

Micro-sited Smaller Turbine Layout Alternative

Overview

The Micro-sited Smaller Turbine Layout alternative results from Sand Hill Wind, LLC's ("Sand Hill") efforts to minimize adverse impacts to birds and bats to the extent possible given unavoidable Project constraints (*e.g.*, mandatory setbacks, turbine availability, and the need to maintain commercial viability).

The Micro-sited Smaller Turbine Layout alternative is driven by the recommendations of two sequential, Project-specific micro-siting reports: Smallwood and Neher (2018), and Estep (2019). These studies analyzed the proposed Project's expected avian impacts on a turbine-by-turbine level—taking into account factors ranging from current understandings of raptor behavior to the effects of expected grading at the Project—and suggested revised turbine locations to minimize raptor collision risks. Incorporating the results of these studies to the extent possible, the Micro-sited Smaller Turbine Layout alternative relocates roughly half of the proposed Project's turbines, as indicated in the attached Sand Hill Turbine Tracking Spreadsheet ("Turbine Spreadsheet").¹ This alternative further employs the results of these micro-siting reports to reduce the rotor-swept area ("RSA") and increase the minimum blade-to-ground distance of 35 of the proposed Project's 40 turbines, with the intent to reduce overall risk to birds and bats.

In all, the Micro-sited Smaller Turbine Layout alternative relocates 19 of the proposed Project's 40 turbines,² reduces overall Project capacity by 24% from 144.5 MW to 109.5 MW, reduces rotor-swept area by 13%, from 568,775 m² to 496,220 m², and raises the average clearance of turbine blades by 75%, from 14.1 m to 24.7 m above the ground. (*Id.*) As a result of these changes, the Micro-sited Smaller Turbine Layout alternative is expected to substantially reduce bird and bat mortality compared to the proposed Project.

Initial Micro-siting: Smallwood and Neher (2018) and Layout 4

Smallwood and Neher's approach to micro-siting relies heavily on computer-based collision hazard models. Previously, they had prepared such models for the Tres Vaqueros, Vasco Winds, Patterson Pass, Golden Hills, Golden Hills North, and Summit Winds repowering projects. (Smallwood and Neher (2018) at 1). After analyzing additional data collected since the creation of these earlier models and incorporating lessons learned from other projects (including three years of fatality monitoring following construction of Vasco Winds), Smallwood and Neher developed updated models specific to the Project. (*Id.*)

¹ The Turbine Spreadsheet, attached hereto as **Exhibit 1**, provides detail on each turbine site, including risk levels assigned and relocation recommendations made by Smallwood and Neher (2018) and Estep (2019), and actions taken in response thereto. Images depicting the locations of relocated Project turbines, in both pre-micro-siting layouts (Layouts 1-3) and post-micro-siting layouts (Layouts 4-5), are attached as **Exhibit 2**.

² Three additional turbines were moved for reasons other than to reduce bird and bat collision risks. Turbine 8 was moved to further distance it from a nearby road. The location for Turbine 28 was revised to accommodate a pipeline easement. And Turbine 40 was relocated in response to a setback requirement.

Smallwood and Neher's models for the Project were designed to predict and map collision hazards for golden eagle, red-tailed hawk, American kestrel, and burrowing owl. (*Id.* at 2, 5, 31). Their models incorporated three primary variables: (1) flight behavior data (including data from surveys made during more than 2,000 hours of site visits across the APWRA and the Project site, and, in the case of golden eagles, GPS/GSM telemetry positions tracking actual golden eagle flight patterns at the Project location); (2) fatality rates at monitored wind turbines; and (3) the topographic landscape using a digital elevation model. (*Id.* at 2-3, 5, 18-19, 32).

Smallwood and Neher (2018) also drew from site visits in which Smallwood rated collision hazards at Proposed Project turbine sites using modified SRC criteria. (*Id.* at 5). This allowed Smallwood and Neher (2018) to address site-specific risks not captured in their hazard models. For example, even though the computer hazard models did not consider the effects of grading for turbine access roads or tower pads, Smallwood and Neher (2018) were able to analyze risks associated with grading at specific turbine locations. (*Id.* at 71, 72).

Smallwood and Neher (2018) then compared proposed turbine locations set forth in the three pre-micro-siting Proposed Project layouts (Layouts 1, 2, and 3) to (a) Smallwood's SRC-style hazard ratings; (b) predicted computer-generated collision hazards; and (c) fatality monitoring histories for golden eagle, red-tailed hawk, American kestrel, and burrowing owl. (*Id.* at 71, 73-75). Finally, Smallwood and Neher (2018) made turbine-by-turbine micro-siting recommendations based on this analysis, including recommendations expressly responding to risks associated with grading. (*Id.* at 72, 76-78) Smallwood and Neher (2018) concluded that, with micro-siting, the Project would be expected to reduce fatalities of raptors and birds as a group compared to the pre-repowering baseline, although bat fatalities may increase despite micro-siting efforts. (*Id.* at 1, 2, 71).

In response to Smallwood and Neher (2018), Sand Hill compiled a fourth turbine layout—Layout 4—that incorporated that study's micro-siting recommendations to the extent possible. (Turbine Spreadsheet).

Subsequent Micro-siting: Estep (2019) and Layout 5

Although Layout 4 was expected to reduce the Project's avian collision risks, room for additional refinement remained. As Smallwood and Neher (2018) acknowledged, "map-based collision hazard maps need to be interpreted carefully, meaning the hazards of specific terrain and wind situations . . . should always trump model predictions." (Smallwood and Neher (2018) at 71). Sand Hill therefore commissioned a second Project-specific micro-siting report: Estep (2019). The Estep report was designed to refine Smallwood and Neher (2018) by reexamining each proposed turbine location in Layouts 1-4, and providing more specific relocation recommendations. (Estep (2019) at 3).

While Smallwood and Neher (2018) represents an important contribution to understanding collision risk in the APWRA generally, Estep (2019) takes a more Project-centered approach that focuses on the results of site visits and on SRC turbine siting guidelines (SRC 2010) to produce more accurate micro-siting recommendations at the Project level. (Estep (2019) at 6-7). Estep (2019) considered a number of potential risk factors when evaluating each proposed turbine location. (*Id.* at 7-9). These included not only existing topographical features such as slopes, ridges, and swales, but expected changes to those features resulting from grading at the proposed Project. Thus, Estep (2019) performed "an assessment of . . . the most likely road access, the need to construct new roads, and the extent of road improvements necessary to accommodate the new larger turbines." (*Id.* at 8). Similarly, Estep (2019)

assessed “the extent of disturbance to construct a new turbine pad and how this might alter the configuration of ridges or slopes (e.g., create berms or notches along ridgelines or create new benches on slopes) that would result in additional risk.” (*Id.*).

After visiting and evaluating each proposed turbine site, Estep (2019) assigned each location a relative potential risk designation: very high risk, high risk, moderate-high risk, moderate risk, moderate-low risk, or low risk. (*Id.* at 8).³ No proposed turbine site earned a “very high risk” designation. Estep (2019) then made a micro-siting recommendation for each site, including a determination of whether an alternative location would reduce potential mortality. (*Id.* at 8-9). Estep (2019) made these recommendations exclusively on the basis of potential reduction of raptor collision risk, and did not consider other constraints, such as setback requirements. (*Id.* at 9).

In response to the Estep micro-siting report, Sand Hill prepared a fifth and final turbine layout, Layout 5, which became the Micro-sited Smaller Turbine Layout alternative. In this alternative, Sand Hill was able to follow many of the micro-siting recommendations made by Smallwood and Neher (2018) and Estep (2019), thereby reducing expected collision risk. In certain instances, however, unavoidable Project constraints such as County setback requirements prevented Sand Hill from relocating turbines in accordance with these reports. In these events, Sand Hill attempted to reduce risk in other ways, including by continuing to work with Estep to find suitable alternative turbine locations, and, in almost all instances, by reducing turbine sizes (and therefore decreasing rotor-swept area and increasing blade heights above ground-level).

For example, Layouts 1-3 (the non-micro-sited layouts) would have used 35 3.8 MW turbines, and five 2.3 MW turbines. The Micro-sited Smaller Turbine Layout alternative, by contrast, uses 35 2.8 MW turbines, and five 2.3 MW turbines. As the following table indicates, the result is not just a smaller rotor-swept area, but also greater distance between the ground and turbine blades.

