



U.S. Fish and Wildlife Service

# Final Environmental Assessment

*Granite Target Site at White Sands Missile Range, New Mexico:  
Permit for Incidental Disturbance Take of Golden Eagles*

**U.S. Fish and Wildlife Service – Division of Migratory Birds  
Albuquerque, New Mexico**

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# ACRONYMS AND ABBREVIATIONS

Bird of Conservation Concern (BCC)

Code of Federal Regulations (CFR)

Defense Threat Reduction Agency (DTRA)

Environmental Assessment (EA)

National Environmental Policy Act (NEPA)

Migratory Bird Treaty Act (MBTA)

Programmatic Environmental Impact Statement for the Eagle Rule Revision (PEIS)

Resource Equivalency Analysis (REA)

White Sands Missile Range (WSMR)

# Chapter 1: PURPOSE AND NEED

## 1.1 Introduction

We, the U.S. Fish and Wildlife Service (Service), have prepared this Environmental Assessment (EA) pursuant to the National Environmental Policy Act (NEPA; 42 U.S.C. §§ 4321 *et seq.*). This EA evaluates the effects of issuing a 1-year permit for take of golden eagles (*Aquila chrysaetos*) that is incidental to otherwise lawful activities associated with the operation of the Granite Target Site (target site) at White Sands Missile Range (WSMR), New Mexico. The permit may be renewed. Should any of the current conditions change, additional NEPA analysis may be required. Permit issuance is done under authorization of the Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668-668d and 50 Code of Federal Regulations [CFR] § 22.26; hereafter referred to as Eagle Act). Specifically, WSMR has applied for a permit from our agency, the Service, for incidental take of golden eagles due to disturbance caused directly by "... hard rock penetration, static high explosive, and Advanced Weapon Systems testing and evaluation (WSMR 2016) during January 2017 through November 2018. Hereafter, these are referred to collectively as weapons tests (as distinguished from tests of conventional weapons). Disturbance take, if it were to occur, would be the loss of one breeding season's reproductive effort by one nesting pair. The permit would provide for offsetting such a loss in the event that disturbance take occurs. The target site will be constructed and prepared in 2018, with weapons tests starting soon afterwards. The target site and weapons tests will be operated for an estimated 20 years by the Defense Threat Reduction Agency and the U.S. Strategic Command Center for Combating Weapons of Mass Destruction (WSMR 2016).

Our decision whether to issue an eagle take permit constitutes a discretionary federal action that is subject to NEPA; WSMR has requested a permit for the disturbance take of one golden eagle breeding pair for 1 year. We will evaluate the request for consistency with the Eagle Act's permit regulations.

This EA evaluates the potential effects to the human environment of our decision to issue a permit for potential disturbance take of golden eagles by weapons tests at WSMR, and assesses the significance of impacts that could result from the proposed alternatives. "Significance" under NEPA is defined by regulation at 40 CFR § 1508.27, and requires short-term and long-term consideration of both the context of a proposal and its intensity. As required by NEPA, all alternatives must undergo an equal level of analysis, and the final proposal may include all or some components of a single alternative, or it may include a combination of components from more than one alternative.

Our analysis within this EA shows that while the incremental effect of the take is small, it could contribute to adverse effects on the species at least on a local scale. We anticipate that, by issuing a permit, we would ensure that take of golden eagles would be offset through compensatory mitigation.

## 1.2 Background

The Defense Threat Reduction Agency (DTRA) is preparing to conduct weapon tests at the target site. A new test bed covering about 50 acres is to be created some time in 2018. Development mainly consists of construction of weapons test infrastructure, which may take as little as 2-3 weeks (WSMR 2016). Frequency and timing of testing are unknown, but two to six (average 3.8) test events of large-scale armaments were conducted per year on other sites at WSMR during 2010-2015, mainly during March through September (excluding events with multiple weapons; WSMR 2016). The site may be used for weapons testing for 20 years (WSMR 2016).

Annually since at least 2014, a pair of golden eagles has nested near the planned target site, either (a) about 0.35 miles away, on a mountainside overlooking the target site, or (b) on the opposite side of the mountain, 0.6 miles away and visually separated from the target site by a high mountain ridge; hereafter,

these two areas historically used for nesting are referred to as the east mountainside and west mountainside, respectively. The golden eagle breeding territory encompassing these nests and the target site is known as the Southwest (SW) Mockingbird territory. Weapons tests at the target site may directly disturb the pair of eagles that occupies this territory by causing one or both members of the pair to temporarily or permanently abandon their nest or territory. Take in the form of physical injury to or death of the eagles or their eggs or young caused by blast fragments or concussive force is unlikely as long as nesting does not occur on the east mountainside (WSMR 2017) and tests do not occur during nighttime (Appendix A). As a risk minimization measure, two nests on the east mountainside were rendered unusable by WSMR in December 2016 under permit from the Service. This was done to discourage nesting there and, conversely, to encourage nesting on the west mountainside.

The Eagle Act allows for authorization of take of golden eagles and bald eagles (*Haliaeetus leucocephalus*) or their nests, with the appropriate federal permits. The take must be incidental to actions that are otherwise lawful. The Eagle Act's implementing regulations define "take" as to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb" individuals, their nests and eggs (50 CFR § 22.3); "disturb" is further defined as "to agitate or bother a bald or golden eagle to a degree that causes . . . (1) injury to an eagle . . . , (2) a decrease in its productivity [also known as reproductive success, this is defined herein as the number of young reaching near-fledging age – about 7 weeks for golden eagles] . . . , or (3) nest abandonment" (50 CFR § 22.3). Weapons testing planned for the target site in 2018 may result in incidental disturbance take of golden eagles, so the appropriate type of take permit is for individual instances of take that cannot practicably be avoided, under 50 CFR § 22.26. *Practicable* means " . . . available and capable of being done after taking into consideration existing technology, logistics, and cost in light of a mitigation measure's beneficial value to eagles and the activity's overall purpose, scope, and scale" (50 CFR § 22.3).

### 1.3 Purpose and Need for the Federal Action

The purpose for the federal action analyzed in this EA is issuance of a permit under the Eagle Act to WSMR for disturbance take of one pair of breeding golden eagles for 1 year. This is driven by our need to make a permitting decision that enables WSMR to conduct weapons tests in a manner that is consistent with the Eagle Act. The permit would make possible an increase in knowledge needed to support a more robust and better-informed, longer-term permit and associated NEPA process in subsequent years. In responding to the request for a permit, we must ensure compliance with the Eagle Act and our goal "... to maintain stable or increasing breeding populations of bald eagles and golden eagles in all eagle management units and the persistence of local populations throughout the geographic range of each species." This goal is known as the preservation standard. We may consider issuance of an eagle disturbance take permit if (1) the incidental take is necessary to protect legitimate interests, (2) the take is compatible with the preservation standard of the Eagle Act, (3) the applicant has avoided and minimized impacts to eagles to the extent practicable and, (4) compensatory mitigation will be provided for any take.

This purpose and need establishes the basis for determining if other viable alternatives to WSMR's request as described in their permit application may meet the target site's intended purpose and reduce potential negative effects of weapons tests at the site. Alternatives considered in this analysis are a No-Action Alternative and two action alternatives.

### 1.4 Regulatory Setting, Authorities, and Guidance

A Programmatic Environmental Impact Statement for the Eagle Rule Revision, published by the Service in 2016 (PEIS; Service 2016a), summarizes authorities that apply to the permit action being considered in this EA. Chief among these are: (1) the Eagle Act; (2) the Migratory Bird Treaty Act (MBTA) and associated regulations and guidance including Executive Order 13186 – Responsibilities of Federal

Agencies to Protect Migratory Birds; (3) the NEPA; (4) Consultation and Coordination with Tribal Governments; and (5) Department of the Interior Adaptive Management Implementation Policy.

## 1.5 Scope of Analysis

This EA considers three alternatives for issuing a permit for disturbance take of golden eagles potentially caused by weapons testing at the target site during 2018 and analyzes the effects of each alternative on the human environment. The analysis primarily focuses on golden eagles; documents summarized in Previous Environmental Analyses, below, evaluate other elements of the permitting action related to the human environment.

### Permit Issuance Criteria

In the analysis of alternatives, we consider the degree to which each alternative will conform to the permit issuance criteria for non-purposeful take permits under the Eagle Act. We may not issue a take permit under the Eagle Act unless the following issuance criteria are met, as required in 50 CFR § 22.26(f) (1–6):

1. The direct and indirect effects of the take and required mitigation, together with the cumulative effects of other permitted take and additional factors affecting the eagle population(s), within the eagle management unit and local area population, are compatible with the preservation of bald eagles and golden eagles;
2. The taking is necessary to protect an interest in a particular locality;
3. The taking is associated with, but not the purpose of, the activity;
4. The applicant has applied all appropriate and practicable avoidance and minimization measures to reduce impacts to eagles;
5. The applicant has applied all appropriate and practicable compensatory mitigation measures, when required, pursuant to 50 CFR § 22.26(c), to compensate for remaining unavoidable impacts after all appropriate and practicable avoidance and minimization measures have been applied;
6. Issuance of the permit will not preclude issuance of another permit necessary to protect an interest of higher priority as set forth in 50 CFR § 22.26(e)(7);

### Geographic Extent

Geographic scales of analysis for this EA are (1) the SW Mockingbird golden eagle territory, which encompasses about 7 square miles around the target site; and (2) the local area population of golden eagles, defined as golden eagles occurring within 109 miles of the target site. This 109-mile criterion is based on distances between sites where golden eagles in the western U.S. were banded as nestlings or fledglings and where the respective eagles later were observed or found dead when at breeding age (Millsap et al. 2014; Service 2016b; Figure 1).

