Sand Hill Wind Repowering Project

Appendix A-3. Assessment of Turbines 21 through 30

March 2019

Turbine 21

Turbine 21 has four alternative locations, 21A (Layout 1), 21B (Layout 2), 21C (Layout 3), and 21D (Layout 4) (Figure A-21).

Topographical Description

Site 21A is located on a steep (20%) east-southeast-facing slope below a high rounded hill. The terrain descends steeply on the east, south, and north, and continues ascending to the west toward the top of the hill. The site is near the top of a shallow swale extending from the east (Plate 46).

Site 21B is on relatively flat ground approximately 800 feet east-northeast of Site 21A. It's on a broad bench of a gradually declining eastward slope. There are swales to the north and south of the site. To the east, the ground remains even, but gradually slopes downward (Plate 47).

Site 21C is on a north-facing slope of an east-west ravine that intersects with a north-south ravine approximately 400 feet eastward (Plate 48). It's on a gradually descending eastward slope and downslope of Sites 21A, B, and D.

Site 21D is between Sites 21A and 21B. It's downslope of the road to the north and the hill to the west. The slope also descends eastward. The site is in a low spot situated between higher slopes to the north and west (Plate 49).

Proximity to Other Potential Risk Factors

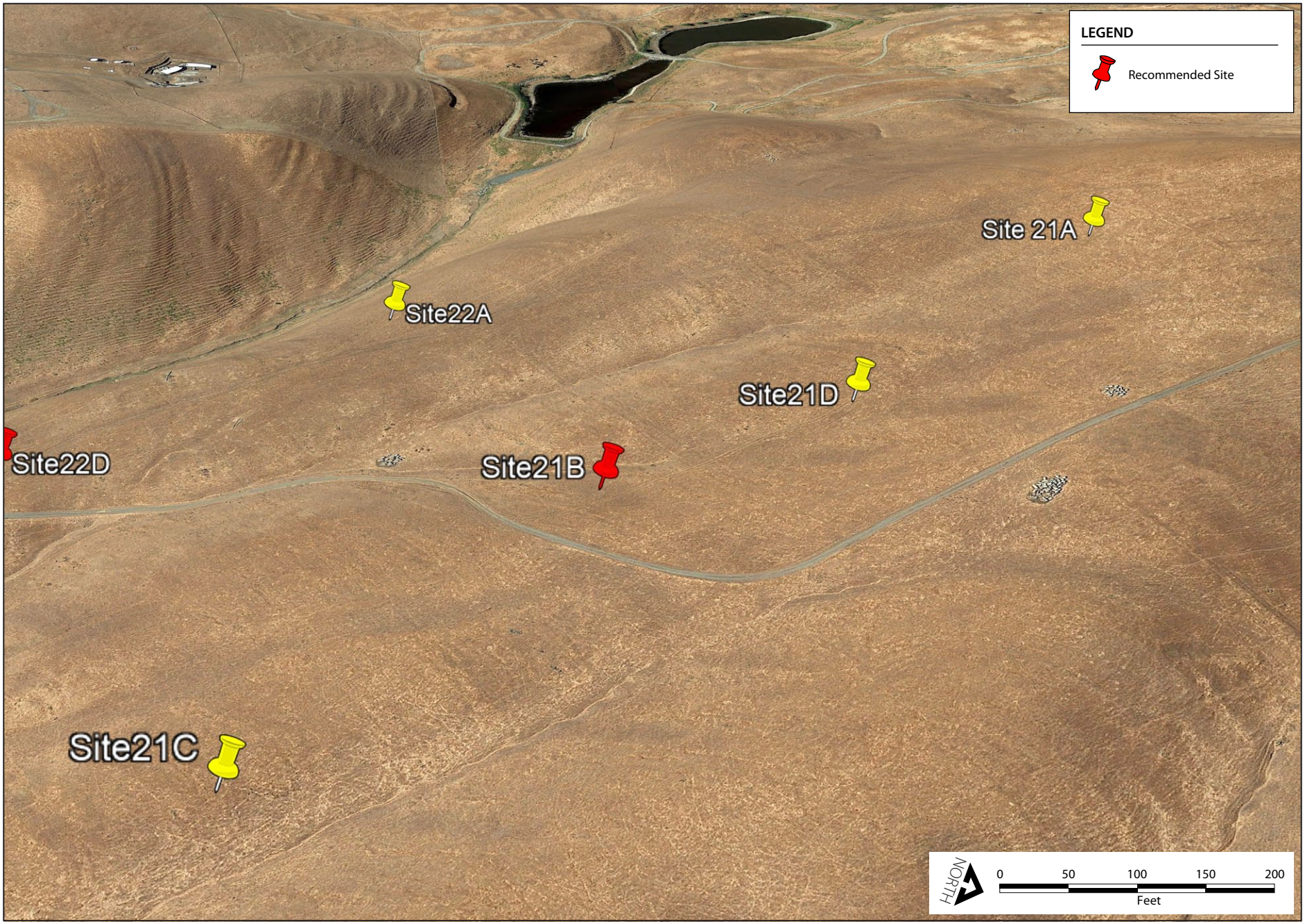
There is a debris pile within 280 feet of Sites 21B and D.

Relative Risk- Determination

Each of these sites are considered moderate to high risk. The topography in this area is less defined by ridges and basins and includes low hills and swales generally increasing in elevation westward. Raptor use of the area is also probably less predictable based on topographical features compared with other areas in the vicinity. However, even in this area, steep slopes and close proximity to swales and other drainage features are considered riskier sites. Each of the sites is on or at the base of a slope.

Site 21A is considered a high-risk site due to its position on a steep slope below the top of a hill. Road and turbine pad construction at this location would create a large bench and berm on the slope, which may influence raptor movement through the site and potentially increase risk.

Although on relatively flat terrain, Site 21B is considered a moderate-risk site because it is in a low area relative to the surrounding hills, particularly to the south and west. However, at this



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SOURCE: Google Earth 2018.

Figure A-21
Location of Alternative Sites for Turbine 21 at the Sand Hill Wind Project

location turbine pad and road construction would not substantially alter the local topography sufficient to influence raptor movement.

Site 21C is considered a moderate-to high-risk site because it's on a slope above a ravine and is also subject to increase risk from road and turbine pad construction.

Site 21D is considered a high-risk site due to its location at the base of slopes to the north and west. Risk may be particularly problematic from raptors flying around the hill from the west and across the low ridge from the north.

Recommendation

There are limited opportunities to reduce risk for any of the Turbine 21 alternatives. Of the four, Site 21B may be the lowest risk due to the distance from slopes and the relatively flat ground. But relocating this site to reduce risk is also problematic. Therefore, although it is considered a moderate-risk site, Site 21B is the recommended location for Turbine 21 (Figure A-21). This is generally consistent with Smallwood and Neher (2018).

Alternatively, risk at Site 21A could be reduced by moving it northwest about 360 feet (37.753741/121.599336). This moves the site off of the slope and onto the top of the hill.

