State Of California | The Resources Agency of California

Memorandum

Date: August 27, 2010
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To: Commissioner Jeffrey Byron, Presiding Member
Commissioner James D. Boyd, Associate Member

From: California Energy Commission – John Kessler, Project Manager
1516 Ninth Street
Sacramento, CA 95814-5512

Subject: **ENERGY COMMISSION STAFF'S TRANSMITTAL OF SUGGESTED EDITS TO THE PRESIDING MEMBER'S PROPOSED DECISION – SET 1 IVANPAH SOLAR ELECTRIC GENERATING SYSTEM (07-AFC-5)**

In response to the Notice of Availability of the Presiding Member's Proposed Decision (PMPD) and Notice of Committee Conference and Evidentiary Hearing for the Ivanpah Solar Electric Generating System, staff is providing Set 1 of suggested edits to the PMPD. Staff's comments are presented with strikeout showing suggested deleted text, underline showing suggested new text, and italics for any clarifying statements that help to put a particular comment in context. Staff's suggested edits are primarily for the following topics:

- Greenhouse Gas Emissions
- Air Quality
- Biological Resources
- Soil & Water
- Noise & Vibration
- Visual Resources
- Recreation

Staff's objectives in these PMPD comments are to provide the Committee opportunity to consider the following:

1. Clarification of Staff Testimony - Provide edits to the PMPD to accurately capture staff's testimony to which the Committee has made reference;
2. Updates Related to BLM's Final Environmental Impact Statement (FEIS) - Provide information for the Committee to consider related to BLM's FEIS and staff's updated testimony in support of BLM; and
3. Updates in Wildlife Agency Guidance – Provide the most current Renewable Energy Action Team (REAT) Guidance for Desert Tortoise mitigation and relocation/translocation, as well as new guidance from the USFWS for their Regional Raven Management Program.

Staff's suggested edits to Conditions of Certification are associated with the following:

1. The most current wildlife habitat compensation guidance from agencies represented by the Renewable Energy Action Team; Staff previously filed its Transmittal of Updated Renewable Energy Action Team Agency Guidance for

PROOF OF SERVICE (REVISED 11/3/10) FILED WITH
ORIGINAL MAILED FROM SACRAMENTO ON 8/30/10
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Mitigation Cost Estimates and Desert Tortoise Translocation on July 30, 2010 (Previously filed as Exhibit 316);

2. Energy Commission Staff's Compilation of Edits to Recommended Conditions of Certification dated March 29, 2010 ; These represent previously agreed-to edits to Conditions of Certification between staff and applicant.(Previously filed as Exhibit 317);
3. *USFWS' Environmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise, March 2008* (Attachment 1, consisting of Summary – 3 pages and EA – 156 pages); Staff has proposed the addition of a Regional Raven Management Program fee to Condition of Certification **BIO-12** (Raven Management Plan). This assures consistency with the USFWS' comprehensive, regional raven management and monitoring program in the California Desert Conservation Area established to address the regional, significant threat that increased numbers of common ravens pose to desert tortoise recovery efforts.
4. *USFWS' Cost Allocation Methodology for Implementation of the Regional Raven Management Plan, dated July 9, 2010* (Attachment 2); This document provides an explanation of the cost allocation methodology for the Regional Raven Management Program.
5. Updates to Condition of Certification **BIO-17** (Desert Tortoise Compensatory Mitigation) to clarify the order and timing of verification of the measures described in the condition and to better describe the required Security for compensation; and
6. Consideration of staff's testimony in the Recreation section of the FSA-DEIS, including whether the project conforms with §25529 of the Warren-Alquist Act pertaining to establishment of a Public Use Area. If the Committee agrees, staff would recommend that Condition of Certification **REC-1** be included in the PMPD. An updated version of **REC-1** is included herein.

Also for the Committee's reference, staff is providing the following documents:

1. U.S. Fish and Wildlife Service (USFWS) *Translocation of Desert Tortoises (Mojave Population) From Project Sites (Plan Development Guidance)*, August 2010 (Attachment 3); USFWS is currently revising the Ivanpah draft BO according to this most recent update to its guidance for desert tortoise translocation.
2. USFWS *Preparing for Any Action That May Occur Within the Range of the Mojave Desert Tortoise* (*Gopherus agassizii*): *2010 Field Season*. This describes the methods used in the BO to calculate desert tortoise densities and methods for site assessment and the pre-project field survey protocol for potential desert tortoise habitats (Attachment 4).
3. Explanation from the applicant's botanical experts explaining the misidentification of *small-flowered androstephium*, a special-status plant species described as occurring at the project site in the FSA/DEIS, but does not actually occur there (Previously filed as Applicant's Exhibit 91)
4. USFWS Draft Biological Opinion (BO) on BrightSource Ivanpah Solar Electric Generating System, San Bernardino County, California, (CACA-48668, 49502, 49503, 49504) (8-8-10-F-24) which was submitted to the BLM in April 2010;

Please note that the April 26, 2009 date on the transmittal for this document is an error, it should be 2010; This April 2010 draft of the BO includes a discussion about densities of desert tortoise at the project site. (Attachment 5)

5. BLM's California Desert Conservation Area Plan Amendment/Final Environmental Impact Statement (FEIS) for Ivanpah Solar Electric Generating System, FEIS-10-31 (Exhibit 318) as found at http://www.blm.gov/ca/st/en/fo/needles/nefo_nepa.html

Staff also wishes to inform the Committee and parties that it intends to file subsequent comments to the PMPD at the earliest opportunity, but no later than September 2, 2010, the end of the PMPD comment period, pertaining to the following:

1. Desert Tortoise Relocation/Translocation – During the August 24, 2010 Committee Conference and Evidentiary Hearing, staff reported that there were two options being considered by the REAT agencies for desert tortoise relocation and translocation. These consist of either moving all tortoises west and north of the ISEGS on adjacent BLM land or moving some tortoises to adjacent land and some to the Mojave National Preserve. Following the hearing, staff received information from National Park Service that they were not able to overcome the hurdles required to allow for the translocation into the Mojave National Preserve. Staff will continue working with the REAT agencies to determine if there are any updates necessary for the Energy Commission's record in the Ivanpah proceeding related to tortoise relocation/translocation to meet the latest USFWS guidelines, and if so, will file this information with the Committee and parties at the earliest opportunity.

2. Possible Phasing of Biological Resources Compensatory Mitigation Security – The REAT agencies are developing guidance related to options for applicant's of renewable energy projects to phase their payments of the Biological Resources Compensatory Mitigation Security. Rather than paying the entire security initially for all project phases, this guidance could allow payments to occur commensurate with, and prior to initiating construction of distinct phases of a project. Initiating construction would be considered to occur if the activity would cause ground, habitat or species disturbance. If the REAT agencies determine that Brightsource is eligible for phased payments, staff will file recommended updates to its Conditions of Certification.

Docket (07-AFC-5)
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V. PUBLIC HEALTH AND SAFETY

A. GREENHOUSE GAS (GHG) EMISSIONS

The majority of staff's recommended edits correct typographical errors, incorporate current language on compliance with SB 1368 and provide clarifying language. Where appropriate, background information is provided in Comments immediately preceding the text with the recommended changes.

GHG Page1

1. INTRODUCTION AND SUMMARY

The generation of electricity using fossil fuels, even in auxiliary equipment (such as auxiliary boilers or back-up generators) ~~a back-up generator~~ at a thermal solar plant, ~~(such as auxiliary boilers or back-up generators)~~ produces ~~air emissions known as~~ greenhouse gases in addition to the criteria air pollutants that have been traditionally regulated under the federal and state Clean Air Acts. California is actively pursuing policies to reduce GHG emissions; among them is a policy to add ~~that include adding~~ non-GHG emitting renewable generation resources to the system.

GHG Page 2

- Whether ISEGS GHG construction and operation emissions ~~will~~ would have significant impacts;
- Whether ISEGS operation ~~will~~ would be consistent with the state's GHG policies and would ~~will~~ help achieve the state's GHG goals by causing a decrease in overall electricity system GHG emissions.

GHG Page 3

c. Emissions Performance Standard

Senate Bill (SB) 1368 of 2006, and regulations adopted by the Energy Commission and the Public Utilities Commission pursuant to the bill, prohibit utilities from entering into long-term commitments with any base load facilities that exceed an Emission Performance Standard (EPS) of 0.500 metric tonnes of CO_2 per megawatt-hour (this is the equivalent of 1100 pounds of CO_2/MWh). (Pub. Util. Code, § 8340 et seq.; Cal. Code Regs., tit. 20, § 2900 et seq.; CPUC D0701039.) Currently, the EPS is the only LORS that has the effect of limiting power plant GHG emissions. The ISEGS is a solar project with a nightly shutdown so it will operate at less than a 60 percent capacity factor. It therefore is not subject to the requirements of SB 1368 (Chapter 11, Greenhouse Gases Emissions Performance Standard, Article 1, Section 2903 [b][1]), which exempts facilities operating at less than a 60 percent capacity factor. Nonetheless, the ISEGS, at 0.029 $MTCO_2e$ /MWh, would easily meet the Greenhouse Gas Emission Performance Standard required by SB 1368, which is 0.5 MTCO2e/MWh. ~~ISEGS is exempt from SB 1368 because it would operate at or below a 60 percent capacity factor.~~

GHG Page 5

There is no adopted, enforceable federal or state LORS applicable to ISEGS construction emissions of GHG. ~~Nor is there a quantitative threshold over which GHG emissions are considered "significant" under CEQA.~~ Nevertheless, there is guidance from regulatory agencies on how the significance of such emissions should be assessed. For example, the most recent guidance from CARB staff recommends a "best practices" threshold for construction emissions. [CARB, Preliminary Draft Staff Proposal, Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the California Environmental Quality Act (Oct. 24, 2008), p. 9]. Such an approach is also recommended on an interim basis, or proposed, by major local air districts.

GHG Page 6

Comment - Mirror cleaning and vegetation removal are maintenance activities for the heliostat field not the power block. The boilers are permitted to run up to four (4) hours per day. The revised estimates for GHG emissions were presented in the Final Staff Assessment Addendum (Ex. 315, p 4-25) and are based on the reduced scope of ISEGS as presented by the applicant in the Biological Mitigation Proposal ("Mitigated Ivanpah 3") (Ex. 88).

4. DIRECT/INDIRECT OPERATION IMPACTS AND MITIGATION

a. Anticipated Emissions

For this solar project the primary fuel, solar energy, is greenhouse gas free, but there is a natural gas-fired steam boiler for each of the three plants. The proposed ISEGS project would cause GHG emissions from heliostat field ~~power block~~ maintenance activities, including mirror cleaning and vegetation removal, weekly testing of the emergency generator and firewater pump, daily ~~one hour per day of~~ operation of each boiler, and employee trips. (Ex. 200, p. 6.1-64) Operations GHG emissions are shown in **Greenhouse Gas Table 2**. All emissions are converted to CO_2-equivalent and totaled.

Greenhouse Gas Table 2
Estimated ISEGS Potential Operating Greenhouse Gas Emissions

	CO_2-equivalent (MTCO$_2$e [a] per year)
Boilers	~~25,458~~ 23,549
Emergency Generator Engines	~~346~~ 260
Fire Pump Engine	15
Maintenance Vehicles	~~474~~ 385
Worker Vehicles	1118
Delivery and Waste Haul Vehicles	22
Equipment Leakage (SF_6)	10
Total Project GHG Emissions – MTCO$_2$e [b]	**~~27,444~~ 25,359**
Facility MWh per year [c]	~~960,000~~ **888,000**
Facility GHG Performance (MTCO$_2$e /MWh)	0.029

Source: Ex. ~~200, p. 6.1-65, Greenhouse Gas Table 3~~ 315, p. 4-25, Addendum Greenhouse Gas Table 1
[a] One metric tonne (MT) equals 1.1 short tons or 2,204.6 pounds or 1,000 kilograms.
[b] The vast majority of the CO2E emissions, over 99 percent, are CO_2 from these emission sources.
[c] Approximately a 28 percent capacity factor. BSE2007a.

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The proposed project would be permitted, on an annual basis, to emit over ~~27,000~~ 25,000 metric tonnes of CO_2-equivalent per year if operated at its maximum permitted level. The ISEGS is a solar project with a nightly shutdown so it will operate at less than a 60 percent capacity factor. It therefore is not subject to the requirements of SB 1368 (Chapter 11, Greenhouse Gases Emissions Performance Standard, Article 1, Section 2903 [b][1]), which exempts facilities operating at less than a 60 percent capacity factor. ~~ISEGS is a solar project with a nightly shutdown so it will operate less than 60 percent of capacity; therefore, the project is not subject to the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard.~~ Nonetheless, the ISEGS, at 0.029 MTCO$_2$e /MWh, would easily meet the Greenhouse Gas Emission Performance Standard required by SB 1368, which is 0.5 MTCO2e/MWh. ~~both.~~

GHG Page 8

Comment - Please remove the negative sign from the last cell in the table. It currently reads as a double negative.

Greenhouse Gas Table 3
Estimated Changes in Non-Renewable Energy Potentially Needed to Meet California Loads, 2008-2020

California Electricity Supply	***Annual GWh***	
Statewide Retail Sales, 2008, estimated [a]	265,185	
Statewide Retail Sales, 2020, forecast [a]	308,070	
Growth in Retail Sales, 2008-20	42,885	
Growth in Net Energy for Load [b]	46,316	
California Renewable Electricity	**GWh @ 20% RPS**	**GWh @ 33% RPS**
Renewable Energy Requirements, 2020 [c]	61,614	101,663
Current Renewable Energy, 2008	29,174	
Change in Renewable Energy-2008 to 2020 [c]	32,440	72,489
Resulting Change in Non-Renewable Energy [d]	13,876	(-36,173)

Source: Ex. 200, p. 6.1-67, Greenhouse Gas Table 4
Notes:
a. Not including 8 percent transmission and distribution losses.
b. Based on 8 percent transmission and distribution losses, or 42,885 GWh x 1.08 = 46,316 GWh.
c. Renewable standards are calculated on retail sales and not on total generation, which accounts for 8 percent transmission and distribution losses.
d. Based on net energy (including 8 percent transmission and distribution losses), not based on retail sales

GHG Page 12

Net GHG emissions for the integrated electric system will decline when new renewable power plants are added to: 1) increase~~s~~ renewable generation towards the 33 percent target; 2) improve the overall efficiency and thus reduce the GHG emission rate of the electric system; or 3) serve load growth or capacity needs more efficiently and produce fewer GHG emissions. We find that ISEGS furthers the state's progress toward achieving these important goals and is consistent with the state policies we discussed in Section 2 of this chapter.

GHG Page 13

Eventually the facility would ~~will~~ close, either at the end of its useful life or due to some unexpected situation such as a natural disaster or catastrophic facility breakdown.

When the facility closes, all sources of air emissions would cease to operate and thus impacts associated with those greenhouse gas emissions would no longer occur. The only other expected GHG emissions would be temporary equipment exhaust (off-road and on-road) from the dismantling activities. These activities would be of much a shorter duration than construction of the project, the equipment is assumed to have lower comparative GHG emissions due to technology advancement, and would be required to be controlled in a manner at least equivalent to that required during construction. Therefore, we find that while there ~~will~~would be a temporary CEQA impact due to GHG emissions during decommissioning, it ~~will~~would be less than significant.

GHG Pages 13 and 14

FINDINGS OF FACT

1. The GHG emissions from the ISEGS project construction are estimated ~~likely~~ to be 17,779 $MTCO_2e$ during the 4-year construction period, which is the annual equivalent of 4,445 $MTCO_2e$.

2. The construction GHG emissions would be minimal in comparison to the GHG emission reductions that the project would create in its lifetime. ~~There is no numerical threshold of significance under CEQA for construction-related GHG emissions.~~

3. ISEGS would ~~will~~ use best practices to control its construction-related GHG emissions.

4. Construction-related GHG emissions would be ~~are~~ less than significant if they are controlled with best practices.

8. The maximum annual CO_2 emissions from ISEGS operation would ~~will~~ be ~~27,444~~ 25,359 $MTCO_2e$, which constitutes an emissions performance factor of 0.029 $MTCO_2e$ / MWh.

9. The ISEGS is a solar project that would operate at less than a 60 percent capacity factor, and therefore is not subject to the requirements of the SB 1368 Emissions Performance Standard which exempts facilities operating at less than a 60 percent capacity factor. Nonetheless, the ISEGS would easily meet the Greenhouse Gas Emission Performance Standard required by SB 1368. ~~The SB 1368 EPS is not applicable to ISEGS GHG emissions because the project will be shut down nightly and will operate at or below a 60 percent capacity factor.~~

14. There is no evidence in the record that construction or operation of ISEGS would ~~will~~ be inconsistent with the loading order.

15. ISEGS would ~~will~~ displace generation from ~~less-efficient (i.e., higher-heat-rate and therefore~~ higher-GHG-emitting~~)~~ power plants.

16. ISEGS would ~~will~~ replace power from coal-fired power plants that will be unable to enter into new contracts or renew contracts with California utilities under the SB 1368 EPS, and from once-through cooling power plants that must reduce their use of coastal or estuarine water.

17. ISEGS operation would ~~will~~ reduce overall GHG emissions from the electricity system.

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CONCLUSIONS OF LAW

1. ISEGS construction-related GHG emissions would ~~will~~ not cause a significant adverse environmental impact.

~~2. The GHG emissions from a power plant's operation should be assessed in the context of the operation of the entire electricity system of which the plant is an integrated part.~~ (*redundant with #7 below*)

~~3~~2. ISEGS operational GHG emissions would~~will~~ not cause a significant environmental impact.

~~4~~3. The ISEGS is a solar project with a nightly shutdown so it will operate at less than a 60 percent capacity factor. It therefore is not subject to the requirements of SB 1368 (Chapter 11, Greenhouse Gases Emissions Performance Standard, Article 1, Section 2903 [b][1]), which exempts facilities operating at less than a 60 percent capacity factor. Nonetheless, the ISEGS, at 0.029 MTCO$_2$e /MWh, would easily meet the Greenhouse Gas Emission Performance Standard required by SB 1368, which is 0.5 MTCO2e/MWh. ~~The SB 1368 EPS does not apply to ISEGS, but if it did, ISEGS GHG emissions will not exceed the EPS limit.~~

~~5~~4. ISEGS operation would ~~will~~ help California utilities meet their RPS obligations.

~~6~~5. ISEGS operation would ~~will~~ be consistent with California's loading order for power supplies.

~~7~~6. ISEGS operation would ~~will~~ foster the achievement of the GHG goals of AB 32 and Gubernatorial Executive Order S-3-05.

~~8~~7. The GHG emissions of any power plant must be assessed within the context of the operation of the entire electricity system on a case-by-case basis to ensure that the project would ~~will~~ be consistent with applicable ~~the~~ goals and policies. ~~enunciated above.~~

~~9~~8. Any new power plant that we certify must:

a) not increase the overall system heat rate;

b) not interfere with generation from existing renewables or with the integration of new renewable generation; and

c) have the ability to reduce system-wide GHG emissions.

B. AIR QUALITY

The majority of staff's recommended edits to the Air Quality section of the PMPD for the ISEGS are changes to correct typographical errors, incorporate the latest information from the Supplemental Staff Analysis and to provide clarifying language. Where appropriate, background information is provided in Comments immediately preceding the text with the recommended changes.

Air Quality Page 5, Paragraph 3

The emissions estimates in Air Quality Table 3 incorporate the fugitive dust control measures contained in Condition **AQ-SC3**. Staff evaluated the~~se~~ applicant's original emission estimates and deemed them reasonable, with the caveat that ~~that~~ the fugitive dust emissions ~~estimate~~ may have been ~~be~~ underestimated. Notably, ~~S~~staff determined that aggressive mitigation would be ~~is~~ necessary to ensure that the PM10 annual emissions during construction would not be greater than 100 tons per year and exceed General Conformity applicability thresholds thereby triggering a formal conformity determination under the federal Clean Air Act General Conformity Rule. (Ex. 300, pp. 6.1-13, 6.1-22.) As a result, we have adopted Conditions of Certification **AQ-SC1** through **AQ-SC 5** to mitigate the potentially significant impacts and ensure compliance with the General Conformity Rule.

Air Quality Pages 8 and 9

The emissions estimates in **Air Quality Table 5** incorporate the fugitive dust control measures contained in Condition **AQ-SC7**. Staff evaluated the~~se~~ applicant's original emission estimates and determined that that the fugitive dust emissions ~~estimate~~ may have been ~~be~~ underestimated. As with the construction-related emissions, s~~S~~taff determined that aggressive mitigation would be ~~is~~ necessary to ensure that the PM10 annual emission during operation would not be greater than 100 tons per year and would not exceed General Conformity applicability thresholds thereby triggering a formal conformity determination under the federal Clean Air Act General Conformity Rule. Staff also determined that there is ~~also~~ potential for localized exceedances of the federal PM10 AAQS. As a result, we have adopted Conditions of Certification **AQ-SC6** through **AQ-SC10** to mitigate the potentially significant impacts and ensure compliance with the General Conformity Rule. (Ex. 300, pp. 6.1-14 through 6.1-15, 6.1-22 through

6.1-24, 6.1-38.) Staff also considered the loss of soil crusts due to disturbance of the ISEGS site, physical or biotic, during the evaluation of potential project fugitive dust impacts. This potential loss is a major factor in the staff's recommendation to use soil binders both during construction and operation (Conditions of Certification **AQ-SC3** and **AQ-SC7** which we adopt) that will mitigate the loss of dust control from the disturbance of the natural soil crusts.

Air Quality Page 9, Paragraph 3

The Applicant also provided a modeling analysis to estimate the impacts of the project's NOx, PM10, CO, and SOx emissions[1] resulting from project operation. **Air Quality Table 6** presents the results of the Applicant's modeling analysis, which indicates that with the exception of 24-hour PM10 impacts, the project operation would not create new exceedances or contribute to existing exceedances for any of the modeled air pollutants.

Air Quality Page 10

Comment - The revised 1-hour NO_2 estimates were presented in the Final Staff Assessment Addendum (Ex. 315, p 4-6) and are based on information provided by the applicant on the reduced scope of ISEGS as presented in the Biological Mitigation Proposal ("Mitigated Ivanpah 3") (Ex. 88).

Air Quality Table 6
Project Operation Emissions Impacts

Pollutants	Avg. Period	Impacts ($\mu g/m^3$)	Background [a] ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Standard ($\mu g/m^3$)	Percent of Standard
NO_2	1-hr	~~150.4~~ 153.4	73.3	~~223.4~~ 226.4	339	~~66%~~ 67%
	Annual	0.1	7.3	7.4	57	13%
PM10	24-hr	3.3	96	99.3	50	199%
	Annual	0.5	12.7	13.2	20	66%
PM2.5 [c]	24-hr [b]	0.2	12.9	13.1	35	37%
	Annual	0.0	4.5	4.5	12	38%
CO	1-hr	321	4,025	4,346	23,000	19%
	8-hr	55	1,367	1,422	10,000	14%
SO_2	1-hr	3.9	94.3	98.2	665	15%
	24-hr [b]	0.1	13.1	13.2	105	13%
	Annual	0.0	2.7	2.7	80	3%

Source: CH2ML 2008h; Ex. 88, p 3-2.

Staff evaluated the Applicant's results and again, as with Staff's evaluation of construction emission impacts, determined that the operating NOx, VOC, and PM emissions are potentially CEQA significant and require mitigation. The modeling analysis shows that with implementation of the recommended ~~fugitive dust~~ mitigation measures contained in Conditions of Certification **AQ-SC6** and **AQ-SC7**, ISEGS operation is not predicted to cause significant violations of the federal AAQS or cause significant NEPA and CEQA impacts. (Ex. 300, p. 6.1-23 through 6.1-24.)

Air Quality Pages 10-11

Comment: To support the applicant's request to convert the District's annual limit on operating hours to an annual limit on fuel consumption, the applicant completed air quality modeling analysis for annual boiler operation above that which would be allowed by AQ-SC10.

Additionally, implementation of Conditions of Certification **AQ-SC8** through **AQ-SC10** will further ensure that potential impacts are insignificant. Condition **AQ-SC8** will ensure that the license is amended as necessary to incorporate changes to the air quality permits. Condition **AQ-SC9** requires new engines to meet model year EPA/ARB Tier emission standards for the year purchased. Condition ~~AQ~~**AQ-SC10** would~~will ensure that the boiler operation does not exceed the amount that was modeled in the Applicant's air quality modeling analysis and to~~ formalize the Applicant's assertion in the Application for Certification that "[h]eat input from natural gas will not exceed 5 percent of the heat input from the sun, on an annual basis." (Exs. 1, p. 5.1-1, 300, pp. 6.1-28, 6.1-39.)

Air Quality Pages 12-13

There are, however, several proposed projects near the project site including several other renewable energy facilities (solar and wind), an airport, a high speed train, a new commercial/residential development in Jean, Nevada, and other long-term projects with minimal air quality impacts, and temporary projects with no long-term air quality impacts. Staff determined that in general, most of these projects would create minimal long-term emissions, but construction emissions of the other renewable energy facilities, the airport, and the large development in Jean, Nevada, will likely have high temporary emissions from construction vehicles and fugitive dust. Staff further determined that in the long-term, several of the developments should cause beneficial impacts such as the

[1] The Applicant's modeling analysis uses assumptions that are somewhat different than those presented by **Air Quality Table 7** in Staff's Final Staff Assessment. These differences in the analyses do not change Staff's overall modeling analysis impact findings. (Ex. 300, p. 6.1-23.)

high-speed train reducing traffic emissions on I-15, and the renewable energy projects reducing emissions within the area of the Western Electricity Coordinating Council.

Air Quality Page 13

Staff has assisted BLM in preparing a FEIS response to National Park Service' concern that the air quality analysis does not evaluate the air quality impacts to the Mojave National Preserve with respect to visibility and nitrogen deposition. Staff offers the following should the Committee wish to address the comments in the PMPD.

7. Public and Agency Comments

National Park Service (NPS) expressed concern that the air quality analysis does not evaluate the air quality impacts to the Mojave National Preserve with respect to visibility and nitrogen deposition. NPS contends that fugitive dust emissions and primary pollutant emissions from construction equipment and point sources have the potential to impact visibility at the park. NPS stated that recent studies evaluating the effects of nitrogen deposition in both Mojave National Preserve and nearby Joshua Tree National Park indicate that nitrogen deposition may be causing negative effects to these ecosystems. There are a number of reasons why visibility and deposition modeling was not performed for the analysis of project impacts, including the following:

- The project is a minor source and does not trigger Prevention of Significant Deterioration (PSD) permitting and associated visibility modeling analysis requirements, and there are no other regulatory requirements to perform visibility modeling.
- Even if the project were a major source triggering PSD permitting, there are no Class 1 Areas located within 100 km of the site; the Mojave National Preserve is not a listed Class 1 Area and thus does not trigger visibility modeling.
- The facility's maximum permitted stationary source emissions of NOx, PM, and SOx are less than 12, 6 and 2 tons per year; the predominate wind patterns in the site area are directly away from the Mojave National Preserve; and the maximum project impacts all occur well east and outside of the portion of the Clark Mountain portion of the Preserve and north of the project site, well away from the main portion of the Preserve.

When considered together, it is reasonable to conclude that the Mojave National Preserve will not be significantly impacted from the ISEGS project. (FEIS p. A.1-90)

~~No public or agency comments were received. However,~~ Intervenor Basin Range and Watch asked about the source and quantity of water for dust control during operation and construction and recommended that this information should be provided. Staff responded that the source of water for dust control during plant construction and operation is assumed to be the same on-site ground water wells used for other plant water needs. Staff further explained that ~~the~~ even though the Applicant estimated 128 acre-feet of use during the 15 months of initial grading for the three project phases based on a 5 day per week construction schedule and 5 months of initial grading per construction phase, the Applicant did not provide estimates of water use for dust control during the rest of the construction period or for ongoing operations. Staff advised Basin and Range Watch that Staff modified recommended Conditions of Certification **AQ-SC3** and **AQ-SC7** to both increase dust control efficiency and minimize water use through the required use of polymeric dust suppressants on the site's unpaved roads and other disturbed surfaces to create and maintain stabilized surfaces during project construction and operation. We have adopted those conditions are recommended. (Ex. 300, pp. 6.1-37 – 6.1-38.)

Air Quality Page 14

FINDINGS AND CONCLUSIONS

2. The ISEGS project area is designated as moderate nonattainment for the state ozone standard, attainment for federal ozone standards, nonattainment for both the state and federal PM10 standards, and attainment ~~of~~ or unclassified for the state and federal CO_2, NO_2, SO_2, and PM2.5 standards.

3. The project would ~~will~~ not cause new violations of any NO_2, SO_2, PM2.5, or CO ambient air quality standards. Therefore, the NO_x, SO_x, PM2.5, and CO emission impacts are not significant.

4. The project's NO_x and VOC emissions can contribute to the existing violations of the ozone standards. However, the required mitigation would ~~will~~ reduce the project's impacts to a level that is less than significant.

5. The project's PM10 emissions can contribute to the existing violations of the state 24-hour PM10 air quality standard during construction and operation. However, the required mitigation would ~~will~~ reduce the project's impacts to a level that is less than significant.