Turbine Model	Capacity (MW)	Tower Height (m)	Rotor-Swept Area (m ²)	Height of blades from ground (m)
GE 3.8-137	3.8	81.5	14,741	13
GE 2.8-127	2.8	88.6	12,668	25
GE 2.3-116	2.3	80	10,568	22

In many cases, Sand Hill was able to use a combination of Smallwood and Neher (2018), Estep (2019), and ongoing consultation with Estep to move turbines from relatively moderate- or high-risk sites to locations expected to reduce collision threats. The following examples are illustrative:

- **Turbine 29.** Both Smallwood and Neher (2018) and Estep (2019) concluded that Turbine 29 as proposed in Layouts 1-3 would pose a considerable collision risk to raptors, with Estep designating it a relatively high-risk site. (Smallwood and Neher (2018) at 74-75; Estep (2019), Appendix A-3). Smallwood and Neher (2018) recommended moving the turbine east toward

³ Estep (2019) notes that its relative risk designations are based on current understandings of conditions that lead to raptor-turbine interactions, and that as a result may lead to higher collision rates. (Estep (2019) at 8). That report further cautions that its relative risk designations “do not otherwise indicate that a site *will* have more or less collision events than another, only that . . . the *potential for* more or less collision events is assumed.” (*Id.* at 8-9).

higher ground. (Smallwood and Neher (2018) at 77). Sand Hill did so in Layout 4, and Estep (2019) confirmed that the new site would reduce risk to moderate-to-high levels. (Estep (2019), Appendix A-3). Estep noted, however, that “placement of a turbine pad at this location could create a notch along the top of the slope above the swale and potentially result in additional risk,” and recommended further moving Turbine 29-4. (*Id.*). Although setback requirements prevented Sand Hill from accommodating this recommendation, Sand Hill proposed another alternative location for Turbine 29 following additional site visits; Estep confirmed that this location—used in the Micro-sited Smaller Turbine Layout alternative—would reduce expected collision risks to a low-to-moderate level. (*Id.*). In addition, Turbine 29 is reduced from 3.8 MW (rotor-swept area of 14,741 m² with blades 13 m from the ground) to 2.3 MW (rotor swept area of 10,568m² with blades 22m from the ground), which is expected to further reduce collision risks for birds and bats by reducing rotor-swept area by 28% and increasing blade height from the ground by 69%.

- **Turbine 20.** In Layouts 2 and 3, Turbine 20 presented what Estep (2019) predicted would be a moderate collision risk, owing in part to the expected effects of grading for road access to those sites. (Estep (2019), Appendix A-2). Smallwood and Neher (2018) recommended siting Turbine 20 on the crest of a hill near the location proposed in Layout 1. (Smallwood and Neher (2018) at 77). However, because this would have resulted in two or more turbines being placed so closely together that wake interference would render them commercially infeasible, Sand Hill was unable to so relocate Turbine 20 in Layout 4. (Turbine Spreadsheet). Estep (2019) concluded that the Layout 1 site would pose a low to moderate risk, and did not anticipate special risks due to grading. (Estep (2019), Appendix A-2). Estep further concluded that this risk could be further mitigated by moving Turbine 20 approximately 80 feet. (*Id.*). In the Micro-sited Smaller Turbine Layout alternative, Sand Hill located Turbine 20 in accordance with the Estep (2019) recommendation. (Turbine Spreadsheet). In addition, it reduced the size of Turbine 20 by over 26%, from 3.8 MW to 2.8 MW. (*Id.*) This cut Turbine 20’s rotor-swept area by approximately 14%, from 14,741 m² to 12,668 m², and raised its blades approximately 92% higher off the ground (from 13m to 25 m), thereby further lessening risk to birds and bats.

In many instances, micro-siting recommendations would have resulted in diminished turbine production due to wake effect. Because Sand Hill could not sustain unlimited output losses due to wake effect, it prioritized high-risk sites in the Micro-sited Smaller Turbine Layout alternative. For example:

- **Turbines 14, 15, and 16.** Estep (2019) designated Turbines 14, 15, and 16 as proposed in certain previous layouts as relatively high-risk sites. For each turbine, Estep (2019) provided a relocation recommendation that would result in wake-effect losses. (Estep (2019), Appendix A-2). Prioritizing changes at these relatively high-risk sites, the Micro-sited Smaller Turbine Layout alternative follows Estep’s recommendations for each site despite wake effect losses. (Turbine Spreadsheet). In addition, this alternative reduces the size of Turbines 14, 15, and 16 from 3.8 MW to 2.8 MW (resulting at each turbine in a 26% MW reduction, a 14% RSA reduction from 14,741 m² to 12,668 m² and blades raised approximately 92% higher off the ground from 13m to 25 m). The Micro-sited Smaller Turbine Layout alternative also avoids grading-related risks that Estep (2019) flagged for certain non-micro-sited locations of Turbine 15. (Estep (2019), Appendix A-2).

- **Turbine 36.** Estep (2019) recommended moving Turbine 36 approximately 200 feet. (Estep (2019), Appendix A-4). The resulting wake-effect loss would be similar to that sustained by relocating Turbine 14. However, because Turbine 36 is only a moderate-risk site (and one for which neither Estep (2019) nor Smallwood and Neher (2018) noted any grading-related concerns), the Micro-sited Smaller Turbine Layout does not relocate Turbine 36, but instead reduces its size by over 26% from 3.8 MW to 2.8 MW (resulting in a 14% RSA reduction from 14,741 m² to 12,668 m² and blades raised approximately 92% higher off the ground from 13m to 25 m).

At other sites, Sand Hill used micro-siting to make already relatively low-risk turbines even safer. The following examples are illustrative:

- **Turbine 1.** Smallwood and Neher (2018) recommended moving Turbine 1 approximately 197 feet from its proposed location in Layouts 1-3. (Smallwood and Neher (2018) at 76). Sand Hill was largely able to accommodate this relocation, as reflected in Layout 4. (Turbine Spreadsheet). Although neither Estep (2019) nor Smallwood and Neher (2018) noted concerns with respect to grading at either location, Estep (2019) found the Layout 4 site to be a slight improvement that presented a low-to-moderate collision risk. (Estep (2019), Appendix A-1). Estep (2019) then recommended placing Turbine 1 approximately 60 feet north of the Layout 4 site, which would further distance Turbine 1 from an upward slope, better center it within a broad valley, and move it further from rock piles and overhead powerlines. (*Id.*). Sand Hill was able to move Turbine 1 60 feet north. (Turbine Spreadsheet). Additionally, the Micro-sited Smaller Turbine Layout alternative further minimizes risk by reducing the size of Turbine 1 from 3.8 MW to 2.8 MW, resulting in 26% MW reduction, a 14% RSA reduction from 14,741 m² to 12,668 m² and blades raised approximately 92% higher off the ground from 13m to 25 m. (Turbine Spreadsheet).
- **Turbine 12.** Prior to micro-siting, Turbine 12 would have been situated in areas designated by Estep (2019) as either low or low-to-moderate risk. (Estep (2019), Appendix A-2). Neither Estep (2019) nor Smallwood and Neher (2018) noted concerns with respect to grading at any proposed Turbine 12 location. Sand Hill re-sited Turbine 12 based on Smallwood and Neher's recommendations, and Estep (2019) confirmed the new site to be the safest local alternative. (Turbine Spreadsheet; Estep (2019), Appendix A-2). Following an additional site visit, Sand Hill proposed moving Turbine 12 an additional 37 feet south; Estep confirmed that this was an equally safe location, and a recommended site. (Estep (2019), Appendix A-2). In addition, Sand Hill also further minimized risk by reducing the size of Turbine 12 from 3.8 MW to 2.8 MW, resulting in 26% MW reduction, a 14% RSA reduction from 14,741 m² to 12,668 m² and blades raised approximately 92% higher off the ground from 13m to 25 m. (Turbine Spreadsheet).

In some instances, although Estep (2019) or Smallwood and Neher (2018) suggested relocating a turbine, relocation proved infeasible. To compensate, Sand Hill attempted to reduce expected collision threats to birds and bats through other means, primarily by reducing turbine sizes. The following examples are illustrative.

