ Large Projects: check if separate project landowner data file submitted

4. VERNAL POOL LOCATION INFORMATION

a. Location Township: Rumford

Brief site directions to the pool (using mapped landmarks):

From Rumford center, drive ~ 3.5 miles N on 120 W (Swift River Road) to 299-353 (44.6017649, -70.562831). Head NW on Yonder Way for ~ 2 miles. Then hike ~ 0.6 miles west to arrive at PVP.

b. Mapping Requirements

i. USGS topographic map OR aerial photograph with pool clearly marked.

ii. GPS location of vernal pool (use Datum NAD83 / WGS84)

Longitude/Easting: -70.611422 Latitude/Northing: 44.606729

Coordinate system: ____________

Check one:

( ) GIS shapefile
- send to Jason.Czapiga@maine.gov; observer has reviewed shape accuracy (Best)

( ) The pool perimeter is delineated by multiple GPS points. (Excellent)
- Include map or spreadsheet with coordinates.

(•) The above GPS point is at the center of the pool. (Good)

( ) The center of the pool is approximately _____ m ( ) ft ( ) in the compass direction of _____ degrees from the above GPS point. (Acceptable)

5. VERNAL POOL HABITAT INFORMATION

a. Habitat survey date (only if different from indicator survey dates on page 3): ____________

b. Wetland habitat characterization

- Choose the best descriptor for the landscape setting:
  - ○ Isolated depression
  - ○ Floodplain depression
  - ⦿ Pool associated with larger wetland complex
  - ○ Other: ____________

- Check all wetland types that best apply to this pool:
  - ☑ Forested swamp
  - ☑ Shrub swamp
  - ☐ Peatland (fen or bog)
  - ☐ Emergent marsh
  - ☐ Wet meadow
  - ☐ Lake or pond cove
  - ☐ Abandoned beaver flowage
  - ☐ Active beaver flowage
  - ☐ Slow stream
  - ☐ Floodplain
  - ☐ Mostly unvegetated pool
  - ☑ ATV or skidder rut
  - ☐ Dug pond or borrow pit
  - ☐ Roadside ditch
  - ☐ Other: ____________

c. Vernal pool status under the Natural Resources Protection Act (NRPA)

i. Pool Origin: ○ Natural ⦿ Natural-Modified ○ Unnatural ○ Unknown

If modified, unnatural or unknown, describe any modern or historic human impacts to the pool (**required**):

Pool modified by skidder tracks.

ii. Pool Hydrology

- Select the pool's estimated hydroperiod AND provide rationale in box (**required**):
  - ○ Permanent
  - ○ Semi-permanent (drying partially in all years and completely in drought years)
  - ⦿ Ephemeral (drying out completely in most years)
  - ○ Unknown

Explain:

Pool was dry during spring survey

- Maximum depth at survey: ⦿ 0-12" (0-1 ft.) ○ 12-36" (1-3 ft.) ○ 36-60" (3-5 ft.) ○ >60" (>5 ft.)

- Approximate size of pool (at spring highwater): Width: _____ ○ m ⦿ ft Length: _____ ○ m ⦿ ft

- Predominate substrate in order of increasing hydroperiod:
  - ○ Mineral soil (bare, leaf-litter bottom, or upland mosses present)
  - ○ Mineral soil (sphagnum moss present)
  - ○ Organic matter (peat/muck) shallow or restricted to deepest portion
  - ⦿ Organic matter (peat/muck) deep and widespread

- Pool vegetation indicators in order of increasing hydroperiod (check all that apply):
  - ☐ Terrestrial nonvascular spp. (e.g. haircap moss, lycopodium spp.)
  - ☐ Dry site ferns (e.g. spinulose wood fern, lady fern, bracken fern)
  - ☑ Moist site ferns (e.g. sensitive fern, cinnamon fern, interrupted fern, New York fern)
  - ☐ Moist site vasculars (e.g. skunk cabbage, jewelweed, blue flag iris, swamp candle)
  - ☐ Sphagnum moss (anchored or suspended)
  - ☐ Wet site ferns (e.g. royal fern, marsh fern)
  - ☑ Wet site shrubs (e.g. highbush blueberry, maleberry, winterberry, mountain holly)
  - ☑ Wet site graminoids (e.g. blue-joint grass, tussock sedge, cattail, bulrushes)
  - ☐ Aquatic vascular spp. (e.g. pickerelweed, arrowhead)
  - ☐ Floating or submerged aquatics (e.g. water lily, water shield, pond weed, bladderwort)
  - ☐ No vegetation in pool

- Faunal indicators (check all that apply):
  - ☐ Fish
  - ☐ Bullfrog or Green Frog tadpoles
  - ☐ Other: ____________

iii. Inlet/Outlet Flow Permanency

Type of inlet or outlet (a seasonal or permanent channel providing water flowing into or out of the pool):

- ⦿ No inlet or outlet
- ○ Intermittent inlet or outlet
- ○ Permanent inlet or outlet (channel with well-defined banks and permanent flow)
- ○ Other or Unknown (explain): ____________

6. VERNAL POOL INDICATOR INFORMATION

a. Indicator survey dates: 2022-04-26

b. Indicator abundance criteria and pool survey effort

- Is pool depression bisected by 2 ownerships (straddler pool)? ○ Yes ◉ No
- Was the entire pool surveyed for egg masses? ◉ Yes ○ No; what % of entire pool surveyed? ______
- For each indicator species, indicate the exact number of egg masses, confidence level for species determination, and egg mass maturity. Separate cells are provided for separate survey dates.

INDICATOR SPECIES	Egg Masses (or adult Fairy Shrimp)									Tadpoles/Larvae[4]					
	Visit #1	Visit #2	Visit #3	Confidence Level[1]			Egg Mass Maturity[2]			Observed			Confidence Level[1]		
Wood Frog	0			3											
Spotted Salamander	0			3											
Blue-spotted Salamander	0			3											
Fairy Shrimp[3]	0			3											

1-Confidence level: 1 = <60%, 2 = 60-95%, 3 = >95%
2-Egg mass maturity: F= Fresh (<24 hrs), M= Mature (round embryos), A= Advanced (loose matrix, curved embryos), H= Hatched or Hatching
3-Fairy shrimp: X = present
4-Tadpoles/larvae: X = present

c. Rarity criteria

- Note any rare species associated with vernal pools. <u>Observations should be accompanied by photographs</u>.

SPECIES	Method of Verification*			CL**	SPECIES	Method of Verification*			CL**
	P	H	S			P	H	S	
Blanding's Turtle	☐	☐	☐		Wood Turtle	☐	☐	☐	
Spotted Turtle	☐	☐	☐		Ribbon Snake	☐	☐	☐	
Ringed Boghaunter	☐	☐	☐		Other:	☐	☐	☐	

*Method of verification: P = Photographed, H = Handled, S = Seen
**CL - Confidence level in species determination: 1= <60%, 2= 60-95%, 3= >95%

d. Optional observer recommendation:

☐ SVP ☐ Potential SVP ☐ Non Significant VP ☐ Indicator Breeding Area

e. General vernal pool comments and/or observations of other wildlife:

Natural modified pool near the summit of South Twin Mountain. Dry during spring site visit.

Send completed form and supporting documentation to: Jason.Czapiga@maine.gov

NOTE: Digital submissions are preferred but if not possible, please mail to: Maine Department of Inland Fisheries and Wildlife
Attn: Vernal Pools
650 State Street
Bangor, ME 04401

<u>**For MDIFW use only**</u> Reviewed by MDIFW Date:______ Initials:______

This pool is: ☐ **Significant** ☐ **Potentially Significant** but lacking critical data ☐ **Not Significant** due to: ○ does not meet biological criteria. ○ does not meet MDEP vernal pool criteria.

Comments:


Potential vernal pool VP-KMN-5
Flycatcher April 26, 2022


Potential vernal pool VP-KMN-5
Flycatcher April 26, 2022

Exhibit 7-6
Memorandum of Findings
Great Blue Herons

MEMORANDUM OF FINDINGS

Date:	January 18, 2023
To:	Lindsay Deane-Mayer (Palmer Capital Corporation)
From:	Rodney Kelshaw (Flycatcher LLC)
CC:	Sumul Shah (Palmer Capital), Katelin Nickerson (Flycatcher)
Subject:	Fall 2022 Aerial Stick Nest Survey Results – Twin Energy, Oxford County, Maine

INTRODUCTION

Flycatcher LLC (Flycatcher) is providing wildlife and natural resource survey support for the Twin Energy Project (Project), a proposed wind electric generation facility located on South Twin Mountain in Rumford and Roxbury, Maine. Twin Energy LLC (Twin Energy) is proposing to install three wind energy generation turbines, each with a nameplate capacity of approximately six-megawatts.

The proposed Project includes three turbines that generally run west to east, with elevations ranging between 1,950 and 2,155 feet, along the northern ridge of South Twin Mountain. The proposed turbines will each have a hub height of approximately 384-feet (117 meters), blade tip height of approximately 645-feet (196 meters), and total blade swing diameter of approximately 490-feet (149 meters). The access road and collector line are proposed to extend from the existing RoxWind project in Roxbury southerly to South Twin Mountain in Rumford.

During pre-permitting consultations biologists from the Maine Department of Inland Fisheries and Wildlife (MDIFW) requested that aerial surveys be completed to identify rookeries (colonies) for great blue heron (*Ardea herodias)*, a Maine listed Species of Special Concern. This request aligns with the *Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize Bat Mortality* published by MDIFW in 2018. Typically, these surveys are performed in the spring, coinciding with aerial eagle nest surveys to identify nests and determine nest productivity (are they occupied and are there eggs or chicks present). It is the Project team's understanding that aerial eagle nest surveys will not be requested by the MDIFW because there is sufficient information on eagle nests in the vicinity of the proposed Project.

Due to various factors an early spring survey, that is typical for this type of survey, was not performed. However, through collaboration between the Project team and MDIFW biologists, a substitute aerial survey methodology was developed whereby biologists would perform a late fall/early winter aerial stick nest survey during leaf off conditions, and before significant snowfall. This allows for biologist to determine presence and/or probable absence of stick nests within proximity to the proposed Project, to support permitting review by MDIFW and determine if further studies would be required.

METHODS

Rodney Kelshaw, a wildlife biologist with Flycatcher, performed a fall aerial search for large stick nests, and specifically targeting great blue heron rookeries within a five-mile radius of the proposed Twin Energy Project in Rumford and Roxbury. Rodney was accompanied by MDIFW wildlife biologist and wading bird specialist, Danielle D'Auria. The survey team was piloted by Chris Carrol of Penobscot Island Air.

Prior to the flight, Flycatcher established the survey area and transect flight path for review by MDIFW and to prepare for the survey. The survey area encompasses a five-mile radius around the proposed Project with transects set at a 0.5-mile offset (Figure 1). To support navigation during the survey, digital data of the survey area were provided to the pilot, uploaded to his Global Positioning System (GPS), and overlaid onto an aerial photograph. The flight originated and ended at the Augusta State Airport. Once the team arrived at the site, the survey began on the western side of the survey area. Biologists had the benefit of observing a known great blue heron rookery just west of the five-mile radius of the survey area. This allowed the survey team to determine how visible nests would be, and to calibrate a search image for the remainder of the survey. The survey then generally followed the predetermined transects moving west to east; the flight path was recorded and is depicted on Figure 2.

RESULTS

The survey flight occurred on November 22, 2022. Weather conditions during the survey were sunny with good visibility and moderate winds, with higher gusts particularly near the ridgelines. The flight took place during leaf-off conditions which provided good visibility in the predominantly deciduous landscape. The light snow cover created a contrast to help surveyors identify nests since they held enough snow to look different than the tree it was in without blending in with the white ground below. Overall, conditions were favorable for identifying large stick nests within the survey area.

At the onset of the survey flight two (2) nests were observed in the known great blue heron rookery, just outside of the survey area. The flight path then generally followed the 0.5 mile transects, avoiding the existing turbines and high wind areas along the ridgelines. Approximately mid-way through the flight the known bald eagle nest, on French Island in Ellis Pond, was observed intact with two (2) adult bald eagles perched on an adjacent tree.

The remaining transects were completed followed by additional passes over observed suitable habitat along Mitchell and Walton Brooks. One (1) apparent great blue heron nest was observed in a beaver impoundment of Walton Brook, located north of Poplar Hill Road in Mexico (Figure 2). This was the only stick nest observed within the survey area (other than the known rookery and eagle nest). The location of this nest is over 3-miles from the nearest proposed turbine.

Based on these findings it appears there is a low density of great blue heron nests within the vicinity of the proposed Project. Additionally, the likelihood there are other large stick nests suitable for larger raptors or herons within the survey area is low. It is our opinion that this survey should satisfy MDIFW's requirement for a great blue heron nest survey. It also provides evidence to suggest the proposed Project is unlikely to have a significant negative effect on the local population of great blue heron.

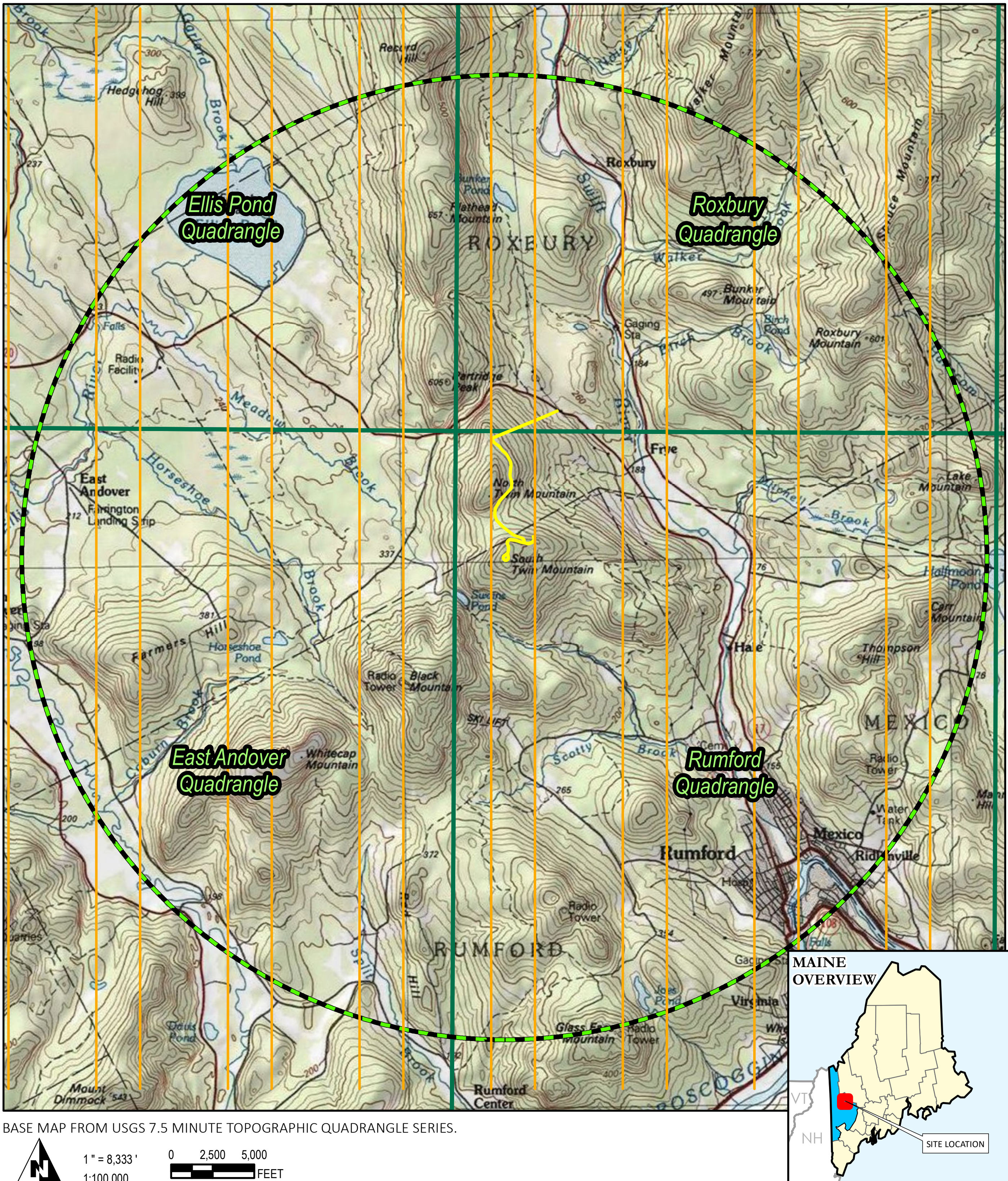
Thank you for the opportunity to work with you on this Project. Please contact me if you have additional questions or comments.

Rodney Kelshaw, CWB/PWS/CPSS/CPESC/LSE/LSS
rodney@flycatcherllc.com
(207) 944-6776

Attachment 1. Figures 1 & 2

ATTACHMENT 1

Figure 1: Site Location and Transect Map
Figure 2. Aerial Stick Nest Survey Results Map



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

1 " = 8,333 '
1:100,000

0 2,500 5,000 FEET

PALMER
Flycatcher LAND + SCIENCE + PEOPLE

PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

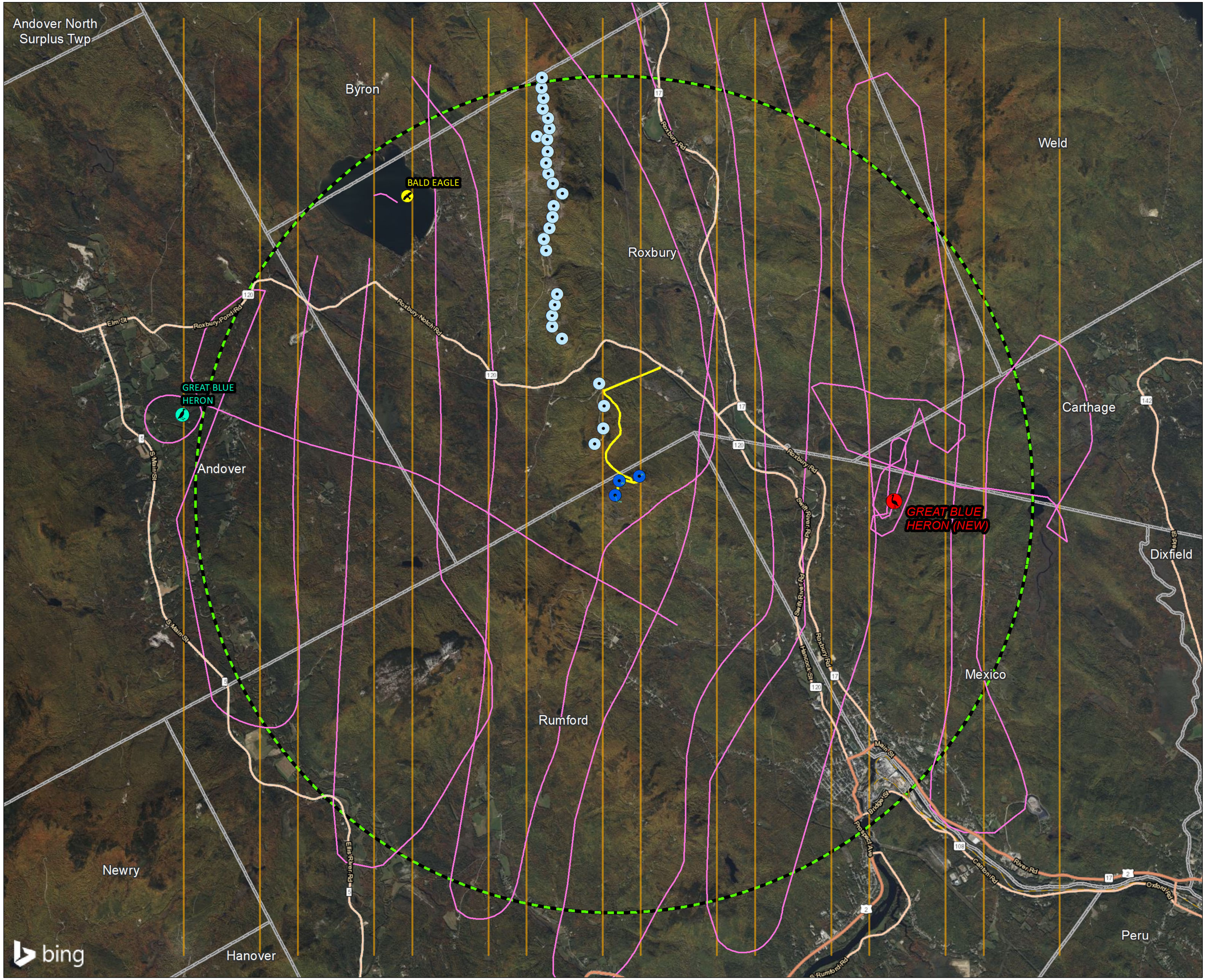
LEGEND:

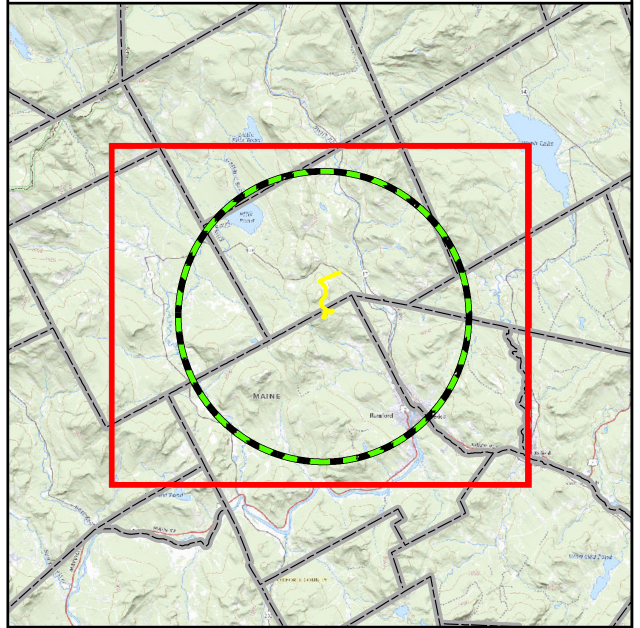
PROPOSED PROJECT BOUNDARY
5 MILE TURBINE RADIUS
PROPOSED SURVEY TRANSECT (0.5 MILE SPACING)

DRAWN BY:	D. KENWORTHY
CHECKED BY:	R. KELSHAW
MONTH:	JANUARY
YEAR:	2023
PROJ. NO.:	21ZP
CLIENT:	PALMER

FIGURE 1 - LOCATION AND SURVEY TRANSECTS

C:\FLYCATCHER\Projects\Solaya\Palmer_TwinEnergy_AerialStickNest_Fig1_USGS_8x11P.mxd -- Saved By: DREWKENWORTHY on 1/9/2023, 16:54:13 PM





LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- EXISTING TURBINE LOCATION
- BALD EAGLE (KNOWN)
- GREAT BLUE HERON (KNOWN)
- GREAT BLUE HERON (NEWLY IDENTIFIED)
- PROPOSED SURVEY TRANSECT
- FLIGHTPATH
- 5 MILE TURBINE RADIUS
- TOWN BOUNDARY

NOTES:

1 BASEMAP IMAGERY FROM BING AERIAL IMAGERY.
2 PROPOSED FLIGHT SURVEY TRANSECTS ARE SPACED AT 1/2 MILE INTERVALS.
3 ACTUAL FLIGHT PATHS WERE FLOWN IN NOVEMBER 2022.
4 EXISTING WIND TURBINE DATA FROM FAA WIND TURBINE UPDATE JANUARY 2023.

N

0 1.5 3
Miles

PROJECT:
TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
FALL 2022 AERIAL STICK NEST SURVEY RESULTS

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	R. KELSHAW	**FIGURE 2**	
MONTH:	JANUARY		
YEAR:	2023		

Flycatcher LAND + SCIENCE + PEOPLE PALMER

FILE NO.: Palmer_TwinEnergy_2022AerialStickNest_Fig2_Results_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

Plot Date: 1/13/2023, 09:25:57 AM by DREWKENWORTHY -- LAYOUT: ANSI B(11"x17")
Path: C:\FLYCATCHER\Projects\Solaya\Palmer_TwinEnergy_2022AerialStickNest_Fig2_Results_11x17L.mxd

Exhibit 7-7
Bat Survey Report

Summer 2023: Pre-Construction Bat Acoustic Survey Report

Twin Energy Project - Oxford County, Maine

Summer 2023: Pre-Construction Bat Acoustic Survey Report

Twin Energy Project - Oxford County, Maine

Prepared for:
Palmer/ Twin Energy LLC
13 Elm Street, Suite 200
Cohasset, MA 02025

Prepared for:
Flycatcher LLC
106 Lafayette Street, Suite 2A
Yarmouth, ME 04096
http://www.flycatcherllc.com

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10 Roadking Aly
Limington, ME 04049

September 2023

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BAT ACOUSTIC SURVEYS TWIN ENERGY

EXECUTIVE SUMMARY

The Twin Energy Project, a proposed wind electric generation facility in Rumford and Roxbury, Maine, aims to install three wind energy turbines with a capacity of six megawatts each. To support permitting requirements and assess potential impacts on bat species, Twin Energy LLC contracted Flycatcher LLC and Moonrise Ecological Services (MES) to conduct bat acoustic surveys. The surveys were conducted in accordance with guidelines established by the United States Fish and Wildlife Service (USFWS) and Maine Department of Inland Fisheries and Wildlife (MDIFW). Bat acoustic surveys were conducted over 33 days and 99 survey nights using three detectors, exceeding USFWS and State of Maine Guidelines. Despite varying weather conditions, the detectors recorded bat activity on every night except one. Five bat species, including big brown, eastern red, hoary, silver-haired, and little brown bats, received statistically significant MLE p-values (<0.05) through the autoclassification analysis. MES conducted manual vetting to confirm or change species identifications from autoclassification, focusing on high-frequency (HiF) phonic group bats. Manual vetting confirmed the presence of eastern red, little brown, and tri-colored bats. The federally listed northern long-eared bat was not confirmed due to distorted or insufficient recordings.

The bat acoustic surveys indicated the probable presence of five bat species, including big brown, eastern red, little brown, and tri-colored bats. The federally listed northern long-eared bat was not confirmed during the survey. Overall bat activity was relatively low, with an average of 4.51 calls per evening recorded over nearly 100 survey nights. The combination of Twin Energy's commitment to curtailment and the limited bat presence suggests that Myotis bats are not likely to be adversely affected by the project. These survey results provide valuable information for Twin Energy LLC and regulatory agencies as they assess the potential impacts of the Twin Energy Project on local bat populations and work towards obtaining the necessary permits for the wind energy facility.

INTRODUCTION

PROJECT DESCRIPTION

The Twin Energy Project (Project) is a proposed wind electric generation facility located on South Twin Mountain in Rumford and Roxbury, Maine. Twin Energy LLC (Twin Energy) is proposing to install three wind energy turbines, each with a nameplate capacity of approximately six-megawatts. The access road and collector line are proposed to extend from the existing RoxWind project in Roxbury southerly to South Twin Mountain in Rumford.

The proposed Project includes three turbines that generally are aligned from west to east, with elevations ranging between 1,950 and 2,155 feet, along the northern ridge of South Twin Mountain. The proposed turbines will each have a hub height of approximately 384-feet (117 meters), blade tip height of approximately 645-feet (196 meters), and total blade swing diameter of approximately 490-feet (149 meters). The access road and collector line are proposed to extend from the existing RoxWind project in Roxbury southerly to South Twin Mountain in Rumford.

Flycatcher LLC (Flycatcher) and Moonrise Ecological Services (MES) were contracted by Twin Energy to complete bat acoustic surveys to aid in Project siting and to support permitting requirements for the Project. Flycatcher/MES biologists consulted with the Maine Department of Inland Fisheries and Wildlife (MDIFW), and the United States Fish and Wildlife Service (USFWS) to develop a site-specific survey plan that will collect sufficient data to support these two agencies in making a determination about the Project during their respective review processes.

SURVEY BACKGROUND

During pre-survey consultations, USFWS recommended that bat acoustic surveys be completed to support their review and meet the Project's obligations for permitting under the US Army Corps of Engineers (USACE) Maine General Permits (GP: USACE, 2020). While completing these surveys was not recommended by MDIFW, the Department was consulted prior to initiating the survey. In this consultation, MDIFW referenced a study completed by Jesse De La Cruz out of the College of Natural Resources and Environment at Virgina Tech (De La Cruz 2022). The results of this study suggest that 11 nights of surveys are required to detect northern long-eared bat, and therefore MDIFW has a standard 14 nights of survey when completing studies at their survey sites which this study exceeds with 33 nights per detector.

Flycatcher/MES developed a draft survey plan that was provided to both MDIFW and USFWS for comment and review during the spring of 2023. The survey plan was approved by USFWS in June 2023. The acoustic devices were deployed on June 30th and were demobilized August 2nd, 2023. All of the detectors were fully functioning at demobilization. Figures 1 and 2, depict the Project area and bat detector survey locations.

SURVEY OBJECTIVES

The acoustic surveys were conducted in accordance with survey protocols established by USFWS in the 2023 Range-wide Indiana/ Northern long-eared Bat Summer Survey Guidelines (IBat Guidelines) (USFWS 2023a) and in consideration of the guidance from Maine MDIFW (De La Cruz 2022). The IBat/Northern long-eared Bat Guidelines outline the current protocols to determine the presence or absence of northern long-eared bats and other bats of concern. MES possesses a Federal Permit from USFWS (Appendix A) to conduct acoustic surveys in the State of Maine.

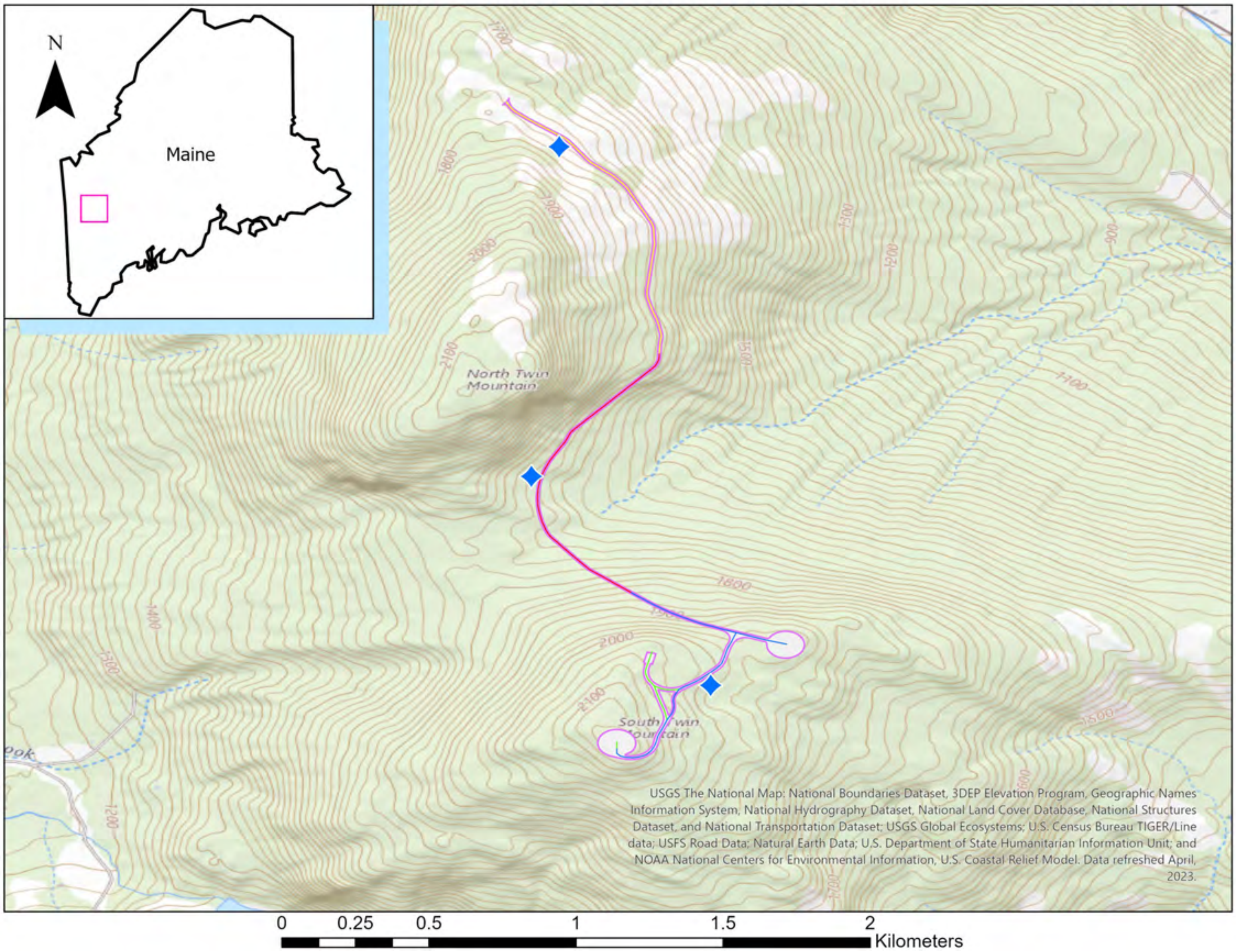

Figure 1. Twin Energy Bat Survey Vicinity map.

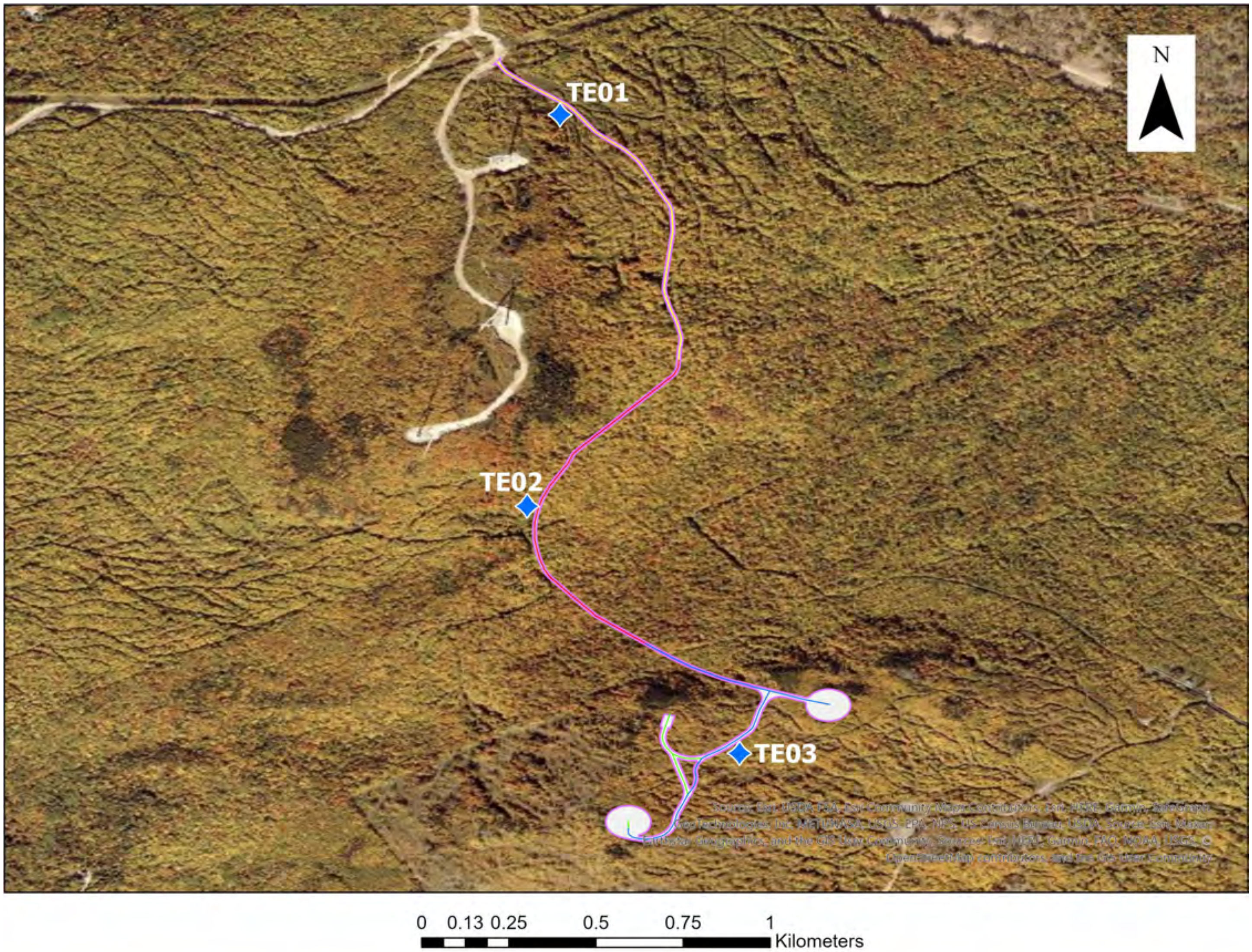

Figure 2. Twin Energy Bat Survey Site Locations map.

SURVEY METHODS

Survey Description and Location

Wildlife Acoustic® SM4BAT acoustic detectors with weatherproofed ultrasonic microphones that are designed for recording echolocation calls of bats were deployed. These detectors record bat calls in full spectrum; the resulting information can be used to identify bat species at a sampling site. The detectors recorded and stored data on internal Secure Digital (SD) cards. Microphones for each detector were placed at a slight upward angle, 4 meters above the ground. Detectors were programmed to record from 30 minutes before sunset to 30 minutes after sunrise.

A total of three detectors were deployed between 30 June, 2023 and 2 August, 2023, for a total of 99 detector nights far exceeding the recommendations of 14 detector nights per site (42 detector nights (Table 1 and Figure 3))[1]. Habitat assessment photos and datasheets for all detector locations are provided in Appendix B. At each location MES performed a visual inspection of the area surrounding the detector deployment site noting any potential bat roosting habitat, forest age and structure, and water resources. Potential roosting habitat was noted if there were buildings present (several bat species including northern long-eared, little brown, and big brown bats regularly use buildings), other anthropogenic structures (i.e., bridges or culverts), or trees that could provide roosting habitat for bats. Based on current knowledge and increased research, the northern long-eared bat seems to select roosting locations based on structural characteristics (i.e., micro-habitat features, solar exposure, and tree diameter) rather than specific tree species; both species have also been documented using anthropogenic structures (i.e., buildings and bat boxes). Trees were considered to have obvious bat roosting habitat potential by having visual micro-habitat conducive to bat roosting i.e., flaking bark (due to tree die-off, or species (i.e., shagbark hickories, mature white oak, or American elm) or cavities in the trunk or branches. There are times that roosting areas within a tree are not outwardly visible. This habitat assessment of the area is done to provide justification for the selection of the recording site and to provide information about the type of habitat that is within the detection range of the microphone. Acoustic detector Sites TE01, TE02, and TE03 were deployed in the proposed construction sites (Figure 2). Site TE01 and TE03 were deployed along an existing ATV/skidder trail over a wetland with pooled water with an adjacent young successional forest. Site TE02 was placed in a mid-aged forest with large canopy and small stream and field adjacent to detectors. All sites were located in areas where resources provided potential roosting habitat for bats, as described above.

Weather data was obtained from the nearest-available NOAA National Weather Service Station (Appendix C). A night of acoustic sampling was considered complete if the climatic conditions for the night (temperature and humidity/precipitation) met the acceptable standards outlined in the IBat/NLEB 2023 Guidelines. All nights were included in the study as there was bat activity recorded every detector night except one.

Data Collection

A trained biologist conducted the analysis of data. All data recorded was filtered (or “scrubbed”) to remove files that contained only noise or poor-quality recordings. The files that remained were processed with Kaleidoscope Pro. 5.4.7g with the auto classifier Bats of North America 5.4.0 region Maine (Wildlife Acoustics, Maynard, Massachusetts), and Sonobat® 4 (Sonobat, Inc, Humbolt, CA) Northeast classifier to determine which files have bat calls present.

[1] USFWS requested four detector nights at three locations, 12 detector nights. MDIFW did not request acoustic data but stated that at least 14 detector nights per location (42 detector nights) would be MDIFW’s survey recommendation.

The autoclassification software utilizes a Maximum Likelihood Estimator (MLE) to generate probability values, referred to as p-values. These p-values play a crucial role in determining whether a particular species is likely to be present or absent. To illustrate this likelihood statistically, the Kaleidoscope Pro software generates a presence p-value table. This table quantifies the probability that a bat species is present based on factors such as the quantity and quality of recorded calls.

A p-value below 0.05 indicates a probable presence of the species with a high level of confidence, as explained in the IBat/NLEB Guidelines. Essentially, when the p-value is close to zero (e.g., less than 0.05), it suggests that the observed data cannot be attributed to random chance if assuming the null hypothesis is correct. On the other hand, larger p-values (approaching 1) don't necessarily indicate the absence of a species; rather, they suggest a lack of statistical evidence to support its presence. Conversely, low p-values (close to zero) do not guarantee the presence of a species; instead, they indicate that the data statistically supports presence because the results cannot be explained by observed data and known error rates.

After completing the autoclassification process, experienced acoustic technicians conducted a manual examination of all high-frequency bat call files and NoID calls to ensure accuracy. These calls were meticulously reviewed by biologists qualified under the MES standard (see Appendix E). Eastern bat calls can be categorized into two phonetic groups: low-frequency bats (LoF) and high-frequency bats (HiF). The LoF group comprises species such as big brown bats, silver-haired bats, and hoary bats, while the HiF group includes eastern red bats, tri-colored bats, little brown bats, northern long-eared bats, and eastern small-footed bats. During the examination, all HiF calls were assessed for quality and species-specific characteristics, including factors like maximum and minimum frequency, duration, the presence of multiple pulses within a call, and call shape. If all these parameters were met, a species-level identification was assigned (refer to Table 3 or Table 4).

In cases where the available information was insufficient to make a species identification, the calls were classified into one of the two phonetic groups. When a call's quality was poor but it could still be attributed to a specific phonetic group, it was identified as either LoF or HiF as appropriate. If a file contained a bat call but was accompanied by a high level of ambient noise, making it impossible to determine the phonetic group, the call was classified as having no identification (NoID). Conversely, if a file contained no bat calls at all, it was categorized as noise and labeled accordingly as "Noise" (Appendix D).

Table 1. Twin Energy Acoustic Survey Locations

Detector Location Name	**Latitude / Longitude WGS84**		**Dates Surveyed**
	North	**West**	
Site 01	44.6222175	-70.6150975	6/30-8/2
Site 02	44.61213617	-70.6159465	6/30-8/2
Site 03	44.6057635	-70.61047133	6/30-8/2

SURVEY RESULTS

Survey Effort and Weather

Bat acoustic surveys were conducted for a total of 33 days and 99 survey nights, over three detectors which exceeds USFWS and MDIFW recommendations. Even though there were rain and wind events during the extended survey period, the detectors recorded bats every night except one night.

Autoclassification

Table 2 and 3 shows the detections and MLE p-values, respectively, from the autoclassification software, which indicates the likelihood of presence for each species at each detector location. Big brown, eastern red, hoary, silver-haired and little brown bats had significant p-values (<0.05). Software outputs for each night are provided in Appendix D. A total of five species received a statistically significant MLE p-value through the autoclassification analysis. Site TE01 had the highest number of species with four species with probable presence; followed by Sites TE02 and TE03 with three species. Of the 728 wav files recorded over month, 451 were classified as bat calls by KPro and around 100 calls of HiF were manually vetted (Table 4).

Table 2. Autoclassification of bat calls by KPro

Species/Site	TE01	TE02	TE03
Big brown bat	60	17	19
Eastern red bat	13	0	7
Hoary bat	22	143	76
Silver-haired bat	30	38	10
Eastern small-footed bat	0	0	0
Little brown bat	6	2	3
Northern long-eared bat	0	1	0
Tri-colored	2	0	2
Total	**133**	**201**	**117**

*Table 3. Autoclassification MLE P-values (KPro) Results for Twin Energy**

Species	Detector Location		
	TE01	TE02	TE03
Big brown bat	**0.00**	**0.00**	**0.00**
Eastern red bat	**0.00**	1.00	**0.00**
Hoary bat	**0.00**	**0.00**	**0.00**
Silver-haired bat	**0.01**	0.55	1.00
Eastern small-footed bat	1.00	1.00	1.00
Little brown bat	0.06	**0.01**	0.29
Northern long-eared bat	1.00	0.18	1.00
Tri-colored	0.97	1.00	0.64

*Bolded and highlighted in yellow are values that indicate statistically significant MLE p-values (<0.05).

Manual Vetting

During the manual vetting process, MES took all files that were labeled with an autoclassification species identification that fall into the HiF phonic group and manually inspected each file to confirm or change the identification given by the autoclassification process. The HiF phonic group includes eastern red, tri-color, little brown, northern long-eared, and eastern small-footed. In Table 4 the results of the manual vetting show the calls that were confirmed by a trained technician to the species level within the HiF phonic group. Manual vetting confirmed the probable presence of eastern red, little brown and tri-colored bats. After manual vetting, no calls contained enough information to confirm the probable presence of the federally endangered or threatened species. The one file that was auto classified as the northern long-eared bat was clipped files (distorted due to the recording overwhelming the microphone) and an ambient noise level that was too high, or there were too few calls recorded in the file to make a species determination. Distortion of a recording is generally produced by the bat being too close to the microphone and the recorded calls are too loud producing a potentially false high maximum frequency.

*Table 4. Results for Twin Energy. Manually Vetted File Results for Twin Energy**

Species/Site	**TE01**	**TE02**	**TE03**
HiF	15	3	1
LoF	2	0	0
Eastern Red	2	0	0
Little Brown	2	0	2
Myotis species	0	0	2
Northern long-eared	0	0	0
Tri-colored	0	0	1

*Results show the number of files vetted to each category.

CONCLUSIONS

Five species were confirmed for probable presence through the autoclassification MLE results including big brown, eastern red, little brown and tri-colored and was confirmed for probable presence through manual vetting. The one federally listed species northern long-eared was not confirmed through manual vetting during this survey. Very little bat activity was recorded over a month period of time we had 3 detectors out for almost a 100-night effort and only had 451 calls recorded. Since Twin Energy has conceded they will use curtailment during operations and the lack of bats present now, *Myoid* bats will not likely be adversely affected.

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Appendix A. Federal Bat Permits

NATIVE ENDANGERED & THREATENED SP. RECOVERY
ENDANGERED & THREATENED WILDLIFE
Permit Number: TE63633A-5
Effective: 08/14/2018 Expires: 07/31/2023

Issuing Office:

Department of the Interior
U.S. FISH & WILDLIFE SERVICE
Ecological Services Permit Office
1875 Century Boulevard Atlanta, GA 30345
permitsR4ES@fws.gov

CHIEF, DIVISION OF ENVIRONMENTAL REVIEW

Permittee:

BIODIVERSITY RESEARCH INSTITUTE
276
CANCO
ROAD
PORTLA
ND, ME
04103
U.S.A.

Name and Title of Principal Officer:
DAVID C EVERS - EXECUTIVE DIRECTOR

Authority: Statutes and Regulations: 16 USC 1539(a), 16 USC 1533(d); 50 CFR 17.22, 50 CFR 17.32, 50 CFR 13.

Location where authorized activity may be conducted:
Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming.

Reporting requirements:

Annual reports are due by January 31 following each year that this permit is in effect.

Authorizations and Conditions:

A. General conditions set out in Subpart B of 50 CFR 13, and specific conditions contained in Federal regulations cited above, are hereby made a part of this permit. All activities authorized herein must be carried out in accordance with and for the purposes described in the application submitted. Continued validity, or renewal of this permit is subject to complete and timely compliance with all applicable conditions, including the filing of all required information and reports.

B. The validity of this permit is also conditioned upon strict observance of all applicable foreign, state, local tribal, or other federal law.

C. The following individuals are authorized to conduct activities as authorized by this permit: **ALL ACTIVITIES/ALL SPECIES**: Carl Anderson, Timothy Divoll, Shaylyn Hatch, Dustin Meattey, and David Yates.

ALL ACTIVITIES/INDIANA BATS ONLY: Jonathan Fiely.
ALL ACTIVITIES *EXCEPT* ENTERING HIBERNACULA AND HARP TRAPPING/INDIANA BAT AND NORTHERN LONG-EARED BATS ONLY: Caroline Byrne.
MIST-NET, HANDLE, IDENTIFY, BAND, AND RADIO-TAG/NORTHERN LONG-EARED BATS ONLY: Morgan Ingalls.

Trained assistants not named on this permit may work on permitted bat activities under the direct and on-site supervision of the individual named above. However, trained assistants may not work independently at a site.

Trained assistants are individuals who are considered qualified by the permitted biologist to select sampling sites, deploy sampling equipment and nets, and handle bats in the field.

Permittee must remain present at each mist-net and harp trap site while it is being operated.

D. Acceptance of this permit serves as evidence that the permittee understands and agrees to abide by the terms of this permit and all sections of title 50 Code of Federal Regulations, Parts 13 and 17, pertinent to issued permits. Section 11 of the endangered species act of 1973, as amended, provides for civil and criminal penalties for failure to comply with permit conditions. In addition, the permittee shall have all other applicable Federal, Tribal, State, and/or local government permits prior to the commencement of activities authorized in this permit.

E. Permittee is authorized to take (enter hibernacula or maternity roost caves, salvage dead bats, capture with mist nets or harp traps, handle, identify, collect hair samples, band, radio tag, and wing-punch) gray bats (*Myotis grisescens*), Indiana bats (*Myotis sodalis*), and northern long-eared bats (*Myotis septentrionalis)* for scientific research aimed at recovery of the species, such as presence/absence surveys, studies to document habitat use, population monitoring, and to evaluate potential impacts of white-nose syndrome or other threats, as described in permittee's June 27, 2011, September 18, 2012, May 7, 2013, March 3, 2014, February 29, 2016, and January 3, 2018, applications and as conditioned below.

F. The permitted activities described above require prior, site-specific approval from the USFWS Field Supervisor in the state(s) where the project will occur. Permittee shall notify the USFWS Field Supervisor for the state in which activities are proposed to occur at least 15 days prior to conducting any activities. Contact information is in Condition P., below. Your request for this site-specific approval must be in writing and must indicate:

F.1. The purpose and a description of the activities proposed (e.g., surveys, radio telemetry studies, etc.). If the purpose includes collection of hair samples or wing punches for genetic analyses or other research purposes, a copy of the specific study proposal must be included.

F.2. Location of proposed activities, including project site (legal description and lat/long), county, and state.

F.3. Dates when the project is proposed to take place.

F.4. You may proceed with activities only <u>upon receipt of written concurrence</u> from the applicable USFWS Field Supervisor. *Your concurrence letter/email must be carried with this permit to authorize site-specific activities*.

G. Permittee shall adhere to the following conditions involving capture and handling of bats:

G.1. Federally listed bats may be captured (e.g., mist-nets and harp traps) following the protocol(s) provided by the USFWS, when available. Permittees must contact the USFWS FO in the state(s) which activities are proposed to ensure correct protocol(s) are used. For example, the current Range-wide Indiana Bat Summer Survey Guidelines are available at: http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html. The monitoring interval for mist nets is once every 10 minutes. Harp traps must be continually monitored.

G.2. Captured bats may be held for a maximum of 30 minutes, unless injured. If an exception is required to this prohibition, permittee must receive prior written approval from the USFWS Field Supervisor for the state in which the activities are proposed to occur.

G.3. Permittee shall carry out non-intrusive measurements on all captured bats. Data shall be recorded for all bats captured and include, but not be limited to, the data requested in any automated or species specific data form provided by the USFWS (e.g., USFWS Bat Reporting Form available at: http://www.fws.gov/midwest/Endangered/mammals/inba/inbasummersurveyguidance.html). Handling should be limited to the maximum extent practicable and should cease immediately at signs of undue stress (e.g., bat becoming unresponsive, etc.). Bats that appear stressed from handling should be placed in a dark, quiet location away from activity where it can safely fly away after recovery, and should be checked to ensure successful recovery before leaving the study site. Photographs of the identifying characteristics for each individual federally listed species captured are encouraged. The permittee may be requested to provide individual photographs after submittal of annual reporting data.

G.4. If bands are applied, these must be lipped metal bands having a unique identifier. Bands should be applied to the forearm of captured bats prior to release. No more than one band per bat may be used. Position the band on the wing so that when the bat is hanging upside down, the band numbers are right-side up. A single band should be placed on the right forearm of each male and the left forearm of each female bat.

G.5. Radio transmitters may be applied during spring, summer, and fall roosting and migration periods via nontoxic skin bond adhesive. The total weight of the transmitter may not exceed 5% of the bat's body weight and the total weight of the package (transmitter <u>and</u> adhesive) may not exceed 6% of the bat's body weight. The lightest package (both transmitter and adhesive) capable of accomplishing the required task should be used, especially with pregnant females and newly volant juveniles. Bats carrying transmitters must be monitored daily for at least five days, or until the transmitter falls off, whichever occurs first. **** Although not required as a condition of this permit,***

in order to gather needed information to promote the conservation of the northern long-eared bat, it is recommended that the permittee radio-track female and juvenile northern long-eared bats captured when conducting mist-netting and radio-tracking of Indiana bats within the white-nose syndrome (WNS) zone of the range of the northern long-eared bat. Specifics on the number of females and juvenile bats to be tracked will be determined in coordination with the appropriate Field Office, as specified in Condition F (above).

G.6. No capture activities shall occur within 20 meters of a known or potential summer or winter roost site, either natural or artificial, of a federally listed bat. If an exception is required to this prohibition, permittee must receive prior written approval from the USFWS Field Supervisor for the State in which the activities are proposed to occur.

G.7. Permittee may collect dorsal hair samples from captured bats for scientific study. Hair samples shall be obtained via clipping fur from between scapula from females and juvenile males. The clipped area is the same area frequently clipped for radio transmitter attachment. Wing tissue samples may be taken using a new, sterile biopsy punch (2mm) for each endangered bat sampled. No more than two samples, one from each wing, may be obtained per individual. All boards and equipment used to obtain samples must be disinfected according to the protocol cited in Condition G.8.

G.8. Equipment used to capture and handle bats shall be cleaned and decontaminated, including personal gear such as boots and gloves, using products cited in decontamination guidelines and in compliance with label directions. The most recent decontamination guidance is found on the web at: http://whitenosesyndrome.org/.

G.9. Caves mines or other suitable hibernation sites may be quietly searched in a manner that minimizes disturbance by utilizing the minimum number of people and time required to complete the survey. Surveys of known hibernacula conducted during the winter hibernation season shall follow the guidelines established in the recovery plans for each federally listed bat species with regards to how often a site may be visited and other species-specific requirements related to entering hibernaculum. Under no circumstances should multiple trips to the hibernation area occur within the same year without written approval of the USFWS Field Supervisor for the state in which activities are proposed.

Bats may be handled during winter surveys in order to collect band information and confirm the identification of listed species. When possible, bands should be read without touching the bat. Banded bats should only be handled if easily accessible and removal of the bat does not disturb a large number of additional bats and is unlikely to result in injury to the bat. Detailed photographs should be taken to document the presence of listed species in previously undocumented hibernaculum. Where hibernacula area and safety conditions allow, individuals entering hibernacula are recommended to utilize night vision goggles or red-filtered light and to remain in the site no more than 90 minutes to complete the work.

G.10. Surveys of gray bat maternity roosts and their other known summer roost sites shall be conducted by observing the bats with night vision equipment and/or infrared light sources (e.g., thermal infrared) as they emerge from their roosts to avoid any possible disturbance to these bats.

At previously undocumented sites for these species, the accepted method to determine if they are present is to carefully and slowly enter the potential roost site to check for evidence of presence/use, such as visual observation of bats, significant quantities or a strong smell of guano, or the audible sounds produced by bats roosting at the site. As soon as any evidence is obtained that the roost site is being used by a federally-listed bat species, survey team members shall immediately exit the roost site and make further observations from outside the entrance to the roost. All further observations shall be made from the entrance during the evening emergence.

H. Upon determination that endangered bats are present, permittee shall notify the following offices immediately (not to exceed 1 business day): the USFWS Field Office within the geographic location of study areas (Condition P.).

I. Permittee must carry a copy of this permit at all times when conducting the authorized activities. Shipments of collected biological materials should also be accompanied by a copy of this permit. NOTE: This permit is limited to the above activities and identified species.

J. Issuance of this permit does not constitute permission to conduct these activities on National Wildlife Refuges or any other public or private lands; such permission must be obtained separately from the appropriate landowner or land manager before beginning these authorized activities. This permit, neither directly nor by implication, grants the right of trespass.

K. The USFWS anticipates that no federally listed bats will be injured or killed as a result of permitted activities. If any injury or mortality does occur, the permittee shall immediately notify the appropriate Species Recovery Lead(s) noted in Condition O., below. Notification shall also be made within 24 hours to the Southeast Regional Permit Coordinator and appropriate Field Office, at the addresses and telephone numbers noted in Conditions N.3. and P., below. Based on consultation between these offices, a decision will be made as to whether any of the authorized activities can continue. Decisions will also be made concerning the disposition of any dead or injured specimens. The permittee shall provide a written statement to the USFWS offices noted in Conditions N, O, and P, below, which documents the cause of the injury or mortality, and identifies the remedial measures employed by the permittee to eliminate future mortality or injury events. The final decision on remedial measures and disposition of specimens rests with the USFWS.

Upon locating a dead, injured, or sick listed species, under circumstances not addressed in this authorization, initial notification must be made immediately to the USFWS field office in the state in which the specimen is found, identified in Condition P., below. Notification should also be made by the next work day to the USFWS Southeast Regional Office identified in Condition N.3., below. Care should be taken in handling sick, injured, or dead specimens to ensure effective treatment or to preserve biological materials for later analysis. In conjunction with the care of sick or injured endangered or threatened species, and the preservation of biological materials from a dead animal, the finder should take responsible steps to ensure that the site is not unnecessarily disturbed. L. This permit is non-transferable.

M. An annual report summarizing authorized activities must be submitted by January 31 following each year this permit is valid to the offices identified in Conditions N, O, and P, below. When possible, electronic copies shall be submitted in lieu of hard copies in MS Word, Portable Document Format, Rich Text Format, or other file format that is compatible with the receiving office. Each report should include, at a minimum, the following information: M.1. The date, time, geographic locations (including datum and projection information).

M.2. All locations surveyed (regardless of whether federally-listed bats were captured/observed).

M.3. Band numbers of all bats banded.

M.4. Information on any injuries and/or mortalities and disposition of specimens.

M.5. Location and characteristics of roost trees and bat colonies.

M.6. Copies of any separate reports and/or publications resulting from work conducted under the authority of this permit.

M.7. Data shall be submitted for all bats captured and include, but not be limited to, the data requested in any automated or species-specific data form provided by the USFWS (e.g., USFWS Bat Reporting Form available at: http://www.fws.gov/midwest/Endangered/mammals/inba/inbasummersurveyguidance.html). Photographs of the identifying characteristics for each individual federally-listed species captured are encouraged. The Permittee may be requested to provide individual photographs after submittal of annual reporting data. M.8. Copies of all site specific authorization letters/emails required under Condition F.

IF NO ACTIVITIES OCCURRED OVER THE COURSE OF THE YEAR, INDICATION OF SUCH SHALL BE SUBMITTED AS AN ANNUAL REPORT.

N. Copies of your reports shall be sent to the offices listed below.

N.1.

Regional Recovery Permits Coordinator

U.S. Fish and Wildlife Service - Southwest Region (Region 2)

500 Gold Ave., SW

P.O. Box 1306

Albuquerque, New Mexico 87103-1306 (505/248-6665; fax 505/248-6788) permitsR2ES@fws.gov

N.2.

Regional Recovery Permits Coordinator

U.S. Fish and Wildlife Service - Midwest Region (Region 3)

Ecological Services - Endangered Species

5600 American Blvd. W., Suite 990

Bloomington, Minnesota 55437-1458 (612/713-5343; fax 612/713-5292) permitsR3ES@fws.gov

N.3.

Regional Recovery Permits Coordinator

U.S. Fish and Wildlife Service - Southeast Region (Region 4)

1875 Century Boulevard, Ecological Services

Atlanta, Georgia 30345-3301 (404/679-7097; fax 404/679-7081) permitsR4ES@fws.gov

N.4.

Regional Recovery Permits Coordinator

U.S. Fish and Wildlife Service - Northeast Region (Region 5)

Endangered Species Division

300 Westgate Center Drive

Hadley, Massachusetts 01035-9589 (703/358-2402; fax 413/253-8482) permitsR5ES@fws.gov

N.5.

Regional Recovery Permits Coordinator & Assistant Regional Recovery Coordinator

U.S. Fish and Wildlife Service - Mountain-Prairie Region (Region 6)

Endangered Species Permits Office

Denver Federal Center, P.O. Box 25486

Denver, Colorado 80225-0489 (303/236-4212;

fax 303/236-0027)
permitsR6ES@fws.gov

O. Additionally, based on species, reports and publications shall be submitted to the following:

O.1. For studies involving gray bats:

Shauna Marquardt

U.S. Fish and Wildlife Service

Missouri Ecological Services Field Office

101 Park De Ville Drive, Suite A

Columbia, Missouri 65203

(573/234-2132 x174; fax 573/234-2181)

Shauna_Marquardt@fws.gov

O.2. For studies involving Indiana bats:

Lori Pruitt

U.S. Fish and Wildlife Service

Indiana Ecological Services Field Office

620 S. Walker Street

Bloomington, Indiana 47403-2121

(812/334-4261 x1213; fax 812/334-4273)
Lori_Pruitt@fws.gov

O.3. For studies involving northern long-eared bats:

Jill Utrup

U.S. Fish and Wildlife Service

Twin Cities Ecological Services Field Office

4104 American Blvd. E

Bloomington, Minnesota 55425

(612/725-3548 x207; fax 612/725-3609

Jill_Utrup@fws.gov

P. Additionally, based on geographic area, reports and publications shall be submitted to the following

P.1. For studies conducted in Alabama:

Field Supervisor

Alabama Ecological Services Field Office

1208-B Main Street

Daphne,
Alabama 36526-
4419 (251) 441-
5181

P.2. For studies conducted in Arkansas:

Field Supervisor

Arkansas Field Office

110 South Amity Road

Suite 300

Conway,
Arkansas 72032-
8975 (501) 513-
4470

P.3. For studies conducted in Connecticut:

Field Supervisor

New England Field Office

70 Commercial Street, Suite 300

Concord, NH 03301

(603) 223-2541

P.4. For studies conducted in Delaware:

Field Supervisor

Chesapeake Bay Field Office

177 Admiral Cochrane Drive

Annapol
is, MD

21401
(410)
573-
4573

P.5. For studies conducted in the District of Columbia:

See P.4. (above).

P.6. For studies conducted in Florida:

P.6.a.

Field Supervisor

North Florida Ecological Services Office

7915 Baymeadows Way

Suite 200

Jacksonville, FL
32256-7517
(904) 731-3336

P.6.b.

Field Supervisor

Panama City Ecological Services Field Office

1601 Balboa Avenue

Panama City, FL
32405-3792
(850) 769-0552

P.7. For studies conducted in Georgia:

Field Supervisor

Georgia Field Office

RG Stephens, Jr. Federal Building

355 East Hancock Avenue, Room
320, Box 7 Athens, GA 30601
(706) 613-9493; fax 706/613-6059
Georgiaes@fws.gov

P.8. For studies conducted in Illinois:

P.8.a.

Kristen Lundh

Endangered Species Coordinator for Illinois/Iowa

U.S. Fish and
Wildlife Service
Ecological
Services Field
Office 1511 47th
Ave.

Moline, Illinois 61265
(309/757-5800, x215;
fax 309/757-5807)

P.8.b.

Joe Kath

Endangered Species Coordinator

Illinois Department of Natural Resources

Division of Natural Heritage

One Natural Resource Way

Springfield, Illinois 62702-1271

(217/785-8764; fax

217/785-2438) P.9.

For studies

conducted in

Indiana:

P.9.a.

Lori Pruitt

Endangered Species Coordinator for Indiana

U.S. Fish and Wildlife Service

Ecological Services Field Office

620 S. Walker Street

Bloomington, Indiana 47403-
2121 (812/334-4261 x1213; fax
812/334-4273)

P.9.b.

Scott Johnson

Indiana Department of Natural Resources

5596 East State Road 46

Bloomington,

Indiana 47401

(812/334-1137,

ext. 3400) P.10.

For studies

conducted in

Iowa:

P.10.a.