6. The Mojave Desert Air Quality Management District issued a Final Determination of Compliance (FDOC) finding that ISEGS would ~~will~~ comply with all applicable District rules and regulations for project operation. The District's FDOC conditions are included herein as Conditions of Certification **AQ-1** through **AQ-31**.

8. Implementation of the Conditions of Certification listed below ensures that the ISEGS would ~~will~~ not result in any significant direct, indirect, or cumulative adverse impacts to air quality.

(PMPD Air Quality - Page 15)

CONCLUSION OF LAW

1. The Commission therefore concludes that the mitigation measures imposed are sufficient to ensure that ISEGS would ~~will~~ conform with all applicable laws, ordinances, regulations, and standards relating to air quality as set forth in the pertinent portion of **Appendix A** of this Decision.

CONDITIONS OF CERTIFICATION

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*Comment – the recommended changes to **AQ-SC5** are needed to conform this condition with the revised 3/29/10 version agreed to by staff and applicant.*

AQ-SC5 Diesel-Fueled Engine Control: The AQCMM shall submit to the CPM~~,~~ in the Monthly Compliance Report ~~MCR,~~ a construction mitigation report that demonstrates compliance with the Air Quality Construction Mitigation Plan (AQCMP)~~following~~ mitigation measures for purposes of controlling diesel construction-related emissions. Any deviation from the AQCMP~~following~~ mitigation measures shall require prior ~~and~~ CPM notification and approval.

~~a. All diesel-fueled engines used in the construction of the facility shall have clearly visible tags issued by the on-site AQCMM showing that the engine meets the conditions set forth herein.~~

~~b. All construction diesel engines with a rating of 50 hp or higher shall meet, at a minimum, the Tier 3 California Emission Standards for Off-Road Compression-Ignition Engines, as specified in California Code of Regulations, Title 13, section 2423(b)(1), unless a good faith effort that is certified by the on-site AQCMM demonstrates that such engine is not available for a particular item of equipment. This good faith effort shall be documented with signed written correspondence by the appropriate construction contractors along with documented correspondence with at least two construction equipment rental firms. In the event that a Tier 3 engine is not available for any off-road equipment larger than 100 hp, that equipment shall be equipped with a Tier 2 engine, or an engine that is equipped with retrofit controls to reduce exhaust emissions of nitrogen oxides (NOx) and diesel particulate matter (DPM) to no more than Tier 2 levels unless certified by engine manufacturers or the on-site AQCMM that the use of such devices is not practical for specific engine types. For purposes of this condition, the use of such devices is "not practical" for the following, as well as other, reasons.~~

~~1. There is no available retrofit control device that has been verified by either the California Air Resources Board or U.S. Environmental Protection Agency to control the engine in question to Tier 2 equivalent~~

~~emission levels and the highest level of available control using retrofit or Tier 1 engines is being used for the engine in question; or~~

2. ~~The construction equipment is intended to be on site for 5 days or less.~~

3. ~~The CPM may grant relief from this requirement if the AQCMM can demonstrate a good faith effort to comply with this requirement and that compliance is not possible.~~

c. ~~The use of a retrofit control device may be terminated immediately, provided that the CPM is informed within 10 working days of the termination and that a replacement for the equipment item in question meeting the controls required in item "b" occurs within 10 days of termination of the use, if the equipment would be needed to continue working at this site for more than 15 days after the use of the retrofit control device is terminated, if one of the following conditions exists :~~

1. ~~The use of the retrofit control device is excessively reducing the normal availability of the construction equipment due to increased down time for maintenance, and/or reduced power output due to an excessive increase in back pressure.~~

2. ~~The retrofit control device is causing or is reasonably expected to cause engine damage.~~

3. ~~The retrofit control device is causing or is reasonably expected to cause a substantial risk to workers or the public.~~

4. ~~Any other seriously detrimental cause which has the approval of the CPM prior to implementation of the termination.~~

d. ~~All heavy earth-moving equipment and heavy duty construction-related trucks with engines meeting the requirements of (b) above shall be properly maintained and the engines tuned to the engine manufacturer's specifications.~~

e. ~~All diesel heavy construction equipment shall not idle for more than five minutes. Vehicles that need to idle as part of their normal operation (such as concrete trucks) are exempted from this requirement.~~

f. ~~Construction equipment will employ electric motors when feasible.~~

Verification: The AQCMM shall include in the Monthly Compliance Report (**COMPLIANCE-6**) the following to demonstrate control of diesel construction-related emissions:

A. A summary of all actions taken to maintain compliance with this condition;

B. A list of all heavy equipment used on site during that month, including the owner of that equipment and a letter from each owner indicating that equipment has been properly maintained; and

C. Any other documentation deemed necessary by the CPM, and the AQCMM to verify compliance with this condition. Such information may be provided via electronic format or disk at the project owner's discretion.

The following off-road diesel construction equipment mitigation measures shall be included in the Air Quality Construction Mitigation Plan (AQCMP) required by **AQ-SC2**.

a. All diesel-fueled engines used in the construction of the facility shall have clearly visible tags issued by the on-site AQCMM showing that the engine meets the conditions set forth herein.

b. All construction diesel engines with a rating of 50 hp or higher shall meet, at a minimum, the Tier 3 California Emission Standards for Off-Road Compression-Ignition Engines, as specified in California Code of Regulations, Title 13, section 2423(b)(1), unless a good faith effort to the satisfaction of the CPM that is certified by the on-site AQCMM demonstrates that such engine is not available for a particular item of equipment. ~~This good faith effort shall be documented with signed written correspondence by the appropriate construction contractors along with documented correspondence with at least two construction equipment rental firms~~. In the event that a Tier 3 engine is not available for any off-road equipment larger than 100 hp, that equipment shall be equipped with a Tier 2 engine, or an engine that is equipped with retrofit controls to reduce exhaust emissions of nitrogen oxides (NOx) and diesel particulate matter (DPM) to no more than Tier 2 levels unless certified by engine manufacturers or the on-site AQCMM that the use of such devices is not practical for specific engine types. For purposes of this condition, the use of such devices is "not practical" for the following, as well as other, reasons.

   1. There is no available retrofit control device that has been verified by either the California Air Resources Board or U.S. Environmental Protection Agency to control the engine in question to Tier 2 equivalent emission levels and the highest level of available control using retrofit or Tier 1 engines is being used for the engine in question; or

2. The construction equipment is intended to be on site for 5 days or less.

3. The CPM may grant relief from this requirement if the AQCMM can demonstrate a good faith effort to comply with this requirement and that compliance is not practical ~~possible~~.

c. The use of a retrofit control device may be terminated immediately, provided that the CPM is informed within 10 working days of the termination and that a replacement for the equipment item in question meeting the controls required in item "b" occurs within 10 days of termination of the use, if the equipment would be needed to continue working at this site for more than 15 days after the use of the retrofit control device is terminated, if one of the following conditions exists :

1. The use of the retrofit control device is excessively reducing the normal availability of the construction equipment due to increased down time for maintenance, and/or reduced power output due to an excessive increase in back pressure.

2. The retrofit control device is causing or is reasonably expected to cause engine damage.

3. The retrofit control device is causing or is reasonably expected to cause a substantial risk to workers or the public.

4. Any other seriously detrimental cause which has the approval of the CPM prior to implementation of the termination.

d. All heavy earth-moving equipment and heavy duty construction-related trucks with engines meeting the requirements of (b) above shall be properly maintained and the engines tuned to the engine manufacturer's specifications.

e. All diesel heavy construction equipment shall not idle for more than five minutes. Vehicles that need to idle as part of their normal operation (such as concrete trucks) are exempted from this requirement.

f. Construction equipment will employ electric motors when feasible.

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*The recommended changes to **AQ-SC6** are needed to conform this condition with the revised 3/29/10 version agreed to by staff and applicant.*

AQ-SC6 The project owner, when obtaining dedicated on-road or off-road vehicles for mirror washing activities and other facility maintenance activities, shall only obtain new model year vehicles that meet California on-road vehicle emission standards or appropriate U.S.EPA/California off-road engine emission standards for the model year when obtained.

~~Other vehicle/fuel types may be allowed assuming that the emission profile for those vehicles, including fugitive dust generation emissions, is comparable to the vehicles types identified in this condition.~~

Verification: At least 60 days prior to the start of commercial operation ~~production~~, the project owner shall submit to the CPM a copy of the plan that identifies the size and type of the on-site vehicle and equipment fleet and the vehicle and equipment purchase orders and contracts and/or purchase schedule. The plan shall be updated every other year and submitted in the Annual Compliance Report (**COMPLIANCE-7**).

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*The recommended changes to **AQ-SC7** are needed for consistency in terminology and to correct the due date for a regulatory submittal.*

AQ-SC7 The project owner shall provide a site Operations Dust Control Plan, including all applicable fugitive dust control measures identified in the verification of **AQ-SC3** that would be applicable to reducing fugitive dust from ongoing operations~~;~~ that:

A. describes the active operations and wind erosion control techniques such as windbreaks and chemical dust suppressants, including their ongoing maintenance procedures, that shall be used on areas that could be disturbed by vehicles or wind anywhere within the project boundaries; and

B. identifies the location of signs throughout the facility that will limit traveling on unpaved portion of roadways to solar equipment maintenance vehicles only. In addition, vehicle speed shall be limited to no more than 10 miles per hour on these unpaved roadways, with the exception that vehicles may travel up to 25 miles per hour on stabilized unpaved roads as long as such speeds do not create visible dust emissions.

The site Operations ~~fugitive~~ Dust Control Plan shall include the use of durable non-toxic soil stabilizers on all regularly used unpaved roads and disturbed off-road areas, or alternative methods for stabilizing disturbed off-road areas, within the project boundaries, and shall include the inspection and maintenance procedures that will be undertaken to ensure that the unpaved roads remain stabilized. The soil stabilizer used shall be a non-toxic soil stabilizer or soil weighting agent that can be determined to be both as efficient or more efficient for fugitive dust control as ARB approved soil stabilizers, and shall not increase any other environmental impacts including loss of vegetation.

The performance and application of the fugitive dust controls shall also be measured against and meet the performance requirements of condition **AQ-SC4**. The performance requirements of **AQ-SC4** shall also be included in the Operations Dust Control Plan.

Verification: At least 60 days prior to start of commercial operation, the project owner shall submit to the BLM's Authorized Officer and the CPM for review and approval a copy of the site Operations Dust Control Plan that identifies the dust and erosion control procedures, including effectiveness and environmental data for the proposed soil stabilizer, that will be used during operation of the project and that identifies all locations of the speed limit signs. Within~~At least~~ 60 days after commercial operation, the project owner shall provide to the BLM's Authorized Officer and the CPM a report identifying the locations of all speed limit signs, and a copy of the project employee and contractor training manual that clearly identifies that project employees and contractors are required to comply with the dust and erosion control procedures and on-site speed limits.

VI. ENVIRONMENTAL ASSESSMENT

A. BIOLOGICAL RESOURCES

Many of staff's suggested edits are minor corrections (for example, italicizing the scientific names of plant and animal species). In addition, staff offers suggested edits to the PMPD to indicate that small-flowered androstephium, a special-status plant species described as occurring at the project site in the Final Staff Assessment/Draft Environmental Impact Statement (FSA/DEIS), does not actually occur there but rather was a misidentification (see Attachment 6 for an explanation from the applicant's botanical experts regarding this misidentification).

In addition to these minor edits, staff has suggested some more substantial changes to conditions of certification. The majority of these changes involve updating the PMPD to include the changes as described in the U.S. Bureau of Land Management's (BLM's) Final Environmental Impact Statement (FEIS). In general, the conclusions and mitigation recommendations are in close agreement with those in the FSA/DEIS, with the FEIS incorporating staff's conditions of certification ***BIO-1*** *through* ***BIO-20*** *from the FSA/DEIS. The FEIS also adds eight new conditions, BIO-21 – BIO-28.* ***PMPD Comment Table 1*** *summarizes the new BLM conditions and provides a cross-reference to the generally equivalent condition(s) in the FSA. In an effort to achieve maximum consistency between BLM and Energy Commission mitigation measures, staff has added a few sentences to conditions of certification in the* ***BIO-19*** *(Bighorn Sheep Mitigation) and* ***BIO-14*** *(Closure, Revegetation and Rehabilitation Plan) so that these measures will be substantially the same in the PMPD and FEIS. In addition, staff has added an entirely new condition,* ***BIO-21*** *(Avian and Bat Monitoring and Management Plan) to capture the mitigation requirement described in BLM's BIO-23.*

PMPD Comment Table 1
New BLM Conditions and Cross-Reference to FSA Conditions

BLM FEIS Mitigation Measures	***Equivalent CEC Condition***
BIO-21 *Determine if additional special-status plant surveys are needed for state- and federally-listed and candidate plant species and BLM sensitive species, and implement avoidance measures if special-status plants are detected.*	***BIO-18*** *Special-status Plant Surveys. Item #3 requires pre-construction surveys and implementation of avoidance measures if special-status plants are detected.*
BIO-22 *Prepare Migratory Bird Treaty Act (MBTA) Conservation Agreement in coordination with the USFWS, BLM, and CFGD to identify procedures to minimize or eliminate impacts to MBTA species.*	***BIO-15*** *Pre-construction Nest Surveys;* ***BIO-21*** *Avian and Bat Monitoring and Management Plan (see description below)*
BIO-23 *Biweekly surveys for bird and bat mortalities throughout the project*	***BIO-21*** *– Avian and Bat Monitoring and Management Plan. Staff created a new*

site.	*condition to monitor for project-related bird and bat injuries and mortalities and implement adaptive management measures if monitoring reveals impacts.*
BIO-24 *To prevent impacts to Nelson's bighorn sheep, no barbed wire would be permitted at the northern perimeter of ISEGS 3 fenceline.*	***BIO-19*** *– Bighorn Sheep Mitigation- staff added language to preclude use of barbed wire at the northern boundary fence.*
BIO-25 *Control of noxious weeds at bighorn sheep water source.*	***BIO-19*** *– Bighorn Sheep Mitigation: staff added language to require weed control within 100 feet of new water source.*
BIO-26 *Implement mitigation in the USFWS Biological Opinion.*	***BIO-7*** *Biological Resources Monitoring and Mitigation Plan (BRMIMP). Item #3 of this condition incorporates all biological resource mitigation, monitoring and compliance measures required in federal agency terms and conditions, including those in the USFWS Biological Opinion.*
BIO-27 *The project owner shall implement the Closure, Revegetation, and Rehabilitation Plan, Revision 3, dated July 6, 2010, with the following modifications.*	***BIO-14*** *Closure, Revegetation and Rehabilitation. Staff has added four items to this condition to achieve consistency with BLM's revegetation mitigation.*
BIO-28*: Compliance with the Eagle Act.*	***BIO-21****, Avian and Bat Monitoring and Management Plan;* ***BIO-17****, Desert Tortoise Compensatory Mitigation*

<u>Biological Resources Pages 2 – 5</u>

Scientific names should be italicized (for example, the scientific name for creosote bush should be shown as *Larrea tridentata* rather than Larrea tridentata) in the following paragraphs:

Page 2, paragraphs 2, 3
Page 3, paragraphs 2, 4
Page 4, paragraph 4
Page 5, paragraphs 2, 3, 4, 5

<u>Pages 7 – 9, Biological Resources Table 1</u>

- *(**Page 7, Table 1**) Small-flowered androstephium (the 5th plant species listed in the table) should not be in bold-face type; Instead, it should be in normal font.*
- *(**Page 8, Table 1**) Crowned muilla should be in bold-face type.* This species was detected (originally misidentified as the small –flowered androstephium);
- *(**Page 8, Table 1)** Short-joint beavertail, white margined beardtongue, Death valley beardtongue and Stephen's beardtongue all need an "S" added to indicate BLM Sensitive status; and*

- (***Page 9, Table 1***) *Change PLANTS to WILDLIFE and remove CNPS from Status. Change color of header from blue to green.*

These changes are reflected in the table and are highlighted in yellow for the convenience of the reader.

Biological Resources Table 1
Special-Status Species Known or Potentially Occurring in the ISEGS Project Area and Vicinity

PLANTS		
Common Name	***Scientific Name***	**Status State/Fed/CNPS/BLM**
Mormon needle grass	*Achnatherum aridum*	__/__/2.3
Clark Mountain agave*	***Agave utahensis* var. *nevadensis***	**__/__/4.2**
Desert ageratina	*Ageratina herbacea*	__/__/2.3
Coyote gilia	*Aliciella triodon*	__/__/2.2
Small-flowered androstephium	*Androstephium breviflorum*	__/__/2.2
White bear poppy	*Arctomecon merriamii*	__/__/2.2
Mojave milkweed	***Asclepias nyctaginifolia***	**__/__/2.1**
Cima milk-vetch	*Astragalus cimae* var. *cimae*	__/__/1B.2/S
Providence Mountain milk-vetch	*Astragalus nutans*	__/__/4.2
Scaly cloak fern	*Astrolepis cochisensis* ssp. *cochisensis*	__/__/2.3
Black grama	*Bouteloua eriopoda*	__/__/4.2
Red grama	*Bouteloua trifida*	__/__/2.3
Alkali mariposa lily	*Calochortus striatus*	__/__/1B.2/S
Purple bird's-beak	*Cordylanthus parviflorus*	__/__/2.3
Desert pincushion	***Coryphantha chlorantha***	**__/__/2.1**
Viviparous foxtail cactus*	***Coryphantha vivipara* var. *rosea***	**__/__/2.2**
Winged cryptantha	*Cryptantha holoptera*	__/__/4.3
Gilman's cymopterus	*Cymopterus gilmanii*	__/__/2.3
Utah vine milkweed	***Cynanchum utahense***	**__/__/4.2**
Nine-awned pappus grass	***Enneapogon desvauxii***	**__/__/2.2**
Naked-stemmed daisy	*Enceliopsis nudicaulis* ssp. *nudicaulis*	__/__/4.3
Limestone daisy	*Erigeron uncialis* var. *uncialis*	__/__/1B.2/S
Forked buckwheat	*Eriogonum bifurcatum*	__/__/1B.2/S
Hairy erioneuron	*Erioneuron pilosum*	__/__/2.3
Clark Mountain spurge	*Euphorbia exstipulata* var.	__/__/2.1

PLANTS		
Common Name	***Scientific Name***	**Status State/Fed/CNPS/BLM**
	exstipulata	
Wright's bedstraw	*Galium wrightii*	__/__/2.3
Pungent glossopetalon	*Glossopetalon pungens*	__/__/1B.2/S
Parish club-cholla	***Grusonia parishii***	**__/__/2.2**
Hairy-podded fine-leaf hymenopappus	*Hymenopappus filifolius* var. *eriopodus*	__/__/2.3
Jaeger's ivesia	*Ivesia jaegeri*	__/__/1B.3/S
Knotted rush	*Juncus nodosus*	__/__/2.3
Hillside wheat grass	*Leymus salinus* ssp. *mojavensis*	__/__/2.3
Plains flax	*Linum puberulum*	__/__/2.3
Spearleaf	*Matelea parvifolia*	__/__/2.3
Rough menodora	*Menodora scabra*	__/__/2.3
Polished blazing star	*Mentzelia polita*	__/__/1B.2/S
Utah mortonia*	***Mortonia utahensis***	**__/__/4.3**
Tough muhly	*Muhlenbergia arsenei*	__/__/2.3
Crowned muilla	***Muilla coronata***	**__/__/4.2**
False buffalo-grass	*Munroa squarrosa*	__/__/2.2
Cave evening-primrose*	***Oenothera cavernae***	**__/__/2.1**
Short-joint beavertail	*Opuntia basilaris* var. *brachyclada*	__/__/1B.2/S
Curved-spine beavertail	*Opuntia curvospina*	__/__/2.2
Spiny cliff-brake	*Pellaea truncata*	__/__/2.3
White-margined beardtongue	*Penstemon albomarginatus*	__/__/1B.2/S
Rosy two-toned beardtongue	*Penstemon bicolor* ssp. *roseus*	__/__/2.3
Limestone beardtongue	*Penstemon calcareous*	__/__/1B.3
Death Valley beardtongue	*Penstemon fruticiformis* var. *amargosae*	__/__/1B.3/S
Stephen's beardtongue	*Penstemon stephensii*	__/__/1B.3/S
Thompson's beardtongue	*Penstemon thompsoniae*	__/__/2.3
Utah beardtongue	*Penstemon utahensis*	__/__/2.3
Aven Nelson's phacelia	*Phacelia anelsonii*	__/__/2.3
Barneby's phacelia	*Phacelia barnebyana*	__/__/2.3
Sky-blue phacelia	*Phacelia coerulea*	__/__/2.3
Parish's phacelia	*Phacelia parishii*	__/__/1B.1/S
Jaeger's phacelia	*Phacelia perityloides* var. *jaegeri*	__/__/1B.3/S
Chambers' physaria	*Physaria chambersii*	__/__/2.3
Small-flowered rice grass	*Piptatherum micranthum*	__/__/2.3
Desert portulaca	***Portulaca halimoides***	**__/__/4.3**
Abert's sanvitalia	*Sanvitalia abertii*	__/__/2.2

PLANTS		
Common Name	***Scientific Name***	**Status State/Fed/CNPS/BLM**
Many-flowered schkuhria	*Schkuhria multiflora* var. *multiflora*	__/__/2.3
Johnson's bee-hive cactus	*Sclerocactus johnsonii*	__/__/2.2
Mojave spike-moss	*Selaginella leucobryoides*	__/__/4.3
Rusby's desert-mallow	***Sphaeralcea rusbyi* var. *eremicola***	**__/__/1B.2/S**
WILDLIFE		
Common Name	***Scientific Name***	**Status State/Fed/BLM**
Reptiles		
Desert tortoise	***Gopherus agassizii***	**ST/FT/__**
Banded gila monster	*Heloderma suspectum cinctum*	CSC/__/__/S
Birds		
Burrowing owl	***Athene cunicularia***	**CSC/FSC/__**
Golden eagle	***Aquila chrysaetos***	**CSC, FP/FSC/S**
Vaux's swift	***Chaetura vauxi***	**__/FSC/__**
Gray-headed junco	*Junco hyemalis caniceps*	WL/FSC/__
Loggerhead shrike	***Lanius ludovicianus***	**CSC/FSC/__**
Hepatic tanager	*Piranga flava*	WL/FSC/__
Summer tanager	*Piranga rubra*	CSC/__/__
Brewer's sparrow	***Spizella breweri***	**__/BCC/__**
Bendire's thrasher	*Toxostoma bendirei*	CSC/BCC/S
Crissal thrasher	***Toxostoma crissale***	**CSC/BCC/__**
Le Conte's thrasher	***Toxostoma lecontei***	**WL/BSS/__**
Virginia's warbler	*Vermivora virginiae*	WL/BCC/__
Gray vireo	*Vireo vicinior*	CSC/BCC/S
Mammals		
Townsend's big-eared bat	*Corynorhinus townsendii*	CSC/__/S
Pallid bat	*Antrozous pallidus*	CSC/__/S
Long-legged myotis	*Myotis volans*	__/__/S
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	__/__/S
American badger	***Taxidea taxus***	**CSC/__/__**

Bold-face-type species names are those observed on or near the proposed project site or plants observed in the one-mile buffer by the applicant during the 2007/08 field surveys.
* Found in buffer area surveys only. For all but *Utah mortonia*; no specific location information was included in the applicant's final botanical plant report (CH2M Hill 2008x).

Status Codes:

Federal: FE - Federally listed endangered: species in danger of extinction throughout a significant portion of its range

FT - Federally listed, threatened: species likely to become endangered within the foreseeable future

BCC: Fish and Wildlife Service: Birds of Conservation Concern: Identifies migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent highest conservation priorities <www.fws.gov/migratorybirds/reports/BCC2002.pdf>

State CSC = California Species of Special Concern Species of concern to CDFG because of declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.

SE - State listed as endangered

ST = State listed as threatened

WL = State watch list

California Native Plant Society

List 1B - Rare, threatened, or endangered in California and elsewhere

List 2 - Rare, threatened, or endangered in California but more common elsewhere

List 3 - Plants which need more information

List 4 - Limited distribution – a watch list

0.1 - Seriously threatened in California (high degree/immediacy of threat)

0.2 - Fairly threatened in California (moderate degree/immediacy of threat)

0.3 - Not very threatened in California (low degree/immediacy of threats or no current threats known)

Bureau of Land Management (BLM): S = Sensitive

BLM Manual §6840 defines sensitive species as"…those species that are (1) under status review by the FWS/NMFS; or (2) whose numbers are declining so rapidly that Federal listing may become necessary, or (3) with typically small and widely dispersed populations; or (4) those inhabiting ecological refugia or other specialized or unique habitats." <www.blm.gov/ca/pdfs/pa_pdfs/biology_pdfs/SensitiveAnimals.pdf>

(Ex. 300, pp. 6.2-16 – 6.2-18.)

Page 10, Paragraph 3

Small-Flowered Androstephium (Androstephium breviflorum). Small-flowered androstephium is a bulbiferous herb found mainly in San Bernardino County, though it has been recorded in adjacent Riverside County and possibly Inyo County. This species also occurs in Arizona, Nevada, and Utah. It is found in dry, loose sandy to rocky soils, and on sand dunes and alluvial fans. The CNDDB Element Occurrence records are all presumed extant. In addition, approximately 31 occurrences were documented in the AFC for the Stirling Energy Systems Solar One Project (now called Calico Solar). In 2008 a total of 12 individuals were mapped in four locations on the ISEGS project site, within Ivanpah 1 and 2, in Mojave creosote bush scrub. ~~Many new occurrences of this species have been found in recent years and the project area includes only a very small portion of its total distribution in California.~~ However, in 2010 the applicant reported that the individuals previously mapped as this plant were mis-identified individuals of crowned muilla (*Muilla coronata*), a CNPS List 4 (watch list) species.

Page 19, Paragraph 2

Pallid and Townsend's big-eared bats could use the project area for foraging and might use nearby mine shafts for roosting. Though no mines exist on the project site, Staff observed a mine shaft in the limestone hill immediately west of Ivanpah 3. While BLM staff conducted a visual night survey on June 23, 2008, at least five bats were observed from the limestone hill, and one individual flew into and out of the mine shaft. Species identification was not possible with this type of survey. Although standard acoustic surveys would be able to distinguish most species, they would not successfully detect Townsend's big-eared bat. (Ex. 300, pp. 6.2-26 – 6.2-27.)

Page 25, Paragraph 1

1. Direct and Indirect Impacts and Mitigation

A substantial portion of the Ivanpah Valley documented occurrences of ~~small-flowered androstephium~~, Mojave milkweed, desert pincushion, nine-awned pappus grass, Parish's club-cholla, and Rusby's desert-mallow would be directly, indirectly, and cumulatively impacted by the project. Plants are particularly vulnerable to the effects of habitat fragmentation; small fragments of habitat can only support small populations and are more vulnerable to extinction. Even minor fluctuations in climate can be catastrophic in a small fragmented population. For ~~small-flowered androstephium~~, Mojave milkweed, desert pincushion, nine-awned pappus grass, and Parish's club-cholla, the California populations are already geographically marginal relative to their core populations outside the state. For most of these species, these Ivanpah Valley populations represent a substantial portion of their total documented range regionally and within California. Loss of a substantial portion of these populations makes them more vulnerable to extirpation within the state, especially for Mojave milkweed; its California distribution outside of the Ivanpah Valley is restricted to only two other observations and a handful of historic herbarium collections. **Biological Resources Table 2** summarizes the percentage of statewide documented occurrences for these special-status plant species. (Ex. 300, pp. 4-4 – 4-6.)

Page 25, Biological Resources Table 2

Biological Resources Table 2
Percentage of Statewide Documented Element Occurrences[2] for Special-Status Plant Species in the ISEGS Project

Name Scientific (Common)	CDFG's CNDDB Rank Global/State and CNPS List	Total Documented Occurrences in CNDDB* (including project occurrences)	Additional Occurrences from Consortium of California Herbaria **	Occurrences From Other Available Data (other projects) ***	Project Site Occurrences (as reported by CNDDB 2/2010)	Project Site % of Documented Occurrences in California (List 2 plants) or Globally (List 1B)
~~*Androstephium breviflorum* (**small-flowered androstephium**)~~	~~G5 S1.2, List 2.2~~	~~82~~	~~0~~	~~1~~	~~3~~	~~3/(82+1) = 4%~~
Asclepias nyctaginifolia (**Mojave milkweed**)	G4G5 S1, List 2.1	22	1	1	11	11/(22+1+1) = 46%
Coryphantha chlorantha **(desert pincushion)**	G2G3 S1, List 2.1	22	1	n/a	5	5/(22+1) = 22%
Enneapogon desvauxii (**nine-awned pappus grass**)	G5 S2, List 2.2	21	0	1	3	3/(21+1) = 14%

[2] The term "Element Occurrence (EO)" refers to populations or groups of individuals occurring in close proximity to each other, and is defined by the CNDDB as individuals of a particular species occurring within one-quarter mile of each other. When numerous localities are documented by a reporter within very close proximity of each other, CNDDB uses this standardized and nationally accepted mapping convention, which allows a common metric for comparison, using a quarter-mile grid. Data provided to CNDDB by the applicant (CH2M Hill 2008c, Table 5-1) were mapped by CNDDB using this convention into the number of EOs shown in the column "Project Site Occurrences as reported by CNDDB 2/2010." These numbers should not be confused with numbers of individual plants.