- **Turbine 9.** Estep (2019) gave the Turbine 9 location a "moderate" relative risk designation. (Estep (2019), Appendix A-1). Both Estep (2019) and Smallwood and Neher (2018) recommended that Turbine 9 be moved closer to the top of a nearby hill. (Smallwood and

Neher (2018) at 76; Estep (2019), Appendix A-1). However, it was not possible to relocate Turbine 9 because it would have resulted in infeasibly high wake effect interference with Turbine 8. Instead, the Micro-Sited Smaller Turbine Layout alternative reduces the size of Turbine 9 by nearly 40% (3.8 MW to 2.3 MW). (Turbine Spreadsheet). This results in an approximately 28% reduction in RSA (from 14,741 m² to 10,568 m²) and rotor blades that are more than 69% higher off the ground (from 13 m above the ground to 22 m).

- **Turbine 27.** Although neither noted any grading concerns, both Estep (2019) and Smallwood and Neher (2018) made relocation recommendations for Turbine 27, which Estep classified as posing a relatively high collision risk. (Smallwood and Neher (2018) at 78; Estep (2019), Appendix A-3). However, mandatory setbacks prohibited Sand Hill from relocating Turbine 27. (Turbine Spreadsheet). Instead, the Micro-sited Smaller Turbine Layout alternative cuts the size of Turbine 27 more than 26%, from 3.8 MW to 2.8 MW (thereby reducing RSA by 14% from 14,741 m² to 12,668 m² and increasing blade distance from the ground by 92% from 13 m to 25 m). (Turbine Spreadsheet).
- **Turbine 37.** While not finding concerns related to grading, both Estep (2019) and Smallwood and Neher (2018) classified Turbine 37 as relatively high risk, and recommended relocation. (Smallwood and Neher (2018) at 75, 78; Estep (2019), Appendix A-4). However, relocating Turbine 37 would have resulted in unacceptably high wake effect, rendering these recommendations infeasible. (Turbine Spreadsheet). In order to reduce risk at Turbine 37, the Micro-sited Smaller Turbine Layout alternative instead reduces the size of Turbine 37 by nearly 40% (3.8 MW to 2.3 MW), resulting in a 28% reduction of RSA from 14,741 m² to 10,568 m² and an increase in blade distance from ground by 69% from 13 m to 22 m). (*Id.*).

Similarly, there were a number of turbine sites in Layouts 1-3 for which neither Smallwood and Neher (2018) nor Estep (2019) were able to identify a nearby relocation site that would reduce raptor collision risks. Here too, Sand Hill attempted to reduce collision potential at higher-risk locations by reducing turbine sizes. For example, Estep (2019) designated Turbine 6 as moderate risk, and neither Estep nor Smallwood and Neher (2018) proposed a better alternative site. (Smallwood and Neher (2018) at 76; Estep (2019), Appendix A-1). The Micro-sited Smaller Turbine Layout alternative nevertheless reduces the size of Turbine 6 from 3.8 MW to 2.8 MW, a more than 26% capacity reduction that reduces rotor-swept area by 14% from 14,741 m² to 12,668 m², and raises the turbine's minimum blade elevation by 92% from 13 meters to 25 meters.

In order for the Project to meet its primary objectives of satisfying Power Purchase Agreements obtained for the Project by siting up to 40, fourth-generation turbines and maintaining commercial viability, its capacity can be no less than 109.5 MW. Turbine-size reductions in the Micro-sited Smaller Turbine Layout alternative therefore decrease the overall capacity of the Project to the maximum extent feasible, from 144.5 MW to 109.5 MW.

In total, the Micro-sited Smaller Turbine Layout alternative relocates 19 of the proposed Project's 40 turbines, reduces overall Project capacity by 24% from 144.5 MW to 109.5 MW, reduces rotor-swept area by 13%, from 568,775 m² to 496,220 m², and raises the average clearance of turbine blades by 75%, from 14.1 m to 24.7 m above the ground. Each of these steps is expected to reduce bird and bat mortality based on input obtained from the Smallwood and Neher (2018) and Estep (2019) micro-siting studies prepared for the Project.

EXHIBIT 1

Turbine	Used in Micro-sited Smaller Turbine Layout Alternative?	Original Nameplate MW	Final Nameplate MW	Smallwood SRC-Style Hazard Rating	Smallwood Fuzzy Logic Rating	Smallwood Micro-siting Recommendation	Layout 4: Turbine Relocated in Response to Smallwood?	Estep Relative Risk Rating	Estep micro-siting Recommendation	Layout 5: Turbine Relocated in Response to Estep?	Has Risk Been Reduced?
SH01-1,2,3	No	GE 3.8	-	8.5	1	Maybe move ENE 60 m.	Yes. Moved 80m (260 ft) east to site 01-4. Modified Smallwood recommendation to avoid beam path issue.	Low-Mod	Use modified site 01-4, which is slightly lower risk than this site.	Not using this site.	Yes - site removed.
SH01-4	Yes, modified	GE 3.8	GE 2.8				Yes. Moved to this site in Layout 4 based on Smallwood recommendation.	Low-Mod	Move at least 60 feet north, which moves turbine further from the upward slope to the south, centers it better within the broad valley, and moves it further from rock piles and overhead powerlines.	Yes. Moved 60 feet north in Layout 5.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH02-1,2,3, 4	Yes	GE 2.3	GE 2.8	6	1	None. No concern with this site.	N/A	Low	Use this site.	Using this site.	Recommended, low-risk site, and blade height above ground increased.
SH03-1, 2, 3, 4	Yes, modified	GE 2.3	GE 2.8	6	1	None. No better options locally.	N/A	Low-Mod	Move approximately 105 feet south, further from the swale to the east to slightly reduce collision risk.	Yes. Moved 105 feet south.	Yes - turbine moved and blade height above ground increased.
SH04-1,2,3	No	GE 2.3	-	10	3	None. Recommends avoiding this site.	Yes. Moved 80 m (260 ft) SW to move farther from ravine (farthest move possible due to wake) to Site 04-4.	High	None.	Not using this site.	Yes - site removed.
SH04-4	Yes	GE 2.3	GE 2.8				Yes. Moved to this site in Layout 4 to move farther from ravine and closer to top of hill.	High	Move approximately 225 feet due south of Site 04-4 to the top of the hill, and further off of northwest-facing slope edge.	No. Could not move further south due to wake effect. Turbine size slightly increased because smaller turbines required at other locations for setbacks and/or to reduce golden eagle risk.	Yes - turbine moved and blade height above ground increased.
SH05-1,2,3	No	GE 3.8	-	6	1	Shift SW to hill peak.	Yes. Moved 62 m (205 ft) SW to hill peak to Site 05-4.	Low-Mod	None.	Not using this site.	Yes - site removed.
SH05-4	Yes, modified	GE 3.8	GE 2.8				Yes. Moved to this site in Layout 4 based on Smallwood recommendation.	Low-Mod	Move approximately 80 feet northeast to keep the turbine further from the edge of slope.	Yes. Moved 53 feet east to back away from steep slope. Could not move north due to wake effect. Also reduced turbine size.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH06-1,2,3,4	Yes	GE 3.8	GE 2.8	7	3	None. This site likely safest site on ridge.	N/A	Mod	No relocation recommended.	Using this site.	Yes - site recommended, turbine blade height above ground increased, and RSA and MWs reduced.
SH07-1,2,3	No	GE 3.8	-	6.5	1	Move to N ridge crest.	Yes. Moved 12 m (40 ft) N (farthest move possible due to wake) to Site 07-4.	Mod	None.	Not using this site.	Yes - site removed.
SH07-4	Yes	GE 3.8	GE 2.8				Yes. Moved to this site in Layout 4 based on Smallwood recommendation.	Mod	Move approximately 200 feet northwest to the top of hill/ridge.	No. Could not move further due to wake effect.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH08-1,2,3	No	GE 3.8	-	8	3	None. This site likely safest local option.	N/A	Low	Move 50 feet north to center on ridge top.	Not using this site. Could not move north due to proximity of road.	Yes - site removed.
SH08-4	Yes	GE 3.8	GE 2.8					Low	None. Use modified site 08-1.	Using this site.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.
SH09-1,2,3,4	Yes	GE 3.8	GE 2.3	7	1	Shift west and uphill.	No. Turbine cannot be relocated west and uphill due to wake.	Mod	Move approximately 280 feet northwest to top of hill.	No. Could not move due to wake effect.	Yes - turbine could not be moved, but turbine blade height above ground increased, and RSA and MWs reduced.
SH10-1,2,3,4	Yes	GE 2.3	GE 2.8	7.5	1	None. Uncertain about likely impacts here.	N/A	Low-Mod	Use this site.	Using this site.	Recommended, low-mod risk site, and blade height above ground increased.
SH11-1,2,3,4	Yes	GE 3.8	GE 2.8	4	4	None. This site safest place in area.	N/A	Mod	Use this site.	Using this site.	Yes - site recommended, turbine blade height above ground increased, and RSA and MWs reduced.
SH12-1	No	GE 3.8	-	7	2	Move 25 m west.	Yes. Moved 25 m (82 ft) W, to site 12-4.	Low	Use site 12-4.	Not using this site.	Yes - site removed.
SH12-2	No	GE 3.8	-	6	1	None. This site safest place in area.	N/A.	Low-Mod	Use site 12-4.	Not using this site.	Yes - site removed.
SH12-3	No	GE 3.8	-	6	1	None. This site safest place in area.	N/A	Low-Mod	Use site 12-4.	Not using this site.	Yes - site removed.
SH12-4	Yes, modified	GE 3.8	GE 2.8				Yes. Moved to this site in Layout 4 based on Smallwood recommendation.	Low	Use this site.	Following site visit, moved additional 37 feet south. Estep confirmed this location as safe as 12-4, and is also recommended site.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH13-1	No	GE 3.8	-	7	1	Move east to ridge crest.	Yes. Moved 30 m (100 ft) E to ridge crest to site 13-4.	High	Use modified site 13-4.	Not using this site	Yes - site removed.
SH13-2	No	GE 3.8	-	8	3	Use modified site 13 or 13-2.	N/A.	High	Use modified site 13-4.	Not using this site.	Yes - site removed.
SH13-3	No	GE 3.8	-	8.5	3	Move east to peak of hill.	No. Layout 4 does not use this site because site 13 micro-sited to reduce risk.	High	As alternative, move this turbine 400 ft NE to top of hill.	Not using this site.	Yes - site removed.
SH13-4	Yes, modified	GE 3.8	GE 2.8				Yes. Moved to this site in Layout 4 based on Smallwood recommendation.	High	Move 50 feet to top of hill.	Yes. Moved 50 feet to top of hill.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.