Kristen Lundh

Endangered Species Coordinator for Illinois/Iowa

U.S. Fish and
Wildlife Service
Ecological
Services Field
Office 1511 47th
Ave.

Moline, Illinois 61265
(309/757-5800, x215;
fax 309/757-5807)

P.10.b.

Kelly Poole

Endangered Species Coordinator

Iowa Department of Natural Resources

Parks, Recreation, and Preserves

Wallace State Office Building

East 9th and Grand Avenue

Des Moines, Iowa 50319-
0034 (515/281-8524)

P.11. For studies conducted in Kansas:

Field Supervisor

Kansas Field Office

2609 Anderson Avenue

Manhattan, Kansas 68502

785/539-3474; fax 785/539-8567

P.12. For studies conducted in Kentucky:

Field Supervisor

Frankfort Field Office

J C Watts Federal Bldg., Rm 265

330 West Broadway

Frankfort, KY 40601-8670

(502) 695-0468

Kentuckyes@fws.gov

P.13. For studies conducted in Louisiana:

Field Supervisor

Louisiana Ecological Services

646 Cajundome Blvd., Suite 400

Lafayette, La. 70506

Pho
ne
337
.29
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100
Fax
337
.29

P.14. For studies conducted in Maine:

Field Supervisor

Maine Field Office

U.S. Fish and Wildlife Service

17 Godfrey Drive, Suite 2

Orono, ME 04473

Phone: 207-866-3344

P.15. For studies

conducted in

Maryland:

See P.4. (above).

P.16. For studies conducted in Massachusetts:

Field Supervisor

New England Field Office

70 Commercial Street, Suite 300

Conco
rd,
NH
03301
(603)
223-
2541

P.17. For studies conducted in Michigan:

P.17.a.

Barbara Hosler

Endangered Species Coordinator for Michigan

U.S. Fish and
Wildlife Service
2651 Coolidge
Road

East Lansing, Michigan
48823 (517/351-6326; fax
517/351-1443)

P.17.b.

Dan Kennedy

Endangered Species Coordinator

Michigan Department of Natural Resources

Wildlife Division

P.O. Box 30444

Lansing, Michigan 48909-7444

(517) 284-6194; fax

517/373-6705 P.18.

For studies conducted

in Minnesota:

P.18.a.

Endangered Species Coordinator for Minnesota and Wisconsin

U.S. Fish and
Wildlife Service
Ecological
Services Field
Office 4101
American Blvd E.

Bloomington, Minnesota
55425 (612/725-3548
x2206; fax 612/725-3609)

P.18.b.

Richard Baker

Minnesota Endangered Species Coordinator

Division of Ecological and Water Resources

Minnesota Department of Natural Resources

500 Lafayette Rd., Box 25

St.
Paul,
MN
55155
Phone:
651/25
9-5073
richard
.baker
@state
.mn.us

P.19. For studies conducted in Mississippi:

Field Supervisor

Mississippi Field Office

6578 Dogwood View Pkwy, Suite A

Jackson,
MS 39213-
7856 (601)
321-1122

P.20. For studies conducted in Missouri:

P.20.a.

Field Supervisor

U.S. Fish and Wildlife Service

Missouri Ecological Services Field Office

101 Park DeVille Drive, Suite A

Columbia, Missouri 65203-
2132 (573/234-2132; fax
573/234-2181)

P.20.b.

Scientific Collecting Permit Coordinator

Missouri Department of Conservation

Endangered Species and Natural History Division

2901 W. Truman Blvd., P.O. Box 180

Jefferson City, Missouri 65102-0180

(573/522-4115 ext. 3322; fax

573/751-4864) P.21. For

studies conducted in Montana:

Project Leader

585 Shepard Way

Helena, Montana 59601

Telephone
: 406-449-
5225 Fax:
406-449-
5339

P.22. For studies conducted in Nebraska:

Assistant Field Supervisor

9325 South Alda Road

Wood River, NE 68883

Fax:(308) 384-8835

Phone: (308) 382-6468

P.23. For studies conducted in New Hampshire:

Field Supervisor

New England Field Office

70 Commercial Street, Suite 300

Concord, NH 03301

(603) 223-2541

P.24. For studies conducted in New Jersey:

Field Supervisor

New Jersey Field Office

4 East Jimmie Leads Road

Gallo
way,
NJ
08205
(609)
646-
9310

P.25. For studies conducted in New York:

Field Supervisor

New York Field Office

3817 Luker Road

Cortla
nd, NY
13045
(607)
753-
9334

P.26. For studies conducted in North Carolina:

P.26.a. Field Supervisor

Asheville Field Office

160 Zillicoa Street

Asheville,
NC 28801-
1082 (828)
258-3939

P.26.b. Field Supervisor

Raleigh Field Office

Post Office Box 33726

Raleigh, North Carolina
27636-3726 (919) 856-
4520

P.27. For studies conducted in North Dakota:

North Dakota Field Office

3425 Miriam Avenue

Bismarck, North Dakota 58501-7926

Phone: (701) 250-

4481 Fax: (701)

355-8513 P.28.

For studies

conducted in

Ohio:

P.28.a.

Endangered Species Coordinator for Ohio

U.S. Fish and Wildlife Service

Ohio Ecological Services Field Office

4625 Morse Road, Suite 104

Columbus, Ohio 43230

(614/416-8993, x22; fax 614/416-8994)

P.28.b.

Endangered Species Coordinator

Ohio Department of Natural Resources

Division of Wildlife

2045 Morse Road, Building G

Columbus, Ohio 43229-

6693 (614-265-6329;

fax 614/262-1143) P.29.

For studies conducted

in Oklahoma:

P.29.a.

Field Supervisor

Oklahoma
Field
Office U.S.
Fish and
Wildlife
Service
9014 E.
21st St.

Tulsa, Oklahoma
74129-1428
(918) 382-4501

P.29.b.

Todd Fagin

Oklahoma Natural
Heritage Inventory 111
E. Chesapeake St.

Norman, OK 73019

405 325-4700 (Direct Line)

405 325-4042 (Oklahoma Biological Survey main office)

405 325-7702
(Fax)
tfagin@ou.edu

P.29.c.

Oklahoma Department of
Wildlife Conservation Wildlife
Division 1801 N. Lincoln Blvd.

Oklahoma City, Oklahoma
73105 405/990-7259; fax
405/521-4706

P.30. For studies conducted in Pennsylvania:

Field Supervisor

Pennsylvania Field Office

315 So. Allen
Street, Suite 322
State College,
PA 16801-4850
(814) 234-4090

P.31. For studies conducted in Rhode Island:

Field Supervisor

New England Field Office

70 Commercial Street, Suite 300

Conco
rd,
NH
03301
(603)
223-
2541

P.32. For studies conducted in South Carolina:

P.32.a.

Field Supervisor

South Carolina Field Office

176 Croghan Spur Road, Suite 200

Charleston,
SC 29407-
7558 (843)
727-4707
x227

P.32.b.

Biologist/Preserve Manager

South Carolina Department of Natural Resources

311 Natural Resources Drive

Clemson, SC 29631

(864) 654-6738 x15

Fax: (864) 654-9168

P.33. For studies conducted in South Dakota:

South Dakota Ecological Services Field Office

420 S. Garfield Avenue,

Suite 400

Pierre, SD 57501-5408

Phone
(605)
224-
8693
FAX
605-
224-
9974

P.34. For studies conducted in Tennessee:

P.34.a.

Field Supervisor

Cookeville Field Office

U.S. Fish and Wildlife Service

446 Neal Street

Cookeville, TN
38501-4027
(931) 528-
6481

P.34.b.

Josh Campbell

Wildlife Diversity Coordinator, Region II

Tennessee Wildlife Resources Agency

P.O. Box 41489

Nashville, TN 37204

(615) 781-6626

Josh.Campbell@tn.gov

P.35. For studies conducted in Vermont:

Field Supervisor

New England Field Office

70 Commercial Street, Suite 300

Concord, NH 03301

(603) 223-2541

P.36. For studies conducted in Virginia:

Field Supervisor

Virginia Field Office

6669 Short Lane

Gloucest
er, VA
23061
(804)
693-
6694

P.37. For studies conducted in West Virginia:

Field Supervisor

West Virginia Field Office

694 Beverly Pike

Elki
ns,
WV
262
41
(304
)
636-
658
6

P.38. For studies conducted in Wisconsin:

P.38.a.

Endangered Species Coordinator for Minnesota and Wisconsin

U.S. Fish and
Wildlife Service
Ecological
Services Field
Office 4101
American Blvd E.

Bloomington, Minnesota
55425 (612/725-3548
x2206; fax 612/725-3609)

P.38.b.

Owen Boyle

Wisconsin Department of Natural Resources

101 S. Webster Street

Madison, Wisconsin 53707-7921

(608/266-5244)

Owen.Boyle@wisconsin.gov

P.39. For studies conducted in Wyoming:

Ecological Services Wyoming Field Office

5353 Yellowstone Road, Suite 308A

Cheyenne, Wyoming 82009

Tel: (307) 772-2374

Fax: (307)772-2358

END

Appendix B. Acoustic Site Characteristics with Photographs

Acoustic Site Assessment

Twin Energy Site #1 (TE01)

Date of Deployment
June 30, 2023

Date of Pick up
August 2, 2023

GPS Accuracy
2m

Site Coordinates


Survey Type
Acoustic Full Spectrum

Detector Make
Wildlife Acoustic

Detector Model
SM4Bat

Function and Settings Check Complete?
Yes

Microphone Height
4m

Microphone Direction
360

Project
Twin Energy

Site
TE01

State
ME

County
Franklin

Landowner Information
Linkletter Timberlands

Type of Sampling
Passive

Name of Permitted Biologist
Dave Yates

Federal Permit Number
TE63633A

Personnel
DY

Notes

Basic Overall Site Description
Recent cut with primary growth and small vernal pool

What feature was targeted with this deployment?
Vernal pool

Bat Roost Habitat
Rock, Mine, Snags/damaged live trees

Water Resources
Good water source present

Distance to Nearest Water
5m

Water Body Type of Nearest Water
Pool

DBH of Surrounding Stand
Majority <5cm

Stand Age
Young/even aged

Dominant Tree Species
Birch

Dominant Understory Species
Aspen

Understory Clutter
Minimal clutter (open understory facilitates flight)

PERCENTAGE OF UNDERSTORY CLUTTER
1-25%

DISTANCE TO CLUTTER
5m

LAND COVER
Mostly Forested

PHOTO DETECTOR SETUP

Photo Microphone View

PHOTO TO NORTH OF DETECTOR

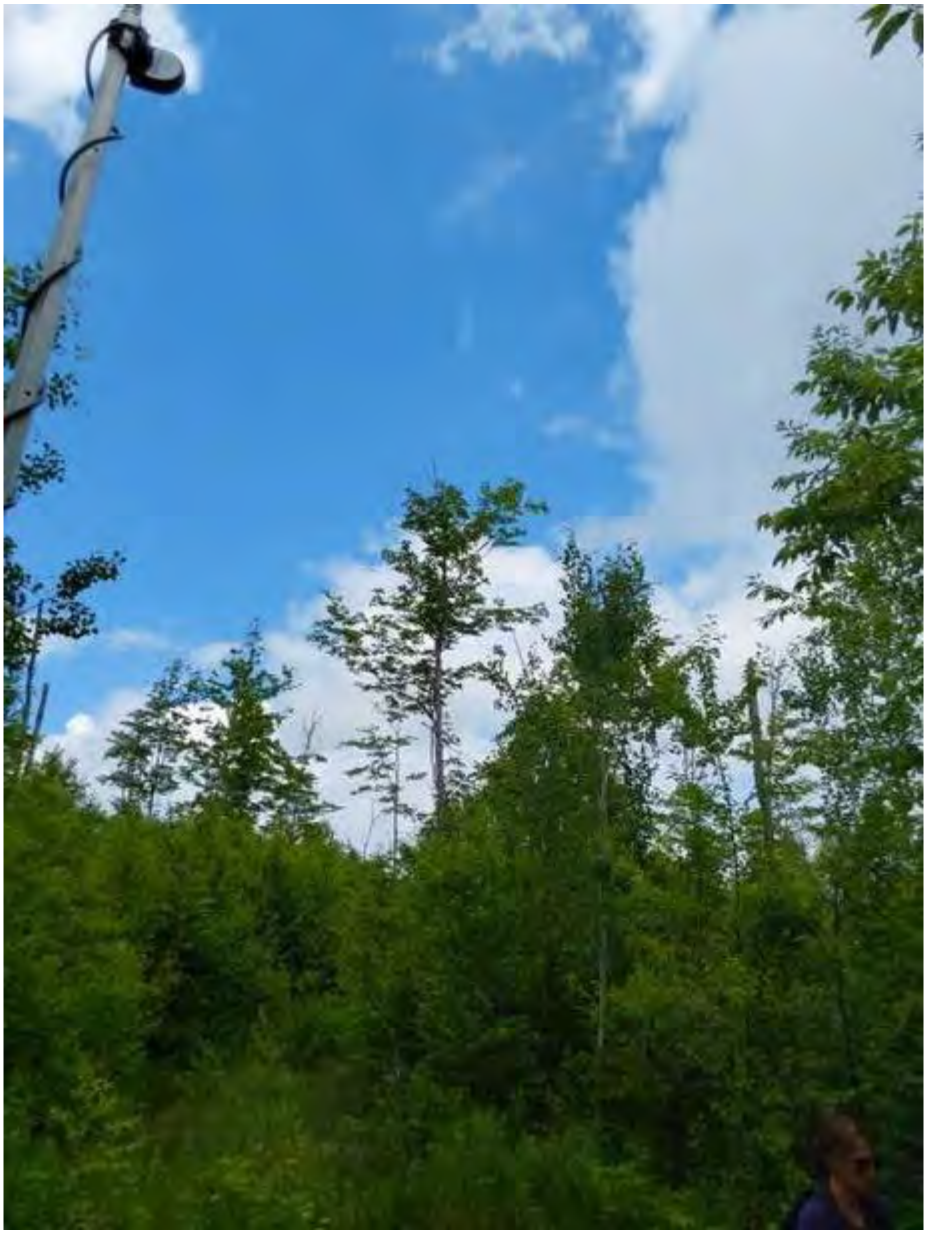


Photo to the East of Detector

PHOTO TO THE SOUTH OF DETECTOR

PHOTO TO THE WEST OF DETECTOR

ACOUSTIC SITE ASSESSMENT

Twin Energy Site #2 (TE02)

DATE OF DEPLOYMENT

June 30, 2023

DATE OF PICK UP

August 2, 2023

GPS ACCURACY

2m

SITE COORDINATES

SURVEY TYPE
Acoustic Full Spectrum

DETECTOR MAKE
Wildlife Acoustic

DETECTOR MODEL
SM4Bat

FUNCTION AND SETTINGS CHECK COMPLETE?
Yes

MICROPHONE HEIGHT
4m

MICROPHONE DIRECTION
90

PROJECT
Twin Energy

SITE
TE02

STATE
ME

COUNTY

Franklin

LANDOWNER INFORMATION

Linkletter Timberlands

TYPE OF SAMPLING

Passive

NAME OF PERMITTED BIOLOGIST

Dave Yates

FEDERAL PERMIT NUMBER

TE63633A

PERSONNEL

DY SY

NOTES

BASIC OVERALL SITE DESCRIPTION

Stream hardwood forest

WHAT FEATURE WAS TARGETED WITH THIS DEPLOYMENT?

Gap stream

Bat Roost Habitat

Rock, Snags/damaged live trees

Water Resources

Good water source present

Distance to Nearest Water

2m

Water Body Type of Nearest Water

Stream

DBH of Surrounding Stand

>15cm present

Stand Age

Some diversity in stand

Dominant Tree Species

Maple

Dominant Understory Species

Beech

UNDERSTORY CLUTTER
Semi-cluttered (cluttered but gaps present)

PERCENTAGE OF UNDERSTORY CLUTTER
26-50%

DISTANCE TO CLUTTER
5m

LAND COVER
Mostly Forested

Photo Detector Setup

PHOTO MICROPHONE VIEW

PHOTO TO NORTH OF DETECTOR

PHOTO TO THE EAST OF DETECTOR

PHOTO TO THE SOUTH OF DETECTOR

Photo to the West of Detector

Acoustic Site Assessment

Twin Energy Site #3 (TE03)

Date of Deployment

June 30, 2023

Date of Pick up

August 2, 2023

GPS Accuracy

2m

Site Coordinates

Survey Type

Acoustic Full Spectrum

Detector Make
Wildlife Acoustic

Detector Model
SM4Bat

Function and Settings Check Complete?
Yes

Microphone Height
4m

Microphone Direction
90

Project
Twin Energy

Site
TE03

State
ME

County
Franklin

Landowner Information
A&B Logging

Type of Sampling
Passive

Name of Permitted Biologist
Dave Yates

Federal Permit Number
TE63633A

Personnel
DY

Notes

Basic Overall Site Description
Recent cut near stream old skidder trail

What feature was targeted with this deployment?
Corridor

Bat Roost Habitat
Rock, Snags/damaged live trees

Water Resources
Water present but not optimal

Distance to Nearest Water
5m

Water Body Type of Nearest Water
Stream

DBH of Surrounding Stand
5-15cm present

Stand Age
Young/even aged

Dominant Tree Species
Beech

Dominant Understory Species
Maple

Understory Clutter
Minimal clutter (open understory facilitates flight)

Percentage of Understory Clutter

26-50%

Distance to Clutter

5m

Land Cover

Mostly Forested

PHOTO DETECTOR SETUP

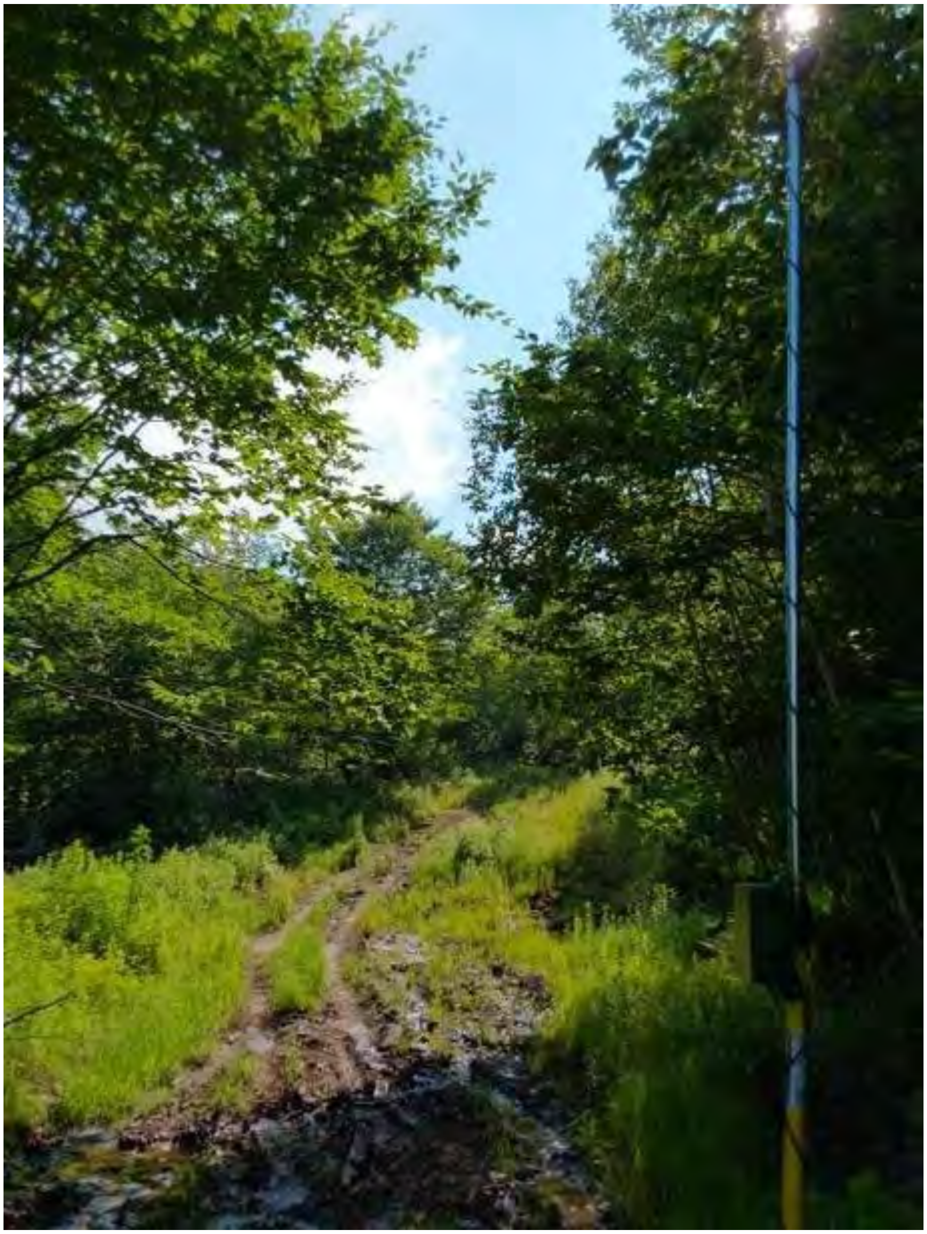
PHOTO MICROPHONE VIEW

PHOTO TO NORTH OF DETECTOR

PHOTO TO THE EAST OF DETECTOR

PHOTO TO THE SOUTH OF DETECTOR

Photo to the West of Detector



Appendix C. Weather Conditions During Acoustics

Date	Temperature (°F)			Humidity (%)			Wind Speed (mph)			Precipitation (in)
July	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Total
1	78	68.8	63	97	84.7	66	12	5.2	0	0
2	69	65.1	63	100	93.8	87	9	5.5	0	0
3	75	68	63	97	87.8	73	9	4.5	0	1.22
4	81	73.2	67	97	84.8	65	6	2.4	0	0.03
5	89	74.3	66	100	79.9	46	9	3.2	0	0.01
6	91	79	68	93	71.5	43	10	3.6	0	0
7	88	75	69	97	80.4	51	12	4.9	0	0
8	78	71	67	93	86.8	74	9	4.7	0	0
9	74	69.4	68	97	93	82	8	2.7	0	0
10	72	68.1	65	97	93.3	83	13	5.8	0	0.03
11	83	69.9	63	97	83.2	51	9	3	0	0.25
12	88	74.4	66	93	76.8	44	20	4.4	0	0
13	85	74.9	67	93	77.6	57	12	6.3	0	0.44
14	79	73.3	68	93	79.7	66	9	5.3	0	0.03
15	79	72.8	69	97	89.5	77	10	5.7	0	0.37
16	75	72.9	71	100	94.4	90	14	8.7	3	0.02
17	85	74.8	70	97	87.8	67	9	4.6	0	1.05
18	82	71.1	66	100	90	67	10	4.5	0	0
19	84	75	69	93	75.5	51	8	4.2	0	0
20	83	73.1	63	84	62.8	41	8	3.5	0	0
21	76	67.6	61	93	83.7	62	10	4.6	0	0
22	79	70	64	96	82.1	64	9	4.1	0	0.07
23	84	74	65	90	65.3	39	9	5.4	0	0.03
24	85	74.6	63	93	68.8	44	9	3.1	0	0
25	84	71.7	65	93	79.8	58	12	5.1	0	0
26	85	72.1	65	97	81.6	51	9	2.4	0	0.31
27	76	72.6	68	97	90.3	79	10	6.2	0	0
28	87	77.2	69	93	74.7	53	8	4.4	0	0.3
29	84	71.2	59	93	79.1	51	15	6.3	0	0
30	76	65.9	57	93	65.4	40	13	7.1	0	0.93
31	76	66.2	58	93	73.1	53	13	3.9	0	0

Appendix D. Software Outputs (KPro and Sonobat with vetting)

KPro OutPut

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/13/2023	21:31:14	21	EPTFUS	77	73	0.948	0.432686	LASNOC	LASCIN	
7/7/2023	1:53:20	1	EPTFUS	58	57	0.983	0.391941	LASNOC	LASCIN	
7/15/2023	1:19:41	1	EPTFUS	62	52	0.839	0.422613	LASNOC		
7/14/2023	23:46:53	23	EPTFUS	61	51	0.836	0.3289			
7/14/2023	22:18:14	22	EPTFUS	56	50	0.893	0.444377	LASNOC		
7/18/2023	0:37:31	0	EPTFUS	50	46	0.92	0.457472	LASNOC	LASCIN	
7/18/2023	21:13:48	21	EPTFUS	63	46	0.73	0.382011	LASNOC	LASCIN	
7/25/2023	23:09:03	23	EPTFUS	50	45	0.9	0.458266	LASNOC	LASCIN	
7/15/2023	1:33:21	1	EPTFUS	52	45	0.865	0.495985	LASNOC		
7/20/2023	21:54:41	21	EPTFUS	52	45	0.865	0.462837	LASNOC	LASCIN	
7/15/2023	4:01:07	4	EPTFUS	43	42	0.977	0.311523	LASNOC	LASCIN	
7/7/2023	0:34:40	0	EPTFUS	52	42	0.808	0.417802	LASNOC	LASCIN	
7/15/2023	1:27:19	1	EPTFUS	52	42	0.808	0.451739	LASNOC		
7/27/2023	0:02:55	0	EPTFUS	45	41	0.911	0.462223	LASNOC	LASCIN	
7/6/2023	23:10:40	23	EPTFUS	42	40	0.952	0.518828	LASNOC		
7/24/2023	22:16:35	22	EPTFUS	40	39	0.975	0.395702			
7/21/2023	22:09:43	22	EPTFUS	45	38	0.844	0.458096	LASNOC		
7/27/2023	21:50:55	21	EPTFUS	56	38	0.679	0.301401	LASNOC	LASCIN	
7/26/2023	0:25:07	0	EPTFUS	37	36	0.973	0.401165	LASNOC	LASCIN	
7/11/2023	23:11:14	23	EPTFUS	38	36	0.947	0.526778	LASNOC	LASCIN	
7/15/2023	21:40:43	21	EPTFUS	38	36	0.947	0.301252	LASNOC	LASCIN	
7/18/2023	4:21:08	4	EPTFUS	49	35	0.714	0.35695	LASNOC	LASCIN	
7/19/2023	1:12:38	1	EPTFUS	33	33	1	0.479787	LASNOC	LASCIN	
7/5/2023	2:41:42	2	EPTFUS	37	32	0.865	0.492241	LASNOC	LASCIN	
7/27/2023	1:03:37	1	EPTFUS	37	32	0.865	0.309302	LASNOC	LASCIN	
7/27/2023	22:42:13	22	EPTFUS	32	30	0.938	0.519975	LASNOC	LASCIN	
7/3/2023	22:37:04	22	EPTFUS	35	30	0.857	0.493348	LASNOC	LASCIN	

7/27/2023	1:36:28	1	EPTFUS	29	29	1	0.5728	LASNOC		
7/27/2023	4:05:19	4	EPTFUS	35	29	0.829	0.343544	LASCIN	LASNOC	

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/7/2023	2:49:22	2	EPTFUS	38	28	0.737	0.250944	LASCIN	LASNOC	
7/14/2023	23:31:00	23	EPTFUS	32	27	0.844	0.436448	LASNOC	LASCIN	
7/20/2023	22:10:27	22	EPTFUS	32	27	0.844	0.466753	LASNOC	LASCIN	
7/26/2023	2:04:09	2	EPTFUS	32	27	0.844	0.304385			
7/27/2023	0:53:24	0	EPTFUS	31	26	0.839	0.428499	LASNOC	LASCIN	
7/21/2023	0:44:02	0	EPTFUS	27	25	0.926	0.400573	LASBOR		
7/20/2023	23:36:14	23	EPTFUS	30	25	0.833	0.529093	LASNOC	LASCIN	
7/27/2023	2:38:18	2	EPTFUS	26	24	0.923	0.286595	LASNOC	LASCIN	
7/27/2023	2:35:52	2	EPTFUS	27	24	0.889	0.382937			
7/18/2023	4:21:35	4	EPTFUS	35	24	0.686	0.280139	LASNOC	LASCIN	
7/6/2023	23:00:18	23	EPTFUS	31	23	0.742	0.359568	LASNOC	LASCIN	
7/18/2023	21:33:23	21	EPTFUS	32	23	0.719	0.305248	LASNOC	LASCIN	
7/7/2023	0:40:26	0	EPTFUS	25	22	0.88	0.289267	LASCIN	LASNOC	
7/18/2023	0:17:04	0	EPTFUS	25	22	0.88	0.223582	LASNOC		
7/29/2023	0:45:02	0	EPTFUS	24	21	0.875	0.364487	LASNOC	LASCIN	
7/19/2023	1:09:25	1	EPTFUS	27	21	0.778	0.31374	LASNOC	LASCIN	
7/28/2023	21:16:45	21	EPTFUS	37	21	0.568	0.215853	LASCIN	LASNOC	
7/14/2023	22:02:42	22	EPTFUS	23	19	0.826	0.33466	LASNOC	LASCIN	
7/6/2023	2:07:54	2	EPTFUS	24	19	0.792	0.434047	LASNOC	LASCIN	
7/11/2023	21:18:42	21	EPTFUS	42	19	0.452	0.26338	LASNOC	LASCIN	
7/5/2023	23:14:09	23	EPTFUS	23	18	0.783	0.314569	LASNOC		
7/28/2023	23:54:27	23	EPTFUS	26	18	0.692	0.307996	LASNOC	LASCIN	
7/7/2023	1:39:43	1	EPTFUS	38	17	0.447	0.235421	LASNOC	LASCIN	
7/25/2023	1:00:09	1	EPTFUS	23	15	0.652	0.373854	LASNOC	LASCIN	
7/27/2023	2:35:14	2	EPTFUS	17	13	0.765	0.429809	LASNOC	LASCIN	
7/26/2023	0:05:45	0	EPTFUS	26	13	0.5	0.290387	LASNOC	LASCIN	
7/14/2023	23:11:37	23	EPTFUS	29	13	0.448	0.23843	LASNOC	LASCIN	

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/21/2023	4:01:14	4	EPTFUS	29	12	0.414	0.183118	LASCIN	LASNOC	
7/7/2023	1:02:16	1	EPTFUS	19	10	0.526	0.287043	LASNOC	LASCIN	
7/18/2023	3:09:04	3	EPTFUS	20	10	0.5	0.275351	LASNOC	LASCIN	
7/14/2023	22:39:06	22	EPTFUS	10	9	0.9	0.494771	LASNOC		
7/13/2023	1:22:33	1	EPTFUS	11	9	0.818	0.317985	LASCIN	LASNOC	
7/18/2023	23:27:09	23	EPTFUS	17	9	0.529	0.255496	LASNOC		
7/29/2023	2:21:48	2	EPTFUS	10	8	0.8	0.450698	LASNOC	LASCIN	
7/22/2023	23:37:18	23	EPTFUS	12	8	0.667	0.300816	LASNOC	LASCIN	
7/27/2023	21:51:45	21	EPTFUS	15	8	0.533	0.333015	LASNOC	LASCIN	
7/29/2023	2:44:28	2	EPTFUS	15	8	0.533	0.321381	LASNOC	LASCIN	
7/29/2023	1:50:36	1	EPTFUS	7	6	0.857	0.338418	LASNOC	LASCIN	
7/28/2023	23:39:06	23	EPTFUS	10	6	0.6	0.339543	LASNOC	LASCIN	
7/14/2023	21:30:15	21	EPTFUS	11	5	0.455	0.284311	LASNOC	LASCIN	
7/14/2023	22:31:53	22	EPTFUS	7	4	0.571	0.175046	LASNOC	LASCIN	
7/20/2023	0:46:00	0	EPTFUS	3	3	1	0.438937	LASNOC	LASCIN	
7/29/2023	1:30:37	1	EPTFUS	3	3	1	0.466415	LASNOC	LASCIN	
7/18/2023	3:58:12	3	EPTFUS	3	3	1	0.266115	LASNOC		
7/19/2023	0:02:19	0	EPTFUS	4	3	0.75	0.321668	LASNOC	LASCIN	
7/19/2023	22:18:21	22	EPTFUS	4	3	0.75	0.418306	LASNOC	LASCIN	
7/27/2023	1:24:39	1	EPTFUS	6	3	0.5	0.243753	LASNOC	LASCIN	
7/18/2023	2:50:51	2	EPTFUS	7	3	0.429	0.354467	LASNOC	LASCIN	
7/30/2023	21:27:28	21	EPTFUS	7	3	0.429	0.194927	LASNOC		
7/28/2023	23:31:08	23	EPTFUS	2	2	1	0.232097	LASCIN	LASNOC	
7/20/2023	21:17:27	21	EPTFUS	2	2	1	0.47495	LASNOC		
7/9/2023	21:53:30	21	EPTFUS	3	2	0.667	0.149684	LASNOC	LASCIN	
7/20/2023	23:55:07	23	EPTFUS	3	2	0.667	0.322407	LASNOC	LASCIN	
7/18/2023	0:16:29	0	EPTFUS	3	2	0.667	0.322724	LASNOC		
7/4/2023	21:02:26	21	EPTFUS	4	2	0.5	0.424138	LASNOC	LASCIN	
7/9/2023	0:33:29	0	EPTFUS	4	2	0.5	0.256579	LASNOC	LASCIN	

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/13/2023	3:45:10	3	EPTFUS	2	1	0.5	0.440673	LASNOC		
7/19/2023	2:10:10	2	EPTFUS	2	1	0.5	0.372196	LASNOC	LASCIN	
7/26/2023	0:50:42	0	EPTFUS	2	1	0.5	0.382742	LASNOC	LASCIN	
7/14/2023	22:38:29	22	EPTFUS	3	1	0.333	0.195248	LASNOC	LASCIN	
7/18/2023	1:19:27	1	EPTFUS	4	1	0.25	0.082271	LASBOR		
7/6/2023	21:20:00	21	EPTFUS	7	1	0.143	0.08394	LASNOC	LASCIN	
7/13/2023	3:24:16	3	LASBOR	24	23	0.958	0.176854	MYOLUC	PERSUB	Labo
7/16/2023	4:08:27	4	LASBOR	23	21	0.913	0.227256	EPTFUS		
7/25/2023	4:44:22	4	LASBOR	21	19	0.905	0.218194			HiF
7/13/2023	3:21:30	3	LASBOR	15	14	0.933	0.234945	MYOLUC	PERSUB	HiF
7/14/2023	22:05:34	22	LASBOR	17	12	0.706	0.17273	PERSUB	MYOLUC	HiF
7/19/2023	3:41:19	3	LASBOR	13	8	0.615	0.167292	PERSUB	MYOLUC	HiF
7/25/2023	4:16:43	4	LASBOR	7	7	1	0.217525			HiF
7/5/2023	4:23:47	4	LASBOR	7	7	1	0.22927	EPTFUS		
7/9/2023	4:37:32	4	LASBOR	6	6	1	0.20613	EPTFUS		
7/22/2023	23:50:31	23	LASBOR	8	6	0.75	0.191388	MYOLUC		HiF
7/9/2023	4:37:20	4	LASBOR	10	6	0.6	0.093968			
7/9/2023	4:37:54	4	LASBOR	12	6	0.5	0.079408			
7/5/2023	3:37:02	3	LASBOR	5	5	1	0.276671	EPTFUS		
7/27/2023	3:17:41	3	LASBOR	6	5	0.833	0.192676			
7/25/2023	21:04:41	21	LASBOR	4	4	1	0.234608	EPTFUS		LoF
7/5/2023	4:22:43	4	LASBOR	4	4	1	0.215733	EPTFUS		
7/18/2023	23:52:37	23	LASBOR	5	4	0.8	0.173712	MYOLUC	PERSUB	
7/25/2023	22:53:57	22	LASBOR	7	4	0.571	0.192679	MYOLUC	PERSUB	HiF
7/26/2023	3:24:10	3	LASBOR	5	3	0.6	0.160357			
7/25/2023	4:40:34	4	LASBOR	3	2	0.667	0.083658			
7/24/2023	2:28:18	2	LASCIN	52	42	0.808	0.332331	LASNOC	EPTFUS	
7/5/2023	1:12:58	1	LASCIN	43	41	0.953	0.305979			
7/5/2023	21:20:59	21	LASCIN	38	38	1	0.438988	EPTFUS		

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/4/2023	22:08:32	22	LASCIN	36	36	1	0.409123	EPTFUS		
7/28/2023	4:12:06	4	LASCIN	34	33	0.971	0.393498			
7/28/2023	4:12:34	4	LASCIN	36	33	0.917	0.386099			
7/24/2023	1:26:35	1	LASCIN	38	33	0.868	0.310039	LASNOC	EPTFUS	
7/5/2023	21:23:33	21	LASCIN	35	32	0.914	0.534297	EPTFUS		
7/13/2023	4:22:50	4	LASCIN	30	30	1	0.470894			
7/24/2023	2:28:48	2	LASCIN	31	30	0.968	0.424302	LASNOC	EPTFUS	
7/20/2023	22:45:56	22	LASCIN	33	30	0.909	0.487012	EPTFUS	LASNOC	
7/23/2023	2:56:43	2	LASCIN	30	29	0.967	0.396357	LASNOC	EPTFUS	
8/1/2023	5:02:40	5	LASCIN	34	29	0.853	0.320973	LASNOC	EPTFUS	
8/1/2023	4:59:20	4	LASCIN	44	29	0.659	0.238743	LASNOC	EPTFUS	
7/28/2023	4:07:32	4	LASCIN	27	27	1	0.351235			
7/5/2023	0:19:05	0	LASCIN	27	26	0.963	0.516966	EPTFUS	LASNOC	
7/5/2023	4:08:47	4	LASCIN	30	26	0.867	0.314839			
7/3/2023	22:39:38	22	LASCIN	33	26	0.788	0.438214	EPTFUS	LASNOC	
7/13/2023	4:20:58	4	LASCIN	25	25	1	0.387872			
7/28/2023	20:58:53	20	LASCIN	29	25	0.862	0.386497	EPTFUS	LASNOC	
7/24/2023	3:09:51	3	LASCIN	33	25	0.758	0.291889	LASNOC	EPTFUS	
7/7/2023	3:47:41	3	LASCIN	40	25	0.625	0.279918	EPTFUS	LASNOC	
7/24/2023	4:01:04	4	LASCIN	25	24	0.96	0.380727	LASNOC	EPTFUS	
7/24/2023	5:10:13	5	LASCIN	36	24	0.667	0.241507	LASNOC	EPTFUS	
7/3/2023	21:15:40	21	LASCIN	40	24	0.6	0.370063	EPTFUS	LASNOC	
8/1/2023	3:19:25	3	LASCIN	25	23	0.92	0.351714	LASNOC	EPTFUS	
7/23/2023	3:01:48	3	LASCIN	34	23	0.676	0.251919	LASNOC	EPTFUS	
8/1/2023	4:22:08	4	LASCIN	32	22	0.688	0.279316	LASNOC	EPTFUS	
8/1/2023	4:21:49	4	LASCIN	38	22	0.579	0.220542	LASNOC	EPTFUS	
7/7/2023	4:22:20	4	LASCIN	21	21	1	0.542811	EPTFUS		
7/14/2023	21:31:29	21	LASCIN	24	21	0.875	0.377911	LASNOC	EPTFUS	
7/27/2023	1:51:58	1	LASCIN	24	21	0.875	0.546488	EPTFUS		

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/20/2023	3:23:13	3	LASCIN	36	21	0.583	0.245364	LASNOC	EPTFUS	
7/24/2023	2:39:42	2	LASCIN	49	21	0.429	0.167578	LASNOC	EPTFUS	
7/9/2023	4:38:57	4	LASCIN	20	20	1	0.373719			
7/24/2023	3:48:49	3	LASCIN	25	20	0.8	0.316449	LASNOC	EPTFUS	
7/28/2023	4:00:42	4	LASCIN	25	19	0.76	0.30693	LASNOC	EPTFUS	
7/28/2023	3:41:54	3	LASCIN	18	18	1	0.437015			
7/28/2023	4:29:49	4	LASCIN	18	18	1	0.333928			
7/10/2023	2:04:56	2	LASCIN	21	18	0.857	0.427094	EPTFUS	LASNOC	
7/28/2023	4:50:14	4	LASCIN	19	17	0.895	0.390548	EPTFUS	LASNOC	
7/24/2023	2:47:27	2	LASCIN	21	17	0.81	0.332375	EPTFUS	LASNOC	
7/28/2023	3:42:11	3	LASCIN	21	17	0.81	0.283192	LASNOC		
7/5/2023	3:22:02	3	LASCIN	24	17	0.708	0.258586			
7/24/2023	2:07:57	2	LASCIN	30	17	0.567	0.229837	LASNOC	EPTFUS	
7/18/2023	4:29:59	4	LASCIN	16	16	1	0.496535			
7/24/2023	1:43:40	1	LASCIN	18	16	0.889	0.37086	EPTFUS	LASNOC	
6/30/2023	21:59:09	21	LASCIN	21	16	0.762	0.332584	LASNOC	EPTFUS	
7/24/2023	2:58:13	2	LASCIN	22	16	0.727	0.26857	LASNOC	EPTFUS	
7/24/2023	2:19:49	2	LASCIN	27	16	0.593	0.228395	LASNOC	EPTFUS	
7/20/2023	2:18:12	2	LASCIN	33	16	0.485	0.208012	LASNOC	EPTFUS	
7/28/2023	3:33:58	3	LASCIN	33	16	0.485	0.203196	LASNOC	EPTFUS	
7/5/2023	1:50:45	1	LASCIN	15	15	1	0.330613			
7/5/2023	3:18:03	3	LASCIN	15	15	1	0.323713			
7/5/2023	4:38:48	4	LASCIN	15	15	1	0.362588			
7/14/2023	21:35:26	21	LASCIN	23	15	0.652	0.230788	LASNOC	EPTFUS	
7/24/2023	1:56:33	1	LASCIN	14	14	1	0.391559	LASNOC	EPTFUS	
7/24/2023	3:49:20	3	LASCIN	14	14	1	0.388286	LASNOC	EPTFUS	
7/5/2023	3:13:10	3	LASCIN	14	14	1	0.357055			
7/5/2023	3:41:22	3	LASCIN	14	14	1	0.280032			
7/13/2023	4:22:38	4	LASCIN	14	14	1	0.529765			

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/24/2023	3:54:12	3	LASCIN	15	14	0.933	0.392856	LASNOC	EPTFUS	
7/28/2023	4:12:55	4	LASCIN	15	14	0.933	0.427885	EPTFUS	LASNOC	
8/1/2023	4:39:55	4	LASCIN	19	14	0.737	0.348626			
7/24/2023	5:02:28	5	LASCIN	21	14	0.667	0.257614	LASNOC	EPTFUS	
7/27/2023	3:22:22	3	LASCIN	13	13	1	0.422406			
7/13/2023	4:19:42	4	LASCIN	13	13	1	0.44337			
7/20/2023	3:34:38	3	LASCIN	15	13	0.867	0.366253	LASNOC	EPTFUS	
8/1/2023	3:55:04	3	LASCIN	15	13	0.867	0.329161	LASNOC	EPTFUS	
7/5/2023	3:42:14	3	LASCIN	15	13	0.867	0.313597			
7/24/2023	1:39:22	1	LASCIN	17	13	0.765	0.28466	LASNOC	EPTFUS	
7/7/2023	4:21:49	4	LASCIN	12	12	1	0.530309			
7/13/2023	4:18:39	4	LASCIN	12	12	1	0.395794			
7/15/2023	22:39:24	22	LASCIN	14	12	0.857	0.418739			
7/24/2023	2:57:55	2	LASCIN	16	12	0.75	0.262739	LASNOC	EPTFUS	
7/16/2023	20:59:34	20	LASCIN	20	12	0.6	0.290833	EPTFUS	LASNOC	
7/28/2023	4:28:49	4	LASCIN	21	12	0.571	0.222185	LASNOC	EPTFUS	
7/16/2023	0:47:09	0	LASCIN	11	11	1	0.382925	EPTFUS		
7/29/2023	4:14:34	4	LASCIN	11	11	1	0.370574			
7/5/2023	1:51:25	1	LASCIN	11	11	1	0.291055			
7/5/2023	3:22:22	3	LASCIN	11	11	1	0.308824			
7/28/2023	3:35:32	3	LASCIN	12	11	0.917	0.43606	EPTFUS	LASNOC	
8/1/2023	3:19:36	3	LASCIN	12	11	0.917	0.363181	LASNOC	EPTFUS	
7/30/2023	22:14:38	22	LASCIN	12	11	0.917	0.466603	EPTFUS	LASNOC	
7/16/2023	21:49:35	21	LASCIN	13	11	0.846	0.552723	EPTFUS	LASNOC	
7/6/2023	0:47:46	0	LASCIN	13	11	0.846	0.343094	EPTFUS	LASNOC	
7/24/2023	2:15:14	2	LASCIN	14	11	0.786	0.310267	LASNOC	EPTFUS	
6/30/2023	21:59:37	21	LASCIN	14	11	0.786	0.291237	LASNOC	EPTFUS	
7/20/2023	1:39:38	1	LASCIN	15	11	0.733	0.359595	EPTFUS	LASNOC	
7/24/2023	4:30:34	4	LASCIN	15	11	0.733	0.271491	LASNOC	EPTFUS	

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
8/1/2023	5:00:51	5	LASCIN	16	11	0.688	0.274116	LASNOC	EPTFUS	
7/23/2023	3:01:55	3	LASCIN	17	11	0.647	0.369521	EPTFUS	LASNOC	
7/24/2023	2:40:18	2	LASCIN	17	11	0.647	0.273364			
7/20/2023	3:38:42	3	LASCIN	25	11	0.44	0.197528	LASNOC	EPTFUS	
7/27/2023	1:51:00	1	LASCIN	10	10	1	0.661273	EPTFUS	LASNOC	
7/24/2023	4:23:27	4	LASCIN	10	10	1	0.393226	EPTFUS	LASNOC	
7/5/2023	3:05:43	3	LASCIN	10	10	1	0.351163			
7/5/2023	1:51:10	1	LASCIN	10	10	1	0.381413			
7/9/2023	2:05:16	2	LASCIN	10	10	1	0.372702			
7/9/2023	4:39:20	4	LASCIN	10	10	1	0.405696			
7/12/2023	3:53:10	3	LASCIN	10	10	1	0.459952			
7/29/2023	0:37:50	0	LASCIN	11	10	0.909	0.453046			
7/28/2023	3:52:11	3	LASCIN	12	10	0.833	0.330575	EPTFUS		
7/24/2023	2:47:54	2	LASCIN	13	10	0.769	0.29466	LASNOC	EPTFUS	
7/4/2023	22:08:35	22	LASCIN	24	10	0.417	0.289882	EPTFUS	LASNOC	
7/24/2023	2:35:35	2	LASCIN	27	10	0.37	0.157623	LASNOC	EPTFUS	
7/12/2023	3:55:21	3	LASCIN	9	9	1	0.24495			
7/28/2023	3:51:32	3	LASCIN	9	9	1	0.393396	LASNOC		
7/13/2023	3:16:50	3	LASCIN	9	9	1	0.308838			
7/24/2023	3:49:13	3	LASCIN	9	9	1	0.39934	LASNOC	EPTFUS	
7/28/2023	3:05:09	3	LASCIN	9	9	1	0.414649			
7/5/2023	1:52:05	1	LASCIN	9	9	1	0.250852			
7/19/2023	21:37:25	21	LASCIN	10	9	0.9	0.401989	LASNOC	EPTFUS	
7/24/2023	3:09:41	3	LASCIN	10	9	0.9	0.426157	LASNOC	EPTFUS	
7/5/2023	3:17:08	3	LASCIN	10	9	0.9	0.268614			
7/28/2023	3:26:30	3	LASCIN	8	8	1	0.447802			
7/28/2023	4:40:54	4	LASCIN	8	8	1	0.445017	EPTFUS	LASNOC	
7/5/2023	3:21:23	3	LASCIN	8	8	1	0.45345			
7/5/2023	3:43:18	3	LASCIN	8	8	1	0.377131			

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/24/2023	1:46:34	1	LASCIN	9	8	0.889	0.420805	EPTFUS	LASNOC	
7/24/2023	3:09:46	3	LASCIN	9	8	0.889	0.35758	LASNOC	EPTFUS	
7/24/2023	3:35:23	3	LASCIN	9	8	0.889	0.36434	LASNOC	EPTFUS	
7/5/2023	1:51:01	1	LASCIN	9	8	0.889	0.23241			
7/24/2023	3:53:59	3	LASCIN	10	8	0.8	0.342225	LASNOC	EPTFUS	
7/28/2023	3:37:12	3	LASCIN	10	8	0.8	0.358722			
8/1/2023	4:40:33	4	LASCIN	10	8	0.8	0.259489	LASNOC	EPTFUS	
7/5/2023	4:57:14	4	LASCIN	10	8	0.8	0.275548			
7/24/2023	2:11:29	2	LASCIN	11	8	0.727	0.286059	LASNOC	EPTFUS	
7/5/2023	3:17:30	3	LASCIN	12	8	0.667	0.281075	LASNOC		
7/24/2023	1:56:13	1	LASCIN	13	8	0.615	0.239081	LASNOC	EPTFUS	
7/16/2023	21:58:38	21	LASCIN	14	8	0.571	0.348426	LASNOC	EPTFUS	
8/1/2023	2:31:24	2	LASCIN	16	8	0.5	0.231038	LASNOC	EPTFUS	
8/1/2023	5:01:36	5	LASCIN	16	8	0.5	0.199755	LASNOC	EPTFUS	
7/24/2023	1:26:54	1	LASCIN	18	8	0.444	0.171952	LASNOC	EPTFUS	
7/29/2023	0:24:41	0	LASCIN	7	7	1	0.424703	EPTFUS		
7/28/2023	4:30:58	4	LASCIN	7	7	1	0.408555	LASNOC	EPTFUS	
7/5/2023	2:16:52	2	LASCIN	7	7	1	0.268366			
7/5/2023	3:17:20	3	LASCIN	7	7	1	0.352989	EPTFUS		
7/5/2023	4:13:16	4	LASCIN	7	7	1	0.265525			
7/9/2023	0:43:23	0	LASCIN	7	7	1	0.420064			
7/15/2023	22:39:36	22	LASCIN	7	7	1	0.44635			
7/24/2023	2:29:05	2	LASCIN	8	7	0.875	0.452519	EPTFUS	LASNOC	
7/28/2023	2:58:10	2	LASCIN	9	7	0.778	0.36688			
7/28/2023	4:00:59	4	LASCIN	11	7	0.636	0.218641	LASNOC	EPTFUS	
7/28/2023	4:52:57	4	LASCIN	11	7	0.636	0.248465	LASNOC	EPTFUS	
7/28/2023	4:13:33	4	LASCIN	12	7	0.583	0.223369	LASNOC	EPTFUS	
7/24/2023	2:40:34	2	LASCIN	14	7	0.5	0.169525	EPTFUS		
7/24/2023	3:13:20	3	LASCIN	14	7	0.5	0.21629	LASNOC	EPTFUS	

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
8/1/2023	4:40:20	4	LASCIN	15	7	0.467	0.160591	LASNOC	EPTFUS	
7/24/2023	1:18:11	1	LASCIN	6	6	1	0.356192	EPTFUS	LASNOC	
7/28/2023	3:48:31	3	LASCIN	6	6	1	0.444719			
7/28/2023	22:31:08	22	LASCIN	6	6	1	0.38041	EPTFUS		
7/4/2023	22:33:06	22	LASCIN	6	6	1	0.448956			
7/5/2023	1:39:16	1	LASCIN	6	6	1	0.303588			
7/5/2023	3:05:30	3	LASCIN	6	6	1	0.304472			
7/5/2023	3:21:35	3	LASCIN	6	6	1	0.232358			
7/13/2023	4:18:49	4	LASCIN	6	6	1	0.370533			
7/24/2023	0:25:16	0	LASCIN	7	6	0.857	0.314272	LASNOC	EPTFUS	
7/24/2023	2:57:04	2	LASCIN	7	6	0.857	0.473971	EPTFUS	LASNOC	
7/28/2023	3:13:06	3	LASCIN	7	6	0.857	0.304557	EPTFUS	LASNOC	
7/24/2023	3:38:09	3	LASCIN	8	6	0.75	0.261219	LASNOC	EPTFUS	
7/28/2023	4:20:53	4	LASCIN	8	6	0.75	0.317937			
7/20/2023	3:34:22	3	LASCIN	10	6	0.6	0.24224	LASNOC	EPTFUS	
7/24/2023	2:02:27	2	LASCIN	10	6	0.6	0.273004	LASNOC	EPTFUS	
7/5/2023	4:25:43	4	LASCIN	11	6	0.545	0.192914			
7/20/2023	1:46:13	1	LASCIN	15	6	0.4	0.181501	LASNOC	EPTFUS	
7/24/2023	2:03:41	2	LASCIN	16	6	0.375	0.15391	LASNOC	EPTFUS	
8/1/2023	4:40:05	4	LASCIN	17	6	0.353	0.159315	LASNOC	EPTFUS	
8/1/2023	3:19:15	3	LASCIN	5	5	1	0.402628	LASNOC	EPTFUS	
7/5/2023	3:21:43	3	LASCIN	5	5	1	0.397652	EPTFUS	LASNOC	
7/16/2023	0:47:25	0	LASCIN	6	5	0.833	0.26338	EPTFUS		
7/29/2023	4:43:44	4	LASCIN	6	5	0.833	0.418871	EPTFUS		
7/24/2023	2:11:58	2	LASCIN	7	5	0.714	0.271696	LASNOC	EPTFUS	
7/5/2023	3:15:36	3	LASCIN	7	5	0.714	0.242219	EPTFUS		
7/3/2023	21:15:59	21	LASCIN	11	5	0.455	0.322369	EPTFUS	LASNOC	
7/24/2023	5:02:46	5	LASCIN	12	5	0.417	0.194332	LASNOC	EPTFUS	
7/18/2023	3:13:49	3	LASCIN	4	4	1	0.357566	EPTFUS		

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/24/2023	0:20:18	0	LASCIN	4	4	1	0.349767	LASNOC	EPTFUS	
7/24/2023	2:12:29	2	LASCIN	4	4	1	0.309372			
7/28/2023	3:32:20	3	LASCIN	4	4	1	0.271822			
7/28/2023	3:32:36	3	LASCIN	4	4	1	0.329753			
7/28/2023	3:32:26	3	LASCIN	4	4	1	0.2895			
7/5/2023	1:07:05	1	LASCIN	4	4	1	0.36559			
7/5/2023	1:39:27	1	LASCIN	4	4	1	0.534772			
7/5/2023	3:43:30	3	LASCIN	4	4	1	0.288472			
7/5/2023	4:08:59	4	LASCIN	4	4	1	0.42298			
7/9/2023	1:35:03	1	LASCIN	4	4	1	0.357876			
7/9/2023	5:05:02	5	LASCIN	4	4	1	0.383744			
7/13/2023	4:19:19	4	LASCIN	4	4	1	0.534772			
7/30/2023	22:11:54	22	LASCIN	4	4	1	0.470405	EPTFUS		
7/19/2023	22:33:42	22	LASCIN	5	4	0.8	0.231652	EPTFUS		
7/24/2023	21:37:59	21	LASCIN	5	4	0.8	0.138784			
8/1/2023	3:03:33	3	LASCIN	5	4	0.8	0.319622			
6/30/2023	21:12:45	21	LASCIN	5	4	0.8	0.465462			
7/28/2023	3:12:25	3	LASCIN	8	4	0.5	0.209662	LASNOC	EPTFUS	
7/20/2023	0:14:16	0	LASCIN	9	4	0.444	0.189873	LASNOC	EPTFUS	
7/22/2023	23:20:52	23	LASCIN	3	3	1	0.372536			
7/24/2023	3:39:35	3	LASCIN	3	3	1	0.267685			
7/24/2023	20:53:53	20	LASCIN	3	3	1	0.38883			
7/28/2023	3:44:00	3	LASCIN	3	3	1	0.35631	EPTFUS		
7/28/2023	21:23:16	21	LASCIN	3	3	1	0.358826	EPTFUS		
8/1/2023	4:18:59	4	LASCIN	3	3	1	0.151083			
8/1/2023	4:19:47	4	LASCIN	3	3	1	0.430879	EPTFUS		
7/5/2023	1:29:51	1	LASCIN	3	3	1	0.422462			
7/5/2023	3:11:52	3	LASCIN	3	3	1	0.459003			
7/5/2023	5:00:08	5	LASCIN	3	3	1	0.459003			

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/13/2023	4:19:59	4	LASCIN	3	3	1	0.327001			
7/13/2023	4:24:15	4	LASCIN	3	3	1	0.537118			
7/6/2023	22:12:05	22	LASCIN	4	3	0.75	0.444898	EPTFUS		
8/1/2023	4:41:02	4	LASCIN	4	3	0.75	0.418817	LASNOC		
7/14/2023	23:20:26	23	LASCIN	5	3	0.6	0.335943	EPTFUS	LASNOC	
7/19/2023	21:34:36	21	LASCIN	6	3	0.5	0.115647			
7/28/2023	3:35:07	3	LASCIN	6	3	0.5	0.455682	EPTFUS		
7/4/2023	21:27:41	21	LASCIN	2	2	1	0.534772			
7/12/2023	3:33:25	3	LASCIN	2	2	1	0.37764	LASNOC	EPTFUS	
7/24/2023	0:51:40	0	LASCIN	2	2	1	0.358826	EPTFUS		
7/28/2023	3:52:53	3	LASCIN	2	2	1	0.411611	EPTFUS	LASNOC	
8/1/2023	3:17:44	3	LASCIN	2	2	1	0.472162	EPTFUS	LASNOC	
7/5/2023	3:25:34	3	LASCIN	2	2	1	0.472201			
7/6/2023	4:47:54	4	LASCIN	2	2	1	0.423797			
7/9/2023	5:08:25	5	LASCIN	2	2	1	0.405835			
7/21/2023	4:05:22	4	LASCIN	2	2	1	0.405298			
7/12/2023	3:00:29	3	LASCIN	3	2	0.667	0.268954	LASNOC	EPTFUS	
7/28/2023	3:34:43	3	LASCIN	3	2	0.667	0.242045	EPTFUS		
7/5/2023	3:17:58	3	LASCIN	3	2	0.667	0.255951			
7/24/2023	2:41:07	2	LASCIN	4	2	0.5	0.198378	LASNOC	EPTFUS	
7/28/2023	4:22:15	4	LASCIN	4	2	0.5	0.209186			
7/24/2023	2:40:26	2	LASCIN	8	2	0.25	0.207342			
7/13/2023	3:06:01	3	LASCIN	2	1	0.5	0.310246	EPTFUS	LASNOC	
7/24/2023	2:14:22	2	LASCIN	2	1	0.5	0.435305	EPTFUS		
8/1/2023	2:32:43	2	LASCIN	2	1	0.5	0.25128	EPTFUS		
7/31/2023	1:01:08	1	LASCIN	3	1	0.333	0.303667	EPTFUS	LASNOC	
7/24/2023	4:11:44	4	LASCIN	5	1	0.2	0.197797	EPTFUS		
7/5/2023	22:01:41	22	LASNOC	66	46	0.697	0.339327	EPTFUS	LASCIN	
7/28/2023	4:00:05	4	LASNOC	47	43	0.915	0.298512	LASCIN	EPTFUS	

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/17/2023	23:56:14	23	LASNOC	46	34	0.739	0.260972	LASCIN	EPTFUS	
7/25/2023	20:46:03	20	LASNOC	32	31	0.969	0.413296	LASCIN	EPTFUS	
7/25/2023	23:02:15	23	LASNOC	32	31	0.969	0.443838	LASCIN	EPTFUS	
7/29/2023	0:30:56	0	LASNOC	32	30	0.938	0.421069	LASCIN	EPTFUS	
7/24/2023	1:36:14	1	LASNOC	28	26	0.929	0.278159	LASCIN	EPTFUS	
7/28/2023	22:08:09	22	LASNOC	34	26	0.765	0.31098	LASCIN	EPTFUS	
7/7/2023	4:20:31	4	LASNOC	22	20	0.909	0.324692	LASCIN	EPTFUS	
7/17/2023	21:51:17	21	LASNOC	20	18	0.9	0.379428	LASCIN	EPTFUS	
7/24/2023	5:07:07	5	LASNOC	24	18	0.75	0.183422	LASCIN	EPTFUS	
7/7/2023	4:25:01	4	LASNOC	17	16	0.941	0.328761	LASCIN	EPTFUS	
7/25/2023	0:59:35	0	LASNOC	21	16	0.762	0.299768	EPTFUS	LASCIN	
7/28/2023	3:30:41	3	LASNOC	18	15	0.833	0.235359	LASCIN	EPTFUS	
7/29/2023	2:06:01	2	LASNOC	18	15	0.833	0.365563	LASCIN	EPTFUS	
7/14/2023	21:46:39	21	LASNOC	15	14	0.933	0.30167	LASCIN	EPTFUS	
7/17/2023	23:59:40	23	LASNOC	22	14	0.636	0.245912	LASCIN	EPTFUS	
7/6/2023	23:01:54	23	LASNOC	26	14	0.538	0.225729	LASCIN	EPTFUS	
7/28/2023	21:47:52	21	LASNOC	14	13	0.929	0.361098	LASCIN	EPTFUS	
7/28/2023	1:44:43	1	LASNOC	16	13	0.812	0.359789	LASCIN	EPTFUS	
7/5/2023	4:24:03	4	LASNOC	16	13	0.812	0.217913	LASCIN	EPTFUS	
7/24/2023	3:53:21	3	LASNOC	15	12	0.8	0.225514	LASCIN	EPTFUS	
7/28/2023	21:38:54	21	LASNOC	17	12	0.706	0.188551	LASCIN	EPTFUS	
7/6/2023	23:01:46	23	LASNOC	10	10	1	0.413378	LASCIN	EPTFUS	
7/28/2023	3:30:24	3	LASNOC	10	10	1	0.437799	LASCIN	EPTFUS	
7/28/2023	4:30:24	4	LASNOC	10	10	1	0.335501	LASCIN	EPTFUS	
7/28/2023	1:58:17	1	LASNOC	11	10	0.909	0.30291	LASCIN	EPTFUS	
7/19/2023	22:55:27	22	LASNOC	16	10	0.625	0.30451	EPTFUS	LASCIN	
7/6/2023	23:08:55	23	LASNOC	9	9	1	0.344444	LASCIN	EPTFUS	
7/20/2023	3:27:09	3	LASNOC	10	9	0.9	0.200899	LASCIN	EPTFUS	
7/24/2023	2:40:55	2	LASNOC	11	9	0.818	0.274029	LASCIN	EPTFUS	

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/6/2023	23:18:16	23	LASNOC	9	8	0.889	0.279767	LASCIN	EPTFUS	
7/24/2023	2:12:04	2	LASNOC	13	8	0.615	0.234286	LASCIN	EPTFUS	
7/28/2023	3:52:02	3	LASNOC	8	7	0.875	0.205334	LASCIN	EPTFUS	
7/24/2023	2:34:21	2	LASNOC	8	7	0.875	0.288206	LASCIN	EPTFUS	
7/9/2023	22:03:53	22	LASNOC	6	6	1	0.483611	EPTFUS	LASCIN	
7/21/2023	3:08:54	3	LASNOC	6	6	1	0.377327	EPTFUS	LASCIN	
7/24/2023	4:10:14	4	LASNOC	6	6	1	0.308747	LASCIN	EPTFUS	
7/24/2023	2:16:00	2	LASNOC	7	6	0.857	0.282671	LASCIN	EPTFUS	
7/25/2023	2:49:10	2	LASNOC	8	6	0.75	0.417416	LASCIN	EPTFUS	
7/28/2023	2:33:22	2	LASNOC	5	5	1	0.374524	LASCIN	EPTFUS	
7/20/2023	3:28:38	3	LASNOC	5	5	1	0.538928	LASCIN	EPTFUS	
7/24/2023	2:58:07	2	LASNOC	5	5	1	0.331959	LASCIN	EPTFUS	
7/4/2023	21:42:40	21	LASNOC	8	5	0.625	0.159894	LASCIN	EPTFUS	
7/6/2023	23:00:53	23	LASNOC	9	5	0.556	0.227911	LASCIN	EPTFUS	
7/1/2023	23:57:07	23	LASNOC	4	4	1	0.31005	LASCIN	EPTFUS	
7/5/2023	2:19:43	2	LASNOC	4	4	1	0.381267	EPTFUS	LASCIN	
7/6/2023	21:56:33	21	LASNOC	4	4	1	0.353749	LASCIN	EPTFUS	
7/18/2023	0:05:07	0	LASNOC	4	4	1	0.346935	LASCIN	EPTFUS	
7/24/2023	2:01:20	2	LASNOC	4	4	1	0.432517	LASCIN	EPTFUS	
7/24/2023	5:08:03	5	LASNOC	4	4	1	0.377432	LASCIN	EPTFUS	
7/24/2023	1:06:51	1	LASNOC	6	4	0.667	0.232249	LASCIN	EPTFUS	
7/24/2023	5:25:36	5	LASNOC	6	4	0.667	0.151976	LASCIN	EPTFUS	
7/12/2023	4:07:07	4	LASNOC	6	4	0.667	0.330726	EPTFUS	LASCIN	
7/19/2023	23:34:03	23	LASNOC	6	4	0.667	0.169421	LASCIN	EPTFUS	
7/23/2023	21:58:37	21	LASNOC	3	3	1	0.184634	LASCIN	EPTFUS	
7/1/2023	23:56:37	23	LASNOC	3	3	1	0.300657	EPTFUS	LASCIN	
7/24/2023	22:19:18	22	LASNOC	3	3	1	0.28096	EPTFUS	LASCIN	
7/28/2023	4:00:52	4	LASNOC	3	3	1	0.34241	LASCIN	EPTFUS	
8/1/2023	4:00:45	4	LASNOC	3	3	1	0.530368	LASCIN	EPTFUS	