Grusonia parishii (**Parish's club-cholla)**	G3G4 S2, List 2.2	16	0	1	2	2/(16+1) = 12%
Sphaeralcea rusbyi var. *eremicola* (**Rusby's desert-mallow**)	G4T2 S2, List 1B.2	29	4	n/a	4	4/(29+4) = 12%

* Number of CNDDB element occurrences February 2010 update)
** Number of occurrences derived from herbarium records, California Consortium of Herbaria
*** Number of occurrences derived from EA for the SCE El Dorado to Ivanpah 220 kV transmission line project

Global Rank is a reflection of the overall condition of an element throughout its global range:

- G2—Imperiled: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors;
- G3—Vulnerable: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors;
- G4—Apparently Secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors;
- G5— Secure: Common; widespread and abundant.

Some of the G-ranks above are expressed as a range. Subspecies receive a T-rank attached to the G-rank. The G-rank refers to the whole species range, but the T-rank refers to the global condition of variety *eremicola* only.

State Rank:

- S1— Critically Imperiled: Critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province;
- S2— Imperiled: Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province;
- S3— Vulnerable: Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation;
- ? —: Indicates some uncertainty about the rank.

State Rank Extension:

0.2—threatened

(Ex. 315, pp. 4-7 – 4-9.)

<u>Page 26, paragraph 1</u>

To mitigate the potentially significant impacts to ~~small-flowered androstephium,~~ Mojave milkweed, desert pincushion, nine-awned pappus grass, Parish's club-cholla, and Rusby's desert-mallow, we impose Condition of Certification **BIO-13**, requiring a Weed Management Plan to help prevent the spread of non-native and invasive plant species on the ISEGS site.

Page 27, paragraph 3
~~Small-flowered androstephium,~~ Mojave milkweed, desert pincushion, nine-awned pappus grass, Parish's club-cholla, and Rusby's desert-mallow are not listed under the California Endangered Species Act, but that does not diminish the potential significance of their loss. Plants on the CNPS List 1A, 1B, and 2 meet the definitions of Sections 2062 and 2067 (CESA) of the California Fish and Game Code, and are eligible for state listing. Furthermore, even if a species is not a California or federally listed species it still may be considered endangered, rare or threatened, if the species can be shown to meet the criteria in Section 15380 of the CEQA Guidelines. "CEQA Section 15380 provides that a plant or animal species may be treated as 'rare or endangered' even if not on one of the official lists if, for example, it is likely to become endangered in the foreseeable future." Plants appearing on CNPS List 1B or 2 are considered to meet that criteria, and impacts to these species are generally considered "significant." (Ex. 300, p. 6.2-38.)

Page 29, paragraph 5
Implementation of staff's proposed Conditions of Certification **BIO-8** and **BIO-9** have inherent risks and could themselves result in direct effects such as mortality, injury, or harassment of desert tortoises due to equipment operation, fence installation activities, removal of tortoise burrows, and tortoise translocation. Installation of exclusionary fencing at the perimeter of the project area would also fragment habitat for desert tortoise and home ranges of individual tortoises. Condition of Certification **BIO-8** ~~To~~addresses ~~agency~~ CDFG and USFWS concerns about harm to tortoise resulting from ~~translocation or the~~ erection of the perimeter fence and desert tortoise clearance surveys. ~~the dangers to desert tortoises associated with translocation,~~. Condition **BIO-9** requires the preparation of a Desert Tortoise Relocation/Translocation Plan in consultation with those agencies to address concerns about harm to desert tortoise resulting from translocation. (Ex. 300, pp. 6.2-47 – 6.2-51.)

***Page 29,* paragraph 6**
The loss of approximately 3,582 acres of occupied habitat and fragmentation and disturbance to adjacent habitat will be compensated pursuant to Condition BIO-17 by the acquisition of lands that would be permanently protected and enhanced to support healthy populations of desert tortoise. The acquired lands will be permanently protected and managed for desert tortoise, and exclude incompatible uses such as grazing, off-highway vehicle use, roads and trails, utility corridors, military operations, construction, mining, grazing by livestock and burros, invasive species, fire, and environmental contaminants. An equally important component is the implementation of enhancement actions to improve desert tortoise survival and reproduction. These actions might include habitat restoration, weed control, road closures or road fencing, reducing livestock and burro grazing, and controlling ravens and other predators. Without permanent protection and enhancement actions on lands acquired for mitigation, the result would be a net loss for desert tortoise populations. Condition of Certification BIO-17 also includes BLM's required mitigation which will consist of desert tortoise habitat enhancement including installation of at least 50 miles of desert tortoise exclusion fencing on roadways in the Northeastern Mojave Recovery Unit, and habitat restoration of at least 50 routes within the Desert Wildlife Management Area.

<u>Page 31, paragraph 2</u>

In addition to ravens, feral dogs have emerged as major predators of the tortoise. Dogs may range several miles into the desert and have been found digging up and killing desert tortoises (USFWS 1994; Evans 2001). Dogs brought to the project site with visitors may harass, injure, or kill desert tortoises, particularly if allowed off leash to roam freely in occupied desert tortoise habitat. The worker environmental awareness training (**BIO-6**) and restrictions on pets being brought to the site required of all personnel (**BIO-11**) would reduce or eliminate the potential for these impacts. Additional raven ~~mitigation tools~~ <u>avoidance and minimization measures</u> have been incorporated into Conditions **BIO-11** and **BIO-12**.

<u>Page 32</u>

5. Cumulative Impacts

A project may result in a significant <u>adverse</u> cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (Cal. Code Regs., tit. 14, § 15130). Cumulative impacts must be addressed if the incremental effect of a project, combined with the effects of other projects is “cumulatively considerable” [14 Cal. Code Regs., § 15130(a).] Such incremental effects are to be “viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects” [14 Cal. Code Regs., § 15164(b)(1).]

<u>Pages 35 - 36</u>

Streambed Alteration Agreement, California Fish and Game Code §§ 1600 1607. Pursuant to these sections, CDFG typically regulates all changes to the natural flow, bed, or bank, of any river, stream, or lake that supports fish or wildlife resources. Construction and operation of the ISEGS would result in direct or indirect impacts to up to 175 acres of waters of the state. Staff recommends Condition of Certification **BIO-~~19~~ <u>20</u>**, which we adopt, to assure compliance.

<u>Page 37</u>

FINDINGS OF FACT

Based on the evidence, we find the following:

5. Twenty-one special status wildlife and <u>227</u> plant species were detected during biological surveys. (**Pg 37, #5**)
6. Implementation of Conditions of Certification **BIO-11**, **BIO-13**, **BIO-14**, and **BIO-18** will reduce impacts to Special-Status plant species. After mitigation, it is uncertain whether potentially significant impacts to plants located on the project site but not in ~~one of the~~ <u>a</u> protected area~~s~~ will be mitigated to insignificant levels.
7. Implementation of Conditions of Certification **BIO-1** through **BIO-6**, **BIO-8** through **BIO-12**, ~~**BIO-17**,~~ ~~**BIO-19**~~ will reduce impacts to Special-Status plant species to insignificant levels, except as described immediately above.

8. A mitigation ratio of 3:1 is appropriate for the provision of habitat compensation lands and habitat enhancements for desert tortoise, as described in Condition of Certification **BIO-17**. In addition to **BIO-17**, implementation of Conditions of certification **BIO-1** through **BIO-12** will also reduce impacts to desert tortoise to insignificant levels. The acquisition and protection of desert tortoise compensation lands will also help mitigate project impacts to Gila monster, ~~big horn sheep,~~ American badger, burrowing owl, golden eagle, Vaux's ~~sift~~ swift, loggerhead shrike, Brewer's sparrow, Crissal thrasher, and Le Conte's thrasher.
9. The effects of dust on wildlife and plants will be mitigated by the implementation of Conditions **BIO-11**, **AQ-SC3**, **AQ-SC-7** and **Soil&Water-1**.
10. Construction noise is not expected to have a substantial impact on nearby wildlife with the implementation of Conditions **NOISE-1** through **NOISE-7**.
11. Implementation of Condition of Certification **BIO-15** will reduce project construction impacts to nesting migratory birds to less than significant levels.
12. Implementation of Condition of Certification **BIO-16** will reduce project impacts to burrowing owls to less than significant levels.
13. Implementation of Condition of Certification **BIO-19** will reduce project impacts to Nelson's bighorn sheep to less than significant levels.
14. Implementation of Condition of Certification **BIO-20** will reduce project impacts to 175 acres of state waters to less than significant levels.
15. Implementation of Condition of Certification **BIO-21** will avoid and minimize Project-related avian or bat impacts related to collisions with facility features and exposure to bright light and heat from concentrating sunlight.

Conditions of Certification

Page 43, BIO-6

Staff's proposed edits to BIO-6 are to provide consistency with the March 29, 2010 version agreed to by staff and applicant.

WORKER ENVIRONMENTAL AWARENESS PROGRAM (WEAP)

BIO-6 The project owner shall develop and implement an Ivanpah SEGS-specific Worker Environmental Awareness Program (WEAP) and shall secure approval for the WEAP from ~~USFWS, CDFG,~~ BLM's Authorized Officer and the CPM. The USFWS and CDFG shall also be provided a copy of the WEAP for review and comment. The WEAP shall be administered to all onsite personnel including surveyors, construction engineers, employees, contractors, contractor's employees, supervisors, inspectors, subcontractors, and delivery personnel. The WEAP shall be implemented during site mobilization, ground disturbance, grading, construction, operation, and closure. The WEAP shall:

1. Be developed by or in consultation with the Designated Biologist and consist of an on-site or training center presentation in which supporting written material and electronic media, including photographs of protected species, is made available to all participants. ~~The training presentation shall be made available in the language best understood by the participants~~;

2. Discuss the locations and types of sensitive biological resources on the project site and adjacent areas, and explain the reasons for protecting these resources; provide information to participants that Gila monsters are venomous and should not be handled, and that no snakes, reptiles, or other wildlife shall be harmed;

3. Place special emphasis on desert tortoise, including information on physical characteristics, distribution, behavior, ecology, sensitivity to human activities, legal protection, penalties for violations, reporting requirements, and protection measures;

4. Include a discussion of fire prevention measures to be implemented by workers during project activities; request workers dispose of cigarettes and cigars appropriately and not leave them on the ground or buried;

5. Present the meaning of various temporary and permanent habitat protection measures;

6. Identify whom to contact if there are further comments and questions about the material discussed in the program; and

7. Include a training acknowledgment form to be signed by each worker indicating that they received training and shall abide by the guidelines.

The specific program can be administered by a competent individual(s) acceptable to the Designated Biologist.

Verification: At least 60 days prior to the start of any project-related site disturbance activities, the project owner shall provide to BLM's Authorized Officer and the CPM a copy of the draft WEAP and all supporting written materials and electronic media prepared or reviewed by the Designated Biologist and a resume of the person(s) administering the program.

The project owner shall provide in the Monthly Compliance Report the number of persons who have completed the training in the prior month and a running total of all persons who have completed the training to date. At least 10 days prior to site and related facilities mobilization, the project owner shall submit two copies of the BLM- and CPM-approved final WEAP.

Training acknowledgement forms signed during construction shall be kept on file by the project owner for at least six months after the start of commercial operation.

Throughout the life of the project, the worker education program shall be repeated annually for permanent employees, and shall be routinely administered within one week of arrival to any new construction personnel, foremen, contractors, subcontractors, and other personnel potentially working within the project area. Upon completion of the orientation, employees shall sign a form stating that they attended the program and understand all protection measures. These forms shall be maintained by the project owner and shall be made available to BLM's Authorized Officer and the CPM and upon request. Workers shall receive and be required to visibly display a hardhat sticker or certificate that they have completed the training.

During project operation, signed statements for operational personnel shall be kept on file for six months following the termination of an individual's employment.

Page 48, BIO-8, Section 2(c) of the Condition

*Staff's proposed edits are to provide consistency with the March 29, 2010 version agreed to by staff and applicant. We recommend that all other parts of **BIO-8** remain unchanged.*

BIO-8

c. Utility Corridor Fencing. The utility rights-of-way shall be temporarily fenced on each side of the right-of-way prior to ground disturbing activities to prevent desert tortoise entry during construction. Temporary fencing ~~must follow guidelines for permanent fencing~~ must be capable of preventing desert tortoises from entering the work area, with ~~and~~ supporting stakes ~~shall be~~ sufficiently spaced to maintain fence integrity. The Designated Biologist or Biological Monitor shall be present to supervise all construction activities occurring within areas bounded by temporary fencing.

Page 50, BIO-9

Staff's proposed edits are to provide consistency with the March 29, 2010 version agreed to by staff and applicant, and to clarify the approving authorities in the verification so as to be consistent with the condition.

DESERT TORTOISE TRANSLOCATION PLAN

BIO-9 The project owner shall develop and implement a final Desert Tortoise Relocation/Translocation Plan (Plan) that is consistent with current USFWS approved guidelines, and meets the approval of BLM~~, USFWS, CDFG and Energy Commission staff~~'s Authorized Officer, USFWS and the CPM, in consultation with CDFG. The final Plan shall be based on the draft Desert Tortoise Relocation/Translocation Plan prepared by the applicant dated May 2009 and shall include all revisions deemed necessary by BLM's Authorized Officer, USFWS, and the CPM, in consultation with CDFG ~~and the Energy Commission staff~~.

Verification: Within 60 days of publication of the Energy Commission Decision the project owner shall provide BLM's Authorized Officer and the CPM with the final version of a Desert Tortoise Relocation/Translocation Plan that has been reviewed and approved by BLM, USFWS, and the CPM in consultation with CDFG ~~and Energy Commission staff~~. BLM's Authorized Officer and the CPM will determine the plan's acceptability within 15 days of receipt of the final plan. All modifications to the approved translocation must be made only after consultation with BLM's Authorized Officer, USFWS and the CPM, ~~USFWS, and~~ in consultation with CDFG. ~~The project owner shall notify BLM's Authorized Officer and the CPM no fewer than 5 working days before implementing any BLM- and CPM-approved modifications to the Plan.~~

Within 30 days after initiation of translocation activities, the Designated Biologist shall provide to BLM's Authorized Officer and the CPM for review and approval, a written report identifying which items of the Plan have been completed, and a summary of all modifications to measures made during implementation of the Plan.

Page 53, BIO-11

Staff's proposed edits to BIO-11 are to provide consistency with the March 29, 2010 version agreed to by staff and applicant. Part #s 1 - 12 of the Condition can remain unchanged. Part #13 should be revised, and Part #14 should be inserted. This will change the numbering for the remaining parts of the condition, from #s 14 – 16 as shown in the PMPD, to #s 15 – 17 as proposed by staff. Staff is also proposing edits to the Verification.

IMPACT AVOIDANCE AND MINIMIZATION MEASURES

BIO-11 During construction the project owner shall implement all feasible measures to avoid or minimize impacts to biological resources, including the following:

13. Dispose of Roadkilled Animals. Road killed animals or other carcasses detected in the project area or on roads near the project area shall be picked up immediately and delivered to the Biological Monitor. Within 1 working day of receipt of the carcass the Biological Monitor shall contact CDFG and/or USFWS for guidance on disposal or storage of the carcass~~upon detection and appropriately disposed of to avoid attracting common ravens and coyotes~~.

14. On-site personnel shall photograph and record the location of all bird carcasses encountered within the solar fields, and shall provide the bird carcass, photograph, and location data to the Designated Biologist. The Designated Biologist shall identify the bird, ascertain a cause of death if possible, maintain a database of this information for all bird carcasses, and each year of operation shall provide a report summarizing this information to the CPM, BLM's Authorized Officer, CDFG and USFWS.

15. Minimize Spills of Hazardous Materials. All vehicles and equipment shall be maintained in proper working condition to minimize the potential for fugitive

emissions of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials. The Designated Biologist shall be informed of any hazardous spills immediately as directed in the project Hazardous Materials Plan. Hazardous spills shall be immediately cleaned up and the contaminated soil properly disposed of at a licensed facility. Servicing of construction equipment shall take place only at a designated area. Service/maintenance vehicles shall carry a bucket and pads to absorb leaks or spills.

16. Worker Guidelines. During construction all trash and food-related waste shall be placed in self-closing containers and removed daily from the site. Workers shall not feed wildlife or bring pets to the project site. Except for law enforcement personnel, no workers or visitors to the site shall bring firearms or weapons. Vehicular traffic shall be confined to existing routes of travel to and from the project site, and cross country vehicle and equipment use outside designated work areas shall be prohibited. The speed limit when traveling on Colosseum Road and other dirt access routes within desert tortoise habitat shall not exceed 20 miles per hour.

17. Monitor Ground Disturbing Activities Prior to Site Mobilization. If ground-disturbing activities are required prior to site mobilization, such as for geotechnical borings or hazardous waste evaluations, a Designated Biologist or Biological Monitor shall be present to monitor any actions that could disturb soil, vegetation, or wildlife.

Verification: All mitigation measures and their implementation methods shall be included in the BRMIMP ~~and implemented~~. Implementation of the measures shall~~will~~ be reported in the Monthly Compliance Reports by the Designated Biologist. Within 30 days after completion of project construction, the project owner shall provide to BLM's Authorized Officer and the CPM, for review and approval, a written construction termination report identifying how measures have been completed. The Designated Biologist shall provide to the CPM, BLM's Authorized Officer, CDFG, and USFWS an annual report summarizing all available data (species of carcass, date and location collected, and cause of death) describing bird and other carcasses collected within the project site each year.

Page 57, BIO-12

RAVEN MANAGEMENT PLAN

Staff's proposed edits to BIO-12 are to provide consistency with the March 29, 2010 version agreed to by staff and applicant and to update the condition to conform to the latest USFWS guidance pertaining to a Regional Raven Management Program. The USFWS has developed a comprehensive, regional raven management and monitoring program in the California Desert Conservation Area to address the regional, significant threat that increased numbers of common ravens pose to desert tortoise recovery efforts. This program is described in USFWS' Renewable Energy Development And Common Raven Predation on the Desert Tortoise – Summary, dated May 2010; Cost

Allocation Methodology for Implementation of the Regional Raven Management Plan, dated July 9, 2010.

BIO-12 The project owner shall implement a Raven Management Plan that is consistent with the most current USFWS-approved raven management guidelines, and which meets the approval of USFWS, ~~CDFG,~~ BLM's Authorized Officer, and the ~~Energy Commission staff~~CPM in consultation with CDFG. The draft Raven Management Plan submitted by the Applicant (CH2M Hill 2008f) shall provide the basis for the final plan, subject to review and revisions from USFWS~~, CDFG,~~ BLM's Authorized Officer and the CPM in consultation with CDFG~~, and the Energy Commission staff~~. The project owner shall submit payment to the project sub-account of the REAT Account held by the National Fish and Wildlife Foundation (NFWF) to support the USFWS Regional Raven Management Program. The amount shall be a one-time payment of $105 per acre of permanent disturbance.

Verification: At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide BLM's Authorized Officer, the CPM, USFWS, and CDFG with the final version of a Raven Management Plan that has been reviewed by USFWS, CDFG, BLM, and the Energy Commission staff. The CPM and BLM's Authorized Officer will determine the plan's acceptability within 15 days of receipt of the final plan. All modifications to the approved Raven Management Plan shall be made only after ~~consultation with~~ approval by BLM's Authorized Officer and the CPM, in consultation with ~~and Energy Commission staff,~~ USFWS, and CDFG. ~~The project owner shall notify BLM's Authorized Officer and the CPM no less than 5 working days before implementing any BLM- and CPM-approved modifications to the Raven Management Plan.~~

No less than 10 days prior to the start of any Project-related ground disturbance activities, the project owner shall provide documentation to the CPM, CDFG and USFWS that the one-time fee for the USFWS Regional Raven Management Program has been deposited in the REAT-NFWS subaccount for the Project.

Within 60 ~~30~~ days after completion of project construction, the project owner shall provide to the CPM for review and approval, a written report identifying which items of the Raven Management Plan have been completed, a summary of all modifications to mitigation measures made during the project's construction phase, and which items are still outstanding.

Page 58, BIO-13

WEED MANAGEMENT PLAN

Staff's proposed edits to BIO-13 are to provide consistency with the March 29, 2010 version agreed to by staff and applicant, and to clarify who are the approving authorities of the Weed Management Plan as also shown in yellow highlight.

BIO-13 The project owner shall implement a Weed Management Plan that meets the approval of BLM and the ~~Energy Commission staff~~ CPM. The draft Weed

Management Plan submitted by the applicant (CH2M Hill 2008e) shall provide the basis for the final plan, subject to review ~~and revisions~~ and approval from BLM and the CPM~~Energy Commission staff~~, in consultation with USFWS, and CDFG. In addition to describing weed eradication and control methods, and a reporting plan for weed management during and after construction, the final Weed Management Plan shall include at least the following Best Management Practices to prevent the spread and propagation of noxious weeds:

1. Limit the size of any vegetation and/or ground disturbance to the absolute minimum, and limit ingress and egress to defined routes.

2. Maintain vehicle wash and inspection stations and closely monitor the types of materials brought onto the site.

3. Reestablish vegetation quickly on disturbed sites.

4. Monitoring and rapid implementation of control measures to ensure early detection and eradication for weed invasions.

5. Use only weed-free straw or hay bales used for sediment barrier installations, and weed-free seed.

6. Reclamation and revegetation shall occur on all temporarily disturbed areas, including pipelines, transmission lines, and staging areas.

Verification: At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide BLM's Authorized Officer and the CPM with the final version of a Weed Management ~~Plan that has been reviewed and approved by BLM, and Energy Commission staff, USFWS, and CDFG~~. BLM's Authorized Officer and the CPM will determine the plan's acceptability within 15 days of receipt of the final plan. All modifications to the approved Weed Control Plan must be made only after consultation with the CPM ~~Energy Commission staff~~, and BLM's Authorized Officer, in consultation with USFWS, and CDFG. ~~The project owner shall notify the CPM no less than 5 working days before implementing any BLM- and CPM-approved modifications to the Weed Management Plan.~~

Within 30 days after completion of project construction, the project owner shall provide to BLM's Authorized Officer and the CPM for review and approval, a written report identifying which items of the Weed Management Plan have been completed, a summary of all modifications to mitigation measures made during the project's construction phase, and which items are still outstanding.

Page 59, BIO-14

CLOSURE, REVEGETATION AND REHABILITATION PLAN

Staff's proposed edits to BIO-14 are to provide consistency with the March 29, 2010 version agreed to by staff and applicant, and to provide updated specifications in Part 11 of the Condition as shown in yellow highlight.

BIO-14 The project owner shall develop and implement a revised Closure, Revegetation and Rehabilitation Plan (Plan) in cooperation with BLM and Energy Commission staff~~, USFWS and CDFG~~ to guide site restoration and closure activities, including methods proposed for revegetation of disturbed areas immediately following construction and rehabilitation and revegetation upon closure of the facility. This plan must address preconstruction salvage and relocation of succulent vegetation from the site to ~~either~~ an onsite ~~or nearby~~ nursery facility for storage and propagation of material to reclaim disturbed areas. In the case of unexpected closure, the plan ~~should~~ assumes restoration activities ~~c~~would possibly take place prior to the anticipated ~~lifespan~~ closure of the plant. The Plan shall address all issues discussed in **Biological Resources Appendix -~~A~~B**: *Issues to Address in the ~~Revisions to Draft~~ Closure, Revegetation and Rehabilitation Plan*, and shall include but is not limited to the following elements in the revised plan:

1. Plan Purpose: The plan shall explicitly identify the objective of the revegetation plan to be re-creation of the types of habitats lost during construction and operation of the proposed solar energy facility. The final revegetation plan shall include introduction of mid- to late-successional species.

2. Standards/Monitoring: Performance standards for success thresholds, weed cover, performance monitoring methods and schedule, and maintenance monitoring in the revised Plan shall be conducted as described in **Biological Resources Appendix B**.

3. Baseline Surveys – Baseline vegetation surveys for planning restoration efforts shall be conducted as described in **Biological Resources Appendix B.**

4. Vegetation Clearing: Clearing of vegetation shall be limited to areas for which final maps are provided to BLM before approval of the ROW. Clearing of vegetation will be permitted on roads, utility routes, heliostat maintenance pathways, building and parking areas, and temporary staging areas provided these are specifically documented on a georeferenced construction alignment drawing or aerial photo or shape file, showing the exact locations of soil disturbance. BLM will consider relocating specific installations prior to the beginning of construction and during construction on a case by case basis but will not approve additional acreage beyond that addressed in the current application.

5. Vegetation Mowing; Vegetation mowing shall be limited to areas adjoining vehicle pathways used for heliostat installation to allow installation of the heliostat pylon and allow for tracking clearance under the heliostat. Vegetation mowing may be repeated during the life of the facility to maintain appropriate clearance for heliostat tracking.

6. Succulent Salvage: The revised Plan shall include a table that shows proposed succulent salvage by species the number of plants onsite, the lower threshold height for salvage, the number in each size class, and the fate of plants not salvaged. An inventory and map of proposed succulent transplants shall be provided as described in Appendix A. Information gained from succulent transplant experience gained in ISEGS 1 shall be applied to future salvage operations, as described in **Biological Resources Appendix B**.

7. Seed Handling: Seed collection, testing and application shall be conducted as described in **Biological Resources Appendix B**, with collection areas within 10 miles of the project boundaries and on similar terrain, soil, exposure, slope, and elevation to the project site.

8. Soil Preparation: Soil descriptions, compaction measurements, mulch application, soil storage, seed farming, mycorrhizal inoculation, and biological crust collection and storage shall be conducted as described in **Biological Resources Appendix B.** Soil stockpiles shall not be placed on areas that support special-status plant species or other sensitive biological resources.

9. Weed Management. Weed management activities needed to control weeds resulting from mirror washing shall be conducted as described in **Biological Resources Appendix B**.

10. Final Closure Plan**.** A Final Closure Plan, which addresses the final revegetation and rehabilitation activities upon closure and decommissioning of the project, shall be completed as part of the revised Plan. The Final Closure Plan shall include a cost estimate, adjusted for inflation, reflecting the costs of the revegetation, rehabilitation, and monitoring for the duration of time estimated to achieve the objective of re-creating plant communities impacted by the project.

11. The project owner shall implement the Closure, Revegetation, and Rehabilitation Plan, Revision 3, dated July 6, 2010, with the following modifications.

    a. The long-term soil stockpiles, as discussed in Table 5-2 of the Plan, shall be no higher than 6 feet.

    b. The Preliminary Seeding Plan for Short-Term Disturbed Areas, and to be used as the basis for the seeding during final project decommissioning, shall be based upon the species list provided in Table 7-1 of the Plan rather than the species list in Table 7-2. The list may be modified at the time of decommissioning based on seed availability.

c. Concrete will be removed to a minimum depth of 6 feet unless it is shown that a particular area is prone to flood hazards and a greater depth for concrete removal should be required. All concrete removed shall be hauled off the project site and disposed of in an approved facility. Crushed concrete shall not be used as backfill on the site during decommissioning.

d. Succulents salvaged during project construction shall not be sold by the project owner. Should excess succulents be removed that cannot be transplanted in the Succulent Nursery Area, their disposition will be managed by BLM.

Verification: No more than 30 days from the Energy Commission Decision and BLM Record of Decision the project owner shall provide BLM’s Authorized Officer and the CPM with a draft version of the revised Closure, Revegetation and Rehabilitation Plan. At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide BLM’s Authorized Officer and the CPM with the final version of the Closure, Revegetation and Rehabilitation Plan that has been reviewed and approved by BLM’s Authorized Officer~~, USFWS, CDFG,~~ and the CPM ~~Energy Commission staff~~. All modifications to the approved Revegetation and Reclamation Plan must be made only after consultation with BLM’s Authorized Officer and~~,~~ the CPM~~, USFWS and CDFG~~. ~~The project owner shall notify BLM’s Authorized Officer and the CPM and no less than 5 working days before implementing any BLM- and CPM-approved modifications to the Closure, Revegetation and Rehabilitation Plan.~~

Within 30 days after completion of project construction for each phase of development, the project owner shall provide to BLM’s Authorized Officer and the CPM for review and approval, a written report identifying which items of the Closure, Revegetation and Rehabilitation Plan have been completed, a summary of all modifications to mitigation measures made during the project’s construction phase, and which items are still outstanding.

At least one year prior to planned closure and decommissioning the project owner shall submit to the BLM-Authorized Officer and the CPM a final Closure Plan for review to determine if revisions are needed. The project owner shall incorporate all required revisions to the final Closure Plan and submit to the BLM-Authorized Officer and the CPM no less than 90 days prior to the start of ground disturbing activities associated with closure and decommissioning activities.

Page 64, BIO-17

DESERT TORTOISE COMPENSATORY MITIGATION

Staff's proposed edits are to provide consistency with the March 29, 2010 version agreed to by staff and applicant, to provide additional clarity and to update according to the latest guidance from wildlife agencies.

