

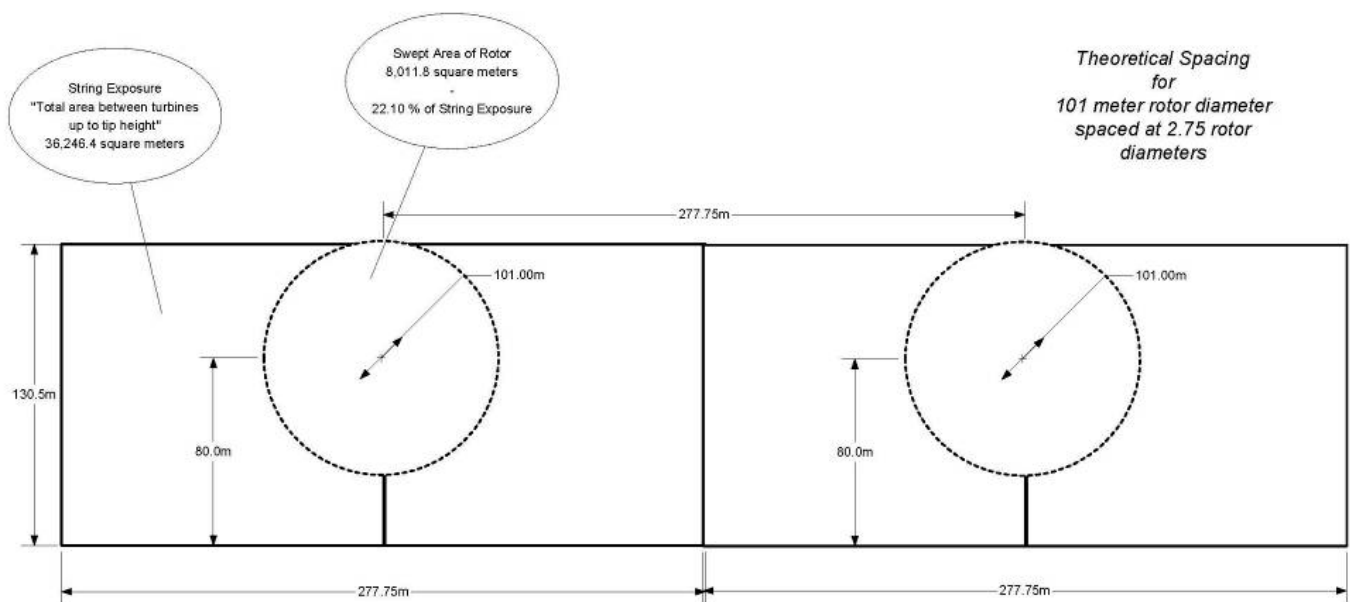
Tier 3 Case Study: Collaboration is Key in Mitigation Planning

Jeff Everett, U.S. Fish and Wildlife Service, Portland, Oregon

The information below is an accompaniment to the case study presented in the second half of Broadcast #1. This information describes in more detail the bank of curtailment hours concept and how those hours may be applied from our real-world project example. Some of the material below is copied directly from the adaptive management section of the project's Eagle Conservation Plan (ECP). It is important to keep in mind that the application of curtailment hours during the high-risk weather patterns are just one aspect of the project's ECP and adaptive management plan.

In the course of meetings with the U.S. Fish and Wildlife Service (Service), Oregon Department of Fish and Wildlife and the U.S. Bureau of Land Management, several concerns were raised and discussed in detail. The developer provided substantial information to the group as the conversations progressed. Several of those topics are addressed below:

- The Service expressed concerns about the ability of birds to pass through a 'picket fence' of turbines, arrayed perpendicular to the prevailing west winds. The developer provided the Service with detailed calculations and illustrations demonstrating anticipated "rotor swept area" calculations and the resultant conditions across the site. (See Figure below.)



Calculation of Rotor Swept Area

- Finally, the Service expressed concerns about seasonal (fall) east winds that might create soaring or 'kiting' conditions over the project area, prompting migrating raptors to possibly collide with turbines. The developer provided the Service with three years of data from on-site meteorological measuring equipment that measures vertical wind patterns (see attachments). Those data indicate the types of conditions that might prompt such behavior occur infrequently. Further discussion of the phenomenon led to the view that even in circumstances of east winds in fall and early winter months, during raptor migrations, there was nothing about the terrain where turbines will be located to suggest that raptors would be more likely to fly over the project than over the valley to the east.