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/24/2023	2:15:08	2	LASNOC	4	3	0.75	0.229495	LASCIN	EPTFUS	
6/30/2023	21:46:19	21	LASNOC	2	2	1	0.436169	LASCIN	EPTFUS	
7/31/2023	0:05:03	0	LASNOC	2	2	1	0.326575	EPTFUS	LASCIN	
7/1/2023	23:55:03	23	LASNOC	2	2	1	0.37009	LASCIN	EPTFUS	
7/17/2023	21:13:41	21	LASNOC	2	2	1	0.327974	LASCIN	EPTFUS	
7/24/2023	4:27:16	4	LASNOC	2	2	1	0.399252	LASCIN	EPTFUS	
7/25/2023	21:42:23	21	LASNOC	2	2	1	0.327974	LASCIN	EPTFUS	
7/26/2023	23:01:30	23	LASNOC	2	2	1	0.254829	EPTFUS	LASCIN	
8/1/2023	4:02:59	4	LASNOC	2	2	1	0.260306	LASCIN	EPTFUS	
7/27/2023	1:37:38	1	LASNOC	3	2	0.667	0.239313	EPTFUS	LASCIN	
7/24/2023	2:06:47	2	LASNOC	3	2	0.667	0.210029	LASCIN	EPTFUS	
7/24/2023	2:15:25	2	LASNOC	3	2	0.667	0.360481	LASCIN	EPTFUS	
7/26/2023	22:30:54	22	LASNOC	3	2	0.667	0.289171	LASCIN	EPTFUS	
7/26/2023	22:08:51	22	LASNOC	4	2	0.5	0.309307	EPTFUS	LASCIN	
7/4/2023	21:59:08	21	LASNOC	2	1	0.5	0.19926	EPTFUS	LASCIN	
7/23/2023	23:01:24	23	MYOLUC	50	30	0.6	0.157453	MYOSEP		Mysp.
7/26/2023	21:28:27	21	MYOLUC	36	29	0.806	0.330853	LASBOR		Mylu
7/23/2023	0:55:44	0	MYOLUC	32	25	0.781	0.194792	MYOSEP		Mylu
7/22/2023	22:50:53	22	MYOLUC	35	25	0.714	0.263726	LASBOR		Mylu
7/25/2023	2:55:13	2	MYOLUC	25	19	0.76	0.302657	LASBOR	PERSUB	Mylu
7/20/2023	22:22:14	22	MYOLUC	11	8	0.727	0.225496	LASBOR		HiF
7/25/2023	3:07:47	3	MYOLUC	6	6	1	0.445109	PERSUB		HiF
7/27/2023	22:31:51	22	MYOLUC	5	4	0.8	0.208175	LASBOR	PERSUB	HiF
7/5/2023	0:22:56	0	MYOLUC	5	4	0.8	0.260153	LASBOR	PERSUB	HiF
7/26/2023	1:04:42	1	MYOLUC	2	2	1	0.566976	LASBOR	PERSUB	
7/20/2023	0:21:48	0	MYOLUC	3	2	0.667	0.231102	LASBOR	PERSUB	
7/5/2023	0:24:53	0	MYOSEP	3	2	0.667	0.0629	MYOLUC		HiF
7/6/2023	23:40:05	23	NoID	3	0	0	0			
7/6/2023	23:01:27	23	NoID	41	0	0	0			

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/7/2023	3:45:18	3	NoID	60	0	0	0			
7/14/2023	23:17:38	23	NoID	6	0	0	0			
7/16/2023	1:54:55	1	NoID	2	0	0	0			
7/15/2023	2:14:37	2	NoID	28	0	0	0			
7/17/2023	22:29:43	22	NoID	4	0	0	0			HiF
7/18/2023	1:38:24	1	NoID	3	0	0	0			HiF
7/17/2023	23:16:47	23	NoID	18	0	0	0			
7/18/2023	21:16:35	21	NoID	12	0	0	0			
7/25/2023	1:34:44	1	NoID	7	0	0	0			LoF
7/27/2023	0:59:27	0	NoID	11	0	0	0			Labo
7/26/2023	0:10:25	0	NoID	10	0	0	0			
7/25/2023	3:25:04	3	NoID	3	0	0	0			
7/27/2023	3:09:45	3	NoID	4	0	0	0			HiF
7/27/2023	2:36:08	2	NoID	8	0	0	0			
7/28/2023	1:46:28	1	NoID	8	0	0	0			
7/28/2023	23:43:54	23	NoID	2	0	0	0			
7/28/2023	2:06:31	2	NoID	28	0	0	0			
7/10/2023	0:23:17	0	NoID	2	0	0	0			
7/12/2023	22:16:45	22	NoID	6	0	0	0			
7/18/2023	0:21:43	0	NoID	2	0	0	0			
7/13/2023	1:48:51	1	NoID	5	0	0	0			
7/18/2023	23:55:41	23	NoID	2	0	0	0			
7/18/2023	3:50:21	3	NoID	2	0	0	0			
7/18/2023	4:01:11	4	NoID	2	0	0	0			
7/13/2023	21:18:37	21	NoID	9	0	0	0			
7/20/2023	1:46:45	1	NoID	4	0	0	0			
7/20/2023	1:39:51	1	NoID	7	0	0	0			
7/19/2023	0:30:28	0	NoID	8	0	0	0			
7/20/2023	3:22:44	3	NoID	3	0	0	0			

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/22/2023	22:14:38	22	NoID	2	0	0	0			HiF
7/20/2023	3:34:04	3	NoID	24	0	0	0			
7/20/2023	3:36:45	3	NoID	12	0	0	0			
7/23/2023	0:07:23	0	NoID	3	0	0	0			
7/22/2023	22:39:04	22	NoID	9	0	0	0			
7/20/2023	3:20:10	3	NoID	27	0	0	0			
7/24/2023	0:52:20	0	NoID	15	0	0	0			
7/24/2023	1:25:49	1	NoID	6	0	0	0			
7/24/2023	1:26:25	1	NoID	8	0	0	0			
7/24/2023	0:52:50	0	NoID	4	0	0	0			
7/24/2023	1:20:24	1	NoID	8	0	0	0			
7/24/2023	1:36:52	1	NoID	3	0	0	0			
7/20/2023	3:23:23	3	NoID	49	0	0	0			
7/24/2023	1:36:39	1	NoID	12	0	0	0			
7/24/2023	2:04:43	2	NoID	7	0	0	0			
7/24/2023	1:37:00	1	NoID	15	0	0	0			
7/24/2023	2:08:55	2	NoID	15	0	0	0			
7/24/2023	2:04:56	2	NoID	24	0	0	0			
7/24/2023	2:41:14	2	NoID	12	0	0	0			
7/24/2023	2:48:16	2	NoID	7	0	0	0			
7/24/2023	3:41:18	3	NoID	23	0	0	0			
7/24/2023	3:54:05	3	NoID	12	0	0	0			
7/24/2023	4:01:21	4	NoID	8	0	0	0			
7/24/2023	4:11:08	4	NoID	12	0	0	0			
7/24/2023	5:08:48	5	NoID	7	0	0	0			
7/25/2023	1:56:03	1	NoID	4	0	0	0			
7/24/2023	22:56:14	22	NoID	2	0	0	0			
7/26/2023	2:41:15	2	NoID	2	0	0	0			
7/26/2023	20:51:26	20	NoID	2	0	0	0			

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/26/2023	4:08:35	4	NoID	2	0	0	0			
7/24/2023	5:11:58	5	NoID	15	0	0	0			
7/28/2023	3:36:33	3	NoID	9	0	0	0			
7/28/2023	4:29:00	4	NoID	6	0	0	0			
7/28/2023	4:11:25	4	NoID	10	0	0	0			
7/28/2023	22:42:53	22	NoID	3	0	0	0			
7/28/2023	23:14:37	23	NoID	3	0	0	0			
7/28/2023	4:39:42	4	NoID	23	0	0	0			
7/28/2023	21:40:22	21	NoID	2	0	0	0			
8/1/2023	2:06:23	2	NoID	6	0	0	0			
8/1/2023	3:03:22	3	NoID	6	0	0	0			
7/31/2023	22:26:59	22	NoID	2	0	0	0			
7/29/2023	3:21:09	3	NoID	7	0	0	0			
8/1/2023	3:18:56	3	NoID	11	0	0	0			
8/1/2023	3:30:30	3	NoID	10	0	0	0			
8/1/2023	4:33:51	4	NoID	8	0	0	0			
8/1/2023	4:40:13	4	NoID	19	0	0	0			
7/5/2023	3:32:49	3	NoID	9	0	0	0			
7/5/2023	3:57:59	3	NoID	2	0	0	0			
7/5/2023	3:51:50	3	NoID	10	0	0	0			
7/5/2023	3:52:13	3	NoID	2	0	0	0			
7/5/2023	3:57:43	3	NoID	13	0	0	0			
7/5/2023	4:21:26	4	NoID	14	0	0	0			
7/5/2023	3:32:08	3	NoID	26	0	0	0			
7/5/2023	3:17:40	3	NoID	25	0	0	0			
7/7/2023	2:29:54	2	NoID	4	0	0	0			
7/5/2023	3:16:25	3	NoID	22	0	0	0			
7/5/2023	4:46:09	4	NoID	18	0	0	0			
7/9/2023	4:49:07	4	NoID	16	0	0	0			

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/19/2023	0:58:31	0	NoID	3	0	0	0			
7/19/2023	1:09:40	1	NoID	2	0	0	0			
7/20/2023	0:43:29	0	NoID	2	0	0	0			
7/20/2023	4:56:40	4	NoID	2	0	0	0			
7/22/2023	22:22:03	22	NoID	20	0	0	0			Mysp.
7/24/2023	3:52:11	3	NoID	13	0	0	0			HiF
7/1/2023	1:16:32	1	Noise							
7/3/2023	22:20:31	22	Noise							
7/2/2023	22:26:20	22	Noise							
7/1/2023	23:09:20	23	Noise							
7/3/2023	5:26:12	5	Noise							
7/3/2023	23:37:49	23	Noise							
7/3/2023	20:25:08	20	Noise							
7/2/2023	22:28:30	22	Noise							
7/3/2023	2:05:36	2	Noise							
7/4/2023	0:42:40	0	Noise							
6/30/2023	21:04:15	21	Noise							
7/2/2023	23:19:52	23	Noise							
7/4/2023	22:05:15	22	Noise							
7/4/2023	22:24:35	22	Noise							
7/5/2023	21:21:48	21	Noise							
7/5/2023	22:01:26	22	Noise							
7/5/2023	23:25:13	23	Noise							
7/5/2023	1:19:22	1	Noise							
7/6/2023	1:56:10	1	Noise							
7/8/2023	22:30:38	22	Noise							
7/10/2023	21:43:45	21	Noise							
7/10/2023	3:23:18	3	Noise							
7/10/2023	22:15:43	22	Noise							

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/11/2023	0:57:53	0	Noise							
7/11/2023	0:49:57	0	Noise							
7/11/2023	1:26:56	1	Noise							
7/11/2023	0:59:20	0	Noise							
7/11/2023	1:22:54	1	Noise							
7/11/2023	1:28:09	1	Noise							
7/11/2023	1:56:52	1	Noise							
7/11/2023	1:35:10	1	Noise							
7/11/2023	3:22:22	3	Noise							
7/11/2023	1:25:57	1	Noise							
7/11/2023	3:05:24	3	Noise							
7/11/2023	21:26:42	21	Noise							
7/11/2023	4:14:54	4	Noise							
7/11/2023	1:57:51	1	Noise							
7/12/2023	4:53:52	4	Noise							
7/11/2023	2:43:20	2	Noise							
7/13/2023	19:59:40	19	Noise							
7/13/2023	22:57:18	22	Noise							
7/13/2023	20:57:52	20	Noise							
7/14/2023	2:19:17	2	Noise							
7/13/2023	20:57:21	20	Noise							
7/14/2023	22:01:36	22	Noise							
7/14/2023	22:01:28	22	Noise							
7/14/2023	21:17:59	21	Noise							
7/17/2023	20:56:14	20	Noise							
7/16/2023	4:19:22	4	Noise							
7/17/2023	21:01:49	21	Noise							
7/17/2023	20:56:07	20	Noise							
7/17/2023	21:08:35	21	Noise							

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/21/2023	1:26:05	1	Noise							
7/21/2023	3:39:35	3	Noise							
7/21/2023	20:42:29	20	Noise							
7/22/2023	5:07:41	5	Noise							
7/22/2023	3:18:09	3	Noise							
7/24/2023	23:43:42	23	Noise							
7/25/2023	21:17:51	21	Noise							
7/25/2023	5:40:39	5	Noise							
7/25/2023	22:42:15	22	Noise							
7/25/2023	23:10:57	23	Noise							
7/26/2023	20:58:43	20	Noise							
7/26/2023	20:58:08	20	Noise							
7/26/2023	20:56:00	20	Noise							
7/27/2023	23:22:52	23	Noise							
7/28/2023	21:09:35	21	Noise							
7/28/2023	23:44:00	23	Noise							
7/29/2023	1:28:41	1	Noise							
7/29/2023	4:11:56	4	Noise							
7/30/2023	4:11:33	4	Noise							
7/30/2023	5:42:29	5	Noise							
8/1/2023	21:08:19	21	Noise							
7/1/2023	3:33:24	3	Noise							
7/5/2023	1:38:24	1	Noise							
8/2/2023	5:48:26	5	Noise							
7/4/2023	21:06:16	21	Noise							
7/5/2023	3:00:46	3	Noise							
7/10/2023	0:18:52	0	Noise							
7/6/2023	21:15:41	21	Noise							
7/6/2023	21:10:10	21	Noise							

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/10/2023	5:09:02	5	Noise							
7/6/2023	21:15:55	21	Noise							
7/11/2023	21:46:36	21	Noise							
7/10/2023	5:26:39	5	Noise							
7/14/2023	22:08:44	22	Noise							
7/15/2023	23:13:43	23	Noise							
7/14/2023	21:04:36	21	Noise							
7/17/2023	22:41:55	22	Noise							
7/15/2023	22:55:14	22	Noise							
7/18/2023	3:41:29	3	Noise							
7/18/2023	1:03:10	1	Noise							
7/20/2023	0:46:17	0	Noise							
7/20/2023	3:09:49	3	Noise							
7/19/2023	21:09:55	21	Noise							
7/20/2023	3:23:39	3	Noise							
7/22/2023	22:32:43	22	Noise							
7/23/2023	0:49:43	0	Noise							
7/23/2023	23:00:01	23	Noise							
7/24/2023	1:57:15	1	Noise							
7/24/2023	2:48:00	2	Noise							
7/24/2023	3:10:05	3	Noise							
7/24/2023	3:49:08	3	Noise							
7/25/2023	20:52:11	20	Noise							
7/24/2023	22:02:59	22	Noise							
7/26/2023	1:53:01	1	Noise							
7/26/2023	20:52:07	20	Noise							
7/25/2023	20:51:58	20	Noise							
7/26/2023	21:28:18	21	Noise							
7/26/2023	20:53:57	20	Noise							

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/27/2023	2:56:38	2	Noise							
7/28/2023	22:21:07	22	Noise							
7/28/2023	21:52:57	21	Noise							
7/28/2023	22:48:19	22	Noise							
7/29/2023	20:48:50	20	Noise							
8/1/2023	2:50:22	2	Noise							
8/1/2023	3:54:57	3	Noise							
8/1/2023	4:01:01	4	Noise							
8/1/2023	21:31:53	21	Noise							
8/1/2023	5:03:20	5	Noise							
7/1/2023	4:37:58	4	Noise							
7/1/2023	23:05:16	23	Noise							
7/1/2023	3:48:12	3	Noise							
7/2/2023	5:17:10	5	Noise							
7/6/2023	0:46:55	0	Noise							
7/9/2023	4:39:33	4	Noise							
7/10/2023	21:33:48	21	Noise							
7/10/2023	20:17:22	20	Noise							
7/10/2023	5:34:11	5	Noise							
7/10/2023	23:50:50	23	Noise							
7/10/2023	4:50:44	4	Noise							
7/16/2023	4:04:45	4	Noise							
7/16/2023	1:35:01	1	Noise							
7/16/2023	4:52:28	4	Noise							
7/16/2023	4:32:18	4	Noise							
7/18/2023	5:19:49	5	Noise							
7/19/2023	20:52:42	20	Noise							
7/19/2023	20:38:14	20	Noise							
7/20/2023	0:44:04	0	Noise							

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/22/2023	21:03:45	21	Noise							
7/23/2023	0:22:39	0	Noise							
7/23/2023	4:18:16	4	Noise							
7/21/2023	4:49:19	4	Noise							
7/25/2023	22:00:43	22	Noise							
7/25/2023	4:44:39	4	Noise							
7/25/2023	4:09:15	4	Noise							
7/25/2023	4:08:56	4	Noise							
7/25/2023	3:59:39	3	Noise							
7/27/2023	0:03:11	0	Noise							
7/25/2023	4:12:25	4	Noise							
7/27/2023	0:34:07	0	Noise							
7/26/2023	23:42:26	23	Noise							
7/26/2023	21:19:26	21	Noise							
7/27/2023	0:40:29	0	Noise							
7/27/2023	0:56:33	0	Noise							
7/28/2023	4:46:24	4	Noise							
7/28/2023	3:59:30	3	Noise							
7/28/2023	19:51:34	19	Noise							
7/28/2023	20:48:09	20	Noise							
7/27/2023	2:02:28	2	Noise							
7/28/2023	21:36:18	21	Noise							
7/29/2023	20:42:06	20	Noise							
7/29/2023	20:22:53	20	Noise							
7/29/2023	21:03:49	21	Noise							
7/29/2023	23:18:26	23	Noise							
7/29/2023	20:57:15	20	Noise							
7/30/2023	5:27:17	5	Noise							
7/29/2023	20:58:48	20	Noise							

DATE	TIME	HOUR	AUTO ID*	PULSES	MATCHING	MATCH RATIO	MARGIN	ALTERNATE 1	ALTERNATE 2	MANUAL ID
7/29/2023	20:42:44	20	Noise							
7/31/2023	19:53:49	19	Noise							
7/29/2023	22:30:21	22	Noise							
7/30/2023	22:12:14	22	Noise							
7/21/2023	4:24:17	4	PERSUB	13	10	0.769	0.29432	LASBOR	MYOLUC	HiF
7/28/2023	23:14:06	23	PERSUB	16	10	0.625	0.178927	LASBOR	MYOLUC	Pesu
7/6/2023	22:26:19	22	PERSUB	7	4	0.571	0.116265	LASBOR	MYOLUC	HiF
7/5/2023	3:15:17	3	PERSUB	2	1	0.5	0.295323	LASBOR	MYOLUC	

Sonobat Output

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE01	1	1	LoF	Epfu	11	13	Epfu	Myse			7/26/2023
TE03	1	1	LoF	Epfu	9	9	Epfu	Myse			7/17/2023
TE01	1	1	LoF	Epfu	4	7	Epfu				7/26/2023
TE01	1		LoF	Labo	9	10	Labo				7/24/2023
TE01	1		HiF	Labo	5	9	Labo				7/12/2023
TE01	1		LoF	Labo	4	6	Labo	Mylu			7/26/2023
TE01	1		LoF	Labo	5	5	Labo				7/22/2023
TE01	1		HiF	Labo	4	5	Labo				7/12/2023
TE01	1		LoF	Labo	4	5	Labo				7/24/2023
TE03	1		Mylu	Mylu	14	26	Mylu	Myse	Labo		7/23/2023
TE01	1		Mylu	Mylu	11	21	Mylu				7/24/2023
TE01	1		Mylu	Mylu	10	12	Mylu				7/22/2023
TE03	1		Mylu	Mylu	2	31	Mylu				7/26/2023
TE03	1		Mysp		7	21	Mylu				7/22/2023
TE01	1		HiF		1	19	Mylu				7/20/2023
TE03	1		HiF		2	8	Mylu	Labo			7/22/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE01	1		NoID		1	6	Mylu				7/24/2023
TE01	1		HiF		1	5	Labo				7/14/2023
TE01	1		HiF		1	5	Pesu				7/18/2023
TE02	1		NoID			5					7/4/2023
TE01	1		NoID		3	4	Labo				7/17/2023
TE01	1		NoID		3	4	Labo				7/27/2023
TE03	1		HiF		1	4	Pesu	Labo			7/23/2023
TE01	1	1	NoID		2	3	Lano				7/24/2023
TE01	1		NoID		2	3	Labo				7/25/2023
TE01	1		HiF		2	3	Labo				7/6/2023
TE01	1		HiF		1	3	Labo				7/20/2023
TE01	1		NoID		1	3	Labo				7/17/2023
TE03	1		HiF			3					7/28/2023
TE02	1		HiF			3	Labo				7/4/2023
TE01	1		LoF		1	2	Labo				7/25/2023
TE01	1		NoID		1	2	Labo				7/26/2023
TE02	1		NoID			1	Labo				7/22/2023
TE01		1		Epfu	30	32	Epfu	Laci			7/3/2023
TE01		1		Epfu	30	32	Epfu				7/13/2023
TE01		1		Epfu	29	32	Epfu	Laci	Lano		7/6/2023
TE01		1		Epfu	28	32	Epfu				7/20/2023
TE01		1		Epfu	27	32	Epfu				7/14/2023
TE01		1		Epfu	27	32	Epfu	Lano			7/14/2023
TE01		1		Epfu	26	32	Epfu	Laci	Lano		7/18/2023
TE01		1		Epfu	24	32	Epfu	Laci	Lano		7/6/2023
TE01		1		Epfu	21	32	Epfu	Laci			7/4/2023
TE01		1		Epfu	19	32	Epfu	Lano			7/6/2023
TE01		1		Epfu	29	31	Epfu	Myse			7/17/2023
TE01		1		Epfu	28	30	Epfu				7/25/2023
TE01		1		Epfu	23	30	Epfu	Laci	Lano		7/27/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE01		1		Epfu	28	29	Epfu				7/26/2023
TE01		1		Epfu	17	29	Epfu	Lano	Laci		7/11/2023
TE01		1		Epfu	28	28	Epfu				7/6/2023
TE01		1		Epfu	25	28	Epfu	Lano			7/25/2023
TE01		1		Epfu	16	27	Epfu	Laci			7/6/2023
TE01		1		Epfu	26	26	Epfu				7/14/2023
TE01		1		Epfu	17	26	Epfu	Lano			7/6/2023
TE01		1		Epfu	23	25	Epfu				7/14/2023
TE01		1		Epfu	23	25	Epfu				7/6/2023
TE01		1		Epfu	23	24	Epfu	Lano			7/27/2023
TE01		1		Epfu	21	23	Epfu				7/14/2023
TE01		1		Epfu	21	23	Epfu	Lano			7/17/2023
TE01		1		Epfu	17	23	Epfu	Lano			7/3/2023
TE01		1		Epfu	17	23	Epfu	Laci			7/21/2023
TE01		1		Epfu	14	23	Epfu	Laci			7/26/2023
TE03		1		Epfu	20	22	Epfu				6/30/2023
TE01		1		Epfu	21	21	Epfu				7/18/2023
TE01		1		Epfu	20	20	Epfu				7/6/2023
TE03		1		Epfu	20	20	Epfu				7/15/2023
TE01		1		Epfu	17	20	Epfu	Laci			7/11/2023
TE01		1		Epfu	15	20	Epfu	Lano	Laci		7/6/2023
TE03		1		Epfu	19	19	Epfu				7/18/2023
TE01		1		Epfu	18	19	Epfu				7/26/2023
TE01		1		Epfu	16	19	Epfu				7/25/2023
TE03		1		Epfu	12	19	Epfu	Lano	Laci		7/6/2023
TE01		1		Epfu	11	19	Epfu	Lano	Laci		7/24/2023
TE03		1		Epfu	18	18	Epfu				7/14/2023
TE01		1		Epfu	17	18	Epfu				7/4/2023
TE01		1		Epfu	17	18	Epfu				7/24/2023
TE03		1		Epfu	15	18	Epfu				7/5/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE01		1		Epfu	14	18	Epfu				7/17/2023
TE03		1		Epfu	14	18	Epfu	Laci			6/30/2023
TE01		1		Epfu	16	17	Epfu	Lano			7/26/2023
TE01		1		Epfu	14	17	Epfu	Laci			7/20/2023
TE01		1		Epfu	13	17	Epfu				7/6/2023
TE03		1		Epfu	13	17	Epfu				7/24/2023
TE03		1		Epfu	12	17	Epfu	Laci	Lano		7/14/2023
TE01		1		Epfu	15	16	Epfu				7/20/2023
TE01		1		Epfu	14	16	Epfu	Laci			7/20/2023
TE01		1		Epfu	13	16	Epfu	Lano			7/17/2023
TE01		1		Epfu	11	16	Epfu	Lano	Laci		7/17/2023
TE01		1		Epfu	11	16	Epfu	Lano	Laci		7/3/2023
TE03		1		Epfu	14	15	Epfu				7/5/2023
TE03		1		Epfu	14	15	Epfu				7/18/2023
TE01		1		Epfu	11	15	Epfu	Lano	Laci		7/28/2023
TE01		1		Epfu	10	14	Epfu	Lano	Laci		7/28/2023
TE02		1		Epfu	10	14	Epfu				7/18/2023
TE01		1		Epfu	8	14	Epfu	Laci			7/25/2023
TE01		1		Epfu	13	13	Epfu				7/14/2023
TE01		1		Epfu	9	12	Epfu	Laci			7/12/2023
TE01		1		Epfu	9	12	Epfu	Lano			7/20/2023
TE01		1		Epfu	8	12	Epfu	Lano			7/22/2023
TE01		1		Epfu	6	12	Epfu	Laci	Lano		7/14/2023
TE03		1		Epfu	10	11	Epfu				7/28/2023
TE01		1		Epfu	6	11	Epfu	Lano			7/19/2023
TE03		1		Epfu	8	10	Epfu	Laci			7/5/2023
TE03		1		Epfu	9	9	Epfu				7/26/2023
TE01		1		Epfu	8	9	Epfu	Laci			7/26/2023
TE01		1		Epfu	4	9	Epfu	Lano	Laci		7/27/2023
TE01		1		Epfu	7	8	Epfu				7/26/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE03		1		Epfu	6	8	Epfu				7/28/2023
TE02		1		Epfu	3	7	Epfu	Laci			7/14/2023
TE02		1		Epfu	3	7	Epfu	Lano			7/18/2023
TE01		1		Epfu	5	6	Epfu				7/27/2023
TE02		1		Epfu	4	6	Epfu				7/17/2023
TE01		1		Epfu	4	5	Epfu				7/14/2023
TE03		1		Epfu	3	5	Epfu				7/28/2023
TE02		1		Epfu	3	5	Epfu	Lano	Laci		7/8/2023
TE01		1		Epfu	3	3	Epfu				7/17/2023
TE01		1		Laci	32	32	Laci				7/5/2023
TE03		1		Laci	20	21	Laci				7/5/2023
TE01		1		Laci	17	21	Laci				7/4/2023
TE03		1		Laci	10	20	Laci	Epfu	Lano		7/4/2023
TE01		1		Laci	13	19	Laci	Epfu			7/14/2023
TE03		1		Laci	10	19	Laci	Epfu	Lano		7/28/2023
TE01		1		Laci	17	17	Laci				7/26/2023
TE02		1		Laci	8	17	Laci	Lano	Epfu		7/31/2023
TE01		1		Laci	15	15	Laci				7/3/2023
TE03		1		Laci	14	15	Laci				7/6/2023
TE02		1		Laci	9	15	Laci	Epfu	Lano		7/19/2023
TE01		1		Laci	8	15	Laci	Epfu	Lano		7/29/2023
TE02		1		Laci	7	15	Laci	Lano			7/22/2023
TE02		1		Laci	9	14	Laci				7/23/2023
TE02		1		Laci	7	14	Laci	Lano			7/23/2023
TE03		1		Laci	13	13	Laci				7/17/2023
TE01		1		Laci	11	13	Laci	Lano			7/18/2023
TE03		1		Laci	9	12	Laci	Epfu			7/28/2023
TE03		1		Laci	6	11	Laci				7/12/2023
TE02		1		Laci	5	11	Laci	Lano			7/31/2023
TE03		1		Laci	10	10	Laci				7/11/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE03		1		Laci	9	10	Laci				7/30/2023
TE03		1		Laci	8	10	Laci				7/12/2023
TE01		1		Laci	5	10	Laci	Lano			7/16/2023
TE03		1		Laci	8	9	Laci				7/15/2023
TE02		1		Laci	7	9	Laci				7/23/2023
TE02		1		Laci	6	9	Laci	Lano			7/22/2023
TE01		1		Laci	4	9	Laci	Epfu	Lano		7/28/2023
TE02		1		Laci	4	9	Laci	Lano			7/31/2023
TE01		1		Laci	8	8	Laci				7/26/2023
TE01		1		Laci	7	8	Laci	Epfu			7/16/2023
TE03		1		Laci	4	8	Laci				7/8/2023
TE01		1		Laci	6	7	Laci				7/26/2023
TE02		1		Laci	6	7	Laci				7/28/2023
TE03		1		Laci	5	7	Laci				7/4/2023
TE03		1		Laci	4	7	Laci				7/4/2023
TE03		1		Laci	4	7	Laci				7/4/2023
TE02		1		Laci	3	7	Laci	Lano			7/23/2023
TE02		1		Laci	3	7	Laci	Lano			7/23/2023
TE02		1		Laci	3	6	Laci				7/23/2023
TE02		1		Laci	2	5	Laci	Lano			7/31/2023
TE03		1		Laci	2	5	Laci				7/4/2023
TE03		1		Laci	4	4	Laci				7/12/2023
TE03		1		Laci	4	4	Laci				7/12/2023
TE01		1		Laci	2	4	Laci	Lano			7/27/2023
TE02		1		Laci	2	4	Laci				7/19/2023
TE02		1		Laci	2	4	Laci				7/23/2023
TE02		1		Laci	2	4	Laci				7/23/2023
TE02		1		Laci	2	4	Laci	Lano			7/23/2023
TE02		1		Laci	2	4	Laci	Lano			7/27/2023
TE02		1		Laci	2	4	Laci				7/31/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE03		1		Laci	2	4	Laci				7/8/2023
TE03		1		Laci	2	4	Laci				7/12/2023
TE03		1		Laci	2	4	Laci				6/30/2023
TE02		1		Laci	3	3	Laci				7/17/2023
TE03		1		Laci	3	3	Laci				7/30/2023
TE02		1		Laci	2	3	Laci				7/19/2023
TE02		1		Laci	2	3	Laci	Lano			7/23/2023
TE02		1		Laci	2	3	Laci	Lano			7/23/2023
TE03		1		Laci	2	3	Laci				7/12/2023
TE02		1		Laci	2	3	Laci				7/28/2023
TE01		1		Laci	2	2	Laci				7/28/2023
TE02		1		Laci	2	2	Laci				7/11/2023
TE02		1		Laci	2	2	Laci				7/23/2023
TE02		1		Laci	2	2	Laci				7/23/2023
TE02		1		Laci	2	2	Laci				7/23/2023
TE02		1		Laci	2	2	Laci				7/23/2023
TE02		1		Laci	2	2	Laci				7/23/2023
TE02		1		Laci	2	2	Laci				7/31/2023
TE03		1		Laci	2	2	Laci				7/6/2023
TE01		1		Lano	29	32	Lano	Laci			7/4/2023
TE01		1		Lano	22	29	Lano	Epfu			7/25/2023
TE01		1		Lano	24	28	Lano	Epfu			7/5/2023
TE03		1		Lano	19	26	Lano	Epfu	Laci		7/28/2023
TE01		1		Lano	16	21	Lano	Laci			7/6/2023
TE01		1		Lano	9	18	Lano	Epfu			7/28/2023
TE01		1		Lano	17	17	Lano				7/17/2023
TE03		1		Lano	16	16	Lano				7/25/2023
TE01		1		Lano	15	15	Lano				7/17/2023
TE02		1		Lano	7	15	Lano	Laci	Epfu		7/19/2023
TE03		1		Lano	10	13	Lano	Laci			7/6/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE02		1		Lano	8	13	Lano	Laci			7/23/2023
TE02		1		Lano	5	11	Lano	Laci			7/23/2023
TE01		1		Lano	9	10	Lano				7/17/2023
TE03		1		Lano	7	10	Lano				7/6/2023
TE01		1		Lano	6	10	Lano	Laci			7/27/2023
TE01		1		Lano	6	10	Lano				7/28/2023
TE01		1		Lano	8	8	Lano				7/6/2023
TE02		1		Lano	6	8	Lano	Laci			7/19/2023
TE03		1		Lano	4	8	Lano				7/4/2023
TE02		1		Lano	4	8	Lano	Epfu	Laci		7/11/2023
TE02		1		Lano	5	7	Lano				7/9/2023
TE02		1		Lano	5	7	Lano	Laci			7/4/2023
TE01		1		Lano	4	7	Lano	Laci			7/27/2023
TE02		1		Lano	4	7	Lano	Laci			7/19/2023
TE01		1		Lano	4	6	Lano				7/6/2023
TE02		1		Lano	3	6	Lano				7/23/2023
TE02		1		Lano	3	6	Lano				7/26/2023
TE02		1		Lano	5	5	Lano				7/23/2023
TE03		1		Lano	5	5	Lano				7/6/2023
TE01		1		Lano	4	5	Lano	Laci			7/27/2023
TE01		1		Lano	3	5	Lano				7/27/2023
TE02		1		Lano	3	5	Lano				7/23/2023
TE03		1		Lano	3	5	Lano				7/6/2023
TE01		1		Lano	4	4	Lano				7/27/2023
TE01		1		Lano	4	4	Lano				7/27/2023
TE02		1		Lano	4	4	Lano				7/27/2023
TE02		1		Lano	3	4	Lano	Epfu			7/20/2023
TE02		1		Lano	3	4	Lano				7/23/2023
TE02		1		Lano	3	4	Lano	Laci			7/23/2023
TE02		1		Lano	3	4	Lano	Laci			7/31/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE03		1		Lano	3	4	Lano				7/14/2023
TE02		1		Lano	3	4	Lano				7/27/2023
TE02		1		Lano	3	3	Lano				7/28/2023
TE01		1			6	23	Lano	Epfu	Laci		7/14/2023
TE01		1			8	20	Epfu	Lano			7/14/2023
TE01		1			8	19	Epfu	Laci	Lano		7/16/2023
TE03		1			5	19	Laci				7/12/2023
TE02		1			8	18	Lano	Laci			7/19/2023
TE01		1			7	17	Epfu	Laci	Lano		7/20/2023
TE02		1			6	17	Lano	Laci			7/23/2023
TE02		1			6	16	Lano	Laci			7/23/2023
TE02		1			5	15	Laci	Lano			7/19/2023
TE02		1			5	15	Laci	Lano			7/31/2023
TE02		1			4	15	Lano	Laci			7/23/2023
TE03		1			5	14	Laci				7/4/2023
TE01		1			4	14	Lano	Laci			7/6/2023
TE02		1			5	13	Laci				7/27/2023
TE02		1			4	13	Epfu	Lano			7/13/2023
TE02		1			3	13	Laci	Lano			7/19/2023
TE02		1			3	13	Lano	Laci			7/19/2023
TE02		1			2	13	Laci	Lano			7/9/2023
TE01		1			5	12	Epfu	Laci			7/14/2023
TE02		1			5	12	Lano	Laci			7/27/2023
TE02		1			4	12	Laci	Lano			7/23/2023
TE02		1			3	12	Lano	Laci			7/23/2023
TE02		1			4	11	Laci	Lano			7/27/2023
TE01		1				11					7/15/2023
TE03		1			4	10	Laci	Lano			7/4/2023
TE01		1			3	10	Epfu	Laci			7/28/2023
TE01		1			3	10	Laci				8/1/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE02		1			2	10	Laci				7/23/2023
TE01		1			5	9	Epfu	Laci	Lano		7/25/2023
TE02		1			3	9	Laci	Lano			7/23/2023
TE02		1			3	9	Lano	Laci			7/31/2023
TE03		1			3	9	Lano	Epfu			6/30/2023
TE03		1			3	9	Lano	Laci			7/20/2023
TE02		1			2	9	Laci	Lano			7/23/2023
TE03		1			4	8	Lano	Laci			7/4/2023
TE02		1			3	8	Lano	Laci			7/27/2023
TE02		1			2	8	Lano	Laci			7/23/2023
TE02		1			2	8	Lano				7/23/2023
TE02		1			2	8	Laci				7/19/2023
TE02		1			2	8	Epfu	Laci	Lano		7/17/2023
TE02		1			1	8	Lano	Laci			7/27/2023
TE02		1				8					7/27/2023
TE02		1			2	7	Lano				7/23/2023
TE02		1			2	7	Laci	Lano			7/27/2023
TE03		1			2	7	Epfu	Lano			7/11/2023
TE02		1			2	7	Epfu	Laci	Lano		7/22/2023
TE02		1			1	7	Laci				7/19/2023
TE02		1			1	7	Laci				7/19/2023
TE03						7					7/6/2023
TE02		1			3	6	Lano	Laci			7/28/2023
TE02		1			3	6	Lano	Laci			7/23/2023
TE02		1			2	6	Laci	Lano			7/23/2023
TE02		1			2	6	Lano	Laci			7/19/2023
TE02		1			2	6	Lano				7/23/2023
TE02		1			2	6	Lano				7/23/2023
TE03		1			2	6	Laci				7/4/2023
TE02		1			2	6	Laci	Lano			7/28/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE02		1			2	6	Lano	Epfu	Laci		7/18/2023
TE02		1			2	6	Lano	Laci			7/17/2023
TE02		1			1	6	Lano	Laci			7/23/2023
TE02		1			1	6	Lano	Laci			7/23/2023
TE02		1			1	6	Laci				7/27/2023
TE03					1	6	Laci				7/8/2023
TE02		1			1	6	Epfu				7/17/2023
TE03						6					7/12/2023
TE01		1			3	5	Epfu	Lano			7/6/2023
TE01		1			3	5	Epfu	Laci			7/12/2023
TE01		1			2	5	Lano	Laci	Epfu		7/4/2023
TE02		1			2	5	Epfu				7/9/2023
TE02		1			2	5	Lano	Laci			7/22/2023
TE02		1			2	5	Lano				7/23/2023
TE02		1			2	5	Lano	Laci			7/27/2023
TE02		1			2	5	Lano	Laci			7/31/2023
TE02		1			2	5	Epfu	Laci			7/12/2023
TE02		1			2	5	Epfu				7/28/2023
TE02		1			2	5	Epfu				7/30/2023
TE02		1			2	5	Lano	Epfu	Laci		7/25/2023
TE02		1			1	5	Lano	Laci			7/19/2023
TE02		1			1	5	Lano				7/23/2023
TE02		1			1	5	Lano				7/23/2023
TE02		1			1	5	Lano	Laci			7/23/2023
TE02		1			1	5	Epfu	Lano	Laci		7/24/2023
TE02		1			1	5	Epfu	Lano			7/4/2023
TE02		1			1	5	Lano				7/23/2023
TE02		1			1	5	Lano				7/31/2023
TE02		1				5					7/27/2023
TE01		1			2	4	Lano				7/27/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE02		1			2	4	Lano	Laci			7/23/2023
TE02		1			2	4	Lano				7/28/2023
TE02		1			2	4	Lano	Laci			7/28/2023
TE02		1			2	4	Epfu	Lano			7/12/2023
TE02		1			2	4	Lano				7/11/2023
TE02		1			2	4	Lano				6/30/2023
TE01		1			1	4	Epfu				7/14/2023
TE02		1			1	4	Laci				7/12/2023
TE02		1			1	4	Lano				7/23/2023
TE02		1			1	4	Lano	Laci			7/23/2023
TE02		1			1	4	Lano	Laci			7/31/2023
TE03					1	4	Laci				7/4/2023
TE02		1			1	4	Epfu	Lano			7/6/2023
TE02		1			1	4	Lano	Laci			7/23/2023
TE02		1			1	4	Mylu	Epfu			7/23/2023
TE03						4					7/4/2023
TE02						4					7/24/2023
TE03		1				4					7/27/2023
TE02		1			2	3	Epfu				7/17/2023
TE02		1			2	3	Lano				7/23/2023
TE02		1			2	3	Lano				7/27/2023
TE03		1			2	3	Lano	Epfu			7/19/2023
TE02		1			2	3	Epfu	Lano			7/25/2023
TE02		1			2	3	Lano				7/18/2023
TE02		1			2	3	Lano	Laci			7/26/2023
TE01		1			1	3	Epfu	Laci			7/20/2023
TE02		1			1	3	Epfu	Lano	Laci		7/11/2023
TE02		1			1	3	Epfu	Laci			7/19/2023
TE02		1			1	3	Laci				7/19/2023
TE02		1			1	3	Laci				7/23/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE02		1			1	3	Lano				7/23/2023
TE02		1			1	3	Lano	Laci			7/23/2023
TE02		1			1	3	Laci				7/27/2023
TE02		1			1	3	Lano	Laci			7/31/2023
TE03		1			1	3	Laci				7/4/2023
TE03		1			1	3	Laci				7/4/2023
TE03		1			1	3	Laci				7/14/2023
TE03		1			1	3	Epfu				7/17/2023
TE02		1			1	3	Lano				7/1/2023
TE02		1			1	3	Epfu	Lano			7/4/2023
TE02		1			1	3	Laci				7/27/2023
TE02		1			1	3	Lano				7/27/2023
TE02		1			1	3	Laci				7/28/2023
TE02		1				3					7/15/2023
TE02		1				3					7/27/2023
TE02		1				3					7/31/2023
TE03						3					7/4/2023
TE03						3					7/4/2023
TE03						3					7/4/2023
TE02						3					7/19/2023
TE01		1			2	2	Epfu				7/12/2023
TE01		1			2	2	Epfu				7/28/2023
TE02		1			2	2	Lano				7/1/2023
TE02		1			2	2	Lano				7/1/2023
TE02		1			2	2	Epfu				7/19/2023
TE02		1			2	2	Lano				7/19/2023
TE02		1			2	2	Lano				7/23/2023
TE02		1			2	2	Lano				7/27/2023
TE02		1			2	2	Lano				7/27/2023
TE02		1			2	2	Lano				7/27/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE03		1			2	2	Epfu				7/18/2023
TE03		1			2	2	Epfu				7/18/2023
TE01		1			1	2	Lano				7/6/2023
TE01		1			1	2	Lano	Laci			7/27/2023
TE01		1			1	2	Epfu	Lano			7/28/2023
TE02		1			1	2	Lano				7/17/2023
TE02		1			1	2	Laci				7/19/2023
TE02					1	2	Laci				7/23/2023
TE02					1	2	Laci				7/23/2023
TE02		1			1	2	Lano				7/23/2023
TE02		1			1	2	Laci				7/23/2023
TE02		1			1	2	Laci				7/23/2023
TE02		1			1	2	Lano				7/23/2023
TE02		1			1	2	Lano				7/23/2023
TE02		1			1	2	Laci				7/23/2023
TE02		1			1	2	Lano				7/25/2023
TE02		1			1	2	Epfu	Laci			7/26/2023
TE02		1			1	2	Laci				7/28/2023
TE02		1			1	2	Laci				7/31/2023
TE02		1			1	2	Lano	Laci			7/31/2023
TE03					1	2	Laci				7/4/2023
TE03		1			1	2	Laci				7/4/2023
TE03					1	2	Laci				7/4/2023
TE03		1			1	2	Laci				7/4/2023
TE03		1			1	2	Laci				7/4/2023
TE03		1			1	2	Laci				7/4/2023
TE03		1			1	2	Laci				7/4/2023
TE03		1			1	2	Laci				7/4/2023
TE03		1			1	2	Lano				7/8/2023
TE03		1			1	2	Lano				7/18/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE02		1			1	2	Lano	Laci			7/22/2023
TE02		1			1	2	Laci				7/25/2023
TE02		1			1	2	Epfu	Lano			7/25/2023
TE02		1			1	2	Epfu	Lano			7/20/2023
TE02		1			1	2	Laci				7/23/2023
TE02		1			1	2	Lano				7/24/2023
TE02		1			1	2	Epfu				7/26/2023
TE01		1				2					7/26/2023
TE01						2					7/29/2023
TE02		1				2					7/17/2023
TE02		1				2					7/23/2023
TE02		1				2					7/23/2023
TE02		1				2					7/23/2023
TE02						2					7/27/2023
TE03						2					7/4/2023
TE03		1				2					7/4/2023
TE03		1				2					7/4/2023
TE03						2					7/8/2023
TE03						2					7/15/2023
TE01		1				2					7/9/2023
TE02		1				2					7/23/2023
TE03						2					7/4/2023
TE01					1	1	Epfu				7/12/2023
TE01					1	1	Lano				7/14/2023
TE01					1	1	Lano				7/15/2023
TE01					1	1	Epfu				7/20/2023
TE01					1	1	Lano				7/24/2023
TE01					1	1	Labo				7/24/2023
TE01					1	1	Lano				7/27/2023
TE01					1	1	Lano				7/28/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE01					1	1	Laci				7/28/2023
TE02					1	1	Epfu				7/9/2023
TE02					1	1	Epfu				7/17/2023
TE02					1	1	Epfu				7/18/2023
TE02					1	1	Epfu				7/19/2023
TE02					1	1	Lano				7/23/2023
TE02					1	1	Lano				7/23/2023
TE02					1	1	Lano				7/23/2023
TE02					1	1	Lano				7/23/2023
TE02					1	1	Laci				7/23/2023
TE02					1	1	Lano				7/23/2023
TE02					1	1	Lano				7/23/2023
TE02					1	1	Laci				7/24/2023
TE02					1	1	Epfu				7/24/2023
TE02					1	1	Lano				7/26/2023
TE02					1	1	Laci				7/26/2023
TE02					1	1	Epfu				7/26/2023
TE02					1	1	Laci				7/27/2023
TE02					1	1	Lano				7/27/2023
TE02					1	1	Lano				7/27/2023
TE02					1	1	Laci				7/27/2023
TE02					1	1	Lano				7/28/2023
TE02					1	1	Epfu				7/28/2023
TE02					1	1	Laci				7/31/2023
TE02					1	1	Lano				7/31/2023
TE03					1	1	Laci				7/4/2023
TE03					1	1	Laci				7/4/2023
TE03					1	1	Lano				7/8/2023
TE03					1	1	Laci				7/12/2023
TE03					1	1	Labo				7/25/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE01					1	1	Laci				7/29/2023
TE01						1					7/6/2023
TE01						1					7/10/2023
TE01						1					7/10/2023
TE01						1					7/14/2023
TE01						1					7/24/2023
TE01						1					7/26/2023
TE02						1					7/19/2023
TE02						1					7/22/2023
TE02						1					7/22/2023
TE02						1					7/22/2023
TE02						1					7/23/2023
TE02						1					7/23/2023
TE02						1					7/23/2023
TE02						1					7/23/2023
TE02						1					7/23/2023
TE02						1					7/23/2023
TE02						1					7/24/2023
TE02						1					7/25/2023
TE02						1					7/26/2023
TE02						1					7/26/2023
TE02						1					7/27/2023
TE02						1					7/28/2023
TE02						1					7/28/2023
TE02						1					7/31/2023
TE03						1					7/1/2023
TE03						1					7/4/2023
TE03						1					7/4/2023
TE03						1					7/4/2023
TE03						1					7/4/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE03						1					7/4/2023
TE03						1					7/4/2023
TE03						1					7/4/2023
TE03						1					7/8/2023
TE03						1					7/19/2023
TE03						1					7/19/2023
TE03						1					7/26/2023
TE03						1					7/26/2023
TE03						1					7/26/2023
TE03											7/31/2023
TE03											7/30/2023
TE03											7/29/2023
TE03											7/29/2023
TE03											7/29/2023
TE03											7/29/2023
TE03											7/29/2023
TE03											7/29/2023
TE03											7/29/2023
TE03											7/29/2023
TE03											7/29/2023
TE03											7/29/2023
TE03											7/28/2023
TE03											7/28/2023
TE03											7/28/2023
TE03											7/27/2023
TE03											7/26/2023
TE03											7/26/2023
TE03											7/26/2023
TE03											7/26/2023
TE03											7/25/2023

Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
TE03											7/24/2023
TE03											7/24/2023
TE03											7/24/2023
TE03											7/24/2023
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Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
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Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
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Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
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Site	HiF	LoF	Species Manual ID	SppAccp	#Maj	#Accp	1st	2nd	3rd	4th	Monitoring Night
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TE01											7/1/2023
TE01											6/30/2023
TE01											6/30/2023
TE01											6/30/2023

Appendix E. Resume for Vetting

DAVID YATES
10 Roadking Alley
Limington, ME 04049
(207) 491-4707

EDUCATION:

Bachelor of Science, Wildlife Biology and Management
Unity College, Unity, ME
Graduated May 1999

M.Sc., Conservation Biology
Antioch University New England
Graduated May 2006

SKILLS:

- Proficient in animal tagging and release methods
- Ability to identify bats of N. and C. America and QIBS by USFWS and PA State
- HERO training
- Collected and prepared blood samples for contaminant analyses.
- Permitted for Gray, Indiana, Virginia Big Eared and Northern Long eared bats all activities
- Analyzed water quality of ponds, rivers and streams
- Experience using tranquilizers/sedatives
- B3 and HUET certificates for low level flights
- HAZWOPR/30 Hr. OSHA Training
- Trained bats acoustics by BCM (4 times)
- Trained by Safe-Capture live capture methods
- Current DEA drug license

EXPERIENCE:

Moonrise Ecological Services – *Wildlife Biologist,* Limington, ME January 2023 -present

* Principle/Expert Biologist ESA bat surveys for numerous DoD installations
* Expert Investigator for EPA Pike Hill Mine, VT
* Acoustic Vetting of bat calls for projects around east coast
* Lead Biologist Bat Survey Kings Bay Sub Base, GA
* Lead Bat Biologist for Solar Projects in MO, KY
* Lead Bat Biologist for Customs and Border Patrol Project NY 1,000 Islands

Biodiversity Research Institute – *Research Biologist/Mammal Director*, Gorham, ME January 1998 -2023

* Principle/Expert Biologist ESA bat surveys for numerous DoD installations on east coast
* Principle Investigator for EPA Ely Mine Bat Survey, VT
* Project Manager/Lead Biologist for various Solar Projects located in Northeast US
* Principle Investigator for FPL Maine Hydro. Furbearer telemetry study
* Principle Investigator Biologist for live trapping mink and otter study in Maine for state DEP (Master's thesis)
* Project Manager/Lead Biologist for live trapping mink and otter study in Massachusetts for EPA and other superfund studies
* Project Manager for Maine IF&W Ecoregion for three areas in Maine, birds and small mammals
* Principle Investigator for Acadia National Park bat survey and tracking study
* Project Manager and conducted bat surveys for US Navy in VA, NJ and Maine
* Project Manager for Pipeline acoustic surveys in NY and CT
* Principle Investigator for Bat study examining PAHs in WY Oil and Gas Fields
* Lead Biologist Indiana bat surveys for Gas fracking and pipelines in PA
* Project Manager/Lead Biologist for Maine IF&W Eco-region Surveys for bats for 5 years
* Project Manager/Lead Biologists for bat mercury studies at superfund sites from VA to Maine involving U.S.F.&W.S.
* Project Manager/Lead Biologist at 4 U.S. Fish and Wildlife NRDAR sites for bats and furbearers
* Project Manager bat surveys at multiple National Wildlife Refuges in the northeast
* Prepared Webinar on acoustics for USFWS region 5 biologists
* Telemetry Coordinator Gulf Oil Spill Project for USFWS NRDAR bird injury assessment
* Developed Scope of Work for USFWS NRDAR Gulf Oil Spill bird injury assessment
* Coordinated aerial and ground tracking of more than 400 birds using multiple airplanes and satellite technology

* Project Manager for common loon monitoring in northern and western Maine
* Project Manager/Lead Biologist for National Park Service survey of small and large mammals of Appalachian Trail in Maine
* Winter large/small carnivore tracking surveys for NPS and private landowner
* Administered schedule III drugs for mink and otter study
* DEA Schedule II-III license
* Researched recent trends of mercury and lead contaminants in the North American piscivorous bird's mammals.
* Captured, banded and gathered mercury and lead level data in piscivorous birds.
* Entered banding data into database for Biodiversity Research Institute data analysis.
* Compiled banding data into official banding schedules for U.S. Fish & Wildlife Services.
* Supervised banding of Common Loons, Eagles, Kingfishers and various other species.
* Surveyed reservoirs and lakes for Common Loons, Kingfishers and other piscivorous birds.
* Presented Mammal, Bat and Common Loon slide show to various organizations for educational purposes
- Proposed, designed and organized a mink and otter Hg study for Maine Department of Environmental Protection.

Publications and Reports:

Karouna-Renier, N. K., White, C., Perkins, C. R., Schmerfeld, J. J., & Yates, D. (2014). Assessment of mitochondrial DNA damage in little brown bats (Myotis lucifugus) collected near a mercury-contaminated river. Ecotoxicology, 23(8), 1419-1429.

Yates, David E., Evan M. Adams, Sofia E. Angelo, David C. Evers, John Schmerfeld, Marianne S. Moore, Thomas H. Kunz et al. Mercury in bats from the northeastern United States. Ecotoxicology 23, no. 1 (2014): 45-55.

Nam, D.-H., Yates, D., Ardapple, P., Evers, D. C., Schmerfeld, J., & Basu, N. 2012. Elevated mercury exposure and neurochemical alterations in little brown bats (Myotis lucifugus) from a site with historical mercury contamination. Ecotoxicology, 12(4), 1094–1101

Yates, D., K. Taylor, and C. Niven. 2008. Effects of Water Levels on Muskrat (Ondatra zibethicus) Populations within the West Grand Lake Project, Maine. Report BRI 2008-25 submitted to BIA and OA System Corporation, Amarillo, Texas. BioDiversity Research Institute, Gorham, Maine.

Wada, H., D. Yates, D. Evers, R. Taylor, W. Hopkins. 2010. Tissue mercury concentrations and adrenocortical responses of female big brown bats (Eptesicus fuscus) near a contaminated river. Ecotox. 19:7 1277-84.

Yates, D., S. Angelo, T. Divoll and D.C. Evers, 2009. Assessment of mercury exposure to bats at Onondaga Lake, New York. Report BRI 2010-11 submitted to U.S. Fish and Wildlife Service, Cortland, NY. BioDiversity Research Institute, Gorham, Maine, 44 pp.

T. Divoll, D. Yates, D.C. Evers, 2008. Pilot assessment of mercury exposure to bats at Onondaga Lake, New York. Report BRI 2009-10 submitted to U.S. Fish and Wildlife Service, Cortland, NY. BioDiversity Research Institute, Gorham, Maine, 44 pp.

Yates, D., S.E. Angelo, M.W. Goodale and D.C. Evers. 2011. Bat Mercury Study Examining Footprint Area and Downstream: South River, Virginia - 2009. Report BRI 2009-10 submitted to DuPont Corporate Remediation Group, Newark, Delaware and the U.S. Fish Wildl. Serv., Gloucester, Virginia. BioDiversity Research Institute, Gorham, ME. 57pp.

Yates, D., M. Moore, T. Kunz, and D.C. Evers 2008. Pilot assessment of methlymercury availability to bats on the South River, Virginia - 2008. Report BRI 2009-16 submitted to DuPont Corporate Remediation Group, Newark, Delaware and the U.S. Fish Wildl. Serv., Gloucester, Virginia.BioDiversity Research Institute, Gorham, ME. 47pp.

Yates, D., D.C. Evers, and D. Meattey. 2008. Pilot assessment of methlymercury availability to muskrat and shrews on the South Fork River, Virginia - 2008. Report BRI 2009-21 submitted to the U.S. Fish Wildl. Serv., Gloucester,Virginia.BioDiversity Research Institute, Gorham, ME.

Yates, D., W. Goodale, M. Holden, and D. Evers. 2008. Home ranges size in relation to water level fluctuations in river otter, muskrat, mink and beaver on Brassua Lake and surrounding waterbodies. Report BRI 2008-18 submitted to FPL Energy Maine Hydro. BioDiversity Research Institute, Gorham, Maine.

Yates, D. and D.C. Evers. 2007-6. Small Mammals and Bat Inventory of the Appalachian Trail in Maine-2006. Report BRI 2007-6 submitted to the Maine Natural Areas Program and NPS. BioDiversity Research Institute, Gorham, ME.

Yates, D., H. Wada , M. Moore, B. Hopkins, T. Kunz, and D.C. Evers 2007. Pilot assessment of methlymercury availability to bats on the South River, Virginia - 2007. Report BRI 2008-08 submitted to DuPont Corporate Remediation Group, Newark, Delaware and the U.S. Fish Wildl. Serv., Gloucester, Virginia. BioDiversity Research Institute, Gorham, ME. 42pp.

Yates, D., D.C. Evers, and L. Savoy. 2004. Developing a mercury exposure profile for mink and river otter in Maine. Report BRI 2004-09 submitted to Maine Department of Environmental Protection and Maine Inland Fisheries and Wildlife. BioDiversity Research Institute, Gorham, Maine.

Yates, D. E., D.T. Mayack, K. Munney, D.C. Evers, A. Major, T. Kaur, and R.J. Taylor. 2005. Mercury levels in mink (*Mustela vison*) and river otter *(Lontra canadensis*) from northeastern North America. Ecotoxicology 14:263-274.

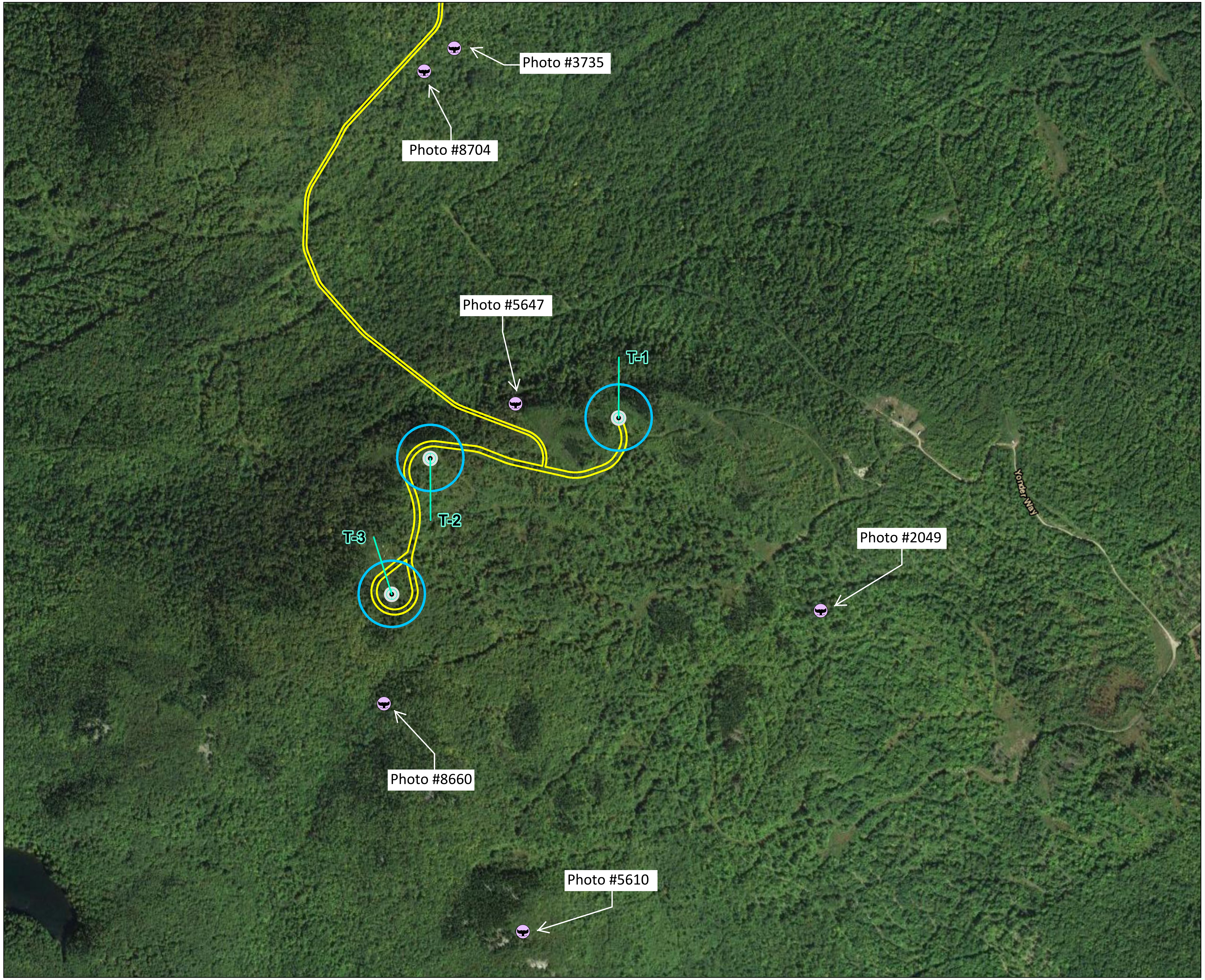
Yates and D.C. Evers. 2007. Pilot assessment of methlymercury availability to furbearers on the North Fork of the Holston River, Virginia - 2005. Report BRI 2007-10 submitted to the U.S. Fish Wildl. Serv., Gloucester, Virginia. BioDiversity Research Institute, Gorham, ME.

Yates, D., and D.C. Evers. 2006. Assessment of bats for mercury contamination on the North Fork of the Holston River, VA- 2005. Report BRI 2006-9. BioDiversity Research Institute, Gorham, ME.

Yates, D.E. and D. Evers. 2005. An overall assessment of the loon population at Lake Umbagog National Wildlife Refuge: Investigations into individual-specific demographics and assessment of individual and population health. Report BRI 2004-13 BioDiversity Research Institute, Gorham, Maine. 17pp.