BIO-17 To fully mitigate for habitat loss and potential take of desert tortoise, the project owner shall provide compensatory mitigation at a 3:1 ratio for impacts to ~~4,073~~ 3,582 acres or the area disturbed by the final project footprint. At least two thirds of the 3:1 mitigation requirement ~~to satisfy the Energy Commission's Complementary Mitigation Measures~~ shall be achieved by acquisition, in fee title or in easement, of no less than ~~8,146~~ 7,164 acres of land suitable for desert tortoise or two thirds of the area disturbed by the final project footprint. The Energy Commission's compensatory mitigation requirement consists of habitat acquisition at a 2:1 ratio ~~and is complementary~~ as well as the BLM's 1:1 desert tortoise mitigation approach of habitat enhancement. The project owner shall provide funding for the acquisition, initial habitat improvements and long-term management ~~endowment of~~ for the~~se~~ Energy Commission's ~~complementary~~ compensation lands. The remaining third of the 3:1 compensatory mitigation, to satisfy BLM's mitigation requirements and the balance of the Energy Commission's mitigation requirements, shall be developed in accordance with BLM's desert tortoise mitigation requirements as described in the Northern and Eastern Mojave Desert Management Plan (BLM 2002). BLM's compensatory mitigation plan, serving as one third of the 3:1 mitigation ratio required to satisfy CESA, consists of~~would include acquisition of up to 4,073 acres of land within the Eastern Mojave Recovery Unit, or~~ desert tortoise habitat enhancement including installation of at least 50 miles of desert tortoise exclusion fencing on roadways in the Northeastern Mojave Recovery Unit, and habitat restoration of at least 50 routes within the Desert Wildlife Management Area.~~or rehabilitation activities that meet BLM, CDFG, USFWS and Energy Commission approval, or some combination of the two.~~ In lieu of acquiring lands and implementing the fencing and habitat enhancement described above, the project owner may satisfy the requirements of this condition by depositing funds into the Renewable Energy Action Team (REAT) Account established with the National Fish and Wildlife Foundation (NFWF) in an amount ~~equivalent to~~ that is the sum of: 1) BLM's compensatory mitigation cost covering the cost of fencing and route restoration; and 2) the costs of acquiring, enhancing and managing the Energy Commission compensation lands and 3) the Long-Term Maintenance of Fencing and Habitat Restoration Fee, as described below in #6. The Energy Commission requirements for acquisition of ~~8,146~~ 7,164 acres of compensation lands and maintenance of fencing and habitat enhancements shall include the following:

1. Responsibility for Acquisition of Compensation Lands: The responsibility for acquisition of compensation lands may be delegated ~~by written~~

~~agreement from the Energy Commission and CDFG~~to a third party, such as a non-governmental organization supportive of Mojave Desert habitat conservation. Such delegation shall be subject to approval in writing by the CPM ~~and CDFG~~, in consultation with BLM, CDFG and USFWS, prior to land acquisition, enhancement or management activities. If habitat disturbance exceeds that described in this analysis, the project owner shall be responsible for funding acquisition, habitat improvements and long-term management of additional compensation lands or additional funds required to compensate for any additional habitat disturbances. Additional funds shall be based on the adjusted market value of compensation lands at the time of construction to acquire and manage habitat. Water and mineral rights shall be included as part of the land acquisition. Agreements to delegate land acquisition to CDFG or an approved third party and to manage compensation lands shall be implemented within 18 months of the Energy Commission's decision.

2. Selection Criteria for Compensation Lands. The compensation lands selected for acquisition shall:

   a. be as close to the project site as possible;

   b. provide good quality habitat for desert tortoise with capacity to regenerate naturally when disturbances are removed;

   c. be near larger blocks of lands that are either already protected or planned for protection, or which could feasibly be protected long-term by a public resource agency or a non-governmental organization dedicated to habitat preservation;

   d. be connected to lands currently occupied by desert tortoise, ideally with populations that are stable, recovering, or likely to recover;

   e. not have a history of intensive recreational use or other disturbance that might make habitat recovery and restoration infeasible;

   f. not be characterized by high densities of invasive species, either on or immediately adjacent to the parcels under consideration, that might jeopardize habitat recovery and restoration, and

   g. not contain hazardous wastes.

3. Review and Approval of Compensation Lands Prior to Acquisition. A minimum of three months prior to acquisition of the property, the project owner shall submit a formal acquisition proposal to the CPM, CDFG, USFWS and BLM describing the parcel(s) intended for purchase. This acquisition proposal shall discuss the suitability of the proposed parcel(s) as compensation lands for desert tortoise in relation to the criteria listed above. Approval from ~~CDFG and~~ the CPM, in consultation with BLM,

CDFG and the USFWS, shall be required for acquisition of all parcels comprising the ~~8,146~~ 7,164 acres.

4. Energy Commission Compensation Land ~~Complementary~~ Mitigation Security. The project owner shall provide financial assurances to the CPM and CDFG with copies of the document(s) to BLM and the USFWS, to guarantee that an adequate level of funding is available to implement the Energy Commission ~~Complementary~~ compensation land ~~M~~mitigation ~~Measures~~ requirement described in this condition (Condition of Certification **BIO-17**). These funds shall be used solely for implementation of the measures associated with the project. Alternatively, financial assurance can be provided to the CPM and CDFG in the form of an irrevocable letter of credit, a pledged savings account or another form of security ("Security") prior to initiating ground-disturbing project activities. Prior to submittal to the CPM, the Security shall be approved by ~~CDFG and~~ the CPM, in consultation with BLM, CDFG and the USFWS, to ensure funding in the amount of ~~$20,446,460~~ $24,556,482. This Security amount was calculated in accordance with the REAT Biological Resource Compensation/Mitigation Cost Estimate Breakdown for use with the REAT-NFWF Mitigation Account dated July 23, 2010. This Security estimate is based on the most current guidance from the REAT agencies (*Desert Renewable Energy REAT Biological Resource Compensation/Mitigation Cost Estimate Breakdown for use with the REAT-NFWF Mitigation Account, July 23, 2010*) and may be revised with updated information. This Security estimate reflects the amount that would be required for Security if the project owner acquired the 7,164 acres of mitigation lands itself. If the project owner elected to satisfy this mitigation requirement through the REAT Account, NFWF would require additional administrative costs estimated at $570,938, bringing the total required Security to $25,127,420.

5. Actual Cost. The actual cost to comply with this condition will vary depending on the final footprint of the Project, and the actual costs of acquiring, improving and managing the compensation lands. Regardless of actual cost, the project owner shall be responsible for implementing all aspects of this condition. ~~as follows and may be revised upon completion of a Property Analysis Record (PAR) or PAR-like analysis of the proposed compensation lands:~~

   ~~h. land acquisition costs for compensation lands, calculated at $910/acre = $7,412,860;~~

   ~~i. costs of initial habitat improvements to compensation lands, calculated at $250/acre = $2,036,500;~~

   ~~j. costs of establishing an endowment for long-term management of compensation lands, calculated at $1,350/acre = $10,997,100; and~~

   ~~k. total security = $20,446,460.~~

6. Compensation Lands Acquisition Conditions The project owner shall comply with the following conditions relating to acquisition of the Energy Commission ~~Complementary Mitigation~~ compensation lands after the CDFG and the CPM, in consultation with BLM and the USFWS, have approved the proposed compensation lands and received Security as applicable and as described above.

   a. Preliminary Report: The project owner, or approved third party, shall provide a recent preliminary title report, initial hazardous materials survey report, biological analysis, and other necessary documents for the proposed ~~8,146~~ 7,164 acres. All documents conveying or conserving compensation lands and all conditions of title/easement are subject to a field review and approval by ~~CDFG and~~ the CPM, in consultation with BLM, CDFG and the USFWS, California Department of General Services and, if applicable, the Fish and Game Commission and/or the Wildlife Conservation Board.

   b. Title/Conveyance: The project owner shall transfer fee title or a conservation easement to the ~~8,146~~ 7,164 acres of compensation lands to CDFG under terms approved by CDFG. Alternatively, a non-profit organization qualified to manage compensation lands (pursuant to California Government Code section 65965) and approved by CDFG and the CPM may hold fee title or a conservation easement over the habitat mitigation lands. If the approved non-profit organization holds title, a conservation easement shall be recorded in favor of CDFG in a form approved by CDFG. If the approved non-profit holds a conservation easement, CDFG shall be named a third party beneficiary. If a Security is provided, the project owner or an approved third party shall complete the proposed compensation lands acquisition within 18 months of the start of project ground-disturbing activities.

   c. Initial Habitat Improvement Fund. The project owner shall fund the initial protection and habitat improvement of the ~~8,146~~ 7,164 acres. Alternatively, a non-profit organization may hold the habitat improvement funds if they are qualified to manage the compensation lands (pursuant to California Government Code section 65965) and if they meet the approval of ~~CDFG and~~ the CPM in consultation with CDFG. If CDFG takes fee title to the compensation lands, the habitat improvement fund must go to CDFG.

   d. Long-term Management ~~Endowment~~ and Maintenance Fund. Prior to ground-disturbing project activities, the project owner shall provide to CDFG a non-wasting capital ~~endowment~~ long-term management and maintenance fee in the amount determined through the Property Analysis Record (PAR) or PAR-like analysis that will be conducted for the ~~8,146~~ 7,164 acres. ~~The project owner's financial responsibility for the actual cost of mitigation shall not increase by more than 25% of the Security Amount ($20,446,460).~~ Alternatively, a non-profit organization may hold the ~~endowment~~ long-term management and maintenance fees if they are qualified to manage the compensation lands (pursuant to California Government Code section 65965) and if they meet the approval of ~~CDFG and~~ the CPM in consultation with CDFG. If CDFG takes fee title to the compensation lands, the ~~endowment~~ long-term management and maintenance fee must go to CDFG, where it will be held in the special deposit fund established pursuant to California Government Code section 16370. If the special deposit fund is not used to manage the ~~endowment,~~ long-term management and maintenance fund, the California Wildlife Foundation or similarly approved entity identified by CDFG shall manage the long-term management and maintenance fund ~~endowment~~ for CDFG and with CDFG supervision.

e. Interest, Principal, and Pooling of Funds. The project owner, CDFG and the CPM shall ensure that an agreement is in place with the ~~endowment~~ long-term management and maintenance fund holder/manager to ensure the following conditions:

- Withdrawal of Principal. The ~~endowment~~ long-term management and maintenance fund principal shall not be drawn upon unless such withdrawal is deemed necessary by the CDFG or the approved third-party ~~endowment~~ long-term management and maintenance fund manager to ensure the continued viability of the species on the ~~8,146~~ 7,164 acres. If CDFG takes fee title to the compensation lands, monies received by CDFG pursuant to this provision shall be deposited in a special deposit fund established pursuant to Government Code section 16370. If the special deposit fund is not used to manage the ~~endowment~~ long-term management and maintenance fund, the California Wildlife Foundation or similarly approved entity identified by CDFG will manage the ~~endowment~~ long-term management and maintenance fund for CDFG with CDFG supervision.
- Pooling ~~Endowment~~ Long-Term Management and Maintenance Funds. CDFG, or a CPM and CDFG approved non-profit organization qualified to hold ~~endowments~~ long-term management and maintenance fund pursuant to California Government Code section 65965, may pool the ~~endowment~~ long-term management and maintenance fund with other ~~endowments~~ such funds for the operation, management, and protection of the ~~8,146~~ 7,164 acres for local populations of desert tortoise. However, for reporting purposes, the ~~endowment~~ long-term management and maintenance fund must be tracked and reported individually to the CDFG and CPM.
- Reimbursement Fund. The project owner shall provide reimbursement to CDFG or an approved third party for reasonable expenses incurred during title, easement, and documentation

review; expenses incurred from other state or state approved federal agency reviews; and overhead related to providing compensation lands.

7. Long-term Maintenance of Fencing and Habitat Restoration. In addition to the funding described above for the acquisition, enhancement and management of the Energy Commission compensation lands, the Project owner shall provide sufficient funds to maintain the habitat improvements required by BLM for the ISEGS project, including fencing of roads in the Northeastern Mojave Recovery Unit, and habitat restoration of routes in the Desert Wildlife Management Area. The maintenance shall occur as long as the roads continue to operate as functional roadways and for the duration of project impacts. This long-term maintenance fee shall be calculated upon completion of a Property Analysis Record (PAR) or PAR-like analysis of the proposed enhancement actions, and shall be sufficient to fund annual inspections and repairs/maintenance of all fencing and habitat improvements completed as part of the BLM mitigation requirements for the ISEGS project.

   The Project owner may choose to satisfy its mitigation obligations identified in this Decision by paying an in lieu fee instead of acquiring compensation lands, pursuant to Fish and Game code sections 2069 and 2099 or any other applicable in-lieu fee provision, to the extent the in-lieu fee provision is found by the Commission to be in compliance with CEQA and CESA requirements.

Verification: The Project owner shall provide the CPM with written notice at least 30 days prior to the start of ground-disturbing activities on the Project site.

If purchase of 7,164 acres of mitigation lands as described in this condition is not completed at least 30 days prior to the start of ground-disturbing activities, the Project owner shall provide the CPM with approved Security at least 30 days prior to the start of ground-disturbing activities. The Security shall be $24,556,482 or the amount calculated based on the most current REAT Biological Resource Compensation /Mitigation Cost Estimate available at the time of deposit of the Security.

If the project owner elected to satisfy the mitigation requirement for purchase of 7,164 acres through the REAT-NFWF Account, the total required Security shall be $25,127,420 (or the amount calculated based on the most current REAT Biological Resource Compensation/Mitigation Cost Estimate, including NFWF fees, available at the time of deposit of the Security). The project owner shall provide documentation of deposit of the required security to the REAT-NFWF Account at least 30 days prior to start of ground-disturbing activities on the project site.

At least 60 days prior to ground-disturbing project activities the project owner shall provide to the CPM for review and approval a Property Analysis Record (PAR) or PAR-like analysis to establish the appropriate amount for the long-term maintenance fee to fund maintenance of the proposed enhancement actions (desert tortoise exclusion fencing and DWMA route restoration). The project owner shall deposit the long-term maintenance fee into the REAT-NFWF account or another third-party recipient acceptable to the CPM and CDFG within 18 months of the Energy Commission decision.

Starting with the first year following construction and continuing for the duration of project impacts, the project owner shall provide to the CPM and CDFG an annual report describing: the results of the annual inspection of fencing and rehabilitated routes; a summary of fence repairs and maintenance of reclaimed routes completed during the year; and recommendations and a cost estimate for repairs and maintenance activities needed for the upcoming year.

A minimum of three months prior to acquisition of the property, the project owner shall submit a formal acquisition proposal to the CPM, CDFG, USFWS and BLM describing the parcels intended for purchase.

No later than 18 months following the publication of the Energy Commission Decision the project owner shall provide written verification to the CPM and CDFG that the Energy Commission ~~Complementary Mitigation~~ compensation lands or conservation easements have been acquired and recorded in favor of the approved recipient(s). ~~Alternatively, no later than 30 days prior to beginning project ground-disturbing activities, the project owner shall provide written verification of Security in accordance with this condition of certification.~~ ~~If Security is provided, t~~The project owner, or an approved third party, shall complete and provide written verification of the proposed compensation lands acquisition within 18 months of the start of project ground-disturbing activities. If NFWF or another approved third party is being used for the acquisition, the project owner shall ensure that funds needed to accomplish the acquisition are transferred in timely manner to facilitate the planned acquisition and to ensure the land can be acquired and transferred prior to the 18-month deadline. Within six months of the land or easement purchase, as determined by the date on the title, the project owner, or an approved third party, shall provide CDFG and the CPM with a management plan for the Energy Commission ~~Complementary Mitigation~~ compensation lands and associated funds. ~~CDFG and t~~The CPM shall review and approve the management plan, in consultation with CDFG, BLM and the USFWS.

Within 90 days after completion of project construction, the project owner shall provide to the CPM and CDFG an analysis with the final accounting of the amount of habitat disturbed during project construction. If habitat disturbance exceeds ~~4,073~~ 3,582 acres, the project owner shall provide a compensation plan to the CMP ~~and CDFG~~ for their review and approval, in consultation with CDFG, BLM and the USFWS. The compensation plan shall be submitted no later than 90 days from the CPM's receipt of the final accounting, and shall include a description of additional funds required or lands that must be purchased to compensate for the unanticipated habitat disturbances, and a schedule for that acquisition or funding inclusive of all associated long-term management and maintenance fund ~~endowment~~ and enhancement costs. The amount of funding for habitat acquisition, initial habitat improvement, and long-term management ~~endowment~~ shall be calculated at the adjusted market value at the time of construction. ~~The project owner's financial responsibility for the actual cost of mitigation shall not increase by more than 25 percent of the Security Amount ($20,446,460).~~

If the project owner elects to satisfy its mitigation obligations by paying an in-lieu fee instead of acquiring compensation lands, pursuant to Fish and Game code sections 2069 and 2099 or any other applicable in-lieu fee provision, the Project owner shall notify the Commission that it would like a determination that the Project's in-lieu fee proposal meets CEQA and CESA requirements.

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Special-Status Plant Impact Avoidance And Minimization

Staff's proposed edits are to provide consistency with the March 29, 2010 version agreed to by staff and applicant and to remove reference to small-flowered androstephium.

BIO-18 The project owner shall implement the following measures to avoid and minimize impacts to special-status plant species. Items 2, 3, 5, 6, 7, ~~and~~ 10, and 11 are recommended exclusively by Energy Commission staff.

1. On-Site Plant Avoidance/Minimization Areas: To the extent feasible the project owner shall avoid and minimize disturbance to all special-status plant species within the project site. Impact avoidance (i.e., protection from project-related impacts of any kind through removal of acreage from the project footprint) and impact minimization efforts shall occur in all feasible locations. Impact avoidance shall focus on areas that support the highest density and diversity of special-status plant species and shall remove, at a minimum, ~~but shall focus in particular on~~ the three areas totaling 476 acres and labeled "Rare Plant Mitigation Area" in **Project Description Figure 13** from the project footprint. The natural gas pipeline shall be aligned and narrowed to avoid special-status plant occurrences north of Ivanpah 3 as depicted in **Project Description Figure 13**. Impact minimization shall be conducted throughout the site. ~~depicted in **Biological Resources Figure 2** that indicate the highest densities of Mojave milkweed, Rusby's desert-mallow, desert pincushion, nine-awned pappus grass, and Parish's club-cholla. The highest priorities for protection shall be small-flowered androstephium,~~ Impact minimization within the solar field shall consist of protecting small perimeters ("halos") around Mojave milkweed, desert pincushion, and Rusby's desert-mallow plants as indicated in the applicant's January 2010 draft plant (Exhibit 81, Appendix B). ~~The project owner shall implement all feasible impact avoidance and minimization measures within the following areas:~~

   ~~a. ISEGS 1 and 3: Reconfigure project features to the extent feasible within the northern portions of ISEGS 1 and 3 to avoid areas that support the highest density and diversity of special-status plant species.~~

   ~~b. Construction Logistics Area: Reconfigure the layout and design of the Construction Logistics Area to maximize protection of high density and diversity special-status plant areas.~~

~~c. Natural Gas Pipeline: Adjust the alignment of the proposed 75-foot wide natural gas pipeline and narrow the construction footprint to avoid special-status plant occurrences north of ISEGS 3.~~

2. Protection Goals : The project owner shall implement all feasible measures to protect 75 percent of the individuals of ~~small-flowered androstephium,~~ Mojave milkweed, Rusby's desert-mallow, desert pincushion, nine-awned pappus grass, and Parish's club-cholla within the project area (as mapped in Figure 5-3 of the applicant's final botanical survey report [CH2M Hill 2008x]). Each year during construction the measurement of percent protection achieved shall be calculated based on a comparison of numbers of individuals of each of these five species present in this area identified before construction compared to numbers remaining post –construction. These pre- and post-construction plant numbers shall be based on floristic surveys conducted by a qualified botanist.

3. Identify and Establish Special-Status Plant Protection Areas: The project owner shall identify Special-Status Plant Protection Areas ~~within~~ for exclusion from the project footprint and avoidance of project-related impacts of any kind ~~as needed~~ to ~~achieve~~ facilitate achieving the 75 percent protection goal. To accurately identify the ~~locations~~ boundaries of these areas, pre-construction floristic surveys shall be conducted by a qualified botanist at the appropriate time of year for special-status plant identification including both spring and summer/fall blooming periods. The surveys shall encompass at a minimum the three areas totaling 476 acres and labeled "Rare Plant Mitigation Area" in **Project Description Figure 13** ~~all the high plant density areas depicted in~~ ~~**Biological Resources Figure 2**~~ and shall extend 150 feet on both sides of the proposed gas pipeline alignment and 250 feet out from the project fenceline. The locations of the Special-Status Plant Protection Areas shall be clearly depicted on all final maps and project drawings and descriptions for exclusion of all project activities.

4. Protection of Adjacent Occurrences: The project owner shall identify special-status plants occurrences within 250 feet of the project fenceline during the pre-construction plant surveys described above. A qualified botanist shall delineate the boundaries of these special status plant occurrences prior to the initiation of ground disturbing activities. These flagged special status plant occurrences shall be designated as Environmentally Sensitive Areas on plans and specifications, and shall be protected from accidental impacts during construction (e.g. vehicle traffic, temporary placement of soils or vegetation) and from the indirect impacts of project operation (e.g., herbicide spraying, changes in upstream hydrology, etc).

5. Develop and Implement a Special-Status Plant Protection and Monitoring Plan : The project owner shall develop and implement a Special-Status

Plant Protection and Monitoring Plan for special-status plants occurring within the Special-Status Plant Protection Areas and on-site areas designated for impact minimization. The goal of the Special-Status Plant Protection and Monitoring Plan shall be to maintain the special-status plant species ~~within the Special-Status Plant Protection Areas~~ as healthy, reproductive populations that can be sustained in perpetuity. At a minimum, the Special-Status Plant Protection and Monitoring Plan shall:

- establish baseline conditions and numbers of the plant occurrences in all protected areas (i.e., those to be excluded from the footprint and on-site areas to be protected) ~~within the Special-Status Plant Protection Areas~~ and success standards for protection of special-status plant occurrences ~~within the Plant Protection Areas;~~
- provide information about microhabitat preferences and fecundity, essential pollinators, reproductive biology, and propagation and culture requirements for each special-status species;
- describe measures (e.g., fencing, signage) to avoid direct construction and operation impacts to special-status plants within all protected areas ~~the Special-Status Plant Protection Areas~~;
- describe measures to avoid or minimize indirect construction and operations impacts to special-status plants within ~~the Special-Status Plant Protection Areas~~ protected areas (e.g., runoff from mirror-washing, use of soil stabilizers/tackifiers, alterations of hydrology from drainage diversions, erosion/sedimentation from disturbed soils upslope, herbicide drift, the spread of non-native plants, etc).
- provide a monitoring schedule and plan for assessing the numbers and condition of special-status plants ~~within the Special-Status Plant Protection Areas~~; and
- identify specific triggers for remedial action (e.g., numbers of plants dropping below a threshold);

6. Develop Special-Status Plant Remedial Action Plan: The project owner shall develop a detailed Special-Status Plant Remedial Action Plan to be implemented if special-status plants within the ~~Plant Protection Areas~~ 476 acres of protected area and on-site minimization “halos” fail to meet success standards described in the Special-Status Plant Protection and Monitoring Plan. The Plant Remedial Action Plan shall include specifications for ex-situ/offsite conservation of seed and other propagules, and the seed bank and other symbionts contained in the topsoil where these plants occur. The remedial measures described in the Plant Remedial Action Plan shall not substitute for plant protection or other mitigation measures. The Special-Status Plant Remedial Action Plan shall include, at a minimum:

   - guidelines for pre-construction seed collection (and/or other propagules) for each ~~of the five~~ species;

- specifications for collecting, storing, and preserving the upper layer of soil containing seed and important soil organisms;
- detailed replacement planting program with biologically meaningful quantitative and qualitative success criteria (see Pavlik 1996), monitoring specifications, and triggers for remedial action; and
- ecological specifications for suitable planting sites.

7. Seed Collection: Implementation of the Special-Status Plant Remedial Action Plan would require a source of local source of seeds/propagules. In addition, seed collection would serve to preserve germplasm in the event that all mitigation fails. The project owner shall develop and implement a Seed Collection Plan to collect and store seed for ~~small-flowered androstephium,~~ Mojave milkweed, Rusby's desert-mallow, desert pincushion, nine-awned pappus grass, and Parish's club-cholla. The source of these seeds shall be from plants proposed for removal within the project footprint. The project owner shall engage the services of a qualified contractor approved by the CPM to undertake seed collection and storage.

8. Gas Pipeline Revegetation and Monitoring: In the natural gas pipeline construction corridor where disturbed soils will be revegetated, the topsoil excavated shall be segregated, kept intact, and protected, under conditions shown to sustain seed bank viability. At a minimum, the top 2 cm of the soil shall be separately stored and preserved. Topsoil salvage, storing, and replacement shall be replaced in its original vertical orientation following pipeline installation ensuring the integrity of the top 2 cm in particular. The project owner shall prepare a Gas Pipeline Revegetation and Monitoring Plan targeted at re-establishment of Rusby's desertmallow, desert pincushion, Mojave milkweed, and potentially other special-status plant species. The Gas Pipeline Revegetation and Monitoring Plan shall identify success criteria for re-establishment and shall continue for a period of no less than 10 years until the defined success criteria are achieved. The Gas Pipeline Revegetation and Monitoring Plan shall include measures for seeding or other remedial actions. If no individuals of Rusby's desert-mallow, desert pincushion, or Mojave milkweed, are located during the first year of monitoring, the project owner shall conduct supplemental seeding or other remedial measures in the area disturbed by natural gas pipeline installation.

9. Surveys on Acquired and Public Lands: The project owner shall conduct floristic surveys for Rusby's desert-mallow and Mojave milkweed on all lands that will be acquired as part of the desert tortoise compensatory mitigation requirements (see Condition of Certification **BIO-17**). ~~Similar surveys shall be conducted for small-flowered androstephium, desert pincushion, nine-awned pappus grass, and Parish's club-cholla for those species for which the 75 percent on-site avoidance goal has not been achieved.~~ The goal of the surveys shall be to identify at least the same number of occurrences on off-site compensation or public lands as the

number of occurrences in the project area excluding the occurrences in the Special-Status Plant Protection Areas in **Project Description Figure 13** ~~were impacted by the ISEGS project~~. If this goal is not met by surveys on proposed acquisition lands, additional surveys shall be conducted within suitable habitat on public lands ~~until the same number of occurrences of each species that were impacted are identified~~. To be counted toward fulfillment of the goal the occurrences must reflect new data not previously documented in other survey efforts. The survey requirements shall include the following:

- All surveys shall be conducted by a qualified botanist in accordance with BLM, CDFG, and CNPS plant survey guidelines;
- Surveys shall occur the first spring after construction begins and continue each year for a maximum of ten years until the same number of ~~special-status plant~~ Mohave milkweed and Rusby's desert-mallow occurrences are identified on acquisition lands and/or ~~BLM~~ public lands as located outside Special-Status Plant Protection Areas ~~as were impacted, or predicted to be impacted based on final site design, by the ISEGS project construction and operation;~~
- For each year surveys are conducted yearly survey results shall be provided to the CPM, BLM's Authorized Officer and CDFG, and shall include CNDDB field survey forms for all special-status plant species encountered during the surveys; and
- All field survey forms shall be submitted to the CNDDB at the time of submittal to the CPM, BLM and CDFG.
- ~~For each of the species for which surveys were conducted, t~~The project owner's qualified botanist shall submit a completion report documenting fulfillment of the target goals and which describe the number of new, previously undiscovered occurrences identified and mapped. Locations shall be reported with GPS coordinates compatible with inclusion in a GIS database.

10. Security for Implementation of Plans: The project owner shall provide security adequate to fund implementation of the Special-Status Plant Protection and Monitoring Plan, the Special-Status Plant Remedial Action Plan for the life of the project, as well as the Seed Collection Plan, and the Gas Pipeline Revegetation Monitoring Plan.

11. Acquire Off- Site Occurrence of Mojave Milkweed or Adjacent Land: The project owner shall acquire, in fee or in easement, a parcel or parcels of land that includes at least 30 acres supporting a viable occurrence of Mojave milkweed (or suitable habitat adjacent to a known occurrence). The terms and conditions of this acquisition or easement shall be as described in Condition of Certification **BIO-17** with the additional criteria that the Mojave milkweed mitigation lands: 1) provide habitat for the

special-status plant species that is of similar or better quality (e.g., in terms of native plant composition) than that impacted; 2) contain OR abut a known occurrence of Mojave milkweed, ideally with populations that are stable, recovering, or likely to recover, that shares the same watershed as the land; and 3) be adequately sized and buffered to support self-sustaining special-status plant populations. These mitigation lands may be included with the desert tortoise mitigation lands ONLY if the above criteria are met. **Estimated security for acquisition of compensation lands for Mojave milkweed is $109,618**. If sufficient new Mojave milkweed occurrences are discovered on desert tortoise compensation lands (not public lands) in accordance with item 9 above prior to acquiring this land, the associated security shall be refunded to the project owner.

Verification: No less than 30 days following the publication of the Energy Commission Decision the project owner shall submit final maps and design drawings depicting the location of Special-Status Plant Protection Areas within and adjacent to the project site, and shall identify the species and numbers of plants within each of the Special-Status Plant Protection Areas.