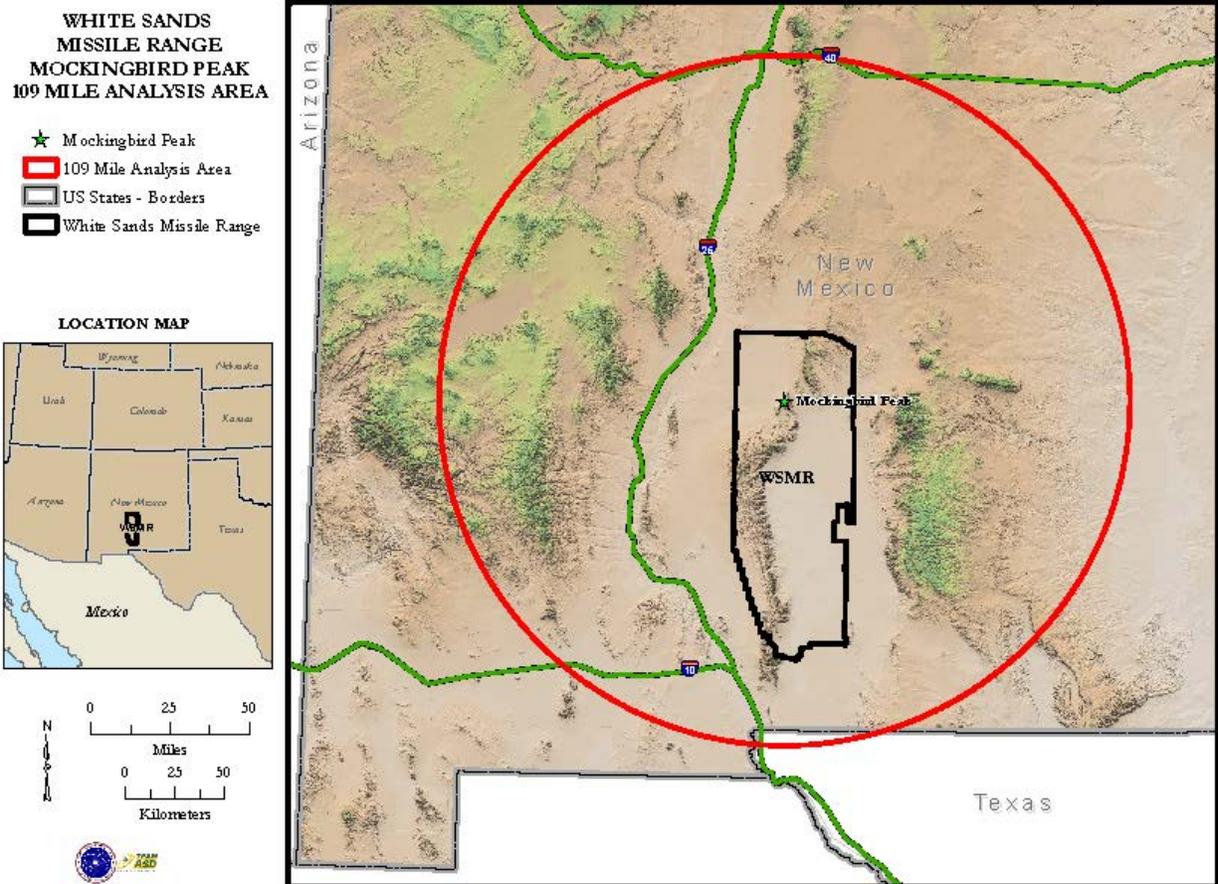


Figure 1. Area within 109 miles of the Granite Target Site at White Sands Missile Range, New Mexico, encompassing the local area population of golden eagles associated with the site. The 109-mile buffer is based on the species' natal dispersal distance in the western U.S. (Millsap et al. 2014, Service 2016b).

### Previous Environmental Analyses

Closely related environmental analyses are encompassed by the documents described below. These evaluate most elements of the project related to the human environment and thus allow the analysis in this EA to be focused on golden eagles.

- WSMR Environmental Impact Statement (WSMR 2009) – Changes designation of land use areas to augment the existing Army's capability to test and evaluate weapon systems with expanded training requirements
- Granite Target Site Environmental Assessment and Finding of No Significant Impact (WSMR 2016) – Establishment of target site can occur without a significant impact on environment; includes an appendix (C) "Golden Eagle Effects Analysis" that describes legal status of the eagle, the golden eagle breeding population on WSMR, and nest sites near the proposed target site. Data on the frequency of weapons tests and activities associated with testing are provided to help assess potential effects on eagles. Monitoring and mitigation measures are proposed.
- Granite Target Site Final Supplemental Environmental Assessment (WSMR 2017) – Acknowledges possibility that golden eagles may be injured or killed due to weapons tests at the

target site, but concludes such injury or death is unlikely because eagle nests close and directly exposed to the target site have been and will continue to be removed or rendered unusable before breeding seasons.

Previous analyses by the Service for issuance of take permits authorized by the Eagle Act include the PEIS and the Service's 2009 Final Environmental Assessment of a Proposal to Permit Take Provided under the Bald and Golden Eagle Protection Act (Service 2009). These and the above documents provide a foundation for this EA's analysis of most other elements of our eagle take permit process related to the human environment, and thus allow the current analysis to focus primarily on eagles and our action, which is consideration of issuance of an eagle disturbance take permit. Analyses listed above are hereby incorporated by reference into this EA.

## **1.6 Scoping, Tribal Coordination, and Public Participation**

Internal scoping including our agency, WSMR, and the DTRA began in June 2015. In January 2016 WSMR biologists met with us (Division of Migratory Birds, U.S. Fish and Wildlife Service, Region 2) to begin to develop an Eagle Conservation Plan and this EA for take of golden eagles associated with weapons testing activities at the target site. The purpose of the Eagle Conservation Plan was to provide details of (1) an assessment of risk posed to eagles; (2) avoidance, minimization, and compensatory mitigation measures; and (3) methods for monitoring outcomes (i.e., any evidence of effects on eagles). The plan helps form the basis of this EA's appendices. Additionally, an EA for the target site (WSMR 2016) evaluated potential impact of the development and use of the site to any species of flora or fauna listed as threatened or endangered by the Service or the state of New Mexico. The EA concluded there would be no impact from the proposed action on Critical Habitat of Threatened or Endangered species.

Tribal consultation and public review were included in the WSMR 2016 EA for the target site (WSMR 2016). This included golden eagles in the Affected Environment analysis. All Southwest Region Tribes were notified of the availability of the Draft EA and offered a 30-day period to submit comments. Comments were received from three Tribes. All comments were considered before making a final decision on permit issuance.

## Chapter 2: ALTERNATIVES

As referenced in the Council on Environmental Quality's NEPA regulations regarding the contents of an EA (40 CFR 1508.9{b}), NEPA Section 102(2) requires federal agencies to develop, study, and briefly describe reasonable alternatives to any proposed action with the potential to result in unresolved resource conflicts. This chapter briefly describes the alternatives we considered during preparation of this EA and alternatives that were considered but eliminated from further consideration. Alternative 3 is our Preferred Alternative.

### 2.1 Alternative 1: No Action

Under the No-Action Alternative, we would take no action or would deny the permit application and not issue an eagle take permit. WSMR presumably would conduct weapons tests without a take permit being issued. We considered this alternative because NEPA requires evaluation of a No-Action Alternative; not issuing the permit is a possible response to the permit application. Under the No-Action Alternative, we would deny the permit application because it fails to meet one or more of several issuing criteria under 50 CFR 22.26 as described in section 1.5.2, or because we have determined that the risk of disturbance to eagles is so low that a take permit is unnecessary.

### 2.2 Alternative 2: Issue a 5-year (or longer) permit

Under Alternative 2, we would issue a permit for incidental take due to disturbance, authorizing loss of the eagle breeding pair's productivity for at least a 5-year period (beginning in 2018) due to disturbance take caused directly by weapons test events. For golden eagles, the loss of 1 year's productivity equals 0.59 eagles (Service 2016b). However, there is much uncertainty regarding the physical impacts of weapons tests to be conducted at the target site, e.g., the magnitude of concussive force, extent of shock waves, types and ballistics of blast debris, duration and intensity of noise. Predicting disturbance take due to weapons tests for a period of 5+ years invokes much speculation regarding the physical impacts of weapons test events and the response of eagles to such impacts. Information on effects of various forms of disturbance on golden eagles and raptors in general is sparse (Service 2017), with no reasonable inference that can be applied to disturbance impact at the target site. We recommended, and WSMR concurred, that a much shorter-term permit would be more appropriate in this instance because it would provide opportunity for increased knowledge on which to base a longer-term permit without unduly burdening WSMR as the permit holder.

To quantify the loss of 1 year's productivity for golden eagles, our agency uses the 80<sup>th</sup> quantile value from a distribution of productivity data for the species in the western U.S.: 0.59 eagles fledged per breeding pair per year (Service 2016a). Per the Eagle Rule (2016c), compensatory mitigation for golden eagles is to be completed at a ratio of 1:1.2 such that, in this case, a loss of 0.59 eagles in 1 year must be offset by 0.5 eagles gained (i.e., based on 1:1.2 ratio,  $0.59 * 1.2 = 0.7$ ). For a 5-year permit term, the maximum total loss if nest failure occurred every year would be  $0.7 * 5 = 3.5$  eagles.

### 2.3 Alternative 3: Issue a 1-year permit

Under Alternative 3, we would issue a permit for incidental take due to disturbance, authorizing loss of the eagle breeding pair's productivity in 2018. Disturbance take, if it occurs, would result directly from weapons test events. To quantify the loss of 1 year's productivity for golden eagles, the Service uses the 80<sup>th</sup> quantile value from a distribution of productivity data for the species in the U.S.: 0.59 eagles fledged per breeding pair per year (80<sup>th</sup> quantile value; Service 2016a,b). Per the Eagle Rule (2016b), compensatory mitigation for golden eagles is to be completed at a ratio of 1:1.2 such that, in this case, a loss of 0.59 eagles must be offset by 0.7 eagles gained (i.e., based on 1:1.2 ratio,  $0.59/1.2 = 0.72$ ). There

is much uncertainty regarding the physical impacts of weapons tests at the target site and whether those impacts will disturb eagles, e.g., the magnitude of concussive force, extent of shock waves, types and ballistics of blast debris, duration and intensity of noise. A key goal of this permit is to develop greater knowledge of these impacts to support a more robust, longer-term permit for disturbance take, if warranted. To assess responses of the breeding pair of eagles to weapons-test events, permit conditions would include intensive monitoring of their nesting and movement behavior via satellite transmitters (PTTs) in addition to standard ground-based observation to assess productivity.

## **2.4 Alternatives Considered but Dismissed**

### Issue a permit for take resulting in injury or death of golden eagles

Take of the breeding pair of golden eagles or their eggs or young could occur directly via injury or mortality attributed to weapons tests. An eagle could be perched close to or fly over the target site when detonation occurs and be injured or killed by trauma from blast debris or concussive force. Results from a simple analysis of PTT data collected from the SW Mockingbird breeding pair during January 30-June 30 2017 suggest that risk of direct injury or mortality probably is negligible; there is roughly a 0.01% chance that an eagle would be within 0.5 km of the target site during the same hour that a test event occurs (Appendix A). However, distribution of the eagle pair's GPS locations recorded at midnight (i.e., night roost sites) indicate that if weapons tests were conducted during nighttime, the risk of an eagle being injured or killed by the event increases, even if the eagles have no nests on the east mountainside. Thus, a critical assumption of Alternative 3 – the preferred Alternative – is that weapons tests are conducted only during daytime such that risk of injury or mortality is negligible.

### Issue a permit for incidental take of golden eagles due to disturbance associated with weapons testing activities in general

Besides possible disturbance caused directly by weapons test events, construction activity to prepare for weapons tests at the target site, heavy equipment and other traffic to and from the target site, or human activity at the target site just before and after testing could potentially disturb the SW Mockingbird breeding pair, resulting in lost productivity. Though effects of most sorts of disturbance on golden eagles are not well understood, a comprehensive review of this subject currently being completed by the Service's Western Golden Eagle Team (document final draft, July 2017) generally supports the idea that potential for negative impacts caused by construction and other human activities such as those planned for the target site – in particular effects on breeding pairs at nests – is low when the activities occur at least 0.5-0.6 miles away and are of relatively short (< 1 hour) duration. Nests on the west mountainside are 0.6 miles from and not in line-of-site of the target site; as such, construction, traffic, or human activity at the target site should not cause disturbance take of eagles at these nests. Instead, these disturbances at the target site could help protect the eagles by discouraging use, especially nesting, of the east-facing mountainside overlooking the target site. Another potential source of disturbance is vehicle traffic on the target site's only access road that, at its nearest point, is 0.7 miles from nests on the west mountainside. These would be short-duration disturbance events. Again, based on current knowledge of disturbance effects on golden eagles, this distance buffer should adequately safeguard the breeding pair.