SH14-1,4	Yes, modified	GE 3.8	GE 2.8	7.5	3	Use site 14-2.	No. Cannot use site 14-2 in Layout 4 due to wake effect.	High	Move 130 feet north along ridge.	Yes. Moved 130 feet north, farther from the shoulder on the south. Although move likely to negatively impact wake, prioritized this move due to high risk designation.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH14-2	No	GE 3.8	-	6.5	2	None.	N/A. Cannot use this site in Layout 4 due to wake effect.	Low-Mod	Use this site.	Unable to use this site due to wake effect.	Yes - site removed.
SH14-3	No	GE 3.8	-	7	3	Use site 14-2.	N/A	Mod	None.	Not using this site.	Yes - site removed.
SH15-1,4	Yes, modified	GE 3.8	GE 2.8	6	2 (3)	Shift north 25 m.	No. Turbine could not be moved due to wake.	High	Move 140 feet northwest to top of ridge.	Yes. Moved 140 feet northwest to top of ridge. Although move likely to negatively impact wake, prioritized this move due to high risk designation.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH15-2	No	GE 3.8	-	6.5	1	Use site 15-1.	N/A	Mod	Move 200 feet northwest to top of ridge.	Not using this site.	Yes - site removed.
SH15-3	No	GE 3.8	-	6.5	2 (4)	Use site 15-1.	N/A	Mod	Move 450 feet northwest to top of hill. This is recommended site.	Not using this site, due to wake effect.	Yes - site removed.
SH16-1,4	Yes, modified	GE 3.8	GE 2.8	7	3	None.	N/A. Using this site in Layout 4 because less risk than 16-2 and 16-3.	High	Move 90 feet east-southeast to top of hill.	Yes. Moved 90 feet east-southeast to top of hill. Although move likely to negatively impact wake, prioritized this move due to high risk designation.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH16-2	No	GE 3.8	-	7	2	None. Recommends avoiding this site.	N/A	High	Move 120 feet east-southeast to top of ridge. This is the recommended site.	Not using this site, due to wake effect.	Yes - site removed.
SH16-3	No	GE 3.8	-	8.5	1	None. Recommends avoiding this site	N/A	High	Limited opportunities to relocate. Would need to move at least 500-600 feet east-southeast.	Not using this site.	Yes - site removed.
SH17-1,4	Yes	GE 3.8	GE 2.8	6	3	Move north to ridge crest	No. Turbine cannot be moved north to ridge crest due to wake. Using this site in Layout 4 because less risk than 17-2.	Mod	Move 230 feet north to top of hill.	No. Could not move due to wake effect.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.
SH17-2	No	GE 3.8	-	8	1	None. Recommends avoiding this site	N/A.	Mod-High	None.	Not using this site.	Yes - site removed.
SH17-3	No	GE 3.8	-	7.5	1	Move north to ridge crest	N/A. Layout 4 uses Site 17-1.	Mod	Move 250 feet west-northwest to top of hill.	Not using this site.	Yes - site removed.
SH18-1,4	Yes, modified	GE 3.8	GE 2.8	7	3	None. This site best option on this ridge	N/A. Using this site in Layout 4 because less risk than 18-2 and 18-3.	High	Move 290 feet northeast to top of ridge.	Yes. Moved 290 feet northeast to top of ridge.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH18-2	No	GE 3.8	-	7	3 (4)	Use site 18-1	N/A	Mod-High	Move 100 feet northeast.	Not using this site due to wake effect.	Yes - site removed.
SH18-3	No	GE 3.8	-	7	2 (4)	Use site 18-1	N/A	Mod-High	None. May be safest site.	Not using this site due to wake effect.	Yes - site removed.
SH19-1,4	Yes	GE 3.8	GE 2.3	6	4	Might be safer 30 m south	No. Cannot move turbine 30m south due to wake.	Mod-High	None.	Using this site.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.
SH19-2	No	GE 3.8	-	6	4	Use either site 19-1 or 19-3	N/A. Using site 19-1 in Layout 4 because safer than site 19-2.	Mod	None.	Not using this site due to wake effect.	Yes - site removed.
SH19-3	No	GE 3.8	-	5	2	None. This site safest local option except for burrowing owls.	N/A. Cannot use this site in Layout 4 due to wake effect.	Low-Mod	Move 200 feet south to top of hill.	No. Not using this site, due to wake effect and additional ground disturbance that would have been required.	Yes - site removed.
SH20-1,4	Yes, modified	GE 3.8	GE 2.8	8	3 (4)	Move N to crest	No. Turbine cannot be moved north to crest due to wake. Using this site in Layout 4 because less risk than 20-2 and 20-3.	Low-Mod	Move 80 feet north-northeast to highest point on ridge. This is the recommended location.	Yes. Moved 80 feet north-northeast to highest point on ridge.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH20-2	No	GE 3.8	-	9.5	1	None. Recommends avoiding this site.	N/A.	Mod	Move 170 feet northwest to ridge top.	Not using this site.	Yes - site removed.
SH20-3	No	GE 3.8	-	8	3	None.	N/A.	Mod	None.	Not using this site.	Yes - site removed.
SH21-1	No	GE 3.8	-	8	2	None. Recommends avoiding this site.	Yes. Moved 150 m E, closer to 21-2 (farthest move possible due to wake), to site 21-4.	High	Move northwest 360 feet to top of hill.	Not using this site.	Yes - site removed.
SH21-2	No	GE 3.8	-	6	1	None. This site safest place in area.	N/A. Cannot use this site in Layout 4 due to wake effect.	Mod	Probably lowest risk site.	Not using this site, due to wake effect.	Yes - site removed.
SH21-3	No	GE 3.8	-	6	1	Use site 21-2.	N/A.	Mod-High	None.	Not using this site.	Yes - site removed.
SH21-4	Yes	GE 3.8	GE 2.8				Yes. Moved to this site in Layout 4 based on Smallwood recommendation.	High	None.	Using this site.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH22-1	No	GE 3.8	-	8.5	2	Move N away from canyon edge or use 22-2.	N/A. Layout 4 uses modified site 22-2.	Mod-High	As alternative, move 200 feet away from east-facing slope.	Not using this site.	Yes - site removed.
SH22-2	No	GE 3.8	-	7.5	2	Move N away from edge of deep ravine.	Yes. Site 22-2 has been relocated 25 m northwest away from edge of ravine, to site 22-4.	Mod-High	None.	Not using this site.	Yes - site removed.
SH22-3	No	GE 3.8	-	7.5	4	Use modified site 22-2.	N/A.	Mod-High	None.	Not using this site.	Yes - site removed.