Plate 46. Looking east (downslope) from Site 21A.

Plate 47. Looking southeast from Site 21B.

Plate 48. Looking east from Site 21C.

Plate 49. Looking north from Site 21D. The site is at the base of the slope to the north, and at the base of a larger slope to the west.

Turbine 22

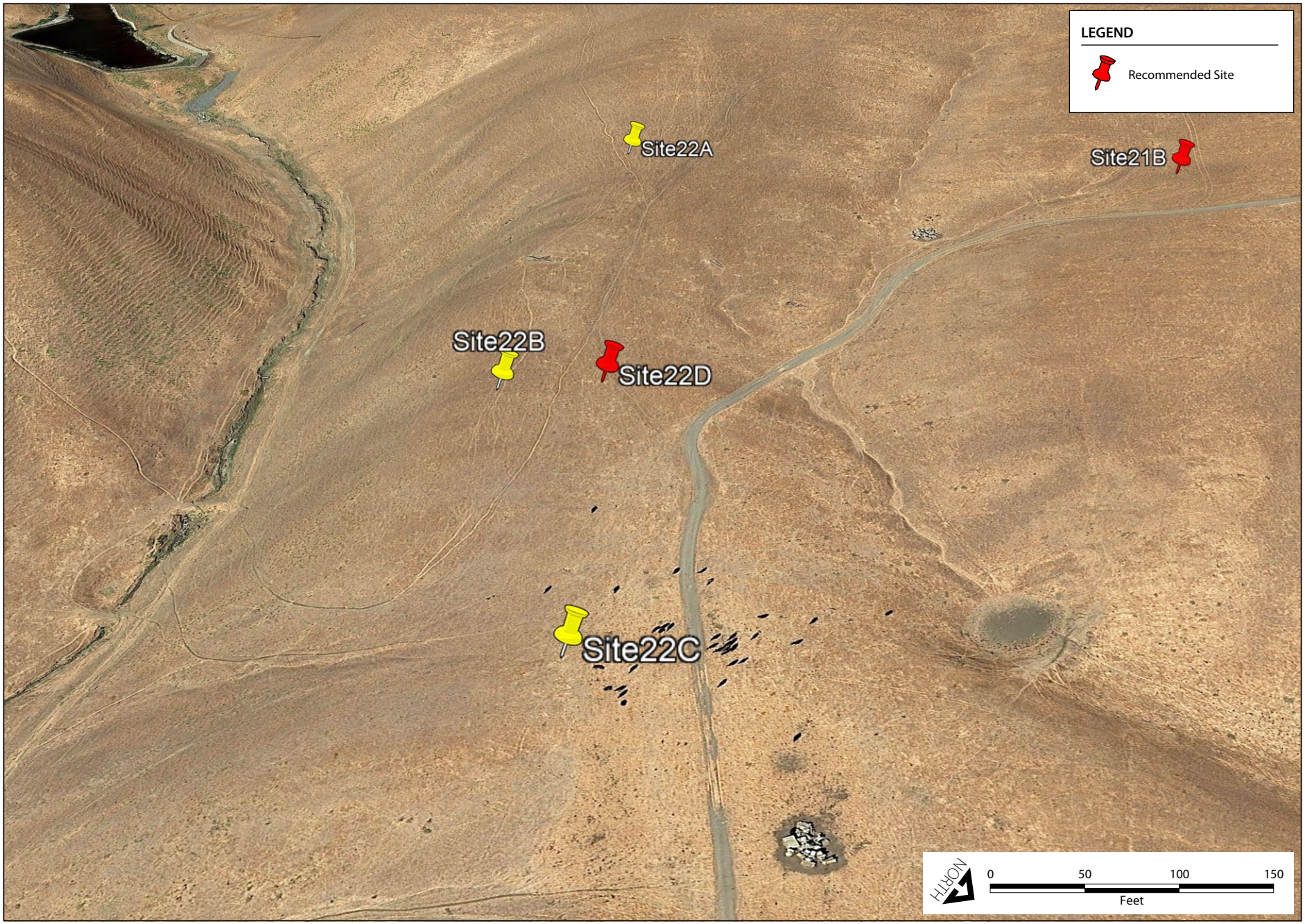
Turbine 22 has four alternative locations, 22A (Layout 1), 22B (Layout 2), 22C (Layout 3), and 22D (Layout 4) (Figure A-22).

Topographical Description

All four sites are along a northeast-southwest-oriented ridge with a gradually northeastward descending ridge slope, on a gradual southeast-facing slope above a deep ravine. In general, the area is characterized by relatively low-profile topography and low-elevation rolling hills.

Site 22A is the westernmost of the four, located on the upper edge of a steep south-facing slope along the northeast-southwest-oriented ridge (Figure A-22). The ridge slope ascends to the west (Plate 50) but is relatively flat toward the east – although the ridge slope trends downward toward the east. The site is flat toward the north for about 200 feet before dropping into a swale.

Site 22B is on relatively flat ground (Plate 51), but near the descending southeastern slope into the deep ravine and more gently toward the northeast into a swale. The ridgeline ascends toward the southwest. To the east, the ground is fairly level for several hundred feet along the ridge but is generally trending downward along the ridgeline.



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SOURCE: Google Earth 2018.

Figure A-22
Location of Alternative Sites for Turbine 22 at the Sand Hill Wind Project

Site 22C is also on relatively flat ridge top although trending up slightly to the southwest along the ridgeline (Plate 52). It's the easternmost of the four alternative sites, and is on a portion of the ridge that levels out after a gradual downward slope toward the east. The site is on a wide bench (approximately 600 feet) below the steeper sloped portion of the ridge. It's also on a broader, flatter part of the ridge, sloping to the south into the deep ravine and to the north into the shallower swale. Approximately 225 feet east of the site is a transverse swale across the ridge creating a dip in the ridgeline.

Site 22D is 90 feet northwest of and slightly upslope of Site 22B (Plate 53). The conditions are generally the same except Site 22D is further away from the edge of the south-facing slope.

Proximity to Other Potential Risk Factors

There is a debris pile approximately 200 feet from Site 22C.

Relative Risk and Determination

There are two primary issues that contribute to potential risk at the Turbine 22 sites: the downward trend of the southwest-northeast slope of the ridge and the proximity of the south-facing slope overlooking a deep ravine. For these reasons, Sites 22A, B, and C are considered relatively moderate-high-risk sites. Site 22A would be subject to addition road construction and the turbine pad at this location could create a notch along the ridge line. Site 22D is somewhat improved due to its position further away from the south-facing slope and closer proximity to existing road access.

Recommendation

Site 22D is probably the safest of the four alternative sites because it is on flat terrain, further from the deep ravine on the south, and closer to an existing access road. It is the recommended location for Turbine 22, which is generally consistent with Smallwood and Neher (2018) (Figure A-22). Alternatively, Site 22A could also be relocated northward about 200 feet away from the east-facing slope, but would require substantial earth-moving to access the site.