The adaptive management plan monitors particularly closely the turbines along the northeastern edge of the project (the "Migratory Corridor Turbines"). These turbines are closest to the eastern edge of the rim, and potentially pose the greatest risk to raptors migrating south along the eastern escarpment. The adaptive management measures for raptors can be applied to the entire site in response to raptor mortalities to minimize the risk of further collisions. Curtailment is defined as the complete cessation of blade rotation of the target turbines. Curtailment will be implemented to coincide as much as possible with the conditions that resulted in the mortality and applied to the turbines nearest the mortality. The developer will consult with the Service in any case, in order to implement the curtailments in times and areas most likely to reduce the chances of future raptor mortalities.

The Service is most concerned with east wind conditions in the fall that might bring raptors in close proximity to the seven turbines planned to be placed along the east rim (the "Migratory Corridor Turbines"). These seven are nearest a steeply-sloped portion of the eastern escarpment, where updrafts from easterly winds, particularly during migration, might lead to soaring or kiting over the project site. If mortalities were to occur here during east wind conditions, increasing hours of curtailment would be phased-in during those conditions.

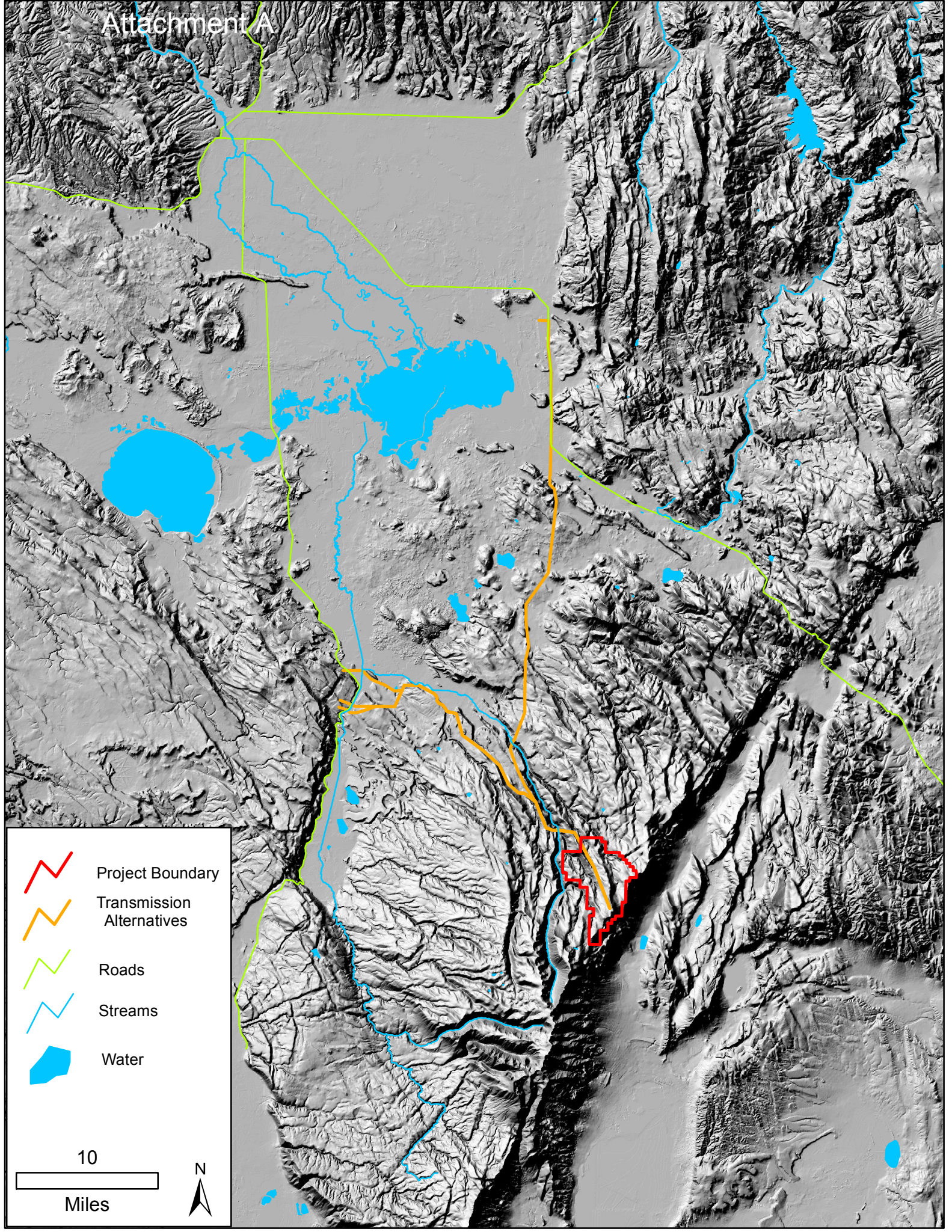
Curtailments will be applied in four equal hour phases of 333 turbine-hours up to a total of 1,332 hours. The maximum number of hours is based on the developer's pre-project meteorological tower data of wind conditions along the proposed Migratory Corridor Turbines, which demonstrated that there are, on average, 46 hours during the fall migration season (defined as the months between September and November) and 82 hours during the spring migration season, when winds blow from the east during the daylight hours (approximately 10.4 hours per day). This equals 1,332 turbine hours. The developer commits to curtail a percentage of these hours during each adaptive management phase, in four equal increments of 25 percent each.