SH22-4	Yes	GE 3.8	GE 2.8				Yes. Moved to this site in Layout 4 based on Smallwood recommendation.	Mod	This is the recommended site.	Using this site.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH23-1,2,3,4	Yes	GE 2.3	GE 2.8	8	2 (3)	None. No safer local option.	N/A	Mod-High	Move 100 feet south to top of hill.	No. Could not move due to setback requirements.	No - constrained by setback requirements, but blade height above ground increased.
SH24-1,2,3,4	Yes, modified	GE 3.8	GE 2.8	6	2	None. No safer local option.	N/A	Low	Move at least 150 feet southwest closer to top of hill.	Yes. Moved 150 feet southwest closer to top of hill.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH25-1,2,3,4	Yes	GE 3.8	GE 2.8	9	3	None. Recommends avoiding this site.	N/A	Mod-High	No recommendation.	N/A	Yes - turbine blade height increased, and RSA and MWs reduced.
SH26-1,2,3	No	GE 3.8	-	8	1	Move SW to crest or south to higher ground.	Yes. Moved 50 m SW to higher ground, to site 26-4.	Mod	Use modified site 26-4.	Not using this site.	Yes - site removed.
SH26-4	Yes, modified	GE 3.8	GE 2.8				Yes. Moved to this site in Layout 4 based on Smallwood recommendation.	Low-Mod	Use this site.	Following site visit, moved additional 33 feet south. Estep confirmed this location as safe as 26-4, and is also recommended site.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH27-1,2,3,4	Yes	GE 3.8	GE 2.8	8	-	Move north to hill peak.	No. Unable to move north due to setback requirements.	High	Move 200 feet south to top of hill, or 275 feet north to top of hill.	No. Could not move north due to setback requirements. Could not move south due to wake effect.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.
SH28-1,2,3	No	GE 3.8	-	8	-	Move north to hill peak.	No. Cannot be moved due to wake.	High	Use modified site 28-4.	Not using this site.	Yes - site removed.
SH28-4	Yes	GE 3.8	GE 2.8					High	Move 150 feet toward top of hill.	No. Could not be moved due to wake effect.	Yes-turbine blade height above ground increased, and RSA and MWs reduced.
SH29-1,2,3	No	GE 3.8	-	8	-	Move east to high ground.	Yes. Moved 60 m E to higher ground, to site 29-4.	High	Use modified site 29-4.	Not using this site.	Yes - site removed.
SH29-4	Yes, modified	GE 3.8	GE 2.3				Yes. Moved to this site in Layout 4 based on Smallwood recommendation.	Mod-High	Move 140 feet east-northeast across road, where site would be considered low risk.	Yes. Moved 165 feet southeast, away from the edge of the swale. Original Estep recommendation could not be made because of setback requirements. Estep confirmed that this location is only low-to-moderate risk.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH30-1,2,3,4	Yes, modified	GE 3.8	GE 2.8	6	-	None. No better local options.	N/A	High	No recommendation.	Moved slightly based on field visit, and in order to accommodate site 29-4 move. Estep confirmed that new location a slight improvement.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH31-1,2,3	No	GE 3.8	-	4	-	Avoid berm by moving west.	Yes. Moved 25 m W/SW to site 31-4.	Low	Use site 31-4.	Not using this site	Yes - site removed.
SH31-4	Yes	GE 3.8	GE 2.8				Yes. Moved to this site in Layout 4 based on Smallwood recommendation.	Low	Use this site.	Using this site.	Yes - turbine moved, blade height above ground increased, and RSA and MWs reduced.
SH32-1,2,3,4	Yes	GE 3.8	GE 2.3	3	-	None. This site safest place in area.	N/A	Low	Use this site.	Using this site.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.
SH33-1,2,3,4	Yes	GE 3.8	GE 2.8	4	-	None. This site safest place in area.	N/A	Low	Use this site.	Using this site.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.
SH34-1,2,3,4	Yes	GE 3.8	GE 2.8	8	-	None. Recommends avoiding this site.	N/A	High	Move 350 feet east-southeast to hilltop.	No. Could not move due to setback.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.
SH35-1,2,3,4	Yes	GE 3.8	GE 2.8	5	-	None. This site safest place in area.	N/A	Low	Use this site.	Using this site.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.
SH36-1,2,3,4	Yes	GE 3.8	GE 2.8	7	3	Move NNW away from canyon edge.	No. Cannot move due to wake.	Mod	Move 200 feet northwest up slope.	No. Could not move due to wake effect.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.
SH37-1,2,3,4	Yes	GE 3.8	GE 2.3	8	4	Move west to higher ground.	No. Unable to move west due to wake.	High	Move 140 feet south-southwest onto flat ground, or 300 feet west across access road.	No. Could not move due to wake effect.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.
SH38-1,2,3,4	Yes	GE 3.8	GE 2.8	6	2	None. Safest place in area.	N/A	Low	Use this site.	Using this site.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.
SH39-1,2,3,4	Yes	GE 3.8	GE 2.8	6	2	None. Safest place in area.	N/A	Low	Use this site.	Using this site.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.
SH40-1,2,3	No	GE 3.8	-	7	1	None. No local option to recommend.	N/A	Mod	None.	Not using this site.	Yes - site removed.
SH40-4	Yes	GE 3.8	GE 2.8					Mod	Move northwest 275 feet where slope levels off.	No. Could not be moved due to wake effect.	Yes - turbine blade height above ground increased, and RSA and MWs reduced.

EXHIBIT 2



Figure 1: SH01-1,2,3 is representative of Layouts 1-3. SH01-4 was relocated 80 m E in response to Smallwood's recommendation and a beam path constraint. SH01-5 was relocated 60 ft N in response to Estep's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).

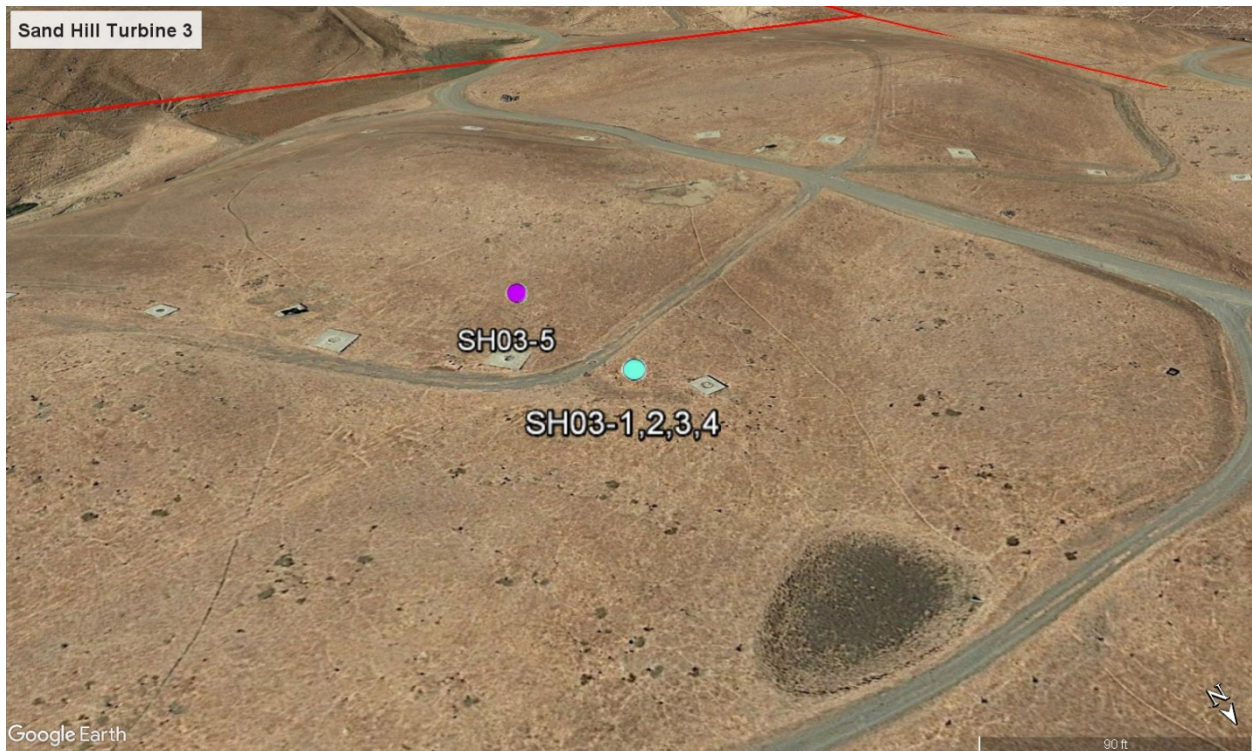


Figure 2: SH03-1,2,3,4 is representative of Layouts 1-4. SH03-5 was relocated 105 ft S in response to Estep's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).