Plate 50. Looking west from Site 22A. Note the steep drop-off to the south.

Plate 51. Looking northwest from site 22B.

Plate 52. Looking northeast from Site 22C.

Plate 53. Looking northeast from Site 22D.

Turbine 23

Turbine 23 has only one location (23A) for the four layouts (Figure A-23). A second location was initially noted, but it is within 10 feet of Site 23A, so they are considered here as the same site.

Topographical Description

Site 23A is near the highest point on a northeast-southwest oriented ridge. The site is slightly downslope on the northeast-facing slope (Plate 54). There are steep slopes (30%) descending on all sides of the hill leading to a deep ravine on the northwest, a deep swale on the south, and to a saddle on the lower part of the ridge to the west (Figure A-23).

Proximity to Other Potential Risk Factors

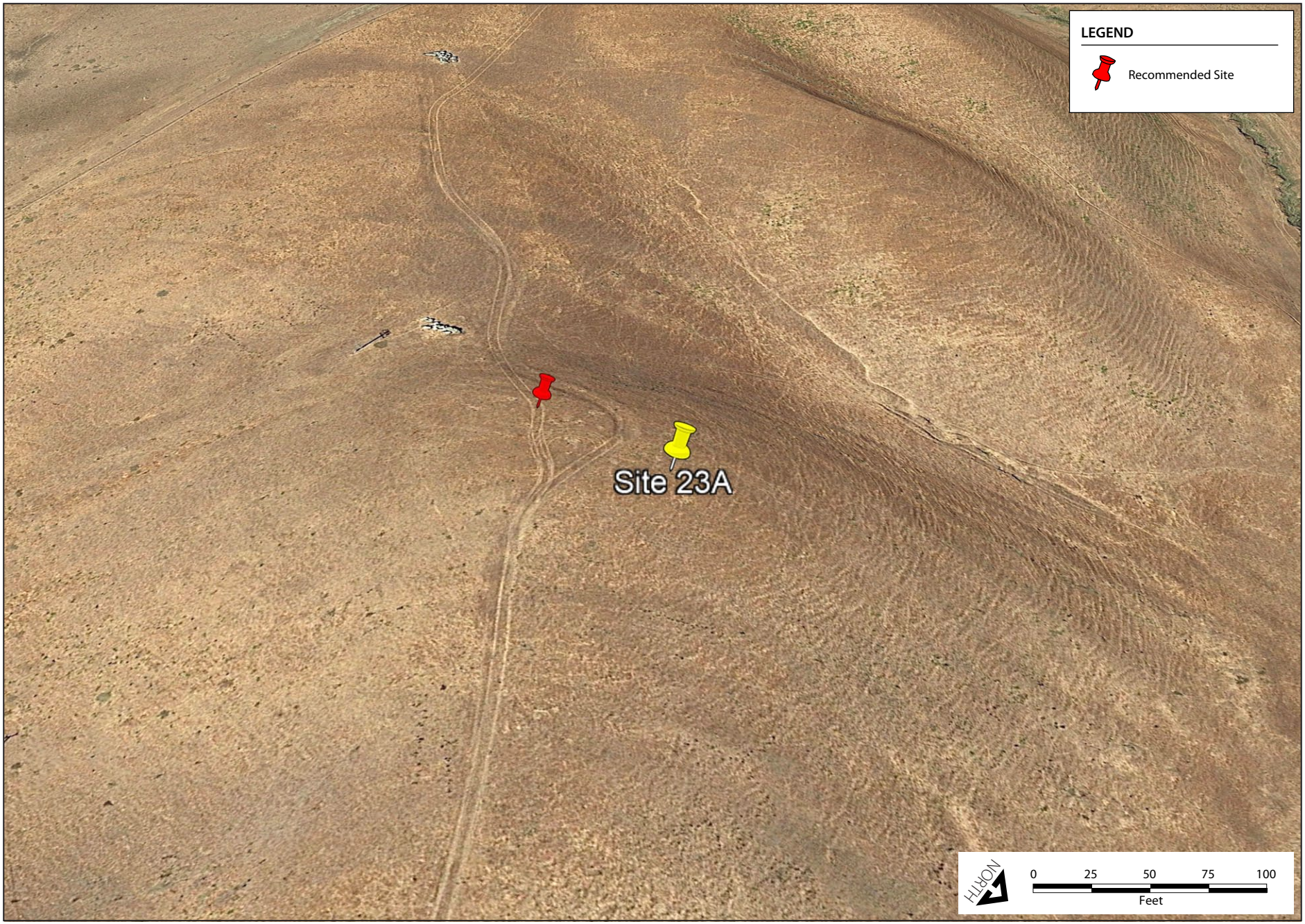
There is an overhead power line within 100 feet (which would be removed) and a debris pile within 100 feet.

Relative Risk and Determination

There is likely significant raptor movement through the ravine and swale on the north and south sides of Site 23A. The site is probably high enough on the slope to avoid most contour hunting, but because it is on the slope, it still represents some risk to raptors moving through and hunting along these slopes. Because the site is on a relatively steep slope, it is considered a moderate- to high-risk site.

Recommendation

Risk can be reduced at Site 23A by moving the turbine upslope to the top of the hill approximately 100 feet south (37.752922/121.590500) (Plate 55) (Figure A-23). This will move turbine off of the slope and onto a relatively broad hill top. This assessment is generally consistent with Smallwood and Neher (2018); however, they do not recommend relocation of Site 23A.



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SOURCE: Google Earth 2018.

Figure A-23
Location of Alternative Sites for Turbine 23 at the Sand Hill Wind Project

Plate 54. Looking northwest from Site 23A.

Plate 55. Looking south from Site 23A toward the top of the hill (at vehicle) and the recommended location.

Turbine 24

Turbine 24 has only one location (Site 24A) for the four layouts (Figure A-24). A second location was initially noted, but it is within 10 feet of Site 24A, so they are considered here as the same site.

Topographical Description

Site 24A is near the east end of a small low-profile east-west-oriented ridge with a gradual eastward-descending ridge slope. The general topography in the general area is low-profile without extreme topographical features. Site 24A is on a relatively flat hill top, although slightly downslope on the east-facing slope. To the east, the slope descends toward the California Aqueduct (Plate 56), to the south into a deep swale, and to the north into a ravine. To the west and southwest, the land is fairly level for at least 1,000 feet, although trending gradually upward along the ridge.