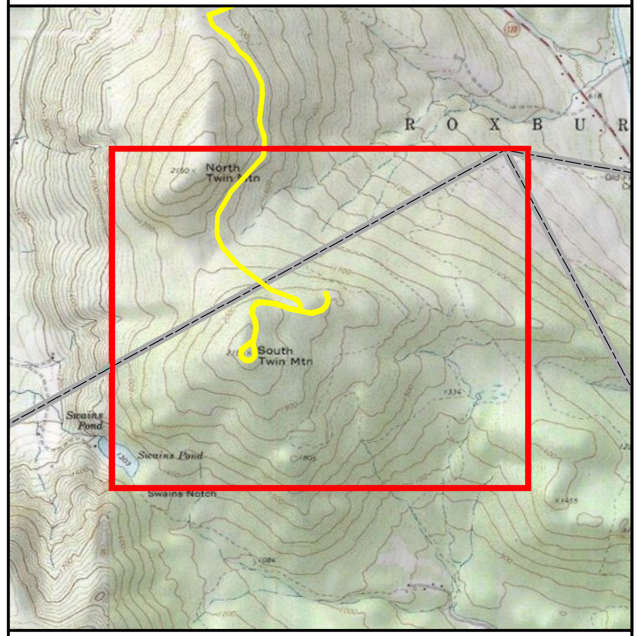
Exhibit 7-8
Representative Photos

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0



LEGEND

- PROPOSED PROJECT BOUNDARY
- PROPOSED TURBINE LOCATION
- ROTOR SWEPT AREA
- POTENTIAL BAT HIBERNACULA



NOTES:

1 BASEMAP IMAGERY FROM ESRI/NAIP "WORLD IMAGERY" SERVICE LAYER.

N

0 700 1,400
Feet
1 " = 700 '
1:8,400

PROJECT:
TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
POTENTIAL BAT HIBERNACULA

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	J. HUTCHINSON	**FIGURE 1**	
MONTH:	MARCH		
YEAR:	2022		

Flycatcher LAND + SCIENCE + PEOPLE
PALMER

FILE NO.: Palmer_TwinEnergy_PotentialBat_Aerial_11x17L.mxd

Plot Date: 3/8/2022, 10:44:32 AM by JAKEN -- LAYOUT: ANSI B(11"x17")
Path: D:\Flycatcher\Projects\Solaya\Palmer_TwinEnergy_PotentialBat_Aerial_11x17L.mxd


W
NW
N
NE
270
300
330
0
30
60
LAT: 44.614816 LON: -70.612222 ±16ft ALT: 1694ft
Rox
Twin winds
Oct 20 2021, 1:32:30 PM


55°NE (T) 19 T 372258 4939468 ±13ft ▲ 1737ft
Twin Wind
21 Sep 2021 11:21:28
Obs. 6 rocks with potential


123°SE (T) 19 T 372260 4940658 ±13ft ▲ 1913ft
Twin Winds
21 Sep 2021, 15:27:16
Obs. 17


NW
N
NE
E
300
330
0
30
60
90
120
33°NE (T) LAT: 44.598038 LON: -70.610056 ±16420ft ▲ 1818ft
ROC and bats
Flycatcher
Twin Wind
19 Oct 2021, 12:33:31


W NW N NE E
0 300 330 0 30 60 90
6°N (T) LAT: 44.614689 LON: -70.612398 ±29ft ▲ 1648ft
Talus slope and outcrops
Flycatcher
Twin Wind
21 Oct 2021, 09:06:40

Exhibit 7-9
Minutes from January 18, 2022 Call

Meeting Notes

Twin Wind Energy – Roxbury, Rumford, Mexico

January 18, 2022, 3:00-4:15 PM

Attendees:
MDIFW – Bob Stratton, John Perry, Sarah Boyden, Steve Walker
Twin Wind LLC – Lindsay Deane-Mayer, Sumul Shah
Flycatcher LLC – Katelin Nickerson, Rodney Kelshaw, Rich Jordan, Jessie Hutchinson

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Introductions – Twin Wind LLC - Project background, evolution/history, timelines

- Lindsay: Worked development of RoxWind, enjoyed IF&W input on that project. Want to get ahead of outreach with the department. While RoxWind was under construction, neighbors of adjacent property reached out with interest in wind on his property. While at the blade signing ceremony this summer, the economic development director of the town of Rumford indicated the town is interested in wind in Rumford. Began with an expanded study area to review two access routes: upgrading road "Yonder Way" or approach from the north from RoxWind. Based on results of natural resource surveys, the team decided on coming from the RoxWind side due to fewer resources and buildability, leaving Yonder Way alone.
- Katelin: Contracting came through in mid-September, initial surveying was of RTE species. Total site walkover initially, then got back in touch with IF&W. Wildlife work on front end before wetlands and soils.
- Sumul: Turbine locations basically final, road adjustments to grade expected.
- The project is being designed to support 6 megawatt turbines. The Blades come as two pieces assembled onsite. Turbines will have a 158m rotor (sweep zone). Hub height will be 101 or 107m.
- Permitting path: The team is planning to submit a Site Law application as large wind for this, not under the small-scale wind.

Fall 2021 Wildlife Survey Results:

Roaring Brook Mayfly

- Had Marcia Siebenmann assisted the Flycatcher team with methods and protocols as well as habitat identification of RBM. No RBM or *Epeorus* found onsite.

Northern Spring Salamander

- Bob: Recommends filling out the MRAP forms for the department and factor NSS buffer recommendations (250ft) into project design.
- Katelin: Found NSS in Goff Brook, S-JLH-2 (assuming presence in tributary), S-KMN-7. Proposed road to cross S-KMN-7. Worked with Lindsay and Sumul to microsite crossing of stream along existing skidder trail, while the skidder trail has naturalized to be a wetland,

would limit clearing canopy to use this trail as crossing. S-KMN-7 surprisingly diverse for micro-invertebrates.

Northern Bog Lemming

- Two sites sampled. Areas likely to not be impacted.

Discussion/Questions from MDIFW

- Bob: Good to see the map with turbine and resource locations to determine whether there will be impacts to wildlife. Positioning structures to minimize impacts is just what we want to hear. Recommends looking at potential for onsite mitigation if impacts are proposed and if there are resources that are already impacted by previous timber harvest/other activities. Agreed that the skidder trail is good to utilize for proposed access road by reducing impacts to canopy since NSS need mature canopy. Bob would be surprised if scat analyses is NBL, but at least not impacting area.
    - Further discussion here and throughout the meeting about potential for onsite mitigation

Bats: Talus/rocky slopes ≥1,000 square feet within 3 miles of Project area (Whitecap Mountain hibernaculum is located 3.3 miles from South Twin peak)

Discussion of photos provided by Flycatcher

Seasonal curtailment

- Bob: Curtailment plan would be recommendation as well, Whitecap is closer to South Twin than RoxWind. Only thing that would change their recommendations would be new hibernacula this could extend the curtailment recommendation into the shoulder seasons.
- Nothing changed onsite for >1,000sq ft within 3 miles. A corresponding map with photo locations would be helpful. Some photos suggested potential for use but nothing that would support sizeable populations.
- Bob requested a joint site visit, late winter/early Spring (March) to look at areas that may be more potential areas. Recommendations would be 6.0 basic, 6.5 lowest they would go but 6.9 or so before issuing ITP. If the project were required to conduct post construction mortality surveys, MDIFW would ask for canine surveys. Though the department prefers to emphasize the curtailment recommendations so they don't have to broach that.
- Rich: Let us know if there are photos they do not consider habitat we will exclude them from our map to make the effort more efficient.

Wetland Delineation Results: Wetlands, watercourses, and potentially significant vernal pools

PSVP discussion

- Four PSVPS found on site, spring survey will tell us what we need to know, we would be surprised if they met significance numbers.

Discussion/Questions from MDIFW

- Bob: How far is T1 from PSVPs? If you have time and budget to go back in spring that will help the application review, otherwise assume significance and implement 250' critical terrestrial habitat buffer and other development requirements for SVPS. Bob requests

Flycatcher to Submit Maine State Vernal Pool Assessment Forms following the spring VP survey.

- Recommendations for stream crossings include both intermittent and perennial streams (1.2 bank full width, open bottom, matching stream grade, 100ft vegetative buffer along streams) is goal. If not possible and must impact, look at mitigation. Demonstrate you've avoided wetlands.

Raptor & eagle migration

Existing data available?

Data collected from Record Hill

Discussion

- Bob: Raptor surveys were not completed for RoxWind, they were done at Record Hill. The additional 3 turbines proposed for Twin Energy add to the existing string of wind turbines from Record Hill to down to Twin. Worth a conversation about previous data but recommends surveying. Curtailment does not influence raptors, turbine placement may. The department wants to know if raptors significantly using this area. He will talk with Erynn, suggestion seems reasonable but will need to discuss if this is a reasonable expectation to do less than 4 seasons in 2 years.
- Rod: regarding turbine placement, since this project is only 3 turbines and the project has been microsited to avoid other resources, there is not a lot of room to move turbines around, and asks what kind of information will surveys provide for the Department to make a determination. What kind of guidance could we receive based on results of surveys? Would be good to have lead time for surveying if we need to survey starting soon.
- Bob will talk with Erynn. Need to discuss what they truly need. Again, good to see turbine locations to review. March 1 starts spring raptors, eagles start Feb 15. Plan on doing spring surveys, and then validate if timeline of surveys will change. Bob will look at Record Hill raptor data.
- Lindsay: Hopefully get input from Erynn sooner than later, trying to shuffle cards now as turbine placement will have large impact on project development timeline. Want to be as efficient as possible.
- Rich – requiring two years of surveys could significantly derail the project, so we are asking for flexibility from the department.

Great Blue Heron

Existing data available?

Discussion

- Locating rookeries within 4 miles radius, MDIFW biologist, Becca, is out of country but will check when she is back. Bob saw no occurrences within 4 miles on MDIFW maps – doesn't mean this is complete record. Can combine with eagle surveys if need-be. Danielle D'Auria is also the heron expert for department. Talk to Danielle about what to do if eagle flyovers don't happen in terms of methodology.

(Update from Becca Settele since the meeting: one mapped nest/rookery 5.5 miles west of the proposed project site)

Bicknell's Thrush

Highest elevation 2,150-feet

Limited/patchy habitat observed fall 2021

- <u>Bob:</u> Bird group has asked to characterize the potential for Bicknell's, on the surface works against providing habitat but has seen potential for it in lower elevations. Need to characterize thoughts on potential habitat. Bob not sure what radius would be.
- <u>Katelin:</u> What size radius do you want for this effort? 2150 is highest point onsite. Bob will follow up on this question.

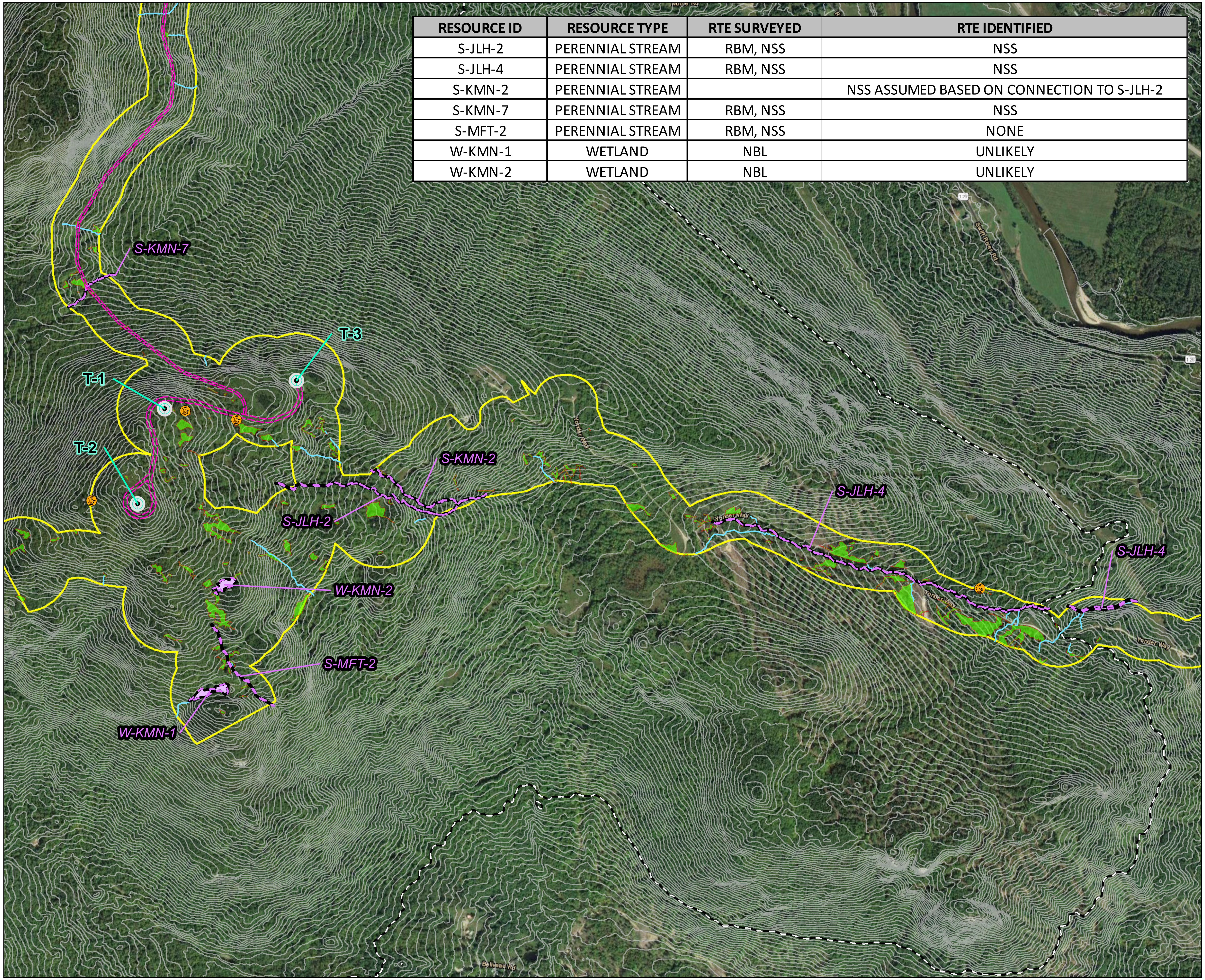
Fisheries Habitat

Follow BMPs for stream crossings

Discussion

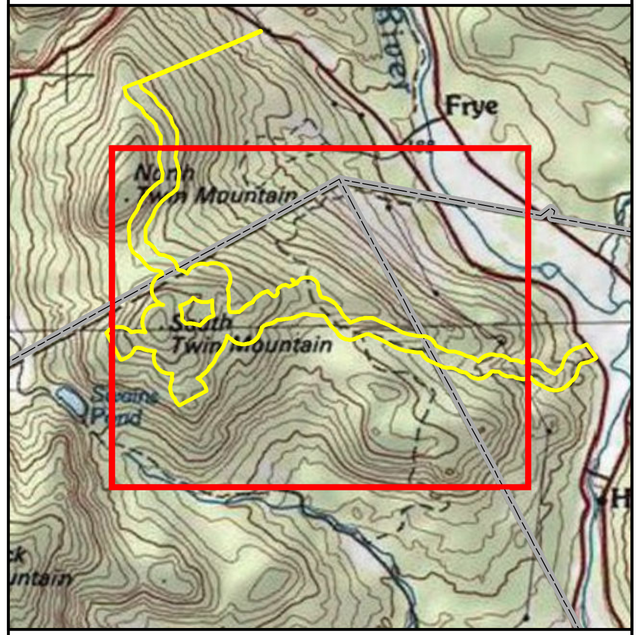
- <u>Katelin and Bob:</u> Agree that NSS, BMPs recommendations will encompass fisheries.

RESOURCE ID	RESOURCE TYPE	RTE SURVEYED	RTE IDENTIFIED
S-JLH-2	PERENNIAL STREAM	RBM, NSS	NSS
S-JLH-4	PERENNIAL STREAM	RBM, NSS	NSS
S-KMN-2	PERENNIAL STREAM		NSS ASSUMED BASED ON CONNECTION TO S-JLH-2
S-KMN-7	PERENNIAL STREAM	RBM, NSS	NSS
S-MFT-2	PERENNIAL STREAM	RBM, NSS	NONE
W-KMN-1	WETLAND	NBL	UNLIKELY
W-KMN-2	WETLAND	NBL	UNLIKELY



LEGEND

- PROJECT SURVEY AREA
- RTE SURVEY AREA
- DELINEATED WETLAND
- DELINEATED STREAM
- POTENTIALLY SIGNIFICANT VERNAL POOL
- PROPOSED TURBINE LOCATION
- PROPOSED ACCESS ROAD
- 1000' CONTOUR LINE
- CONTOUR LINE (10' INTERVAL)



NOTES:

1 BASEMAP IMAGERY FROM ESRI/NAIP, "WORLD IMAGERY" WEB BASEMAP SERVICE LAYER, 2021.

2 RTE SURVEYS WERE CONDUCTED BY FLYCATCHER IN SEPTEMBER AND OCTOBER 2021.

0 1,000 2,000
Feet
1 " = 1,000 '
1:12,000

PROJECT:
TWIN WIND LLC
TWIN WIND PROJECT
OXFORD COUNTY, MAINE

TITLE:
RARE, THREATENED, AND ENDANGERED SURVEY LOCATIONS AND RESULTS

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON	FIGURE 2	
MONTH:	JANUARY		
YEAR:	2022		

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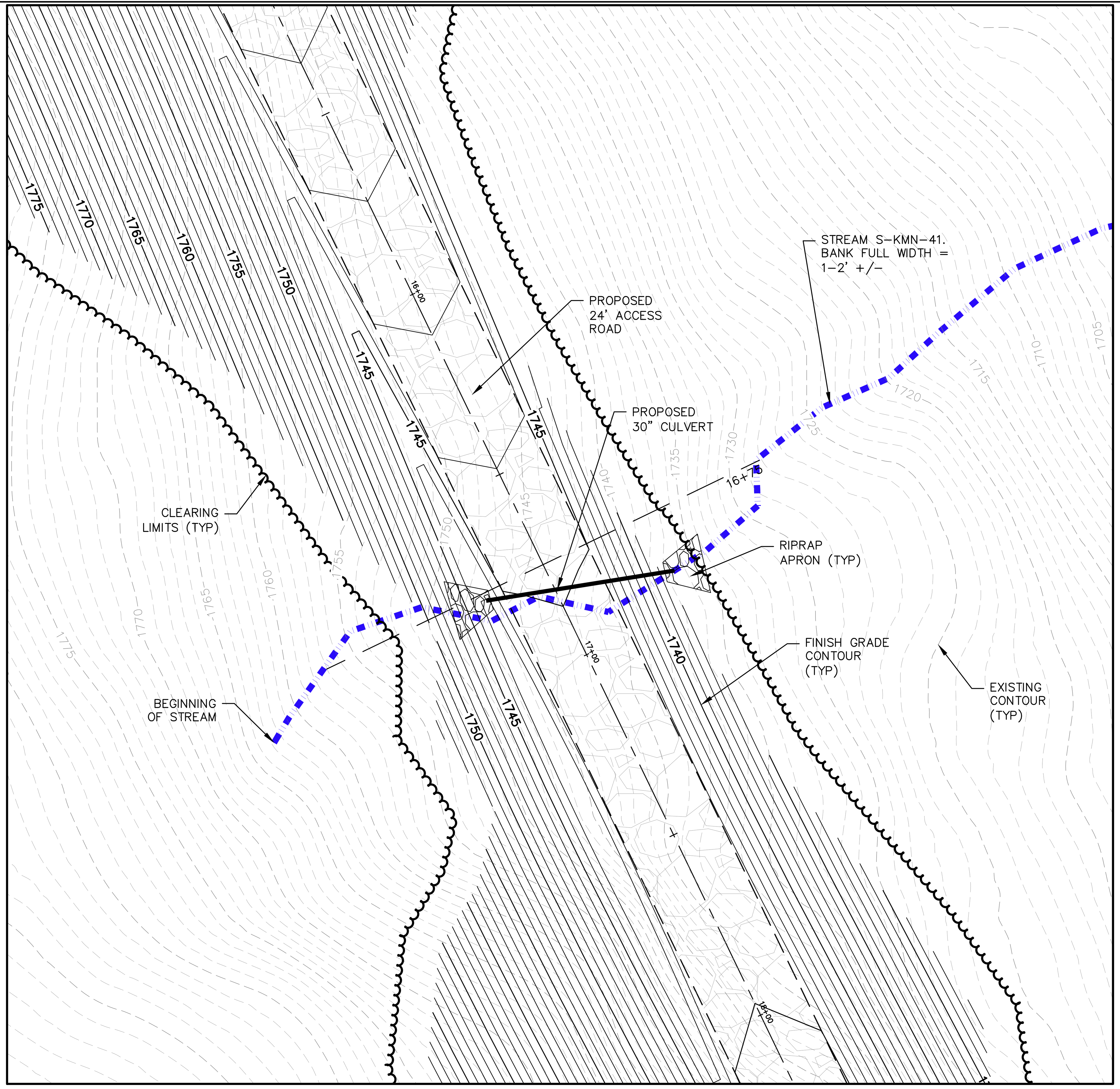
PALMER

FILE NO.: Solaya_TwinWind_RTE_Fig2_Aerial_11x17L.mxd

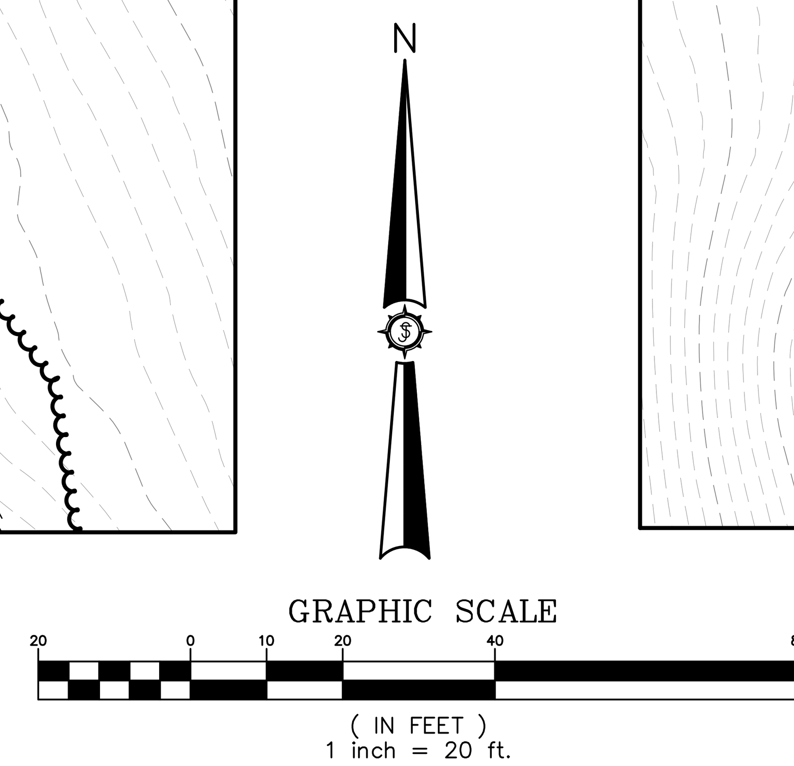
Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

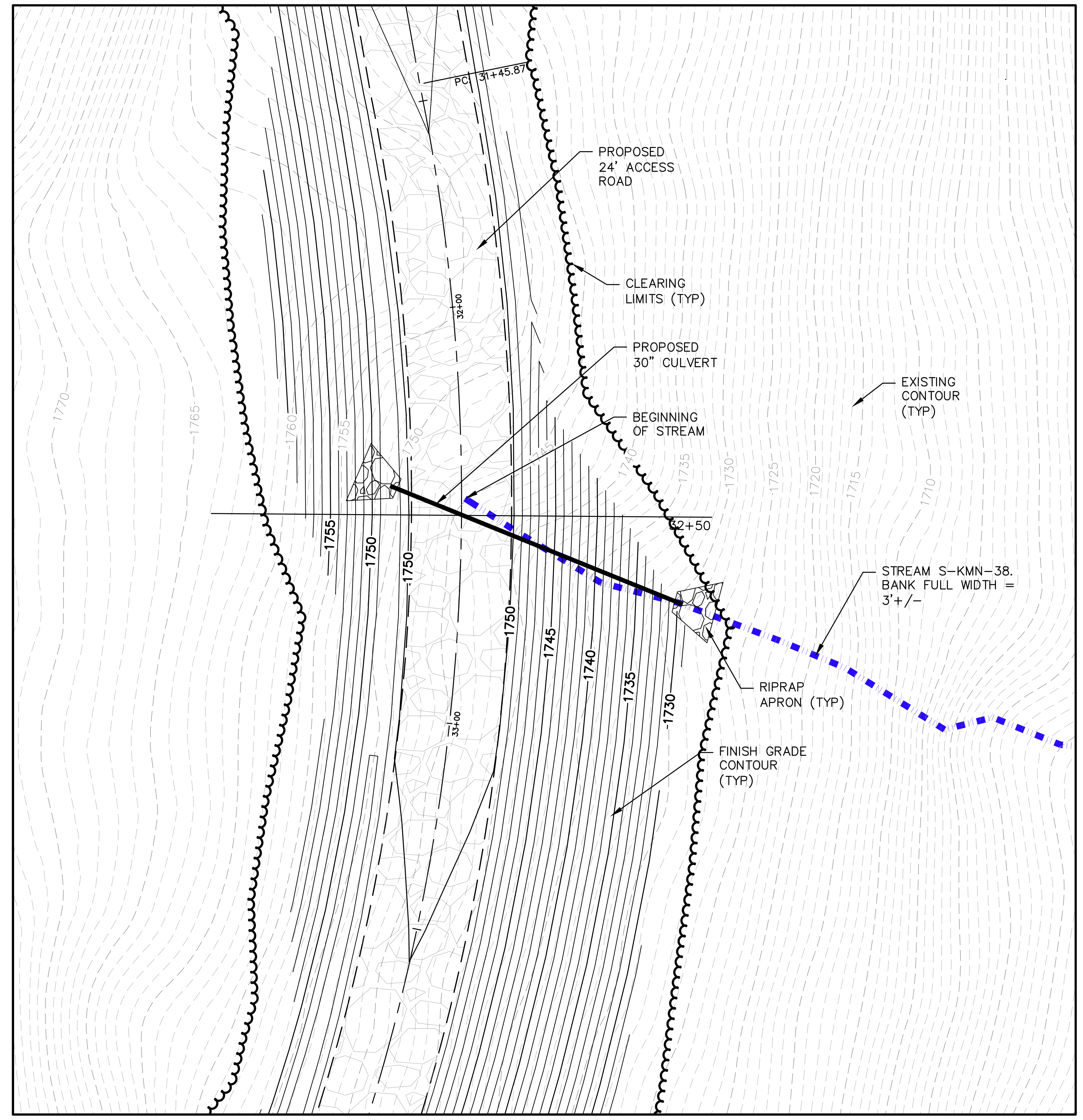
Plot Date: 1/20/2022, 11:07:28 AM by JAKEN -- LAYOUT: ANSI B(11"x17")
Path: D:\Flycatcher\Projects\Solaya\Solaya_TwinWind_RTE_Fig2_Aerial_11x17L.mxd

Exhibit 7-10
Stream Crossing Cross-Sections

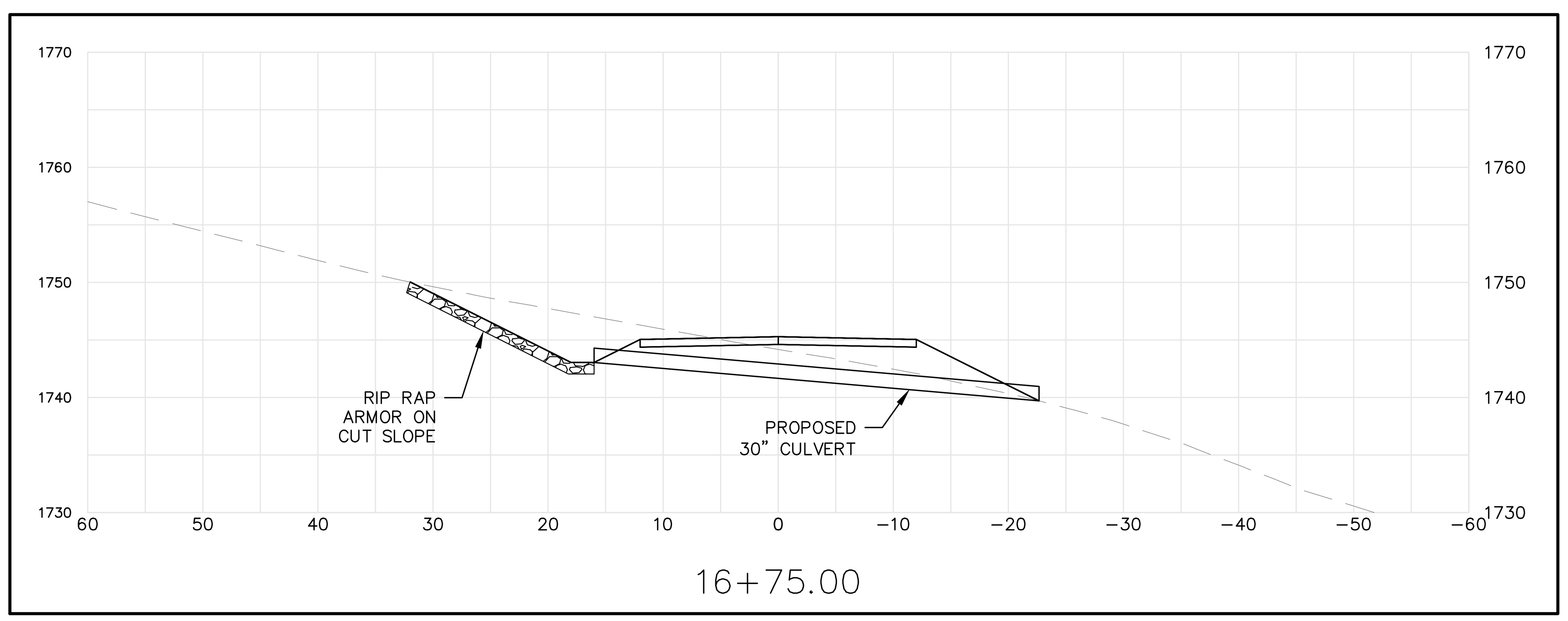


ROAD IMPACTS A "DEAD-END" STREAM WITHIN 50' OF ITS BEGINNING POINT. TRADITIONAL CULVERT PROPOSED. STEEP CULVERT SLOPE AND LARGE RESULTANT ROADWAY FILL SLOPE WOULD COMPLICATE OTHER ALTERNATIVES SUCH AS AN OVERSIZED EMBEDDED CULVERT.

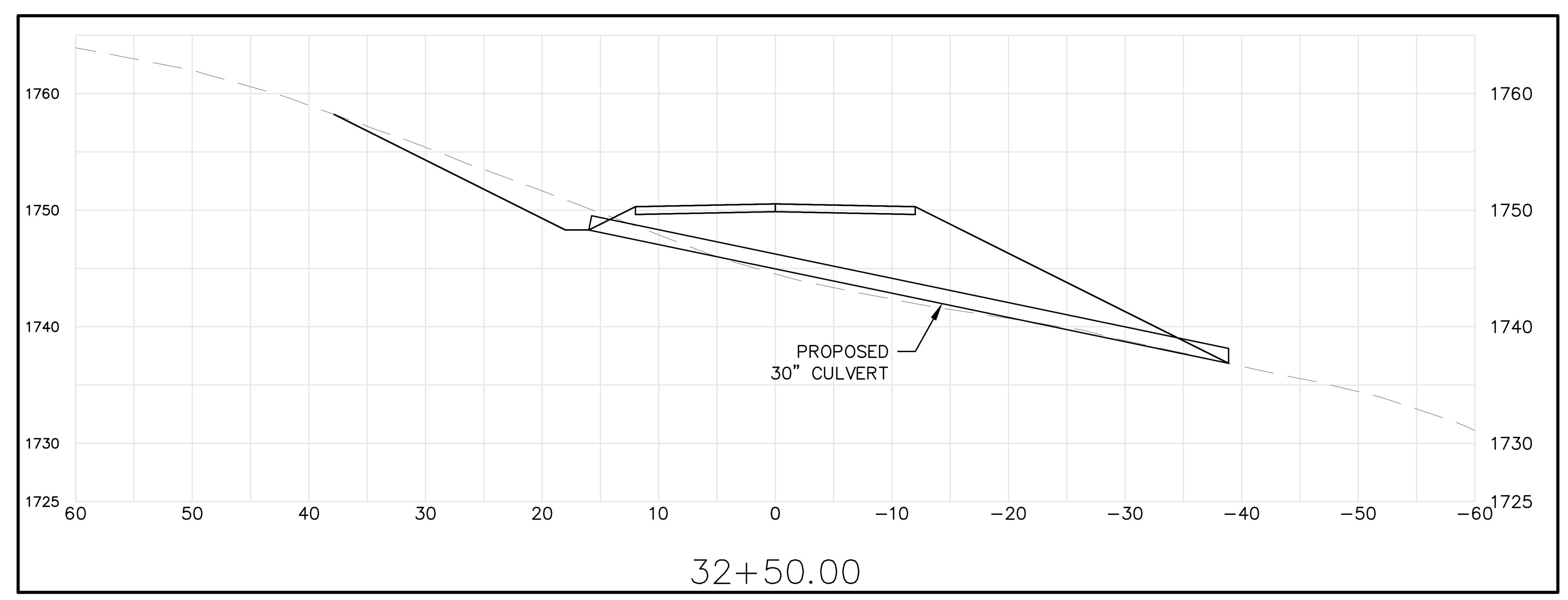




ROAD IMPACTS THE VERY END OF A "DEAD-END" STREAM. TRADITIONAL CULVERT PROPOSED. STEEP CULVERT SLOPE AND LARGE RESULTANT ROADWAY FILL SLOPE WOULD COMPLICATE OTHER ALTERNATIVES SUCH AS AN OVERSIZED EMBEDDED CULVERT.



SCALE: 1 INCH = 10 FT



SCALE: 1 INCH = 10 FT

DRAFT NOT FOR CONSTRUCTION

Rev. #	Dwg. By	Description	Date

Designed By | Drawn By | Checked | Approved

Date 11/28/2022

Scale AS SHOWN

TWIN ENERGY LLC

RUMFORD, MAINE

Project Location RUMFORD, MAINE

Drawing Description

Seal

Project No. 381.21.01

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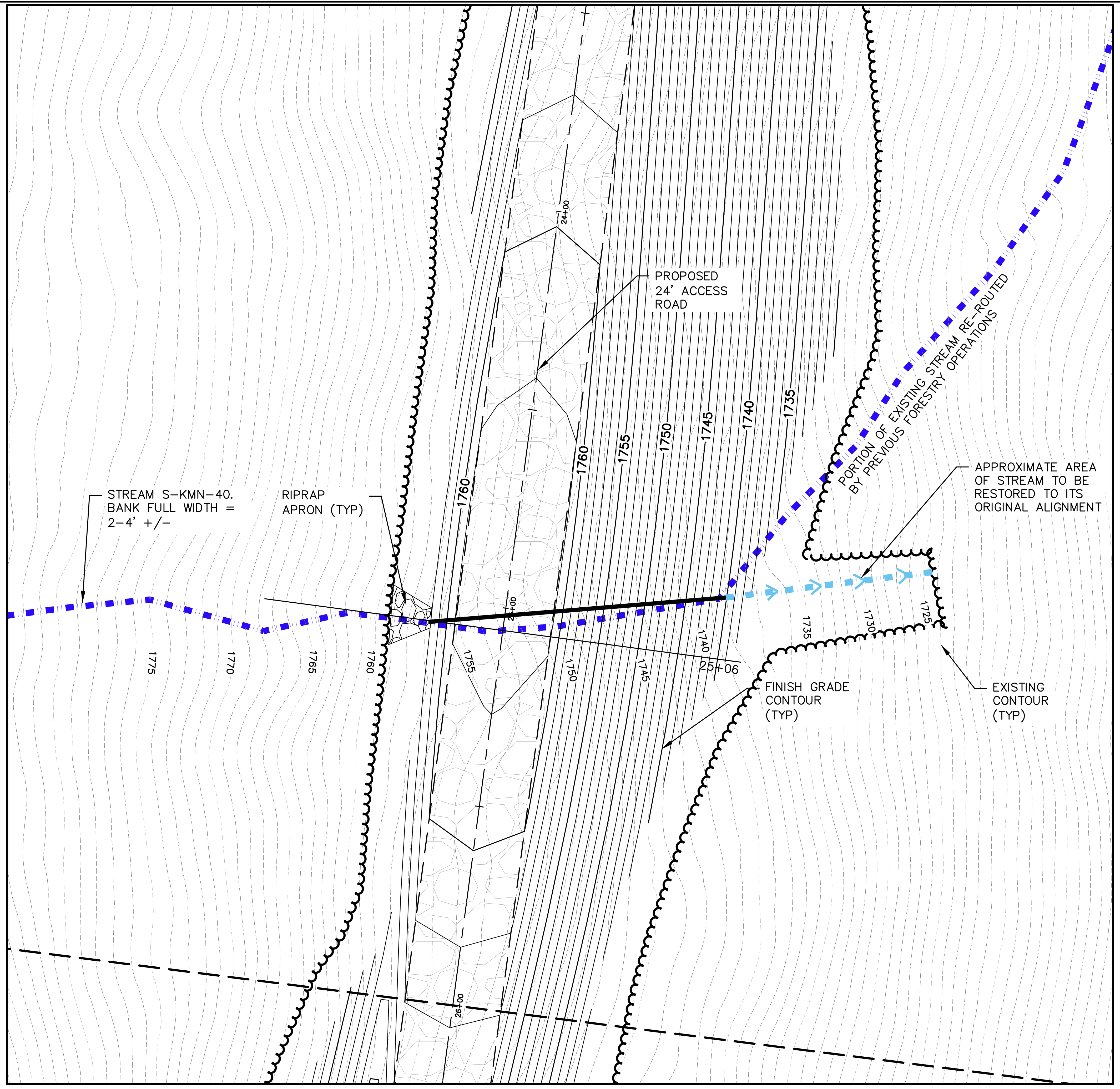
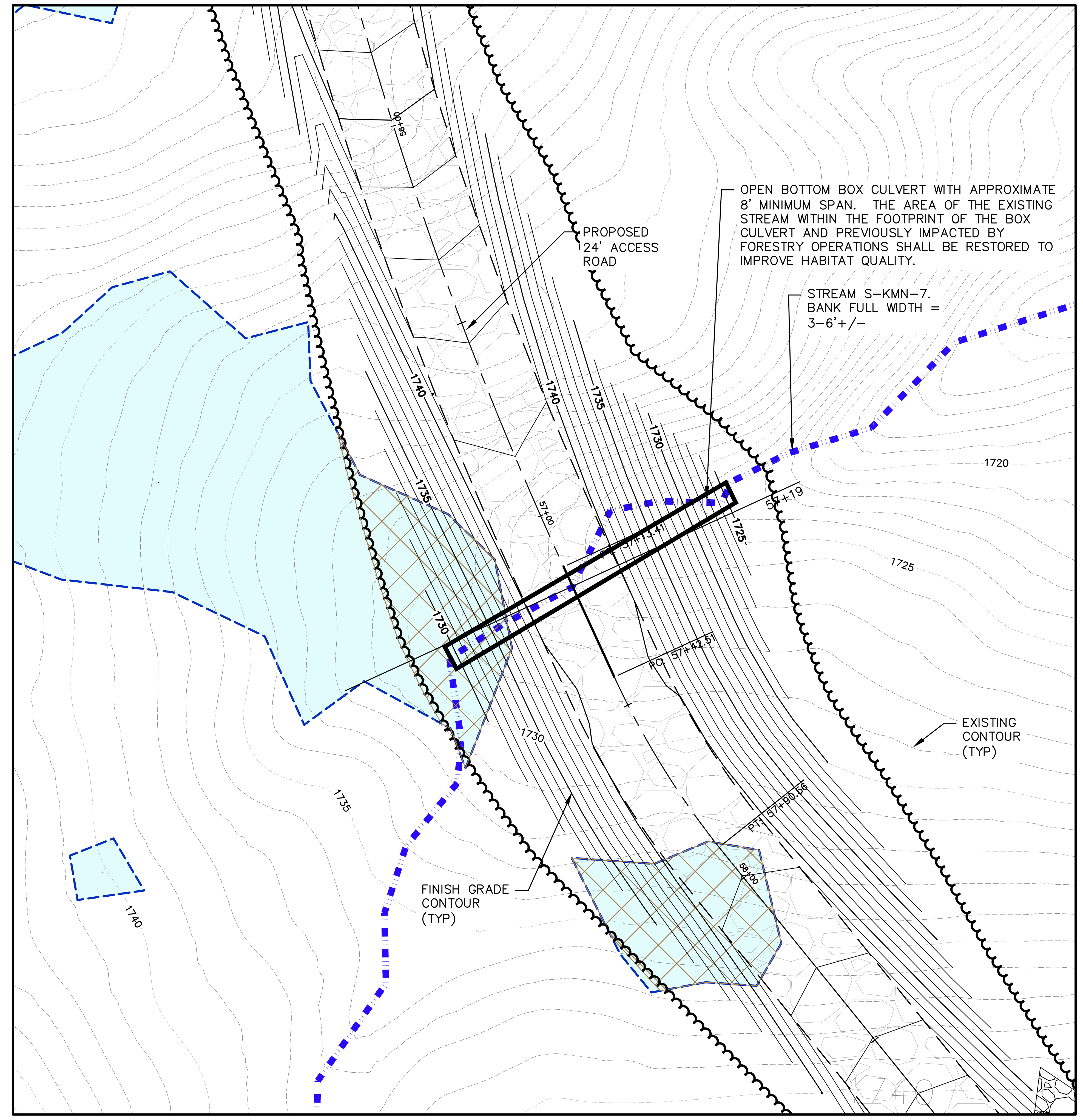
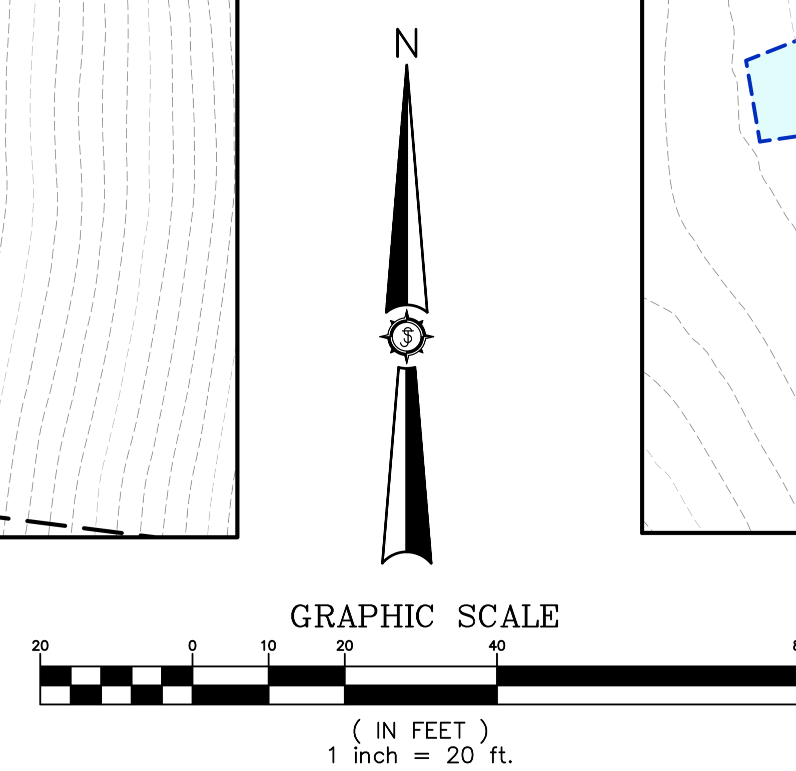
Sheet No. X-SECS

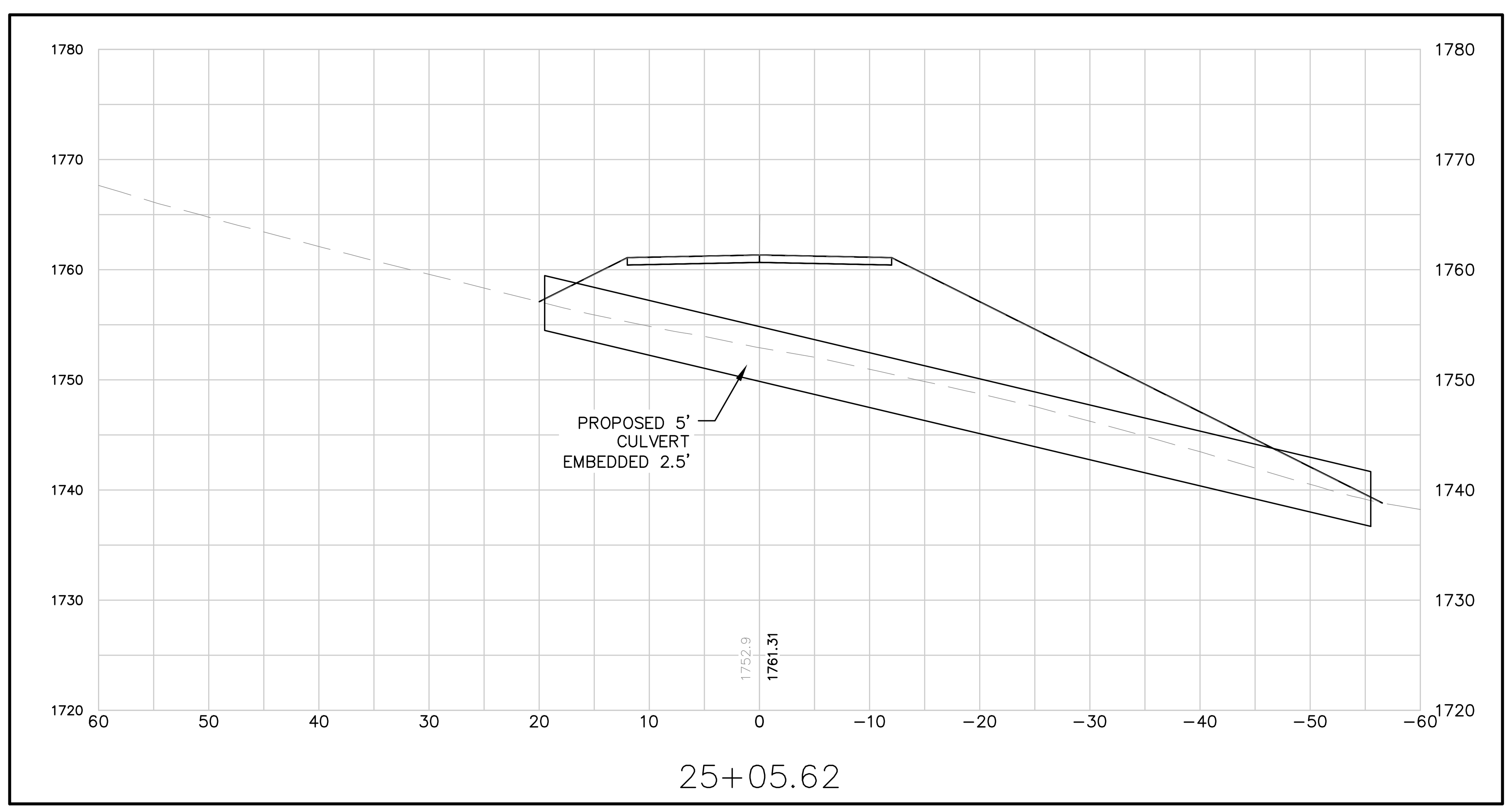


5' CULVERT WITH 2.5' OF EMBEDMENT IS PROPOSED AT THIS CROSSING

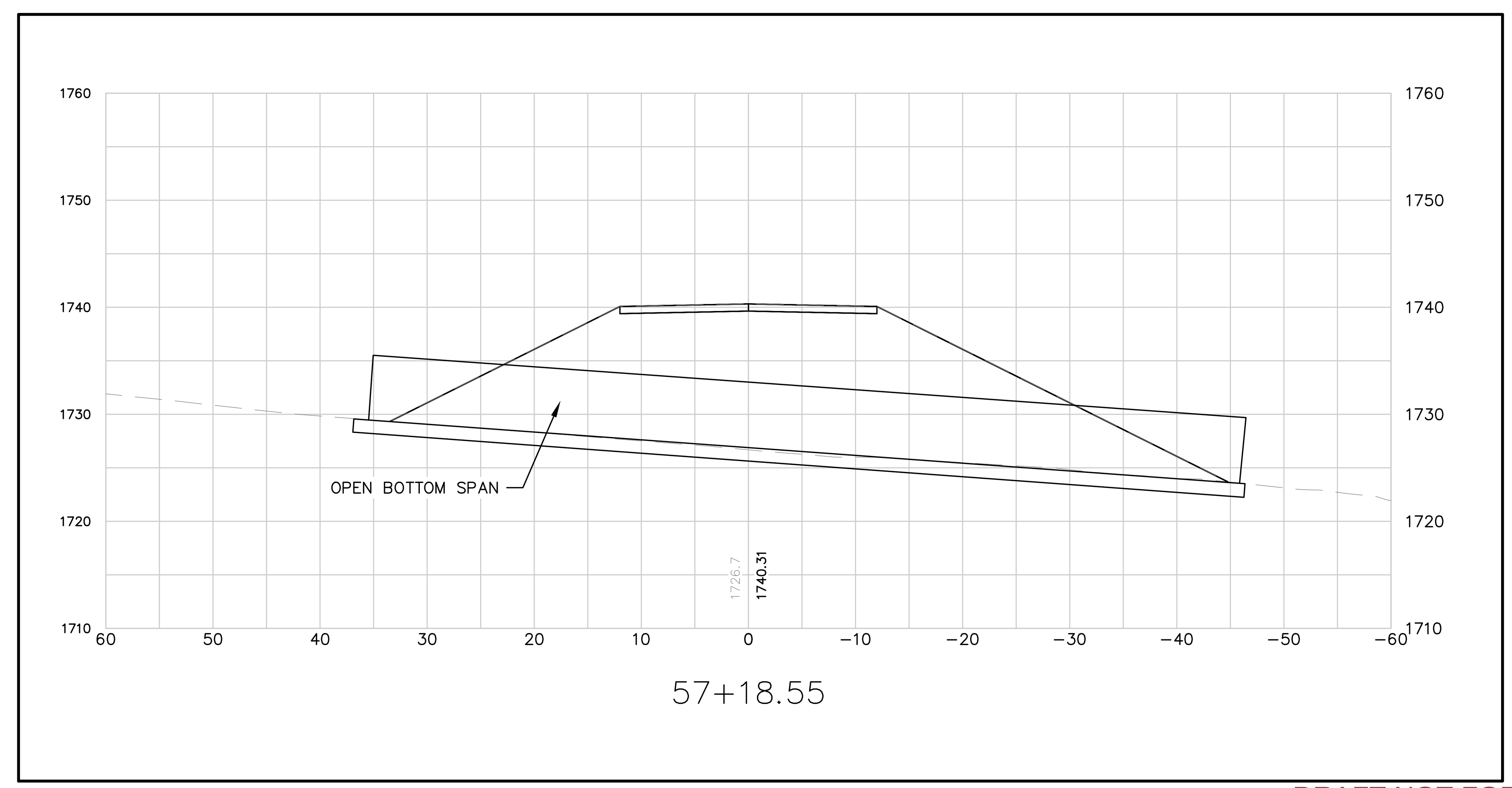


8' MINIMUM SPAN, OPEN-BOTTOM CULVERT PROPOSED AT THIS CROSSING





SCALE: 1 INCH = 10 FT



SCALE: 1 INCH = 10 FT

DRAFT NOT FOR CONSTRUCTION

TWIN ENERGY LLC

RUMFORD, MAINE

Date 12/16/2022

Scale AS SHOWN

381.21.01

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Sheet No. X-SECS.

Exhibit 7-11
MDIFW Email re Bicknell's Thrush

Lindsay Deane-Mayer

From:	Stratton, Robert D <Robert.D.Stratton@maine.gov>
Sent:	Thursday, February 10, 2022 10:45 AM
To:	Katelin Nickerson
Cc:	Lindsay Deane-Mayer; Sumul Shah; Richard Jordan; Rodney Kelshaw; Perry, John; Boyden, Sarah; Stearns, Cory R
Subject:	Twin Wind BITH and Rocky Features

Katelin,

I believe MDIFW had two remaining questions to address from our 01/18/22 meeting, related to Bicknell's thrush (BITH) habitat surveys and identifying which of the rocky feature photo locations should be identified on the site plan and targeted for early spring 2022 visits.

1. BITH – Based on the maximum elevation of the South Twin Mountain site (2,150 feet) and reports of an absence of BITH habitat detected during surveys conducted on North Twin Mountain for RoxWind, we have reevaluated this issue and will not be recommending BITH surveys for this project.

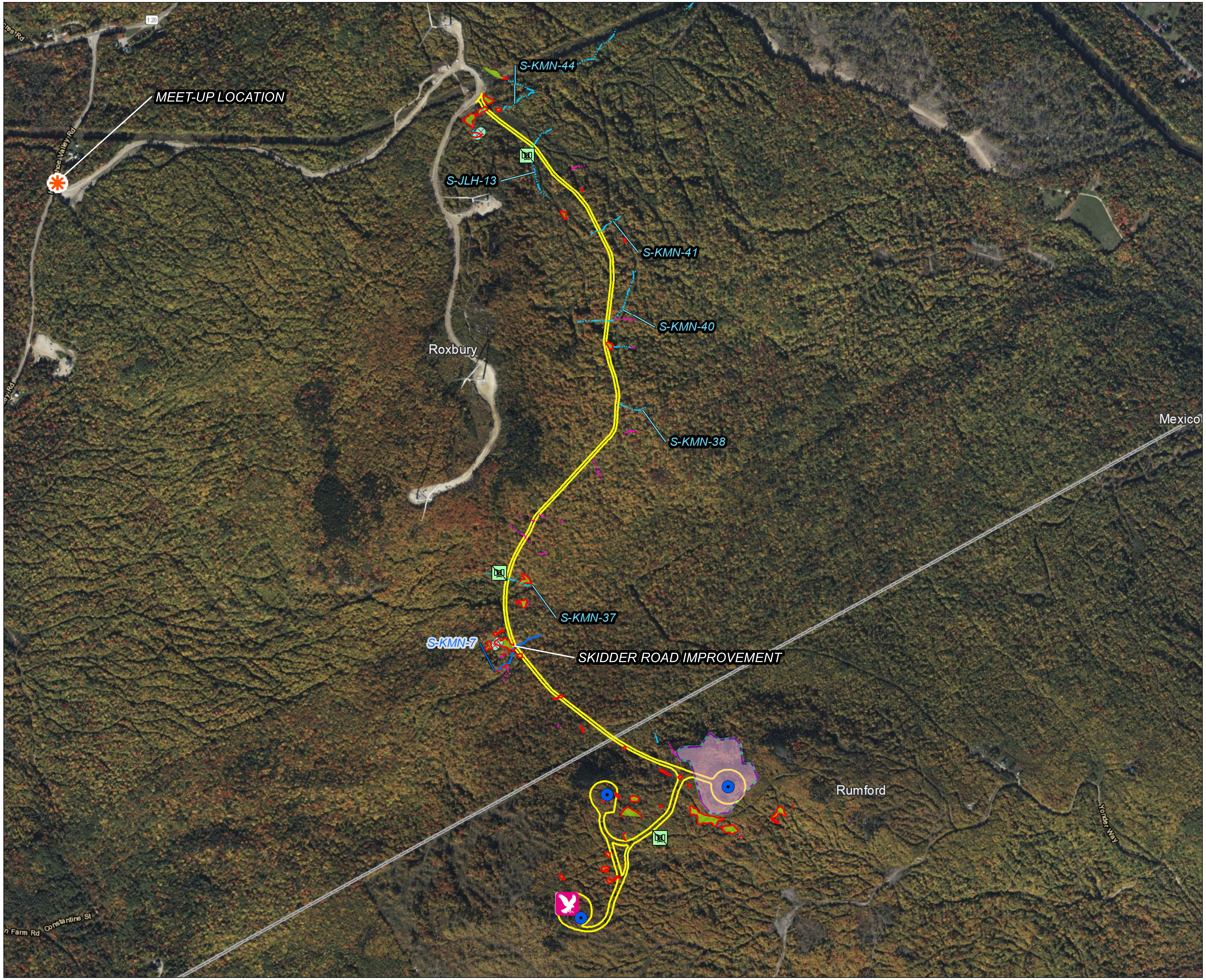
2. MDIFW requests that all distinct rocky feature photo locations be indicated on a site plan that also shows the locations of proposed turbines and other project infrastructure. Based on examination of the photos, we would like to view areas indicated in the following photos: 2049, 3735, 5610, 5647, 8660, 8704.

Thank you for providing the <u>Spring 2022 Raptor and Eagle Survey Plan</u> yesterday. We will review it and provide feedback as soon as possible.

Please let me know of any other concerns or questions. Thank you, Bob.

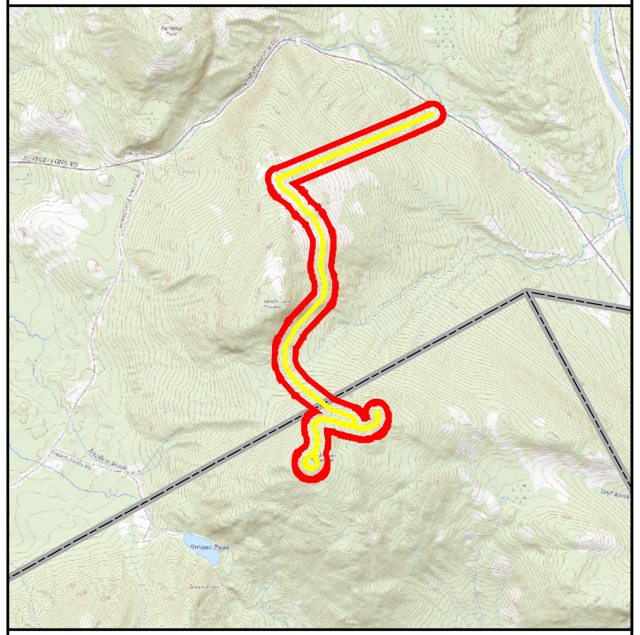
Bob Stratton
Wildlife Biologist
Environmental Program Manager
Maine Department of Inland Fisheries & Wildlife
353 Water Street; 41 State House Station
Augusta, Maine 04333-0041
(207) 287-5659 office; (207) 592-5446 cell
mefishwildlife.com

Exhibit 7-12
USFWS and ACOE Site Walk Map



LEGEND

- PROPOSED PROJECT ROADS
- MEET-UP LOCATION
- PROPOSED TURBINE LOCATION
- TOWN BOUNDARY
- BAT DETECTOR
- RAPTOR SURVEY LOCATION
- APPROXIMATE LYNX HABITAT
- DELINEATED WETLAND BOUNDARY
- UPLAND DRAINAGE
- DELINEATED INTERMITTENT STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED WETLAND



NOTES:

1 BASEMAP IMAGERY FROM BING AERIAL IMAGERY.

0 1,000 2,000
Feet

PROJECT: TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE: AUGUST 2023
USACE/MDEP/USFWS
FIELD MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON		FIGURE 1
MONTH:	AUGUST		
YEAR:	2023		

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PALMER

FILE NO.: Palmer_TwinEnergy_August2023_MDEP_FieldMap_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

Plot Date: 8/9/2023, 17:07:27 PM by DREWKENWORTHY -- LAYOUT: ANSI B(11"x17")
Path: C:\FLYCATCHER\Projects\Solaya\Palmer_TwinEnergy_August2023_MDEP_FieldMap_11x17L.mxd

Exhibit 7-13
Wetland Watercourse Survey Report

Wetland & Watercourse Delineation & Potential Vernal Pool Survey Report

Twin Energy Project
Oxford County, Maine

Prepared for:
Palmer/ Twin Energy LLC
13 Elm Street, Suite 200
Cohasset, MA 02025

Prepared by:
Flycatcher LLC
106 Lafayette Street, Suite 1C
Yarmouth, ME 04096
http://www.flycatcherllc.com

January 2022

Contents

Figures

Appendices

1.0 Introduction

As requested by Twin Energy LLC, in September and October of 2021, Flycatcher LLC (Flycatcher) conducted an environmental field survey of approximately 458 acres off Roxbury Notch and Swift River Road (Route 120) in Oxford County, Maine. The extent of the field survey is outlined in yellow (Survey Area) depicted on Figures 1 and 2. The purpose of the field survey was to identify and map wetlands, watercourses, and potential vernal pools to inform avoidance and minimization of impacts to protected natural resources during design of a proposed wind energy facility. Field surveys completed by Flycatcher also included rare, threatened, and endangered (RTE) species and a soil survey within the Survey Area. The methods and findings of these surveys are provided in separate reports respectively.

This report provides a description of the methods used, and the findings of the field wetland and watercourse delineation and potential vernal pool survey effort. Definitions and methodologies used follow those prescribed by the Maine Department of Environmental Protection (MDEP) and the US Army Corps of Engineers (USACE), the two lead agencies that oversee natural resources protection and permitting in Maine.

2.0 Survey Area

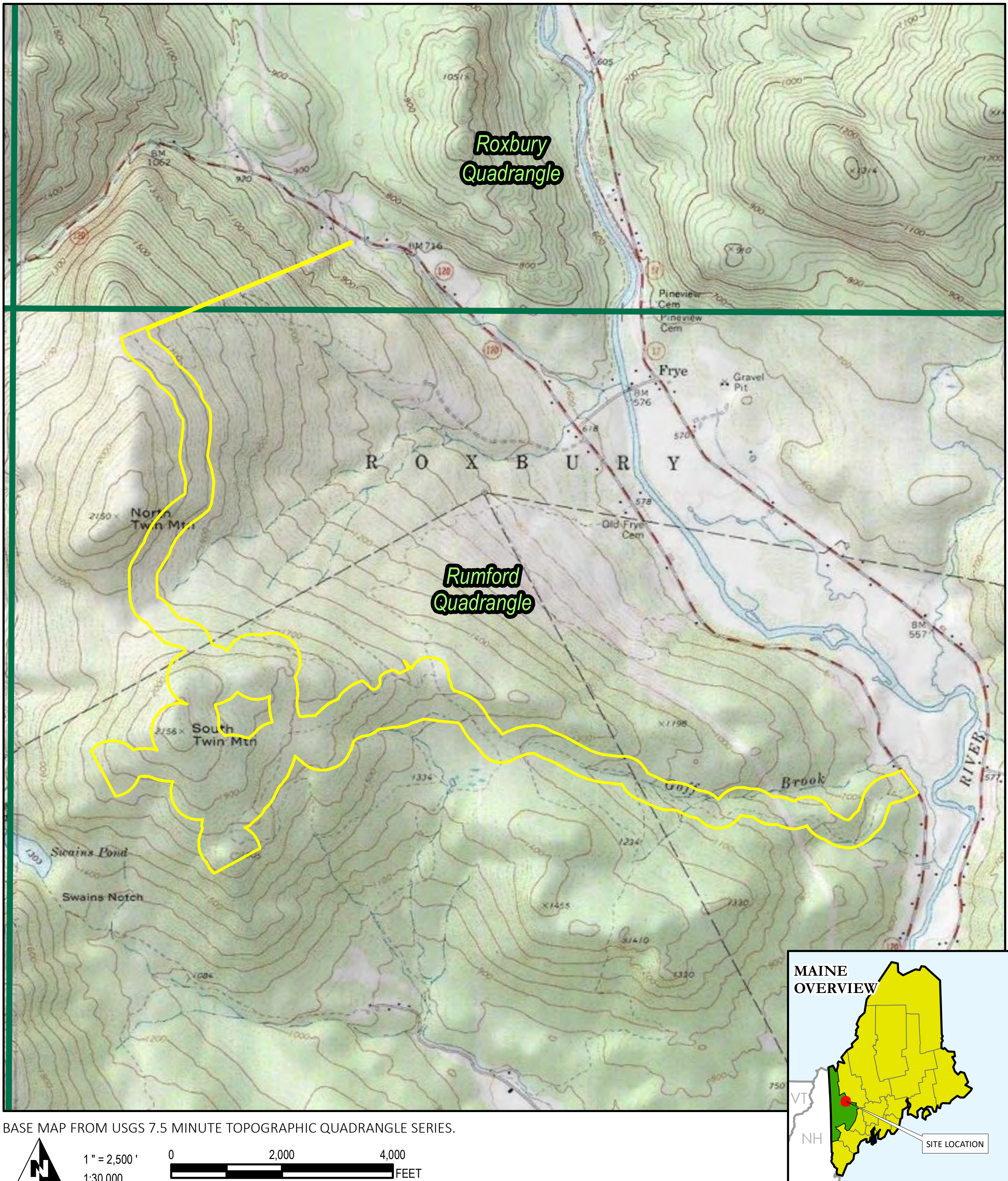
General Description: As seen on Figure 1, the Survey Area is approximately 458 acres, located west of the Swift River, and north of Scotty Stream in Oxford County, Maine. The Survey Area extends northwest from Route 120 in Mexico, follows an existing road paralleling Goff Brook for approximately 7,000 feet, then continues to the top of South Twin Mountain, in Rumford for a total of 12,000 feet. The Survey Area encompasses the peak of South Twin Mountain, and then extends another 7,000 feet north, flanking the peak of North Twin Mountain to the west. From there, a thirty-foot wide, 4,400 foot long, section turns east, adjacent to an existing overhead transmission line, and connects back to Route 120 in Roxbury.