Figure 3: SH04-1,2,3 is representative of Layouts 1-3. SH-04-4,5 was relocated 80 m SW away from the ravine and closer to the top of the hill and is the Micro-sited Smaller Turbine Layout (Layout 5).



Figure 4: SH05-1,2,3 is representative of Layouts 1-3. SH05-4 was relocated 62 m SW in response to Smallwood's recommendation. SH05-5 was relocated 53 ft E in response to Estep's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).



Figure 5: SH07-1,2,3 is representative of Layouts 1-3. SH07-4,5 was relocated 12 m N in response to Smallwood's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).



Figure 6: SH12-1,-2,-3 are representative of Layouts 1-3. SH12-4 was relocated 25 m W in response to Smallwood's recommendation. SH12-5 was relocated 37 ft S following a site visit and is the Micro-sited Smaller Turbine Layout (Layout 5).



Figure 7: SH13-1,-2,-3 are representative of Layouts 1-3. SH13-4 was relocated 30 m E in response to Smallwood's recommendation. SH13-5 was moved 50 ft NW to top of hill in response to Estep's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).



Figure 8: SH14-1,4,-2,-3 are representative of Layouts 1-4. SH14-5 was relocated 130 ft N away from southern shoulder in response to Estep's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).

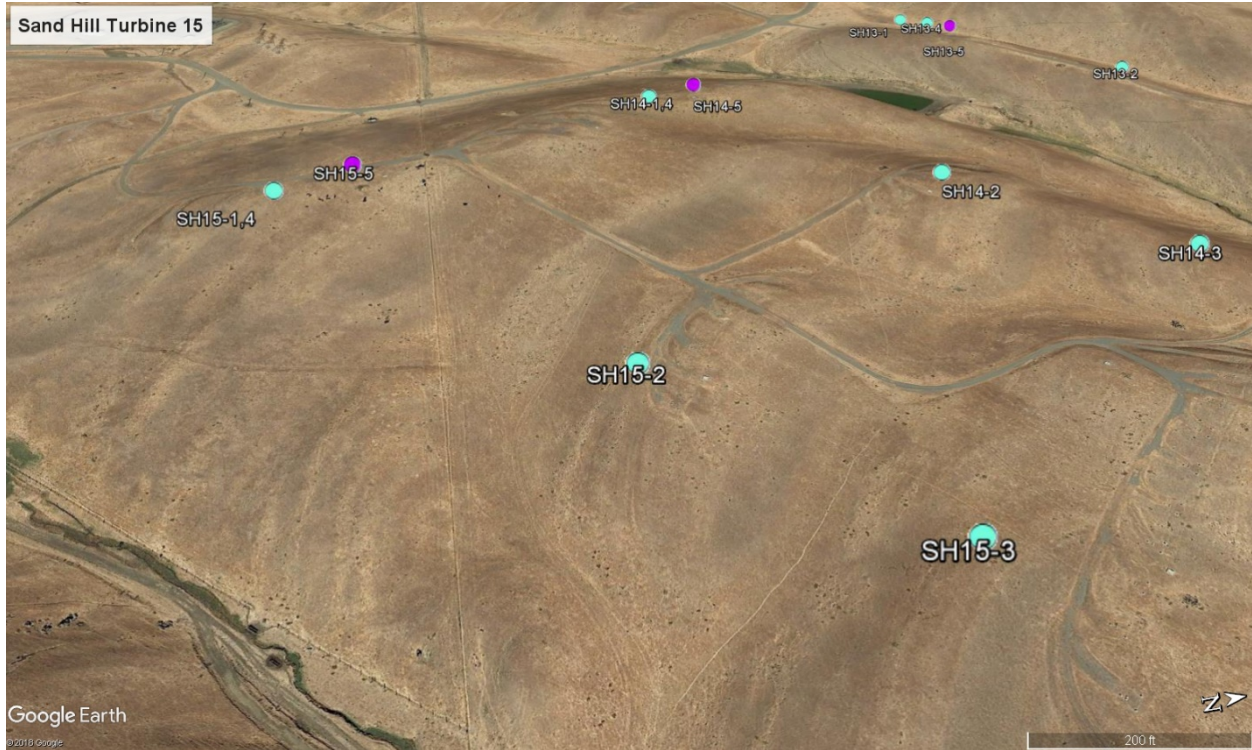


Figure 9: SH15-1,4,-2,-3 are representative of Layouts 1-4. SH15-5 was relocated 140 ft NW in response to Estep's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).

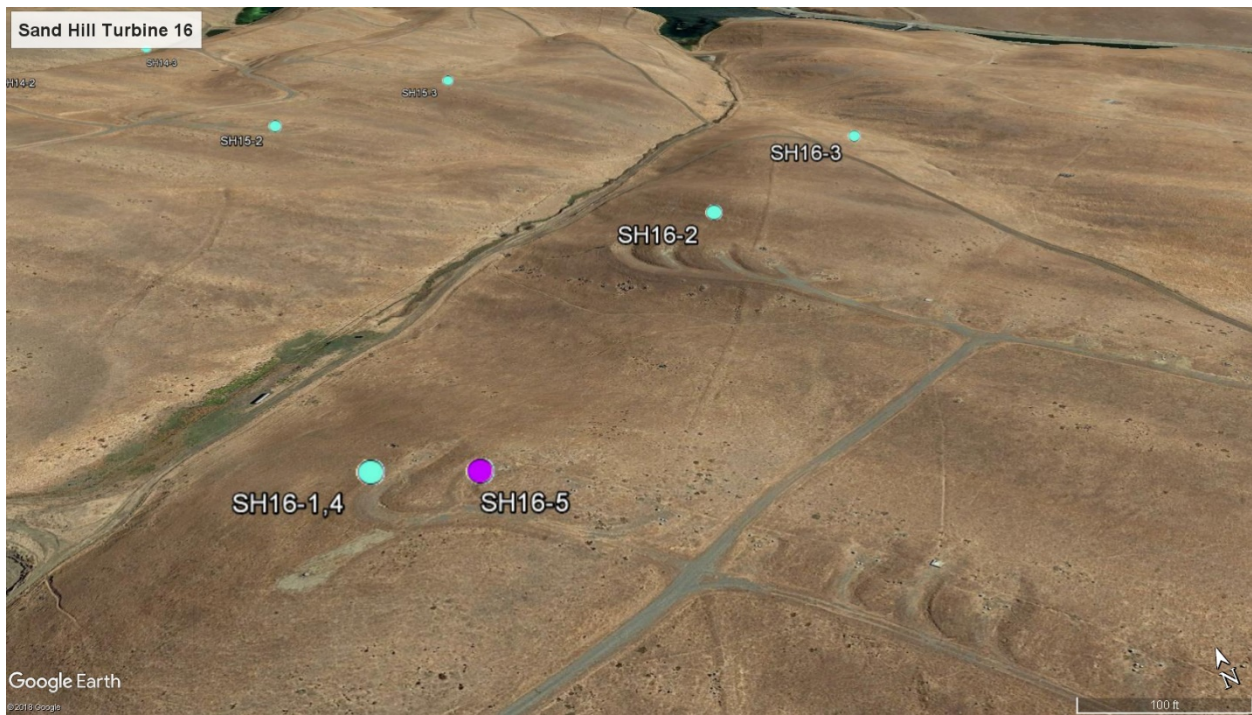


Figure 10: SH16-1,4,-2,-3 are representative of Layouts 1-4. SH16-5 was relocated 90 ft E/SE to top of hill in response to Estep's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).