Proximity to Other Potential Risk Factors

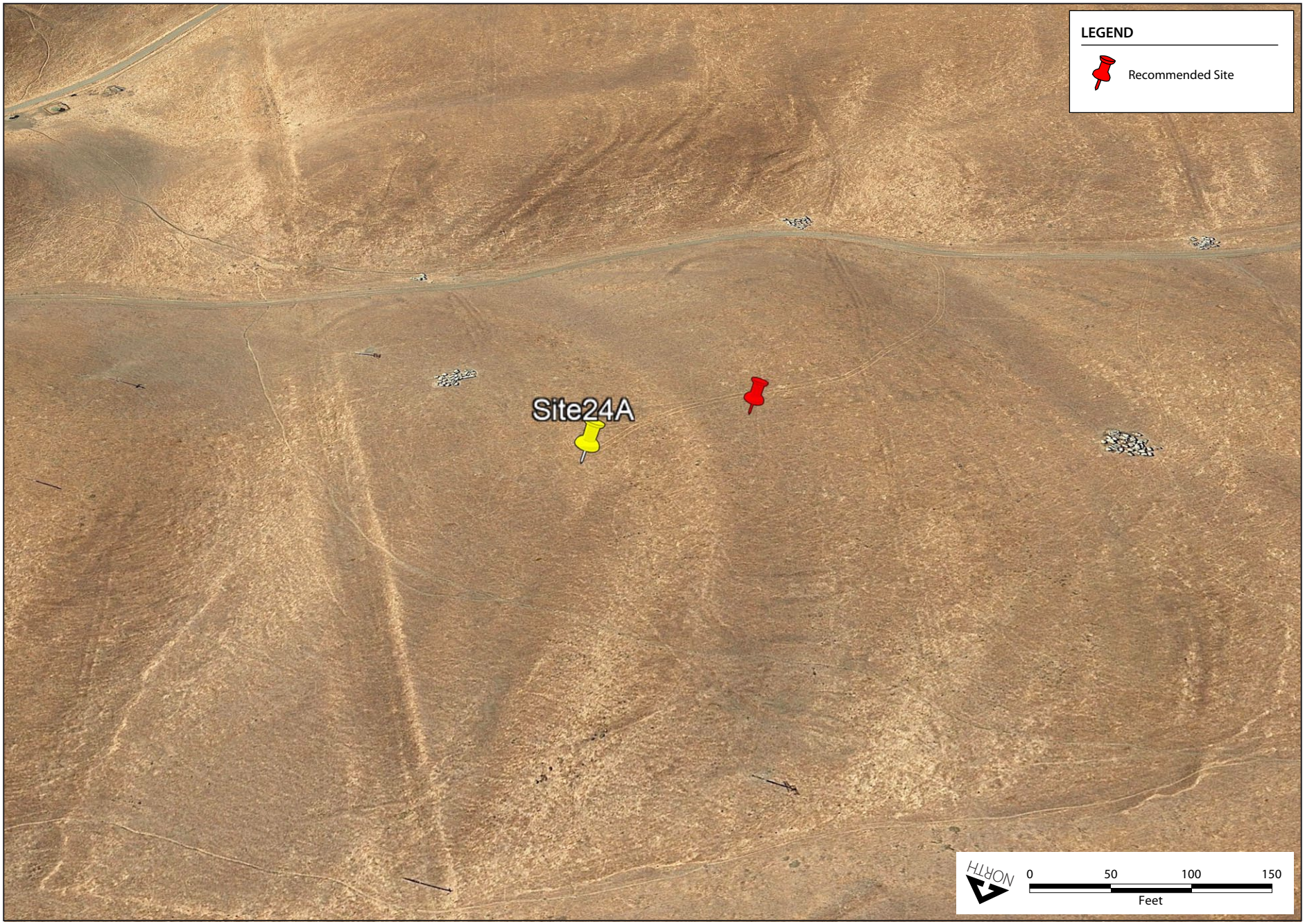
There is a debris pile with 200 feet of the site.

Relative Risk-Determination

Site 24A is considered a low-risk site due to the lack of steep slopes, the broad and generally flat top of the low-profile ridge, and the lack of other risky topographic features.

Recommendation

To further reduce risk, move the turbine at least 150 feet southwest closer to the top of hill (37.762950/121.595078) (Plate 57).



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SOURCE: Google Earth 2018.

Figure A-24
Location of Alternative Sites for Turbine 24 at the Sand Hill Wind Project

Plate 56. Looking northeast from Site 24A.

Plate 57. Looking northeast from recommended location for Turbine 24 at top of hill. Site 24A is near the person standing in the background.

Turbine 25

Turbine 25 has only one location (Site 25A) for the four layouts (Figure A-25). A second location was initially selected, but it is within 10 feet of Site 25A, so they are considered here as the same site.

Topographical Description

Site 25 is on the top of a small hill within an area of relatively low-profile hilly topography. The site slopes down all around the hill top leading to deep swales on the north and south and converging toward the east. The hill also slopes to the west into a north-south swale before rising up westward toward another low-profile ridge (Plate 58). The hill is isolated from more extensive ridges to the north, south, and west, and is lower in elevation than much of the surrounding hill tops (Plate 59).

Proximity to Other Potential Risk Factors

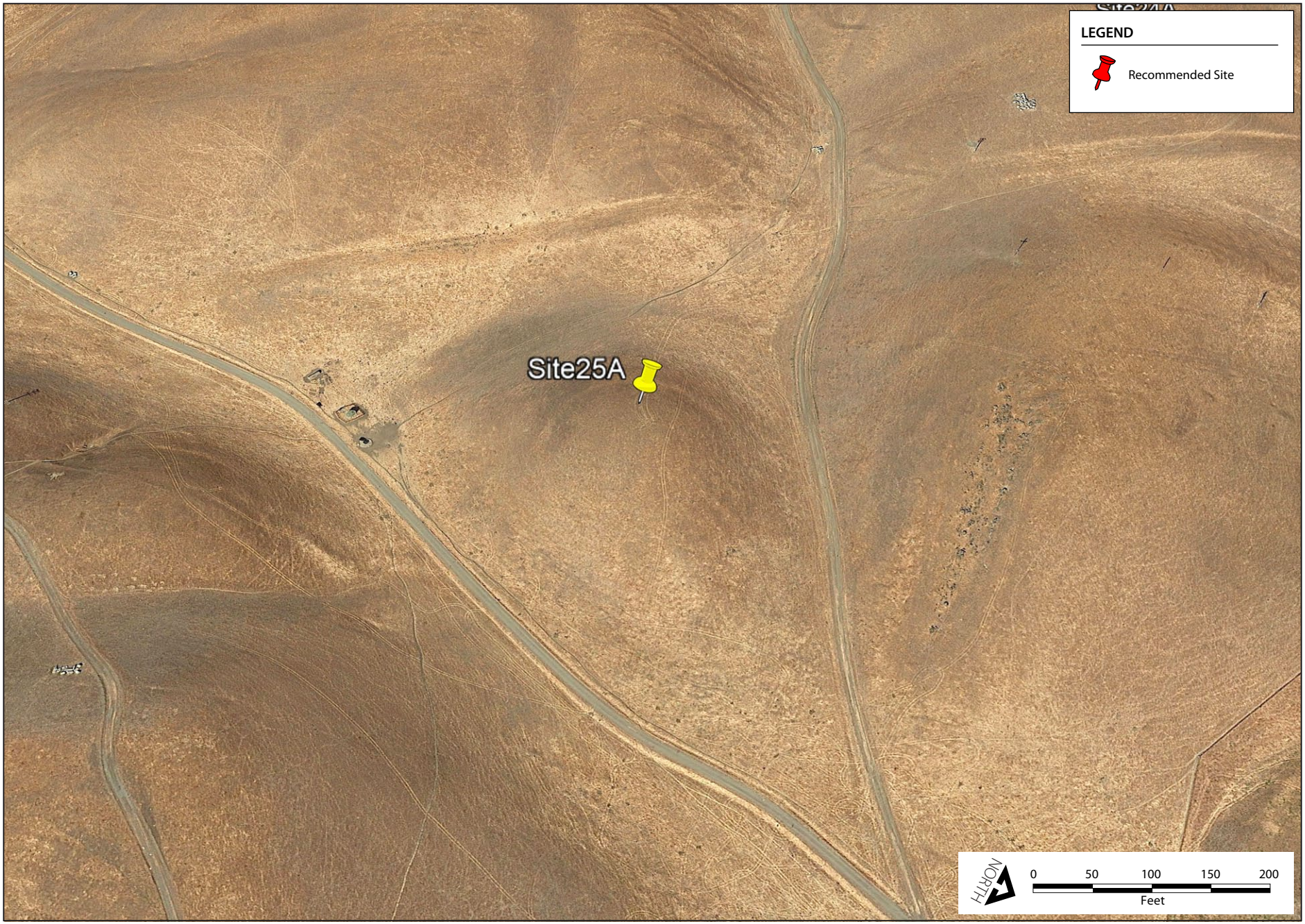
None.