## 2.5 Key Elements for the Action Alternatives

### Take Authorization

Authorizing take by disturbance of a golden eagle breeding pair due to weapons tests at the Granite Target Site in far southeastern Socorro County, New Mexico, occurring about 0.6-0.9 miles east of the pair's nests (35.513° North -106.485° East) during January 1-December 31, 2018, may entail the loss of 1 year of productivity for the eagle pair. As described under Alternative 3 in this chapter and references therein (Service 2016a,b), golden eagle pairs occupying breeding territories in the U.S. produce 0.6 fledglings per year (80<sup>th</sup> quantile value). To offset this loss, 0.7 golden eagles must be saved from mortality or 0.7 more golden eagles must be produced; 0.7 is used rather than 0.6 because compensation for the loss of golden eagles must occur at a ratio of 1.2 eagles gained for 1 eagle lost (Service 2016a).

### Monitoring

Through terms and conditions outlined in a permit from the Service authorizing disturbance take, WSMR would be required to document whether the golden eagle breeding pair from SW Mockingbird territory continues to occupy the territory after any weapons test is conducted in 2018. Occupancy would be determined via data from PTTs per details in Appendix B. Location data from the eagles' PTTs would be used to determine whether, when, for how long, and to what spatial extent a member of the breeding pair shifts its distribution of use away from its normal use area following a weapons test event. If it appears that abandonment may have occurred due to testing, biologists from WSMR and our agency will assess the weight of evidence suggesting this, and not coincidence, and whether it affected productivity. If a weapons test is conducted at the target site during the breeding season, status of nesting would be documented via ground-based observation as soon as possible before and after such a test (ideally, the day before and day after). The pair's productivity would be determined via standard procedures for raptors, using ground-based visits at least every 4 weeks during the normal mid-incubation stage until young are nearly fledged (~7 weeks of age), or until it is confirmed that the pair was not successful in producing young (see Appendix B).

### Compensatory Mitigation

As a compensatory mitigation measure to offset the potential loss of 0.7 golden eagles due to disturbance at the SW Mockingbird territory, WSMR would retrofit 22 power poles along electrical distribution lines in high priority areas to reduce electrocution risk to eagles. The number of poles to be retrofitted is based on a Resource Equivalency Analysis (Appendix C) and is additive in nature to the retrofits already scheduled as part of WSMR's avian protection plan. Retrofitting should be done within 109 miles of the target site, i.e., within bounds of the local area population of golden eagles, and would target poles with the most hazardous line configurations in areas that appear most attractive to the eagle per guidelines in EDM International, Inc. (2015). If no take of eagles is detected during the 1-year term of the permit, WSMR would be credited for compensatory mitigation completed and can use the credit for any subsequent permit from the Service for take of golden eagles on WSMR (Service 2016c). The Service prefers that compensatory mitigation required as a permit condition is completed before actions posing potential for take occur, though this often is not possible as would be the case in the 1-year permit for disturbance take due to weapons tests at the target site. Therefore, a condition of the permit should be that 22 hazardous power poles will be retrofitted within 1 year of the end of the permit period (e.g., before 1 December 2019 if the permit period is 1 December 1 2017 through 30 November 2018).

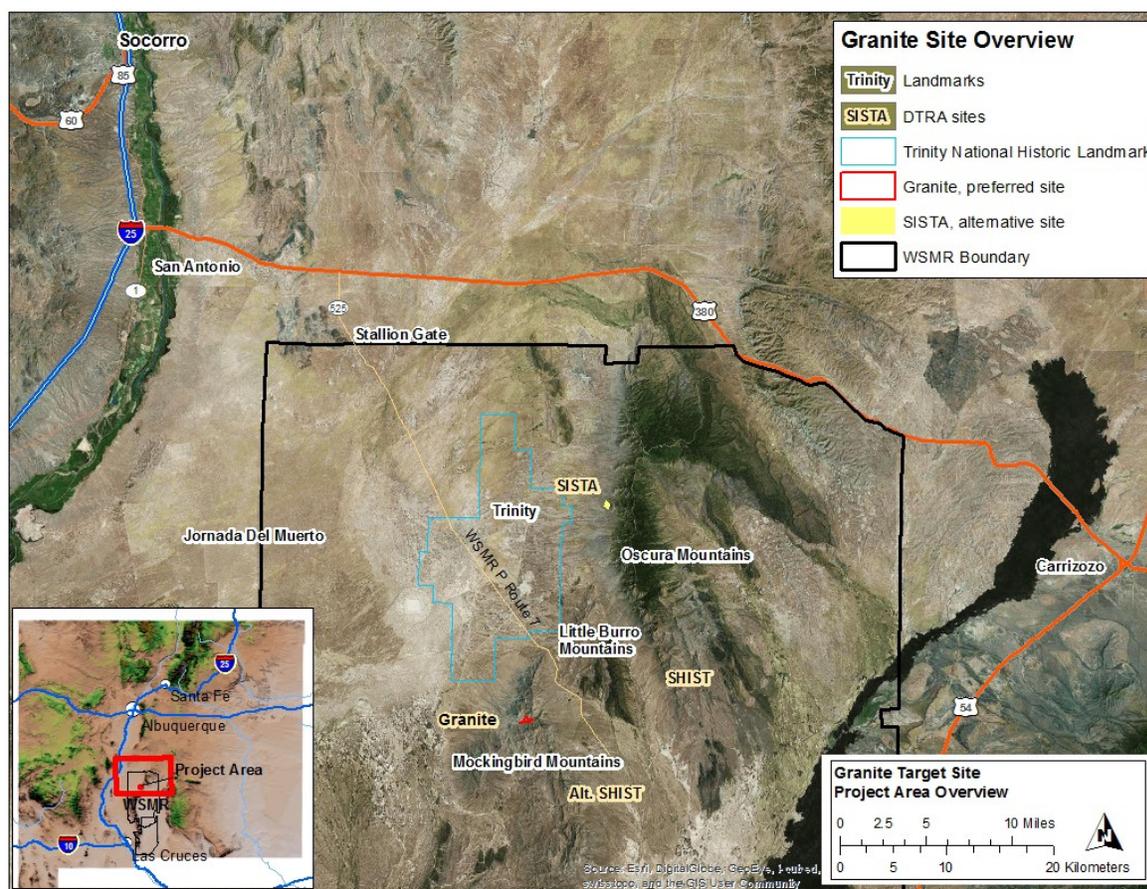
## Chapter 3: Environmental Setting

### 3.1 Affected Environment

This section provides background on environmental resources that are evaluated in the context of the federal action of permit issuance for take of golden eagles. Descriptions are relatively brief, as most relevant information is provided in detail in the 2016 EA (WSMR 2016) and Appendix D. The 2016 EA also includes reference sources for information provided here.

#### Physical Environment

The target site is in the northern part of WSMR, in far southeastern Socorro County, New Mexico (Figure 2). The Rio Grande River and 230,000-acre Sevilleta National Wildlife Refuge are about 25 miles northwest of the site. The nearest human population centers are San Antonio (35 miles northwest) and Carrizozo (35 miles east-northeast). The target site is within the Mockingbird Mountains, a small range that extends north of the San Andres Mountains. Surface drainage from the site passes west into the Jornada del Muerto, a vast closed basin. Elevation is 6000-6400 feet above mean sea level at the target site and 5550-7400 feet within about 1 mile of the target site.



**Figure 2.** Location of the Granite Target Site (“Granite”) on the northern part of White Sands Missile Range, New Mexico, relative to the missile range boundary, geographic features, roads, and population centers.

## Climate

The climate of WSMR is typical of the northern Chihuahuan Desert, with an arid to semi-arid climate with a monsoonal precipitation pattern during summer. Summers are hot and winters are cool; average July and January minimum-maximum temperatures are 60.8-90.5° F and 21.6-50.8° F, though elevation gradients and mountain ranges create site-specific climates (WSMR 2016). The average annual precipitation is 10.7 inches but varies much; most rain occurs during July-September. Average annual snowfall is 7.4 inches.

## Biological Environment

The target site area is within the Basin and Range Section of the Chihuahuan Semi-desert Ecoregion (reviewed in WSMR 2016). Major physiographic features overlapping WSMR include the Tularosa Basin, San Andres Mountains, Oscura Mountains, and the Jornada del Muerto Basin; the latter is a closed basin that encompasses the target site (Figure 2). The only perennial water source for wildlife in the target site area is a spring about 1 mile north of the site. Surface water from thunderstorms flows from the target site into the Jornada del Muerto Basin. Groundwater is limited at the target site because soils are shallow and well-drained.

Extensive native tracts of desert grassland and shrubland occur on WSMR, typically dominated by several species of gramma (*Bouteloua* spp.) and oak (*Quercus* spp.), yucca (*Yucca* spp.), sumac (*Rhus* spp.), and mountain mahogany (*Cercocarpus montanus*) shrubs (WSMR 2016). Vegetation specific to the target site is detailed in the 2016 EA. Wild mammals within 10-20 miles of the target site include mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), oryx (an introduced species; *Oryx gazella*), coyote (*Canis latrans*), kit fox (*Vulpes macrotis*), bobcat (*Lynx rufus*), and mountain lion (*Puma concolor*). Smaller mammals include black-tailed jackrabbits (*Lepus californicus*), desert cottontails (*Sylvilagus auduboni*), and many rodent species. The target site area and nearby landscape provides high quality breeding, migration, and winter habitat for many species of grassland and shrubland songbirds especially sparrows (Emberizidae) and western meadowlarks (*Sturnella neglecta*). Besides golden eagles, raptor species likely to occur include mainly red-tailed hawks (*Buteo jamaicensis*) and Swainson's hawks (*B. swainsoni*). Bald eagles occur on WSMR, but are rare during migration or winter months.

## Current Anthropogenic Causes of Mortality

WSMR documented six electrocutions of golden eagles at power poles during 1984-1993 and 15 during 2009-2017 (T. Cutler and WSMR, unpublished data). In 2014, WSMR completed an avian protection plan that focused on retrofitting of power poles along electrical distribution lines throughout the missile range to reduce electrocution risk to raptors including golden eagles (WSMR 2014). Currently, human-caused negative impacts to golden eagles in the local area population and in New Mexico in general include mainly power line electrocutions; collisions with wind turbine blades, vehicles, and power lines collision, lead poisoning from remains of animals shot with firearms, secondary poisoning from rodenticides, and shooting (R. Murphy, U.S. Fish and Wildlife Service, unpublished data). Examples of indirect, human-caused threats include degradation or complete loss of prey habitat due to land use practices and/or conversions, and climate variability (i.e., negative impacts on abundance of the eagle's prey). The relative importance of these and other sources of mortality to golden eagle population dynamics is currently under study at broader geographic levels (Service 2016b). For the local area population of golden eagles encompassing the target site, mortality and displacement associated with expanding wind energy infrastructure and prey reduction associated with climate change may become the most important human-caused limiting factors in the foreseeable future. Golden eagles seem uniquely vulnerable to collision with wind turbines (Pagel et al. 2013). In parts of the southwestern U.S., unpredictable extremes in climate variability may also cause juvenile golden eagles to disperse earlier and farther from their natal areas, resulting in decreased survival during their first year of life (Murphy et al. 2017).