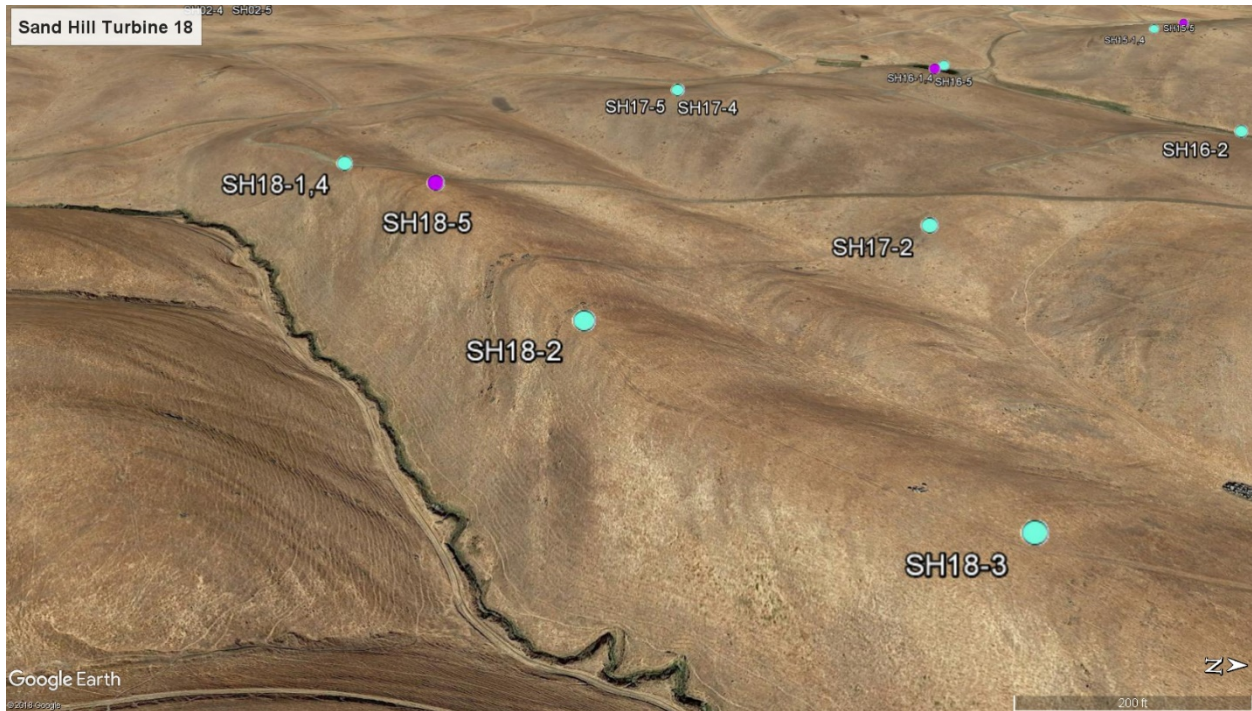


Figure 11: SH18-1,4,-2,-3 are representative of Layouts 1-4. SH18-5 was relocated 290 ft NE in response to Estep's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).

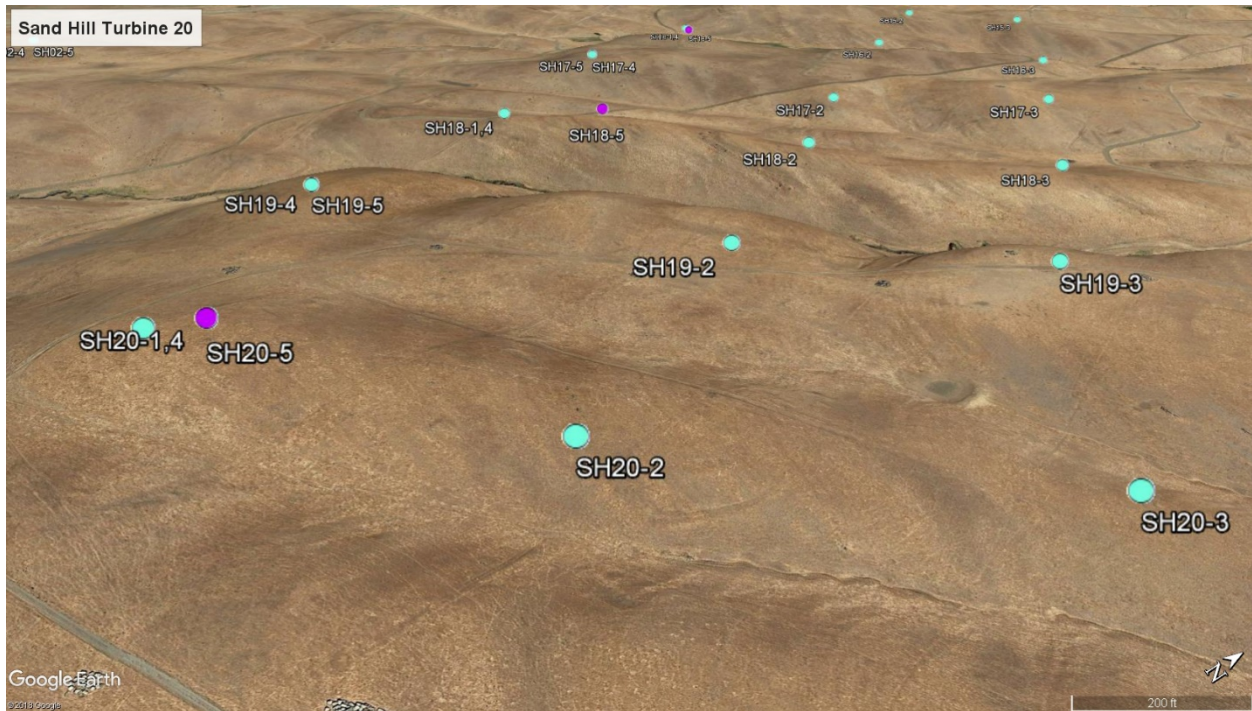


Figure 12: SH20-1,4,-2,-3 are representative of Layouts 1-4. SH20-5 was relocated 80 ft N/NE to highest point on the ridge in response to Estep's micro-siting recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).

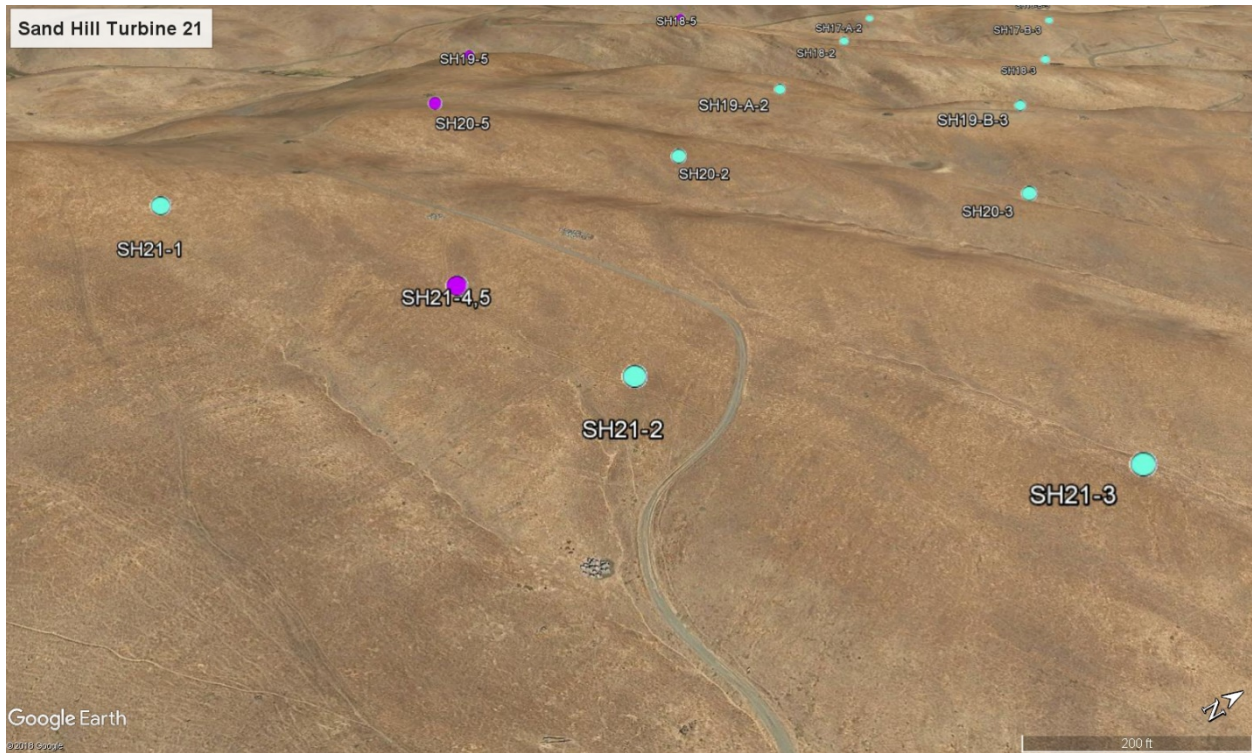


Figure 13: SH21-1,-2,-3 are representative of Layouts 1-3. SH21-4,5 was relocated 150 m E in response to Smallwood's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).