Relative Risk and Determination

Site 25A is considered a moderate-to high-risk site due to the small size of the hill, its isolation from nearby ridges, and its low elevation relative to surrounding hills. Also, the hill is small and will require significant earth moving to accommodate a turbine pad. Along with creating road access to the top of the small hill, this will alter the topography of the site and may alter bird movement through it. Although the turbine is at the top of the hill, the turbine rotors would extend over the swales to the north and south, creating a possible hazard for birds moving through them.

Recommendation

There are no alternative locations in the immediate vicinity that would reduce the potential risk at Turbine 25, and thus there is no recommendation.



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SOURCE: Google Earth 2018.

Figure A-25
Location of Alternative Sites for Turbine 25 at the Sand Hill Wind Project

Plate 58. Looking northeast from Site 25A.

Plate 59. Looking west from Site 25A.

Turbine 26

Turbine 26 has three alternative locations: Site 26A (the location for layouts 1, 2, and 3); Site 26B (the location for layout 4), and Site 26C (an additional proposed alternative as per the February 4-5 site visit by sPower engineers) (Figure A-26).

Topographical Description

All sites are located in a relatively low-profile hilly terrain. Site 26A is on a northeast-facing slope above a swale to the northeast that leads up to a hill/ridge top to the southwest. The terrain descends to the north and south into broad swales and toward the east where the swales converge. The general area is fairly low-profile hilly terrain with no extreme topographic features in the immediate area (Plate 60).

Site 26B is approximately 200 feet southwest of Site 26A at the highest point on the broad and low-profile hill/ridge. From the hilltop, the terrain descends in all directions with a particularly steep slope to the west where there is a broad west- and southwest-facing slope (Plate 61).

Site 26C is 33 feet south of Site 26B with similar topographic conditions.

Proximity to Other Potential Risk Factors

There is a debris pile within 60 feet of Sites 26B and 26C and a transmission line corridor within 600 to 700 feet of all sites.

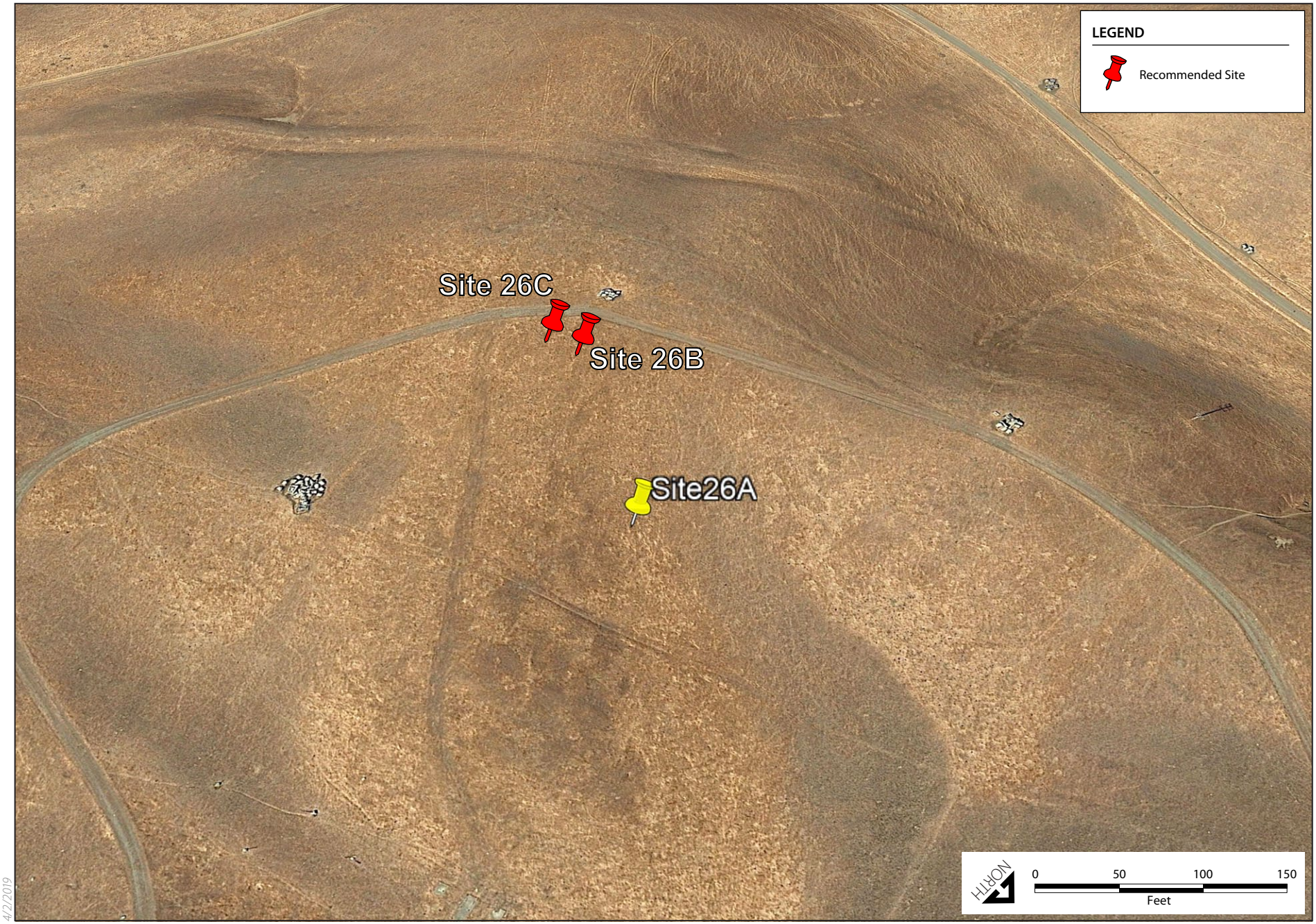
Relative Risk and Determination

Site 26A is considered to have moderate risk due to its location on a slope above a swale and below the hill/ridge top. Because of the low-profile terrain, road and turbine pad construction at this site would not substantially alter the local topography and increase risk.