No less than 30 days following the publication of the Energy Commission Decision the project owner shall submit draft versions of the Special-Status Plant Protection and Monitoring Plan, the Special-Status Plant Remedial Action Plan, the Seed Collection Plan, and the Gas Pipeline Revegetation Monitoring Plan for review by the CPM, BLM's Authorized Agent, and CDFG. The project owner shall also provide a cost estimate for implementation of these plans which is subject to approval by the CPM, BLM's authorized agent, and the CDFG. The final plans shall be submitted for approval by the CPM, in consultation with BLM's Authorized Agent, CDFG, and CNPS within 90 days of the publication of the Commission Decision. The final plans shall be incorporated into the BRMIMP. At this time, the project owner shall also provide security sufficient to fund the implementation of the plans.

Within 30 days of the start of construction, the project owner shall submit copies of the contract with the CPM-approved seed contractor and the check for seed collection and curation fees to the CPM.

The project owner shall identify special-status plants occurrences within 250 feet of the project fence line during the pre-construction plant surveys described above. A qualified botanist shall delineate the boundaries of these special status plant occurrences at least 30 days prior to the initiation of ground disturbing activities.

On January 31st of each year following construction the project owner's qualified botanist shall submit a report, including CNDDB field survey forms, describing the results of off-site plant surveys for Mojave milkweed and Rusby's desert-mallow to the BLM's authorized officer, the CPM, CDFG, and CNDDB. Submittal of survey reports shall continue for a maximum of 10 years until the same number of occurrences in the project area excluding the occurrences in the Special-Status Plant Protection Areas ~~impacted by the project for small-flowered androstephium , Rusby's desert-mallow and~~

~~Mojave milkweed~~ are identified on these off-site lands. ~~as were impacted by the project. Similar reports shall be submitted for desert pincushion, nine-awned pappus grass, and Parish's club-cholla for each of those species for which 75 percent avoidance was not achieved. For each of the species for which surveys were conducted, the~~ The project owner's qualified botanist shall submit a completion report documenting fulfillment of the target goals and which describe the number of new, previously undiscovered occurrences identified and mapped using GIS techniques for each species. Mapping results shall include GPS coordinates of the plants found.

The Designated Biologist shall maintain written and photographic records of the tasks described above, and summaries of these records shall be submitted along with the Monthly Compliance Reports to the CPM, BLM Authorized Agent, and CDFG. During project operation, the Designated Biologist shall submit record summaries in the Annual Compliance Report for a period not less than 10 years for the Gas Pipeline Revegetation Plan, and for the life of the project for the Special-Status Plant Protection and Monitoring Plan, and the Special-Status Plant Remedial Action Plan, including funding for the seed storage.

No less than 90 days prior to acquisition of the parcel(s) containing or adjacent to a known Mojave milkweed occurrence, the project owner, or a third-party approved by the CPM, in consultation with CDFG, shall submit a formal acquisition proposal to the CPM and CDFG describing the parcel(s) intended for purchase.

Draft agreements to delegate land acquisition to CDFG or an approved third party and agreements to manage compensation lands shall be submitted to Energy Commission staff for review and approval (in consultation with CDFG) prior to land acquisition. Such agreements shall be mutually approved and executed at least 60 days prior to start of any project-related ground disturbance activities. The project owner shall provide written verification to the CPM that the compensation lands have been acquired and recorded in favor of the approved recipients(s). Alternatively, before beginning project ground-disturbing activities, the project owner shall provide Security in accordance with this condition. Within 90 days after the lands purchase, as determined by the date on the title, the project owner shall provide the CPM with a management plan for review and approval, in consultation with CDFG, for the compensation lands and associated funds.

Page 75, BIO-19

NELSON'S BIGHORN SHEEP MITIGATION

Staff's proposed edits are to provide consistency with BLM's FEIS.

BIO-19 To compensate for project impacts to Nelson's bighorn sheep the project owner shall finance, construct and manage an artificial water source in the eastern part of the Clark Mountain range or in the State Line Hills outside of designated Wilderness. The project owner shall monitor and control noxious and invasive weeds within 100 feet of the artificial water source. Control of weeds shall be coordinated with the CPM and BLM staff and shall consist of removal by mechanical methods, rather than herbicides. To minimize potential impacts to Nelson bighorn sheep, the project owner shall not use barbed wire fence on the northern perimeter of the Ivanpah 3 site, unless the project owner provides evidence that such fencing is essential for security reasons.

Verification: Within 60 days of publication of the Energy Commission Decision the project owner shall submit to the BLM's Authorized Officer, the CPM and CDFG a Draft Bighorn Sheep Mitigation Plan identifying a proposed location for the artificial water source and providing plans for its construction and management. At least 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide BLM's Authorized Officer and the CPM with the final version of the Bighorn Sheep Mitigation Plan that has been reviewed and approved by BLM, CDFG, and the Energy Commission staff. BLM's Authorized Officer and the CPM will determine the plan's acceptability within 30 days of receipt of the final plan.

No later than 18 months following the publication of the Energy Commission Decision, the project owner shall provide written verification to BLM's Authorized Officer and the CPM that the construction of the artificial water source has been completed. At the same time, the project owner shall provide evidence of an agreement (Memorandum of Understanding) and a funding mechanism to provide ongoing maintenance of the water source by CDFG or some other party approved by BLM's Authorized Office and the CPM.

Page 75, BIO-20

Streambed Impact Minimization and Compensation Measures

Staff's proposed edits to BIO-20 are to provide consistency with the March 29, 2010 version agreed to by staff and applicant and to specify the Security for implementation of mitigation in accordance with the latest REAT guidance.

BIO-20 The project owner shall implement the following measures to avoid, minimize and mitigate for impacts to ephemeral drainages:

1. Acquire Off-Site Desert Wash: The project owner shall acquire, in fee or in easement, a parcel or parcels of land that includes ephemeral washes with at least ~~198~~ 175 acres of state jurisdictional waters. The terms and conditions of this acquisition or easement shall be as described in Condition of Certification **BIO-17** with the additional criteria that the desert wash mitigation lands: 1) include at least ~~198~~ 175 acres of state jurisdictional waters; 2) be characterized by similar soil permeability, hydrological and biological functions as the impacted drainages; and 3) be within the same watershed as the impacted wash. The desert wash mitigation lands may be included with the desert tortoise mitigation lands ONLY if the above three criteria are met.

2. Security for Implementation of Mitigation: A security in the form of an irrevocable letter of credit, pledged savings account, or certificate of deposit for the amount of all mitigation measures pursuant to this condition of certification shall be submitted to, and approved by, the CPM, in consultation with CDFG, prior to commencing project activities within areas of CDFG jurisdiction. This amount shall be based on a cost estimate which shall be submitted to CDFG for review and to the CPM for approval within 60 days of the Energy Commission Decision's publication and prior to commencing project activities within areas of CDFG jurisdiction. Estimated security for acquisition of compensation lands for state waters is $623,959. The security shall be approved by the CPM, in consultation with CDFG's legal advisors, prior to its execution, and shall allow the CPM at its discretion to recover funds immediately if the CPM, in consultation with CDFG, determines there has been a default.

3. Preparation of Management Plan: The project owner shall submit to Energy Commission CPM and CDFG a draft Management Plan that reflects site-specific enhancement measures for the drainages on the acquired compensation lands. The objective of the Management Plan shall be to enhance the wildlife value of the drainages, and may include enhancement actions such as weed control, fencing to exclude livestock, or erosion control. No later than 12 months after publication of the Energy Commission Decision the project owner shall submit a final Management Plan for review and approval to the CPM and CDFG.

4. Right of Access and Review for Compliance Monitoring: The CPM reserves the right to enter the project site or allow CDFG to enter the project site at any time to ensure compliance with these conditions. The project owner herein grants to the CPM and to CDFG employees and/or their representatives the right to enter the project site at any time, to ensure compliance with the terms and conditions and/or to determine the impacts of storm events, maintenance activities, or other actions that might affect the restoration and revegetation efforts. The CPM and CDFG may, at the CPM's discretion, review relevant documents maintained by the operator, interview the operator's employees and agents, inspect the work site, and take other actions to assess compliance with or effectiveness of mitigation measures.

5. Notification: The project owner shall notify the CPM and CDFG, in writing, at least five days prior to initiation of project activities in jurisdictional areas as noted and at least five days prior to completion of project activities in jurisdictional areas. The project owner shall notify the CPM and CDFG of any change of conditions to the project, the jurisdictional impacts, or the mitigation efforts, if the conditions at the site of a proposed project change in a manner which changes risk to biological resources that may be substantially adversely affected by the proposed project. The notifying report shall be provided to the CPM and CDFG no later than seven days after the change of conditions is identified. As used here, change of

condition refers to the process, procedures, and methods of operation of a project; the biological and physical characteristics of a project area; or the laws or regulations pertinent to the project as defined below. A copy of the notifying change of conditions report shall be included in the annual reports.

a. Biological Conditions: a change in biological conditions includes, but is not limited to, the following: 1) the presence of biological resources within or adjacent to the project area, whether native or non-native, not previously known to occur in the area; or 2) the presence of biological resources within or adjacent to the project area, whether native or non-native, the status of which has changed to endangered, rare, or threatened, as defined in section 15380 of Title 14 of the California Code of Regulations.

b. Physical Conditions: a change in physical conditions includes, but is not limited to, the following: 1) a change in the morphology of a river, stream, or lake, such as the lowering of a bed or scouring of a bank, or changes in stream form and configuration caused by storm events; 2) the movement of a river or stream channel to a different location; 3) a reduction of or other change in vegetation on the bed, channel, or bank of a drainage, or 4) changes to the hydrologic regime such as fluctuations in the timing or volume of water flows in a river or stream.

c. Legal Conditions: a change in legal conditions includes, but is not limited to, a change in Regulations, Statutory Law, a Judicial or Court decision, or the listing of a species, the status of which has changed to endangered, rare, or threatened, as defined in section 15380 of Title 14 of the California Code of Regulations.

6. Code of Regulations: The project owner shall provide a copy of the Streambed Impact Minimization and Compensation Measures from the Energy Commission Decision to all contractors, subcontractors, and the applicant's project supervisors. Copies shall be readily available at work sites at all times during periods of active work and must be presented to any CDFG personnel or personnel from another agency upon demand. The CPM reserves the right to issue a stop work order or allow CDFG to issue a stop work order after giving notice to the project owner, the CPM, if the CPM in consultation with CDFG, determines that the project owner has breached any of the terms or conditions or for other reasons, including but not limited to the following:

a. The information provided by the applicant regarding streambed alteration is incomplete or inaccurate;

b. New information becomes available that was not known to it in preparing the terms and conditions;

c. The project or project activities as described in the Final Staff Assessment have changed; or

d. The conditions affecting biological resources changed or the CPM, in consultation with CDFG, determines that project activities will result in a substantial adverse effect on the environment.

7. Best Management Practices: The project owner shall also comply with the following conditions:

   a. The project owner shall minimize road building, construction activities and vegetation clearing within ephemeral drainages to the extent feasible.
   b. The project owner shall not allow water containing mud, silt, or other pollutants from grading, aggregate washing, or other activities to enter ephemeral drainages or be placed in locations that may be subjected to high storm flows.
   c. The project owner shall comply with all litter and pollution laws. All contractors, subcontractors, and employees shall also obey these laws, and it shall be the responsibility of the project owner to ensure compliance.
   d. Spoil sites shall not be located within drainages or locations that may be subjected to high storm flows, where spoil shall be washed back into a drainage.
   e. Raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances that could be hazardous to vegetation or wildlife resources, resulting from project-related activities, shall be prevented from contaminating the soil and/or entering waters of the state. These materials, placed within or where they may enter a drainage or Ivanpah Dry Lake, by project owner or any party working under contract or with the permission of the project owner shall be removed immediately.
   f. No broken concrete, debris, soil, silt, sand, bark, slash, sawdust, rubbish, cement or concrete or washings thereof, oil or petroleum products or other organic or earthen material from any construction or associated activity of whatever nature shall be allowed to enter into, or placed where it may be washed by rainfall or runoff into, waters of the state.
   g. When operations are completed, any excess materials or debris shall be removed from the work area. No rubbish shall be deposited within 150 feet of the high water mark of any drainage.
   h. No equipment maintenance shall occur within 150 feet of any ephemeral drainage where petroleum products or other pollutants from the equipment may enter these areas under any flow.

Verification: No less than 90 days prior to acquisition of the parcel (s) containing ~~198~~ 175 acres of waters of the state, the project owner, or a third-party approved by the

CPM, in consultation with CDFG, shall submit a formal acquisition proposal to the CPM and CDFG describing the parcel(s) intended for purchase.

Draft agreements to delegate land acquisition to CDFG or an approved third party and agreements to manage compensation lands shall be submitted to Energy Commission staff for review and approval (in consultation with CDFG) prior to land acquisition. Such agreements shall be mutually approved and executed at least 60 days prior to start of any project-related ground disturbance activities. The project owner shall provide written verification to the CPM that the compensation lands have been acquired and recorded in favor of the approved recipient(s). Alternatively, before beginning project ground-disturbing activities, the project owner shall provide Security in accordance with this condition. Within 90 days after the land purchase, as determined by the date on the title, the project owner shall provide the CPM with a management plan for review and approval, in consultation with CDFG, for the compensation lands and associated funds.

No fewer than 30 days prior to the start of work potentially affecting waters of the state, the project owner shall provide written verification (i.e., through incorporation into the BRMIMP) to the CPM that the above best management practices will be implemented and provide a discussion of work in waters of the state in Compliance Reports for the duration of the project.

<u>Page 80 – Please insert new condition</u>

<u>AVIAN AND BAT MONITORING AND MANAGEMENT PLAN</u>

Staff's proposed Condition of Certification BIO-21 is to provide consistency with BLM's FEIS.

<u>BIO-21</u> <u>The Project owner shall prepare and implement an Avian and Bat Monitoring and Management Plan (Plan) to monitor death and injury of birds and bats from collisions with facility features including the solar receiver tower and reflective heliostat mirrors, and exposure to bright light and heat from concentrating sunlight. The Project owner shall use the monitoring data to inform and develop an adaptive management program that would avoid and minimize Project-related avian or bat impacts. Any Project-related bird or bat deaths or injuries shall be reported to the CPM, CDFG and USFWS, and then the CPM in consultation with CDFG and USFWS, shall then determine if the Project-related bird or bat deaths or injuries warrant implementation of adaptive management measures contained in the Plan. The study design for the Plan shall be approved by the CPM in consultation with CDFG and USFWS, and, once approved, shall be incorporated into the project's BRMIMP and implemented.</u>

<u>During construction, bird and bat deaths or injuries shall be reported in the Monthly Compliance Report. For one year following the beginning of power plant operation, the Designated Biologist shall submit quarterly reports to the CPM, CDFG, and USFWS. describing the results of monitoring. The monthly and quarterly reports shall provide a detailed description of any Project-related bird or bat deaths or injuries detected</u>

during the monitoring study or at any other time, including describing the dates, species found injured or dead, where found, expected cause of injury or death, other appropriate results of monitoring, and a description of adaptive management measures proposed or implemented in accordance with any applicable CDFG or USFWS guidelines to avoid or minimize deaths or injuries. Following the completion of the fourth quarter of monitoring, the Designated Biologist shall prepare an Annual Report that summarizes the year's data, analyzes any Project-related bird fatalities or injuries detected, and provides recommendations for future monitoring and any adaptive management actions needed.

Verification: No less than 30 days prior to the start of construction-related ground disturbance activities the Project owner shall submit to the CPM, USFWS and CDFG a final Avian and Bat Monitoring and Management Plan. Modifications to the Plan shall be made only after approval from the CPM in consultation with CDFG and USFWS.

No later than January 31st of every year the Annual Report shall be provided to the CPM, CDFG, and USFWS. Quarterly reporting shall continue until the CPM, in consultation with CDFG and USFWS determine whether more years of monitoring are needed, and whether mitigation and adaptive management measures are necessary. After two years of data collection, the project owner or contractor shall prepare a report that describes the study design and monitoring results of the Avian and Bat Monitoring and Management Plan. The report shall be submitted to the CPM, CDFG and USFWS no later than the third year after onset of Project operation.

B. SOIL AND WATER RESOURCES

Page 12

7. Cumulative Impacts and Mitigation

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (Cal. Code Regs., tit. 14, § 15130). The locations of existing and reasonably foreseeable developments in the Ivanpah Valley are presented in the ~~the~~ Cumulative Scenario section of Exhibit 300 (pp. 5-11 – 5-17). The estimated water use of those projects potentially affecting the Ivanpah Valley groundwater basin is summarized in **SOIL AND WATER RESOURCES Table 4**, below.

Pages 13 and 14 – Please update the value in Table 4 shown on the next page

SOIL & WATER RESOURCES Table 4
Large-Scale Projects under Development or Reasonably Foreseeable in the Ivanpah Valley

Potential New Groundwater Users	Estimated Water Use	
	During Construction	During Operation
Desert Xpress Rail Line A proposed high-speed rail from Victorville to Las Vegas.	Unknown (limited duration)	Negligible
Interstate 15 Improvements Includes: (1) a proposed point-of-entry inspection station near the California-Nevada border; (2) a 12-mile-long northbound truck descending lane and pavement rehabilitation; and (3) re-grading of median slopes.	Unknown (limited duration)	<10 AFY
Temporary Caltrans Batch Plant The batch plant would be used during widening of the I-15 Highway.	Negligible	Negligible
Mixed-Use Development (near Jean) Demolition of the Nevada Landing Casino and redevelopment of this and adjoining land as a 166-acre master-planned community of affordable housing, commercial businesses, shops, and a new-hotel casino. This development is contingent on the construction of the new Ivanpah Valley Airport.	Unknown (limited duration)	Unknown

Ivanpah Energy Center A 500-MW, air-cooled, gas-turbine, combined-cycle power plant. Although the facility would be using up to 50 AFY of water, this water would be recycled water from the WWTP.	Unknown (limited duration)	15 AFY from an Undisclosed Groundwater Source 35 AFY from Recycled Water
Las Vegas Valley Water District Pipeline Proposed construction and operation of a water supply pipeline from the existing 2420 Zone Bermuda Reservoir (located in southern Las Vegas) to Jean, Primm, the Southern Nevada Correctional Center, and the proposed Ivanpah Valley Airport.	Unknown (limited duration)	Negligible The use of imported surface water in the Ivanpah Basin would result in additional discharges of wastewater. At least a portion of this wastewater would likely infiltrate to the groundwater basin, increasing groundwater recharge in the basin.
Southern Nevada Supplemental Airport (Ivanpah Valley Airport) The proposed airport is anticipated to use water supplied by the Las Vegas Valley Water District pipeline for both construction and operation activities	None	None

Potential New Groundwater Users	Estimated Water Use	
	During Construction	**During Operation**
Wind Energy Projects – Clipper Wind and PPM Wind	Unknown (limited duration)	Negligible
SCE Transmission Line Upgrades	Unknown (limited duration)	Negligible
Reoperation of the Molycorp Mine	Negligible	~~400~~1,200 AFY
NextLight Silver State North and South Photovoltaic Power Plant (250-MW)	Unknown (limited duration)	Estimated 14 AFY
FirstSolar Photovoltaic Power Plant	Unknown (limited duration)	Estimated 6 to 30 AFY
Primm Outlet Mall New Fast-Food Restaurant To be located adjacent to the Primm Outlet Mall	Negligible	Estimated at 15 AFY

Ex. 300, pp. 6.9-41 – 6.9-42.

CONDITIONS OF CERTIFICATION

Page 20 – Soil&Water-2

Staff recommends that Soil&Water-2 be updated in accordance with guidance from the RWQCB.

WASTE DISCHARGE REQUIREMENTS

SOIL&WATER-2: The project owner shall comply with the requirements specified in Appendix B, C, and D for dredge and fill, wastewater, and storm water discharges associated with construction and industrial activity. These requirements relate to discharges, or potential discharges, of waste that could affect the quality of waters of the state, and were developed in consultation with staff of the State Water Resources Control Board and/or the applicable California Regional Water Quality Control Board (hereafter "Water Boards"). It is the Commission's intent that these requirements be enforceable by both the Commission and the Water Boards. In furtherance of that objective, the Commission hereby delegates the enforcement of these requirements, and associated monitoring, inspection and annual fee collection authority, to the Water Boards. Accordingly, the Commission and the Water Board shall confer with each other and coordinate, as needed, in the enforcement of the requirements. The project owner shall pay the annual waste discharge permit fee associated with this facility to the Water Boards. In addition, the Water Boards may "prescribe" these requirements as waste discharge requirements pursuant to Water Code Section 13263 solely for the purposes of enforcement, monitoring, inspection, and the assessment of annual fees, consistent with Public Resources Code Section 25531, subdivision (c). The project owner shall develop, obtain both BLM's Authorized Officer and CPM approval of, and implement a construction Storm Water Pollution Prevention Plan (SWPPP) for the construction of the project and an Industrial SWPPP for operation of the project.

Verification: At least sixty (60) days prior to construction, the project owner shall submit to both BLM's Authorized Officer and the CPM a copy of the construction SWPPP for construction of the project for review and approval. At least sixty (60) days prior to commercial operation, the project owner shall submit to both BLM's Authorized Officer and the CPM a copy of the Industrial SWPPP for operation of the project for review and approval prior to commercial operation. The project owner shall retain a copy on site. The project owner shall submit copies to both BLM's Authorized Officer and the CPM of all correspondence between the project owner and the Lahontan RWQCB regarding the WDRs for discharge of storm water associated with construction and industrial activity within ten (10) days of its receipt or submittal.

Page 27- Soil&Water-7

Please add Condition Soil&Water-7 as it was inadvertently omitted from the PMPD.

WASTEWATER COLLECTION SYSTEM REQUIREMENTS

SOIL&WATER-7: The project owner shall recycle and reuse all process wastewater streams to the extent practicable. Prior to transport and disposal of any facility operation wastewaters that are not suitable for treatment and reuse onsite, the project owner shall test and classify the stored wastewater to determine proper management and disposal requirements. The project manager shall ensure that the wastewater is transported and disposed of in accordance with the wastewater's characteristics and classification and all applicable LORS (including any CCR Title 22 Hazardous Waste and Title 23 Waste Discharges to Land requirements).

Verification: Prior to transport and disposal of any facility operation wastewaters that are not suitable for treatment and reuse onsite, the project owner shall test and classify the stored wastewater to determine proper management and disposal requirements. The project manager shall ensure that the wastewater is transported and disposed of in accordance with the wastewater's characteristics and classification and all applicable LORS (including any CCR Title 22 Hazardous Waste and Title 23 Waste Discharges to Land requirements).

PAGE 29 – SOIL AND WATER RESOURCES - Appendix B

Please insert a new paragraph at the beginning of Section 1 and retain the other language as-is so as to coincide with the RWQCB's Final Waste Discharge Requirements

SOIL AND WATER RESOURCES - Appendix B

FACTS FOR WASTEWATER DISCHARGE

1. Reason for Action and Regulatory Authority

   The Discharger submitted a Report of Waste Discharge/Joint Technical Document (hereafter collectively referred to as the RWD) with the California Energy Commission (Energy Commission) and Lahontan Regional Water Quality Control Board (Lahontan Water Board). The Energy Commission will coordinate reviews and approvals with the regulatory agencies to ensure that the proposed project meets the California Environmental Quality Act (CEQA) requirements and conforms with the Porter-Cologne Water Quality Control Act. The Energy Commission will certify this project and has included waste discharge requirements (WDRs) as conditions of certification in accordance with the Warren-Alquist Act[3]. The WDRs are not being proposed by staff of the Regional Board to its Board for consideration and adoption at this time. Once the Energy Commission certifies the proposed project, the Board of the Lahontan Water Board under Section 13263 of the Water Code may prescribe these requirements as WDRs solely for the purpose of enforcement, annual fee collection, inspection and monitoring, and related purposes, but any action of the Board of the Regional Board under Section 13263 of the Water Code must be

[3] The Warren-Alquist State Energy Resources Conservation and Development Act is the enabling legislation for the California Energy Commission. The Act is codified as Public Resources Code (PRC), Section 25000 et seq. PRC Section 25500 establishes the Commission's authority to certify all sites and related facilities for thermal power plants with power ratings of 50 megawatts or more. The section further declares that "the issuance of a certificate by the commission shall be in lieu of any permit, certificate, or similar document required by any state, local or regional agency, or federal agency to the extent permitted by federal law, for such use of the site and related facilities, and shall supersede any applicable statute, ordinance, or regulation of any state, local, or regional agency, or federal agency to the extent permitted by federal law."

consistent with the Warren-Alquist Act, including without limitation the non-reviewability provision of subdivision (c) of Section 25531 of the Public Resources Code.

SOIL AND WATER RESOURCES - Appendix D

SURFACE WATER MONITORING AND REPORTING PROGRAM FOR WASTEWATER DISCHARGE

PAGE 57 – Attachments A and B to Appendix D

Please insert Attachments A and B at the end of page 57.

ATTACHMENT A

GENERAL PROVISIONS
FOR
MONITORING AND REPORTING

1. Sampling And Analysis

   a. All analyses shall be performed in accordance with the current edition(s) of the following documents:

      i. Standard Methods for the Examination of Water and Wastewater, American Public Health Association, et al.

      ii. Methods for Chemical Analysis of Water and Wastes, USEPA

   b. All analyses shall be performed in a laboratory certified to perform such analyses by the California Department of Public Health or a laboratory approved by the BLM's Authorized Officer and CPM. Specific methods of analysis must be identified on each laboratory report.

   c. Any modifications to the above methods to eliminate known interferences shall be reported with the sample results. The methods used shall also be reported. If methods other than the methods listed above are used, the exact methodology must be submitted for review and must be approved by the BLM's Authorized Officer and CPM prior to use.

   d. The applicant shall establish chain-of-custody procedures to insure that specific individuals are responsible for sample integrity from commencement of sample collection through delivery to an approved laboratory. Sample collection, storage, and analysis shall be conducted in accordance with an approved SAP. The most recent version of the approved SAP shall be kept at the ISEGS project.

e. The applicant shall calibrate and perform maintenance procedures on all monitoring instruments and equipment to ensure accuracy of measurements, or shall insure that both activities will be conducted.

f. A grab sample is defined as an individual sample collected in fewer than 15 minutes.

g. A composite sample is defined as a combination of no fewer than eight individual samples obtained over the specified sampling period at equal intervals. The volume of each individual sample shall be proportional to the discharge flow rate at the time of sampling. The sampling period shall equal the discharge period, or 24 hours, whichever period is shorter.

2. Operational Requirements

a. *Sample Results*

The applicant shall maintain all sampling and analytical results including: strip charts; date, exact place, and time of sampling; date analyses were performed; sample collector's name; analyst's name; analytical techniques used; and results of all analyses. Such records shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the BLM's Authorized Officer and CPM.

b. *Operational Log*

An operation and maintenance log shall be maintained at the ISEGS project. All monitoring and reporting data shall be recorded in a permanent log book.

3. Reporting

a. For every item where the requirements are not met, the applicant shall submit a statement of the actions undertaken or proposed which will bring the discharge into full compliance with requirements at the earliest time, and shall submit a timetable for correction.

b. All sampling and analytical results shall be made available to the BLM's Authorized Officer and CPM upon request. Results shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the BLM's Authorized Officer and CPM.

c. The applicant shall provide a brief summary of any operational problems and maintenance activities to the BLM's Authorized Officer and CPM with each monitoring report. Any modifications or additions to, or any major maintenance conducted on, or any major problems occurring to the wastewater conveyance system, treatment facilities, or disposal facilities shall be included in this summary.

d. Monitoring reports shall be signed by:

iii. In the case of a corporation, by a principal executive officer at least of the level of vice-president or his duly authorized representative, if such representative is responsible for the overall operation of the ISEGS project from which the discharge originates;

iv. In the case of a partnership, by a general partner;

iii. In the case of a sole proprietorship, by the proprietor; or

iv. In the case of a municipal, state or other public project, by either a principal executive officer, ranking elected official, or other duly authorized employee.

e. Monitoring reports are to include the name and telephone number of an individual who can answer questions about the report.

ATTACHMENT B

GOOD HOUSEKEEPING BEST MANAGEMENT PRACTICES

1. Good housekeeping measures for construction materials include:
   a. Maintaining an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced.

   b. Covering and berming loose stockpiled construction materials (e.g. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

   c. Storing chemicals in watertight containers or in a bermed storage shed (completely enclosed) with appropriate secondary containment.

   d. Minimizing contact of construction materials with precipitation.

   e. Implementing BMPs to reduce or prevent the offsite tracking of loose construction and landscape materials.