## 3.2 Golden Eagle

This section is composed of text directly excerpted from section 3.3.1.1 of the PEIS (Service 2016a). For the sake of brevity, references herein to information sources are excluded from the References section of this EA but can be found in the PEIS.

### *General*

- worldwide distribution in the northern hemisphere
- delayed reproduction; does not attain the definitive [adult] plumage until fifth year
- females larger than males; size increases with increasing latitude
- may travel great distances during dispersal and migration but usually return to within 30 miles of natal area to breed
- occupy discrete breeding territories, typically used continuously for many years
- pairs establish and defend breeding territories that may have multiple alternative nests
- typically lays one to three eggs (rarely four) once per year, incubation lasts around 42 days
- some northern populations of golden eagles migrate southward in winter and some nonbreeding golden eagles from southern latitudes migrate northward in summer
- feed mainly on small to mid-sized mammals, especially rabbits, hares and jackrabbits, ground squirrels (*Spermophilus* spp.), marmots (*Marmota* spp.), and prairie dogs (*Cynomys* spp.)
- carrion can be an important part of the diet particularly in winter

### *Population Status Designation*

- listed by the Service as a BCC [Bird of Conservation Concern] because of its BCC assessment score, which is based on “population trend, threats, distribution, abundance . . .” [Birds of Conservation Concern are species that are likely to become candidates for listing under the federal Endangered Species Act unless factors limiting their populations can be resolved; Service 2008]

### *Survival*

- point estimates of annual survival rates in Table 3.5 of Service (2016b) for first-year, second-year, third-year, and after third-year individuals are 0.70, 0.77, 0.84, and 0.87, respectively.

### *Mortality Causes* (based on 386 golden eagles tracked via satellite telemetry during 1997–2013)

- 56% of mortality attributed to human-caused factors
- human-caused factors resulted in about 10% increase in overall annual mortality rate
- proportion of mortality caused by humans increased with eagle age
- major causes death: (1) starvation (largely restricted to eagles in their first year); (2) illegal poisoning; (3) illegal shooting; (4) intra-specific fighting; (5) collisions with power distribution lines, vehicles, and wind turbines; and (6) electrocution

### *Population Size and Trajectory*

- for the western U.S., late summer population over the most recent decade averaging 31,000
- demographic projections consistent with expected effect of the high rate of [human-caused] mortality observed
- together, these support the interpretation that golden eagle populations might be gradually declining toward a new, lower equilibrium.

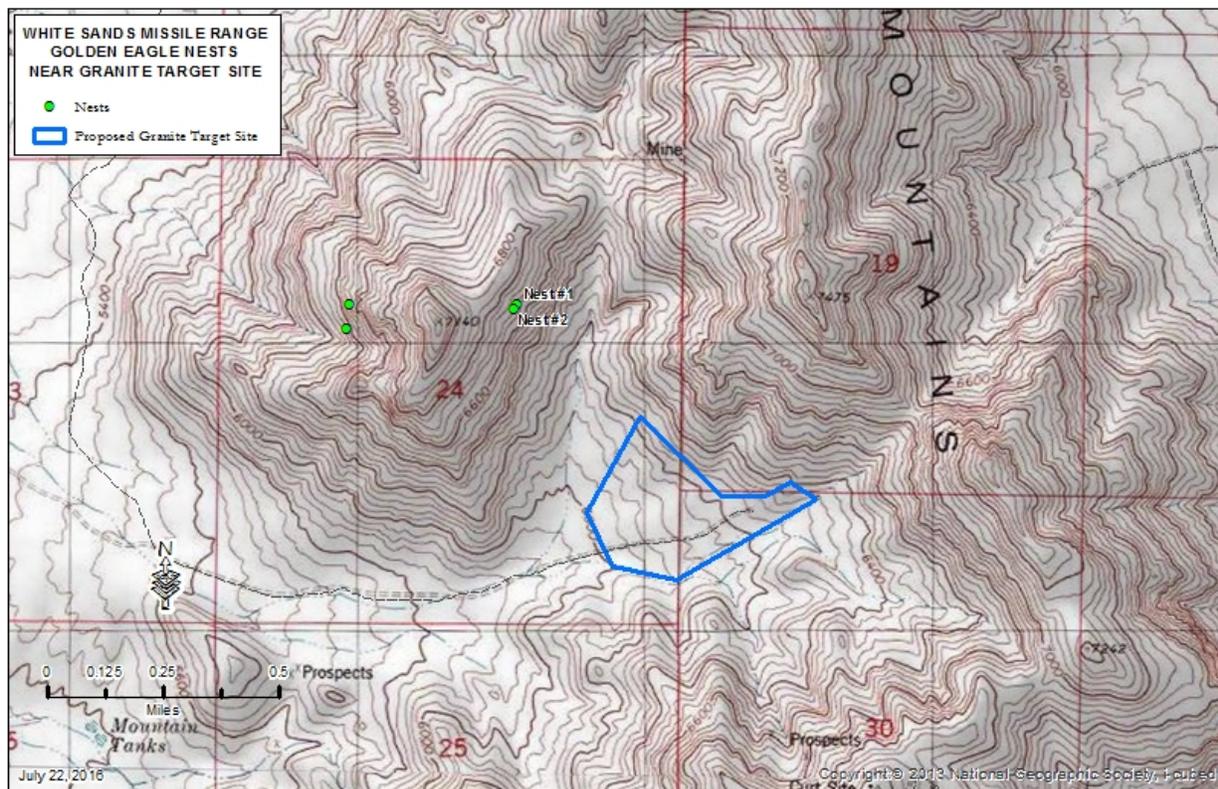
### *Disturbance*

- have not demonstrated same level of adaptation to human disturbance and land-use conversion as bald eagles; effects of habitat loss and disturbance may be having more substantial population-level effects
- relatively minor human activities near nests may cause nest abandonment and/or death of young

### Golden Eagles at WSMR

Thirty-one breeding territories have been identified; in 2016, 26 of the territories were occupied by breeding pairs and single adult eagles were noted at the other five territories (Juergens 2016). Breeding season generally begins with courtship during mid-December through January to mid-February, with egg-laying during mid-January to mid-February. Hatching of eggs and fledging of young occur during early Mar-early April and early May-early June, respectively. Based on what is known about golden eagles elsewhere in the southwestern U.S. (Murphy et al. 2017), juveniles probably rely on their parents for food for at least 2 months after fledging; most juvenile eagles on WSMR likely disperse from their natal areas during late summer through late fall. Herein, we consider the breeding season at WSMR to encompass mid-December through mid-June, about 6 months. Weapons test events occurring later than this (i.e., between fledging and dispersal) also could disturb both the breeding adults from the SW Mockingbird territory and their young, but we believe this is less likely because the eagles are no longer closely tied to their nests.

The SW Mockingbird territory, which encompasses the target site, was discovered by WSMR biologists in 2014; an adult was observed in an incubating position on a nest 0.6 miles west of the target site, on a west-facing mountainside (Figure 3). In 2015, a large nestling was noted in a nest on the east-facing mountainside, about 0.35 miles from and in direct line-of-sight of the target site. In 2016, two nestlings were produced in the “west” nest that was used in 2014. Under permit from the Service in December 2016, WSMR rendered the 2015 “east” nest and a second nest nearby unusable by covering it with a construction cone. The intent of this measure was to discourage the eagles from nesting on the east mountainside, where weapons testing and associated human activities being planned for the target site could disturb the eagles, resulting in take due to loss of productivity. The work also was done to minimize risk of eagles being struck by blast debris or concussive force from detonated weapons, under an assumption that likelihood of such take was much greater if the eagles nested on the east mountainside. Conversely, the minimization measure was done to encourage nesting on the west mountainside, farther away, and where a high mountain ridge would protect nests from blast debris. In 2017, golden eagles laid eggs in the west nest, though the breeding attempt failed some time during the early nestling stage. Three golden eagle breeding territories adjoin the SW Mockingbird territory. Central points among the multiple nests within each of these territories are 1.0, 1.8, and 3.2 miles from that of the SW Mockingbird territory.



**Figure 3.** Map of Granite Target Site and four nearby golden eagle nests within the Southwest Mockingbird eagle territory at White Sands Missile Range, New Mexico. In December 2016, the two nests closest to the target site (nests 1 and 2) were rendered unusable to the eagles, as authorized via permit from the U.S. Fish and Wildlife Service.

In late January 2017, the SW Mockingbird breeding pair of golden eagles was captured and each eagle was fitted with a satellite transmitter then both eagles were released. Data from the transmitters reveal each eagle's GPS-based location ( $\pm 60$ -foot accuracy) at hourly intervals through the day plus midnight. As of June 30, 2017, 3070 total locations from the breeding pair were recorded. The location data are being used mainly to (1) monitor year-round occupancy of the territory by both members of the breeding pair, (2) document seasonal distribution of use relative to the nest and target site, and (3) document immediate and short-term responses to weapons test events. In Appendix A, the telemetry data are used to (1) estimate likelihood of occurrence of each eagle at or near the target site during the early nesting season and spring, (2) illustrate spatial distribution of daytime GPS locations relative to nest and target sites, and (3) illustrate and quantify spatial distribution of midnight GPS locations relative to the target site.

#### *Local area population*

To manage take of golden eagles, the Service currently uses the 80<sup>th</sup> quantile value of the distribution of the species' natal dispersal distances based on band encounters in Millsap et al. (2014) to represent, from a point or area on a given landscape, the radius of a circle encompassing the eagle's local area population. The population size for the area is estimated based on densities for overlapping Bird Conservation Regions. Once population size is estimated, we can determine the maximum level of take to authorize under a permit (Service 2016b). The natal dispersal distance criterion currently used is 109 miles. Within this distance from the target site (Figure 1), an estimated 399 golden eagles occur (H. White and R. Murphy, from internal Service cumulative effects tool, June 23 2017). Potential disturbance take of 0.6

eagles due to weapons testing at the target site comprises only 0.2% of this population. Uncompensated take of golden eagles cannot be permitted by the Service, but take of up to 5% of the golden eagles in a given local area population can be authorized annually if offset by a 1:1.2 ratio. The 5% benchmark for annual take from the local area population encompassing the target site is 20 golden eagles. As of July 2017, no take of golden eagles from this local area population has been authorized by permit from the Service.