Sites 26B and 26C are considered low to moderate-risk sites because they are on the top of the hill/ridge. However, the west-facing slope to the west of these sites may contribute to slope-accelerated winds that attract hunting raptors. But the sites may be sufficiently distant from the edge of the west-facing slope (approximately 130 feet). Both Sites 26B and 26C are near an existing access road on relatively flat terrain. Road improvements and turbine pad construction at this location would not substantially alter the topography of the site and would have little influence on raptor use or flight patterns.

Recommendation

Sites 26B and 26C are similar risk and are the recommended sites for Turbine 26. This is generally consistent with Smallwood and Neher (2018).



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SOURCE: Google Earth 2018.

Figure A-26
Location of Alternative Sites for Turbine 26 at the Sand Hill Wind Project

Plate 60. Looking east from Site 26A.

Plate 61. Looking southwest from Site 26B.

Turbine 27

Turbine 27 has only one location (Site 27A) for the four layouts (Figure A-27). A second location was initially noted, but it is within 10 feet of Site 27A, so they are considered here as the same site.

Topographical Description

Site 27A is located within an east-west-oriented swale descending from a saddle in the ridge just to the east. The terrain slopes up steeply to the east, north, and south. The swale continues west following a road (Plate 62). The is at an elevational low point surrounded by higher terrain to the north, east, and south.

Proximity to Other Potential Risk Factors

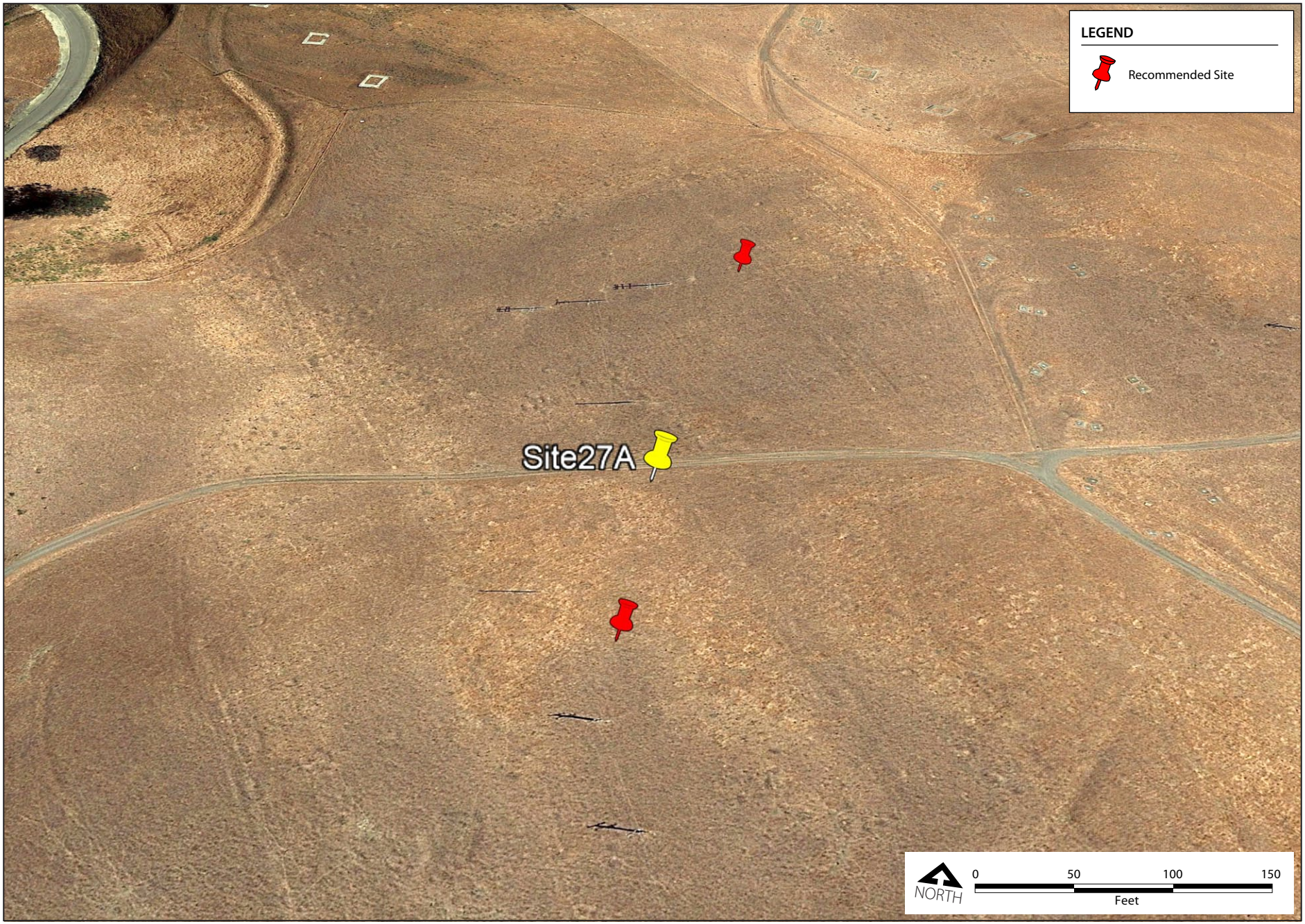
There is an overhead powerline within 60 feet, a group of eucalyptus trees within 700 feet, and the edge of Bethany Reservoir within 800 feet of the site.

Relative Risk and Determination

Site 27A is considered a high-risk site because it is located below a saddle and within a swale surrounding on three sides by upward sloping terrain. Raptors moving through the saddle would be at risk.

Recommendation

To reduce risk at Site 27A, move the turbine upslope approximately 200 feet south to the top of the hill (37.771110/121.597990) (Plate 63), or north approximately 275 feet to the hill top north of the site (37.772408/121.597877). This relocates the turbine out of the swale, off of the slope, and onto an adjacent hill top. This is generally consistent with Smallwood and Neher (2018).



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SOURCE: Google Earth 2018.

Figure A-27
Location of Alternative Sites for Turbine 27 at the Sand Hill Wind Project

Plate 62. Looking southwest from Site 27A toward the saddle.

Plate 63. Looking north toward Site 27A (at vehicle) (note the location within the swale) from hilltop to south (recommended relocation site); and toward the alternate relocation site on the hilltop north of Site 27A.