U.S. Fish and Wildlife Service

Wind Energy Training Broadcast #1: The Tiered Approach

east wind conditions will be tracked by the project and curtailment will initiate upon an east wind event until all curtailment hours are exhausted for that phase of implementation. If there is some pattern to the mortalities that is revealed over time, the turbines in which curtailments occur might be shifted to maximize the benefit of curtailment to raptors across the project. Turbine curtailment shall not commence prior to 06:00 hours or after 20:00 hours, and adjusted within that time window depending on the availability of daylight hours within the season.

Attachment A



Project Boundary



Transmission Alternatives



Roads

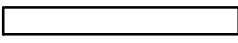


Streams



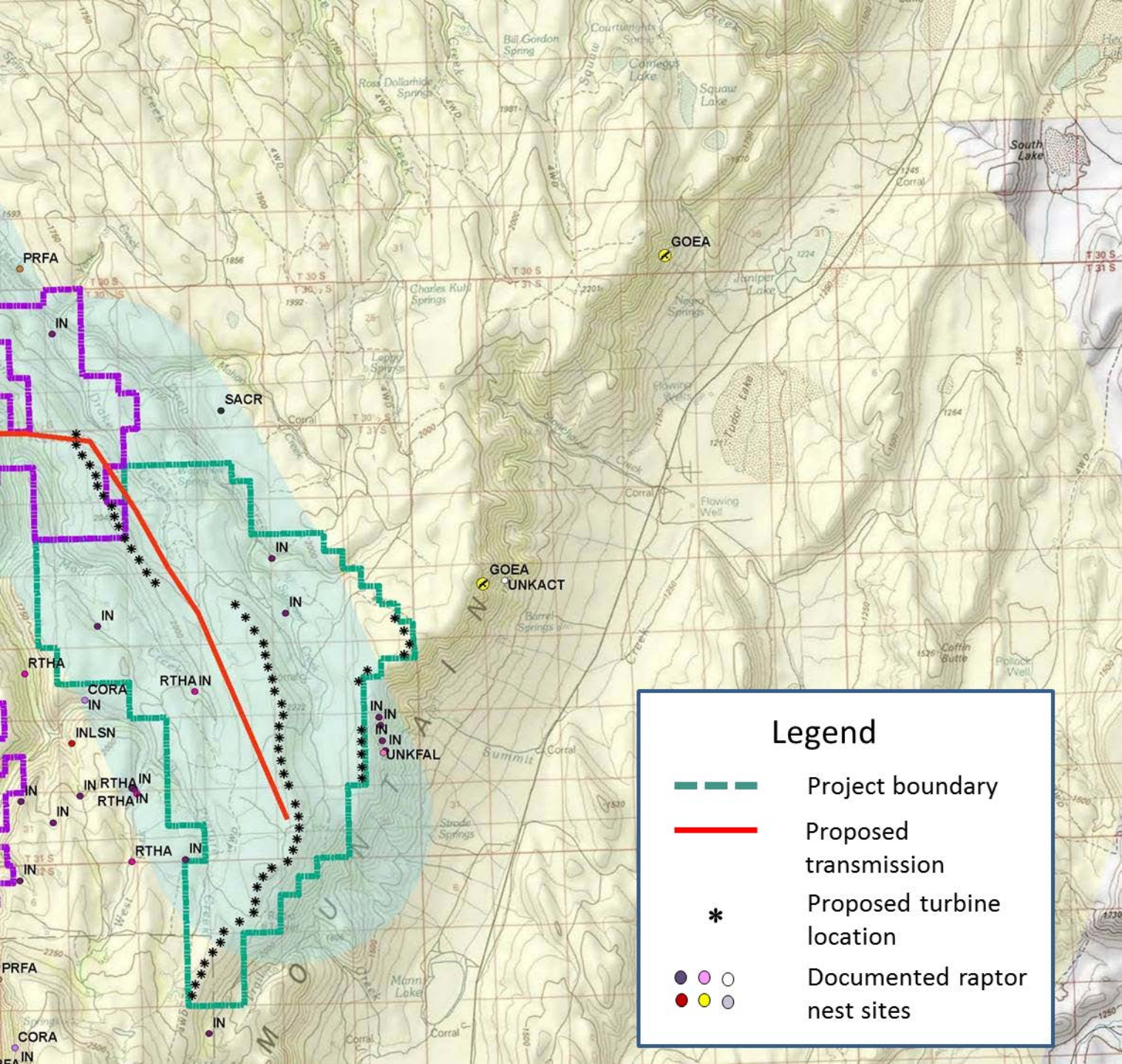
Water

10












Miles





Legend

-  Project boundary
-  Proposed transmission
-  Proposed turbine location
-    Documented raptor nest sites
-   