Based on data from annual aerial surveys conducted during late summer plus trends from bird survey routes, Millsap et al. (2014) reported that golden eagle populations in the western U.S. generally were stable, including populations in Bird Conservation Regions 16, 34, and 35, which overlap the target area's local area population (Millsap et al. 2014: Figure 5). However, recent demographic models suggest that population levels of golden eagles in the western U.S. are either starting to decline or are already in a slow, long-term decline (Service 2016a).

# Chapter 4: Environmental Consequences

## 4.1 Introduction

This chapter describes environmental consequences of the three permitting alternatives. The analysis considers two action alternatives that provide a reasonable range of options for responding to the WSMR application for an eagle permit and evaluates the impacts on the human environment, mainly the impacts on the local area and project-level eagle populations.

*Alternative 1: No Action*

*Alternative 2: Issue a 5-year (or longer) permit for incidental take of golden eagles due to disturbance*

*Alternative 3: Issue a 1-year permit for incidental take of golden eagles due to disturbance*

## 4.2 Impact Analysis

### Effects Related To Take Of Golden Eagles

In determining the significance of effects of alternatives on golden eagles, we considered the degree to which each alternative would conform to permit issuance criteria for incidental take permits, as described in Chapter 1. We used methods in our ECP Guidance (Service 2013) to quantify local area population size and coarsely assess cumulative impacts.

### Effects Common to All Alternatives

Injury and death of golden eagles due to electrocution and vehicle collision have been documented on WSMR (Trish Cutler, WSMR, personal communication). However, injury, death, or disturbance caused by testing of weapons to be tested at the target site have not been documented. Direct effects of authorizing take of a single golden eagle breeding pair by disturbance from weapons tests during the December-July 2018 eagle breeding season could potentially entail the loss of 1 year of productivity for the pair. Although it has not been documented before, this loss could stem from 1) disruption of courtship activities that normally precede egg-laying, especially if extremely loud noise and intense shock waves are created by a weapons test and one or both breeding eagles respond by vacating the area for several days or weeks, and possibly longer, 2) loud noise or shock waves may also cause an incubating adult to inadvertently damage its eggs while springing from the nest, 3) if the breeding pair temporarily abandon their nest, their eggs (embryos) or downy nestlings could be exposed to lethal chilling or overheating, the latter especially from prolonged, direct sun exposure, 4) if the male temporarily abandoned the nest area or territory in response to a test, his provisioning of food to an incubating or brooding female or to nestlings would be suspended, possibly leading directly or indirectly to the death of embryos or nestlings, and 5) eggs or small nestlings in an unattended nest could be depredated by ravens (*Corvus* spp.) or other predators.

## 4.3 Cumulative Effects

The purpose of this cumulative effects evaluation is to identify situations where take, either at the target site scale or in combination with other present or foreseeable future actions and other limiting factors at the local-area population scale, may be approaching levels that are biologically problematic or that cannot reasonably be offset through compensatory mitigation. The scale of our cumulative effects analysis is the area within 109 miles of the target site, based on information about natal dispersal distances of golden eagles.

Here, we define target-site scale as the area within 1 mile of the target site. This area overlaps the core area of use (i.e., densest cluster of 50% of the pair's GPS location points) of the SW Mockingbird

breeding pair. At this scale, cumulative impacts to the golden eagles may increase if future construction activity, infrastructure, human presence, and test frequency expanded beyond what is described in the Granite Target Site EA (WSMR 2016) and considered in this EA as the reference level for testing operations. Golden eagles occupying the SW Mockingbird territory could experience lowered productivity under any of the three alternatives.

At the local area population level, we anticipate that issuing a permit to authorize incidental take via disturbance would ensure that if any take occurs it would be offset by the compensatory mitigation required as a permit condition. Thus, permit issuance would cause no significant, adverse cumulative effects on the local area population of golden eagles. Moreover, in 2016 we issued a 5-year permit to WSMR to remove or render unusable any new nest construction by golden eagles on the east-facing mountainside overlooking and within about 0.35 miles of the target site; as the primary minimization measure, this action was intended to substantially reduce eagle use of the area directly exposed to blast impacts of weapons tests. (As an additional minimization measure, commercial propane exploders designed to scare wildlife could be placed strategically near the target site 2-5 hours before a test event, with timers set to emit hourly “booms”). Further, our permit conditions would require WSMR to monitor occupancy of golden eagle territories adjoining the SW Mockingbird territory for at least 3 years, to help gauge our tentative assumption that the respective breeding pairs will not be affected by weapons tests.

Currently, human-caused negative impacts to golden eagles in the local area population and in New Mexico in general include mainly power line electrocutions; collisions with wind turbine blades, vehicles, and power lines collision, lead poisoning from remains of animals shot with firearms, secondary poisoning from rodenticides, and shooting (R. Murphy, U.S. Fish and Wildlife Service, unpublished data). Examples of indirect, human-caused threats include degradation or complete loss of prey habitat due to land use practices and/or conversions, and climate variability (i.e., negative impacts on abundance of the eagle’s prey). The relative importance of these and other sources of mortality to golden eagle population dynamics is currently under study at broader geographic levels (Service 2016b). For the local area population of golden eagles encompassing the target site, mortality and displacement associated with expanding wind energy infrastructure and prey reduction associated with climate change may become the most important human-caused limiting factors in the foreseeable future. Golden eagles seem uniquely vulnerable to collision with wind turbines (Pagel et al. 2013). In parts of the southwestern U.S., unpredictable extremes in climate variability may also cause juvenile golden eagles to disperse earlier and farther from their natal areas, resulting in decreased survival during their first year of life (Murphy et al. 2017).

#### **4.4 Cultural Effects**

Cultural effects were reviewed in the Granite Target Site EA (WSMR 2016). Eagles and their feathers and remains are revered and considered sacred by many Native American tribes. All Southwest Region Tribes were notified of the availability of the Draft EA and offered a 30-day period to submit comments. All comments were considered before making a final decision on permit issuance.

#### **4.5 Other Priority Uses**

Other priority uses described in our regulations (Service 2016a) include safety emergencies, activities necessary to ensure public health and safety, renewal of nest-take permits, and resource development or recovery operations (only for golden eagle nests that are not “in-use”). Tests of advanced weapons at the target site, including disturbance take of eagles, is not expected to interfere with other priority uses or permits because compensatory mitigation required as a permit condition under both alternatives will uphold a no-net-loss standard.

## CHAPTER 5: CONCLUSION

The potential incremental effect of disturbance associated with advanced weapons tests at the target site during the 2018 breeding season is small, i.e., the loss of productivity of one golden eagle pair for one breeding season, equaling 0.6 golden eagles based on average productivity in the western U.S. (Service 2016b). However, if not offset, the take would be inconsistent with the preservation standard of "...maintaining stable or increasing breeding populations in all eagle management units and the persistence of local populations..." (Service 2016c). We have determined that, by issuing a permit, we would have a means to ensure that minimization measures would be implemented and that if take occurred despite these measures, it would be more than offset by compensatory mitigation. By issuing a permit to WSMR for disturbance take of golden eagles breeding at the SW Mockingbird territory, no-net-loss of the eagle resource can be achieved. Conversely, conservation opportunity would be lost if the permit was not issued.

### 5.1 Assessment of Alternatives

In assessing whether there is a "significant" impact, we have considered both the context and intensity of the action and its effects (40 CFR 1508.27). Context refers to the affected environment in which the proposed action takes place and may include the socioeconomic, legal, and political situation surrounding an action. Intensity refers to the severity of the proposed action's impact on the environment and may consider environmentally beneficial actions, public health, unique characteristics of the geographic area, controversy, uncertainty, precedent-setting elements, cumulative effects, cultural resource effects, effects on species listed as Threatened or Endangered, and consistency with environmental laws (40 CFR 1508.27[b]). In the case of the Preferred Alternative – issuance of a 1-year permit for disturbance take – we have assumed that the context is the advanced weapons tests. Consideration of intensity addresses the relative severity of effects on eagles, the possibility of the federal action to establish a precedent for future eagle take permits, and the efficacy of the action in mitigating adverse effects.

Under the action alternatives, the "action" of issuing a disturbance take permit to WSMR will result in no additional impacts to the human environment. WSMR will likely continue to develop the target site.

#### Alternative 1: No Action

Under the No-Action Alternative, we would take no action or would deny the permit application and not issue an eagle take permit. We considered this alternative because NEPA requires evaluation of a No-Action Alternative; not issuing the permit is a possible response to the permit application. Under the No-Action Alternative, we could deny the permit application if it fails to meet one or more of several issuing criteria under 50 CFR 22.26 (presented under "Scope of Analysis" in this EA). The permit application meets all the issuance criteria, however.

We also could deny the permit if we determined that the risk to eagles is so low that a permit is unwarranted. However, based on (1) reconnaissance of the site; (2) communication and information-sharing with WSMR staff; (3) review of relevant scientific literature; (4) assessment of 2017 (through June) satellite telemetry data from the breeding pair of eagles (all encompassed by Appendix A); and (5) our internal review process, we determined that risk of disturbance posed by weapons tests at the target site to the nearby breeding pair of golden eagles currently is highly uncertain but probably great enough to render a No-Action Alternative indefensible.

Without a permit for disturbance take of the pair of golden eagles breeding near the target site, WSMR could proceed to test weapons at the target site. However, if take of eagles occurred due to disturbance, WSMR would be in violation of the Eagle Act, with which the Department of Defense and all of its

branches must comply. Operations of the target site, as described in the 2016 EA (WSMR 2016), would not be within compliance of the law.

If a permit is not issued, WSMR will continue with the eagle conservation plans as outlined in their Avian Protection Plan. In 2014, an avian protection plan (APP) was completed that focused on retrofitting of power poles on WSMR to reduce electrocution risk to raptors including golden eagles (WSMR 2014). In the APP's 15-year implementation schedule, 1,350 of the most hazardous<sup>1</sup> poles were to be retrofitted during 2015-2020 at a cost of \$1,350,000. Due to funding deficits, however, only 200 of these were retrofitted as of June 2017, an average of about 67 poles per year compared to about 225 per year planned in the APP. However, WSMR recently garnered additional funding to retrofit 152 poles in 2018.

### Alternative 2: Issue a 5-year (or longer) permit

Under Alternative 2, we would issue a permit for incidental take due to disturbance, authorizing the potential loss of the eagle breeding pair's productivity for at least a 5-year period (beginning in 2018) due to disturbance take caused directly by weapons test events. For a 5-year permit term, a maximum total loss if nest failure occurred every year would be  $0.7 * 5 = 3.5$  eagles to be offset by compensatory mitigation. There is much uncertainty regarding the physical impacts of advanced weapons tests to be conducted at the target site, e.g., the magnitude of concussive force, extent of shock waves, types and ballistics of blast debris, duration and intensity of noise. Predicting disturbance take due to weapons tests for a period of 5 or more years requires greater speculation regarding the physical impacts of weapons test events and the response of eagles to such impacts. Information on effects of various forms of disturbance on golden eagles and raptors in general is sparse (per review by the Service's Western Golden Eagle Team, document final draft, July 2017), making it more difficult to accurately determine potential disturbance impact at the target site. We recommended, and WSMR concurred, that a much shorter-term permit would be more appropriate in this instance because it would provide opportunity for increased knowledge on which to base a longer-term permit while not unduly burdening WSMR as the permit holder.