Turbine 28

Turbine 28 has two locations for the four layouts, Site 28A (Layouts 1, 2, and 3) and Site 28B (Layout 4) (Figure A-28). However, because they are only 45 feet from each other and both are on the same steep slope, the conditions at these sites are similar.

Topographical Description

Both sites are on a steep (25%) east-facing slope overlooking a broad valley to the east and southeast (Plate 64). Site 28B is approximately 145 feet from the top of the hill to the northwest. Site 28A is about 45 feet further down the hill slope to the east. The hill slopes up sharply to the northwest toward the hill top (Plate 65). There are no significant features on the hill slope. From the top of the hill, the topography slopes down southward to a lower bench before dropping into the valley. On the west and northwest sides of the hill, the land drops steeply toward the California Aqueduct.

Proximity to Other Potential Risk Factors

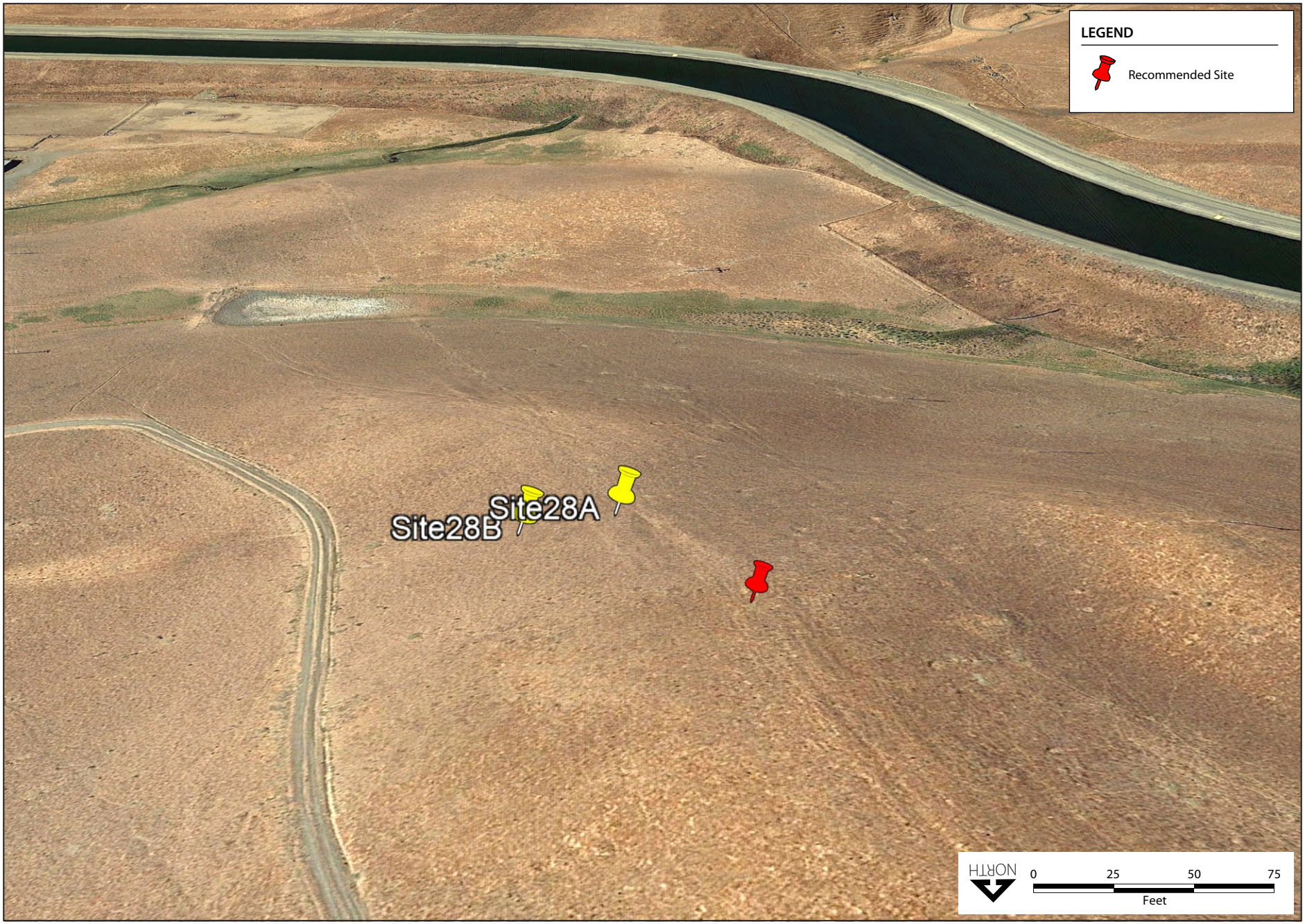
Site 28B is approximately 280 feet from an overhead powerline (which would be removed).

Relative Risk and Determination

Sites 28A and B are considered relatively high-risk sites due to their location on the steep hillslope. Either site would require the construction of a bench along the slope to accommodate the tower pad. Along with road construction to the site, this would require substantial earth moving and the alteration of the slope, which could influence raptor use of the site and create additional risk.

Recommendation

To reduce risk at Sites 28A and B, move the turbine upslope to the northwest from Site 28B approximately 150 feet toward the top of the hill (37.770050/121.596461). This will relocate the turbine off of the slope and on the top of the hill and is generally consistent with Smallwood and Neher (2018).



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SOURCE: Google Earth 2018.

Figure A-28
Location of Alternative Sites for Turbine 28 at the Sand Hill Wind Project

Plate 64. Looking east from Site 28B. Site 28A is just downslope from the stake.

Plate 65. Looking upslope to the northwest from Site 28B, toward the recommended site on the hilltop.

Turbine 29

Turbine 29 has three locations for the four layouts, Site 29A (Layouts 1, 2, and 3), Site 29B (Layout 4), and Site 29C (the proposed alternative to the recommended location as per the February 4-5 site visit by sPower engineers). Site 29B is approximately 200 feet east of Site 29A and Site 29C is approximately 170 feet southeast of Site 29B (Figure A-29).

Topographical Description

Each site is situated in an area of relatively low-profile hilly topography.

Site 29A is located in a broad, deep swale at the base of a west-facing slope (Plate 66). The swale extends toward the south and southwest. It intersects with a second northwest-southeast swale creating a small valley. The site sits at the base of the west-facing slope, which ascends approximately 200 feet east toward the top of the swale.

Site 29B is about 200 feet east and upslope of Site 29A. It's near the top of the swale (Plate 67) on the west side of the access road. To the west, the terrain descends down into the small valley toward Site 29A; to the south is a shallow east-west-oriented swale; and to the east-northeast, the land is fairly flat for at least 500 feet before descending in a very gradual slope.

Site 29C is on the north edge of the east-west swale about 270 feet southwest of Site 29B. The terrain gently ascends south of the swale, and is generally flat to the east-northeast.