Attachment C

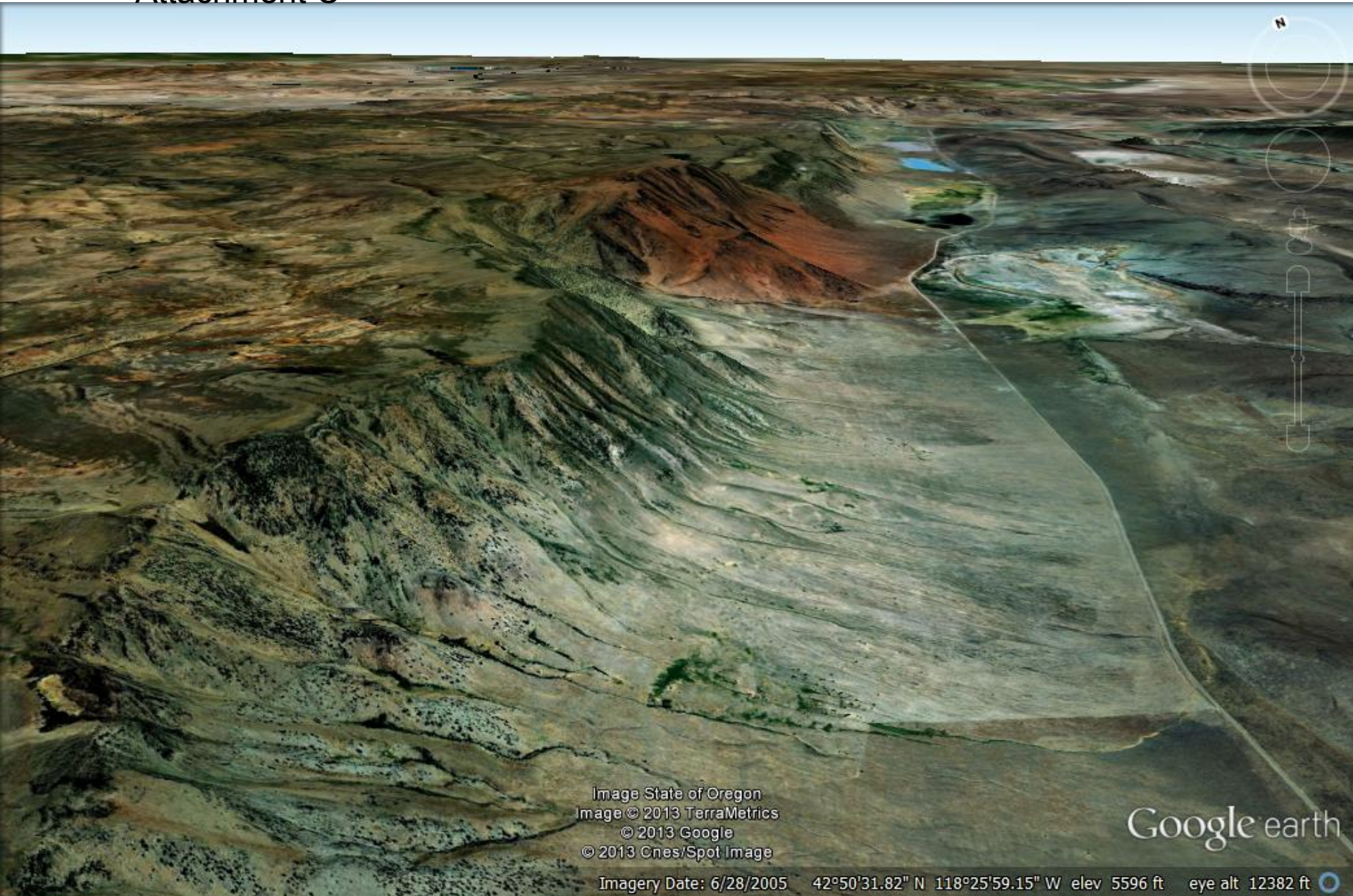


Image State of Oregon
Image © 2013 TerraMetrics
© 2013 Google
© 2013 Cnes/Spot Image

Google earth

Imagery Date: 6/28/2005 42°50'31.82" N 118°25'59.15" W elev 5596 ft eye alt 12382 ft

Attachment D

Wind Vector Inflow Angle - 2009 Meterological Tower ECH-1