The Survey Area is largely forested and is accessible via logging roads and recreational vehicle trails. The forest is a mix of hard and softwood trees and shrubs, with evidence of past logging such as skidder trails, landing areas, haul roads, and early to late successional growth. There are a couple of small cabins located just outside of the Survey Area southeast of South Twin Mountain. A rough gravel road starts at Swift River Road (State Route 120) and provides access to the cabins and other trails in the area. It is referenced on base map aerial imagery from ESRI/NAIP as "Yonder Way".

Topography/drainage: South Twin Mountain is the highest point within the Survey Area, with a summit elevation of approximately 2,150 feet. There is a dip in topography with a perennial stream flowing to the east between South and North Twin Mountains. Terrain generally slopes easterly to where the Survey Area intersects with Route 120. Field evidence suggests groundwater discharges in several areas throughout the site. Steep eroded swales form several drainages that eventually develop into streams downslope. Goff Brook forms approximately midway up the southern ridge of South Twin Mountain, flows east, and joins the Swift River offsite.

Vegetation: Upland areas are a mixture of early and mid-successional forest, dominated by American beech *(Fagus grandifolia),* eastern hemlock (*Tsuga canadensis*), balsam fir (*Abies balsamea*), northern red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), and red maple (*Acer rubrum*). Upland forests have a dominance of hardwood species, but softwood species occur more often at higher elevations.

Forested wetland areas are dominated by balsam fir, red maple, yellow birch (*Betula alleghaniensis*), green ash *(Fraxinus pennsylvanica), and* gray birch *(Betula populifolia)*. Shrub habitat within wetlands is dominated by speckled alder *(Alnus incana),* dwarf red raspberry *(Rubus idaeus),* steeplebush *(Spiraea tomentosa),* red maple, yellow birch, and gray birch. Emergent habitat within wetlands contains cinnamon fern *(Osmundastrum cinnamomeum),* sensitive fern *(Onoclea sensibilis),* evergreen wood fern *(Dryopteris intermedia),* cottongrass bulrush *(Scirpus cyperinus),* fringed sedge *(Carex crinita),* nodding sedge *(Carex gynandra),* spotted touch-me-not *(Impatiens capensis),* and melic manna grass *(Glyceria melicaria).*



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

1 " = 2,500 '
1:30,000

0 2,000 4,000 FEET

PALMER
Flycatcher
LAND • SCIENCE • PEOPLE

PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

LEGEND:

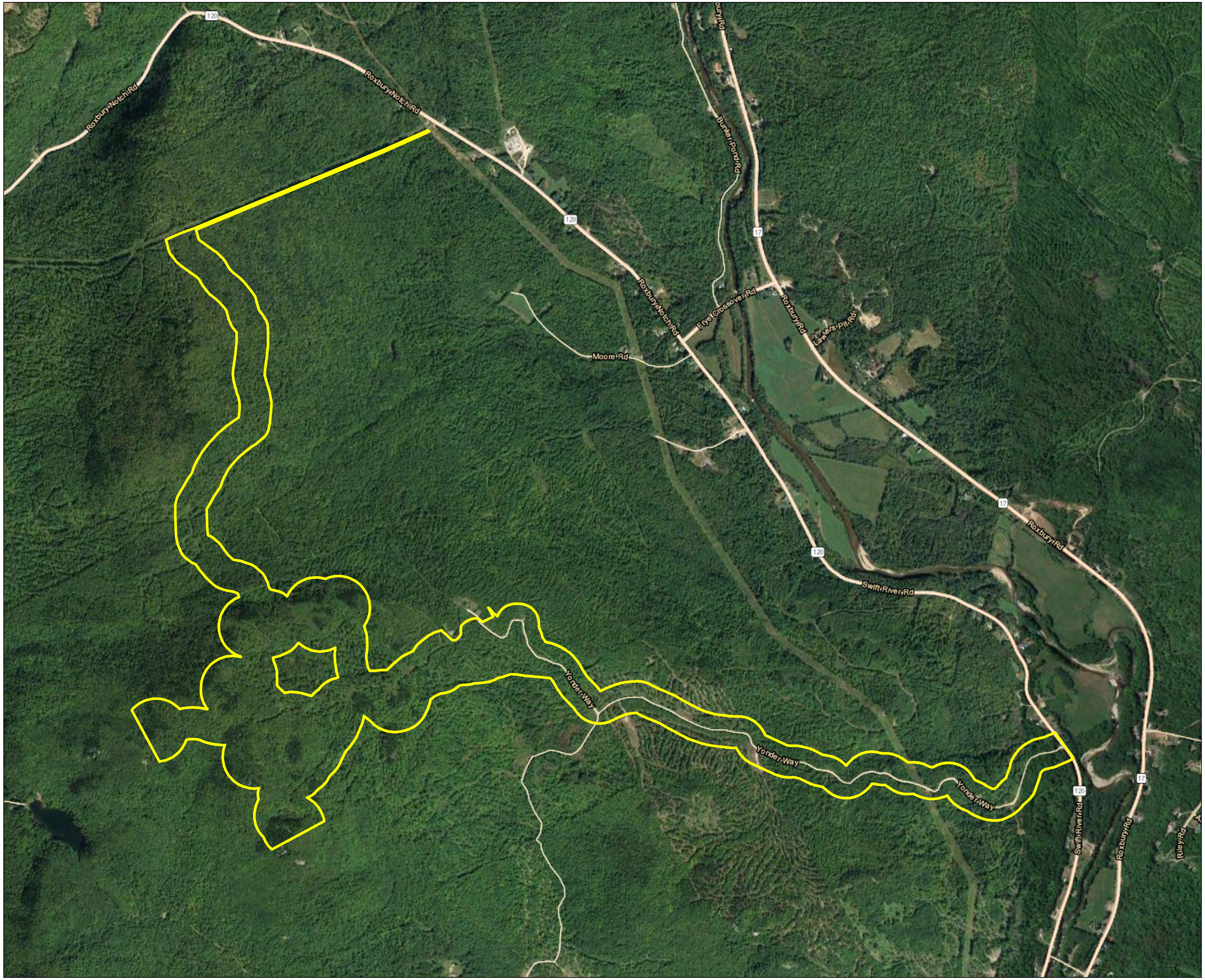
PROJECT SURVEY AREA
USGS 7.5-MINUTE QUADRANGLE BOUNDARY

DRAWN BY:	D. KENWORTHY
CHECKED BY:	K. NICKERSON
MONTH:	NOVEMBER
YEAR:	2021
PROJ. NO.:	21ZP
CLIENT:	SOLAYA

FIGURE 1

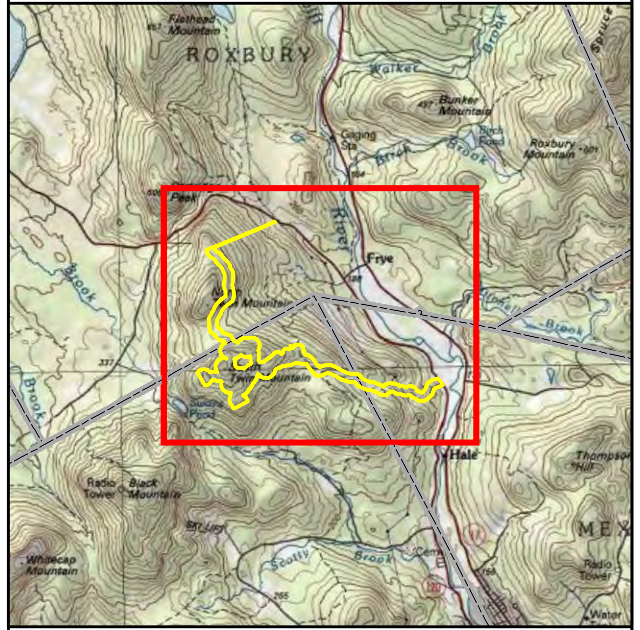
Plot Date: 12/15/2021, 17:06:49 PM by JAKEN -- LAYOUT: ANSI B(11"x17")
Path: D:\Flycatcher\Projects\Sebago\Solaya_TwinWind_Delin_Fig2_Aerial_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0



LEGEND

PROJECT SURVEY AREA



NOTES:

1 BASEMAP IMAGERY FROM ESRI/NAIP "WORLD IMAGERY" SERVICE LAYER.

N

0 1,500 3,000
Feet
1 " = 1,500 '
1:18,000

PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:

AERIAL PROJECT LOCATION MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON	**FIGURE 2**	
MONTH:	DECEMBER		
YEAR:	2021		

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FILE NO.: Solaya_TwinWind_Delin_Fig2_Aerial_11x17L.mxd

3.0 Methods

3.1 Desktop Review

Prior to visiting the site, Flycatcher reviewed existing data sources including:

- United States Geological Survey (USGS) topographic maps;
- United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) maps;
- Natural Resources Conservation Service (NRCS) medium-intensity soil survey maps;
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs);
- USGS National Hydrography Dataset (NHD); and
- Recent and historic aerial photography (via Google Earth).

These data were used to assist in the identification of protected natural resources during field surveys.

3.2 Agency Outreach

Flycatcher conducted outreach to the Maine Department of Inland Fisheries and Wildlife (MDIFW) and the Maine Natural Areas Program (MNAP) for information on known or potential state-listed RTE or special concern species or habitats within or proximal to the Survey Area. Results of the outreach are discussed in Section 4.2. Additionally, more detailed discussion of agency outreach regarding RTE species is included in a separate report, *Twin Energy Rare, Threatened, & Endangered Species Survey Report* (Flycatcher 2022).

3.3 GPS Location

Features (e.g., wetland boundaries or watercourses) located during the on-site investigations were geolocated using a mapping grade global positioning system (GPS) unit (Juniper Systems' Geode GPS Antenna and ESRI's ArcGIS Collector software). The data were collected using real-time correction and standards specified by the manufacturer to achieve sub-meter accuracy.

3.4 Wetland Delineation

Wetlands are defined by the federal government as: "*Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas*." [1] The State of Maine also uses this definition.

Wetland delineations were conducted in accordance with the USACE Wetland Delineation Manual[2] and the Northcentral and Northeast Regional Supplement (Version 2.0).[3] The manual and supplement provide a repeatable methodology to identify wetland areas and are the accepted wetland delineation methodology of the MDEP and the USACE. The USACE, as part of an interagency effort with the U.S. Environmental Protection Agency (EPA), the USFWS and the U.S. Department of Agriculture NRCS, developed the 2016 National Wetland Plant List (NWPL). The NWPL is used to determine whether the hydrophytic vegetation parameter is met when conducting wetland determinations under the Clean Water Act. Plant names and hydrophytic determinations were based on

[1] *Code of Federal Regulations. 2021. Definition of Waters of the United States. 33 CFR 328.3(c)(16).*
[2] *Environmental Laboratory. 1987. "Corps of Engineers Wetlands Delineation Manual," Technical Report Y-87-1, U.S. Army Engi- neer Waterways Experiment Station, Vicksburg, Miss.*
[3] *U.S. Army Corps of Engineers. 2011. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0), ed. J. S. Wakeley, R. W. Lichvar, C. V. Noble, and J. F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.*

the 2020 update to the NWPL.[4] Hydric soil determinations were based on *Field Indicators for Identifying Hydric Soils in New England, Version 4,*[5] *Field Indicators of Hydric Soils in the United States, Version 8.2,*[6] and the Maine Association of Professional Soil Scientist (MAPSS) Key for the Identification of Soil Drainage Class[7].

The Survey Area was investigated by a wetland scientist and when a location appeared to have the requisite three factors that constitute a wetland (i.e., hydrophytic vegetation, indicators of hydrology, and the presence of hydric soils) an investigation was undertaken. The scientist analyzed site-specific data to determine if the area met the criteria to be considered a wetland. When wetlands were identified, the boundaries of the wetlands were marked with glo-pink flagging and numbered in sequential order. Each flag was geo-located as described in Section 3.3.

3.4.1 Wetlands of Special Significance (WoSS)

Wetland value is the importance of a wetland with respect to the individual or collective functions it provides. A wetland may have different values for different functions. In recognition of this, Chapter 310 of the Maine Natural Resources Protection Act (NRPA) defines a subset of wetlands that provide a high level of functions and/or values to the surrounding and regional environment as WoSS. Thus, WoSS are afforded additional protections and generally more rigorous permitting oversight if a permittee's project will result in unavoidable impacts to WoSS. Flycatcher made WoSS determinations based on physical features observed during the delineation and published mapping review.

3.5 Watercourse Identification

Watercourse identification followed the Maine NRPA definition in Section 480(B)(9) of a "river, stream or brook" which *"means a channel between defined banks. A channel 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.
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.
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.
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.
E. The channel contains aquatic vegetation and is essentially devoid of upland vegetation.

'River, stream or brook' does not mean a ditch or other drainage way constructed, or constructed and maintained, solely for the purpose of draining storm water or a grassy swale."

[4] U.S. Army Corps of Engineers 2020. National Wetland Plant List, version 3.4 http://wetland-plants.usace.army.mil/U.S. Army Corps of Engineers Engineer Research and Development Center Cold Regions Research and Engineering Laboratory, Hanover, NH
[5] New England Hydric Soils Technical Committee. 2018 Version 4, *Field Indicators for Identifying Hydric Soils in New England.* New England Interstate Water Pollution Control Commission, Lowell, MA.
[6] United States Department of Agriculture, Natural Resources Conservation Service. 2018. *Field Indicators of Hydric Soils in the United States,* Version 8.2. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.
[7] Maine Association of Professional Soil Scientists. 2013. Key for the Identification of Soil Drainage Class. Revised January 22, 2013.

Watercourse identification was also consistent with the methods outlined in the MDEP *NRPA Identification Guide for Rivers, Streams, and Brooks.*[8]

If a watercourse meeting the above definition was observed, blue survey flagging was hung along the centerline (for streams less than six feet in width) or along the top of the bank (for streams six feet or wider). The locations of each flag were geolocated as described in Section 3.3.

3.6 Waterbody Delineation

The boundary of a waterbody is identified by an "Ordinary High-Water Mark", as defined by the USACE as "*that line on the shore established by the fluctuations of water and indicated by physical characteristics such as:*

A. a clear, natural line impressed on the bank;
B. shelving;
C. changes in the character of soil;
D. destruction of terrestrial vegetation;
E. the presence of litter and debris; or
F. other appropriate means that consider the characteristics of the surrounding areas".

3.7 Potential Vernal Pool Survey

Vernal pools are temporarily/seasonally flooded wetlands that provide the primary breeding habitat for vernal pool indicator species, and a host of secondary faunal species. Wood frogs (*Lithobates sylvaticus*) spotted salamanders (*Ambystoma maculatum*), blue spotted salamanders (*Ambystoma laterale*), and fairy shrimp (*Eubranchipus* spp.) are vernal pool indicator species that depend on vernal pools to complete their life cycle. Vernal pool habitats are defined in Chapter 335 of the NRPA and in the USACE Maine General Permit. Each definition is similar; however, the Maine General Permit definition does not require a pool to be of natural origin.

Productivity of breeding vernal pool species is the primary metric used by regulatory authorities to assess vernal pool quality; thus, vernal pools must be assessed during the breeding season (generally mid-April to late-May). Due to the phenology of indicator species, at least two site visits to pools typically take place to accurately assess breeding productivity. Since the on-site mapping was conducted outside the vernal pool breeding season the Maine Association of Wetland Scientists *Vernal Pool Technical Committee Vernal Pool Survey Protocol* (April 2014) methods for performing potential vernal pool (PVP) surveys were followed (Section 3.4.4, Non-Breeding Season Survey). Using this method, the wetland scientist relies on topography, best professional judgement, evidence of inundation (e.g., water-stained leaves, sparsely vegetated concave surfaces, moss trim lines, etc.) and signs of certain invertebrates, such as caddisfly larvae cases (Order Trichoptera), shells of freshwater clams (Family Sphaeriidae or Pisidiidae) or shed exoskeletons of dragonfly or damselfly larvae. In addition, the wetland scientist carefully reviewed each potential habitat to determine if the pool origin was natural or manmade.

[8] Danielson, T. J. 2018. Natural Resources Protection Act (NRPA) Streams, Rivers, and Brooks. Maine Department of Environmental Protection, Augusta, ME.

4.0 Findings

4.1 Desktop Review

The results of the desktop analysis are depicted in, Figure 3. The USGS NHD data set depicts three intermittent watercourses within the Survey Area. One intermittent stream starts 3,000 ft east-southeast of South Twin Mountain and flows south offsite. Two intermittent streams, Goff Brook, and a tributary to Goff Brook, start approximately 7,000 ft east-southeast of South Twin Mountain and flow east offsite. Accordingly, these areas were investigated for the presence of a watercourse meeting the NRPA definition of a river, stream, or brook.

One freshwater wetland is mapped in the NWI data. This wetland is located just outside the Survey Area near the headwaters of Goff Brook. This NWI-mapped wetland coincides with topographic depressions in the landscape and/or with hydric soils.

The NRCS medium intensity soil survey maps show map units at a broad scale. The maps are a useful tool to identify potential areas of hydric soils which are commonly associated with wetlands. Review of the NRCS medium intensity soil survey indicated that Brayton-Peacham is the only hydric soil map unit located within the Survey Area. Thus, areas where these soils are mapped were a focus of the field work. For additional information regarding soils please see the soils report (Flycatcher 2022).

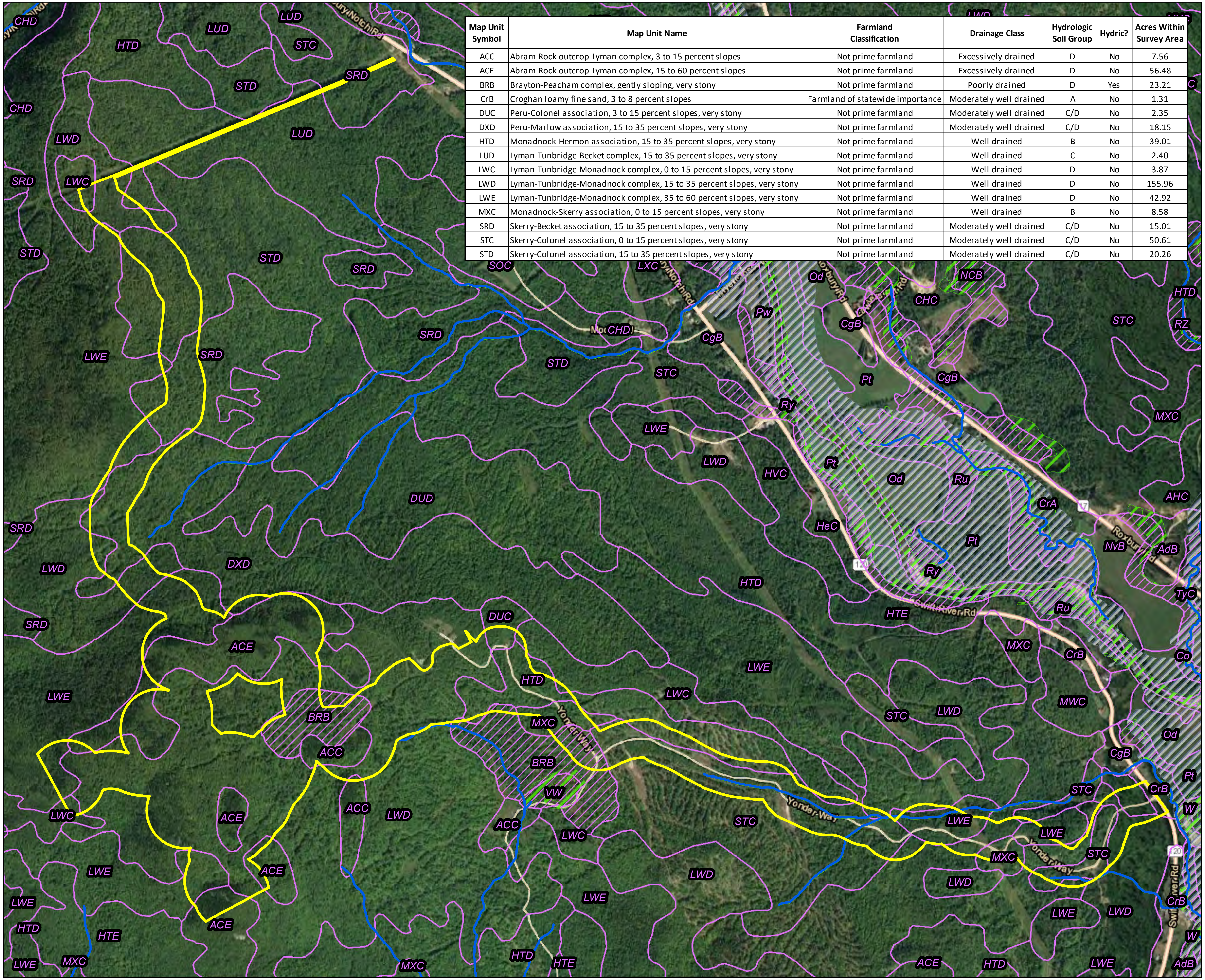
FEMA's FIRM Community Panels, 23017C0652D, 23017C0651D, 23017C0540D, did not show any Special Flood Hazard Areas overlapping the Survey Area

4.2 Agency Outreach

MDIFW and MNAP, were consulted regarding RTE species and habitats within the Survey Area. The results of those correspondences are provided in the *Twin Energy Rare, Threatened, & Endangered Species Survey Report* (Flycatcher 2022). Communication with MDIFW regarding watercourses and vernal pools is included in below.

MDIFW Significant Wildlife Habitat maps indicate no known presence of Significant Vernal Pools in the review area. However, a comprehensive statewide inventory of significant vernal pools has not been completed. Therefore, MDIFW recommends that surveys for vernal pools be conducted within the Project boundary and up to 250 feet beyond the proposed footprint to determine if there are significant vernal pool habitats proximal to development that are jurisdictional under the NRPA.

MDIFW recommends providing a 100-foot buffer to streams within the proposed area of development. The buffers are critical for cold-water fisheries; they maintain cool water temperatures, overall water quality, natural inputs of coarse woody debris and various forms of aquatic life. Stream crossings should be avoided, but if a stream crossing is necessary, or an existing crossing needs to be modified, it should be designed to provide full fish passage. Construction Best Management Practices should be closely followed to avoid erosion, sedimentation, alteration of stream flow, and other impacts as eroding soils from construction activities can travel significant distances as well as transport other pollutants resulting in direct impacts to fish and fisheries habitat. In addition, they recommend that any necessary instream work occur between July 15 and October 1.



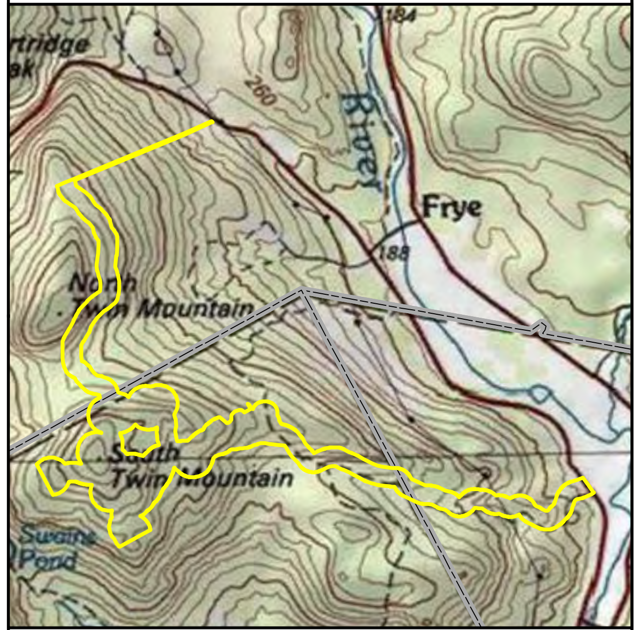
Map Unit Symbol	Map Unit Name	Farmland Classification	Drainage Class	Hydrologic Soil Group	Hydric?	Acres Within Survey Area
ACC	Abram-Rock outcrop-Lyman complex, 3 to 15 percent slopes	Not prime farmland	Excessively drained	D	No	7.56
ACE	Abram-Rock outcrop-Lyman complex, 15 to 60 percent slopes	Not prime farmland	Excessively drained	D	No	56.48
BRB	Brayton-Peacham complex, gently sloping, very stony	Not prime farmland	Poorly drained	D	Yes	23.21
CrB	Croghan loamy fine sand, 3 to 8 percent slopes	Farmland of statewide importance	Moderately well drained	A	No	1.31
DUC	Peru-Colonel association, 3 to 15 percent slopes, very stony	Not prime farmland	Moderately well drained	C/D	No	2.35
DXD	Peru-Marlow association, 15 to 35 percent slopes, very stony	Not prime farmland	Moderately well drained	C/D	No	18.15
HTD	Monadnock-Hermon association, 15 to 35 percent slopes, very stony	Not prime farmland	Well drained	B	No	39.01
LUD	Lyman-Tunbridge-Becket complex, 15 to 35 percent slopes, very stony	Not prime farmland	Well drained	C	No	2.40
LWC	Lyman-Tunbridge-Monadnock complex, 0 to 15 percent slopes, very stony	Not prime farmland	Well drained	D	No	3.87
LWD	Lyman-Tunbridge-Monadnock complex, 15 to 35 percent slopes, very stony	Not prime farmland	Well drained	D	No	155.96
LWE	Lyman-Tunbridge-Monadnock complex, 35 to 60 percent slopes, very stony	Not prime farmland	Well drained	D	No	42.92
MXC	Monadnock-Skerry association, 0 to 15 percent slopes, very stony	Not prime farmland	Well drained	B	No	8.58
SRD	Skerry-Becket association, 15 to 35 percent slopes, very stony	Not prime farmland	Moderately well drained	C/D	No	15.01
STC	Skerry-Colonel association, 0 to 15 percent slopes, very stony	Not prime farmland	Moderately well drained	C/D	No	50.61
STD	Skerry-Colonel association, 15 to 35 percent slopes, very stony	Not prime farmland	Moderately well drained	C/D	No	20.26

LEGEND

- PROJECT SURVEY AREA
- NHD STREAM/RIVER
- NWI WETLAND
- FEMA FLOODPLAIN

NRCS SOILS BY DRAINAGE GROUPS

- EXCESSIVELY DRAINED; MODERATELY WELL DRAINED; SOMEWHAT EXCESSIVELY DRAINED; WELL DRAINED
- POORLY DRAINED; SOMEWHAT POORLY DRAINED; VERY POORLY DRAINED



NOTES:

1. BASEMAP IMAGERY FROM ESRI/NAIP "WORLD IMAGERY" SERVICE LAYER.
2. NATIONAL WETLANDS INVENTORY DATA ACQUIRED FROM U.S FISH AND WILDLIFE WETLANDS MAPPER.
3. FLOODPLAIN INFORMATION FROM FEMA NATIONAL FLOOD HAZARD SERVICE LAYER.
4. NRCS SOIL DATA ACQUIRED FROM ESRI SSURGO DOWNLOADER, ACCESSED DECEMBER 2021.

N

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Feet
1 " = 1,250 '
1:15,000

PROJECT:
TWIN WIND LLC
TWIN WIND PROJECT
OXFORD COUNTY, MAINE

TITLE:
NATIONAL WETLANDS INVENTORY AND NRCS SOIL SURVEY MAP

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON		**FIGURE 3**
MONTH:	DECEMBER		
YEAR:	2022		

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PALMER

FILE NO.: Solaya_TwinWind_Delin_Fig3_NRCSNWI_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

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4.3 Wetlands

Wetland delineations were conducted from October 1st to November 3rd, 2021. As depicted in Appendix A, 140 non-contiguous areas of wetland were delineated within the Survey Area. Wetlands include groundwater seeps, riparian wetlands, palustrine emergent, scrub shrub, and forested wetlands. Many of the wetlands, and adjacent uplands, have been altered by commercial timber harvesting.

Representative photographs are included in Appendix B. Paired data plots were completed at representative locations within the Survey Area, supporting the wetland boundary determinations across the site and to characterize the wetland cover types identified. USACE Wetland Determination Data Forms describing the paired data plots and characterizing the wetlands are included in Appendix C. Descriptions of each wetland, including the hydrology indicators, dominant vegetation, hydric soil indicators, and determinations of WoSS, are included in Appendix D.

4.4 Watercourses

Forty-one watercourses (thirty-five intermittent, three intermittent to perennial, and three perennial watercourses), were delineated within the Survey Area. Watercourses mapped within the Survey Area are mostly high gradient with intermittent flow regimes. Many of these watercourses are associated with wetlands. Photographs are included in Appendix B. Descriptions of each watercourse including flow regime, dominant substrate, dimensions, and associated resources are included in Appendix E.

4.5 Waterbodies

No waterbodies were identified within the Survey Area.

4.6 Potential Vernal Pools

Four natural and natural modified potential vernal pool habitats were identified within the Survey Area. The location of potentially significant vernal pools (PSVP) KMN-1, KMN-4, KMN-5, and KMN-6 are shown in Appendix A. Representative photos are provided in Appendix B. Potential vernal pools with a natural or natural modified origin are considered potentially significant until an in-season survey can be completed.

5.0 Recommendations

5.1 Follow-up Studies

The PSVPs identified in this report are considered natural or natural-modified and should be treated as significant vernal pools if an in-season survey is not competed for the Project. Productivity of breeding vernal pool species is the primary metric used by regulatory authorities to assess vernal pool quality; thus, vernal pools are typically assessed during the breeding season to determine significance.

The MDEP regulates significant vernal pools under Chapter 335 of the NRPA. The pool depression and the 250-foot critical terrestrial habitat (CTH), measured from the spring or fall high water mark of the pool depression, are protected as Significant Wildlife Habitat. If the PSVPs are not surveyed in the spring or if they are surveyed and determined to meet the significance criteria (e.g. number of egg masses or presence of listed species) they will be subject to the habitat management standards for significant vernal pool habitat described in Chapter 335.

Regarding wetlands that are classified as WoSS due to their association with watercourses, the portion of a wetland within 25-feet of the watercourse is considered WoSS, not the entire wetland.

6.0 Certification

The data provided in this report accurately reflects the field studies completed on-site and field studies were conducted in accordance with the methodologies described herein and industry best practices. Katelin Nickerson was the lead scientist that performed the wetland delineation. Ms. Nickerson has studied and practiced wetland science, policy, and delineation throughout the northeast for 13 years and is certified by the Society of Wetland Scientist's as a Professional Wetland Scientist and is a New Hampshire Certified Wetland Scientist.

Katelin Nickerson was supported by Rodney Kelshaw, Rich Jordan, and David Brenneman. Mr. Jordan and Mr. Kelshaw are Professional Wetland Scientists and have practiced wetland science and delineation, with a focus on Maine for over 22 years. Mr. Kelshaw is also a Certified Wildlife Biologist. Mr. Brenneman has practiced wetland science and delineation, with a focus on Maine for over 12 years.

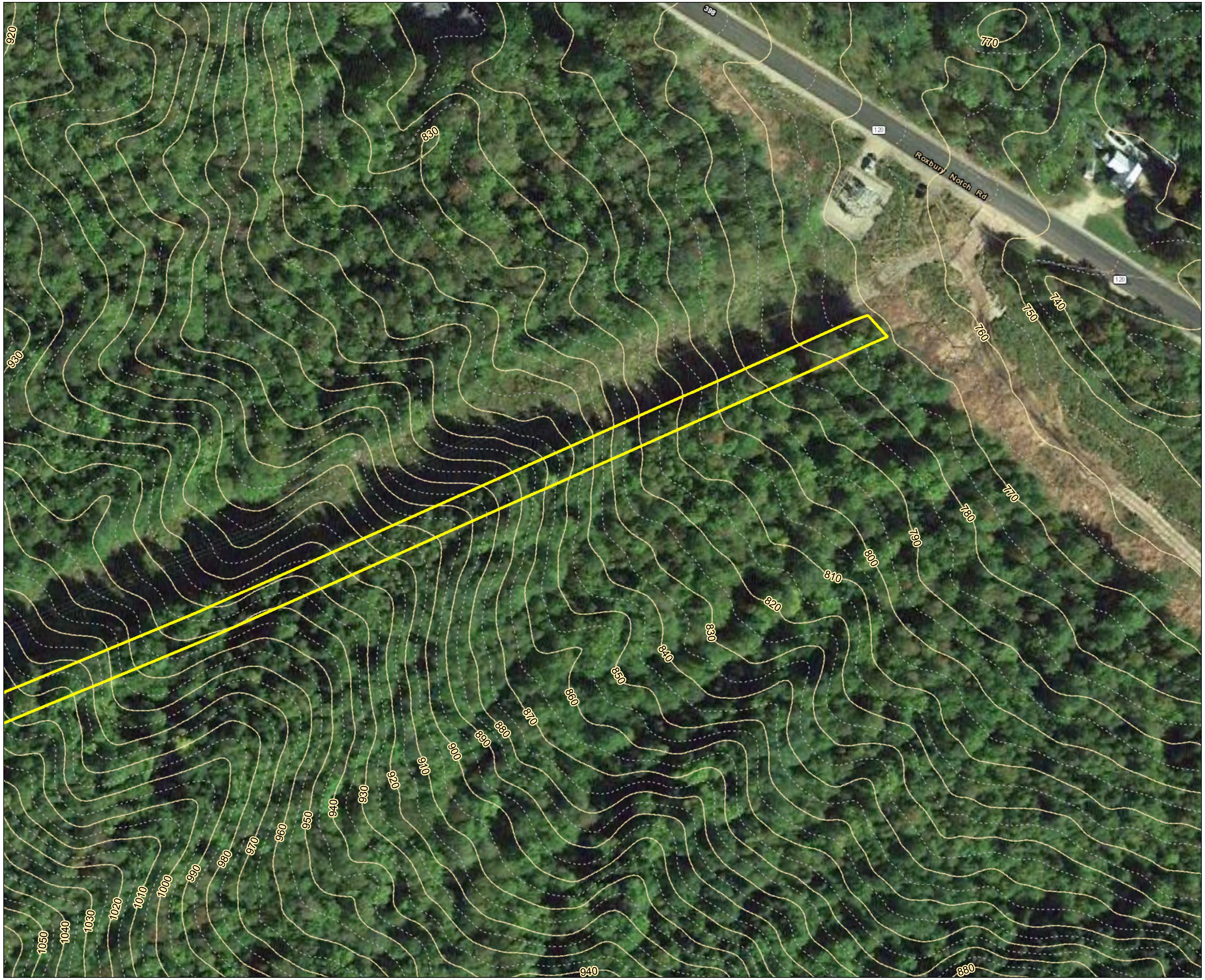
Date: January 26, 2022

Lead Scientist/Firm: Katelin Nickerson / Flycatcher LLC

Signed: Kate M. Nickerson

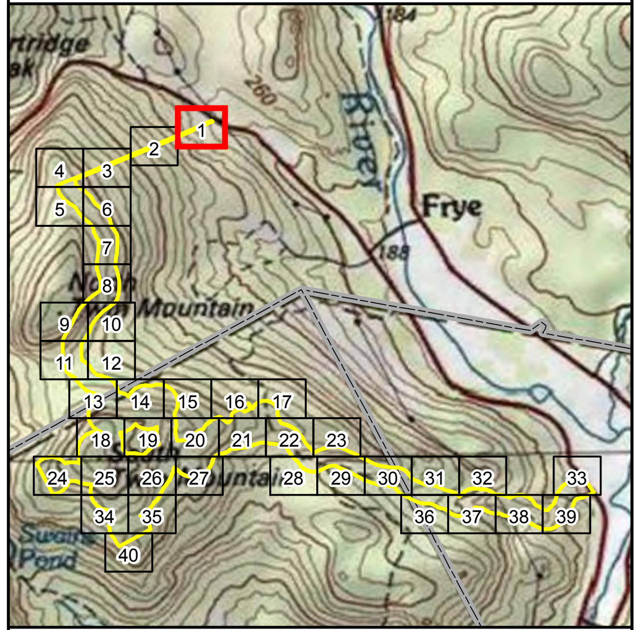
APPENDIX A

Natural Resources Map Set



LEGEND

- PROJECT SURVEY AREA
- CORPS PLOT
- CULVERT
- POTENTIALLY SIGNIFICANT VERNAL POOL
- UPLAND DRAINAGE
- DELINEATED INTERMITTENT STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED WETLAND BOUNDARY
- DELINEATED WETLAND
- CONTOUR LINE (10' INTERVAL)
- CONTOUR LINE (5' INTERVAL)



NOTES:

1 BASEMAP IMAGERY FROM ESRI/NAIP, "WORLD IMAGERY" WEB BASEMAP SERVICE LAYER, 2021.

2 RESOURCES WERE DELINEATED BY FLYCATCHER FROM SEPTEMBER THROUGH NOVEMBER 2021.

N

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Feet

1 " = 100 '

1:1,200

PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:

DELINEATED WETLANDS, WATERBODIES, AND POTENTIAL VERNAL POOL SURVEY

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON	**APPENDIX A**	
MONTH:	JANUARY	Page 1 of 40	
YEAR:	2022		

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PALMER

FILE NO.: Palmer_TwinEnergy_Delin_AppA_ResourceDetail_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
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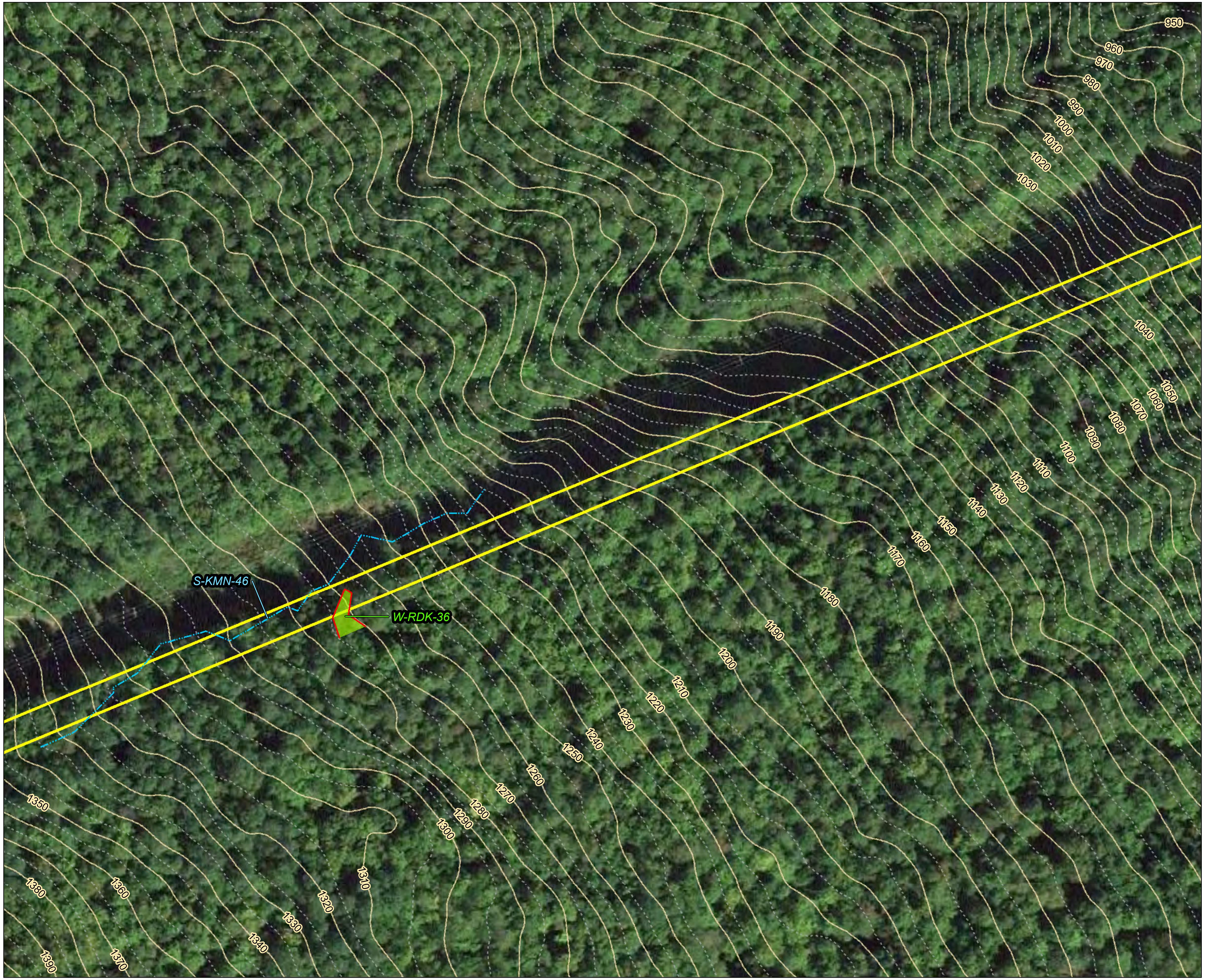

LEGEND

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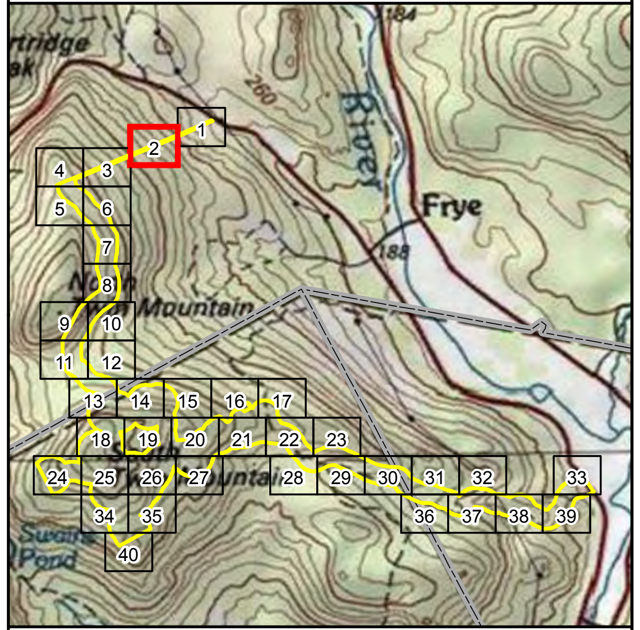

NOTES:

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MONTH:	JANUARY	Page 2 of 40	
YEAR:	2022		

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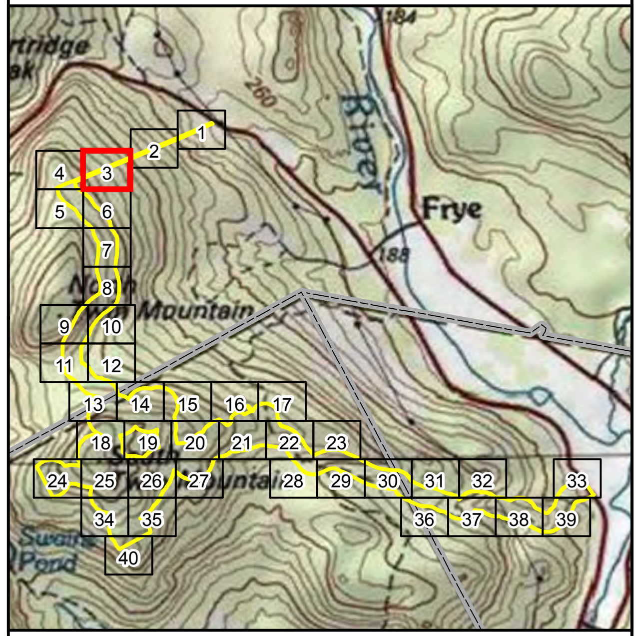

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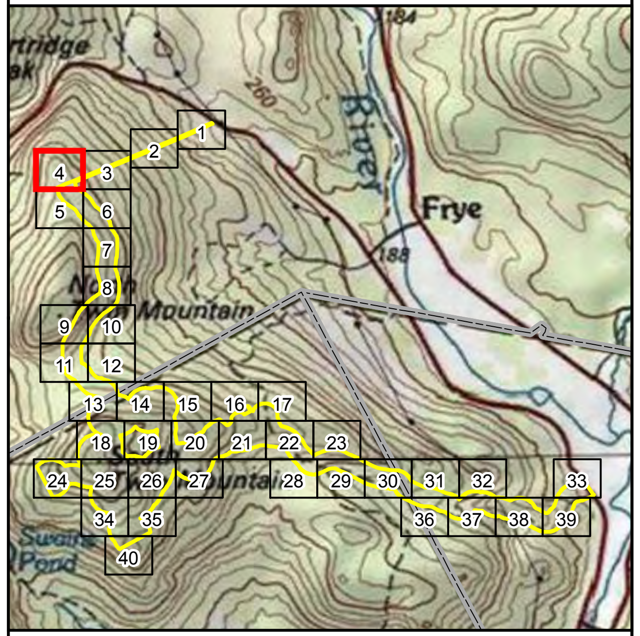

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MONTH:	JANUARY		Page 4 of 40
YEAR:	2022		

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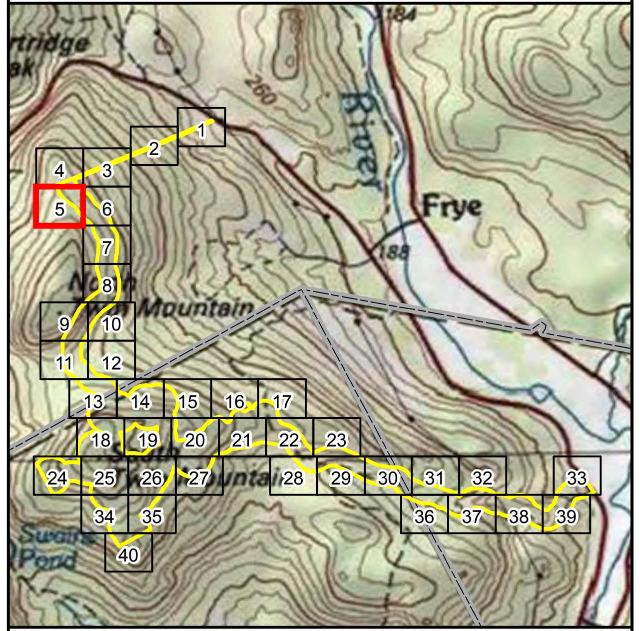

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MONTH:	JANUARY	Page 5 of 40	
YEAR:	2022		

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PALMER

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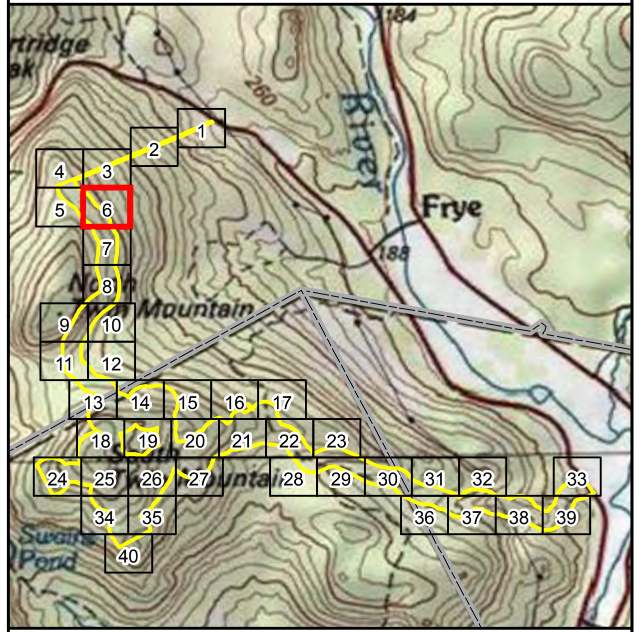

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DELINEATED WETLANDS, WATERBODIES, AND POTENTIAL VERNAL POOL SURVEY

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MONTH:	JANUARY	Page 6 of 40	
YEAR:	2022		

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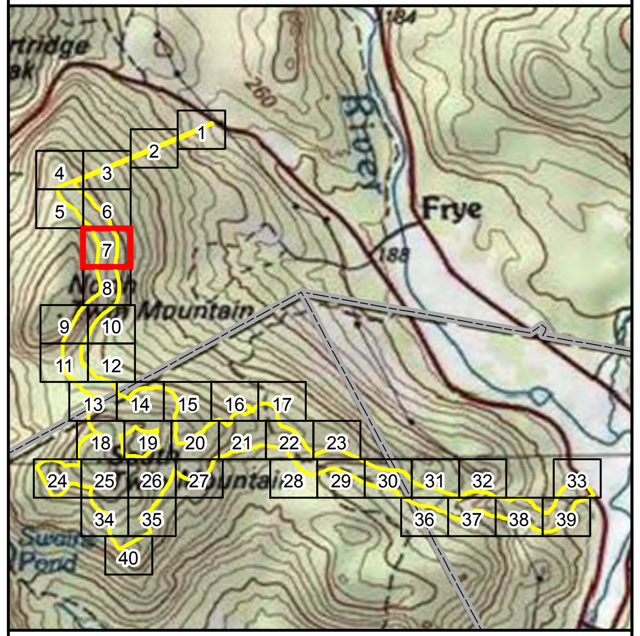

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TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:

DELINEATED WETLANDS, WATERBODIES, AND POTENTIAL VERNAL POOL SURVEY

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON		
MONTH:	JANUARY		
YEAR:	2022		

APPENDIX A
Page 7 of 40

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FILE NO.: Palmer_TwinEnergy_Delin_AppA_ResourceDetail_11x17L.mxd

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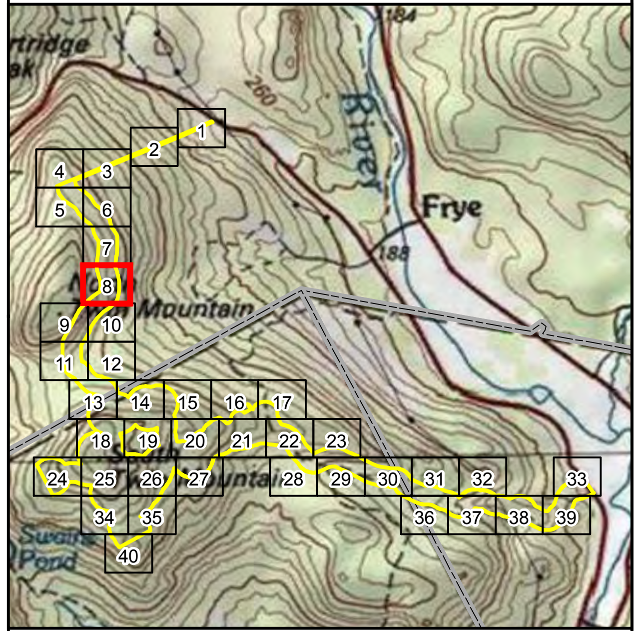

NOTES:

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Feet
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DELINEATED WETLANDS, WATERBODIES, AND POTENTIAL VERNAL POOL SURVEY

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON		
MONTH:	JANUARY	**APPENDIX A**	Page 8 of 40
YEAR:	2022		

Flycatcher
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PALMER

FILE NO.: Palmer_TwinEnergy_Delin_AppA_ResourceDetail_11x17L.mxd

LEGEND

- PROJECT SURVEY AREA
- CORPS PLOT
- CULVERT
- POTENTIALLY SIGNIFICANT VERNAL POOL
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- DELINEATED PERENNIAL STREAM
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- DELINEATED WETLAND
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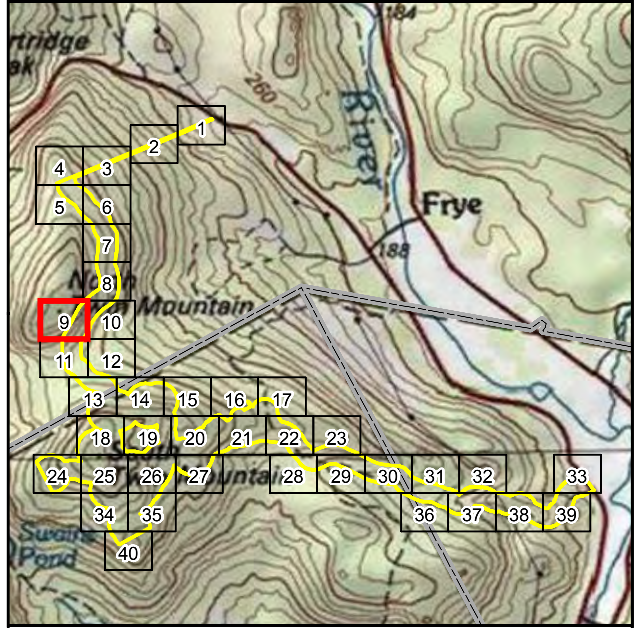

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Feet

1 " = 100 '

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PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:

DELINEATED WETLANDS, WATERBODIES, AND POTENTIAL VERNAL POOL SURVEY

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON		
MONTH:	JANUARY		
YEAR:	2022		

APPENDIX A

Flycatcher LAND + SCIENCE + PEOPLE

PALMER

FILE NO.: Palmer_TwinEnergy_Delin_AppA_ResourceDetail_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

Plot Date: 1/27/2022, 14:01:58 PM by JAKEN -- LAYOUT: ANSI B(11"x17")
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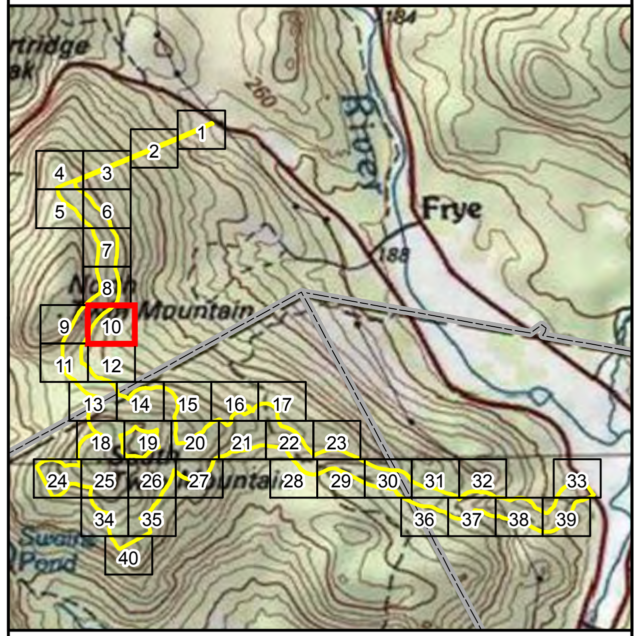

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Flycatcher LAND • SCIENCE • PEOPLE

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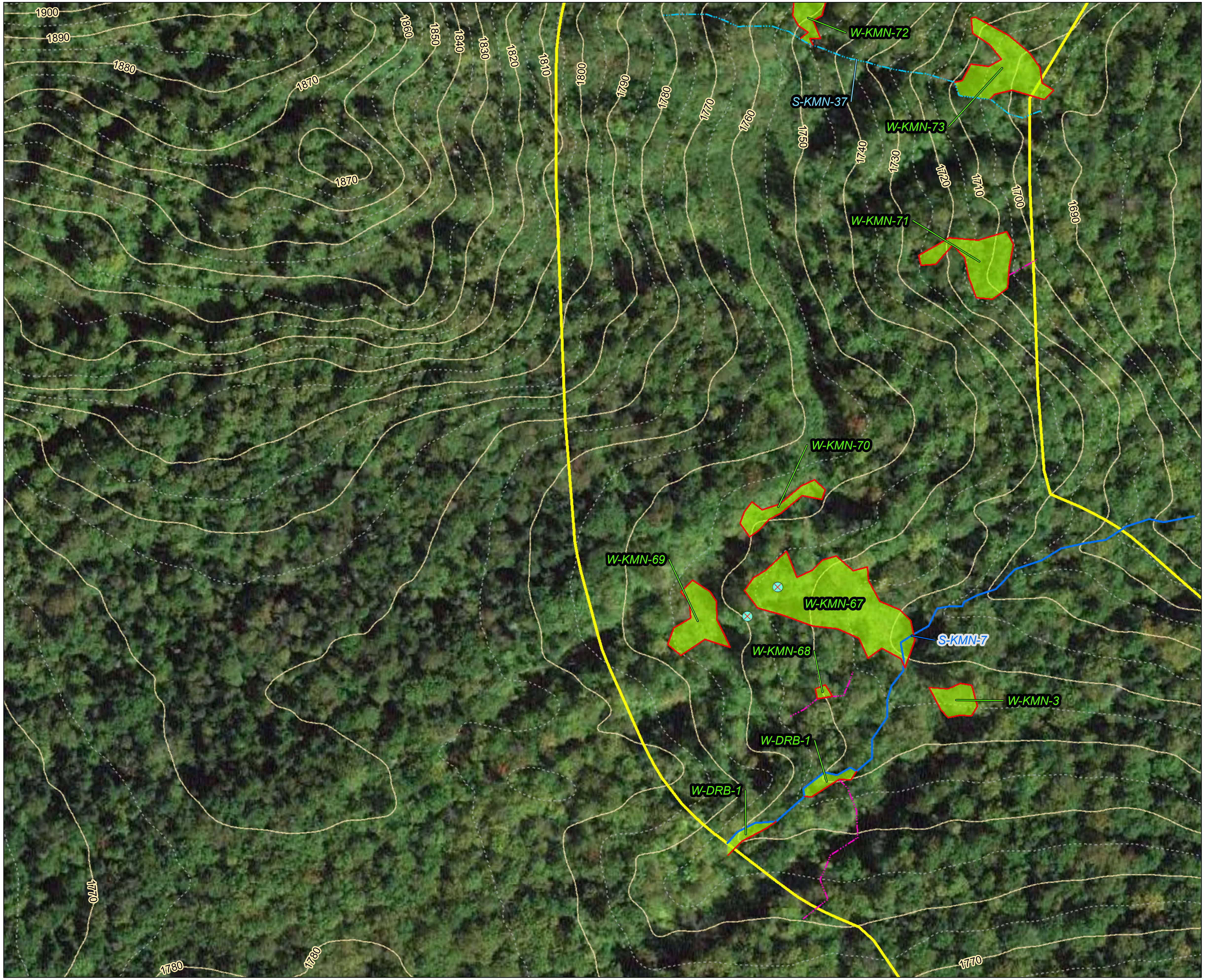

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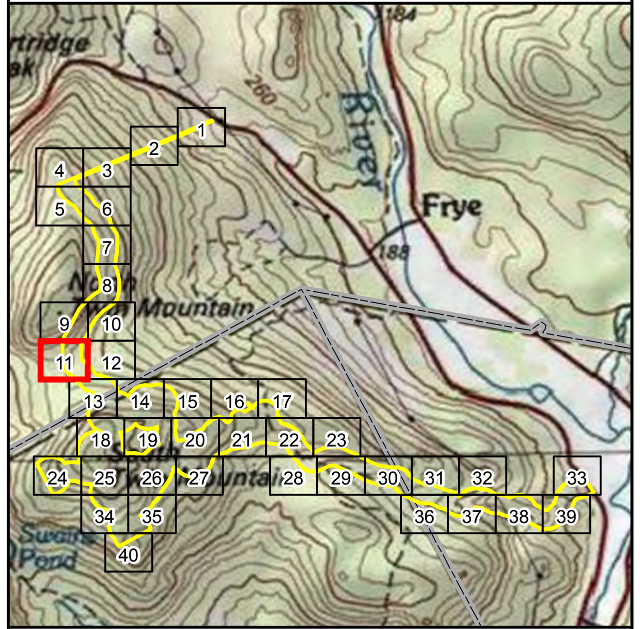

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Flycatcher LAND • SCIENCE • PEOPLE

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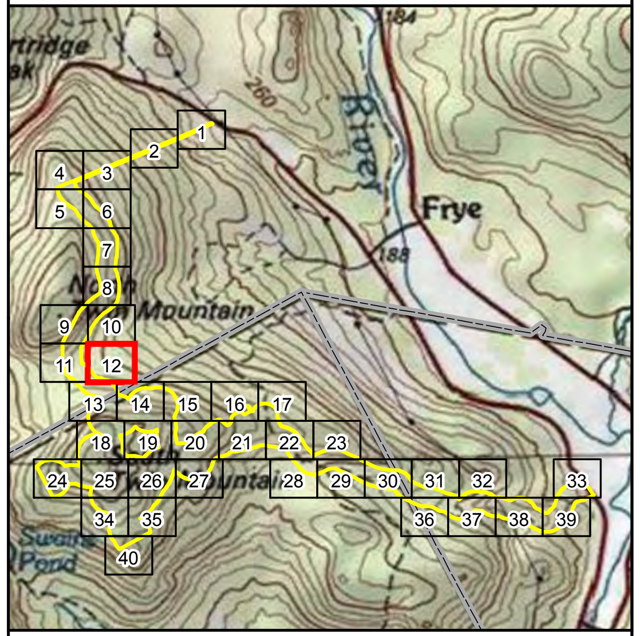

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Flycatcher LAND • SCIENCE • PEOPLE

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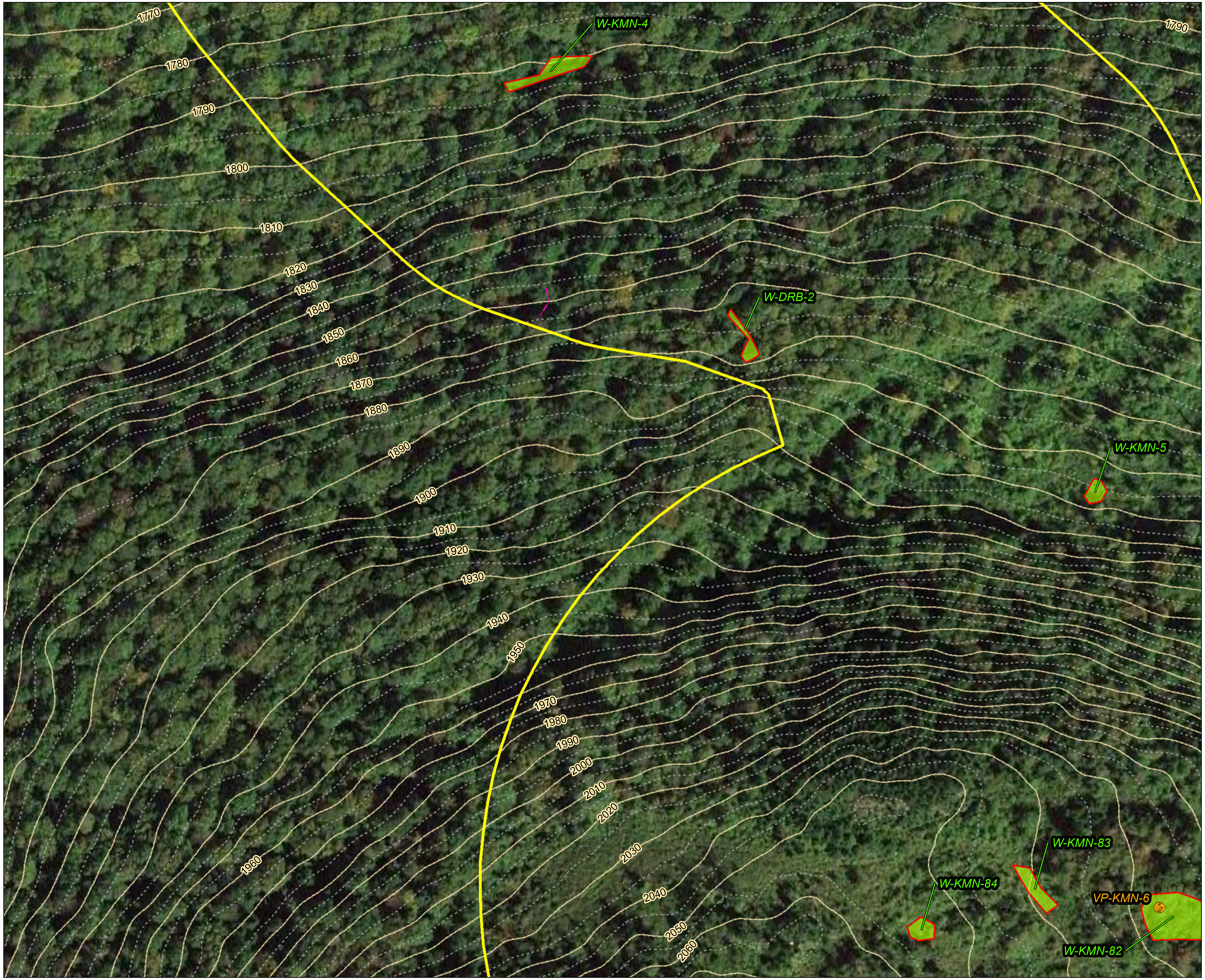