Based on the intensity and context of these effects and consideration of the elements associated with this alternative, Alternative 2 is not expected to result in significant adverse effects.

### Alternative 3: Issue a 1-year permit

Under this alternative, we would issue a permit for incidental take due to disturbance, authorizing loss of the eagle breeding pair's productivity in 2018, which would equal 0.6 eagles (detail is provided in Chapter 2: Alternatives). Disturbance take, if it occurred, would result directly from weapons test events. Based on a 1:1.2 offset ratio required under the take permit, the loss of 0.6 eagles would be offset by 0.7 eagles gained via compensatory mitigation action. There is much uncertainty regarding the physical impacts of advanced weapons tests at the target site, e.g., the magnitude of concussive force, extent of shock waves, types and ballistics of blast debris, duration and intensity of noise. A key goal of this permit, indirectly, is to increase the knowledge of these impacts and thus support a more robust, longer-term permit for disturbance take based on more complete information, if warranted. To assess responses of the breeding pair of eagles to weapons test events, permit conditions would include intensive monitoring of their nesting and movement behavior via satellite transmitters (PTTs) in addition to standard ground-based observation to assess productivity.

Based on the intensity and context of these effects and consideration of the elements associated with this alternative, Alternative 3 is not expected to result in significant adverse effects.

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## APPENDIX A

## POTENTIAL FOR TAKE OF GOLDEN EAGLES AT GRANITE SITE DUE TO INJURY OR MORTALITY

In its EA for the Granite Target Site, DTRA depicted a 500 meter surface danger zone for detonating a 10,000-pound weapon (WSMR 2016: Figure B-4). To estimate the probability that either member of the breeding pair of golden eagles would occur within 500 m (~0.3 miles) of the target site, we used a dataset that included all 1866 hourly, daytime (8 a.m. to 5 p.m) GPS locations collected via satellite telemetry from the SW Mockingbird breeding pair of golden eagles during 30 January-5 March (35 days) plus 1 April-30 June (91 days) 2017. In a GIS framework, 6.9% of these locations occurred within 500 m of the target site, although few were within the target site itself (analyzed by K. Kruse and R. Murphy, Service; Table 1). Not knowing what criteria were used to determine the safety buffers, we also examined eagle occurrence at greater distances (Table 1).

**Table A-1.** Percentage of total GPS locations of the golden eagle pair from Southwest Mockingbird breeding territory within several distances from the Granite Target Site at White Sands Missile Range, New Mexico during 2017. Percentages are presented for each pair member for early breeding season (30 January-5 March) and spring season (1 April-30 June). GPS locations ( $\pm 20$  m) were recorded hourly during 8 a.m. to 5 p.m. via satellite transmitters.

Distance (km) from target site	Breeding season		Spring season		Total (%)
	Male (359) <sup>a</sup>	Female (199)	Male (651)	Female (657)	
0 (within target site)	0	0	1	4	5 (0.3)
0.4	11	0	22	36	69 (3.7)
0.5	45	0	39	45	129 (6.9)
0.6	48	0	71	65	184 (9.9)
0.7	62	2	108	116	288 (15.4)

<sup>a</sup> Total number of daytime (8 a.m. to 5 p.m.) GPS locations in dataset.

Locations of both the female and male occurred less often near the target site during 30 January-5 March (Figure A-1a,c) when the pair was engaged in breeding activities, then during 1 April-30 June (Fig. A-1b,d), well after the pair's breeding attempt failed (due to unknown reasons during 6-13 March). If one weapons test event occurred at the target site during these 91 days, the likelihood that one of the eagles would be within 500 m of the target site at the same hour could be roughly estimated as conveyed below. Underlying assumptions are that (1) test event duration is 1 hour (probably overestimated); (2) potential impacts of a given test event on an eagle in flight do not differ from when the eagle is perched at the same horizontal location; and (3) one GPS location represents an eagle's location for 1 hour i.e., the percentage of hourly GPS locations within 0.5 km equals the percentage of total time:

total daytime hours:

$$91 \text{ days} * 9 \text{ hours per day} = 819 \text{ hours}$$

proportion of total daytime hours for one test event lasting 1 hour:

$$1/819 = 0.00122 \text{ (0.122\%)}$$

estimated proportion of hourly eagle GPS locations within 500 m of target site:

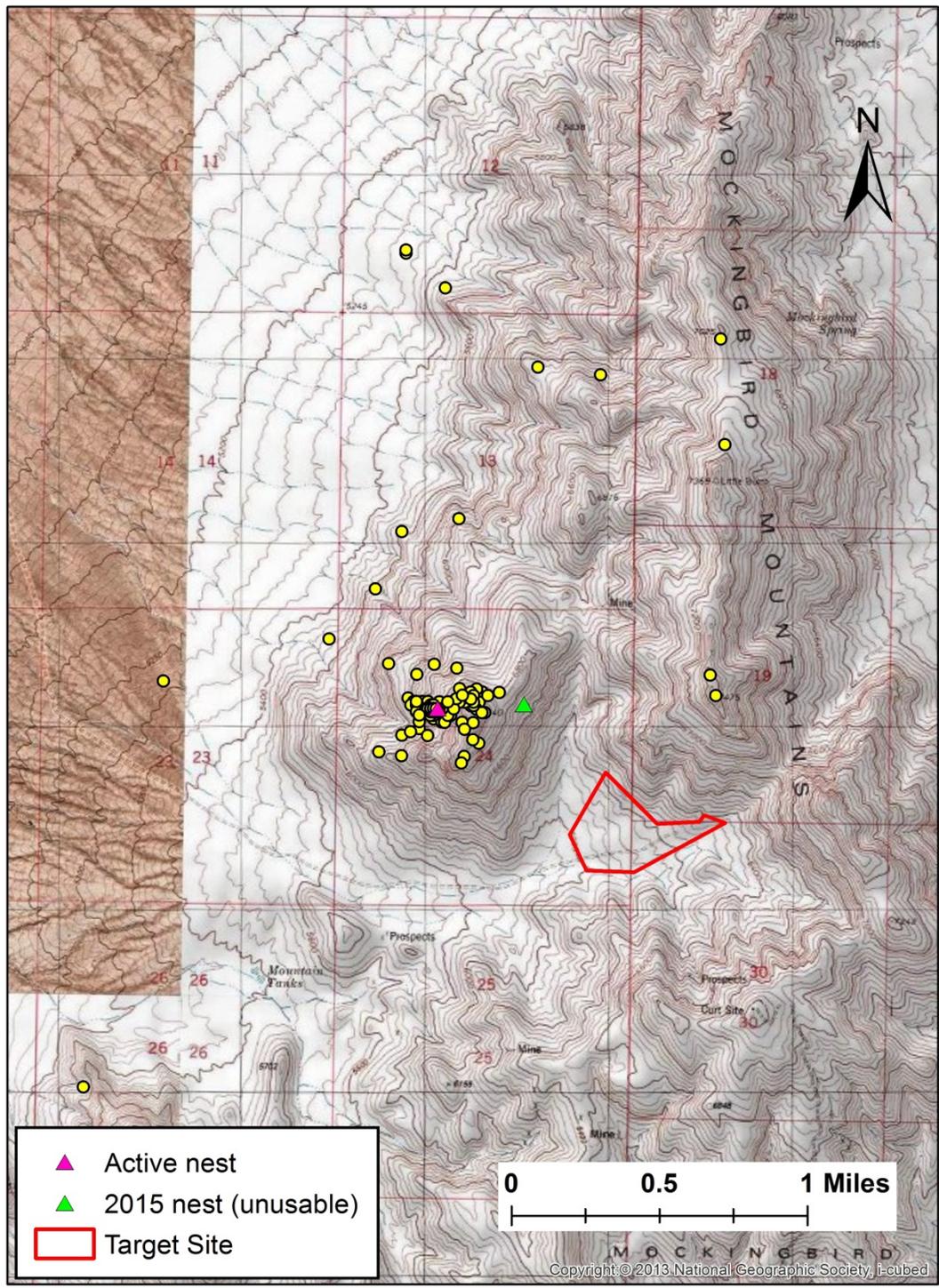
$$129/1866 = 0.0691 \text{ (6.9\%)}$$

estimated probability of eagle being within 0.5 km at time of test event:

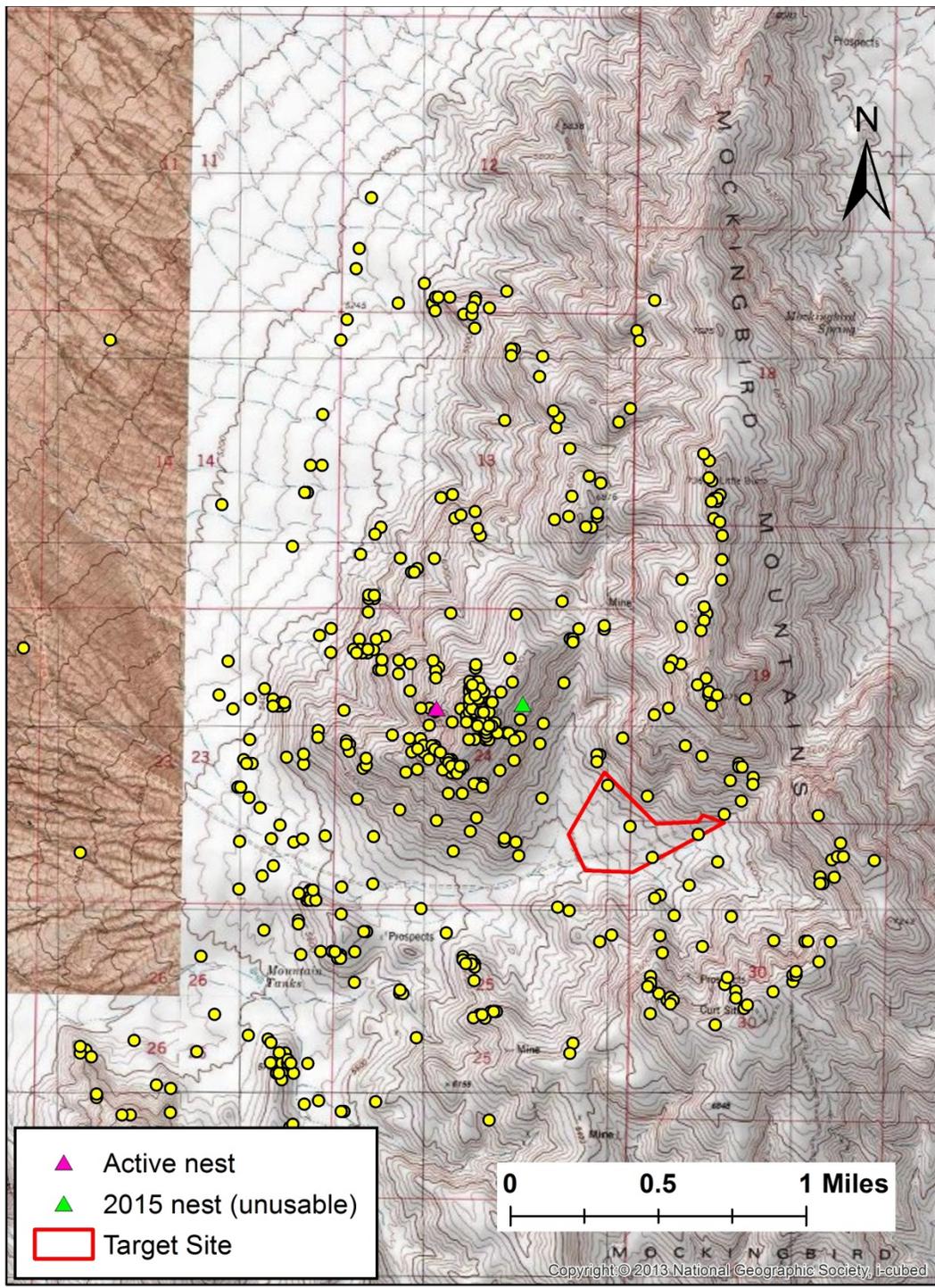
$$0.00122 * 0.069 = 0.00008 \text{ (rounded, 0.01\%)}$$