Figure 14: SH22-1,2,3 are representative of Layouts 1-3. SH22-4,5 was relocated 25 m NW from edge of ravine in response to Smallwood's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).



Figure 15: SH24-1,2,3,4 is representative of Layouts 1-4. SH24-5 was relocated 150 ft SW toward the hilltop in response to Estep's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).



Figure 16: SH26-1,2,3 is representative of Layouts 1-3. SH26-4 was relocated 50 m SW upslope in response to Smallwood's recommendation. SH26-5 was moved an additional 33 ft S following a site visit and is the Micro-sited Smaller Turbine Layout (Layout 5).

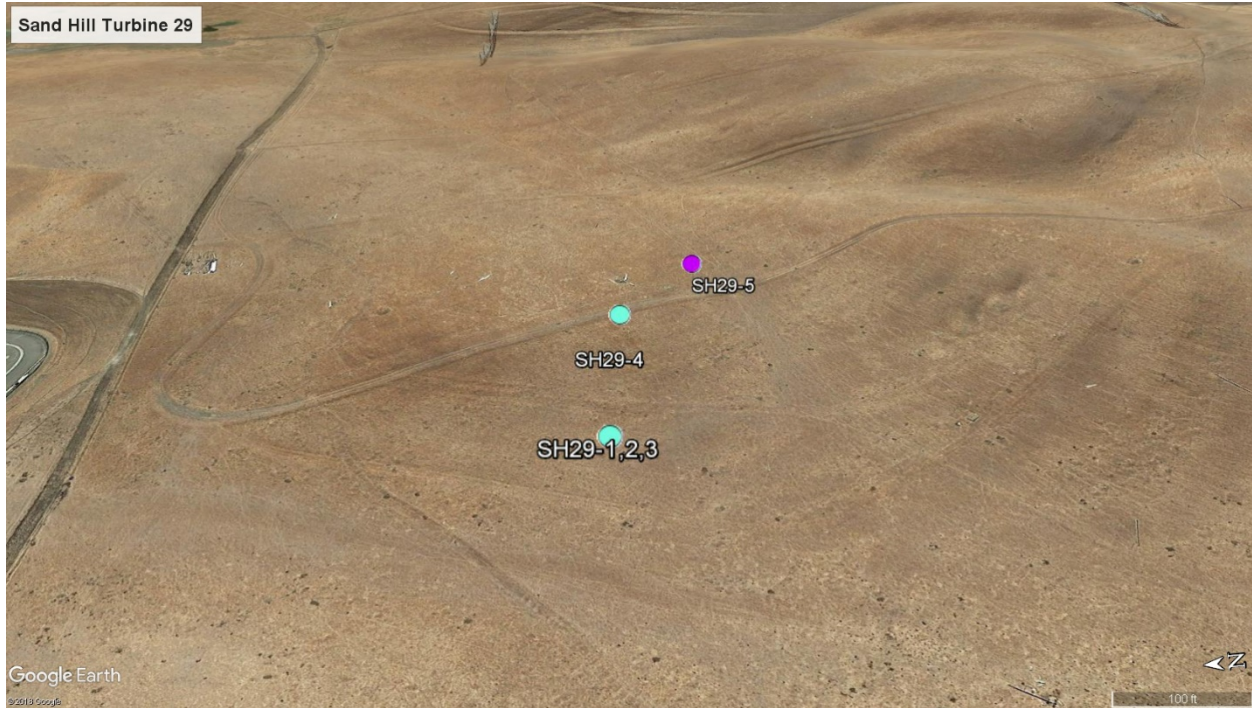


Figure 17: SH29-1,2,3 is representative of Layouts 1-3. SH29-4 was relocated 60 m E in response to Smallwood's recommendation. SH29-5 was relocated an additional 165 ft SE from the edge of the swale following a site visit and is the Micro-sited Smaller Turbine Layout (Layout 5).

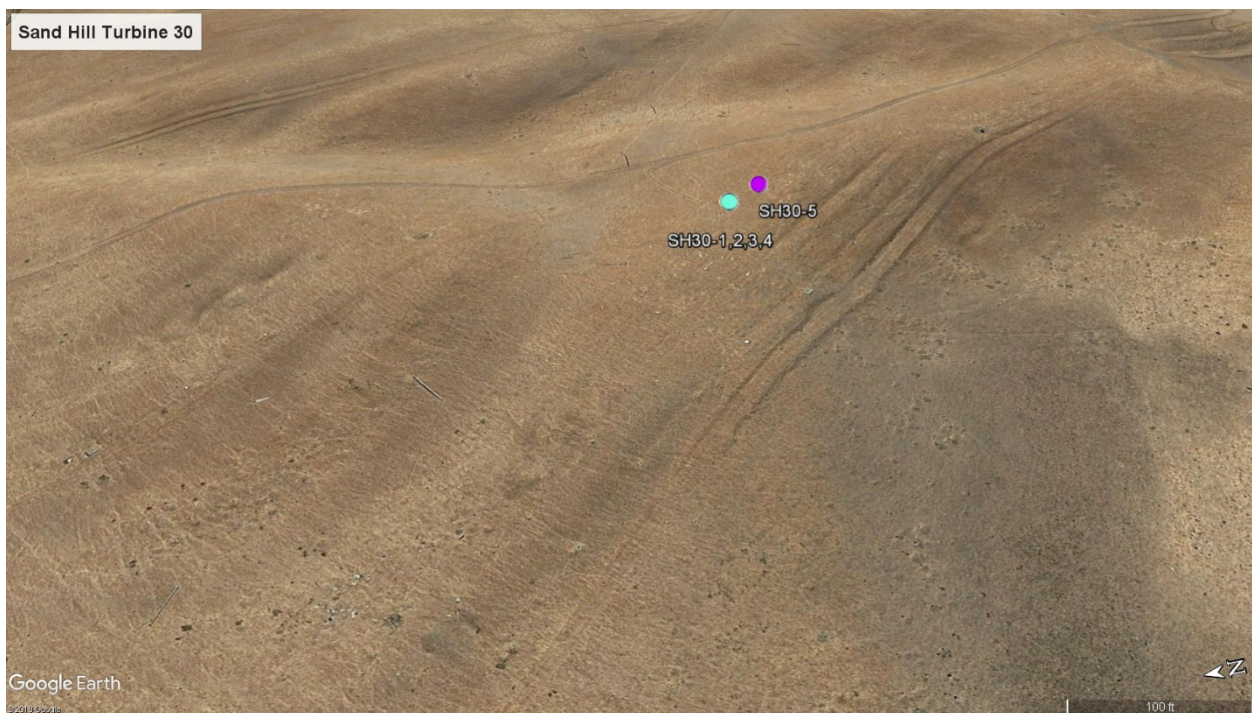


Figure 18: SH30-1,2,3,4 is representative of Layouts 1-4. SH30-5 was moved slightly following a site visit and is the Micro-sited Smaller Turbine Layout (Layout 5).



Figure 19: SH31-1,2,3 is representative of Layouts 1-3. SH31-4,5 was relocated 25 m W/SW in response to Smallwood's recommendation and is the Micro-sited Smaller Turbine Layout (Layout 5).