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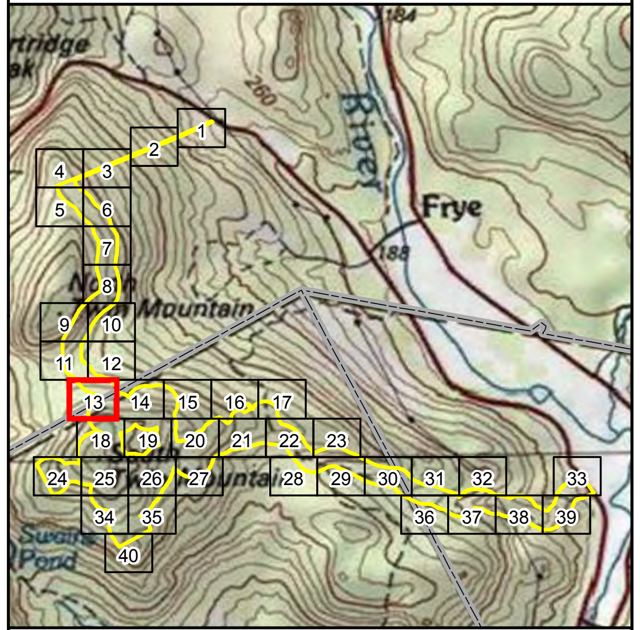

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Flycatcher LAND + SCIENCE + PEOPLE
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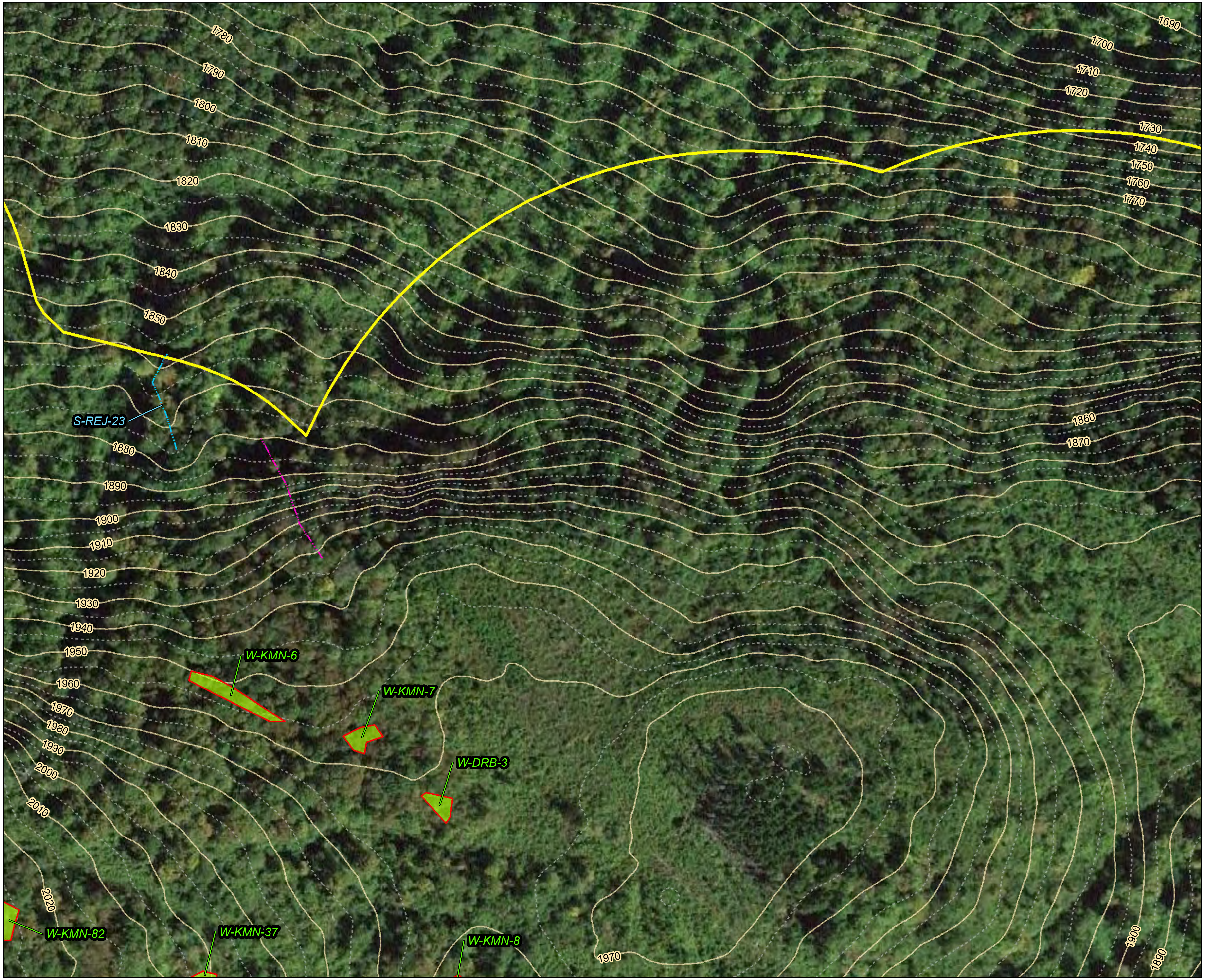

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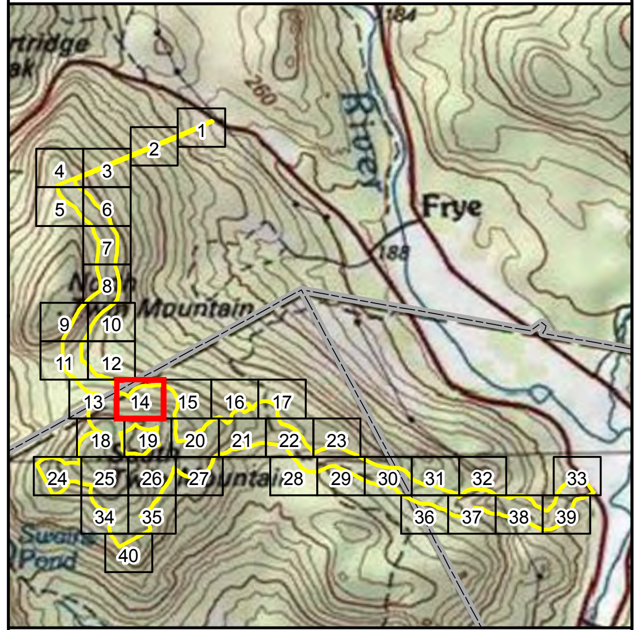

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APPENDIX A

Flycatcher LAND • SCIENCE • PEOPLE
PALMER

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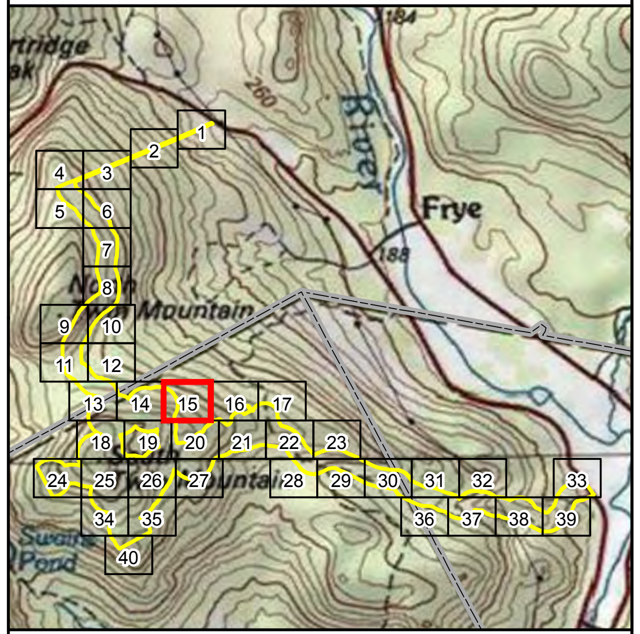

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MONTH:	JANUARY	Page 15 of 40	
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Flycatcher LAND • SCIENCE • PEOPLE

PALMER

FILE NO.: Palmer_TwinEnergy_Delin_AppA_ResourceDetail_11x17L.mxd

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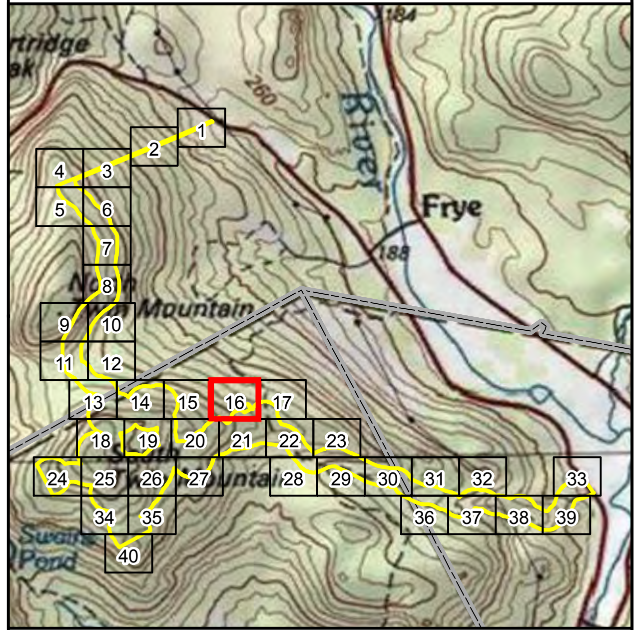

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YEAR:	2022	Page 16 of 40	

Flycatcher LAND + SCIENCE + PEOPLE

PALMER

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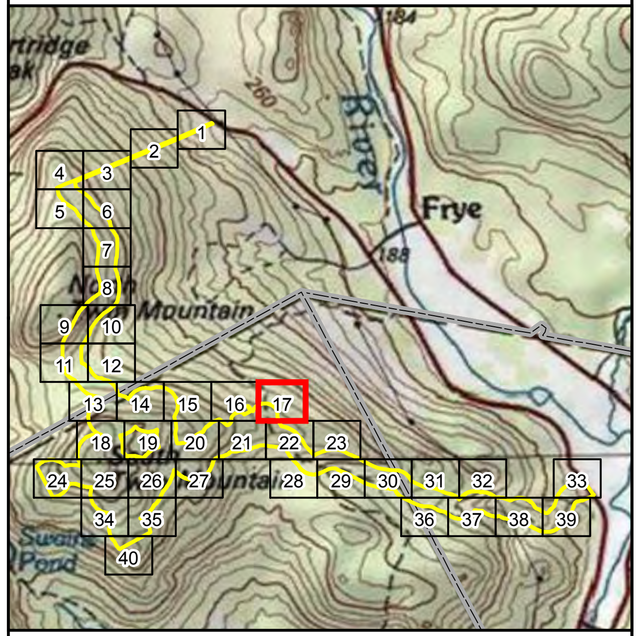

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Flycatcher
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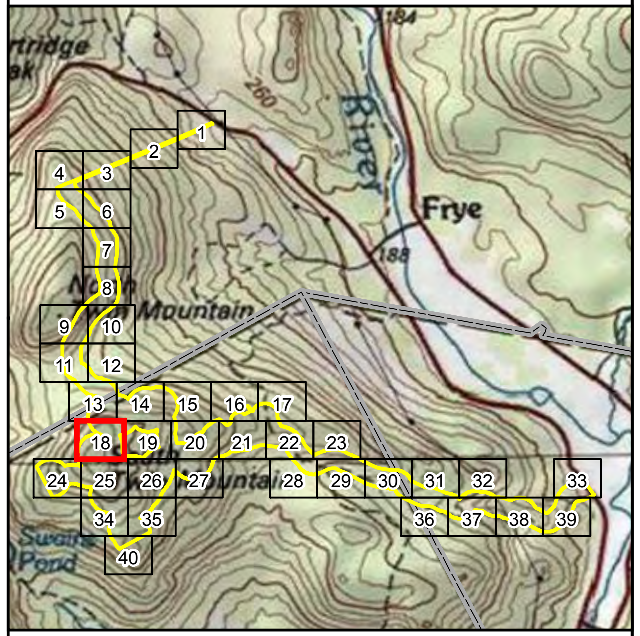

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Flycatcher LAND + SCIENCE + PEOPLE
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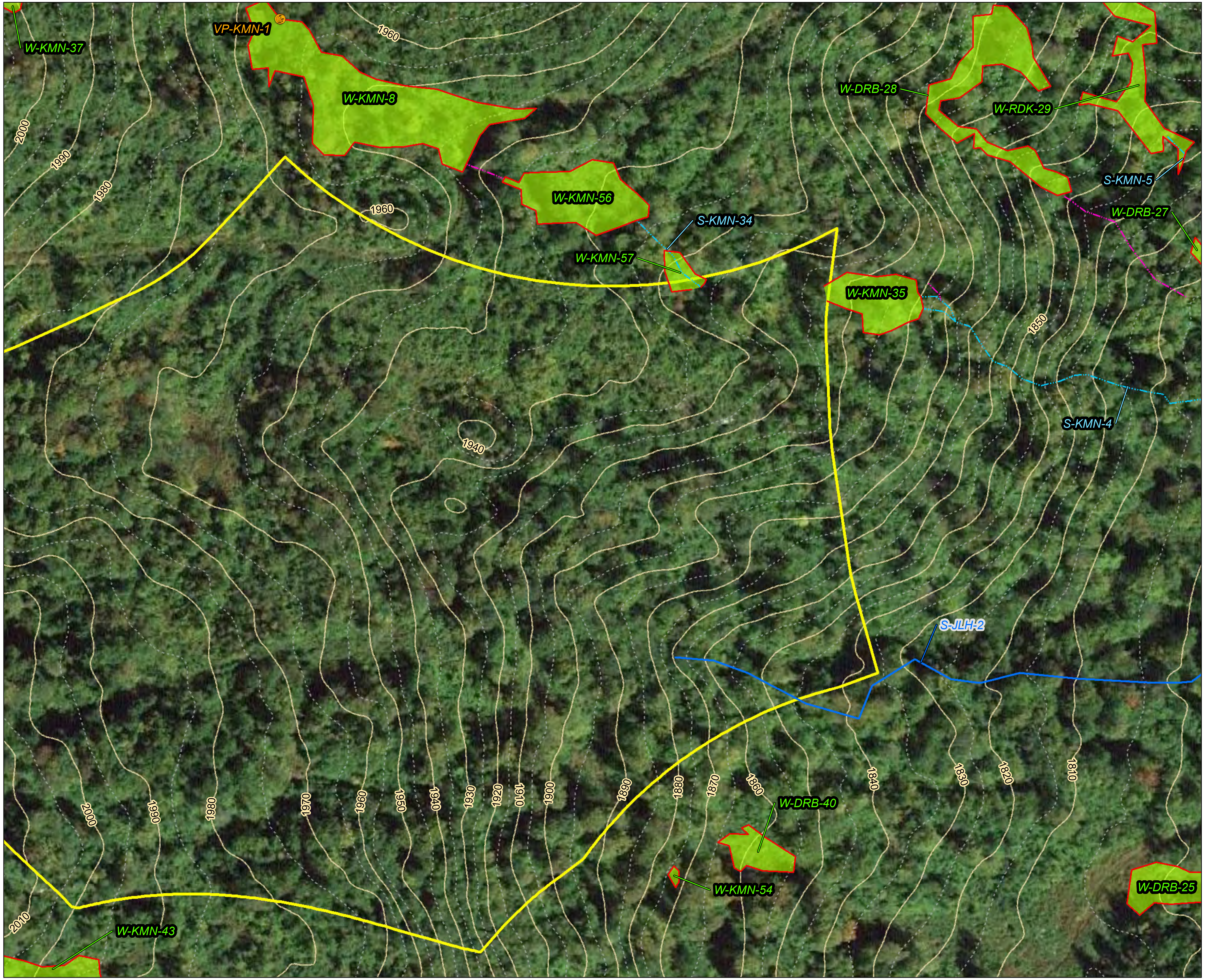

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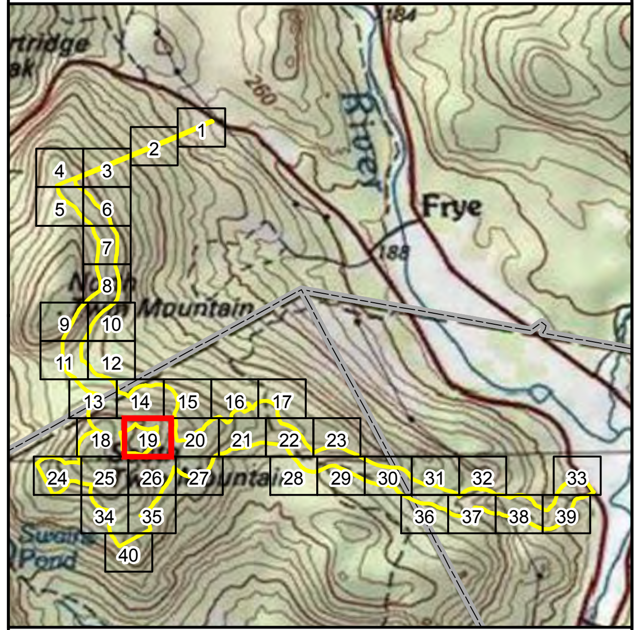

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Flycatcher LAND • SCIENCE • PEOPLE

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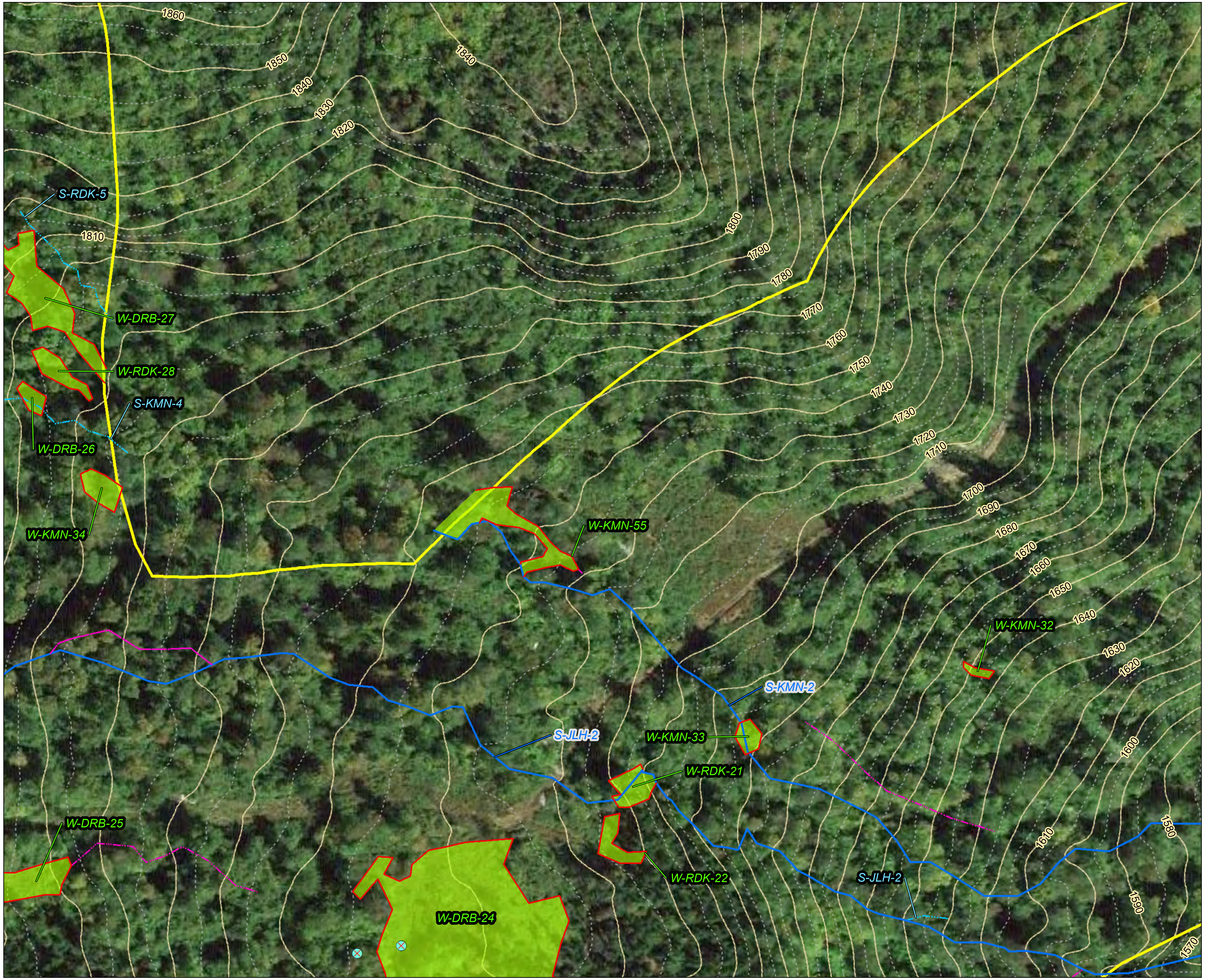

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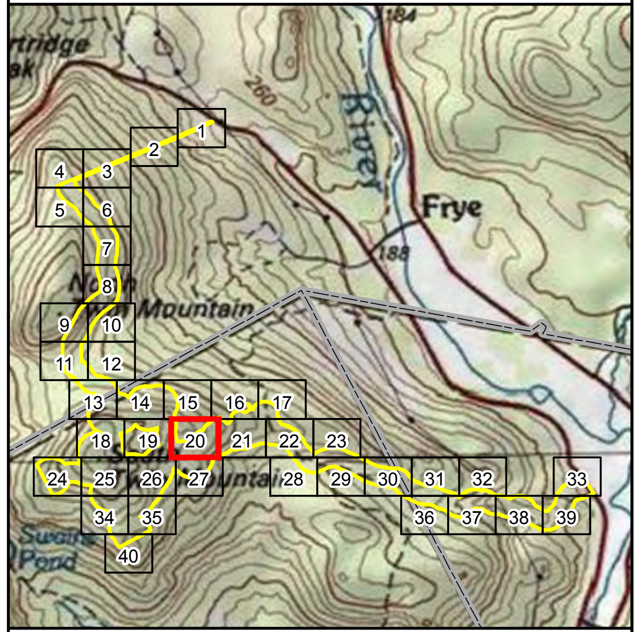

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Flycatcher
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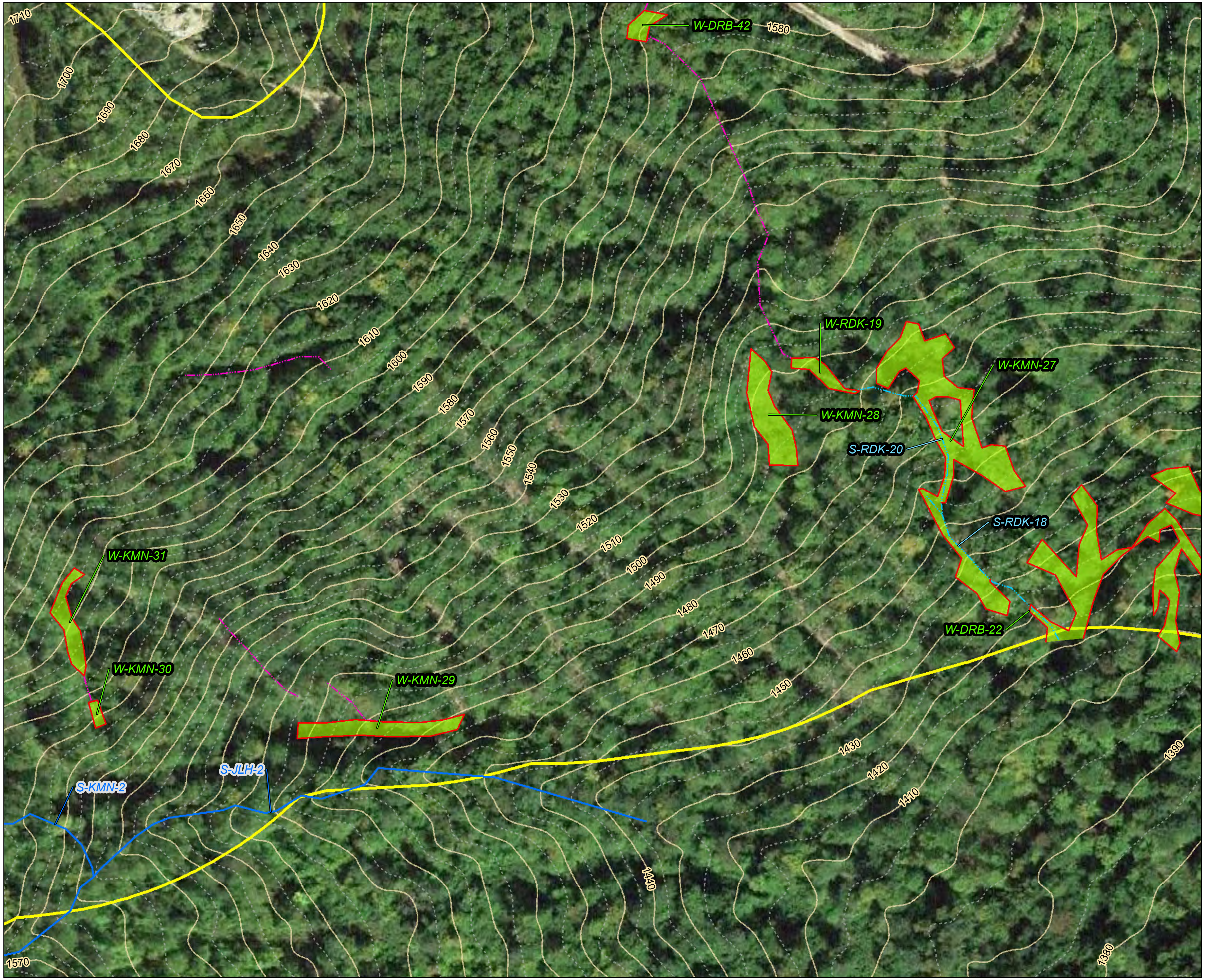

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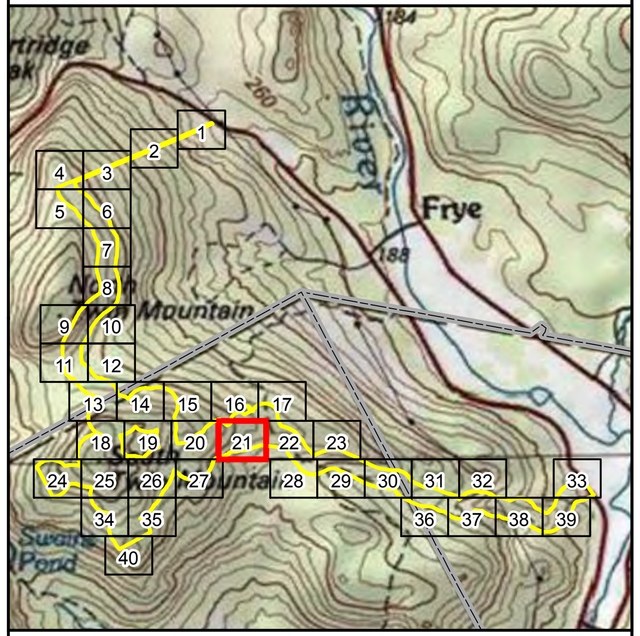

NOTES:

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2 RESOURCES WERE DELINEATED BY FLYCATCHER FROM SEPTEMBER THROUGH NOVEMBER 2021.

N

0 100 200

Feet

1 " = 100 '

1:1,200

PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:

DELINEATED WETLANDS, WATERBODIES, AND POTENTIAL VERNAL POOL SURVEY

DRAWN BY:	D. KENWORTHY	PROJ NO.:	212P
CHECKED BY:	K. NICKERSON		
MONTH:	JANUARY		
YEAR:	2022		

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PALMER

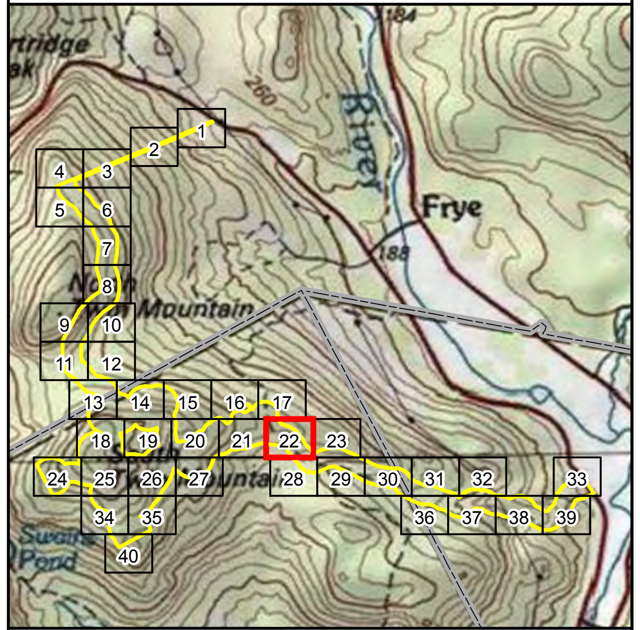
FILE NO.: Palmer_TwinEnergy_Delin_AppA_ResourceDetail_11x17L.mxd

Coordinate System: NAD 1983 StatePlane Maine West FIPS 1802 Feet (Foot US)
Map Rotation: 0

Plot Date: 1/27/2022, 14:01:58 PM by JAKEN -- LAYOUT: ANSI B(11"x17")
Path: D:\Flycatcher\Projects\Solaya\Palmer_TwinEnergy_Delin_AppA_ResourceDetail_11x17L.mxd

LEGEND

- PROJECT SURVEY AREA
- CORPS PLOT
- CULVERT
- POTENTIALLY SIGNIFICANT VERNAL POOL
- UPLAND DRAINAGE
- DELINEATED INTERMITTENT STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED WETLAND BOUNDARY
- DELINEATED WETLAND
- CONTOUR LINE (10' INTERVAL)
- CONTOUR LINE (5' INTERVAL)



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Feet
1 " = 100 '
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PROJECT:
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TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:
DELINEATED WETLANDS, WATERBODIES, AND POTENTIAL VERNAL POOL SURVEY

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON	**APPENDIX A**	
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Flycatcher LAND + SCIENCE + PEOPLE

PALMER

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- CORPS PLOT
- CULVERT
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- CONTOUR LINE (10' INTERVAL)
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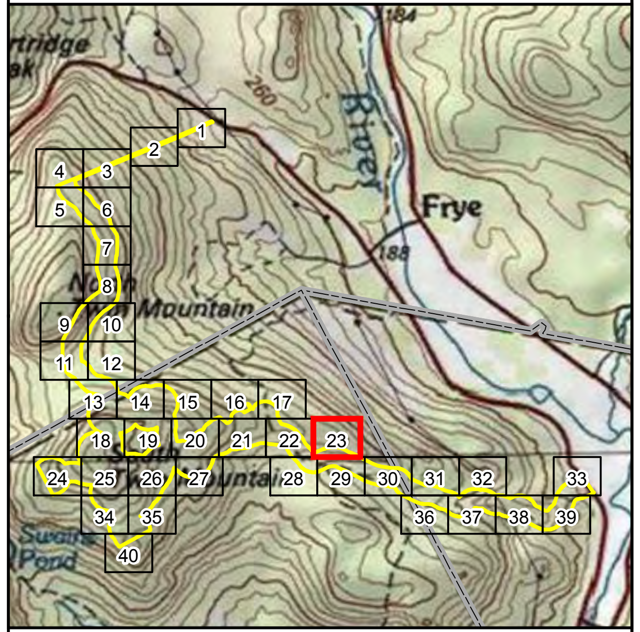

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DRAWN BY:	D. KENWORTHY
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MONTH:	JANUARY
YEAR:	2022

PROJ NO.: 21ZP

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Flycatcher LAND • SCIENCE • PEOPLE

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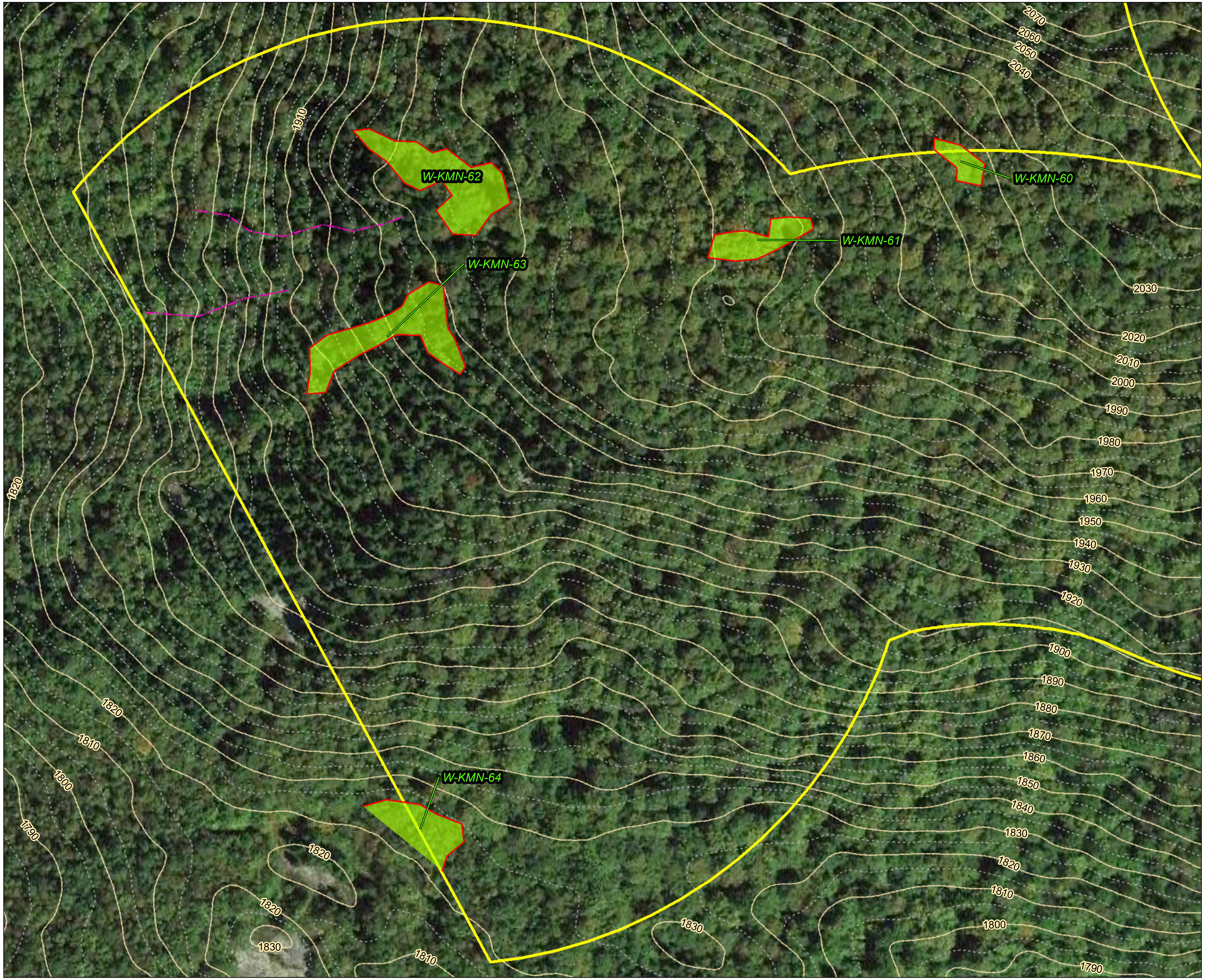

LEGEND

- PROJECT SURVEY AREA
- CORPS PLOT
- CULVERT
- POTENTIALLY SIGNIFICANT VERNAL POOL
- UPLAND DRAINAGE
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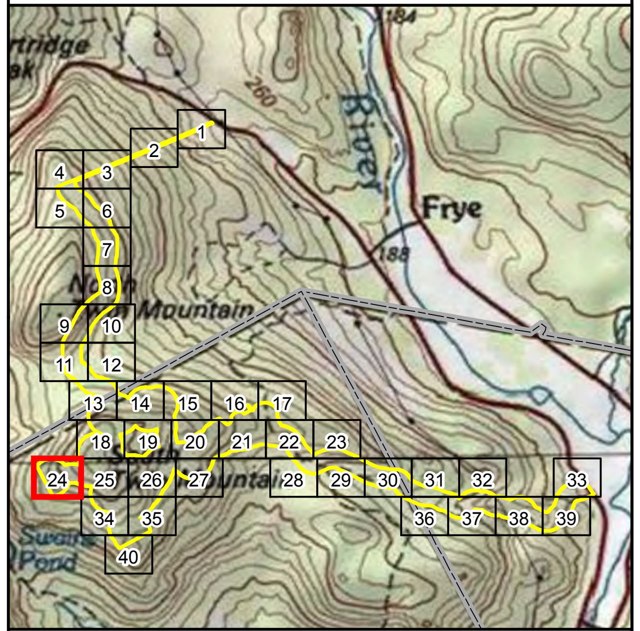

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LEGEND

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- CONTOUR LINE (10' INTERVAL)
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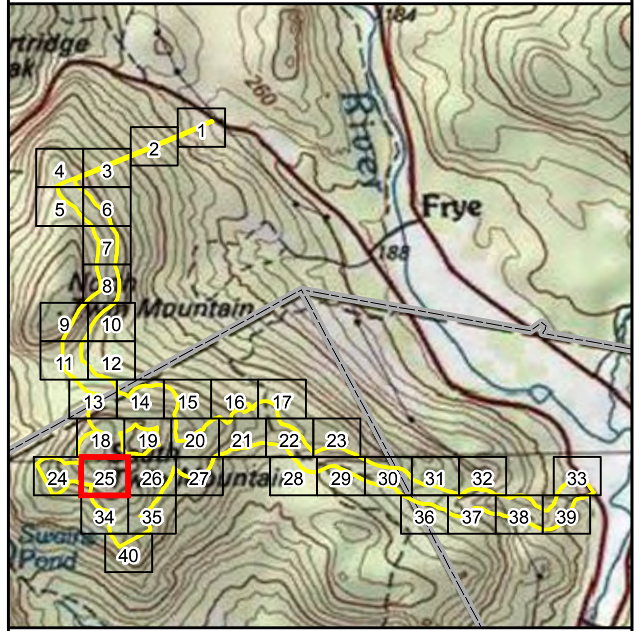

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CHECKED BY:	K. NICKERSON	APPENDIX A	
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Flycatcher LAND • SCIENCE • PEOPLE
PALMER

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PROJECT SURVEY AREA
CORPS PLOT
CULVERT
POTENTIALLY SIGNIFICANT VERNAL POOL
UPLAND DRAINAGE
DELINEATED INTERMITTENT STREAM
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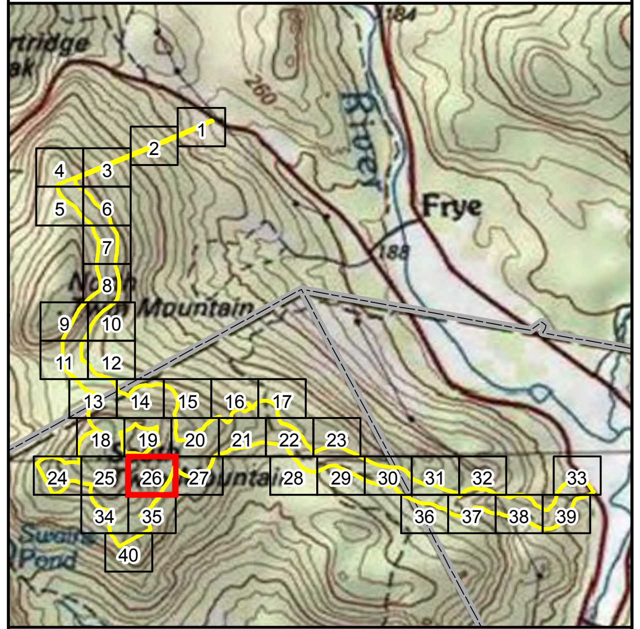

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Flycatcher
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PALMER

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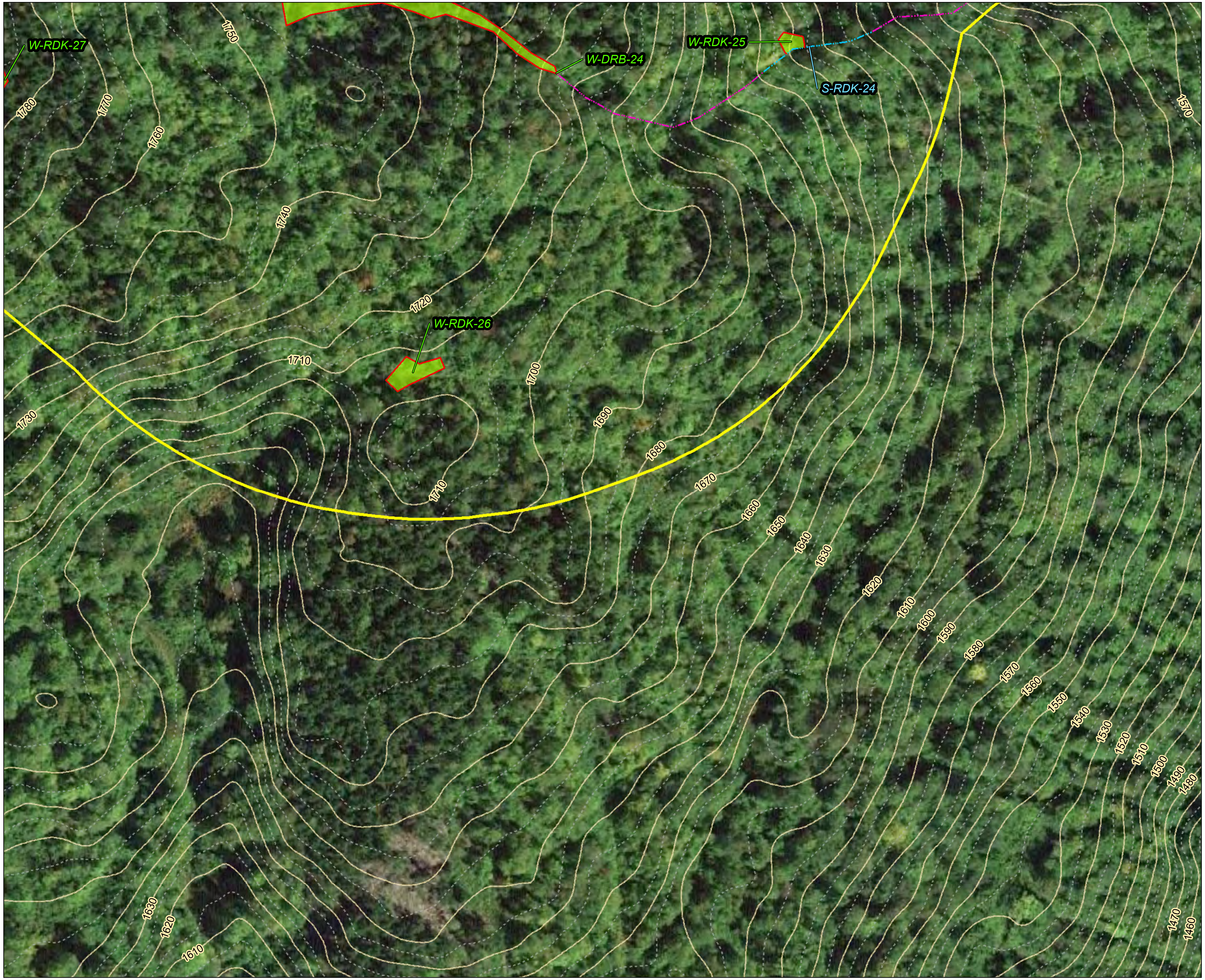

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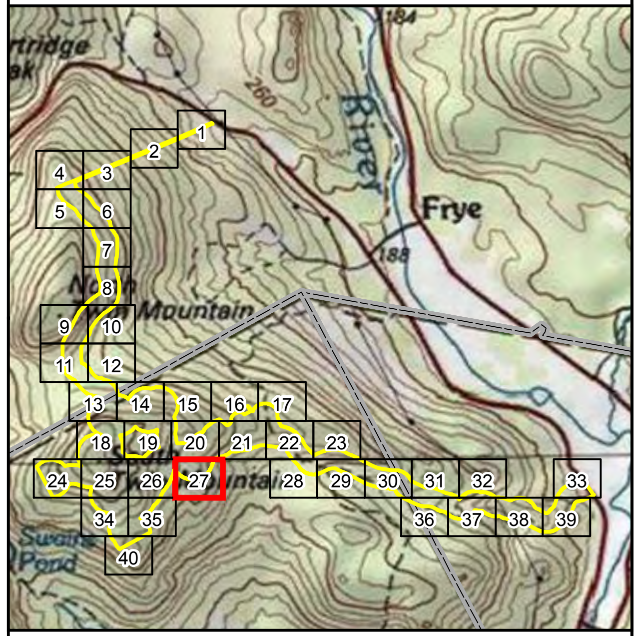

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Flycatcher
LAND + SCIENCE + PEOPLE

PALMER

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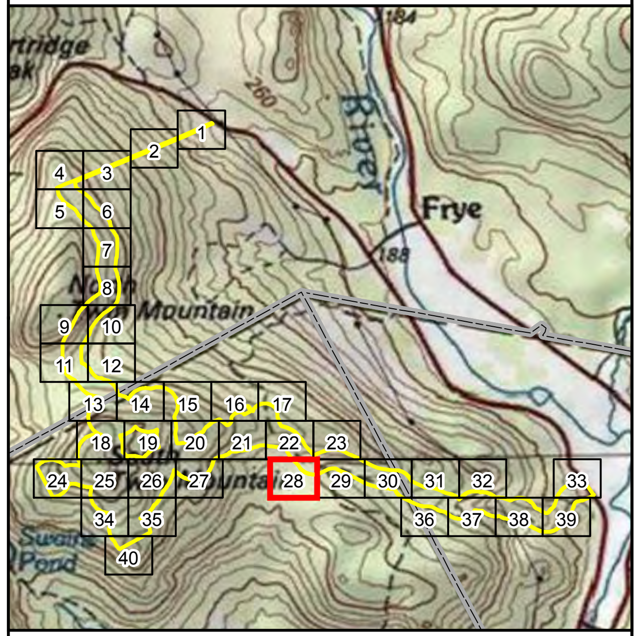

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DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
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Flycatcher LAND • SCIENCE • PEOPLE

PALMER

FILE NO.: Palmer_TwinEnergy_Delin_AppA_ResourceDetail_11x17L.mxd

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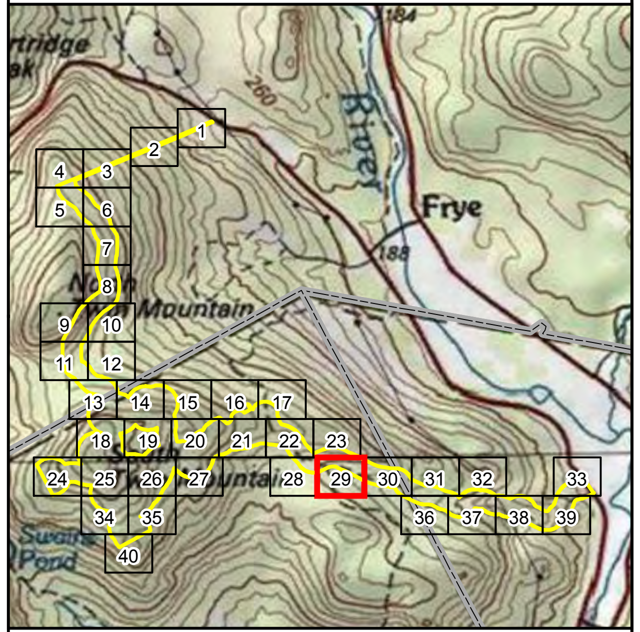

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Flycatcher LAND • SCIENCE • PEOPLE
PALMER

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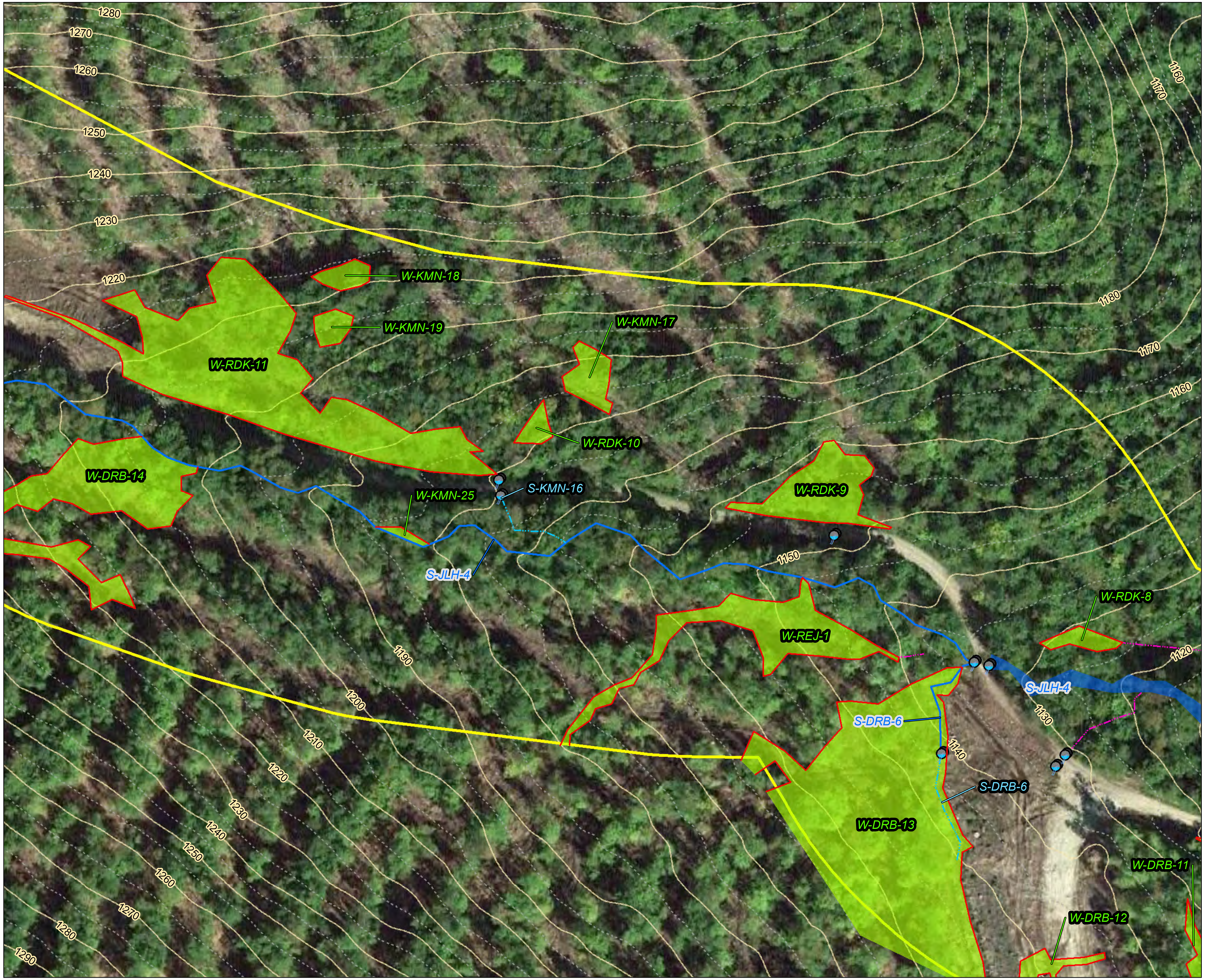

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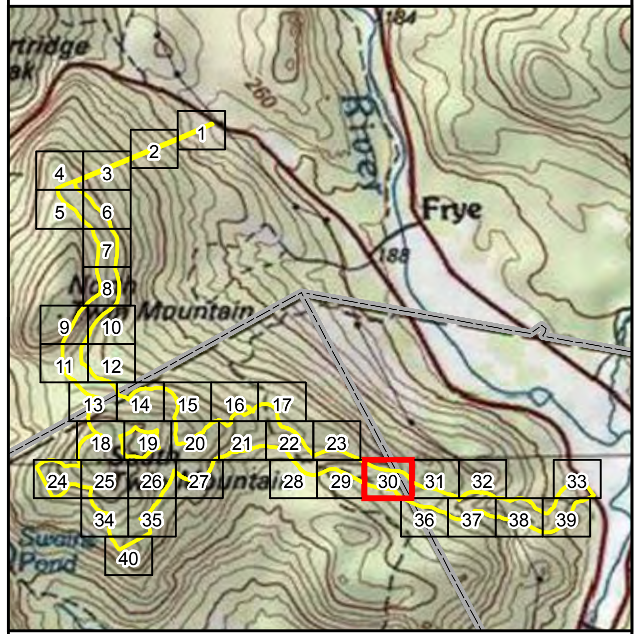

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Flycatcher LAND • SCIENCE • PEOPLE

PALMER

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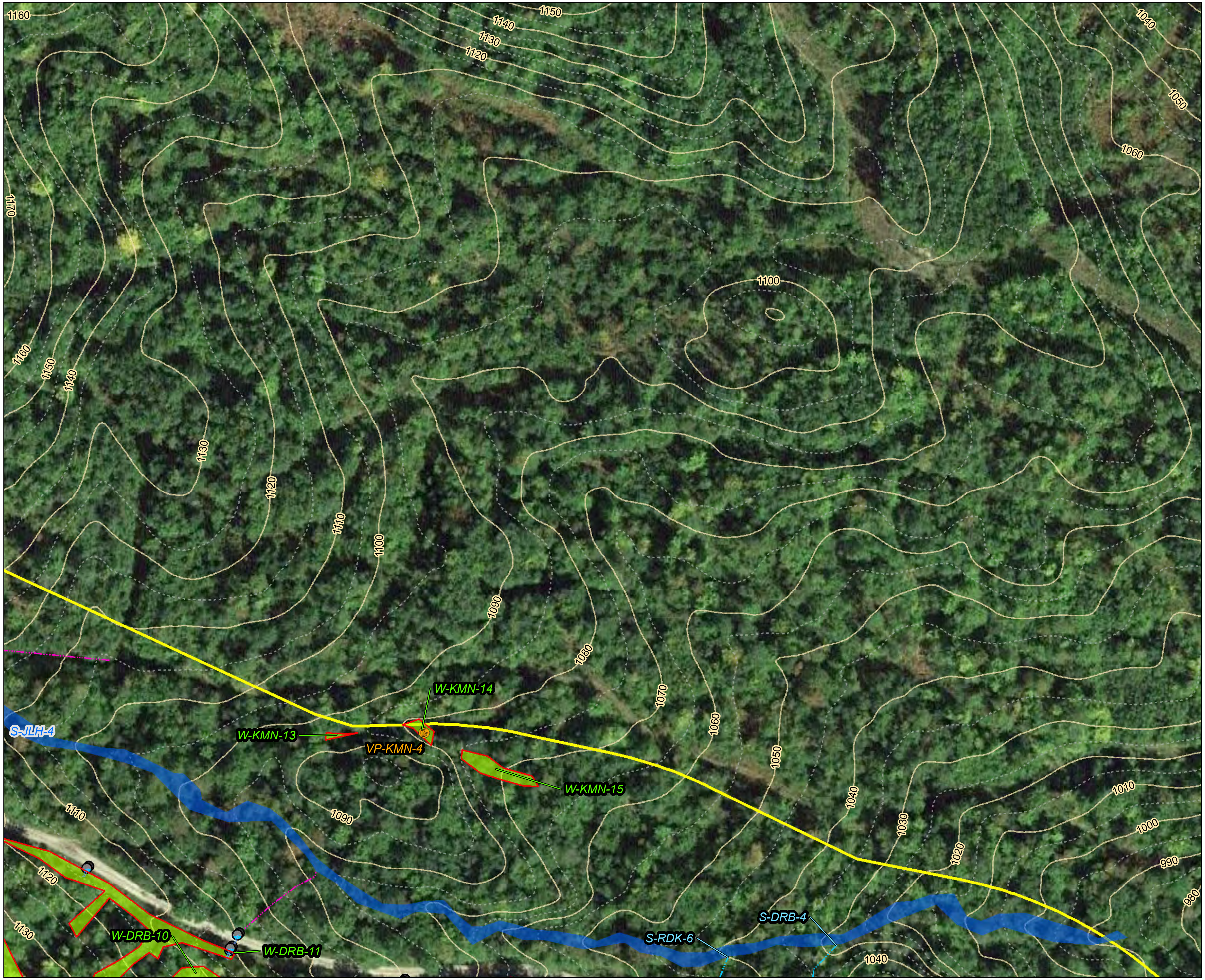

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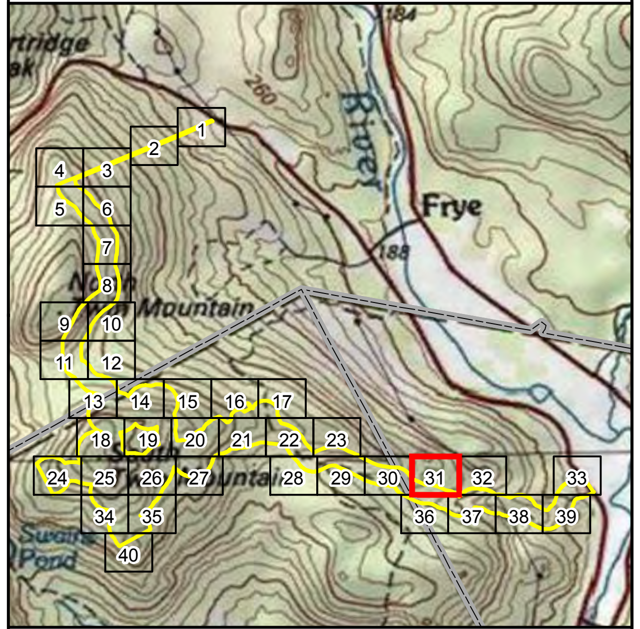

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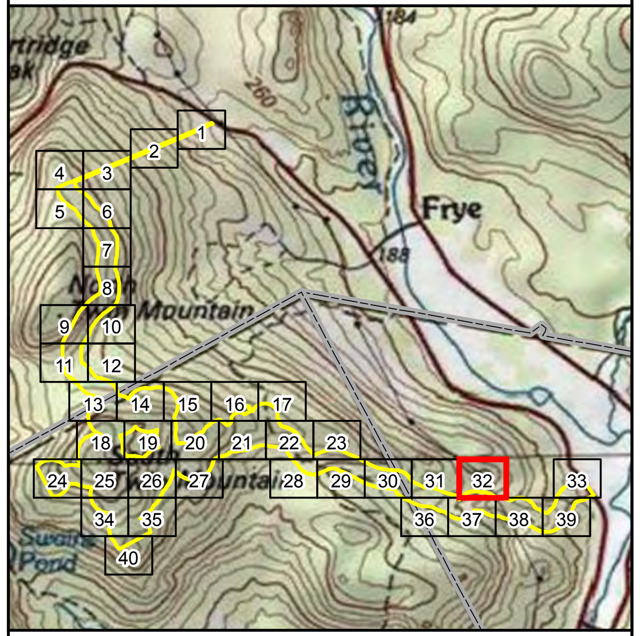

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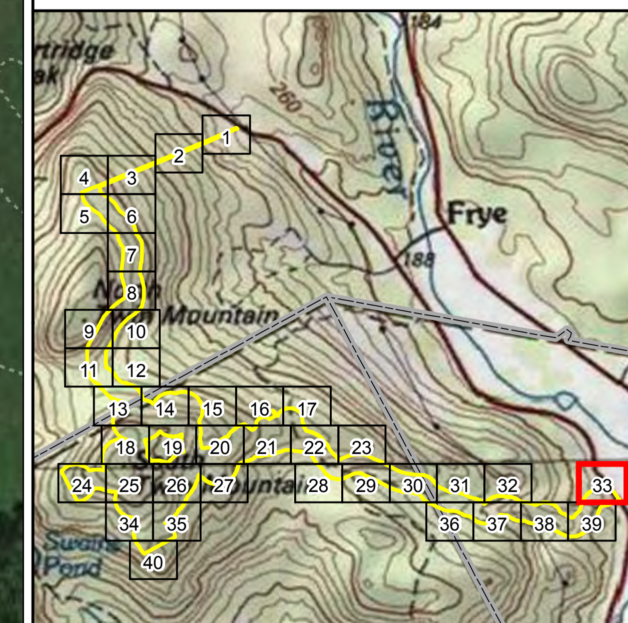

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PALMER

FILE NO.: Palmer_TwinEnergy_Delin_AppA_ResourceDetail_11x17L.mxd

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Map Rotation: 0

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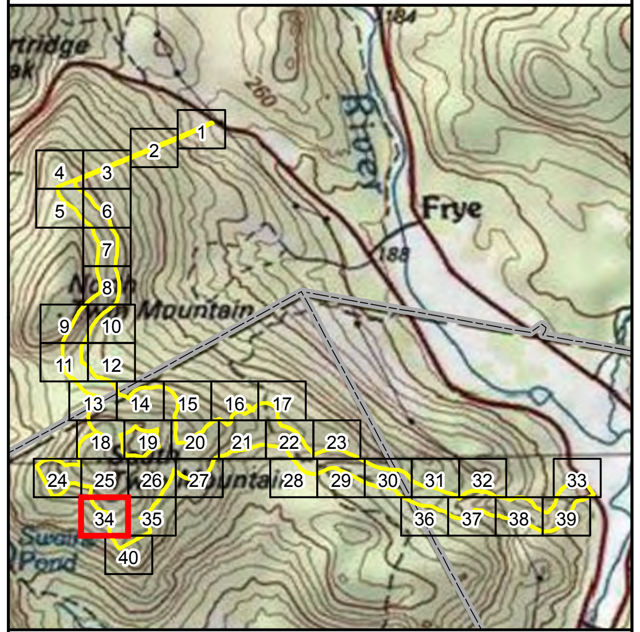
LEGEND

- PROJECT SURVEY AREA
- CORPS PLOT
- CULVERT
- POTENTIALLY SIGNIFICANT VERNAL POOL
- UPLAND DRAINAGE
- DELINEATED INTERMITTENT STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED PERENNIAL STREAM
- DELINEATED WETLAND BOUNDARY
- DELINEATED WETLAND
- CONTOUR LINE (10' INTERVAL)
- CONTOUR LINE (5' INTERVAL)



NOTES:

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2 RESOURCES WERE DELINEATED BY FLYCATCHER FROM SEPTEMBER THROUGH NOVEMBER 2021.