Thus, during 8 a.m. through 5 p.m., we estimate there is roughly a 0.01% chance that an eagle would be within 0.5 km of the target site during the same hour that a test event occurs. Spatial extent of physical impact of a given test event may be greater than 0.5 km from the target site, but information needed to predict the area of blast debris exposure and potentially lethal concussive force is unavailable at this time. This relationship would be better understood with improved information of the total area exposed directly to potentially lethal blast debris from tests and ballistic estimates of blast debris. More broadly speaking, knowledge gained from weapons testing during the 1-year permit period plus additional telemetry data should reduce uncertainty surrounding likelihood of direct injury or death of a golden eagle.

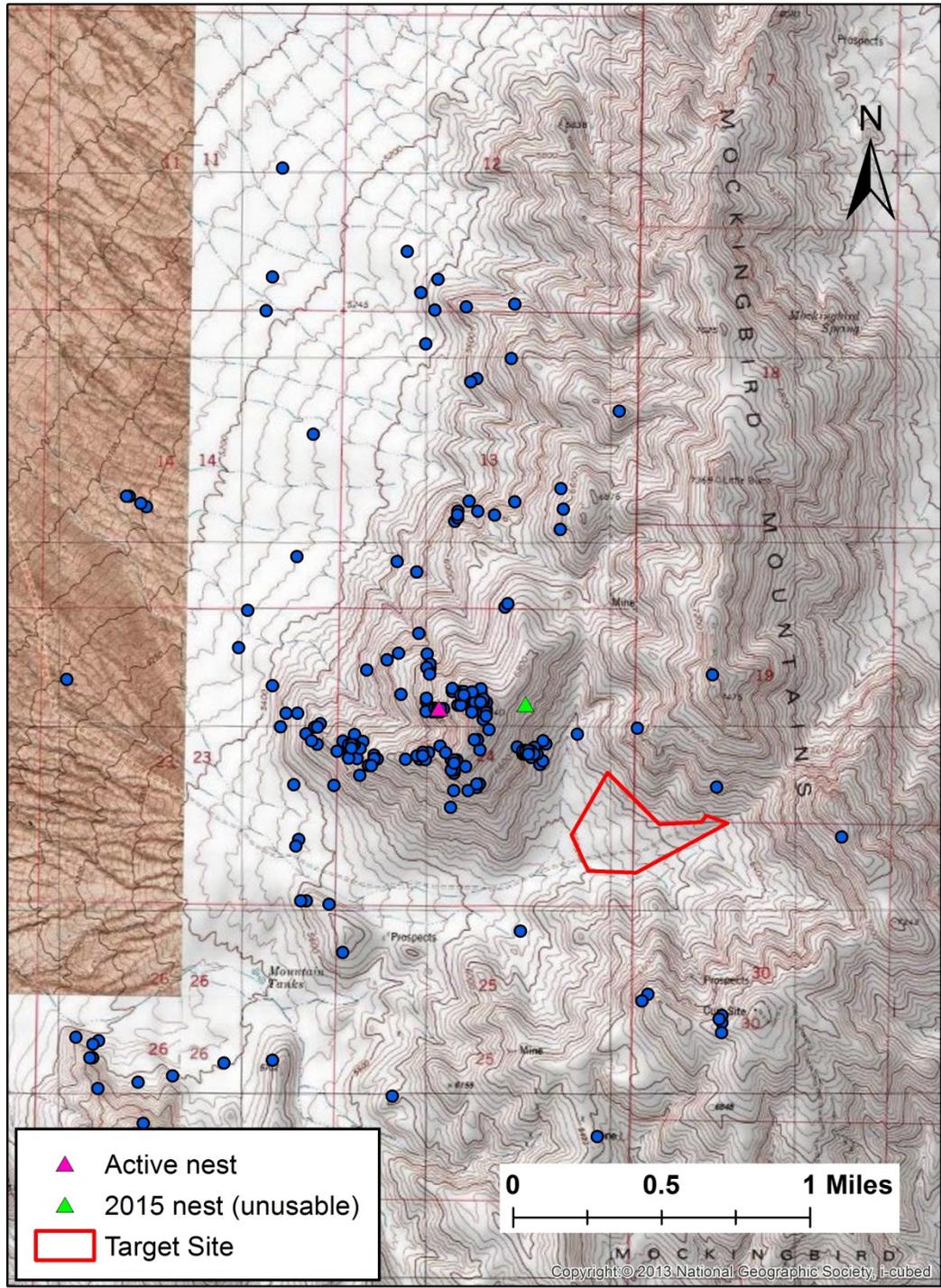
If tests occurred during the night, however, likelihood of an eagle being struck by blast debris from the target site is much greater. Based on a pooled dataset of GPS locations recorded at midnight during nesting season (30 January-5 March) and spring (30 April-30 June) 2017, the female and male roosted 178-500 meters from the target site about one-third and one-half of the time, respectively (Figure A-2). These roost locations were clustered on the east mountainside, overlooking the target site. They also were closer to the target site than the 2015 nest that was rendered unusable by WSMR as a measure to minimize disturbance to the breeding pair while nesting or avoid direct injury or death of the eagles, their eggs, or young due to blast debris or other physical impacts of a test event (WSMR 2017). If take of eagles due to injury or death seem possible at this location, then it is likely to occur at this cluster of roost sites.



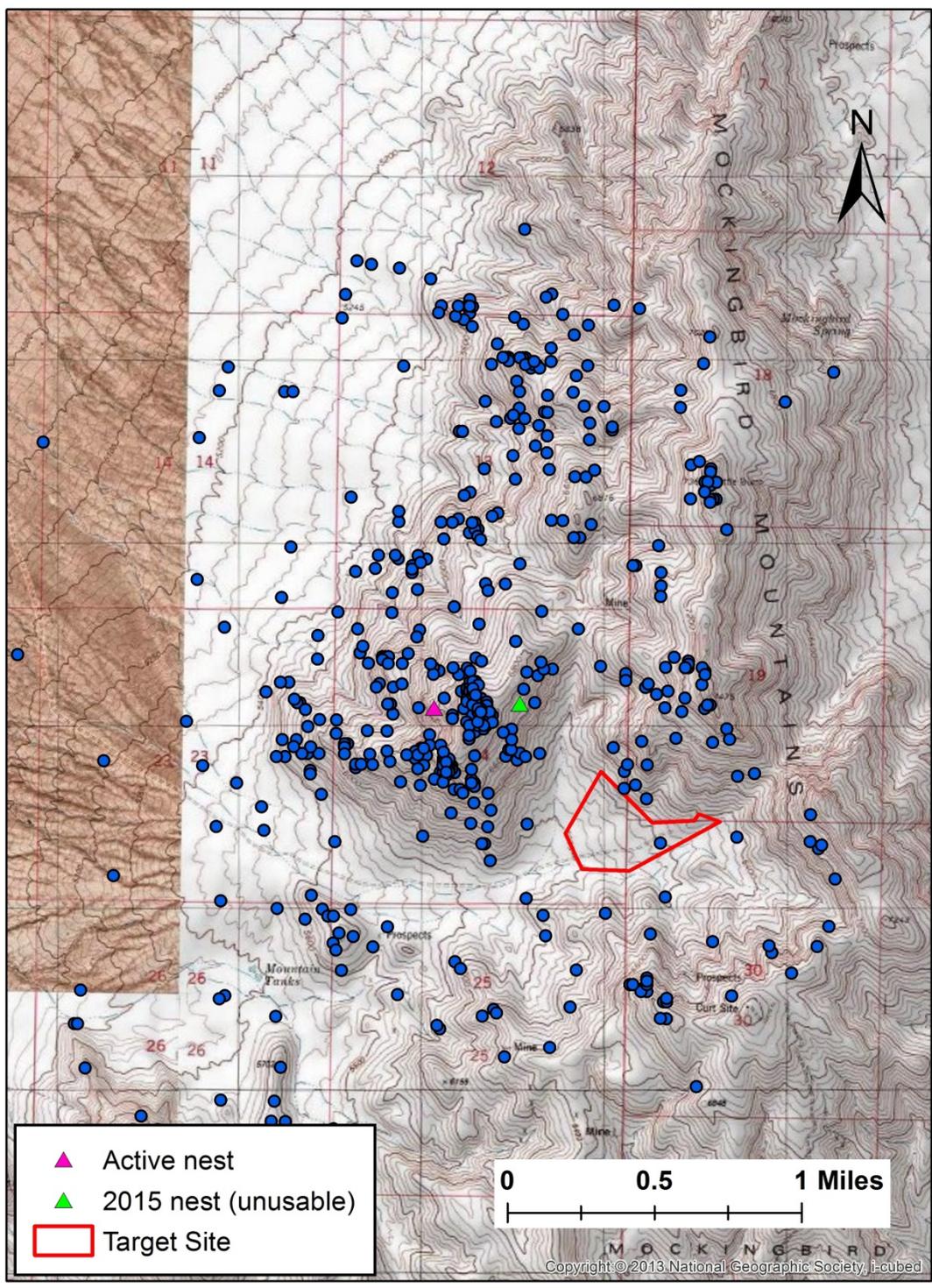
**Figure A-1a.** Daytime (8 a.m. to 5:00 p.m.) GPS locations ( $\pm 20$  m) of the female golden eagle (yellow dots) occupying the Southwest Mockingbird breeding territory on White Sands Missile Range, New Mexico, during early breeding season when the pair had an active nest (30 January-5 March) 2017, in relation to the Granite Target Site established for advanced weapons testing. Locations based on satellite telemetry (WSMR, unpublished data).