Proximity to Other Potential Risk Factors

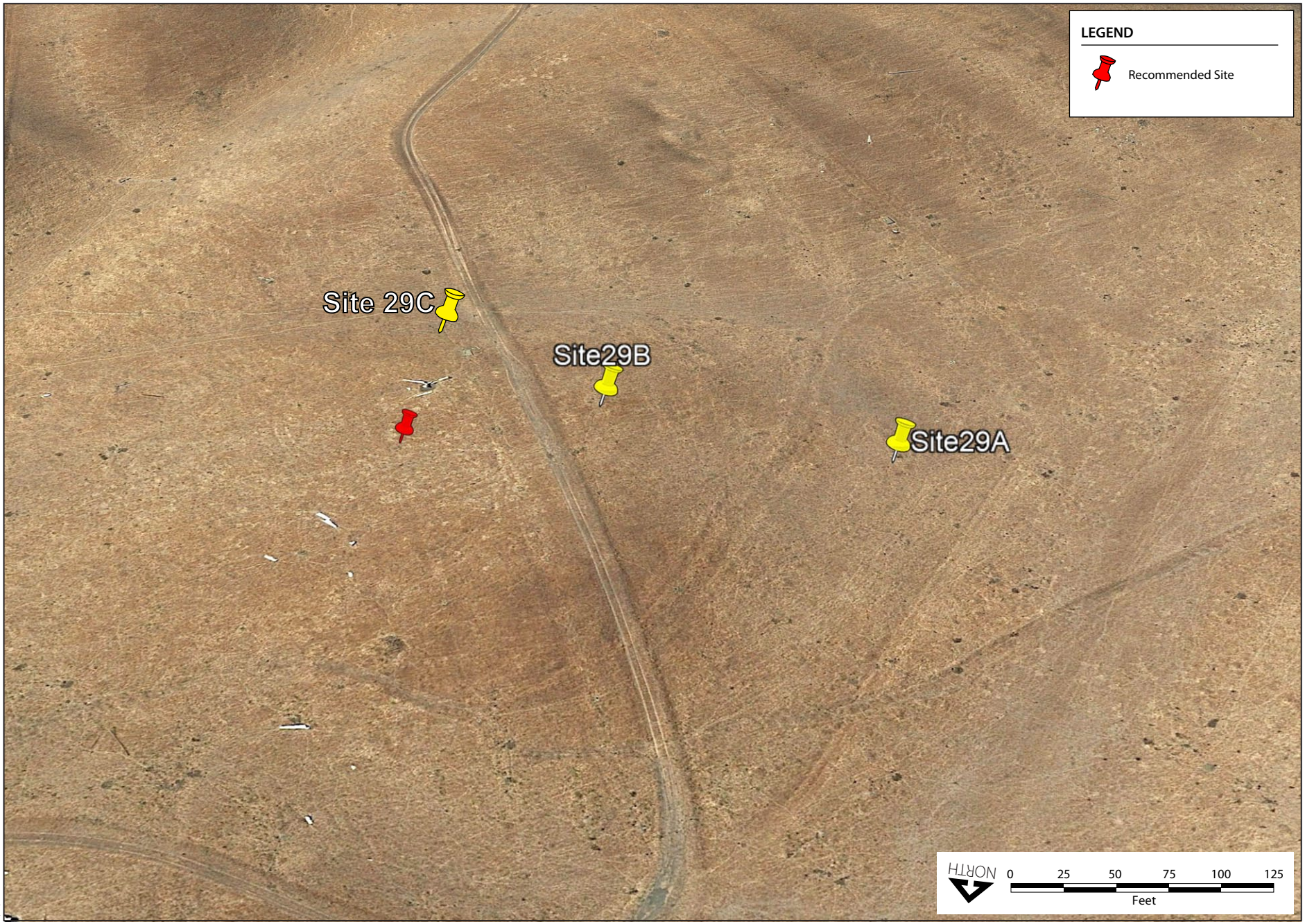
Site 29A is approximately 1,000 feet from a group of eucalyptus trees. There is a power plant with utility poles and a transmission line within 500 feet of Site 29B.

Relative Risk and Determination

Site 29A is considered a relatively high-risk site due to its location within the broad swale and at the base of a steep slope.

Site 29B is considered moderate-risk because it is near the top of the slope. Although an improvement over Site 29A, it is located on the upper edge of the slope, a potentially risky location for raptors flying into and out of the swale and for contour hunters. Also, 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.

Site 29C is considered a low-to-moderate-risk site due to its location along the edge of the shallow swale but otherwise adjacent to open, flat terrain. Because the site is near an existing



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SOURCE: Google Earth 2018.

Figure A-29
Location of Alternative Sites for Turbine 29 at the Sand Hill Wind Project

access road and on generally flat terrain, road and turbine pad construction would not alter the local topography or influence bird use or movement through the area.

Recommendation

To reduce risk, move the turbine east-northeast 140 feet across the road (37.786169/121.601622) from Site 29B. This relocates the turbine to flat ground away from the edge of the swale and other topographical features. This relocated site would be considered low risk. This is generally consistent with Smallwood and Neher (2018).

Plate 66. Looking upslope to the east from Site 29A. Site 29B is upslope near the vehicle.

Plate 67. Looking northeast from Site 29B. Moving the turbine an additional 100 feet east across the road onto the flat, open ground and away from the edge of the slope would reduce risk.

Turbine 30

Turbine 30 has two locations for the four layouts, Site 30A (Layouts 1,2,3, and 4) and Site 30B (the proposed alternative to the recommended location as per the February 4-5 site visit by sPower engineers) (Figure A-30). An additional location was initially selected, but because its within 10 feet of Site 30A, they are considered the same site.

Topographical Description

Site 30A is midway up a fairly steep (17%) north-facing slope. The ascending slope extends along the north-south-oriented ridge about 700 feet to the east and descends to northward about 900 feet. There are deep swales west and east of the site (Plates 68, 69, and 70).

Site 30B is approximately 46 feet southeast of Site 30A along the same north-south-oriented ridge. Conditions at this site are nearly identical to Site 30A, although the north-south slope is slightly less steep at this location.

4/4/2019

SOURCE: Google Earth 2018.

Figure A-30
Location of Alternative Sites for Turbine 30at the Sand Hill Wind Project

Proximity to Other Potential Risk Factors

There are overhead powerlines within about 100 feet (which would be removed).

Relative Risk and Determination

Site 30A is considered a relatively high-risk site due to its position on the north-facing slope, and the proximity of deep swales to the east and west. Site 30B is considered marginally less risky due to its location on the slope, but is still considered a high-risk site.

Recommendation

There are no suitable options for relocating Site 30 locally to significantly reduce risk without moving the site a substantial distance, and thus there is no recommendation for Turbine 30.

Plate 68. Looking east-northeast from Site 30A.

Plate 69. Looking upslope to the south from Site 30A.

Plate 70. Looking northwest from Site 30A.