N

0 100 200

Feet

1 " = 100 '

1:1,200

PROJECT:

TWIN ENERGY LLC
TWIN ENERGY PROJECT
OXFORD COUNTY, MAINE

TITLE:

DELINEATED WETLANDS, WATERBODIES, AND POTENTIAL VERNAL POOL SURVEY

DRAWN BY:	D. KENWORTHY	PROJ NO.:	21ZP
CHECKED BY:	K. NICKERSON	**APPENDIX A**	
MONTH:	JANUARY	Page 34 of 40	
YEAR:	2022		

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PALMER

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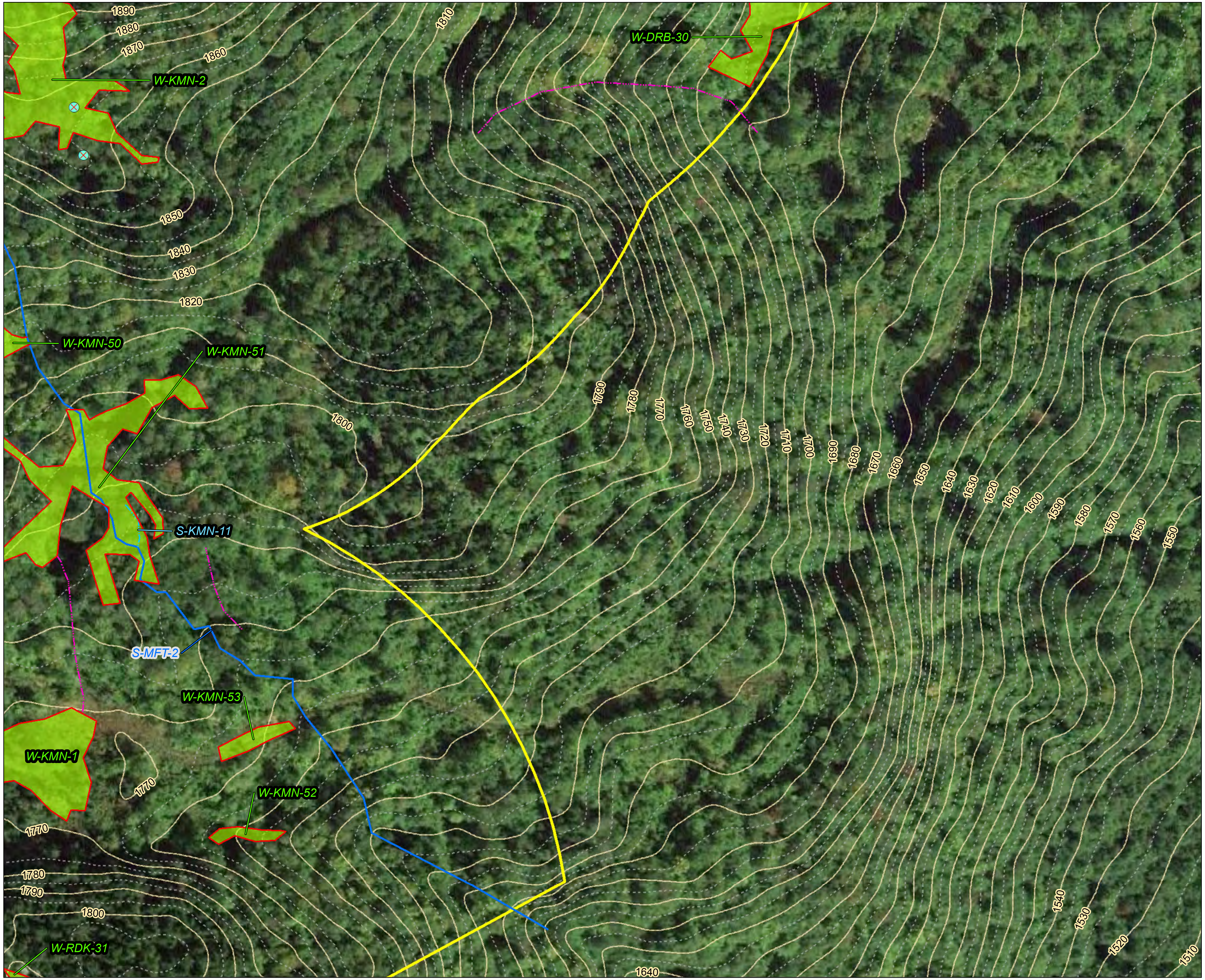

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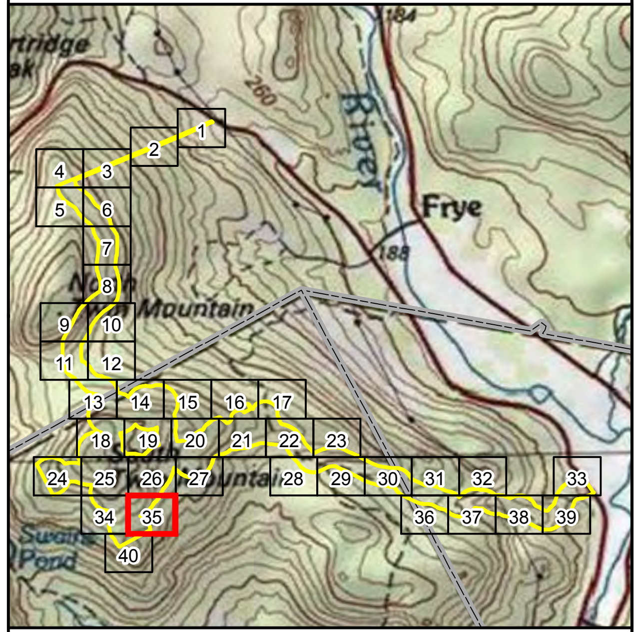

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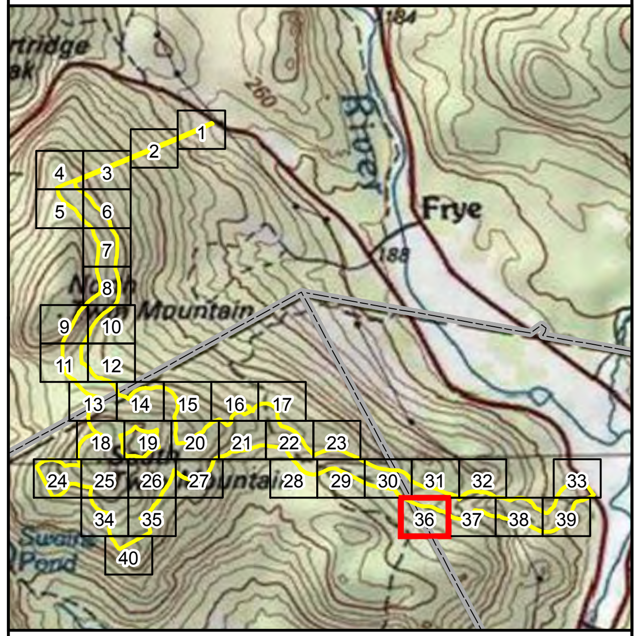

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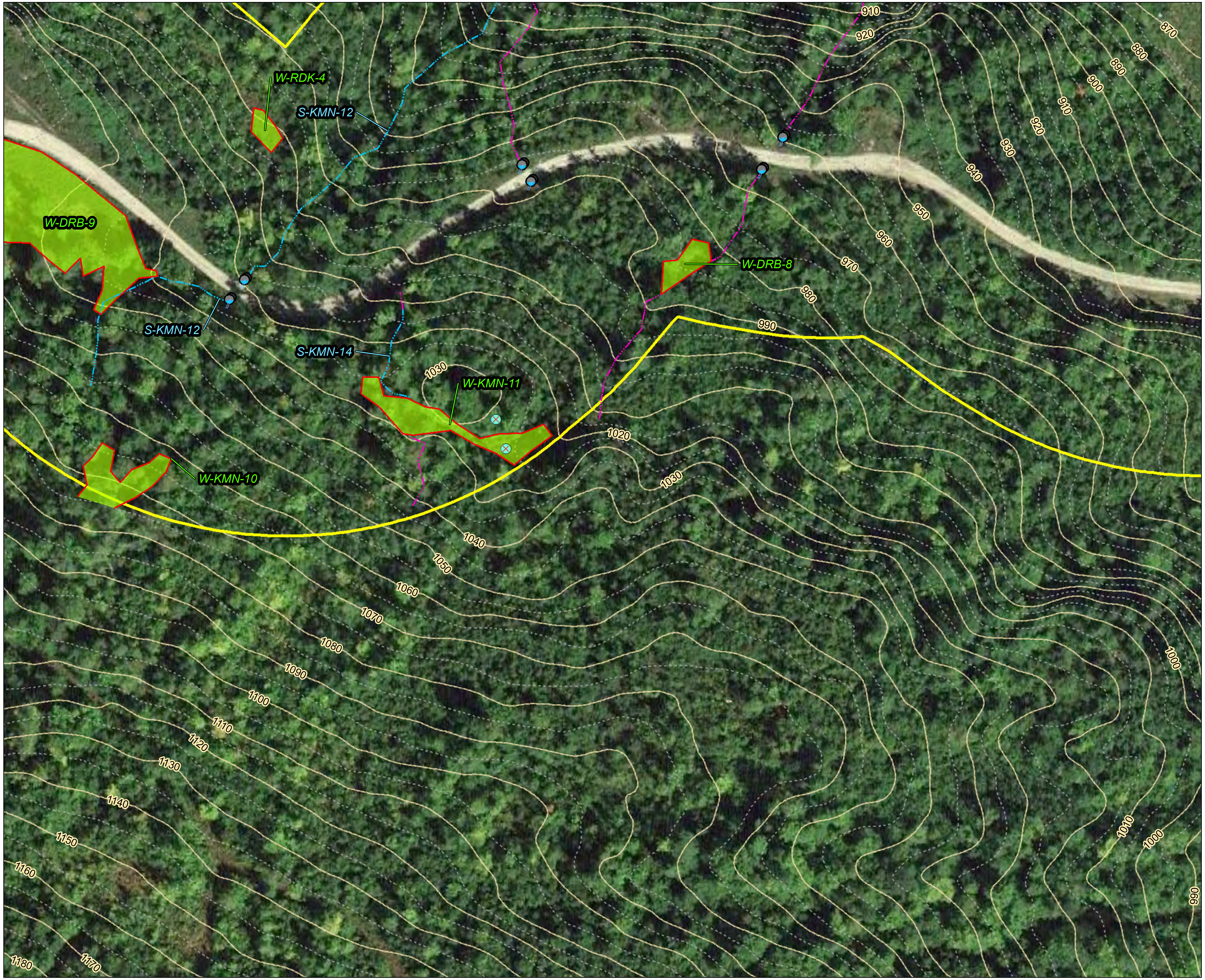

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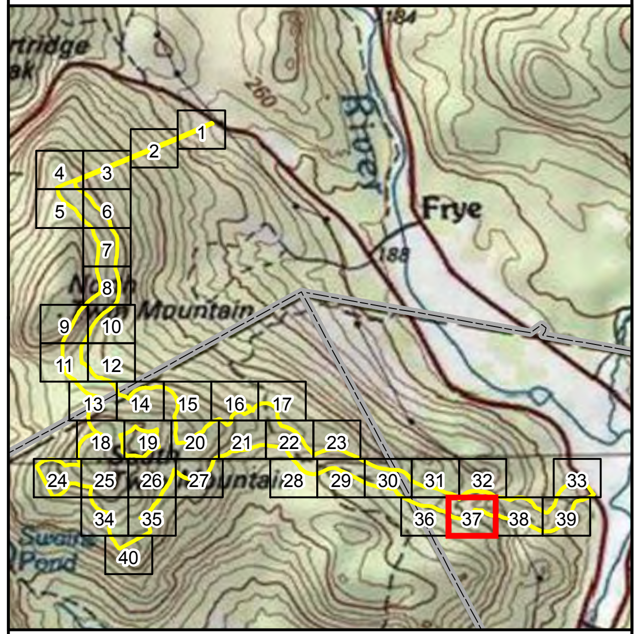

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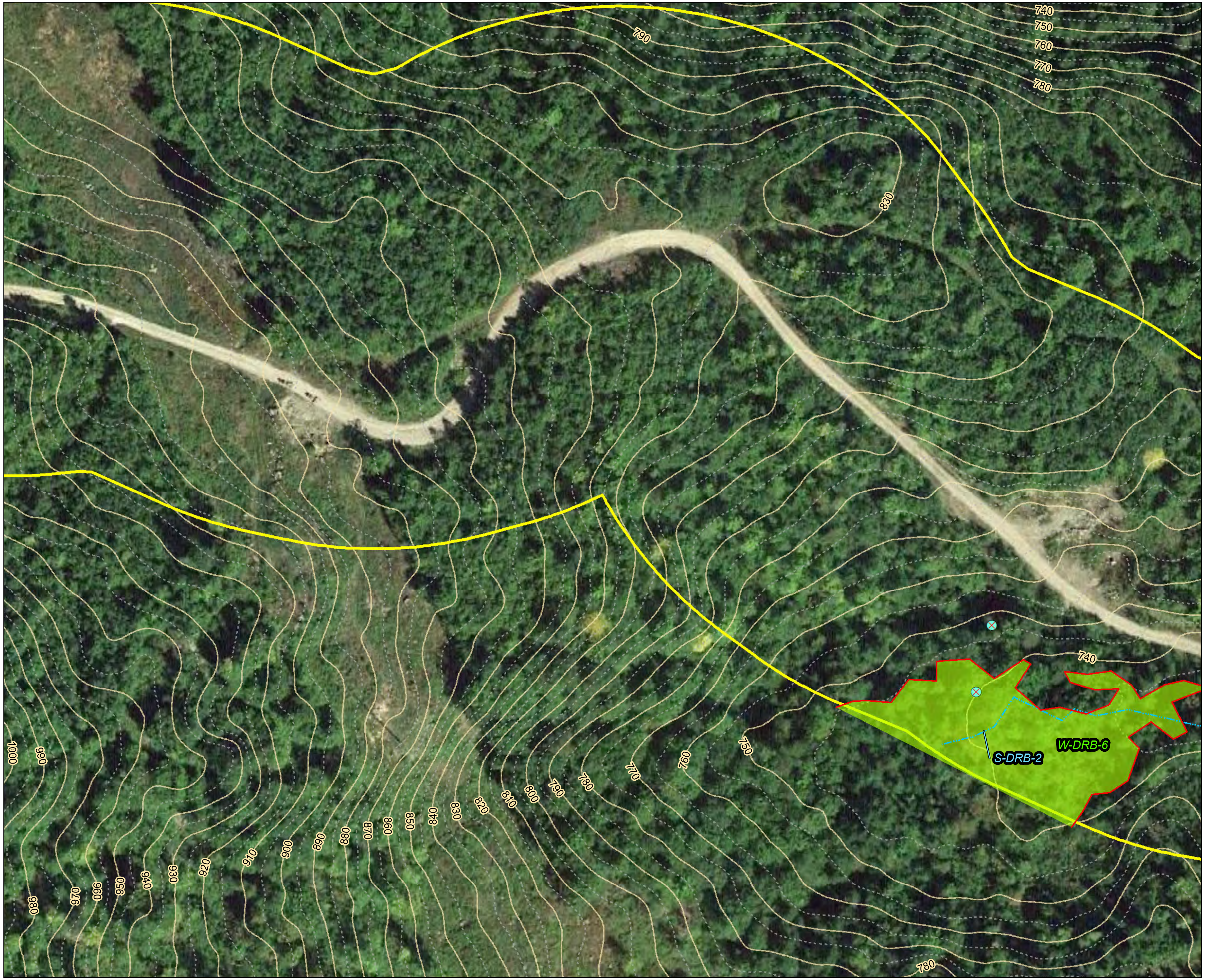

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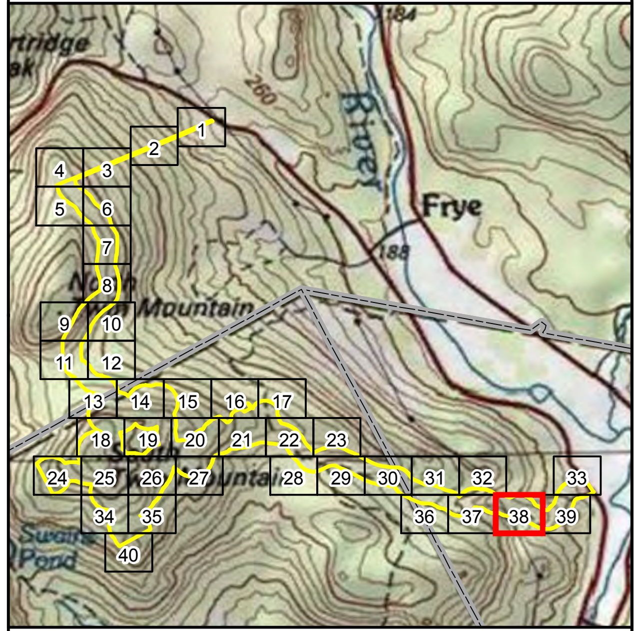

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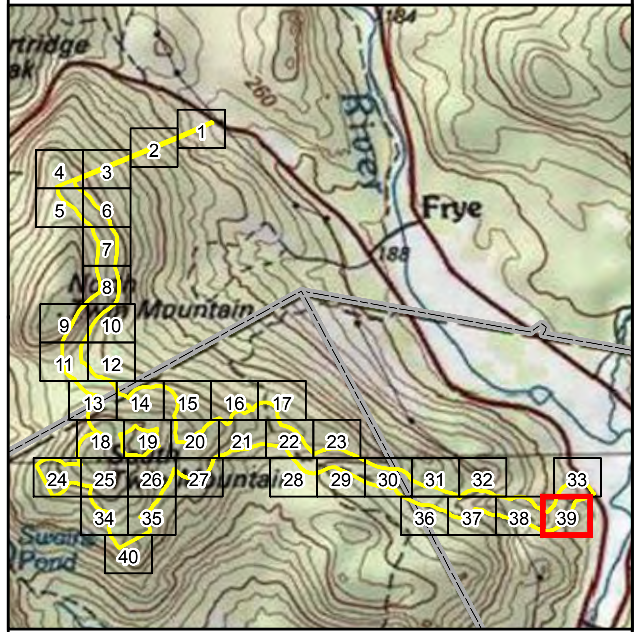

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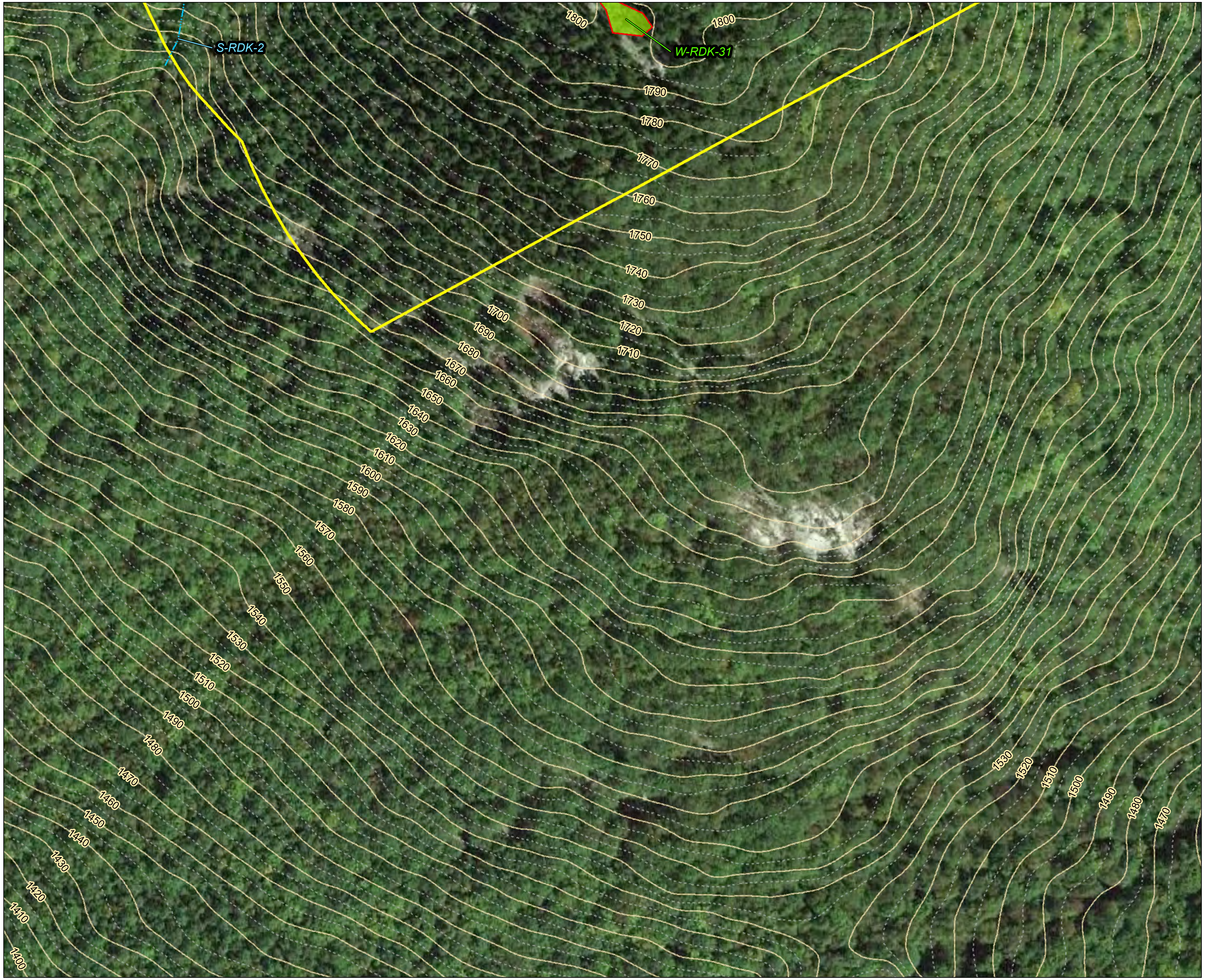

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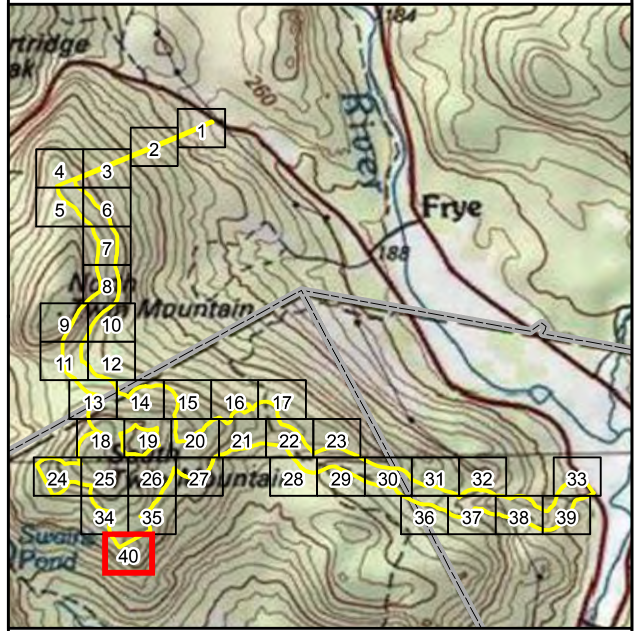

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APPENDIX B

Representative Site Photographs

Wetland W-KMN-8, October 1, 2021.

Wetland W-KMN-9, October 5, 2021.

Wetland W-KMN-11, October 5, 2021.

Watercourse S-KMN-11, October 5, 2021.

Watercourse S-KMN-15, October 6, 2021.

Wetland W-KMN-16, October 6, 2021.

Wetland W-KMN-27, October 7, 2021.

Wetland W-KMN-55, October 14, 2021.

Wetland W-KMN-82 and PSVP-KMN-6, November 3, 2021.

Watercourse S-JLH-4 (Goff Brook), October 7, 2021.

Watercourse S-JLH-4 (Goff Brook), October 3, 2021.

Wetland W-DRB-1, October 1, 2021.

Watercourse S-DRB-2, October 5, 2021.

Wetland W-DRB-3, October 1, 2021.

Wetland W-DRB-6, October 5, 2021.

Wetland W-DRB-8, October 5, 2021.

Wetland W-DRB-9, October 5, 2021.

Wetland W-DRB-12, October 6, 2021.

Wetland W-DRB-18, October 7, 2021.

Wetland W-DRB-22, October 7, 2021.

Watercourse S-RDK-5, October 6, 2021.

Wetland W-RDK-8, October 6, 2021.

Wetland W-RDK-10, October 6, 2021.

Wetland W-RDK-11, October 6, 2021.

Wetland W-RDK-14, October 7, 2021.

Wetland W-RDK-16, October 7, 2021.

Watercourse S-JLH-2, October 8, 2021.

Wetland W-RDK-23, October 8, 2021.

Wetland W-RDK-23, October 8, 2021.

Wetland W-REJ-2, October 6, 2021.

Potentially Significant Vernal Pool PSVP-KMN-5, in wetland W-KMN-59 October 19, 2021

Potentially Significant Vernal Pool PSVP-KMN-4, in wetland W-KMN-14 October 6, 2021

APPENDIX C

USACE Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Twin Energy City/County: Oxford County Sampling Date: 10/5/2021

Applicant/Owner: Twin Energy LLC State: ME Sampling Point: U-KMN-11

Investigator(s): Katelin Nickerson Section, Township, Range: ____

Landform (hillside, terrace, etc.): Shelf/ sideslope Local relief (concave, convex, none): Concave Slope %: 7

Subregion (LRR or MLRA): LRR R Lat: 44.5998031027778 Long: -70.5751036283333 Datum: NAD83

Soil Map Unit Name: NA NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No X
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes ___	No X

Is the Sampled Area within a Wetland? **Yes** ___ **No** x

If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No x	Depth (inches): ___
Water Table Present?	Yes ___	No x	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No x	Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: U-KMN-11

Tree Stratum (Plot size: 60')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fagus grandifolia*	85	Yes	FACU
2. *Picea rubens*	10	No	FACU
3. *Acer rubrum*	10	No	FAC
4. *Betula alleghaniensis*	5	No	FAC
5.			
6.			
7.			
	110	=Total Cover	

Sapling/Shrub Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fagus grandifolia*	30	Yes	FACU
2. *Picea rubens*	10	Yes	FACU
3. *Tsuga canadensis*	5	No	FACU
4. *Abies balsamea*	5	No	FAC
5.			
6.			
7.			
	50	=Total Cover	

Herb Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		=Total Cover	

Woody Vine Stratum (Plot size: 60')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	20	x 3 =	60
FACU species	140	x 4 =	560
UPL species	0	x 5 =	0
Column Totals:	160 (A)		620 (B)

Prevalence Index = B/A = 3.88

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point U-KMN-11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	2.5Y 2.5/1	100					Loamy/Clayey	sandy loam
3-6	10YR 4/6	100					Loamy/Clayey	sandy loam
6-14	2.5Y 5/4	90	7.5YR 5/6	10	C	M	Loamy/Clayey	Prominent redox concentrations
14-18	2.5Y 5/4	100					Loamy/Clayey	gravely sandy loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ High Chroma Sands (S11) (**LRR K, L)**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Compact restrictive layer

Depth (inches): 18

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Twin Energy City/County: Oxford County Sampling Date: 10/5/2021

Applicant/Owner: Twin Energy LLC State: ME Sampling Point: W-KMN-11

Investigator(s): Katelin Nickerson Section, Township, Range: ____

Landform (hillside, terrace, etc.): Shelf/ sideslope Local relief (concave, convex, none): Concave Slope %: 7

Subregion (LRR or MLRA): LRR R Lat: 44.5997186416667 Long: -70.5750631211111 Datum: NAD83

Soil Map Unit Name: NA NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ___ Hydric Soil Present? Yes X No ___ Wetland Hydrology Present? Yes X No ___	**Is the Sampled Area within a Wetland? Yes** x **No** ___ If yes, optional Wetland Site ID: W-KMN-11

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- x Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- x Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		x	
Water Table Present?		x	
Saturation Present? (includes capillary fringe)	x		0

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: W-KMN-11

Tree Stratum (Plot size: 60')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Betula alleghaniensis*	30	Yes	FAC
2. *Acer rubrum*	10	Yes	FAC
3. *Pinus strobus*	10	Yes	FACU
4.			
5.			
6.			
7.			
	50	=Total Cover	

Sapling/Shrub Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Corylus cornuta*	10	Yes	FACU
2. *Acer rubrum*	5	Yes	FAC
3.			
4.			
5.			
6.			
7.			
	15	=Total Cover	

Herb Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Onoclea sensibilis*	60	Yes	FACW
2. *Dryopteris intermedia*	15	No	FAC
3. *Solidago rugosa*	10	No	FAC
4. *Rubus hispidus*	5	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90	=Total Cover	

Woody Vine Stratum (Plot size: 60')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	65	x 2 =	130
FAC species	70	x 3 =	210
FACU species	20	x 4 =	80
UPL species	0	x 5 =	0
Column Totals:	155 (A)		420 (B)

Prevalence Index = B/A = 2.71

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point W-KMN-11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	2.5Y 2.5/1	100					Mucky Loam/Clay	
5-14	2.5Y 5/2	90	10YR 5/6	10	C	M	Loamy/Clayey	Prominent redox concentrations
14-16	2.5Y 5/2	80	7.5YR 4/4	20	C	M	Loamy/Clayey	Prominent redox concentrations

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ High Chroma Sands (S11) (**LRR K, L)**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
_X_ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):
Type: Compact restrictive layer
Depth (inches): 14

Hydric Soil Present? Yes _X_ No ___

Remarks:
This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Twin Energy City/County: Oxford Sampling Date: 10/13/2021

Applicant/Owner: Twin Energy LLC State: ME Sampling Point: U-KMN-45

Investigator(s): Katelin Nickerson Section, Township, Range: ____

Landform (hillside, terrace, etc.): Side Slope Local relief (concave, convex, none): none Slope %: 5

Subregion (LRR or MLRA): LRR R Lat: 44.6022417338889 Long: -70.6098161405556 Datum: NAD83

Soil Map Unit Name: NA NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ? Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____
Water Table Present?	Yes ____	No ____	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No ____	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: U-KMN-45

Tree Stratum (Plot size: 60')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fagus grandifolia*	35	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	35	=Total Cover	

Sapling/Shrub Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fagus grandifolia*	15	Yes	FACU
2. *Acer pensylvanicum*	10	Yes	FACU
3. *Viburnum lantanoides*	10	Yes	FACU
4. *Acer rubrum*	10	Yes	FAC
5. *Picea rubens*	5	No	FACU
6.			
7.			
	50	=Total Cover	

Herb Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer rubrum*	25	Yes	FAC
2. *Fagus grandifolia*	10	Yes	FACU
3. *Oclemena acuminata*	10	Yes	FACU
4. *Dryopteris intermedia*	5	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50	=Total Cover	

Woody Vine Stratum (Plot size: 60')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	40	x 3 =	120
FACU species	95	x 4 =	380
UPL species	0	x 5 =	0
Column Totals:	135 (A)		500 (B)

Prevalence Index = B/A = 3.70

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point U-KMN-45

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4							Muck	Organic/duff
4-13	10YR 3/3	70				M	Loamy/Clayey	very fine sandy loam
	10YR 5/1	30				M		very fine sandy loam
13-18	10YR 4/4	50				M	Loamy/Clayey	Corase sandy loam
	10YR 4/3	30				M		
	10YR 4/2	20				M		
18-22	2.5Y 5/4	100				M	Loamy/Clayey	sandy loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ High Chroma Sands (S11) (**LRR K, L)**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Till/rock

Depth (inches): 22

Hydric Soil Present? **Yes** ___ **No** X

Remarks:
This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Twin Energy City/County: Oxford Sampling Date: 10/13/2021

Applicant/Owner: Twin Energy LLC State: ME Sampling Point: W-KMN-45

Investigator(s): Katelin Nickerson Section, Township, Range:

Landform (hillside, terrace, etc.): Side slope Local relief (concave, convex, none): concave Slope %: 5

Subregion (LRR or MLRA): LRR R Lat: 44.6023425033333 Long: -70.6098308338889 Datum: NAD83

Soil Map Unit Name: NA NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)

Are Vegetation x , Soil ___ , or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x No ___

Are Vegetation ___ , Soil ___ , or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ___	**Is the Sampled Area**
Hydric Soil Present?	Yes X No ___	**within a Wetland?** **Yes** X **No** ___
Wetland Hydrology Present?	Yes X No ___	If yes, optional Wetland Site ID: W-KMN-45

Remarks: (Explain alternative procedures here or in a separate report.)
Wetland is cut over from commercial timber harvest.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- x Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes x	No ___	Depth (inches): 4
Water Table Present?	Yes x	No ___	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes x	No ___	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: W-KMN-45

Tree Stratum (Plot size: 60')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		

Sapling/Shrub Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer pensylvanicum*	5	Yes	FACU
2. *Fagus grandifolia*	5	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	10 =Total Cover		

Herb Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Carex stricta*	50	Yes	OBL
2. *Onoclea sensibilis*	30	Yes	FACW
3. *Solidago rugosa*	10	No	FAC
4. *Carex gynandra*	10	No	OBL
5. *Parathelypteris noveboracensis*	10	No	FAC
6. *Rubus idaeus*	5	No	FACU
7. *Epilobium palustre*	5	No	OBL
8. *Scirpus cyperinus*	5	No	OBL
9.			
10.			
11.			
12.			
	125 =Total Cover		

Woody Vine Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	70	x 1 =	70
FACW species	30	x 2 =	60
FAC species	20	x 3 =	60
FACU species	15	x 4 =	60
UPL species	0	x 5 =	0
Column Totals:	135 (A)		250 (B)

Prevalence Index = B/A = 1.85

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
_X_ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _X_ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point W-KMN-45

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4							Muck	
4-18	10YR 3/1	90	7.5YR 4/4	10	C	M	Mucky Loam/Clay	Coarse fragments at 18"

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: n/a

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:
This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Twin Energy City/County: Oxford Sampling Date: 10/20/2021

Applicant/Owner: Twin Energy LLC State: ME Sampling Point: U-KMN-67

Investigator(s): Katelin Nickerson Section, Township, Range: ____

Landform (hillside, terrace, etc.): Flat Local relief (concave, convex, none): none Slope %: 0

Subregion (LRR or MLRA): LRR R Lat: 44.6103798583333 Long: -70.61608257 Datum: NAD83

Soil Map Unit Name: NA NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes x No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Hydric Soil Present?	Yes ____ No X	If yes, optional Wetland Site ID:	____
Wetland Hydrology Present?	Yes ____ No X		

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Water-Stained Leaves (B9)	
___ High Water Table (A2)	___ Aquatic Fauna (B13)	
___ Saturation (A3)	___ Marl Deposits (B15)	
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	
___ Sparsely Vegetated Concave Surface (B8)		

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No x	Depth (inches): ____
Water Table Present?	Yes ____	No x	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No x	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: U-KMN-67

Tree Stratum (Plot size: 60')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fagus grandifolia*	60	Yes	FACU
2. *Betula papyrifera*	15	Yes	FACU
3.			
4.			
5.			
6.			
7.			
	75	=Total Cover	
Sapling/Shrub Stratum (Plot size: 30')			
1. *Fagus grandifolia*	40	Yes	FACU
2. *Viburnum lantanoides*	25	Yes	FACU
3. *Acer pensylvanicum*	15	No	FACU
4. *Picea rubens*	5	No	FACU
5.			
6.			
7.			
	85	=Total Cover	
Herb Stratum (Plot size: 10')			
1. *Dryopteris intermedia*	10	Yes	FAC
2. *Acer rubrum*	5	Yes	FAC
3. *Abies balsamea*	5	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	20	=Total Cover	
Woody Vine Stratum (Plot size: 60')			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 42.9% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	20	x 3 =	60
FACU species	160	x 4 =	640
UPL species	0	x 5 =	0
Column Totals:	180 (A)		700 (B)

Prevalence Index = B/A = 3.89

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point U-KMN-67

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-2							Muck	duff
2-4	10YR 2/1	100					Loamy/Clayey	coarse sandy loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)

___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ High Chroma Sands (S11) (**LRR K, L)**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
___ Polyvalue Below Surface (S8) (**LRR K, L**)
___ Thin Dark Surface (S9) (**LRR K, L**)
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (F22)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Ledge

Depth (inches): 4

Hydric Soil Present? **Yes** ___ **No** X

Remarks:
This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Twin Energy City/County: Oxford Sampling Date: 10/2021

Applicant/Owner: Twin Energy LLC State: ME Sampling Point: W-KMN-67

Investigator(s): Katelin Nickerson Section, Township, Range: ______

Landform (hillside, terrace, etc.): Side slope Local relief (concave, convex, none): concave Slope %: 5

Subregion (LRR or MLRA): LRR R Lat: 44.6104651016667 Long: -70.6159620505556 Datum: NAD83

Soil Map Unit Name: NA NWI classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ____ (If no, explain in Remarks.)

Are Vegetation x , Soil ____ , or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes x No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	If yes, optional Wetland Site ID: W-KMN-67

Remarks: (Explain alternative procedures here or in a separate report.)
Wetland is regenerating from commercial timber harvest

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ Water-Stained Leaves (B9)
___ High Water Table (A2)	___ Aquatic Fauna (B13)
X Saturation (A3)	___ Marl Deposits (B15)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)
___ Sparsely Vegetated Concave Surface (B8)	

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- x Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No x	Depth (inches): ____
Water Table Present?	Yes ____	No x	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes x	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: W-KMN-67

Tree Stratum (Plot size: 60')	Absolute % Cover	Dominant Species?	Indicator Status
1. *Betula alleghaniensis*	40	Yes	FAC
2. *Acer rubrum*	25	Yes	FAC
3. *Fagus grandifolia*	10	No	FACU
4. *Picea rubens*	10	No	FACU
5. *Betula populifolia*	5	No	FAC
6.			
7.			
	90	=Total Cover	

Sapling/Shrub Stratum (Plot size: 30')			
1. *Picea rubens*	10	Yes	FACU
2. *Pinus strobus*	5	Yes	FACU
3. *Acer rubrum*	5	Yes	FAC
4. *Abies balsamea*	5	Yes	FAC
5.			
6.			
7.			
	25	=Total Cover	

Herb Stratum (Plot size: 10')			
1. *Carex gynandra*	40	Yes	OBL
2. *Onoclea sensibilis*	30	Yes	FACW
3. *Carex scabrata*	15	No	OBL
4. *Euthamia graminifolia*	15	No	FAC
5. *Oclemena acuminata*	5	No	FACU
6. *Epilobium palustre*	5	No	OBL
7. *Impatiens capensis*	5	No	FACW
8.			
9.			
10.			
11.			
12.			
	115	=Total Cover	

Woody Vine Stratum (Plot size: 60')			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	35	x 2 =	70
FAC species	95	x 3 =	285
FACU species	40	x 4 =	160
UPL species	0	x 5 =	0
Column Totals:	230 (A)		575 (B)

Prevalence Index = B/A = 2.50

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point W-KMN-67

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4							Muck	
4-8	10YR 2/1	90	10YR 5/2	10	D	PL	Mucky Loam/Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- X Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Ledge

Depth (inches): 8

Hydric Soil Present? **Yes** X **No** ___

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

APPENDIX D

Summary of Wetlands Identified within the Survey Area

Table 1. Wetland Summary								
Resource Field ID(s)	*Reference Map Number(s)*	*Dominant Covertype*	*Hydrology Indicators*	*Dominant Vegetation*	*Hydric Soil Indicators*	*WoSS*	*Associated Resources*	*Description & Notes*
W-DRB-1	11	PSS1E	A2, A3	Spotted touch-me-not, fringed sedge, yellow birch	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-KMN-7	Riparian wetland along S-KMN-7
W-DRB-2	13	PEM2E	A1, A2, A3, B9	Melic manna grass, cinnamon fern, dwarf red raspberry	Black Histic (A3)	No	NA	Small seep wetland at base of steep slope
W-DRB-3	14	PEM1/2E	B9	Nodding sedge, dwarf red raspberry, red maple, yellow birch	Depleted Below Dark Surface (A11)	No	NA	Depression in skid trail
W-DRB-5	33	PSS1E/PEM1/2E	A2, A3, B9, B10	Reed canary grass, spotted-touch-me-not, speckled alder, yellow birch, sensitive fern	Histosol (A1)	Yes: Portions within 25' of stream	S-DRB-1	Small riparian emergent scrub shrub wetland on either side of S-DRB-1.
W-DRB-6	38, 39	PFO1/4E	A2, A3, B9, B10, D2, D4	New York fern *(Parathelypteris noveboracensis)* , cinnamon fern, balsam fir, yellow birch, white ash *(Fraxinus americana)* , hobblebush *(Viburnum lantanoides)* , American beech, striped maple, eastern hemlock *(Tsuga canadensis)* , quaking aspen *(Populus tremuloides)* , red maple	Histosol (A1)	Yes: Portions within 25' of stream	S-DRB-2	Forested wetland south of Yonder Way; extends south beyond Survey Area; stream S-DRB-2 drains from wetland
W-DRB-7	39	PSS1E	A3, B9, B10	Sensitive fern, melic manna grass, New York fern, yellow birch	Redox Dark Surface (F6)	Yes: Portions within 25' of stream	S-DRB-2, S-DRB-3	Seep along streams; mainly within skid trail
W-DRB-8	37	PSS1E	A3, B9, B10	New York fern, cinnamon fern, gray birch, yellow birch	Mesic Spodic (TA6)	No	none	Small wetland along slope; surface drainages through wetlands
W-DRB-9	36, 37	PSS1/PFO1E	A1, A2, A3,B9, B10	Nodding sedge, melic manna grass, sensitive fern, cinnamon fern, red maple, yellow birch, sugar maple	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-DRB-5, S-DRB-4, S-KMN-12	Side slope seep impacted by commercial timber harvest; drains under Yonder Way through S-DRB-5
W-DRB-10	31, 36	PSS1E	A2, A3, B9, B10	Nodding sedge, New York fern, cinnamon fern, spotted touch-me-not, speckled alder, red maple, black ash *(Fraxinus nigra)* , yellow birch	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	NA	Side slope seep impacted by skid trails
W-DRB-11	30, 31, 36	PSS1E	A2, A3, B9, B10	Nodding sedge, New York fern, cinnamon fern, spotted touch-me-not, speckled alder, red maple, black ash, yellow birch	Depleted Below Dark Surface (A11)	No	NA	Side slope seep impacted by skid trails
W-DRB-12	30, 36	PEM1/2E	A1, A3, B9, B10	Wrinkle-leaf goldenrod *(Solidago rugosa)* , cottongrass bulrush, parasol white-top *Doellingeria umbellata)* , lamp rush *(Juncus effusus)* , pointed broom sedge *(Carex scoparia)* , steeplebush	Depleted Below Dark Surface (A11)	No	NA	Low functioning wetland south of Yonder Way; primarily created by water bar in grassed trail
W-DRB-13	30	PSS1E	A2, A3, B9, B10	Nodding sedge, cottongrass bulrush, swamp candles *(Lysimachia terrestris)* , yellow birch, red maple, gray birch, sugar maple, American witch-hazel *(Hamamelis virginiana)*	Depleted Matrix (F3)	Yes: Portions within 25' of stream	S-DRB-6	Logged side slope seep wetland; S-DRB-6 flows out of wetland to S-JLH-4
W-DRB-14	28, 30	PSS1/PFO1E	A2, A3, B9, B10	Cottongrass bulrush, melic manna grass, nodding sedge, red maple, American beech , yellow birch, gray birch	Depleted Matrix (F3)	Yes: Portions within 25' of stream	S-JLH-4 (Goff Brook)	Skid trail crossing side slope seep
W-DRB-15	28	PSS1E	A3, B9	Cinnamon fern, sensitive fern, flat-top goldentop *(Euthamia graminifolia)* , red maple, yellow birch	Depleted Matrix (F3)	No	NA	Small isolated wetland south of Yonder Way
W-DRB-16	28	PSS1E	A1, A2, A3, B9, B10	Sensitive fern, Canadian goldenrod, cottongrass bulrush, steeplebush, black willow, yellow birch	Sandy Mucky Mineral (S1)	No	NA	Skid trail crossing seep
W-DRB-17	28	PEM2E	B9, B10	Melic manna grass, sensitive fern	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-JLH-4 (Goff Brook), S-JLH-5	Riparian wetland along S-JLH-4 and S-JLH-5; south of Yonder Way
W-DRB-18	28	PFO1E	A3, B10	Melic manna grass, yellow birch, green ash	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-JLH-4 (Goff Brook)	Riparian wetland along S-JLH-4; south of Yonder Way
W-DRB-19	28	PSS1E	A3, B9	Lamp rush, cottongrass bulrush, flat-top goldentop, parasol white-top, steeplebush, speckled alder, yellow birch	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-KMN-9	Skid trail wetland along stream; south of Yonder Way
W-DRB-20	28	PSS1/PEM1/2E	A3	Cottongrass bulrush, parasol white-top, steeplebush, gray willow, speckled alder, yellow birch	Sandy Gleyed Matrix (S4)	Yes: Portions within 25' of stream	NA	Skid trail crossing drainage seep

Table 1. Wetland Summary								
Resource Field ID(s)	***Reference Map Number(s)***	***Dominant Covertype***	***Hydrology Indicators***	***Dominant Vegetation***	***Hydric Soil Indicators***	***WoSS***	***Associated Resources***	***Description & Notes***
W-DRB-21	29	PSS1E	A3	Dwarf red raspberry, cottongrass bulrush, blue joint *(Calamagrostis canadensis)* , steeplebush, speckled alder, red maple	Depleted Below Dark Surface (A11)	No	NA	Old logging landing along gravel logging road
W-DRB-22	21, 22	PSS1/PEM1/2E	A2, A3, B9, B10	Eastern rough sedge, melic manna grass, cottongrass bulrush, fringed sedge, wrinkle-leaf goldenrod, lamp rush, common red raspberry, devil's-pitchfork *(Bidens frondosa)* , spotted touch-me-not, yellow birch, red maple	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-RDK-18	Disturbed groundwater seep along slope
W-DRB-24	20, 27	PSS1E	A2, A3	Fringed sedge, cottongrass bulrush, Devil's-pitchfork, red maple, yellow birch	Depleted Matrix (F3)	No	none	Perched wetland over bedrock; previously harvested; drains through NJD to the southeast along ridge
W-DRB-25	19, 20	PSS1E	A3, B9, B10	Cinnamon fern, parasol white-top, cottongrass bulrush, rattlesnake manna grass *(Glyceria canadensis)* , red maple, yellow birch	Depleted Matrix (F3); Black Histic (A3)	No	none	Disturbed seep; filled with slash; drains to east through upland drainage
W-DRB-26	20	PSS1E	A3	Nodding sedge, black elder *(Sambucus nigra)* , yellow birch	Sandy Mucky Mineral (S1)	Yes: Portions within 25' of stream	S-KMN-4	Scrub shrub wetland along stream
W-DRB-27	19, 20	PSS1/PEM1/2E	A3, B10	Melic manna grass, nodding sedge, sensitive fern, cottongrass bulrush, nodding sedge, flat-top goldentop, pointed broom sedge, red maple, yellow birch	Histic Epipdeon (A2)	Yes: Portions within 25' of stream	S-RDK-5	Seep with skidder trails; stream alongside wetland
W-DRB-28	19	PSS1/PEM1/2E	A3, B10	Melic manna grass, rattlesnake manna grass, sensitive fern, nodding sedge, cottongrass bulrush, pointed broom sedge, flat-top goldentop, spotted touch-me-not, yellow birch, red maple	Histic Epipedon (A2)	No	none	Side slope seep wetland; forms upland drainage to the southeast
W-DRB-29	26	PEM1/2E	A3, B10	Eastern rough sedge *(Carex scabrata)* , melic manna grass	Histic Epipdeon (A2)	Yes: Portions within 25' of stream	S-DRB-7	Emergent wetland along stream fed by upland drainage from W-KMN-43
W-DRB-30	26, 35	PSS1/PEM1/2E	A3, B10	Cinnamon fern, cottongrass bulrush, melic manna grass, red maple, yellow birch	Depleted Matrix (F3)	Yes: Portions within 25' of stream	S-DRB-7	Wetlands extends southeast beyond Survey Area boundary; NJD hydrological inputs
W-DRB-31	26	PEM1/2E	A2, A3, B10	Uptight sedge *(Carex stricta)* , cottongrass bulrush, melic manna grass, parasol white-top, *Solidago sp.,* spotted touch-me-not	Depleted Matrix (F3)	Yes: Portions within 25' of stream	S-DRB-7	Riparian wetland along stream; groundwater seep wetland
W-DRB-32	25	PEM1/2E	A2, A3, B10	Melic manna grass, cottongrass bulrush, nodding sedge	Histic Epipedon (A2)	No	none	Emergent wetland; drains south into upland drainage
W-DRB-34	25	PEM1/2E	A3, B9	Cottongrass bulrush, common red raspberry, dwarf red raspberry, gray willow, yellow birch	Depleted Below Dark Surface (A11)	No	none	Isolated depression in skid trail
W-DRB-35	25	PSS1E	A2, A3, B9	Cottongrass bulrush, parasol white-top, *Sphagnum sp.,* yellow birch, black spruce	Depleted Below Dark Surface (A11)	No	none	Perched wetland on ridge; heavily logged
W-DRB-36	26	PSS1E	A3, B10	Cinnamon fern, sensitive fern, melic manna grass, *Solidago sp.,* red maple, yellow birch	Depleted Matrix (F3)	No	none	Scrub shrub wetland; drains south into NJD
W-DRB-38	26	PSS1E	A2, A3, B9, B10	Dwarf red raspberry, eastern rough sedge, New York fern, cinnamon fern, yellow birch, red maple	Sandy Mucky Mineral (S1)	No	none	Isolated scrub shrub wetland flows into upland drainage
W-DRB-39	26	PSS1E	A1, A2, A3, B9, B10, C3	Cinnamon fern, cottongrass bulrush, nodding sedge, red maple, yellow birch	Sandy Mucky Mineral (S1)	No	none	Scrub shrub wetland; hydrology from upslope wetland via upland drainage
W-DRB-40	19	PSS1/PEM1/2E	A3, B9, B10	Cottongrass bulrush, nodding sedge, parasol white-top, lamp rush, rattlesnake manna grass, yellow birch	Depleted Below Dark Surface (A11)	No	none	Isolated wetland; primarily emergent cover
W-DRB-41	22	PSS1E	B9	Eastern rough sedge, uptight sedge, *Solidago sp.,* black ash	Depleted Matrix (F3)	No	none	Isolated depression north of Yonder Way
W-DRB-42	21	PSS1E	A3, B9	Sensitive fern, *Dryopteris sp.*	Sandy Redox (S5)	No	none	Seep along skid trail; flows to upland drainage

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W-KMN-1	34, 35	PFO4/1E	A1, A2, A3, C4, B10, D2, D3, D4, D5	Three-seed sedge *(Carex trisperma)* , sphagnum *(Sphagnum spp.)* , bristly dewberry, false lil-of-the-valley *(Maianthemum canadense)* , northern water-horehound *(Lycopus uniflorus)* , eastern marsh fern *(Thelypteris palustris)* , interrupted fern *(Osmunda claytonia)* , late lowbush blueberry *(Vaccinium angustifolium)* , spotted touch-me-not, catberry *(Nemopanthus mucronatus)* , red maple, balsam fir, cinnamon fern, fowl manna grass *(Glyceria striata)* , fringed sedge, yellow birch, white spruce *(Picea glauca)* , green ash	Depleted Matrix (F3)	Yes: Portions within 25' of stream	S-RDK-2	Forested wetland with sphagnum patches and upland hummocks; drains to S-RDK-2 to the west; semi-recent timber harvest
W-KMN-2	25, 26, 34, 35	PFO4/1/PSS1E	A1, A2, A3, B10,C4, D2, D3, D4, D5	Three-seed sedge, sphagnum, cottongrass bulrush, black-girdle bulrush *(Scirpus atrocinctus)* , catberry, black spruce, red maple, yellow birch	Redox Dark Surface (F6) and Depleted Matrix (F3)	Yes: Portions within 25' of stream	S-MFT-2	Semi-recent timber harvested, high-elevation bog drained byS-MFT-2 to the southwest
W-KMN-3	11	PFO1E	A3, B10, D2	Fowl manna grass, nodding sedge, sensitive fern, bristly dewberry, evergreen wood fern, whorled nodding-aster *(Oclemena acuminata)* , red maple, American witch-hazel, yellow birch	Histic Epipedon (A2)	No	NA	Small side slope seep crossing skid trail
W-KMN-4	13	PFO1E	A1, A2, A3, B8, B9	Cinnamon fern, red maple, yellow birch, striped maple	Sandy Mucky Mineral (S1)	No	NA	Wetland in naturalized woods road on side slope
W-KMN-5	13	PFO1E	A1, A2, A3, C1	Melic manna grass, sensitive fern, evergreen wood fern, yellow birch, gray birch, American beech -along border	Histic Epipedon (A2) or Hydrogen Sulfide (A4)	No	NA	Small groundwater seep on side slope
W-KMN-6	14	PEM1E	A1, A2, A3	Cottongrass bulrush, bristly dewberry, evergreen wood fern, melic manna grass	Depleted Matrix (F3)	No	NA	Wetland within naturalized skidder trail at base of slope
W-KMN-7	14	PEM1E	A1, A2, A3	Nodding sedge, whorled nodding-aster, cottongrass bulrush, greater bladder sedge *(Carex intumescens)* , pointed broom sedge, sphagnum	Histic Epipedon (A2)	No	NA	Small wetland in skidder trail; site of previous timber harvest
W-KMN-8	14, 19	PEM1/PSS1E	A2, A3, B9, D4	Melic manna grass, eastern marsh fern, cinnamon fern, sphagnum sp., wrinkle-leaf goldenrod, fowl manna grass, sensitive fern, hobblebush, yellow birch, red spruce *(Picea rubens)* , red maple	Sandy Gleyed Matrix (S4)	Maybe: PSVP	PSVP-KMN-1	Depression in plateau; area previously harvested; within northern turbine pad
W-KMN-9	33	PSS1E	A2, A3, B8, B9	Sensitive fern, cinnamon fern, blue joint, spotted touch-me-not, rattlesnake manna grass, speckled alder, yellow birch	Sandy Mucky Mineral (S1)	Yes: Portions within 25' of stream	S-DRB-1	Roadside scrub shrub wetland west of Swift River Rd
W-KMN-10	37	PEM1/PFO1E	A1, A2, A3	Wrinkle-leaf goldenrod, sensitive fern, cottongrass bulrush, interrupted fern, nodding sedge, shallow sedge, flat-top goldentop, beaked hazelnut *(Corylus cornuta)* , eastern hemlock, green ash, balsam fir	Depleted Matrix (F3)	No	NA	Side slope wetland; extends south outside of Survey Area along Yonder Way
W-KMN-11	37	PFO1B	A3, B9, B10	Sensitive fern, eastern wood fern, wrinkle-leaf goldenrod, bristly dewberry, beaked hazelnut, red maple, yellow birch, white pine	Depleted Matrix (F3)	Yes: Portions within 25' of stream	S-KMN-14	Depression on knoll; hydrologic inputs from groundwater and drainage to the south
W-KMN-13	29	PFO1E	A3, B9	Cinnamon fern, yellow birch, balsam fir	Depleted Below Dark Surface (A11)	No	NA	Small forested depression north of Yonder Way
W-KMN-14	31	PFO1E	A3, B9	Melic manna grass, cinnamon fern, evergreen wood fern, *viola spp.,* sensitive fern, green ash, paper birch, yellow birch	Depleted Matrix (F3)	Maybe: PSVP	PSVP-KMN-4	Small forested wetland at base of rock outcrop along northern boundary of Survey Area; north of gravel logging road; contains potential vernal pool
W-KMN-15	31	PFO1E	A3, B9, D2	Sensitive fern, dwarf red raspberry, cinnamon fern, broad beech fern *(Phegopteris hexagonoptera)* , balsam fir, American elm *(Ulmus americana)* , yellow birch, quaking aspen	Depleted Below Dark Surface (A11)	No	NA	Small forested wetland at base of rock outcrop north of Yonder Way

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W-KMN-17	30	PFO1E	A1, A2, A3, D4	Cinnamon fern, interrupted fern, evergreen wood fern, broad beech fern, green ash, balsam fir, yellow birch, red maple	Histic Epipedon (A2)	No	NA	Groundwater side slope seep
W-KMN-18	30	PFO1E	A2, A3, B9, D4	*Epilobium sp.,* evergreen wood fern, rattlesnake manna grass, sensitive fern, wrinkle-leaf goldenrod, red maple, yellow birch, green ash	Depleted Below Dark Surface (A11)	No	NA	Forested side slope seep north of Yonder Way
W-KMN-19	30	PFO1E	A2, A3, B9, D4	Broad beech fern, New York fern, cinnamon fern, green ash, red maple, yellow birch	Depleted Below Dark Surface (A11)	No	NA	Bouldery side slope seep with shallow groundwater table
W-KMN-21	23	PFO1E	A3, B9	Sensitive fern, cottongrass bulrush, allegheny blackberry *(Rubus allegheniensis)* , common red raspberry, parasol white-top, gray willow, red maple, yellow birch	Depleted Below Dark Surface (A11)	No	NA	Forested wetland north of Yonder Way
W-KMN-22	28	PFO1E	A3, B9, D1	Dwarf red raspberry, red maple, balsam fir, green ash, yellow birch	Sandy Mucky Mineral (S1)	Yes: Portions within 25' of stream	S-KMN-9	Small forested floodplain wetland of S-KMN-9
W-KMN-23	28	PFO1E	A3, B9, B10	Uptight sedge, nodding sedge, New York fern, sensitive fern, green ash, yellow birch	Sandy Mucky Mineral (S1)	Yes: Portions within 25' of stream	S-KMN-9	Small forested floodplain wetland of S-KMN-9
W-KMN-25	30	PFO1E	B9, B10, D1	Melic manna grass, dwarf red raspberry, uptight sedge, green ash, sugar maple, yellow birch	Sandy Mucky Mineral (S1)	Yes: Portions within 25' of stream	S-JLH-4 (Goff Brook)	Small forested riparian wetland along Goff Brook
W-KMN-27	21	PFO1/PSS1E	A2, A3, B10	Whorled nodding-aster, zigzag goldenrod, *Epilobium sp.* , sensitive fern, uptight sedge, cottongrass bulrush, wrinkle-leaf goldenrod, northern water-horehound, green ash, red maple, yellow birch	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-RDK-20	Groundwater seep on side slope; begins at base of large treefall
W-KMN-28	21	PSS1E	A2, A3, B9, B10	Cottongrass bulrush, bristly dewberry, evergreen wood fern, melic manna grass, parasol white-top, nodding sedge, eastern rough sedge, yellow birch	Depleted Matrix (F3)	No	none	Regenerating skid road on side slope; shallow groundwater table
W-KMN-29	21	PEM1E	A2, A3, B9, B10	Wrinkle-leaf goldenrod, nodding sedge, pointed broom sedge, cottongrass bulrush, common boneset *(Eupatorium perfoliatum)*	Depleted Matrix (F3)	No	none	Emergent wetland in skidder trail north of S-JLH-2
W-KMN-30	21	PEM1E	A2, A3, B9, B10	Wrinkle-leaf goldenrod, nodding sedge, pointed broom sedge, cottongrass bulrush, common boneset	Depleted Matrix (F3)	No	none	Emergent wetland in skidder trail north of S-JLH-4
W-KMN-31	21	PSS1E	A2, A3, B9, D1	Melic manna grass, sensitive fern, evergreen wood fern, wrinkle-leaf goldenrod, cottongrass bulrush, gray willow, yellow birch	Depleted Matrix (F3)	No	none	Emergent wetland in skidder rail on side slope; hydrology flows to upland drainage connecting to W-KMN-30
W-KMN-32	20	PEM1E	A2, A3, B10	Evergreen wood fern, *viola sp.,* stalk-grain sedge *(Carex stipata)* , American elm, striped maple	Sandy Mucky Mineral (S1)	Yes: Portions within 25' of stream	none	Small emergent groundwater seep in disturbed forested area
W-KMN-33	20	PEM1E	A2, A3, D2	*Epilobium sp.* , wrinkle-leaf goldenrod, nodding sedge, common boneset, shallow sedge	Sandy Mucky Mineral (S1)	Yes: Portions within 25' of stream	S-KMN-2	Emergent skid road through S-KMN-2
W-KMN-34	20	PEM1E	A2, A3, B9, B10	Sensitive fern, nodding sedge, common red raspberry, cottongrass bulrush	Depleted Below Dark Surface (A11)	No	none	Groundwater seep on side slope; along boundary of Survey Area
W-KMN-35	19	PSS1E	A1, A2, A3, B10	Melic manna grass, sensitive fern, nodding sedge, wrinkle-leaf goldenrod, cottongrass bulrush, balsam fir, red maple, yellow birch	Histosol (A1)	Yes: Portions within 25' of stream	S-KMN-4	Groundwater seep wetland at top of slope; adjacent to large outcrop; drains into S-KMN-4 to the east
W-KMN-37	14, 18, 19	PFO1E	A3, B9	Melic manna grass, sensitive fern, whorled nodding-aster, hobblebush, yellow birch, red maple, American elm	Sandy Mucky Mineral (S1)	No	none	Small groundwater seep

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W-KMN-38	18	PFO1E	B9, D4	Melic manna grass, whorled nodding-aster, nodding sedge, red-tinge bulrush *(Scirpus microcarpus)* , evergreen wood fern, cinnamon fern, Canadian bunchberry *(Cornus canadensis)* , steeplebush, gray birch, yellow birch, balsam fir, American beech	Depleted Matrix (F3)	No	none	Predominantly forested wetland between rock outcrops
W-KMN-39	18	PFO1E	A3, B9	Cinnamon fern, sensitive fern, nodding sedge, melic manna grass, whorled nodding-aster, red spruce, gray birch, American beech, red maple, striped maple	Histosol (A1)	No	none	Predominantly forested wetland; slopes to the west
W-KMN-40	18	PSS1E	A3, B9	Nodding sedge, cinnamon fern, blue joint, New York fern, red-tinge bulrush, pointed broom sedge, yellow birch, gray birch	Depleted Below Dark Surface (A11)	No	none	Regenerating skid road at base of slope
W-KMN-41	18	PSS1E	A2, A3, B9	Nodding, sedge, wrinkle-leaf goldenrod, evergreen wood fern, yellow birch, sugar maple, gray birch, red maple	Depleted Matrix (F3)	No	none	Toe slope wetland; forestry impacts; disturbed soils
W-KMN-42	18	PSS1E	A2, A3, B9	Nodding, sedge, wrinkle-leaf goldenrod, evergreen wood fern, yellow birch, sugar maple, gray birch, red maple	Depleted Matrix (F3)	No	none	Toe slope wetland; forestry impacts; disturbed soils
W-KMN-43	18, 19, 25, 26	PSS1E	A2, A3, B9, B10, D3	Melic manna grass, uptight sedge, nodding sedge, cottongrass bulrush, red-tinge sedge, sensitive fern, common red raspberry, yellow birch, gray birch, American beech, red maple, striped maple	Depleted Below Dark Surface (A11)	No	none	Toe slope wetland; forestry impacts; disturbed soils
W-KMN-44	18	PFO1B	A2, A3, B10, D1, D3	Interrupted fern, evergreen wood fern, blue joint, whorled nodding-aster, rattlesnake manna grass, yellow birch, sugar maple, American beech, striped maple	Histic Epipedon (A2)	No	none	Forested seep between rock outcrops
W-KMN-45	26	PEM1B	A1, A2, A3, B9	Sensitive fern, uptight sedge, New York fern, nodding sedge, cottongrass bulrush, wrinkle-leaf goldenrod, common red raspberry, *Epilobium sp.,* American beech, sugar maple	Depleted Below Dark Surface (A11)	No	none	Emergent side slope wetland; previously cut/disturbed
W-KMN-48	25	PEM1/PSS1E	A2, A3, B10	Melic manna grass, wrinkle-leaf goldenrod, evergreen wood fern, interrupted fern, white meadowsweet *(Spiraea alba)* , American beech	Histic Epipdeon (A2)	No	none	Isolated wetland in working forest; forestry impacts
W-KMN-49	26	PFO1E	A2, A3, B10, D1	Evergreen wood fern, spotted touch-me-not, *Epilobium sp.* , American beech, sugar maple	Histic Epipdeon (A2)	No	none	Small side slope seep wetland
W-KMN-50	34, 35	PEM1E	A1, A2, A3, B10	Melic manna grass, nodding sedge, spotted touch-me-not, evergreen wood fern, red-tinge bulrush, rattlesnake manna grass, cottongrass bulrush, Devil's pitchfork	Sandy Mucky Mineral (S1)	Yes: Portions within 25' of stream	S-DRB-9	Emergent wetland adjacent to road and stream; disturbed soils; upland drainage provides hydrology to wetland
W-KMN-51	34, 35	PEM1E	A2, A3, B9, B10, D1	Nodding sedge, spotted touch-me-not, evergreen wood fern, melic manna grass	Sandy Mucky Mineral (S1)	Yes: Portions within 25' of stream	S-KMN-11, S-MFT-2	Emergent wetland in forested setting; skid roads and seeps adjacent to stream
W-KMN-52	35	PFO1E	A1, A2, A3, D1	Evergreen wood fern, whorled nodding-aster, wrinkle-leaf goldenrod, red maple, yellow birch, American beech, red spruce, striped maple	Histic Epipedon (A2)	No	none	Forested groundwater seep; drains to S-MFT-2
W-KMN-53	35	PSS1E	B9, B10	Wrinkle-leaf goldenrod, nodding sedge, lamp rush, cottongrass bulrush, parasol white-top, flat-top goldentop, yellow birch, gray birch, gray willow	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	none	Isolated wetland in skidder trail; proximal to S-MFT-2 but not connected
W-KMN-54	19	PFO1E	A1, A2, A3, D1	Evergreen wood fern, cinnamon fern, interrupted fern, flat-top goldentop, American beech, sugar maple, striped maple, yellow birch	Histic Epipedon (A2)	No	none	Forested groundwater seep
W-KMN-55	20	PFO1E	A3, B9	Melic manna grass, nodding sedge, sensitive fern, wrinkle-leaf goldenrod, gray willow, red maple, yellow birch, American beech	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-KMN-2	Forested wetland with dense emergent understory; adjacent to stream KMN-2; extends beyond Survey Area to north