2. Good housekeeping measures for waste management include:
   a. Preventing disposal of any rinse/wash waters or materials into the storm drain system.

   b. Berming sanitation facilities (e.g. Porta Potties) and preventing them from being kept within the curb and gutter or on sidewalks or adjacent to a storm drain.

   c. Cleaning or replacing sanitation facilities and inspecting them regularly for leaks and spills.

   d. Covering waste disposal containers when they are not in use and preventing them from overflowing.

   e. Berming and securely protecting stockpiled waste material from wind and rain at all times unless actively being used where a spill or spills would enter surface drainage systems.

   f. Implementing procedures to deal with hazardous and non-hazardous spills.

   g. Preparing and implementing a spill response and implementation plan prior to commencement of construction activities, including:
      i. Locations of onsite equipment and materials for cleanup of spills and leaks.

      ii. Procedures to follow in the event of spill or leak that includes immediate cleanup.

      iii. Locations and procedures of disposing of waste materials.

      iv. Identification of and training for spill response personnel.

h. Lining and berming of concrete washout areas so there is no leakage or overflow into the underlying soil or the surrounding areas. Washout areas must be positioned away from drain inlets and waterways and be clearly labeled.

3. Good housekeeping measures for vehicle storage and maintenance include:

   a. Not allowing oil, grease, or fuel to leak in to the soil.

   b. Placing all equipment or vehicles to be fueled, maintained and/or stored in a designated area fitted with appropriate BMPs.

   c. Cleaning leaks immediately and disposing of leaked materials and sorbents properly.

   d. Fixing leaks immediately or removing equipment for service.

4. To assess the potential pollutant sources and identify all areas of the site where good housekeeping or additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and non-storm water discharges, the applicant must assess and report on the following:

   a. The quantity, physical characteristic (liquid, powder, solid, etc.), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

   b. The degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

   c. The direct and indirect pathways that pollutants may be exposed to storm water discharges and non-storm water discharges. This must include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

   d. Sampling, visual observation, and inspection records.

   e. Effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and non-storm water discharges.

VI. Local Impact Assessment

D. NOISE AND VIBRATION

The following proposed edits are in response to comments by National Park Service to the FSA-DEIS concerning noise effects to the Mojave National Preserve. Energy Commission staff assisted BLM in addressing the comments as reflected in BLM's FEIS, and staff is offering similar updates for the PMPD.

Page 1, Paragraph 1

SUMMARY AND DISCUSSION OF THE EVIDENCE

The project will be constructed on 4,073 acres of federally owned land, administered by the BLM, located in San Bernardino County. The nearest residences are in the town of Primm, Nevada, approximately 4.5 miles away. The Primm Valley Golf Club is about 0.5 miles northeast of the eastern boundary of the Ivanpah 1 phase of the project. (Ex. 300, p. 6.6-5.) The nearest boundary of the Mojave National Preserve is located approximately 2.2 miles from the proposed location of the nearest project power block (Ivanpah 3). (FEIS, p. 4.7-7)

Page 2, Paragraph 4

1. Construction

Construction noise is a temporary event, in this instance expected to last about 48 months. High-pressure steam blows are typically the loudest noise encountered during construction. If not silenced, these could create noise levels of roughly 95 dBA at the golf course and 76 dBA at Primm. With a temporary silencer installed, or the use of other measures as provided in Condition **NOISE-7**, the noise levels will be attenuated to no more than 60 dBA and 55 dBA at these locations, respectively. (Ex. 300, pp. 6.6-7 to 6.6-8.) The temporary silencer will also maintain noise during steam blows to no greater than 55 dBA measured at the nearest boundary of the Mojave National Preserve (FEIS, p. 4.7-7). Similarly, pile driving, if used, could create noise levels of nearly 50 dBA at Primm and 58 dBA at the golf course. The evidence shows that these increases will be temporary. (*Id.*)

Pages 6 - 9

Conditions of Certification

Noise Complaint Process

NOISE-2 Throughout the construction (including the steam blow activities) and operation of the ISEGS, the project owner shall document, investigate, evaluate, and attempt to resolve all project-related noise complaints. The project owner or authorized agent shall:

- Use the Noise Complaint Resolution Form (below), or a functionally equivalent procedure acceptable to BLM's Authorized Officer, to document and respond to each noise complaint;
- Attempt to contact the person(s) making the noise complaint within 24 hours;
- Conduct an investigation to determine the source of noise related to the complaint;
- Take all feasible measures to reduce the noise at its source if the noise is project related; and
- Submit a report documenting the complaint and the actions taken. The report shall include: a complaint summary, including final results of noise reduction efforts, and if obtainable, a signed statement by the complainant stating that the noise problem is resolved to the complainant's satisfaction.

Verification: Within 5 days of receiving a noise complaint, the project owner shall file a copy of the Noise Complaint Resolution Form with BLM's Authorized Officer, documenting the resolution of the complaint. If mitigation is required to resolve a complaint, and the complaint is not resolved within a 3-day period, the project owner shall submit an updated Noise Complaint Resolution Form when the mitigation is implemented.

Noise Restrictions

NOISE-4 The project design and implementation shall include appropriate noise mitigation measures adequate to ensure that operation of the project will not cause noise complaints from residents of Primm, Nevada, from the operator of the Primm Valley Golf Course, or from the visitors of the Mojave National Preserve. If legitimate project-related noise complaints are received from residents of Primm, the project owner shall perform a noise survey to demonstrate that noise levels due to plant operation do not exceed an average of 45 dBA L_{eq} measured at the nearest residence of the community of Primm, Nevada. If legitimate project-related noise complaints are received from the operator of the Primm Valley Golf Course or the visitors of the Mojave National Preserve, the project owner shall perform a noise survey to demonstrate that noise levels due to plant operation do not exceed an average of 55 dBA L_{eq} measured at the nearest boundary of the golf course, or the nearest boundary of the Mojave National Preserve, respectively. No new project components creating pure-tone noises will be added to ~~by~~ the project unless they are balanced by other plant features. No single piece of equipment shall be allowed to stand out as a source of noise that draws legitimate complaints.

A. The measurement of power plant noise for the purposes of demonstrating compliance with this mitigation measure may alternatively be made at a location, acceptable to BLM's Authorized Officer, closer to the plant (e.g., 400 feet from the plant boundary) and this measured level then mathematically extrapolated to determine the plant noise contribution at the affected location. The character of the plant noise shall be evaluated at the affected residential locations to determine the presence of pure tones or other dominant sources of plant noise.

Verification: The survey shall take place within 30 days of the receipt of the noise complaint, unless the complaint has been resolved to the complaining party's satisfaction. Within 15 days after completing the survey, the project owner shall submit a summary report of the survey to BLM's Authorized Officer. Included in the survey report will be a description of additional mitigation measures (if any) necessary to achieve compliance with the above-listed noise limit and a schedule, subject to BLM's Authorized Officer approval, for implementing these measures. When these measures are in place, the project owner shall repeat the noise survey.
Within 15 days of completion of the new survey, the project owner shall submit to BLM's Authorized Officer a summary report of the new noise survey, performed as described above and showing compliance with this measure.

Steam Blow Restrictions

NOISE-7 If a high-pressure steam blow is employed, the project owner shall equip steam blow piping with a temporary silencer or take other effective measures that quiet the noise of steam blows to no greater than 60 dBA measured at the Primm Valley Golf Club, to no greater than 55 dBA measured at any affected residential locations in Primm, NV, and to no greater than 55 dBA measured at the nearest boundary of the Mojave National Preserve. The project owner shall conduct high-pressure steam blows only during the hours of 7:00 a.m. to 7:00 p.m.

If a low-pressure continuous steam blow is employed, the project owner shall limit the noise of steam blows to no greater than 45 dBA measured at any affected residential location in Primm, NV. In lieu of specifying the level of silencing above, the project owner may alternatively submit an analysis to the BLM's Authorized Officer that documents that during either high or low pressure steam blows, steam blow noise levels would not exceed 60 dBA at the Primm Valley Golf Club (daytime), or 55 dBA (daytime)/45 dBA (nighttime) at the nearest residential location in Primm.

Verification: At least fifteen (15) days prior to the first high pressure steam blow, the project owner shall submit to BLM's Authorized Officer drawings or other information describing the temporary steam blow silencer or other noise attenuating measures to be taken, the noise levels expected and a description of the steam blow schedule.

E. VISUAL RESOURCES

3. Glare Impacts

A comment from the National Parks Conservation Association to the FSA-DEIS indicates that the Mojave National Preserve contains some of the most pristine night sky views in the continental United States, and new artificial lighting may represent a deterioration of that resource. Staff recommends inserting a new fourth paragraph to address this issue consistent with language developed by staff and BLM for the FEIS.

Page 24, Insert New Paragraph 4

In addition to safety and aesthetic impacts from the mirror arrays and solar receivers, the project would cause nighttime light pollution impacts affecting the Mojave National Preserve which is recognized for having some of the most pristine night sky views in the continental United States. While this issue has been addressed in Condition of Certification **VIS-5,** Temporary and Permanent Exterior Lighting Measures, by requiring shielding of all project lighting including construction lighting to prevent upward-directed illumination, the FAA-required aircraft safety lighting on the three solar receiver towers would include bright strobe lighting that could not be shielded. Because the aircraft safety lighting would be visible to visitors within the Mojave National Preserve, this would present an adverse impact that could not be mitigated. (FEIS p. 4.13-24)

FINDINGS OF FACT

Staff recommends a change to Item 9 of the Findings of Fact to be consistent with a conclusion stated in the last paragraph of the Cumulative Impacts and Mitigation section on PMPD page 26. The conclusion reads as follows: "The anticipated impacts of the ISEGS project in combination with foreseeable future local projects in the Ivanpah Valley are therefore cumulatively considerable and significant. (Ex. 300, pp. 6.12-31 – 6.12-33.)"

The proposed modifications to Finding of Fact # 9 would achieve consistency with the PMPD Cumulative Impacts and Mitigation section conclusion.

Page 28 – Findings of Fact

Based on the evidence, we find and conclude as follows:

9. The visual effects of the ISEGS in combination with past, present, and reasonably foreseeable projects in the ~~area~~ Ivanpah Valley are ~~not~~ in the same viewshed as the ISEGS ~~so they~~ and will be cumulatively considerable. The ISEGS project will ~~not~~ result in significant cumulative impacts within the Ivanpah Valley.

CONDITIONS OF CERTIFICATION

Page 28, VIS-1

SURFACE TREATMENT OF PROJECT STRUCTURES AND BUILDINGS

VIS-1 The project owner shall treat the surfaces of all project structures and buildings visible to the public, other than surfaces that are included to direct or reflect sunlight, such that a) their colors minimize visual intrusion and contrast by blending with the existing tan and brown color of the surrounding landscape; and b) their colors and finishes do not create excessive glare~~; and c) their colors and finishes are consistent with local policies and ordinances~~. The transmission line conductors shall be non-specular and non-reflective, and the insulators shall be non-reflective and non-refractive.

The project owner shall submit for CPM review and approval, a specific Surface Treatment Plan that will satisfy these requirements. ~~The treatment plan shall include:~~

~~A. A description of the overall rationale for the proposed surface treatment, including the selection of the proposed color(s) and finishes;~~

~~B. A list of each major project structure, building, tank, pipe, and wall; the transmission line towers and/or poles; and fencing, specifying the color(s) and finish proposed for each. Colors must be identified by vendor, name, and number; or according to a universal designation system;~~

~~C. One set of color brochures or color chips showing each proposed color and finish;~~

~~D. A specific schedule for completion of the treatment; and~~

~~E. A procedure to ensure proper treatment maintenance for the life of theproject.~~

~~The project owner shall not specify to the vendors the treatment of any buildings or structures treated during manufacture, or perform the final treatment on any buildings or structures treated in the field, until the project owner receives notification of approval of the treatment plan by BLM's Authorized Officer and the CPM. Subsequent modifications to the treatment plan are prohibited without BLM's Authorized Officer and CPM approval.~~

Verification: At least 90 days prior to specifying to the vendor the colors and finishes for each set of ~~the first~~ structures or buildings that are surface treated during manufacture, the project owner shall submit the proposed treatment plan to BLM's Authorized Officer and the CPM for review and approval and simultaneously to San Bernardino County for review and comment. If BLM's Authorized Officer and the CPM determine that the plan requires revision, the project owner shall provide to BLM's Authorized Officer and the CPM a plan with the specified revision(s) for review and approval by BLM's Authorized Officer and the CPM before any treatment is applied. Any modifications to the treatment plan must be submitted to BLM's Authorized Officer and the CPM for review and approval. BLM's Authorized Officer and the CPM shall review and approve the Surface Treatment Plan or identify any material deficiencies within thirty (30) days of receipt.

The treatment plan shall include:

A. A description of the overall rationale for the proposed surface treatment, including the selection of the proposed color(s) and finishes;

B. A list of each major project structure, building, tank, pipe, and wall; the transmission line towers and/or poles; and fencing, specifying the color(s) and finish proposed for each. Colors must be identified by vendor, name, and number; or according to a universal designation system;

C. One set of color brochures or color chips showing each proposed color and finish;

D. A specific schedule for completion of the treatment; and

E. A procedure to ensure proper treatment maintenance for the life of the project.

The project owner shall not specify to the vendors the treatment of any buildings or structures treated during manufacture, or perform the final treatment on any buildings or structures treated in the field, until the project owner receives notification of approval of the treatment plan by BLM's Authorized Officer and the CPM. Subsequent modifications to the treatment plan are prohibited without BLM's Authorized Officer and CPM approval.
Prior to the start of commercial operation, the project owner shall notify BLM's Authorized Officer and the CPM that surface treatment of all listed structures and buildings has been completed and they are ready for inspection and shall submit to each one set of electronic color photographs from the same key observation points identified in (d) above. The project owner shall provide a status report regarding surface treatment maintenance in the Annual Compliance Report. The report shall specify a): the condition of the surfaces of all structures and buildings at the end of the reporting year; b) maintenance activities that occurred during the reporting year; and c) the schedule of maintenance activities for the next year.

Page 30, VIS-2

LANDSCAPE SCREENING OF GOLF COURSE

VIS-2 At the request of, and in consultation with BLM's Authorized Officer, the CPM and the golf course owner, the project owner shall prepare a perimeter landscape screening plan to reduce the visibility of the proposed ISEGS project as seen from the golf course. The purpose ~~intent~~ of the plan shall be to provide screening of the power project, particularly the mirror fields, while retaining as much of the scenic portion of the overall views of Ivanpah Valley and Clark Mountains as feasible. The design approach shall be developed with prior consultation with the golf course owner, and implemented only at the golf course owner’s request. The project owner shall submit to BLM’s Authorized Officer and the CPM for review and approval and simultaneously to the golf course owner for review and comment a preliminary conceptual landscaping plan whose objective is to provide an attractive visual screen to views of the ISEGS project mirror fields. Upon approval by BLM’s Authorized Officer and the CPM and golf course owner, the project owner shall submit to BLM’s Authorized Officer and the CPM for review and approval and simultaneously to the golf course owner for review and comment a landscaping plan whose proper implementation will satisfy these requirements. ~~The plan shall include:~~

~~A. A detailed landscape, grading, and irrigation plan, at a reasonable scale. The plan shall demonstrate how the requirements stated above shall be met. The plan shall provide a detailed installation schedule demonstrating installation of as much of the landscaping as early in the construction process as is feasible in coordination with project construction.~~

~~B. A list (prepared by a qualified professional arborist familiar with local growing conditions) of proposed species, specifying installation sizes, growth rates, expected time to maturity, expected size at five years and at maturity, spacing, number, availability, and a discussion of the suitability of the plants for the site conditions and mitigation objectives, with the objective of providing the widest possible range of species from which to choose;~~

~~C. Maintenance procedures, including any needed irrigation and a plan for routine annual or semi-annual debris removal for the life of the project;~~

~~D. A procedure for monitoring for and replacement of unsuccessful plantings for the life of the project; and~~

~~E. One set each for BLM’s Authorized Officer and the CPM of 11”x17” color photo-simulations of the proposed landscaping at five years and twenty years after planting, as viewed from adjoining segments of I-15 .~~

The plan shall not be implemented until the project owner receives finalapproval from BLM’s Authorized Officer and the CPM.

Verification: The landscaping plan shall be submitted to BLM’s Authorized Officer and the CPM for review and approval and simultaneously to the golf course owner for review and comment at least 90 days prior to installation of the landscaping. If BLM’s Authorized Officer and the CPM determine that the plan requires revision, the project owner shall provide to BLM’s Authorized Officer and the CPM and simultaneously to the golf course owner a revised plan for review and approval by BLM’s Authorized Officer and the CPM. The plan shall include:

A. A detailed landscape, grading, and irrigation plan, at a reasonable scale. The plan shall demonstrate how the requirements stated above shall be met. The plan shall provide a detailed installation schedule demonstrating installation of as much of the landscaping as early in the construction process as is feasible in coordination with project construction.

B. A list (prepared by a qualified professional arborist familiar with local growing conditions) of proposed species, specifying installation sizes, growth rates, expected time to maturity, expected size at five years and at maturity, spacing, number, availability, and a discussion of the suitability of the plants for the site conditions and mitigation objectives, with the objective of providing the widest possible range of species from which to choose;

C. Maintenance procedures, including any needed irrigation and a plan for routine annual or semi-annual debris removal for the life of the project;

D. A procedure for monitoring for and replacement of unsuccessful plantings for the life of the project; and

E. One set each for BLM's Authorized Officer and the CPM of 11"x17" color photo-simulations of the proposed landscaping at five years and twenty years after planting, as viewed from adjoining segments of I-15.

The plan shall not be implemented until the project owner receives final approval from BLM's Authorized Officer and the CPM.
The planting must occur during the first optimal planting season following site mobilization. The project owner shall simultaneously notify BLM's Authorized Officer and the CPM and the golf course owner within seven days after completing installation of the landscaping, that the landscaping is ready for inspection.

The project owner shall report landscape maintenance activities, including replacement of dead or dying vegetation, for the previous year of operation in each Annual Compliance Report.

Page 31, VIS-3

Please delete Condition of Certification VIS-3, as VIS-3 was no longer necessary considering BIO-14 addresses the project site Closure, Revegetation and Rehabilitation Plan.

~~REVEGETATION OF DISTURBED SOIL AREAS~~

~~**VIS-3** The project owner shall revegetate disturbed soil areas to the greatest practical extent, as described in Condition of Certification **BIO-14**. In order to address specifically visual concerns, the required Closure, Revegetation and Rehabilitation Plan shall include reclamation of the area of disturbed soils used for laydown, project construction, and siting of the substation and other ancillary operation and support structures.~~

~~**Verification:** Refer to Condition of Certification **BIO-14**.~~

Page 31 – VIS-4

TEMPORARY AND PERMANENT EXTERIOR LIGHTING

VIS-4 To the extent feasible, consistent with safety and security considerations, the project owner shall design and install all permanent exterior lighting and all temporary construction lighting such that a) lamps and reflectors are not visible from beyond the project site, including any off-site security buffer areas; b) lighting does not cause excessive reflected glare; c) direct lighting does not illuminate the nighttime sky, except for required FAA aircraft safety lighting; d) illumination of the project and its immediate vicinity is minimized, and e) the plan complies with local policies and ordinances. The project owner shall submit to BLM's Authorized Officer and the CPM for review and approval and simultaneously to the County of San Bernardino for review and comment a lighting mitigation plan. ~~that includes the following:~~

~~A. Location and direction of light fixtures shall take the lighting mitigation requirements into account;~~

~~B. Lighting design shall consider setbacks of project features from the site boundary to aid in satisfying the lighting mitigation requirements;~~

~~C. Lighting shall incorporate fixture hoods/shielding, with light directed downward or toward the area to be illuminated;~~

~~D. Light fixtures that are visible from beyond the project boundary shall have cutoff angles that are sufficient to prevent lamps and reflectors from being visible beyond the project boundary, except where necessary for security;~~

~~E. All lighting shall be of minimum necessary brightness consistent with operational safety and security; and~~

~~F. Lights in high illumination areas not occupied on a continuous basis (such as maintenance platforms) shall have (in addition to hoods) switches, timer switches, or motion detectors so that the lights operate only when the area is occupied.~~

<u>Verification:</u> At least 90 days prior to ordering any permanent exterior lighting or temporary construction lighting, the project owner shall contact BLM's Authorized Officer and the CPM to discuss the documentation required in the lighting mitigation plan. At least 60 days prior to ordering any permanent exterior lighting, the project owner shall submit to BLM's Authorized Officer and the CPM for review and approval and simultaneously to the County of San Bernardino for review and comment a lighting mitigation plan. If BLM's Authorized Officer and the CPM determine that the plan requires revision, the project owner shall provide to BLM's Authorized Officer and the CPM a revised plan for review and approval by BLM's Authorized Officer and the CPM. <u>BLM's Authorized Officer and the CPM shall approve or identify any material deficiencies in the Lighting Plan within 30 days following receipt of the Plan. The Lighting Plan shall include the following:</u>

A. Location and direction of light fixtures shall take the lighting mitigation requirements into account;

B. Lighting design shall consider setbacks of project features from the site boundary to aid in satisfying the lighting mitigation requirements;

C. Lighting shall incorporate fixture hoods/shielding, with light directed downward or toward the area to be illuminated;

D. Light fixtures that are visible from beyond the project boundary shall have cutoff angles that are sufficient to prevent lamps and reflectors from being visible beyond the project boundary, except where necessary for security;

E. All lighting shall be of minimum necessary brightness consistent with operational safety and security; and

F. Lights in high illumination areas not occupied on a continuous basis (such as maintenance platforms) shall have (in addition to hoods) switches, timer switches, or motion detectors so that the lights operate only when the area is occupied.

The project owner shall not order any exterior lighting until receiving BLM Authorized Officer and CPM approval of the lighting mitigation plan.

Prior to commercial operation, the project owner shall notify BLM's Authorized Officer and the CPM that the lighting has been completed and is ready for inspection. If after inspection, BLM's Authorized Officer and the CPM notify the project owner that modifications to the lighting are needed, within 30 days of receiving that notification the project owner shall implement the modifications and notify BLM's Authorized Officer and the CPM that the modifications have been completed and are ready for inspection.

Within 48 hours of receiving a lighting complaint, the project owner shall provide BLM's Authorized Officer and the CPM with a complaint resolution form report as specified in the Compliance General Conditions including a proposal to resolve the complaint, and a schedule for implementation. The project owner shall notify BLM's Authorized Officer and the CPM within 48 hours after completing implementation of the proposal. A copy of the complaint resolution form report shall be submitted to BLM's Authorized Officer and the CPM within 30 days.

F. RECREATION

*Staff recommends that the Committee consider staff's testimony in the Recreation section of the FSA-DEIS, including whether the project conforms with §25529 of the Warren-Alquist Act pertaining to establishment of a Public Use Area. If the Committee agrees, staff would recommend that Condition of Certification **REC-1** be included in the PMPD. Staff also understands that the applicant, if required to implement REC-1, desires to coordinate its plans with San Bernardino County and possibly integrate the Solar / Ecological Interpretive Center with another potential development in the vicinity of the ISEGS project. Staff supports this position and has proposed changes to REC-1 in coordination with the applicant that would accommodate the above. Staff recommends replacing the version of REC-1 provided in the FSA-DEIS with the following:*

REC-1: Prior to the start of commercial operations of the first ISEGS power plant to be constructed and in conformance with § 25529 of the Warren-Alquist Act, the project owner shall prepare plans for a Solar / Ecological Interpretive Center to be developed in the vicinity of the ISEGS project. The project owner in consultation with San Bernardino County shall propose a location that if possible provides a vantage point to observe as many features as is possible of the ISEGS project without compromising ISEGS security requirements or exposing the public to excessive construction safety hazards. The project owner's plans for the Solar / Ecological Interpretive Center may be coordinated with San Bernardino County. As a minimum requirement, the Solar / Ecological Interpretive Center shall include or make accessible to the public the following features:,

1. surfaced public parking for 8 vehicles (3 of which would allow vehicles with trailers); should demonstrated public use require additional parking spaces, the project owner shall provide up to four additional spaces, one of which would allow a vehicle with a trailer; If the Center is co-located with a companion facility, then the parking spaces need not be exclusive use.

2. information kiosks describing ISEGS solar energy technology;

3. picnic area with 4 shaded tables; should demonstrated public use require additional tables, the project owner shall provide up to four additional tables.

4. garbage cans;

5. interpretive signs identifying local landmarks and ecological features; and

6. a two stall contained restroom facility (or reasonable access to a facility with flush toilets and sinks should the Solar / Ecological Interpretive Center be constructed adjacent to another facility having a restroom);

Verification: At least 30 days prior to commercial operation of the first power plant of the ISEGS development, the project owner shall submit plans for a Solar / Ecological Interpretive Center to be developed in the ISEGS vicinity in coordination with San Bernardino County, and submit them to BLM's Authorized Officer and the CPM for review and approval. The plans may be submitted at first conceptually for review and comments by BLM's Authorized Officer and the CPM, followed by submittal of the final plans for review and approval by BLM's Authorized Officer and the CPM.

Within 6 months of approval of the proposed Solar / Interpretive Center plans, the project owner shall commence construction of the facility and shall complete construction within one year following the start of construction if located off of the ISEGS site. If located on site then construction of the interpretive center may be delayed to have opening of the Center approximately coincide with completion of all ISEGS construction. If the Center is located on-site, in no case shall it be open to the public until the conclusion of all ISEGS construction. Upon completion, the project owner shall submit notice to BLM and the Energy Commission that it has completed construction of the Solar / Ecological Interpretive Center and shall request final approval by both BLM's Authorized Officer and the CPM.

In each Annual Compliance Report for the life of the ISEGS project, the project owner shall provide a summary of estimated public utilization of the Solar / Ecological Interpretive Center and summarize any issues associated with operating and maintenance activities.

Renewable Energy Development
And
Common Raven Predation on the Desert Tortoise
May 2010

Summary

The desert tortoise is listed as a threatened species under the Federal Endangered Species Act (ESA). A large number of renewable energy projects are currently proposed in remote areas of the California and Nevada deserts where the desert tortoise occurs and human populations are generally small. Due to the locations of these projects, associated infrastructure, and the increase in human activities that will occur if these projects are approved, a corresponding increase in common raven (*Corvus corax*) presence and predation on desert tortoises (*Gopherus agassizii*) is anticipated throughout the region. During the past few decades, the population of the common raven has increased substantially in the California desert, primarily in response to human-provided subsidies of food, water, and nest sites.

The Bureau of Land Management (BLM) addressed the increase of ravens and the associated problems in each of the amendments to the California Desert Conservation Area Plan (CDCA). The CDCA, as amended, established that all new projects with the potential to increase raven populations would be required to implement mitigation measures to reduce or eliminate the opportunity for proliferation of ravens. The BLM's Biological Assessments and the US Fish and Wildlife Service's (USFWS) Biological Opinions for the CDCA reiterate the need to reduce or eliminate the opportunity for common ravens to increase in number. In addition to being listed under the Federal ESA, the desert tortoise is also protected under the California Endangered Species Act (CESA). The California Department of Fish and Game (DFG) requires mitigation measures in each desert tortoise CESA Incidental Take Permit, including measures requiring the permittee to develop a raven control plan and to implement measures off the project site to reduce the cumulative environmental effects of increased raven predation.

To minimize the impacts on desert tortoises, approved renewable energy projects and associated transmission should implement mitigation measures designed to reduce the raven predation on the species at both the local and the population level. Each project applicant should develop an on-site plan to minimize availability of food sources and the potential for ravens to occupy the project site.

The Raven Management Plan outlined below is a regional scale, adaptively managed program designed to address raven predation in the California desert region. Based on the information we have available on all future activities that will attract and increase raven populations in the California desert over the next 20 to 30 years, we have estimated that renewable energy projects with a 20-year term should contribute $64 per acre impacted to the overall effort to reduce predation of ravens on the desert tortoise. Associated transmission lines that are expected to remain after the 20–year term of a given renewable energy project should contribute $105 per acre impacted. These funds will be included as part of the required mitigation to minimize and offset the impacts of renewable energy projects. The funds would be used, as appropriate, to carry out the five primary actions listed below. If approvals are granted to extend the term of a renewable energy project past the initial permit term (i.e. 20 to 30 years), the applicable REAT agencies will re-evaluate whether the implementation of the regional scale Raven Management Plan should be continued, and assess any additional costs necessary to continue the program.

Raven Management Plan

The USFWS together with several cooperating agencies, including the BLM, National Park Service, Department of Defense, and the Department of Agriculture completed an environmental assessment for the implementation of a plan to reduce predation by the common raven on the federally threatened desert tortoise in the California desert (Raven EA; USFWS et al. 2008). This document was prepared because the common raven is a known predator of the desert tortoise and the Desert Tortoise (Mojave population) Recovery Plan identifies reducing predation on the species as an important recovery task.

The Raven EA is expected to be implemented in a phased approach in collaboration with the cooperating agencies and local partners. The program includes five primary actions:

1) Reduction of human provided subsidies (i.e., food, water, sheltering and nesting sites, etc.)
2) Education and outreach
3) Common raven nest removal
4) Common raven removal
5) Evaluation of effectiveness and adaptive management

The latter three activities are accomplished through a combination of identification of offending ravens by observers (whom also can remove nests) and then reporting those birds to Wildlife Services (WS) who are contracted to remove ravens. The evaluation of effectiveness is incorporated into subsequent years of survey effort. Therefore, the survey effort should remain consistent or increasing but should not decrease.

The Raven EA allows for the increase in the number ravens to be removed lethally after 3 years of effectiveness monitoring, thus the level of effort for this component will/could increase every 3 years up to a maximum level at year 6 (these are represented by levels 1-3 below). In addition, there is an understanding among agencies (BLM, CDFG, and FWS) that the entire program may not be implemented each year. For example, an education and outreach program from one year may not need to be repeated annually.