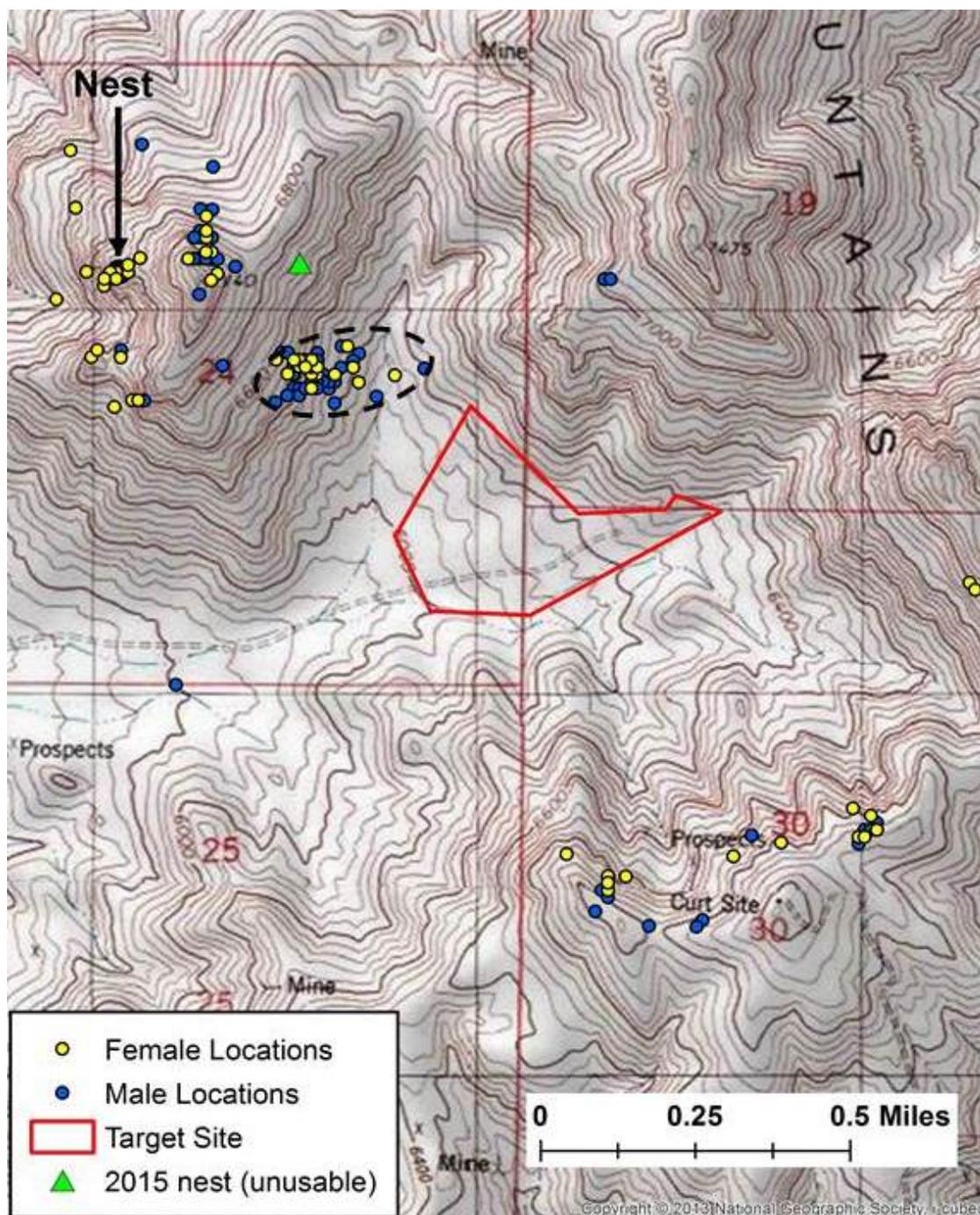
**Figure A-1b.** Daytime (8 a.m. to 5:00 p.m.) GPS locations ( $\pm 20$  m) of the female golden eagle (yellow dots) occupying the Southwest Mockingbird breeding territory on White Sands Missile Range, New Mexico, during spring after nest failure (April-June) 2017, in relation to the Granite Target Site established for advanced weapons testing. Locations were recorded via satellite telemetry (WSMR, unpublished data).



**Figure A-1c.** Daytime (8 a.m. to 5:00 p.m.) GPS locations ( $\pm 20$  m) of the male golden eagle (blue dots) occupying the Southwest Mockingbird breeding territory on White Sands Missile Range, New Mexico, during early breeding season when the pair had an active nest (30 January-5 March) 2017, in relation to the Granite Target Site established for advanced weapons testing. Locations based on satellite telemetry (WSMR, unpublished data).



**Figure A-1d.** Daytime (8 a.m. to 5:00 p.m.) GPS locations ( $\pm 20$  m) of the male golden eagle (blue dots) occupying the Southwest Mockingbird breeding territory on White Sands Missile Range, New Mexico, during spring after nest failure (April-June) 2017, in relation to the Granite Target Site established for advanced weapons testing. Locations are based on satellite telemetry (WSMR, unpublished data).



**Figure A-2.** Midnight GPS locations ( $\pm 20$  m) of the female and male golden eagle occupying the Southwest Mockingbird breeding territory on White Sands Missile Range, New Mexico, in relation to the Granite Target Site during 30 January-5 March and April-June 2017 (pooled dataset). Though not obvious in this figure, the female's locations from 30 January-5 March were heavily clustered at the nest site. GPS locations within the black dashed line, 178-500 m northwest of the target site, include 30 (30.3%;  $n = 99$ ) of the female's and 59 (54.6%;  $n = 108$ ) of the male's; some dots represent use of a given roost site on many nights. Locations are based on satellite telemetry (WSMR, unpublished data).

## APPENDIX B

### MONITORING GOLDEN EAGLE OCCUPANCY AND PRODUCTIVITY AT THE SOUTHWEST MOCKINGBIRD EAGLE BREEDING TERRITORY

#### **Satellite telemetry**

WSMR captured the SW Mockingbird territory's breeding pair of golden eagles in late January 2017 and fitted both birds with PTTs to document their movement behavior via telemetry. PTT attachment methods are detailed in Driscoll (2009). Each PTT unit (Argos-GPS model PTT-100-70, Microwave Telemetry, Inc., Columbia, Maryland USA), weighed about 80g, and was programmed to collect hourly GPS locations accurate to within 60 feet (~18 m) during 7 a.m through 7 p.m. plus midnight (roost location). The location data are available via download from the Argos satellite system (CLS America, Largo, Maryland USA) every 3 days. Each eagle also was banded with a numbered aluminum leg band from the U.S. Geological Survey's Bird Banding Laboratory. Location data from PTTs are being used mainly to (1) monitor year-round occupancy of the territory by both members of the breeding pair, (2) document seasonal distribution of use relative to the nest and target site, and (3) document immediate responses to human activity and weapons test events, as described below.

#### **Territory occupancy and productivity**

Occupancy of the SW Mockingbird territory by golden eagles in 2018 will be determined via satellite telemetry (see below) in addition to direct observation methods used in recent years to survey golden eagle nesting throughout WSMR (Juergens 2015, 2016). However, if one or both of the eagles' PTTs fail or is removed by or falls off the bird(s), ground-based observation should be conducted every 2-3 weeks during the breeding season to verify presence of both pair members. If a weapons test is conducted at the target site during this time, status of nesting should be documented via ground-based observation as soon as possible before and after such a test (ideally, the day before and day after). Productivity of the pair will be determined by using standard procedures for raptors (Steenhof and Newton 2007, Driscoll 2010), via ground-based visits at least every 4 weeks during the normal mid-incubation stage until young are nearly fledged (~7 weeks of age), or until it is confirmed that the pair is not successful in producing young.

#### **Movement behavior**

Location data from the eagle's PTTs will be used to determine whether, when, for how long, and to what spatial extent a member of the breeding pair shifts its distribution of use away from its normal use area following a weapons test event. Standard methods, e.g., kernel density estimates to describe spatial distribution of use (Worton 1989, Seaman and Powell 1996) may be used in these analyses. If abandonment seems apparent, biologists from WSMR and the Service will assess the weight of evidence especially whether abandonment may have affected productivity.

#### ***Data Privileges and Reporting***

Data collected during monitoring described in this document will be shared with the Service in the form of electronic files (spreadsheets, databases, map figures, GIS files, and associated metadata). PTT data will be made available to the USFWS as soon as they become available via download from the Argos system. A report including a description of results, concise data summaries (tables, figures as appropriate), and interpretation and discussion of the implications of results will be provided to the Service within 1 month of the end of the permit period.

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## APPENDIX C

### COMPENSATORY MITIGATION FOR DISTURBANCE TAKE OF THE SOUTHWEST MOCKINGBIRD BREEDING PAIR OF GOLDEN EAGLES

As indicated in 50 CFR § 22.3, “Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.” Weapons test events at the target site may disturb the SW Mockingbird breeding pair of golden eagles. Such disturbance could possibly cause one or both adults to temporarily or permanently abandon the breeding territory; temporary abandonment lasting as little as 1-2 days could result in reproductive failure if it occurs during incubation or when downy young need to be brooded or shaded. Permanent abandonment is less likely than temporary abandonment. If one or both of the breeding pair were to permanently abandon the SW Mockingbird territory, other breeding-age golden eagles likely would attempt to fill the territory vacancy, though such “replacement” eagles could also respond to weapons tests by later abandoning the territory.

The Service uses a Resource Equivalency Analysis (REA) to determine the extent of compensatory mitigation needed to offset incidental take of eagles if conservation measures do not eliminate potential for the take (USFWS 2013: Appendix G). Based on the REA approach, the Service has determined that weapons tests at the target site during the first year could result in the following take in terms of “Present-Value” (PV) bird-years:

- (1) Disturbance take at one golden eagle nest in 1 year = 0.59 golden eagles
- (2) Compensatory mitigation required based on offset ratio of 1:1.2 = 0.7 eagles
- (3) From the REA, take of 1 golden eagle in 1 year = 6 PV bird-years
- (4) 6 PV bird-years \* 0.7 golden eagles = 4.2 PV bird-years

From the REA, 4.2 PV bird-years ÷ 0.191 PV bird-years per pole retrofitted (including maintenance of the retrofits for 10 years) = **22 poles retrofitted**. This is additive in nature to the retrofits already scheduled as part of WSMR’s avian protection plan.

If no take of eagles is detected during the 1-year term of the permit, WSMR would be credited for compensatory mitigation completed and can use the credit for any subsequent permit from the Service for take of golden eagles on WSMR (Service 2016c). The Service prefers that compensatory mitigation required as a permit condition is completed before actions posing potential for take occur, though this often is not possible as is the case in the 1-year permit for disturbance take due to weapons tests at the target site. Therefore, a condition of the permit should be that 22 hazardous power poles will be retrofitted within 1 year of the end of the permit period (e.g., before 31 December 2019 if the permit period is 1 January 2018 through 31 December 2018). Retrofitting should be done within 109 miles of the target site, i.e., within bounds of the local area population of golden eagles, and would target poles with the most hazardous configurations in areas that appear most attractive to eagles, per guidelines in EDM International, Inc. (2015).

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