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W-KMN-56	19	PSS1E	A1, A2, A3, D1	Melic manna grass, common red raspberry, wrinkle-leaf goldenrod, evergreen wood fern, pussy willow, yellow birch, red maple, gray birch, balsam fir	Depleted Matrix (F3)	Yes: Portions within 25' of stream	S-KMN-34	Regenerating harvested area; upland drainage provides hydrology from W-KMN-8; S-KMN-34 flows from wetland and offsite
W-KMN-57	19	PSS1E	B9, B10, D1	Melic manna grass, *Viola sp.*, eastern rough sedge, yellow birch	Histic Epipedon (A2)	Yes: Portions within 25' of stream	S-KMN-34	Small scrub shrub wetland associated with stream
W-KMN-58	18	PSS1E	B9, B10, D1	Cottongrass bulrush, melic manna grass, lamp rush, whorled-nodding aster, rattlesnake manna grass, steeplebush, eastern white pine, yellow birch, red maple	Depleted Below Dark Surface (A11)	No	none	Scrub shrub wetland regenerating on plateau
W-KMN-59	18	PEM1E	A2, A3, B9	Interrupted fern, greater bladder sedge, evergreen wood fern, red spruce, hobblebush	Depleted Matrix (F3)	No	none	Emergent wetland on side slope; extends beyond Survey Area to west
W-KMN-60	24	PEM1E	A1, A2, A3, B10	Flat-top goldentop, cottongrass bulrush, *Epilobium sp.*, common red raspberry, *Viola sp.*, yellow birch	Histic Epipedon (A2)	No	none	Emergent seep; forestry impacts
W-KMN-61	24	PFO1E	A1, A2, A3	Melic manna grass, *Epilobium sp.*, wrinkle-leaf goldenrod,	Histic Epipedon (A2)	No	none	Regenerating forested wetland
W-KMN-62	24	PFO1/PSS1E	A1, A2, A3, B10, D1	Melic manna grass, uptight sedge, wrinkle-leaf goldenrod, bottongrass bulrush, flat-top goldentop, dwarf red raspberry, green ash, yellow birch, red maple, American beech, striped maple	Histic Epipedon (A2)	No	none	Regenerating seep draining to W-KMN-61 upland surface drainage to the west
W-KMN-63	24	PEM1/PFO1E	A3, D1	Melic manna grass, whorled nodding-aster, wrinkle-leaf goldenrod, evergreen wood fern, blue joint, yellow birch, red spruce, hobblebush, paper birch	Histic Epipedon (A2)	No	none	Regenerating forested side slope seep; shallow soils over rock
W-KMN-64	24	PFO1E	A1, A2, A3, D1, D4	Evergreen wood fern, wrinkle-leaf goldenrod, rattlesnake manna grass, dwarf red raspberry, woodland horsetail *(Equisetum sylvaticum)*, red maple, American beech, paper birch	Histic Epipedon (A2)	No	none	Forested wetland extends beyond the Survey Area to the southwest
W-KMN-65	25	PEM1E	A2, A3, B10	Cottongrass bulrush, wrinkle-leaf goldenrod, whorled nodding-aster, *Epilobium sp.*, flat-top goldentop	Histic Epipedon (A2)	Yes: Portions within 25' of stream	S-KMN-36	Emergent skid rut through groundwater seep; hydrological inputs from upland drainage; flows into S-KMN-36 south and out of Survey Area
W-KMN-66	34	PSS1E	A1, A2, A3, B10	Cottongrass bulrush, common red raspberry, interrupted fern, greater bladder sedge, yellow birch, gray birch, quaking aspen	Sandy Mucky Mineral (S1)	No	none	Regenerating skid road in swale upslope from upland drainage ; between rock outcrops; disturbed soils
W-KMN-67	11	PFO1E	A3, D1, D2, D4	Sensitive fern, nodding sedge, flat-top goldentop, eastern rough sedge, whorled nodding-aster, spotted touch-me-not, *Epilobioum sp.*, red spruce, eastern white pine, red maple, balsam fir, yellow birch, gray birch, American beech	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-KMN-7	Forested groundwater seep adjacent to stream and skid road
W-KMN-68	11	PFO1E	B9, B10	Interrupted fern, dwarf red raspberry, evergreen wood fern, green ash, American beech	Depleted Below Dark Surface (A11)	No	none	Forested groundwater seep
W-KMN-69	11	PSS1E	A3, D4	Sensitive fern, nodding sedge, cottongrass bulrush, dwarf red raspberry, wrinkle-leaf goldenrod, gray willow, yellow birch, gray birch, red maple	Depleted Matrix (F3)	No	none	Isolated wetland in skidder trail
W-KMN-70	11	PSS1E	A3, B9, D4	Nodding sedge, flat-top goldentop, uptight sedge, cottongrss bulrush, wrinkle-leaf goldenrod, northern water-horehound	Depleted Matrix (F3)	No	none	Isolated wetland in skidded trail
W-KMN-71	11	PFO1E	A3, B10	Melic manna grass, eastern rough sedge, dwarf red raspberry, sugar maple, American beech, hobblebush, yellow birch	Depleted Matrix (F3)	No	none	Seepy side slope below cliff; drains east out of Survey Area through upland drainage
W-KMN-72	9, 11	PEM1E	A3, B10	Evergreen wood fern, uptight sedge, wrinkle-leaf goldenrod	Depleted Matrix (F3)	Yes: Portions within 25' of stream	S-KMN-37	Emergent wetland in forested landscape; adjacent to stream KMN-37

Table 1. Wetland Summary								
Resource Field ID(s)	***Reference Map Number(s)***	***Dominant Covertype***	***Hydrology Indicators***	***Dominant Vegetation***	***Hydric Soil Indicators***	***WoSS***	***Associated Resources***	***Description & Notes***
W-KMN-73	11	PFO1E	A1, A2, A3, D4, B10	Wrinkle-leaf goldenrod, evergreen wood fern, *Epilobium sp.*, Canadian goldenrod, hobblebush, red maple, sugar maple, American beech, red spruce	Depleted Matrix (F3)	Yes: Portions within 25' of stream	S-KMN-37	Forested side slope seep; adjacent to S-KMN-37
W-KMN-74	8	PEM1E	A1, A2, A3, B10	Nodding sedge, uptight sedge, cottongrass bulrush, melic manna grass, *Epilobium sp.*, common red raspberry, yellow birch	Sandy Mucky Mineral (S1)	Yes: Portions within 25' of stream	S-KMN-39	Wetland in skidder trail; groundwater seep; forestry impacts; drains into S-KMN-39
W-KMN-75	6	PEM1E	A1, A2, A3	Cottongrass bulrush, red-tinge bulrush, flat-top goldentop, *Epilobium sp.*, *Juncus sp.*	Depleted Below Dark Surface (A11)	No	none	Isolated wetland in skidder trail
W-KMN-76	7	PEM1E	A1, A2, A3, B10	*Epilobium sp.*, cottongrass bulrush, nodding sedge, wrinkle-leaf goldenrod, Allegheny blackberry	Depleted Matrix (F3)	No	none	Isolated wetland in skidder trail
W-KMN-77	6	PFO1E	A1, A2, A3, B9	Whorled nodding-aster, evergreen wood fern, green ash, American beech, gray birch	Histic Epipedon (A2)	No	none	Forested seep at base of rock outcrop
W-KMN-78	5	PEM1E	A3, B7	Cottongrass bulrush, lamp rush, wrinkle-leaf goldenrod, black-girdle bulrush	Depleted Below Dark Surface (A11)	No	none	Isolated wetland in skidder trail
W-KMN-79	5	PEM1E	A1, A2, A3, B9, B10	Wrinkle-leaf goldenrod, sensitive fern, nodding sedge, field horsetail *(Equisetum arvense)*, common red raspberry	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-KMN-42	Riparian wetland along S-KMN-42
W-KMN-80	5	PFO1E	A3, B9, B10	Blue joint, wrinkle-leaf goldenrod, nodding sedge, sensitive fern, gray birch, yellow birch, green ash, quaking aspen	Histic Epipdeon (A2)	Yes: Portions within 25' of stream	S-KMN-42	Riparian wetland along S-KMN-42; forestry impacts
W-KMN-81	5	PFO1E	A3, B10	Wrinkle-leaf goldenrod, nodding sedge, flat-top goldentop, gray willow, quaking aspen	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-KMN-44	Riparian wetland of S-KMN-44; forestry impacts
W-KMN-82	13, 14	PFO1E	A1, A2, A3	Nodding sedge, evergreen wood fern, pointed broom sedge, American beech, red maple, yellow birch	Depleted Below Dark Surface (A11)	Maybe: PSVP	PSVP-KMN-6	Isolated wetland; forestry impacts
W-KMN-83	13	PSS1E	A1, A3, B9	Nodding sedge, cottongrass bulrush, wrinkle-leaf goldenrod, steeplebush, yellow birch	Depleted Matrix (F3)	No	none	Isolated wetland; forestry impacts
W-KMN-84	13	PSS1E	A1, A3	Cottongrass bulrush, nodding sedge, red maple, yellow birch	Depleted Matrix (F3)	No	none	Isolated wetland; forestry impacts
W-RDK-4	37	PEM1E	D2, D4, D5	Sensitive fern, fringed sedge, late goldenrod *(Solidago gigantea)*, marsh horsetail, common red raspberry, broad-leaf meadowsweet *(Spiraea latifolia)*, red maple	Depleted Below Dark Surface (A11)	No	none	Emergent disturbed wetland in old woods road north of Yonder Way
W-RDK-7	36	PEM1E	A3, B10, D2, D3, D4, D5	Sensitive fern, reed canary grass, fringed sedge, parasol white-top, wrinkle-leaf goldenrod, gray willow, red maple	Thick Dark Surface (A12)	Yes: Portions within 25' of stream	S-RDK-6	Roadside riparian wetland north of Yonder Way
W-RDK-8	30	PEM1E	A3, B8, B9, B10, C4, D2, D3, D4	Fringed sedge, rattlesnake manna grass	Redox Dark Surface (F6b)	No	none	Isolated depression in woods road; proximal but not connected to S-JLH-2
W-RDK-9	30	PEM1E	A2, A3	Sensitive fern, common red raspberry, bristly dewberry, cinnamon fern, cottongrass bulrush, shallow sedge, pointed broom sedge, fowl manna grass, wrinkle-leaf goldenrod, steeplebush, red maple, balsam fir, green ash, yellow birch	Histic Epipedon (A2)	No	none	Isolated wetland; abuts Yonder Way
W-RDK-10	30	PFO1E	A3, B9, B10, D2, D4, D5	Sensitive fern, marsh horsetail, dwarf red raspberry, rattlesnake manna grass, cinnamon fern, red maple, yellow birch	Histic Epipedon (A2)	No	none	Level area on side slope; groundwater discharge
W-RDK-11	30	PFO1E	A1, A2, A3, B10, D2, D3, D4,D5	Sensitive fern, marsh horsetail, dwarf red raspberry, rattlesnake manna grass, cinnamon fern, red maple, yellow birch	Histic Epipedon (A2)	No	none	Side slope wetland flows to roadside ditch along Yonder Way
W-RDK-12	23, 28, 29	PEM1E	A2, A3, B10, D2, D3, D4, D5	Sensitive fern, parasol white-top, late goldenrod, marsh horsetail, interrupted fern, cottongrass bulrush, gray willow	Redox Dark Surface (F6a)	Yes: Portions within 25' of stream	none	Emergent depression in forested setting north of Yonder Way

Table 1. Wetland Summary								
Resource Field ID(s)	***Reference Map Number(s)***	***Dominant Covertype***	***Hydrology Indicators***	***Dominant Vegetation***	***Hydric Soil Indicators***	***WoSS***	***Associated Resources***	***Description & Notes***
W-RDK-13	22, 23, 29	PSS1E	A3, B10, D2, D3, D4, C4	Fowl manna grass, parasol white-top, cottongrass bulrush, evergreen wood fern, common red raspberry, yellow birch, balsam fir, red maple	Depleted Matrix (F3)	No	none	Isolated shrub cover wetland; forestry impacts
W-RDK-14	22	PFO1/PSS1E	A3, B8, B10, C4, D2, D3, D4	Fringed sedge, cottongrass bulrush, interrupted fern, yellow birch, red maple, sugar maple, balsam fir	Depleted Matrix (F3)	No	none	Isolated forested/shrub cover wetland; forestry impacts
W-RDK-15	22	PFO1/PSS1E	A3, C4, B10, D2, D3, D4, D5	Fringed sedge, sensitive fern, uptight sedge, late goldenrod, cottongrass bulrush, broad-leaf cattail *(Typha latifolia)*	Redox Dark Surface (F6b)	No	none	Forested and rutted groundwater discharge wetland; base of steep slope along Yonder Way
W-RDK-16	22, 29	PFO1/PSS1E	A2, A3, C4, B10, D2, D3, D4, D5	Cottongrass bulrush, pointed broom sedge, fringed sedge, marsh horsetail, cinnamon fern, wrinkle-leaf goldenrod, uptight sedge, sensitive fern, red maple, yellow birch	Redox Dark Surface (F6b)	No	none	Mixed cover forest and shrub wetland; forestry impacts
W-RDK-19	21	PEM1E	A3, B10	Black bent *(Agrostis gigantea)* , uptight sedge, Devil's pitchfork, wrinkle-leaf goldenrod	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-RDK-20	Narrow swale between upland drainage and stream flowing south
W-RDK-21	20	PEM1/PFO1E	A1, A2, A3, B10, D1, D2, D3, D4, D5	Uptight sedge, evergreen wood fern, wrinkle-leaf goldenrod	Stratified Layers (S5)	Yes: Portions within 25' of stream	S-JLH-2	Riparian wetland along S-JLH-2; forestry impacts
W-RDK-22	20	PEM1/PFO1E	A1, A2, A3, B10, D1, D2, D3, D4, D5	Uptight sedge, evergreen wood fern, wrinkle-leaf goldenrod	Stratified Layers (S5)	Yes: Portions within 25' of stream	none	Isolated depression at base of bedrock knoll; forestry impacts; proximal but not connected to S-JLH-2
W-RDK-25	27	PEM1/PFO1E	A1, A2, A3, B10, D2, D3, D4, D5, C4	Wrinkle-leaf goldenrod, melic manna grass, yellow birch	Histic Epipdeon (A2)	Yes: Portions within 25' of stream	S-RDK-24	Emergent wetland in forested setting; riparian to S-RDK-24
W-RDK-26	27	PSS1E	A3, B10, D2, D3, D4, B8, B9, C4	Cottongrass bulrush, cinnamon fern, interrupted fern, rattlesnake manna grass, three-seed sedge, yellow birch	Stripped Matrix (S6)	No	none	Isolated wetland; forestry impacts
W-RDK-27	26, 27	PSS1E	A3, B10, D2, D3, D4, B8, B9, C4	Cottongrass bulrush, cinnamon fern, interrupted fern, rattlesnake manna grass, three-seed sedge, yellow birch	Stripped Matrix (S6)	No	none	Isolated wetland; forestry impacts
W-RDK-28	20	PEM1/PSS1E	A1, A2, A3, C4, B10, D2, D3, D4	Black bent, sensitive fern, fringed sedge, bristly dewberry, yellow birch	Depleted Matrix (F3)	No	none	Isolated wetland
W-RDK-29	15, 19	PEM1/PFO1E	A1, A2, A3, C4, B10, D2, D3, D4	Black bent, sensitive fern, fringed sedge, bristly dewberry, yellow birch	Depleted Matrix (F3)	Yes: Portions within 25' of stream	S-KMN-5	Mixed cover wetland; contains S-KMN-5
W-RDK-31	35, 40	PSS1E	A1, A2, A3, C4, C7, B10, D1, D2, D3, D4	*Sphagnum sp.*, cottongrass bulrush, eastern white pine, red spruce	Depleted Matrix (F3)	No	none	Small isolated depression in bedrock
W-RDK-32	18	PEM2E	A1, A2, A3, B10, D2, D3, D4	Evergreen wood fern, bristly dewberry	Depleted Matrix (F3)	No	none	Side slope wetland within forested setting
W-RDK-33	4, 5	PEM1E	A1, A2, A3, D2, D3, D4	Cottongrass bulrush, pointed broom sedge, wrinkle-leaf goldenrod, lamp rush, yellow birch	Depleted Below Dark Surface (A11)	No	none	Isolated depression adjacent to old logging road
W-RDK-34	4	PFO1E	A1, A2, A3, B10, D2, D3, D4	Rattlesnake manna grass, cinnamon fern, evergreen wood fern, wrinkle-leaf goldenrod, dwarf red raspberry	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-RDK-35	Wetland at edge of new collector line; drains into S-RDK-35
W-RDK-36	2	PEM1E	A2, A3, B10, D2, D4	Marsh horsetail, sensitive fern, bluejoint, wrinkle-leaf goldenrod, dwarf red raspberry, northern water-horehound	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	none	Wetland in forested setting; within collector line; proximal but not connected to S-KMN-46
W-REJ-1	30	PFO1/PSS1E	A2, A3, B10	Cinnamon fern, sensitive fern, shallow sedge, cottongrass bulrush, mosquito bulrush *(Scirpus hattorianus)* , American elm, green ash, American witch-hazel, red maple	Depleted Below Dark Surface (A11)	Yes: Portions within 25' of stream	S-JLH-4	Forested seep wetland south of Yonder Way; altered soils and hydrology; portion drains towards S-JLH-4 (Goff Brook)

Table 1. Wetland Summary								
Resource Field ID(s)	***Reference Map Number(s)***	***Dominant Covertype***	***Hydrology Indicators***	***Dominant Vegetation***	***Hydric Soil Indicators***	***WoSS***	***Associated Resources***	***Description & Notes***
W-REJ-2	28	PEM1E	A1, A2, A3, B9	Melic manna grass, sensitive fern, sugar maple, American witch-hazel	Sandy Mucky Mineral (S1)	Yes: Portions within 25' of stream	S-JLH-4	Riparian wetland of Goff Brook

APPENDIX E

Summary of Watercourses Identified within the Survey Area

Table 2. Watercourse Descriptions									
Resource Field ID(s)	***Reference Map Number(s)***	***Mapped/Local Name***	***Flow Regime***	***Flow Direction***	***Dominant Substrates***	***Approximate Width (ft.)***	***Approximate Depth (ft.)***	***Associated Resources***	***Description***
S-DRB-1	33	UNT of Swift River	Intermittent	NE	Mud, Cobble	2	0.5 to 1	W-DRB-5, W-KMN-9	Fed by groundwater discharge in W-DRB-5; flows through culvert under Yonder Way
S-DRB-2	38, 39	UNT of Swift River	Intermittent to Perennial	E	Cobble, Boulder, Bedrock, Sand, Mud	3 to 5	1	W-DRB-6, W-DRB-7	Begins in wetland and flow east out of Survey Area; several crossings along channel from forestry operation
S-DRB-3	39	UNT of Swift River	Intermittent	E	Cobble, Boulder, Bedrock, Sand, Mud	3 to 5	1	W-DRB-6, W-DRB-7, S-DRB-2	Side channel of S-DRB-2; flows into W-DRB-7
S-DRB-4	31,36	UNT of Goff Brook	Intermittent	NE	Cobble, Boulder, Gravel, Sand	4	0.5 to 1	W-KMN-12, S-JLH-4	Tributary of Goff Brook; crosses Survey Area under Yonder Way through culverts
S-DRB-5	36	UNT of Goff Brook	Intermittent	N	Sand, Gravel, Cobble	2	1	W-KMN-12, S-DRB-4	Flows from wetland into S-DRB-4 over gravel logging road; debris in channel
S-DRB-6	30	UNT of Goff Brook	Intermittent	N	Mud, Cobble	2	0.5 to 1	W-DRB-13, S-JLH-4	Hydrology fed by adjacent wetland; portions appear to be dug and straightened; slash in channel; joins Goff Brook at Yonder Way
S-DRB-7	26	UNT of Scotty Brook	Intermittent	SE	Bedrock, Cobble, Sand	2 to 3	0.5 to 1	W-DRB-31, W-DRB-29	Flows southeast; Road/ATV crossing filled with slash; high gradient
S-DRB-8	26	UNT of Scotty Brook	Intermittent	SE	Bedrock, Cobble, Sand	2 to 3	0.5 to 1	S-DRB-7	Side channel of S-DRB-7
S-JLH-2	19, 20, 21	UNT of Scotty Brook	Perennial	SE	Bedrock, Cobble, Sand	2	2	W-RDK-21, S-KMN-2	S-KMN-2 tributary; NSS salamanders and aquatic invertebrates found
S-JLH-4	28, 30, 31, 32	Goff Brook	Intermittent to Perennial	SE	Sand, Cobble Boulder	4 to 15	3	S-KMN-16, S-RDK-6, S-DRB-4, S-JLH-5, W-REJ-1,W-REJ-2, W-KMN-25, W-DRB-14, W-DRB-17, W-DRB-18	Begins as intermittent flow through culvert under Yonder Way from W-RDK-12; tributaries enter channel downslope to become perennial; NSS found along with aquatic invertebrates and other salamander species
S-JLH-5	28	UNT of Goff Brook	Intermittent	S	Sand, Cobble Boulder	3	1	W-DRB-17, S-JLH-4	Begins at culvert under Yonder Way; flows through W-DRB-17 into Goff Brook
S-JLH-13	5, 6	UNT of Swift River	Intermittent	NE	Sand, Cobble	2	1	none	Watercourse occurs near collector line in northern area of the Project
S-JLH-14	3	UNT of Swift River	Intermittent	SE	Gravel, Sand, Cobble	1 to 2	0.5	S-KMN-45	Tributary to S-KMN-45
S-KMN-2	20, 21	UNT of Scotty Brook	Perennial	SE	Cobble, Bedrock	3 to 6	2	W-KMN-55, W-KMN-33, S-JLH-2	Tributary of S-JLH-2; crosses slash roads; lots of exposed bedrock
S-KMN-4	19, 20	UNT of Scotty Brook	Intermittent	SE	Cobble, Bedrock	2 to 4	3 to 8	W-KMN-35, S-KMN-24, W-DRB-26	Flows from W-KMN-35 across Survey Area; high gradient
S-KMN-5	19	UNT of Scotty Brook	Intermittent	S	Sand	5	2	W-RDK-29	Groundwater fed; flows south within wetland
S-KMN-7	11	UNT of Swift River	Perennial	NE	Sand, Cobble, Gravel	3 to 6	1	W-DRB-1, W-KMN-67	Gently sloping; NSS observed with other salamander and aquatic invertebrate species
S-KMN-9	28, 29	UNT of Goff Brook	Intermittent	E	Sand, Cobble, Rock	2 to 4	1	W-DRB-19, W-KMN-22, W-KMN-23, S-JLH-4	Flows east south of Yonder Way into Goff Brook
S-KMN-11	35	UNT of Scotty Brook	Intermittent	SE	Boulder, Cobble	2-Jan	1	S-MFT-2, W-KMN-51	Intermittent tributary to S-MFT-2
S-KMN-12	32, 37	UNT of Goff Brook	Intermittent	NE	Sand, Cobble Boulder	4	0.5 to 1	W-DRB-9, S-JLH-4	Flows under Yonder Way and north into Goff Brook
S-KMN-13	32, 37	UNT of Goff Brook	Intermittent	N	Cobble, Boulder, Sand	2	0.5	S-JLH-4	Flows starts from culvert outlet at Yonder Way
S-KMN-14	37	UNT of Goff Brook	Intermittent	N	Sand, Cobble	2	0.5 to 1	W-KMN-11	Flows from wetland north into ditch along Yonder Way; likely has groundwater input
S-KMN-16	30	UNT of Goff Brook	Intermittent	SE	Sand, Gravel	2	0.5	S-JLH-4, W-RDK-11	Begins at culvert at Yonder Way; inputs from W-RDK-11; underground flow in areas
S-KMN-34	19	UNT of Scotty Brook	Intermittent	S	Sand, Cobble	2	0.5	W-KMN-56, W-KMN-57	Flows from W-KMN-56 to W-KMN-57; aquatic insects present
S-KMN-36	25	UNT of Scotty Brook	Intermittent	S	Cobble, Boulder, Bedrock	2	0.5	W-KMN-65	Begins in W-KMN-65 and flows south offsite
S-KMN-37	11	UNT of Swift River	Intermittent	E	Gravel, Boulder	2 to 4	0.5 to 1	W-KMN-72, W-KMN-73	Dry in upper 2/3 of channel; flows east out of Survey Area
S-KMN-38	8	UNT of Swift River	Intermittent	E	Sand, Gravel, Boulder, Redrock	3	0.5 to 1	none	Flows east off large rock outcrop; cliff/cascades along channel
S-KMN-39	8	UNT of Swift River	Intermittent	E	Sand, Gravel, Cobble, Boulder	3	0.5	W-KMN-74	Flows east out of wetland
S-KMN-40	7	UNT of Swift River	Intermittent	E/NE	Boulder, Cobble, Gravel, Sand	2 to 4	0.75 to 1.5	none	Skid trail runs over watercourse and redirects along skid road
S-KMN-41	6, 7	UNT of Swift River	Intermittent	NE	Boulder, Gravel , Bedrock	1 to 2	0.5	none	Flows through thick regeneration over skid road and into mature woods

Table 2. Watercourse Descriptions									
Resource Field ID(s)	***Reference Map Number(s)***	***Mapped/Local Name***	***Flow Regime***	***Flow Direction***	***Dominant Substrates***	***Approximate Width (ft.)***	***Approximate Depth (ft.)***	***Associated Resources***	***Description***
S-KMN-42	5	UNT of Swift River	Intermittent	N	Gravel, Cobble, Boulder	3 to 4	0.5 to 1	W-KMN-79, W-KMN-80	Disturbed; flows along skid roads between wetlands
S-KMN-44	4, 5	UNT of Swift River	Intermittent	NE	Gravel, Sand, Cobble	3 to 4	0.5	W-KMN-81, S-RDK-35	Flows east out of W-KMN-81; aquatic vegetation present
S-KMN-45	3	UNT of Swift River	Intermittent	NE	Boulder, Cobble	2	0.5	none	Flows northeast across recently constructed utility line
S-KMN-46	2	UNT of Swift River	Intermittent	NE	Gravel, Sand, Cobble	3 to 6	0.5 to 1	none	Flows northeast across recently constructed utility line
S-MFT-2	34, 35	UNT of Scotty Brook	Perennial	SE	Sand, Cobble Boulder	3	1	W-KMN-2, W-KMN-50, W-KMN-51	Starts from surface drainage and flows southeast through Survey Area; significant cascades along downstream channel; filled in at road crossing
S-REJ-23	14	UNT of Swift River	Intermittent	N	Sand, Muck, Boulder	6	1	none	Low gradient; flows out of side slope and north out of Study Area
S-RDK-2	34, 40	UNT of Scotty Brook	Intermittent	SW	Cobble, Bedrock	2	2	W-KMN-1	Flows southwest from W-KMN-1
S-RDK-5	20	UNT of Goff Brook	Intermittent	SE	Cobble, Boulder, Bedrock, Gravel	3	1	none	Flows southeast out of Survey Area to the east of W-DRB-27
S-RDK-6	31, 36	UNT of Goff Brook	Intermittent	N	Sand, Gravel, Cobble Boulder	3	1	W-DRB-10, W-RDK-7, S-JLH-4	Begins at culvert in Yonder Way, flows north into Goff Brook
S-RDK-18	21	UNT of Scotty Brook	Intermittent	SE	Stone, Mud	2 to 4	2	W-KMN-27, W-DRB-22, S-RDK-20	Flows from W-KMN-27 south out of Survey Area; Inputs from S-RDK-20
S-RDK-20	21	UNT of Scotty Brook	Intermittent	S	Boulder, Cobble, Sand	5	2	S-RDK-18, W-KMN-27, W-RDK-19	Outflow from W-RDK-19 through W-KMN-27 into S-RDK-18
S-RDK-24	27	UNT of Scotty Brook	Intermittent	E	Gravel, Sand, Cobble	4	2	W-RDK-25	Flows through W-RDK-25
S-RDK-35	4	UNT of Swift River	Intermittent	SE	Gravel, Sand, Cobble	1 to 2	0.5	W-RDK-34, S-KMN-44	Flows out of W-RDK-34; tributary to S-KMN-44

Exhibit 7-14
Wetland Functional Assessment

Flycatcher
LAND + SCIENCE + PEOPLE

Wetland Functional Assessment

Date: November 13, 2023

To: Lindsay Deane-Mayer (Palmer)

From: Katelin Nickerson (Flycatcher LLC)

CC: Rue Thurrell (Flycatcher)

Subject: Twin Energy Project, Oxford County, ME

This Wetland Functional Assessment is a supplement to the January 2022 *Wetland and Watercourse Delineation and Potential Vernal Pool Survey Report* by Flycatcher LLC (Flycatcher) for the proposed Twin Energy Wind Project located in Oxford County, Maine. The following provides a summary of proposed impacts to freshwater wetlands and a description of each wetland's functions and values.

Survey Area

General Description: The Survey Area is approximately 458 acres, located west of the Swift River, and north of Scotty Stream in Oxford County, Maine. The Survey Area encompasses the peak of South Twin Mountain, and then extends another 7,000 feet north, flanking the peak of North Twin Mountain to the west. The site is largely forested and is accessible via logging roads and recreational vehicle trails. The forest is a mix of hard and softwood trees and shrubs, with evidence of past logging such as skidder trails, landing areas, haul roads, and early to late successional growth.

Survey Methods

During the Fall 2021 wetland delineation and the spring of 2022 vernal pool survey, Flycatcher collected information on soils, hydrology, vegetation and on the functions and values of each wetland located within the Survey Area.

This functional assessment focuses on a smaller subset of wetlands that are proposed to be impacted by the Project. The assessment was performed pursuant to the approach described by the Army Corps Highway Methodology Workbook Supplement: Wetland Functions and Values[1] (Workbook). In this "Descriptive Approach" to functional assessment, the evaluators first determine if functions and values are present and why, followed by a determination of what functions and values are principal and why. **Functions and values can be considered "principal" if they are an important physical component of a wetland ecosystem (function only), and/or are considered of special value to society, from a local,**

[1] United States Army Corps of Engineers. 1999. The Highway Methodology Workbook Supplement. NAEEP-360-1-30a, New England District.

regional and/or national perspective. When making determinations on the wetland, evaluators are encouraged to determine whether the wetland has the potential to serve the functions and values as well.

Functions are self-sustaining properties of a wetland ecosystem that exist in the absence of society and that result from both living and non-living components of a specific wetland resource. These include all processes necessary for the self-maintenance of the wetland ecosystem such as primary productivity and nutrient cycling, among others. Therefore, functions relate to the ecological significance of wetland properties without regard to subjective human values.

Values are benefits that derive from one or more functions and the physical characteristics associated with a wetland. Most wetlands have corresponding societal value. The value of a particular wetland function, or combination of functions, is based on human judgment of the worth, merit, quality or importance attributed to those functions. Functions and values are listed below and are further described in **Appendix A.**

- **Groundwater Recharge/Discharge -** This function considers the potential for the wetland to serve as a groundwater recharge and/or discharge area. It refers to the fundamental interaction between wetlands and aquifers, regardless of the size or importance of either.
- **Floodflow Alteration (Storage & Desynchronization) -** This function considers the effectiveness of the wetland in reducing flood damage by attenuation of floodwaters for prolonged periods following precipitation events and the gradual release of floodwaters. It adds to the stability of the wetland ecosystem or its buffering characteristics and provides social or economic value relative by protecting downstream lands from erosion and flooding.
- **Fish and Shellfish Habitat -** This function considers the effectiveness of seasonal or permanent watercourses associated with the wetland in providing fish and shellfish habitat.
- **Sediment/Toxicant/Pathogen Retention -** This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland as a trap for sediments, toxicants or pathogens in runoff water from surrounding uplands, or upstream erosive wetland areas.
- **Nutrient Removal/Retention/Transformation -** This function considers the effectiveness of the wetland as a trap for nutrients in runoff water from surrounding uplands or contiguous wetlands and the ability of the wetland to process these nutrients into other forms or trophic levels. One aspect of this function is to prevent the ill effects of nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers or estuaries.
- **Production Export -** This function evaluates the effectiveness of the wetland to produce food or usable products for man or other living organisms.
- **Sediment/Shoreline Stabilization -** This function considers the effectiveness of the wetland in stabilizing stream banks and shorelines against erosion.
- **Wildlife Habitat -** This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and wetland edge habitat. Both resident and migrating species are considered.
- **Recreation -** This value considers the suitability of the wetland and associated watercourses to provide recreational opportunities such as hiking, canoeing, boating, fishing, hunting and other active or passive recreational activities.
- **Educational/Scientific Value -** This value considers the suitability of the wetland as a site for an "outdoor classroom" or as a location for scientific study or research.

- **Uniqueness/Heritage -** This value considers the effectiveness of the wetland or its associated waterbodies to provide certain special values, including archaeological sites, critical habitat for endangered species, its overall health and appearance, its role in the ecological system of the area, or its relative importance as a typical wetland class for the geographic location.
- **Visual Quality/Aesthetics -** This value considers the visual and aesthetic quality or usefulness of the wetland.
- **Endangered Species Habitat -** This value considers suitability of the wetland to support threatened or endangered species.

Findings

Wetland Overview

Overall wetlands proposed to be impacted by Project activity are small and isolated forested side seeps or depressions with evidence of disturbance from past timber harvest activities. The majority of these wetlands are not associated with other resources; however, four wetlands are associated with streams.

Wetland Vegetation, Hydrology, and Soils

Wetlands within the Survey Area are predominantly forested. These forested wetlands are generally comprised of mixed early successional growth forests intermixed with scrub shrubs species. Dominant tree species included balsam fir (*Abies balsamea*), gray birch *(Betula populifolia),* yellow birch (*Betula alleghaniensis*), red maple (*Acer rubrum*), red spruce *(Picea rubens),* and American beech *(Fagus grandifolia)*. Shrub wetland species include gray birch, red maple, striped maple *(Acer pensylvanicum),* yellow birch, and steeplebush *(Spiraea tomentosa).* Common herbaceous plants within wetlands include whorled nodding aster *(Oclemena acuminata),* flat-top goldentop *(Euthamia graminifolia),* wrinkle-leaf goldenrod *(Solidago rugosa),* cottongrass bulrush *(Scirpus cyperinus),* greater bladder sedge *(Carex intumescens),* pointed broom sedge *(Carex scoparia),* red-tinge bulrush *(Scirpus microcarpus),* melic manna grass *(Glyceria melicaria)*, nodding sedge *(Carex gynandra),* blue joint *(Calamagrostis canadensis),* cinnamon fern *(Osmundastrum cinnamomeum),* evergreen woodfern *(Dryopteris intermedia),* sensitive fern (*Onoclea sensibilis*), and bristly dewberry *(Rubus hispidus).*

Wetland hydrology includes surface water, high water table, saturation, water-stained leaves, drainage patterns, stunted or stressed plants, geomorphic position, shallow aquitard, and microtopographic relief.

Soils within wetlands are disturbed in areas of past timber harvest, but generally are not disturbed, largely deep organic or organic over depleted or redoximorphic sandy or silt loams. Many of these wetlands are perched on a shallow aquitard of ledge or bedrock.

Wetland Functions and Values

Overall functions and values served by these wetlands include groundwater recharge and discharge; flood flow alteration; sediment toxicant, and pathogen retention; nutrient removal, retention, and transformation; production export; wildlife habitat; recreation; uniqueness and heritage; and visual quality and aesthetics. The principal functions and values observed for these wetlands include flood flow, wildlife habitat, and uniqueness/heritage. Functions and values for wetlands proposed to be impacted by Project development are listed in Table 1.

Table 1. Wetland Summary with Functions and Values

Resource ID	*Dominant Cowardin Class*[1]	*Size (SF)*	*Wetland Functions and Values*	*Rationale (Reference #)*[2]	*Principal Function(s)/Value(s)*	*Associated Resources*	*Comments, Description, and Notes*	*Approximate Impact (SF)*
W-KMN-3	PFO1E	1,255	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2; **B:** 2, 3, 5, 9, 12; **D:** 4, 5, 6; **E:** 3, 6, 10; **F:** 1, 4, 12; **H:** 3, 4, 5, 7, 8; **I:** 3; **K:** 19, 22; **L:** 5	**H.** Wildlife Habitat	None	Small isolated forested side slope seep crossing skid trail. Located in the dip between North and South Twin Mountain peaks.	1,153
W-KMN-4	PFO1E	1,098	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 4; **B:** 2, 3, 5, 9, 12; **D:** 6; **E:** 3, 10; **F:** 1, 4, 12; **H:** 3, 4, 5, 7, 8; **I:** 3; **K:** 19; **L:** 5, 7	**H.** Wildlife Habitat	None	Small isolated forested wetland in naturalized woods road on side slope located below the peak of South Twin Mountain.	903
W-KMN-5	PFO1E	406	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2; **B:** 2, 3, 5, 9, 12; **D:** 4, 5, 6, 9; **E:** 3, 6, 10; **F:** 1, 4, 12; **H:** 1, 3, 4, 5, 7, 8; **I:** 3; **K:** 19; **L:** 5, 7	**H.** Wildlife Habitat	None	Small isolated forested groundwater seep on side slope located below the peak of South Twin Mountain.	406
W-KMN-7	PEM1E	666	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 6; **B:** 2, 3, 5, 9, 12; **D:** 4, 5, 6; **E:** 3, 6, 9, 10; **F:** 1, 4, 12; **H:** 3, 4, 5, 7, 8; **I:** 3; **K:** 19; **L:** 5	**H.** Wildlife Habitat	None	Small isolated emergent wetland in skidder trail; site of previous timber harvest, located on the side and below the peak of South Twin Mountain.	666
W-KMN-37	PFO1E	309	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 4, 6; **B:** 2, 3, 5, 9, 12; **D:** 4, 5, 6, 9; **E:** 3, 10; **F:** 1, 4, 12; **H:** 1, 3, 4, 5, 7, 8; **I:** 3; **K:** 19; **L:** 5	**H.** Wildlife Habitat	None	Small isolated forested groundwater seep located near the peak of South Twin Mountain.	118
W-KMN-38	PFO1E	10,730	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 6; **B:** 2, 3, 5, 9, 12, 18; **D:** 4, 5, 6, 9; **E:** 3, 10, 11; **F:** 1, 4, 12; **H:** 1, 3, 4, 5, 7, 8, 14, 15; **I:** 3; **K:** 19; **L:** 5	**H.** Wildlife Habitat	None	Predominantly forested wetland between rock outcrops located near the peak of South Twin Mountain.	914
W-KMN-40	PSS1E	1,321	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 4; **B:** 2, 3, 5, 9, 12; **D:** 4, 5, 6; **E:** 3, 9, 10; **F:** 1, 4, 12; **H:** 1, 3, 4, 5, 7, 8; **I:** 3; **K:** 19; **L:** 5	**H.** Wildlife Habitat	None	Small scrub shrub wetland in regenerating skid road at base of slope below the peak of South Twin Mountain.	1,321
W-KMN-42	PSS1E	2,150	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 4; **B:** 2, 3, 5, 9, 12; **D:** 4, 5, 6; **E:** 3, 9, 10; **F:** 1, 4, 12; **H:** 1, 3, 4, 5, 7, 8; **I:** 3; **K:** 19; **L:** 5	**H.** Wildlife Habitat	None	Small toe of slope forested wetland with evidence of forestry impacts and disturbed soils. Located near the peak of South Twin Mountain.	707
W-KMN-44	PFO1B	1,781	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 6; **B:** 2, 3, 5, 9, 12; **D:** 4, 5, 6, 9; **E:** 3, 6, 10; **F:** 1, 4, 12; **H:** 1, 3, 4, 5, 7, 8; **I:** 3; **K:** 19; **L:** 5	**H.** Wildlife Habitat	None	Small, forested seep between rock outcrops located below the peak of South Twin Mountain.	953
W-KMN-67	PFO1E	10,137	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **C. a)** Fish and Shellfish Habitat (Freshwater); **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; **K.** Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 6, 7, **B:** 2, 3, 5, 9, 10, 12, 13; **C. a):** 1, 8, 16; **D:** 4, 5, 6, 10; **E:** 3, 10; **F:** 1, 4, 12; **H:** 1, 3, 4, 5, 6, 7, 8; **I:** 3; **K:** 19, 24; **L:** 5	**B.** Floodflow Alteration; **H.** Wildlife Habitat; **K.** Uniqueness/Heritage	S-KMN-7	Forested groundwater seep adjacent to skid road and stream S-KMN-7. Stream known to contain northern spring salamander (*Gyrinophilus porphyriticus*).	1,114

Resource ID	*Dominant Cowardin Class[1]*	*Size (SF)*	*Wetland Functions and Values*	*Rationale (Reference #)[2]*	*Principal Function(s)/Value(s)*	*Associated Resources*	*Comments, Description, and Notes*	*Approximate Impact (SF)*
W-KMN-74	PEM1E	2,299	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **C. a)** Fish and Shellfish Habitat (Freshwater); **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; **K.** Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 4, 6, 7; **B:** 2, 3, 5, 9, 10, 12, 13; **C. a):** 1, 8, 14, 16; **D:** 4, 5, 6, 10; **E:** 3, 9, 10; **F:** 1, 4, 12; **H:** 1, 3, 4, 5, 6, 7, 8; **I:** 3; **K:** 19; **L:** 5	**B.** Floodflow Alteration; **H.** Wildlife Habitat	S-KMN-39	Small emergent groundwater seep wetland in skidder trail with evidence of forestry impacts; drains into stream S-KMN-39. Located below Peak of North Twin Mountain.	1,644
W-KMN-77	PFO1E	346	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 6; **B:** 2, 3, 5, 9, 12; **D:** 4, 5, 6, 9; **E:** 3, 6, 10; **F:** 1, 4, 12; **H:** 1, 3, 4, 5, 7, 8; **I:** 3; **K:** 19; **L:** 5	**H.** Wildlife Habitat	None	Small isolated forested seep at base of rock outcrop on the northern side slope of North Twin Mountain.	281
W-KMN-80	PFO1E	10887	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 7; **B:** 2, 3, 5, 9, 10, 12, 13; **C. a):** 1, 8, 16; **D:** 4, 5, 6, 10; **E:** 3, 9, 10; **F:** 1, 4, 12; **H:** 1, 3, 4, 5, 6, 7, 8; **I:** 3; **K:** 19; **L:** 5	**B.** Floodflow Alteration; **H.** Wildlife Habitat	S-KMN-42	Forested riparian wetland along S-KMN-42 with evidence of forestry impacts. Located north of the peak of North Twin Mountain.	1,529
W-KMN-81	PFO1E	813	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 7; **B:** 2, 3, 5, 9, 10, 12, 13; **C. a):** 1, 8, 16; **D:** 4, 5, 6, 10; **E:** 3, 9, 10; **F:** 1, 4, 12; **H:** 1, 3, 4, 5, 6, 7, 8; **I:** 3; **K:** 19; **L:** 5	**B.** Floodflow Alteration; **H.** Wildlife Habitat	S-KMN-44	Forested riparian wetland to stream S-KMN-44 with evidence of forestry impacts. Located north of the peak of North Twin Mountain.	336
W-KMN-83	PSS1E	781	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 6; **B:** 2, 3, 5, 9, 12; **D:** 4, 5, 6; **E:** 3, 6, 9, 10; **F:** 1, 4, 12; **H:** 3, 4, 5, 7, 8; **I:** 3; **K:** 19; **L:** 5	**H.** Wildlife Habitat	none	Small, isolated scrub shrub wetland with evidence of forestry impacts. Located just north of the peak of South Twin Mountain.	781
W-KMN-84	PSS1E	515	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 6; **B:** 2, 3, 5, 9, 12; **D:** 4, 5, 6; **E:** 3, 6, 9, 10; **F:** 1, 4, 12; **H:** 3, 4, 5, 7, 8; **I:** 3; **K:** 19; **L:** 5	**H.** Wildlife Habitat	none	Small, isolated scrub shrub wetland with evidence of forestry impacts. Located just north of the peak of South Twin Mountain.	515
W-RDK-32	PEM2E	1,492	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 6; **B:** 2, 3, 5, 9, 12; **D:** 4, 5, 6; **E:** 3, 6, 9, 10; **F:** 1, 4, 12; **H:** 3, 4, 5, 7, 8; **I:** 3; **K:** 19; **L:** 5	**H.** Wildlife Habitat	none	Small emergent side slope seep with evidence of groundwater discharge. Continues out of Survey Area to the east. Located just northeast of the peak of South Twin Mountain.	309
W-RDK-33	PEM1E	3,610	**A.** Groundwater Recharge/ Discharge; **B.** Floodflow Alteration; **D.** Sediment/ Toxicant/ Pathogen Retention; **E.** Nutrient Removal/ Retention/ Transformation; **F.** Production Export; **H.** Wildlife Habitat; **I.** Recreation; K. Uniqueness/ Heritage; **L.** Visual Quality/ Aesthetics	**A:** 2, 6; **B:** 2, 3, 5, 9, 12; **D:** 4, 5, 6; **E:** 3, 6, 9, 10; **F:** 1, 4, 12; **H:** 3, 4, 5, 7, 8; **I:** 3; **K:** 19; **L:** 5	**H.** Wildlife Habitat	none	Small isolated emergent wetland adjacent to an old logging road. Located north of the peak of North Twin Mountain.	1,294

1. Wetland classifications per USFWS' Cowardin et al. 1979 (https://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf)
2. Numbers correspond to the considerations/qualifiers for each function/value in the Highway Methodology 2015 Supplement included as **Appendix A.**

APPENDIX A

Highway Methodology Handbook: Wetland Evaluation Supporting Documentation

Appendix A

Wetland evaluation supporting documentation; Reproducible forms.

Below is an example list of considerations that was used for a New Hampshire highway project. Considerations are flexible, based on best professional judgment and interdisciplinary team consensus. This example provides a comprehensive base, however, and may only need slight modifications for use in other projects.

GROUNDWATER RECHARGE/DISCHARGE— This function considers the potential for a wetland to serve as a groundwater recharge and/or discharge area. It refers to the fundamental interaction between wetlands and aquifers, regardless of the size or importance of either.

CONSIDERATIONS/QUALIFIERS

1. Public or private wells occur downstream of the wetland.
2. Potential exists for public or private wells downstream of the wetland.
3. Wetland is underlain by stratified drift.
4. Gravel or sandy soils present in or adjacent to the wetland.
5. Fragipan does not occur in the wetland.
6. Fragipan, impervious soils, or bedrock does occur in the wetland.
7. Wetland is associated with a perennial or intermittent watercourse.
8. Signs of groundwater recharge are present or piezometer data demonstrates recharge.
9. Wetland is associated with a watercourse but lacks a defined outlet or contains a constricted outlet.
10. Wetland contains only an outlet, no inlet.
11. Groundwater quality of stratified drift aquifer within or downstream of wetland meets drinking water standards.
12. Quality of water associated with the wetland is high.
13. Signs of groundwater discharge are present (e.g., springs).
14. Water temperature suggests it is a discharge site.
15. Wetland shows signs of variable water levels.
16. Piezometer data demonstrates discharge.
17. Other

FLOODFLOW ALTERATION (Storage & Desynchronization) — This function considers the effectiveness of the wetland in reducing flood damage by water retention for prolonged periods following precipitation events and the gradual release of floodwaters. It adds to the stability of the wetland ecological system or its buffering characteristics and provides social or economic value relative to erosion and/or flood prone areas.

CONSIDERATIONS/QUALIFIERS

1. Area of this wetland is large relative to its watershed.
2. Wetland occurs in the upper portions of its watershed.
3. Effective flood storage is small or non-existent upslope of or above the wetland.
4. Wetland watershed contains a high percent of impervious surfaces.
5. Wetland contains hydric soils which are able to absorb and detain water.
6. Wetland exists in a relatively flat area that has flood storage potential.
7. Wetland has an intermittent outlet, ponded water, or signs are present of variable water level.
8. During flood events, this wetland can retain higher volumes of water than under normal or average rainfall conditions.
9. Wetland receives and retains overland or sheet flow runoff from surrounding uplands.
10. In the event of a large storm, this wetland may receive and detain excessive flood water from a nearby watercourse.
11. Valuable properties, structures, or resources are located in or near the floodplain downstream from the wetland.
12. The watershed has a history of economic loss due to flooding.
13. This wetland is associated with one or more watercourses.
14. This wetland watercourse is sinuous or diffuse.
15. This wetland outlet is constricted.
16. Channel flow velocity is affected by this wetland.
17. Land uses downstream are protected by this wetland.
18. This wetland contains a high density of vegetation.
19. Other

FISH AND SHELLFISH HABITAT (FRESHWATER) — This function considers the effectiveness of seasonal or permanent watercourses associated with the wetland in question for fish and shellfish habitat.

CONSIDERATIONS/QUALIFIERS

1. Forest land dominant in the watershed above this wetland.
2. Abundance of cover objects present.

STOP HERE IF THIS WETLAND IS NOT ASSOCIATED WITH A WATERCOURSE

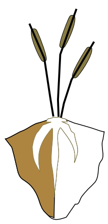
3. Size of this wetland is able to support large fish/shellfish populations.
4. Wetland is part of a larger, contiguous watercourse.
5. Wetland has sufficient size and depth in open water areas so as not to freeze solid and retain some open water during winter.
6. Stream width (bank to bank) is more than 50 feet.
7. Quality of the watercourse associated with this wetland is able to support healthy fish/shellfish populations.
8. Streamside vegetation provides shade for the watercourse.
9. Spawning areas are present (submerged vegetation or gravel beds).
10. Food is available to fish/shellfish populations within this wetland.
11. Barrier(s) to anadromous fish (such as dams, including beaver dams, waterfalls, road crossing) are absent from the stream reach associated with this wetland.
12. Evidence of fish is present.
13. Wetland is stocked with fish.
14. The watercourse is persistent.
15. Man-made streams are absent.
16. Water velocities are not too excessive for fish usage.
17. Defined stream channel is present.
18. Other

Although the above example refers to freshwater wetlands, it can also be adapted for marine ecosystems. The following is an example provided by the National Marine Fisheries Service (NMFS) of an adaptation for the fish and shellfish function.

FISH AND SHELLFISH HABITAT (MARINE) — This function considers the effectiveness of wetlands, embayments, tidal flats, vegetated shallows, and other environments in supporting marine resources such as fish, shellfish, marine mammals, and sea turtles.

CONSIDERATIONS/QUALIFIERS

1. Special aquatic sites (tidal marsh, mud flats, eelgrass beds) are present.
2. Suitable spawning habitat is present at the site or in the area.
3. Commercially or recreationally important species are present or suitable habitat exists.
4. The wetland/waterway supports prey for higher trophic level marine organisms.
5. The waterway provides migratory habitat for anadromous fish.
6. Essential fish habitat, as defined by the 1996 amendments to the Magnuson-Stevens Fishery & Conservation Act, is present (consultation with NMFS may be necessary).
7. Other



SEDIMENT/TOXICANT/PATHOGEN RETENTION — This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland as a trap for sediments, toxicants, or pathogens in runoff water from surrounding uplands or upstream eroding wetland areas.

CONSIDERATIONS/QUALIFIERS

1. Potential sources of excess sediment are in the watershed above the wetland.
2. Potential or known sources of toxicants are in the watershed above the wetland.
3. Opportunity for sediment trapping by slow moving water or deepwater habitat are present in this wetland.
4. Fine grained mineral or organic soils are present.
5. Long duration water retention time is present in this wetland.
6. Public or private water sources occur downstream.
7. The wetland edge is broad and intermittently aerobic.
8. The wetland is known to have existed for more than 50 years.
9. Drainage ditches have not been constructed in the wetland.

STOP HERE IF WETLAND IS NOT ASSOCIATED WITH A WATERCOURSE.

10. Wetland is associated with an intermittent or perennial stream or a lake.
11. Channelized flows have visible velocity decreases in the wetland.
12. Effective floodwater storage in wetland is occurring. Areas of impounded open water are present.
13. No indicators of erosive forces are present. No high water velocities are present.
14. Diffuse water flows are present in the wetland.
15. Wetland has a high degree of water and vegetation interspersion.
16. Dense vegetation provides opportunity for sediment trapping and/or signs of sediment accumulation by dense vegetation is present.
17. Other

NUTRIENT REMOVAL/RETENTION/TRANSFORMATION — This function considers the effectiveness of the wetland as a trap for nutrients in runoff water from surrounding uplands or contiguous wetlands and the ability of the wetland to process these nutrients into other forms or trophic levels. One aspect of this function is to prevent ill effects of nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers, or estuaries.

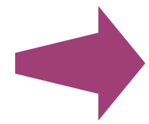
CONSIDERATIONS/QUALIFIERS

1. Wetland is large relative to the size of its watershed.
2. Deep water or open water habitat exists.
3. Overall potential for sediment trapping exists in the wetland.

4. Potential sources of excess nutrients are present in the watershed above the wetland.
5. Wetland saturated for most of the season. Ponded water is present in the wetland.
6. Deep organic/sediment deposits are present.
7. Slowly drained fine grained mineral or organic soils are present.
8. Dense vegetation is present.
9. Emergent vegetation and/or dense woody stems are dominant.
10. Opportunity for nutrient attenuation exists.
11. Vegetation diversity/abundance sufficient to utilize nutrients.

STOP HERE IF WETLAND IS NOT ASSOCIATED WITH A WATERCOURSE.

12. Waterflow through this wetland is diffuse.
13. Water retention/detention time in this wetland is increased by constricted outlet or thick vegetation.
14. Water moves slowly through this wetland.
15. Other



PRODUCTION EXPORT (Nutrient) — This function evaluates the effectiveness of the wetland to produce food or usable products for humans or other living organisms.

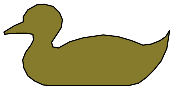
CONSIDERATIONS/QUALIFIERS

1. Wildlife food sources grow within this wetland.
2. Detritus development is present within this wetland
3. Economically or commercially used products found in this wetland.
4. Evidence of wildlife use found within this wetland.
5. Higher trophic level consumers are utilizing this wetland.
6. Fish or shellfish develop or occur in this wetland.
7. High vegetation density is present.
8. Wetland exhibits high degree of plant community structure/species diversity.
9. High aquatic vegetative diversity/abundance is present.
10. Nutrients exported in wetland watercourses (permanent outlet present).
11. "Flushing" of relatively large amounts of organic plant material occurs from this wetland.
12. Wetland contains flowering plants that are used by nectar-gathering insects.
13. Indications of export are present.
14. High production levels occurring, however, no visible signs of export (assumes export is attenuated).
15. Other

SEDIMENT/SHORELINE STABILIZATION — This function considers the effectiveness of a wetland to stabilize streambanks and shorelines against erosion.

CONSIDERATIONS/QUALIFIERS

1. Indications of erosion or siltation are present.
2. Topographical gradient is present in wetland.
3. Potential sediment sources are present up-slope.
4. Potential sediment sources are present upstream.
5. No distinct shoreline or bank is evident between the waterbody and the wetland or upland.
6. A distinct step between the open waterbody or stream and the adjacent land exists (i.e., sharp bank) with dense roots throughout.
7. Wide wetland (>10') borders watercourse, lake, or pond.
8. High flow velocities in the wetland.
9. The watershed is of sufficient size to produce channelized flow.
10. Open water fetch is present.
11. Boating activity is present.
12. Dense vegetation is bordering watercourse, lake, or pond.
13. High percentage of energy-absorbing emergents and/or shrubs border a watercourse, lake, or pond.
14. Vegetation is comprised of large trees and shrubs that withstand major flood events or erosive incidents and stabilize the shoreline on a large scale (feet).
15. Vegetation is comprised of a dense resilient herbaceous layer that stabilizes sediments and the shoreline on a small scale (inches) during minor flood events or potentially erosive events.
16. Other



WILDLIFE HABITAT — This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge. Both resident and/or migrating species must be considered. Species lists of observed and potential animals should be included in the wetland assessment report.[1]

CONSIDERATIONS/QUALIFIERS

1. Wetland is not degraded by human activity.
2. Water quality of the watercourse, pond, or lake associated with this wetland meets or exceeds Class A or B standards.
3. Wetland is not fragmented by development.
4. Upland surrounding this wetland is undeveloped.
5. More than 40% of this wetland edge is bordered by upland wildlife habitat (e.g., brushland, woodland, active farmland, or idle land) at least 500 feet in width.
6. Wetland is contiguous with other wetland systems connected by a watercourse or lake.
7. Wildlife overland access to other wetlands is present.
8. Wildlife food sources are within this wetland or are nearby.
9. Wetland exhibits a high degree of interspersion of vegetation classes and/or open water.
10. Two or more islands or inclusions of upland within the wetland are present.
11. Dominant wetland class includes deep or shallow marsh or wooded swamp.
12. More than three acres of shallow permanent open water (less than 6.6 feet deep), including streams in or adjacent to wetland, are present.
13. Density of the wetland vegetation is high.
14. Wetland exhibits a high degree of plant species diversity.
15. Wetland exhibits a high degree of diversity in plant community structure (e.g., tree/shrub/vine/grasses/mosses)
16. Plant/animal indicator species are present. (List species for project)
17. Animal signs observed (tracks, scats, nesting areas, etc.)
18. Seasonal uses vary for wildlife and wetland appears to support varied population diversity/abundance during different seasons.
19. Wetland contains or has potential to contain a high population of insects.
20. Wetland contains or has potential to contain large amphibian populations.
21. Wetland has a high avian utilization or its potential.
22. Indications of less disturbance-tolerant species are present.
23. Signs of wildlife habitat enhancement are present (birdhouses, nesting boxes, food sources, etc.).
24. Other

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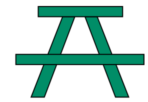
[1]In March 1995, a rapid wildlife habitat assessment method was completed by a University of Massachusetts research team with funding and oversight provided by the New England Transportation Consortium. The method is called WEThings (wetland habitat indicators for non-game species). It produces a list of potential wetland-dependent mammal, reptile, and amphibian species that may be present in the wetland. The output is based on observable habitat characteristics documented on the field data form. This method may be used to generate the wildlife species list recommended as backup information to the wetland evaluation form and to augment the considerations. Use of this method should first be coordinated with the Corps project manager. A computer program is also available to expedite this process.

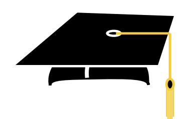
RECREATION (Consumptive and Non-Consumptive) — This value considers the suitability of the wetland and associated watercourses to provide recreational opportunities such as hiking, canoeing, boating, fishing, hunting, and other active or passive recreational activities. Consumptive opportunities consume or diminish the plants, animals, or other resources that are intrinsic to the wetland. Non-consumptive opportunities do not consume or diminish these resources of the wetland.



CONSIDERATIONS/QUALIFIERS

1. Wetland is part of a recreation area, park, forest, or refuge.
2. Fishing is available within or from the wetland.
3. Hunting is permitted in the wetland.
4. Hiking occurs or has potential to occur within the wetland.
5. Wetland is a valuable wildlife habitat.
6. The watercourse, pond, or lake associated with the wetland is unpolluted.
7. High visual/aesthetic quality of this potential recreation site.
8. Access to water is available at this potential recreation site for boating, canoeing, or fishing.
9. The watercourse associated with this wetland is wide and deep enough to accommodate canoeing and/or non-powered boating.
10. Off-road public parking available at the potential recreation site.
11. Accessibility and travel ease is present at this site.
12. The wetland is within a short drive or safe walk from highly populated public and private areas.
13. Other

EDUCATIONAL/SCIENTIFIC VALUE — This value considers the suitability of the wetland as a site for an "outdoor classroom" or as a location for scientific study or research.



CONSIDERATIONS/QUALIFIERS

1. Wetland contains or is known to contain threatened, rare, or endangered species.
2. Little or no disturbance is occurring in this wetland.
3. Potential educational site contains a diversity of wetland classes which are accessible or potentially accessible.
4. Potential educational site is undisturbed and natural.
5. Wetland is considered to be a valuable wildlife habitat.
6. Wetland is located within a nature preserve or wildlife management area.
7. Signs of wildlife habitat enhancement present (bird houses, nesting boxes, food sources, etc.).
8. Off-road parking at potential educational site suitable for school bus access in or near wetland.
9. Potential educational site is within safe walking distance or a short drive to schools.
10. Potential educational site is within safe walking distance to other plant communities.
11. Direct access to perennial stream at potential educational site is available.
12. Direct access to pond or lake at potential educational site is available.
13. No known safety hazards exist within the potential educational site.
14. Public access to the potential educational site is controlled.
15. Handicap accessibility is available.
16. Site is currently used for educational or scientific purposes.
17. Other

UNIQUENESS/HERITAGE — This value considers the effectiveness of the wetland or its associated waterbodies to provide certain special values. These may include archaeological sites, critical habitat for endangered species, its overall health and appearance, its role in the ecological system of the area, its relative importance as a typical wetland class for this geographic location. These functions are clearly valuable wetland attributes relative to aspects of public health, recreation, and habitat diversity.

CONSIDERATIONS/QUALIFIERS

1. Upland surrounding wetland is primarily urban.
2. Upland surrounding wetland is developing rapidly.
3. More than 3 acres of shallow permanent open water (less than 6.6 feet deep), including streams, occur in wetlands.
4. Three or more wetland classes are present.
5. Deep and/or shallow marsh or wooded swamp dominate.
6. High degree of interspersion of vegetation and/or open water occur in this wetland.
7. Well-vegetated stream corridor (15 feet on each side of the stream) occurs in this wetland.
8. Potential educational site is within a short drive or a safe walk from schools.
9. Off-road parking at potential educational site is suitable for school buses.
10. No known safety hazards exist within this potential educational site.
11. Direct access to perennial stream or lake exists at potential educational site.
12. Two or more wetland classes are visible from primary viewing locations.
13. Low-growing wetlands (marshes, scrub-shrub, bogs, open water) are visible from primary viewing locations.
14. Half an acre of open water or 200 feet of stream is visible from the primary viewing locations.
15. Large area of wetland is dominated by flowering plants or plants that turn vibrant colors in different seasons.
16. General appearance of the wetland visible from primary viewing locations is unpolluted and/or undisturbed.
17. Overall view of the wetland is available from the surrounding upland.
18. Quality of the water associated with the wetland is high.
19. Opportunities for wildlife observations are available.
20. Historical buildings are found within the wetland.
21. Presence of pond or pond site and remains of a dam occur within the wetland.
22. Wetland is within 50 yards of the nearest perennial watercourse.
23. Visible stone or earthen foundations, berms, dams, standing structures, or associated features occur within the wetland.
24. Wetland contains critical habitat for a state- or federally-listed threatened or endangered species.
25. Wetland is known to be a study site for scientific research.
26. Wetland is a natural landmark or recognized by the state natural heritage inventory authority as an exemplary natural community.
27. Wetland has local significance because it serves several functional values.
28. Wetland has local significance because it has biological, geological, or other features that are locally rare or unique.
29. Wetland is known to contain an important archaeological site.
30. Wetland is hydrologically connected to a state or federally designated scenic river.
31. Wetland is located in an area experiencing a high wetland loss rate.
32. Other

VISUAL QUALITY/AESTHETICS — This value considers the visual and aesthetic quality or usefulness of the wetland.

CONSIDERATIONS/QUALIFIERS

1. Multiple wetland classes are visible from primary viewing locations.
2. Emergent marsh and/or open water are visible from primary viewing locations.
3. A diversity of vegetative species is visible from primary viewing locations.
4. Wetland is dominated by flowering plants or plants that turn vibrant colors in different seasons.
5. Land use surrounding the wetland is undeveloped as seen from primary viewing locations.
6. Visible surrounding land use form contrasts with wetland.
7. Wetland views absent of trash, debris, and signs of disturbance.
8. Wetland is considered to be a valuable wildlife habitat.
9. Wetland is easily accessed.
10. Low noise level at primary viewing locations.
11. Unpleasant odors absent at primary viewing locations.
12. Relatively unobstructed sight line exists through wetland.
13. Other

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ENDANGERED SPECIES HABITAT — This value considers the suitability of the wetland to support threatened or endangered species.

CONSIDERATIONS/QUALIFIERS

1. Wetland contains or is known to contain threatened or endangered species.
2. Wetland contains critical habitat for a state or federally listed threatened or endangered species.