The USFWS estimated the cost of implementing three primary aspects of the Raven EA (removal (conducted by WS), outreach and education, and monitoring surveys):

- Removal: In 2010, a single year-round WS employee costs approximately $92,000. For the first 3 years of the program, since we would only be using seasonal workers (during raven breeding season), this cost would be reduced. In 2009, $30,000 covered one WS staff for approximately 2.5 months including training. The survey and removal efforts would be divided amongst the three desert tortoise recovery units in the California Desert. Assuming that the optimum use of WS employees would be one per recovery unit, a minimum of 3 personnel are needed at the lowest level of effort (approximately $40,000/WS to cover the raven breeding season). After 3 years the removal efforts are no longer limited to raven breeding season and personnel would be needed year-round. We do not envision needing more than two personnel per recovery unit, even at maximum effort.

- Outreach and education position: Outreach and Education is an important component of the program. We believe 2 people can run the education and outreach program for the Raven EA. A base annual salary for a GS-11 position within the area would be approximately $128,000. Education and outreach would also benefit from media support including pamphlets and radio and television broadcasts.

- Monitoring survey team: The effort, and therefore cost, of the monitoring survey team is dependent on the level of implementation of the Raven EA. Effectiveness monitoring is essential in determining the success of the program, and whether addition efforts will be needed. The three levels of survey effort we considered are compatible with the three levels of removal effort.

The table below estimates the annual cost of these activities at each of the three levels of implantation described in the Raven EA.

Annual budget estimates for implementation of the Raven EA

Primary Activities of the Raven EA	Level 1	Level 2	Level 3
Removal Staff	120,000	276,000	552,000
Outreach	128,000	128,000	128,000
Monitoring Survey Team	820,000	1,000,000	4,381,745
TOTAL	1,068,000	1,404,000	5,061,754

In addition, there are a multitude of additional activities identified in the Raven EA that could be conducted in the desert regarding reduction of raven subsidies. These include: identification and clean up of illegal dump sites, surveys of communities to identify business that do not adequately control their waste and surveys of landfills and transfer stations. Depending on the required level of implementation necessary above, funds to conduct these other activities may be available.

Citation:

U.S. Fish and Wildlife Service, U.S. Department of Agriculture, U.S. Department of Defense, Bureau of Interior. 2008. Environmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise. Ventura Fish and Wildlife Office. Ventura, California.

Environmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise

FINAL

Lead Agency:	**U.S. Department of the Interior** **Fish and Wildlife Service** **Ventura, California**
Cooperating Agencies:	**U.S. Department of Agriculture** **Animal and Plant Health Inspection Service,** **Wildlife Services Program**
	U.S. Department of Defense **Air Force Flight Test Center** **Edwards Air Force Base** **Army National Training Center and Ft. Irwin** **Marine Air Ground Task Force Training Command,** **Twentynine Palms** **Marine Corps Logistics Base, Barstow** **Naval Air Weapons Station, China Lake**
	U.S. Department of the Interior **Bureau of Land Management, California Desert District** **National Park Service, Mojave National Preserve** **National Park Service, Joshua Tree National Park**

March 2008

EXECUTIVE SUMMARY

The United Sates Fish and Wildlife Service (USFWS) and several cooperating agencies are proposing to implement a plan to reduce predation by the common raven (*Corvus corax*) on the federally threatened desert tortoise (*Gopherus agassizii*) in the California desert. During the past few decades, the population of the common raven has increased substantially in the California desert, primarily in response to human-provided subsidies of food, water, and nest sites. The common raven is a known predator of the desert tortoise. There is documentation of numerous carcasses of hatchling and juvenile desert tortoises under the nests of common ravens and a reduction in the proportion of hatchling and juvenile desert tortoises in the population at several locations in the California desert. The Desert Tortoise (Mojave population) Recovery Plan identifies reducing predation on the desert tortoise as a recovery task.

The agencies have developed six alternatives:

1. Alternative A or Current Program;
2. Alternative B–Integrated Predator Management Emphasizing Cultural and Physical Methods;
3. Alternative C–Integrated Predator Management and Removal of Ravens from Desert Tortoise Management Areas;
4. Alternative D–Integrated Predator Management and Removal of Ravens from Desert Tortoise Management Areas and Raven Concentration Areas;
5. Alternative E–Integrated Predator Management using only Nonlethal Cultural and Physical Methods; and
6. Alternative F-Integrated Predator Management using a Phased Approach of Alternatives B, C, and D.

These alternatives were developed to provide the full range of possible levels to reduce predation, from no new programs beyond existing management, to new programs using nonlethal methods, to new programs using nonlethal and lethal methods in various locations in the California desert.

The Alternative A describes the current level of management–limited nonlethal management actions being implemented at a few locations and no lethal control of common ravens. Alternative B focuses on reducing human subsidies of food, water, and nest sites to the common raven in the California desert. It provides immediate protection to hatchling and juvenile desert tortoises by identifying and removing ravens that have preyed or attempted to prey on the desert tortoise. Alternative C includes reduction of human subsidies to common ravens and removal of all ravens in specific areas (e.g., Desert Wildlife Management Areas, critical habitat, and specially designated management areas). No evidence of predation on the desert tortoise would be needed to remove ravens. Alternative D would incorporate raven removal in the areas identified in Alternative C and raven concentration areas, such as landfills. Alternative E would use nonlethal methods to reduce human subsidies of food, water, nest sites, and roost sites for the common raven thereby eventually reducing the size of the common raven population. Alternative F would implement Alternative B followed by Alternatives C and D if each of the previous alternatives were unsuccessful. Removal methods for Alternatives B, C, D, and F include trapping, use of toxicants, and shooting. Depending on the location of the lethal removal, the most appropriate and humane method would be used.

In addition, several alternatives were identified, but eliminated because they are not feasible or would not achieve the purpose of reducing predation by the common raven on the desert tortoise.

The issues identified for analysis included impacts on: target species (common raven), nontarget species (desert tortoise and other wildlife species), socioeconomics, recreation, and human health and safety. The issues that were not analyzed were identified and included in a discussion on why their analysis was not appropriate.

These issues were evaluated for each of the six alternatives. Impacts on the common raven were analyzed so that a potential worst-case scenario is presented for the number of ravens that may be removed annually. For the foreseeable future, the actual impact would probably be much lower than what is estimated in this Environmental Assessment (EA). In addition, with a substantial reduction in human-provided subsidies, the common raven population should start to decline after a few years. The alternatives range from reducing the raven population in the California desert by 2.4 percent (Alternative B) to 18.7 percent (Alternatives D and F). Alternatives B, C, D, E, and F should benefit the desert tortoise and other species of wildlife upon which the common raven preys, but the extent and immediacy of this benefit would vary for these alternatives. With respect to the impacts on the issues, none of the alternatives evaluated rise to the level of significance.

Regarding cumulative impacts, we are unaware of any past, current, or planned future actions that would directly or indirectly impact the common raven with the exception of those proposed in this environmental assessment and a past effort by the Bureau of Land Management (BLM). Past actions to reduce predation by the common raven in the California desert are provided; however, BLM terminated this effort around 1994. Currently there is no organized program being implemented to reduce the number of common ravens in the California desert. Raven removal is occurring in other locations in the state and in adjacent states, primarily associated with loss of agriculture and livestock. Since many of the common ravens in the California desert are resident birds, these removal efforts elsewhere should have little effect on the raven population in the California desert. Future actions that may indirectly impact the common raven would be continued human development throughout various locations in the California desert. These actions would benefit the common raven and would likely contribute to increased population numbers. However, these actions are detrimental to the desert tortoise and other species of wildlife in the California desert.

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1.0 INTRODUCTION

The United States Fish and Wildlife Service's (USFWS's) major responsibilities are to manage the Nation's public resources, which include endangered and threatened species, migratory birds, and anadramous fishes (fish that breed in freshwater but spend their adult life in saltwater). Through the Endangered Species Act of 1973 (ESA), as amended, Congress directed the USFWS as the lead federal agency that works with other federal, state and local agencies, and private citizens to recover and conserve species listed under the ESA so they may be removed from the list. The purpose of the ESA is to provide a means whereby, the ecosystems upon which endangered and threatened species depend may be conserved. The USFWS's goal is to ensure that listed species, and the ecosystems upon which they depend, are properly managed and conserved so the species no longer require protections of the ESA.

The USFWS is the lead agency that administers the Migratory Bird Treaty Act of 1918 (MBTA), as amended. The MBTA provides the USFWS with regulatory authority to protect bird species that migrate to or from the United States. This law prohibits the "take" of these species by any entity, unless permitted by the USFWS; USFWS can issue permits to take migratory birds that are causing damage to resources.

In the California desert, the USFWS works with federal, state, and local agencies to plan and implement activities that would contribute to the recovery and conservation of several listed species including the federally threatened desert tortoise (*Gopherus agassizii*). The desert tortoise occurs on federal, state, and privately-owned land in various locations in the California desert; it continues to decline in numbers from various factors which include predation by the common raven (*Corvus corax*).

The USFWS is also the lead agency and decision maker for this Environmental Assessment (EA), and is responsible for its scope, content, and outcome. Successful implementation of the recovery program for the desert tortoise in the California desert requires cooperation among numerous federal, state, and local agencies and the public. Any program to reduce raven predation on the desert tortoise requires the cooperation of the agencies with management authority for those lands. As part of this partnership recovery effort, this EA has been prepared with the cooperation of the U.S. Department of the Interior (DOI) USFWS, Bureau of Land Management (BLM), and National Park Service (NPS); U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service, Wildlife Services (APHIS-WS); Department of Defense (DOD), Department of the Army, Department of the Navy, the U.S. Marine Corps, and Department of the Air Force. This EA identifies and analyzes the potential environmental impacts related to the proposed action to reduce raven predation on hatchling and juvenile desert tortoises, with the goal of increasing hatchling and juvenile desert tortoise survivorship and recruitment into the adult population. Achieving this goal would bring us closer to recovering the desert tortoise. Many of the activities described in the alternatives to reduce human-provided subsidies of food, water, nest sites, and communal roost sites for the common raven have been initiated on lands administered by these agencies in the California desert. Other efforts to improve desert tortoise survival and recruitment are outside of the scope of this analysis.

This EA considers 16 alternatives in addition to the Current Action Alternative. It also describes alternatives that were considered but dismissed. The USFWS and its cooperating agencies are considering various management actions to increase desert tortoise survivorship by removing human-provided subsidies of food, water, and nest sites that attract and support elevated population numbers of ravens in the California desert. We are also considering removing individual ravens known to prey on desert tortoises, removing ravens from Desert Tortoise Management Areas (DTMAS) (e.g., desert tortoise critical habitat, Desert Wildlife Management Areas (DWMAs), research and other special management areas), and raven concentration areas (e.g., landfills).

Reducing common raven predation on the desert tortoise is one component of a multifaceted effort to aid in the recovery of this species. Other recovery tasks include acquiring, protecting, and restoring habitat; reducing mortality from other human activities; disease management; head starting; translocation; research; monitoring; and education and outreach (USFWS 1994, Tracy et al. 2004). Inherent in all of these activities is human education and outreach. Reducing common raven predation on the desert tortoise may require obtaining a permit to remove common ravens under the Migratory Bird Treaty Act.

1.1 Background

For more than two decades, researchers have documented population declines throughout much of the range of the desert tortoise in California, with some populations showing dramatic declines (Berry 1990, Corn 1994, USFWS 1994, Tracy et al. 2004). Because of these drops, in 1989, the USFWS listed the Mojave population of the desert tortoise as endangered under emergency provisions of the ESA. In 1990, the USFWS published a final rule listing the desert tortoise as threatened, because of sharp population declines that were documented throughout its range (55 Federal Register 12178–12191). The decline of the Mojave population of the desert tortoise is attributed to direct and indirect human-caused mortality including destruction, degradation, fragmentation of habitat, and loss of individual desert tortoises from human contact, predation, and disease. The desert tortoise is also listed as threatened under the California ESA.

The USFWS published a Recovery Plan for the Mojave population of the desert tortoise in 1994. The Recovery Plan identified six recovery units and one or more Desert Wildlife Management Areas (DWMAs) within each recovery unit. The DWMAs are the primary focus areas to promote the recovery and long-term persistence of viable desert tortoise populations (Figure 1-1). The Recovery Plan includes predation as one of the important factors in the decline of the Mojave population of the desert tortoise that must be reduced. This includes predation of adult and subadult desert tortoises by free-roaming and feral dogs and intense predation of hatchling and juvenile desert tortoises by an escalating population of common ravens (Figure 1-2).

Since listed as threatened in 1990, desert tortoise populations in the west Mojave, northeast and east Mojave, and north and east Colorado-desert areas have shown downward trends. These population declines are of particular concern in the west Mojave Desert. The desert tortoise in the west Mojave recovery unit has experienced substantial population decline which are due, to loss of habitat and other threats (Tracy et al. 2004).

Figure 1-1. Hatchling desert tortoise at Edwards Air Force Base. (Photo by Mark Bratton)

Figure 1-2. Juvenile desert tortoise shell with classic puncture marks from a common raven's beak.

Populations of the desert tortoise cannot increase and recover unless the number of young desert tortoises that are recruited into the breeding population (e.g., allowed to survive, reach adulthood, and reproduce) is greater than the number of adults that die (Congdon et al. 1993, USFWS 1994). Several researchers and field biologists have reported occurrences of numerous carcasses of hatchling and juvenile desert tortoises beneath raven nests and perch sites (Berry 1985, BLM 1990a, Campbell 1983, Farrell 1991). Campbell (1983) found 136 dead bodies or carcasses of juvenile desert tortoises with evidence of raven predation at the base of fenceposts on the perimeter of the Desert Tortoise Natural Area. Within a 4-year period, 250 juvenile desert tortoise carcasses were located beneath one raven nest in the west Mojave Desert (Woodman and Juarez 1988). Berry et al. (1986) reported that 29 and 44 percent, respectively, of the desert tortoise deaths or mortality at two study plots during a 6-year period, were probably caused by raven predation. At another location, 70 percent of the mortality to juvenile desert tortoises was attributed to raven predation (Berry et al. 1986). Ravens have also been observed attacking and eating juvenile desert tortoises (Berry 1985, Boarman 1993). Ravens eat hatchling and juvenile desert tortoises by pulling off the head and limbs (40 percent) or pecking holes through the soft carapace (upper half of the shell) (46 percent) or plastron (lower half of the shell) (13 percent; n = 341) (Boarman and Heinrich 1999). Boarman and Hamilton (personal communication) obtained 266 desert tortoise shells collected beneath common raven nests. These carcasses showed patterns of shell damage that were consistent with raven predation. Ravens are able to catch, carry while flying, and eat juvenile and hatchling desert tortoises because of their small size and weight, the lack of ossification or hard bone material in their shells, and the corresponding high-activity periods of both desert tortoises and nesting ravens in the spring. In the open desert in California, 89 percent of ravens observed foraging were eating wild animals in the spring versus 5 percent in fall (McKernan 1992a, McKernan 1992b). This level of predation may prevent recruitment in declining populations (Congdon et al. 1993) such as the desert tortoise.

Populations of the common raven have increased in the California desert in the last several decades. Johnson et al. (1948) reported common ravens as not common in the east Mojave Desert of San Bernardino County in the 1930s. They were not seen in the winter and spring. They were observed in the summer at lower elevations and flying along a railroad track, and near Kelso and Purdy, locations of human development. This information suggests that in the 1930s, common ravens were migratory, not common, and did not overwinter or breed in the desert.

From 1969 to 2004 the numbers of common ravens in the west Mojave Desert increased approximately 700 percent (Boarman and Kristan 2006). Population increases have also been noted at other locations in the California desert. This many-fold increase above historic levels and a shift from a migratory species to a resident species is due in a large part to recent human subsidies of food, water, and nest sites (Knight et al. 1993, Boarman 1993, Boarman and Berry 1995). Table 1-1 presents the rate of increase in survey results for common ravens, golden eagles (*Aquila chrysaetos*), greater roadrunners (*Geococcyx californianus*), and red-tailed hawks (*Buteo jamaecensiis*) in the California desert. From 1966 to 2006, the number of common ravens observed during surveys increased 1,685-fold while golden eagles, greater roadrunners, and red-tailed hawks increased 5-, 13-, and 57-fold, respectively. Raven population numbers have increased at a rate that is disproportionately greater than other predatory birds in the California desert.

Table 1-1. Summary of Results from Christmas Bird Count Surveys in the California Desert for Four Potential Avian Predators of the Desert Tortoise

Years	Number of Observations			
	Common Raven	Golden Eagle	Greater Roadrunner	Red-Tailed Hawk
1961-1965	1	0	5	1
1966-1970	3	3	4	6
1971-1975	174	4	7	21
1976-1980	619	15	24	68
1981-1985	749	39	56	180
1986-1990	1,018	31	52	179
1991-1995	2,591	19	64	210
1996-2000	3,930	25	37	329
2001-2006	5,056	15	65	344

At these elevated population levels, common raven predation on desert tortoise hatchlings and juveniles has shifted the composition of the desert tortoise population to predominantly adult desert tortoises by removing a substantial proportion of hatchling and juvenile desert tortoises in some areas, and has adversely affected recruitment (Berry et al. 1986). Without recruitment of hatchling and juvenile desert tortoises to the next generation of adult desert tortoises in the population, the old adults will eventually die and the population will become extinct. For example, at one location, the percentage of adults in the desert tortoise population increased from

54 to 82 percent from 1979 to 1988, while the percentage of juvenile desert tortoises in the population declined from 27 to 12 percent.

The declines in juvenile desert tortoises were attributed to raven predation (Berry, Woodman, and Knowles 1989). This trend in increased proportion of adults and decreased proportion of juvenile desert tortoises also occurred at other sites (Berry et al. 1990). Ray et al. (1992) developed a simple model of population growth for the desert tortoise. While it contained several assumptions, it demonstrated that the population growth rate of a healthy desert tortoise population could be changed to a declining rate by decreasing the survival rate of hatchling and juvenile desert tortoises by about 25 percent. The decline in juvenile desert tortoises from 27 to 12 percent is a decrease in the survival rate of more than 50 percent. If this declining trend is not reversed soon, these populations of the desert tortoise would eventually be exterminated.

Some of the California desert does not provide suitable habitat for common ravens to survive and reproduce. For example, ravens need a high location to construct a nest (e.g., tree, utility pole, abandoned vehicle, freeway sign, or cliff), and adequate food and water within their nesting territory (Appendix A). Common ravens actively defend their nest territory during the breeding season. In 2004 and 2005, McIntyre (2006) conducted surveys of common raven nests in part of the California desert. The purpose of the surveys was to determine locations of raven nests and collect data on the number of nests with desert tortoise remains under them. In 2004 and 2005, 28 and 27 nests, respectively, were located with desert tortoise remains beneath them.

1.2 Purpose and Need

The purpose and need of this EA is to present and analyze a proposed action to reduce common raven predation on hatchling and juvenile desert tortoises in the California desert by modifying land management practices and selective removal (see Figure 1). The USFWS believes that reducing this predation is needed to increase desert tortoise survivorship. This position is based on the best information currently available (Boarman 2002, Congdon et al. 1993, USFWS 1994). Increased survivorship of juvenile and hatchling desert tortoises into the reproductively active adult population is expected to contribute to the recovery of the species.

1.2.1 Level of Reduction Needed

Common raven pairs establish a home range in which they forage and nest. The entire home range is not defended from other common ravens. However, within this home range, they establish a breeding territory which they actively defend from other ravens, especially during the breeding season (Boarman and Heinrich 1999). The common raven breeds in spring in the California desert. A pair of common ravens constructs a nest and actively defends a territory around this nest. During this breeding period, most of their hunting activity is confined to this territory. Thus, this area is intensively hunted in the spring, which also corresponds to the time when desert tortoise activity is greatest, and the need for food for breeding ravens and their offspring is greatest. In a successfully defended breeding territory, only the common raven breeding adults pose a risk of predation to the desert tortoise with the risk increasing closer to the nest (Kristan and Boarman 2003). Common ravens are accomplished hunters, but not all common ravens hunt and eat desert tortoises (Boarman and Hamilton in prep).

The feeding behavior of nonbreeding common ravens is different from that for breeding adults. Large numbers or crowds of nonbreeding common ravens are attracted to concentrated human-subsidized sources of food, water, and roost sites. In general, these nonbreeding ravens are spatially restricted in the California desert, whereas, breeding common ravens are more evenly distributed throughout the California desert area (Kristan and Boarman 2003). These common raven crowds feed at concentrated food sources (e.g., landfills and illegal dumps) (Chamblin and Boarman 2004) and are frequently reported in the California desert (Boarman and Heinrich 1999). They have also been observed moving between concentrated food source sites. Nonbreeding ravens are gregarious and use other nonbreeding raven as cues of food availability (Kristan and Boarman 2003). Fledgling chicks move to human-subsidized resources that have crowds of common ravens.

Kristan and Boarman (2003) investigated the spatial pattern of risk of common raven predation on the desert tortoise in the Mojave Desert of California. They learned that the risk of raven predation to hatchling and juvenile desert tortoises was high near places attracting large numbers of nonbreeding ravens such as landfills. Where the common raven's human-subsidized habitat is intermixed with the desert tortoise's habitat, the risk of predation by the common raven on the desert tortoise increases and can exterminate the desert tortoise (Kristan and Boarman 2003). Many sources of human-subsidized habitat that support crowds of common ravens are located within or adjacent to human development. Desert tortoise predation from these raven crowds is termed "spillover" predation. For example, the predation by a crowd of common ravens at a landfill spills over from the landfill to any nearby desert tortoise habitat, thus increasing the risk of predation on the desert tortoise occupying this nearby habitat. In certain locations, these crowds of common ravens may represent a threat to the hatchling and juvenile desert tortoise populations at localized sites in the California desert, where these sites are adjacent to desert tortoise habitat.

From the available information, the greatest risk of predation to hatchling and juvenile desert tortoises from the common raven appears to be from breeding common ravens within their territories and from spillover predation from crowds of nonbreeding common ravens. The spillover predation risk appears to be localized and can likely be effectively managed by reducing human subsidies of food, water, and roost sites. The predation risk from breeding common ravens occurs throughout the California desert and does not appear to be substantially limited by food availability.

To determine the number of common ravens that would need to be reduced to effectively manage the predation risk from breeding common ravens, we used the data from McIntyre (2006) on the number of nests or raven pairs preying on desert tortoises from part of the California desert. We also used the information on the reproductive needs and behavior of the common raven (Appendix A). McIntyre's data showed that about 28 common raven nests in 2004, and again in 2005, had desert tortoise remains beneath these nests. We applied or extrapolated McIntyre's information to the range of the desert tortoise throughout the California desert. The result was that approximately 100 nests or pairs of common ravens would have desert tortoise remains under their nests in a given year. Therefore, if 100 pairs of common ravens that prey annually on hatchling and juvenile desert tortoises were removed, this action would eliminate most of the predation on juvenile and hatchling desert tortoises by breeding common ravens in the California desert. Common raven predation on the desert tortoise is primarily a learned behavior. Ravens can learn to hunt for and kill desert tortoises from other ravens or, through trial and error, learn themselves. Because predation on the desert tortoise is a learned behavior, not all common ravens prey on desert tortoises. If other common ravens replace those removed, they may never learn to prey on the desert tortoise. If they do learn, there would likely be a period of time when they do not prey on desert tortoises. This predation reduction should provide immediate relief to the adult-dominated and senescent desert tortoise populations in the California desert by increasing the number of hatchling and juvenile desert tortoises in the populations and increasing the total number of desert tortoises in the populations.

1.2.2 Decisions to Be Made

The USFWS is the lead agency for the proposed action. The USFWS and the cooperating agencies will address the following questions using an interdisciplinary analysis in this EA.

a. What is the method of selected common raven management that will most effectively contribute to desert tortoise recovery in the California desert?

b. What are the environmental effects of implementing the various alternatives?

1.3 Issues and Concerns

The following listed issues were identified using federal laws, regulations, executive orders, agency management policies, and our knowledge of limited or easily impacted resources. The USFWS and the cooperating agencies determined, through interagency consultation, past planning efforts, coordination with environmental groups, input from state agencies, and initial public involvement, that the following issues should be considered in the decision making process for this EA to help compare the impacts of the alternative management strategies. Following is a brief discussion of why certain issues were selected for further analysis and why others were dismissed from further consideration:

a. Impact on the Common Raven–The National Environmental Policy Act (NEPA) calls for an examination of the impacts on all components of the human environment. The BLM, NPS, and DOD policy is to protect the natural abundance and diversity of natural communities. Since all alternatives would involve manipulation of wildlife resources, specifically the common raven, and there are concerns for impacts to nontarget species, impacts on target species are addressed as an impact topic in this document. What effect would the alternatives have on the common raven? How would management strategies affect local or regional populations of the common raven?

b. Impact on Nontarget Species–The ESA requires an examination of effects to all federally listed threatened or endangered species. This section will address all federal and state threatened and/or endangered species. The desert tortoise is a federal and California state-listed species. Therefore, federal and state listed species are addressed as an impact topic in this document.

Since the alternatives would involve manipulation of wildlife resources, and there are concerns for impacts on nontarget species, the impacts on nontarget species will be addressed in this document.

c. Socioeconomic Issues–What effect might the alternatives have on increasing or decreasing the amount of money that would be spent in the area thereby, adding to or subtracting from the economy in the California desert? What effect might the alternatives have on the lifestyle of the residents and businesses in the California desert?

d. Recreation–How might the alternatives affect recreation opportunities and experiences in the California desert?

e. Human Health and Safety–During the scoping period, the public identified concerns for human health and safety regarding some of the raven management actions that are considered in this document. Therefore, human health and safety are addressed in this document. What effect might the alternatives have on human health and safety if the public is at or near locations where lethal methods would be used to remove common ravens?

1.4 Issues Not Discussed with Rationale

a. Impacts on Biodiversity and Ecosystems–If the USDA's APHIS-WS uses lethal methods to remove the common raven, their activities would be confined to removing specific offending individuals or a species at specific locations. They would not remove common ravens to significantly reduce or eradicate the population as a whole. The APHIS-WS operates according to international, federal, and state laws and regulations, which were enacted to ensure species diversity and viability. The APHIS-WS has determined that the impacts of their program on biodiversity from predator management would not have a significant effect nationwide, statewide, or in the analysis area (USDA 1997, revised). The number of ravens that may be removed ranges from a very small to moderate percentage of the total population as analyzed in Section 4.0 of this report.

b. Impact on Minority or Low-Income Persons or Populations (Environmental Justice [EJ] and Executive Order 12898)–All of the activities implemented by the USFWS and federal cooperating agencies are evaluated for their impacts on the human environment and compliance with EO 12898 to ensure EJ. There are no minority or low income populations within the proposed action area on federal land. On nonfederal land, the proposed action is expected to be implemented throughout the California desert or substantial areas of the California desert. Since the proposed management methods would not pose a disproportional risk to low income persons or their environment and does not locate any facilities or contain any ground disturbing activities, we do not anticipate that any of the alternatives would result in any adverse or disproportionate environmental impacts to persons of any race, income, or culture.

c. Protection of Children from Environmental Health and Safety Risks (EO 13045)– Because the USFWS has determined that identifying and assessing environmental health and safety risks is a high priority, the USFWS has considered impacts that the alternatives analyzed in this EA might have on children. Reducing predation by common ravens on the desert tortoise, as proposed in this EA, would only involve legally available and approved management methods in situations or under circumstances where it is highly unlikely that children would have the potential for exposure. Some actions, such as properly containing and disposing of trash and reducing water sources for disease-bearing mosquitoes, would improve human health and safety for children and adults. Therefore, implementation of any of the alternatives is highly unlikely, and not reasonably foreseeable, to pose an environmental health or safety risks to children.

d. Impact on Cultural Resources–The Mojave and Colorado deserts have been occupied by humans for at least 11,000 years. The historical record shows that the region of the Mojave Desert of interest to this project was inhabited and/or used by the Owens Valley Paiute, Timbisha Shoshone, Chemehuevi, Serrano, Mojave, and Cahuilla.

During federal interagency consultations, agencies noted that some tribes may have concerns about the lethal or nonlethal removal of common ravens. Ravens may be important to their cultural and religious heritage.

We contacted tribal offices and cultural committees in the action area in 2004 and invited their comments and concerns about this issue. The Bureau of Indian Affairs initiated outreach to tribal offices and cultural committees in August 2005. One tribe indicated that they would like to receive future documents associated with this project (Appendix B).

Removal of common ravens on tribal lands is not proposed and no ground disturbing activities are planned in any of the alternatives in this EA. The actions that are proposed to reduce human subsidies to the raven do not have the potential to affect objects, sites, or properties that are listed on or eligible for listing on the National Register of Historic Places (NRHP). Therefore, impacts to cultural resources are dismissed from further consideration.

e. Impact on Wilderness–The actions proposed in the alternatives could be implemented within designated, proposed, or potential wilderness areas, but this is not proposed or expected to occur. If any of the actions are implemented in wilderness areas, the land management agency for that area would first prepare a Minimum Tool Analysis, as required by the *Wilderness Act of 1964*. Wilderness should not contain human-subsidized sources of food, water, and nest/roost sites for common ravens. Because federal action to reduce raven predation on the desert tortoise is unlikely in wilderness areas and because any action proposed for implementation in a wilderness area would require additional evaluation through the Minimum Tool Analysis, wilderness impacts are dismissed from further consideration.

f. Impact on Noise–Hunting and shooting are allowed on BLM land and hunting is allowed on the Mojave National Preserve. Discharge of firearms also occurs on military lands. The increase in the level of use of firearms from shooting the common raven would result in a negligible increase in the hunting and shooting that is already allowed in these areas. Noise suppressors in key areas are included in the alternatives and could be used to minimize noise impacts.

g. Other Resources–The actions discussed in this EA involve minimal ground disturbance, no new construction, minimal use of vehicles and equipment, and use of existing roads. Therefore, the following resource values should not be affected by any of the alternatives analyzed: air quality, soils, geology, minerals, water quality, water quantity, floodplains, wetlands, aquatic resources, prime and unique farmlands, park lands, vegetation, ecologically critical areas, traffic, visual quality, energy requirements and conservation, natural or depletable resources, urban quality, unique ecosystems, geological resources (rocks and streambeds), stream-flow characteristics, seismicity, and sacred sites and Indian Trust resources at our proposed sites. There are no wild and scenic rivers in or adjacent to the project area. Each of these topics was analyzed as it relates to the potential alternatives. Each was dismissed because of lack of relevance and/or lack of impact from the proposed alternatives.

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2.0 AFFECTED ENVIRONMENT

2.1 Background–California Desert

The California desert includes the Mojave and Colorado deserts within California. It extends north to the Nevada State Line and Highway 168 junction and continues south to the United States-Mexican border. The California-Nevada and California-Arizona State Lines define its eastern boundary. The following mountain ranges primarily define its western boundary: eastern and southern Sierra Nevada, eastern end of the Tehachapi Mountains, San Bernardino and San Gabriel Mountains, and Mount San Jacinto to the Peninsular Ranges. The California desert occupies more than 30 million acres and covers portions of Imperial, Inyo, Kern, Los Angeles, Riverside, San Bernardino, and San Diego counties.

2.2 Climate

Hot summer temperatures (average daily highs above 100 degrees Fahrenheit) and low annual precipitation (approximately 5 inches or less) characterize the California desert. Precipitation in the form of snow can occur during the winter at higher elevations. Probably more important than the averages is the extreme variability in the weather. Daily temperature variations of 40 degrees can occur. Precipitation extremes are also common; variations of 80 percent in annual precipitation can occur. Summer thunderstorms can drop more precipitation on a site in one event than the mean precipitation for that location for the year. High winds can occur; peak-wind velocities above 50 mph are not uncommon.

During the summer, the west side of the Mojave Desert is heavily influenced by the dry southwest airflows resulting in typically very dry weather. The influence of southwest winds diminishes toward the eastern Mojave Desert. This results in a more continental influence and its resulting monsoonal weather patterns. Thus the western section of the California deserts predominately have winter rains and the eastern sections, which receive winter rainfall, receive more of their annual rainfall with the summer thunderstorms. Both east and west sections of the California deserts can receive rain in both periods.

Extreme variability is another characteristic of the precipitation. Some locations such as the town of Mojave have a mean precipitation of 6.06 inches and a standard deviation of 4.04 inches. This means that the normal precipitation ranges from a low of 2.02 inches to 10.10 inches. This is an 80 percent variation in precipitation.

2.3 Biological Environment

The California desert has a distinct flora and fauna that have adapted to the local conditions and formed distinct natural communities, including species found nowhere else (e.g., endemics). It also incorporates the ecotones or transitional communities from the Sierra Nevada, Tehachapi, San Gabriel, and San Bernardino Mountains. The predominant aspect of the California desert is a flat, sparsely vegetated region interspersed with mountain ranges and dry lakes. Elevational changes range from more than 10,000 feet to below sea level. The Mojave Desert is a part of the high desert, large portions of which lie at elevations between 2,500 and 4,000 feet. The low desert or Colorado Desert occurs at elevations from below sea level to 2,500 feet. Wildflowers cover the characteristic creosote bush and saltbush plant communities of these two deserts in years of above-normal winter rainfall, and up to 90 percent of the floral diversity is composed of annual plants.

The BLM Desert Plan staff inventoried the California Desert Conservation Area (CDCA) for its flora and fauna in the late 1970s (BLM 2005). They recorded 1,836 vascular plant species in 116 families and 635 species of vertebrate animals. This diversity reflects the varied topography, soils, and landforms within the planning area. For example, the western Mojave Desert contains thirty-two distinct plant communities. The most common communities are creosote bush and saltbush scrubs, which occupy 75 percent of the natural lands. Mojave mixed woody scrub accounts for 13 percent of the native vegetation. The remaining 29 plant communities are found in isolated areas with unique conditions, such as freshwater or alkali wetlands, or occur along the south and west edges of the desert-mountain transition.

Inventories of invertebrates, such as insects, mollusks, and fairy shrimp have been completed for only a few groups, but show a high level of endemism and specialization to unique substrates, host plants, and water sources. Thousands of additional invertebrate species are present (BLM 2005).

The region contains at least four endemic vertebrate animals and thirteen endemic plants. A number of disjunct localities exist where plants and animals range into the planning area far from their primary distribution. Many of the rare species are concentrated at special sites, where unique substrates, water sources, or topography is present. Several areas have high biodiversity because of location at the desert-mountain transition zone or ecotone.

A large number of introduced plant species and a small number of introduced animal species (excluding insects) are found in the California desert. A few of these animal species have substantial effects locally on the native environment, particularly feral burros and bullfrogs. They provide a new level of pressure or threat to the native species. In addition, feral and free roaming dogs are a problem in several areas because of added predation on native species. The common raven is a natural predator of the desert tortoise. However, its population numbers have increased markedly in the last few decades, which have increased the level of predation on the desert tortoise (Boarman and Berry 1995, Boarman 2006).

The number of introduced invasive plant species is higher and in some respects more of a threat to the natural ecosystem. Riparian invasive plants include tamarisk (*Tamarix parviflora)*, Russian olive (*Elaeagnus angustifolia*), and common reed (*Phragmites australis*), which crowd out native willows and cottonwoods in riparian habitats. Weedy annuals such as storkbill, several species of brome grass, split grass (*Schismus barbatus)*, Sahara mustard (*Brassica tournefortii* Gouan) and other annual plant species compete with native wildflowers, provide a nutritionally deficient food plant for the desert tortoise (Oftedal et al. 2002), and have altered the fire regimen in the desert. They provide fuel to support and sustain large fires in the desert, which is not adapted to them (Brooks 1998).

3.0 PROPOSED ACTION AND ALTERNATIVES

3.1 Proposed Action

The proposed action is to reduce raven populations by integrating federal, state, and local management plans and developing a major public outreach and education program. The management techniques include cultural and mechanical methods (e.g., reduce human subsidies of food, water, nest sites, roosting sites for the common raven, and aggressive nest removal) with the potential of limited raven removal in designated areas. The alternatives analyzed in Section 4.0 use various combinations of methods to implement the proposed action. We expect this level of effort to include one USFWS administrator (part-time), a part-time identification field team, and potentially a small part-time removal team per year for the life of the project.

The proposed action would occur at various locations within desert tortoise habitat in the California desert and at areas with human development that are in and near desert tortoise habitat (e.g., communities, waste disposal sites, and agricultural areas). Three of the alternatives discussed include the removal of common ravens.

The Proposed Action also contains many safeguards to avoid and/or minimize the potential impacts of this action. These measures include:

a. Measures to Avoid or Minimize Impacts on Target Species Populations

1) California Department of Fish and Game (CDFG) has been consulted on state regulations and policies affecting the management of the common raven and the status of the common raven population in the California desert. Implementation of effectiveness monitoring will ensure that common ravens will be removed only when necessary to meet stated objectives.

2) Wildlife specialists would be used to capture and release or dispatch the common raven.

3) The impacts of the program on the common raven would be monitored annually.

4) The impacts of the program on the common raven would be monitored by considering the "cumulative take" which involves assessing the impacts of all known forms of take against the common raven population estimates and trend indicators.

5) Common ravens that are trapped would not be relocated. They would be euthanized using the most humane methods practicable and offered to museums or laboratories for research purposes.

b. Measures to Avoid or Minimize Impacts on Nontarget Species Including Federal and State Listed Threatened and Endangered Species

1) The CDFG has been consulted on state wildlife regulations and policies concerning the state-listed desert tortoise and Mohave ground squirrel. The CDFG concurred with our determination that take was unlikely to occur (see Section 3.1.a.1).

2) The CDFG has been consulted regarding potential risks to state listed threatened and endangered species.

3) The USFWS would be consulted regarding potential risks to federally listed-threatened and endangered species and species proposed for listing. All applicable measures

identified through the consultation/conference process to protect listed and proposed species would be implemented.

4) The impacts of the removal program on nontarget species would be monitored annually.

5) Bait used for the common raven would be as selective as possible for this species, while still maintaining effectiveness.

6) Personnel working to remove the common raven would be trained to identify federal and state endangered and threatened species that may be present and avoid them.

7) Carrion and meat baits would not be used at baiting platforms.

8) Vehicle speeds on nonpaved roads in desert tortoise habitat would be limited to 25 miles per hour (mph) for personnel accessing sites to remove common ravens.

c. Measures to Avoid or Minimize Impacts on Recreation

1) Suppressed firearms would be used in situations where noise from gunshot would have a negative impact on recreational use of the site.

2) Activities to remove common ravens would only be conducted after agreements, work plans, or other comparable documents are developed with the landowner/managing agency.

3) Work plans would consider activities in closely adjacent settlements and communities to minimize impacts on lifestyle or human communities on adjacent lands.

4) Activities to remove common ravens in areas known to receive extensive human use or close to human communities or settlements would be conducted at times and with methods which would minimize impacts on recreational activities.

d. Measures to Avoid or Minimize Impacts on Human Health and Safety

1) Activities to remove common ravens would only be conducted on private/public lands with the permission of the landowner/managing agency. Agreements, work plans, or other comparable documents would be prepared with the landowner/managing agency designating the times and methods.

2) Activities to remove the common raven would only be conducted after agreements, work plans, or other comparable documents are developed with the landowners, or adjacent communities are informed of the removal activities prior to implementation. No lethal methods would be used in areas with legal or policy restrictions that preclude the proposed activities.

3.2 Effectiveness Monitoring and Adaptive Management

A key component of integrated predator management is to monitor the effectiveness of the management action in meeting the stated objective. This is called effectiveness monitoring. If the action was effective, then it would continue. If it was not effective, then the action would be modified or adapted. This implementation of adaptive management includes monitoring to determine if the adaptive management is effective. Management actions might change or adapt, depending on the results of the monitoring to determine the effectiveness of these actions.

The existing Raven Management Interagency Task Group, established in late 2002, would coordinate implementation of the Proposed Action, evaluate monitoring reports, assess progress of the actions, and recommend changes in the program. This adaptive management/effectiveness monitoring program would include elements to determine if there is a change in predation by the common raven on the desert tortoise and a change in the raven population or distribution at a regional level within the California desert.

To determine change in raven predation on the desert tortoise at a local or site specific level, we propose to measure changes in the occurrence of desert tortoise remains found at raven nests, after removing specific pairs of nesting ravens (Boarman and Kristan 2006). Using data from the previous or current year on nest locations for common ravens, surveys would be conducted at nest sites for evidence of predation on the desert tortoise. The Proposed Action would be effective if the number or percent of nests surveyed, with evidence of predation and the number of desert tortoise carcasses found during surveys, are lower than the baseline or first year's data collected. Another possible approach to measure changes in predation pressure on desert tortoise populations at any location, would be to use an approach similar to Kristan and Boarman (2003), where models of juvenile desert tortoises are placed in the California desert and monitored to determine changes in the frequency of raven attacks (Boarman and Kristan 2006).

Common raven population trends would be monitored using road surveys both inside and outside the Desert Tortoise Management Areas (DTMAs). Trend analysis would also include the Christmas Bird Count (CBC) survey data and the Breeding Bird Survey (BBS) data. The road surveys would provide information on whether ravens use the DTMAs at the same level as unmanaged areas and could yield data for testing the effectiveness of specific actions or projects. The CBC and BBS data sets would provide the overall long-term trend of the raven population in the California desert.

The USFWS, in coordination with the cooperating agencies, would monitor the selected action through periodic reviews of the monitoring data as compared to the goal in the final NEPA document and decision. Data from the USFWS's range-wide monitoring program for the desert tortoise would be used to determine changes in the desert tortoise population regionally or range wide. The APHIS-WS would assist in the production of an annual report discussing the locations where work was conducted, the number of target and nontarget animals, if any, removed, and recommendations for subsequent season's work. The USFWS and cooperating agencies would review the results of the effectiveness monitoring including any recommendations for modifications, and use this information and information from APHIS-WS to determine if the impacts of the program are within the parameters analyzed in the EA, and if a new evaluation pursuant to the NEPA or Section 7 of the ESA is necessary.

3.3 Objectives of the Proposed Action

3.3.1 Objective 1

Reduce human-provided subsidies of food and water; and nest and communal roost sites for the common raven.

Many of the following activities listed would be implemented by state and local agencies and the public. Many would be implemented by the USFWS or any of the agencies previously listed. Since implementation of any of these activities may or may not be a federal action, we are listing all of the activities. From this set of activities, those that require analysis under NEPA are analyzed in Section 4.0, Environmental Consequences.

To implement the first objective, the following activities are proposed:

a. Develop and implement an outreach program–The USFWS and the agencies would develop and implement an outreach program. The outreach program would inform the public about the status of the desert tortoise, build support among the public to help the desert tortoise reverse its declining population numbers, and inform the public that they, as individuals, can help reduce mortality of the desert tortoise by making simple changes in their home, work, or recreational environment. The USFWS recognizes that the public plays a key role in reducing many of the unintentional human-provided subsidies, which have contributed to the raven's population explosion in the California desert in the last few decades and hopes that the public would implement the recommendations provided to them through the outreach program.

Before developing the outreach program, the USFWS and cooperating agencies would conduct a study that would gather baseline data on public attitudes, perceptions, and values about the desert tortoise and the raven, desert tortoise recovery efforts, and conservation of the California desert. The survey results would be used to help design effective public outreach messages and strategies. This outreach program would include developing and distributing written, audio, and video materials directly to residents of the California desert, visitors to the California desert, school children, decision makers, and stakeholders. A follow-up survey would be conducted to evaluate the effectiveness of the outreach program a few years after its full implementation.

b. Reduce or eliminate human-subsidized food and water for the common raven–We would coordinate with local waste management companies, and local, state, and federal agencies to reduce raven access to organic wastes and standing water at locations such as landfills and transfer stations. We would work with local, state, and federal agencies to clean up unauthorized dumps and develop incentives for the public to report unauthorized dumping, trash containment, or watering.

Working with local, state, and federal agencies, we would encourage an enhanced level of enforcement of existing regulations on trash management and water use. If needed, we would work with local agencies to develop and implement additional regulations to reduce human-provided subsidies of food and water to the common raven.

To better manage solid waste at its point of origin (e.g., businesses and homes), we would work closely with federal agencies to contain solid waste on federal lands and at federal facilities, and strongly encourage nonfederal agencies to do the same. Such efforts would include: using raven-proof trash bins at public (e.g., roadside rest stops, campsites), business (e.g., construction sites, restaurants and food manufacturers, gas stations, and grocery stores), and residential (e.g., apartments and houses) facilities; and reduce availability of livestock feed, carcasses, afterbirths, and insects at feedlots and dairy and poultry farms.

To better manage surface water use, we would implement the same approach with federal, state, and local agencies as for solid waste to minimize the availability of surface water, which can be used by ravens. We would coordinate with agencies and appropriate businesses (e.g., water companies, well drilling companies) to promptly repair leaks in landscaping and irrigation systems, reduce over-watering and standing water as products of their operation, and encourage municipalities to reduce water features in their landscapes.

c. Reduce the availability of animal carcasses along roadways–We would continue to work with federal, state, and local road departments to install desert tortoise exclusion fencing and culverts along highways in desert tortoise habitat. These features would direct desert tortoises, and possibly other wildlife, to culverts to safely pass under roadways rather than attempting to cross the roadway where they might be struck by vehicles. We would also work with federal, state, and local highway departments to quickly remove animal carcasses from roadways to reduce food subsidies for common ravens.

d. Remove common raven nests not occupied with eggs or nestling–On federal lands and facilities, we would work with federal agencies to remove raven nests from human-created structures within the DTMAs and along a 2-mile perimeter around the DTMAs. For those ravens whose nests were removed during courtship but prior to egg-laying, we would attempt to trap, tag, and transmitter the ravens to determine whether they attempted to renest, and if so, where.

e. Remove or modify manmade communal roosting sites for ravens–For abandoned or nonfunctioning structures that are used as communal roost sites by common ravens, we would encourage federal and nonfederal entities to remove these unnecessary structures. For human-built structures that are not removed, we would encourage federal and nonfederal entities to modify the existing structures to reduce or eliminate roosting by common ravens. In addition, we would work with federal, state, and local agencies to minimize construction of new structures that are used by ravens for communal roosting (e.g., communication towers, billboards, and shade structures). As structures are designed and built, we would work with project proponents to design structures to minimize or prevent ravens from using them as communal roost sites.

f. Remove or modify human-provided nest sites for ravens–We would encourage federal and nonfederal entities to remove unnecessary structures inside and within 2 miles of any DTMA that are used as nest sites by the common raven. For structures that cannot be removed, we would encourage federal and nonfederal entities to modify existing structures to reduce or eliminate the likelihood of these structures being used as nest sites by ravens. In addition, we would work with federal, state, and local agencies to minimize construction of new structures (e.g., electrical towers, billboards, communication towers, open warehouses, or shade towers). As structures are designed and built, we would work with project proponents to design structures to minimize or prevent ravens from using them as nest sites.

3.3.2 Objective 2

Remove ravens that prey on the desert tortoise. This objective includes:

a. Identify ravens that have preyed on the desert tortoise–Evidence of predation would be locating a minimum of one desert tortoise shell showing the classic peck marks of raven predation within 1 mile of a nest (Boarman 2002b). Direct observation of a common raven preying or attempting to prey on a desert tortoise would also be evidence of predation. All raven pairs documented as desert tortoise predators would be removed.

b. Remove predatory ravens–Common ravens would be removed using the most appropriate humane and safe method. Removal methods could include shooting, using an avicide (DRC-1339), or live trapping and euthanasia. The ravens would be preserved and offered to researchers to collect data on diseases (e.g., West Nile Virus [WNV] and avian influenza), genetics, or for museum collections. Young ravens and eggs found in nests of removed adults would be euthanized after being removed from the nest.

Due to the legal authorities and recognized expertise of APHIS-WS in wildlife damage management, the lead and cooperating agencies implementing lethal removal of ravens would contract this work to WS to be performed by their trained professional staff. The USFWS proposes to use the decision model described in Section 3.3.3 as the primary tool for the selection of common ravens to be removed.

3.3.3 Use of a Decision Model for Implementing Removal of the Common Raven

The *Wildlife Services Decision Model* (Slate et al. 1992) is adopted from the APHIS-WS decision-making process, which is a standardized procedure for evaluating and responding to wildlife damage complaints. The Decision Model is a description of the thought process used by wildlife management specialists, USFWS, and cooperating agencies to develop and implement the most appropriate method to reduce predation by the common raven on the desert tortoise through removal methods (Appendix C).

3.4 Description of Alternatives

This section describes 16 management alternatives. These alternatives were developed and analyzed to provide the full range of reasonable alternatives that provide levels of raven management, ranging from no programs beyond existing management, to a full-scale control program throughout much of the California desert. The current program provides a basis for comparing the management direction and environmental consequences of the other alternative actions. Of these16 alternatives, 10 were dismissed for various technical reasons (see Section 3.5) and 6 alternatives were carried forward.

3.4.1 Alternative A

The Current Program Alternative (Alternative A) describes the current level of management. This alternative would maintain the status quo and would not involve additional actions. This can be thought of as the current “program” alternative. Development in the California desert would continue with increased human subsidies for the common raven of food, water, nest sites, and roost sites. Activities currently being implemented by various federal, state, and local agencies to reduce the population of the common raven in the California desert are limited to a few efforts at selected locations. These current efforts include: reducing trash availability at landfills that have consulted with the USFWS, removing illegal dumps, fencing along highways to reduce road-kills, and installing perch guards on fences at the Desert Tortoise Natural Area. Many of these actions are nonfederal actions and do not require analysis under NEPA. Those actions that are federal actions have been analyzed by the federal action agency through the NEPA process.

3.4.2 Alternative B

Integrated Predator Management Emphasizing Cultural and Physical Methods (removing ravens only after evidence of predation or attempted predation on young desert tortoises has been collected).

Alternative B would reduce human subsidies of food, water, nest, and roosting sites for the common raven, and includes aggressive nest removal. The survival of hatchling and juvenile desert tortoises would be expected to increase from the removal of ravens known to prey or attempting to prey on the desert tortoise.

This alternative applies the principles of integrated pest management (IPM); the biology of the animal dictates the appropriate method(s) and timing of management measures to implement. The primary focus of IPM is to reduce or eliminate the source, cause, or reason the pest species is attracted to a location and causes a problem, thus becoming a pest. The IPM uses nonlethal actions to reduce the number of animals causing problems. Sometimes this is sufficient to reduce the conflict. At other times, removal actions are also needed to achieve the goals and objectives of a pest management situation.

We anticipate that the number of common ravens that would be removed annually would be approximately 100 pairs of ravens and their associated offspring each year. This is 0.5 percent of the adult population and 2.4 percent of the total population (adults plus newly hatched birds). We also anticipate that the need to remove ravens would decline over time with the reduction in human-provided subsidies of food, water, and nest and communal roost sites for the common raven in the California desert. We propose to work with local, state, and federal agencies, and the public to implement management actions to effectively reduce human-provided subsidies to the common raven.

3.4.3 Alternative C

The Integrated Predator Management and Removal of Ravens from Desert Tortoise Management Areas.

Alternative C would implement the portion of the proposed action (Alternative B) on reducing human subsidies for food, water, nest sites, and roost sites, but expand the portion on removal of the common raven to include any raven found within a DTMA. The DTMAs include the desert wildlife management and critical habitat areas in Table 3-1. No evidence of predation on the desert tortoise would be needed to remove common ravens.

We estimate that approximately 2,000 ravens occur in the DTMAs and would be removed each year, or approximately 5.3 percent of the population in the California desert. We used the best available information on common raven population size, geographic area, and other factors to determine the number of ravens to be removed. The lethal removal methods described in Alternative B would be used for raven removal from DTMAs. This removal would occur during any time of the year. Only authorized wildlife specialists would conduct the lethal removals.

Table 3-1. Areas in the California Desert Designated for Management of the Desert Tortoise for Survival and Recovery

Desert Wildlife Management Area	Critical Habitat Unit	Recovery Unit	State	Critical Habitat Unit (acres)
Chemehuevi	Chemehuevi	Northern Colorado	California	937,400
Chuckwalla	Chuckwalla	Eastern Colorado	California	1,020,600
Fenner	Piute-Eldorado	Eastern Mojave	California	453,800
Fremont-Kramer	Fremont-Kramer	Western Mojave	California	518,000
Ivanpah	Ivanpah	Eastern Mojave	California	632,400
Joshua Tree	Pinto Mountain	Western Mojave	California	171,700
Ord-Rodman	Ord-Rodman	Western Mojave	California	253,200
Superior-Cronese	Superior-Cronese	Western Mojave	California	766,900

Under Alternative C, we propose to remove up to 2,000 common ravens per year from the DTMAs in the California desert. This is based on spending twice the effort as Alternative B, but because Alternative C allows for raven removal efforts in defined areas or DTMAs, the ability to remove more ravens in the same period of time would be much greater. Thus, if twice the effort is expended with a reduced need to spend time and money on logistics, we could remove up to 2,000 ravens.

Desert tortoises spend most of their time underground in their burrows where the temperature and humidity remain within a more moderate range than aboveground. The desert tortoise is an ectotherm or cold-blooded animal; its body temperature and metabolic rate are determined by the surrounding temperature. Like most animals, the desert tortoise does not tolerate high temperatures or low temperatures so it modifies its behavior and habitat to occupy space with moderate temperatures. This is accomplished by excavating and using burrows for the cold and hot periods of the year as well as the dry periods. Desert tortoises also use their burrows for protection from predators. Thus, desert tortoises are usually not aboveground at night, in the winter, summer, or hot or cold periods of spring and fall.

Desert tortoise usually emerges from their burrows in the daylight hours of spring to forage on the native annual and perennial herbaceous vegetation produced from the winter rains. They are aboveground for a short period to several hours a day replenishing their bodies with food to last them until the next spring.

For the common raven, the greatest demand for food is in the spring during the breeding season. Common ravens must increase their food intake (protein and calories) to produce eggs and feed nestlings. Breeding ravens actively defend their breeding territories and spend much of their time intensively hunting in these territories. This intensive hunting effort coincides with the active season for desert tortoises.

In 2004 and 2005, McIntyre (2006) observed that 5 percent of the common raven nests surveyed showed evidence of desert tortoise predation. Since two birds establish and use a nest for breeding, this means that about 10 percent of the breeding common ravens in the areas observed had evidence of preying on desert tortoises. If 2,000 common ravens are removed, approximately 10 percent or 200 birds were likely preying on desert tortoises. Thus, in

Alternative C, more common ravens are removed, but the number of ravens that were likely preying on the desert tortoise that would be removed is similar to Alternative B.

3.4.4 Alternative D

Alternative D provides for integrated predator management and removal of ravens from desert tortoise management areas and raven concentration areas.

This alternative would implement the actions proposed in Alternative C and would also incorporate raven removal in DTMAs and raven concentration areas, such as landfills. Under this alternative, about 3,000 to 7,000 ravens, or 8 percent to 18.7 percent of the population, would be removed each year from the California desert including urban and suburban areas. We used the best available information on common raven population size, geographic area, and other factors to determine the number of ravens to be removed. Ravens located at these concentration centers would be removed using any or all of the methods listed under the proposed action. This removal would occur during any time of the year. As described in Alternative B, only authorized wildlife specialists would conduct the removals.

In Alternative D, the level of effort to remove common ravens is three times that of Alternative B. However, the areas identified for raven removal include raven concentration areas. Thus a moderate increase in effort may produce a disproportionate increase in the number of birds removed. Although we estimate that 3,000 to 7,000 common ravens may be removed by this action under Alternative D, many of the ravens removed would be from sites where large groups of ravens feed. These feeding sites are the result of human activity that unintentionally provides a reliable food source for the common raven. Of the 3,000 to 7,000 common ravens that may be removed, we estimate that approximately 1,000 to 5,000 of them may likely be dependent on these human-provided food sources (e.g., landfills and agricultural sites) rather than nonhuman food sources (e.g., desert tortoise and other wildlife species). Therefore, removing 3,000 to 7,000 common ravens may provide us with similar results as Alternatives B and C, that is, the number of common ravens removed that are preying on hatchling and juvenile desert tortoise would be about 200 birds.

3.4.5 Alternative E

Alternative E provides for integrated predator management using only nonlethal cultural and physical methods.

This alternative would not remove common ravens from the California desert. It would reduce human subsidies of food, water, roost, and nest sites, includes aggressive nest removal of raven nests without eggs or nestlings. The primary focus of this alternative is to reduce or eliminate the source, cause, or reason that ravens are attracted to a location and cause a problem, thus becoming a pest. This alternative uses cultural and mechanical methods to reduce the number of ravens preying on hatchling and juvenile desert tortoises. This alternative would implement all of the nonlethal methods listed in Alternative B. Table 3-2 presents the anticipated environmental effects.

Table 3-2. Anticipated Environmental Effects

Issues	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Air Quality	None	None	None	None	None	None
Children and Low Income populations	None	None	None	None	None	None
Noise	None	None	None	None	None	None
Water Resources	None	None	None	None	None	None
Floodplains/wetlands	None	None	None	None	None	None
Cultural Resources	None	None	None	None	None	None
Geology and Soils	None	None	None	None	None	None
Hazardous Material/Waste[1]	None	None	None	None	None	None
Socioeconomics(project costs)	None	$200K	$400K	$550K	None	$200 – 550K
Recreation Impact[2]	None	5–10 days	10–20 days	10–20 days	None	5 – 20 days
Desert Tortoise[3]	Hundreds per year	Up to 75%	Up to 75%	Up to 75%	< 1–5%	Up to 75%
Ravens Removed[4]	None	215/yr	2000/yr	3000-7000/yr	None	215 – 7000/yr
Nontarget Species[5](200g/day/raven)	None	43kg	400kg	600-1400kg	13kg	43 – 1400 kg
Biodiversity/Ecosystem	None	None	None	None	None	None
Wilderness	None	None	None	None	None	None
Traffic	None	None	None	None	None	None
Sensitive Areas	None	None	None	None	None	None
Visual Resources	None	None	None	None	None	None

[1]All wastes and residues would be disposed of in compliance with all exist rules and regulations. The preferred avicide is nontoxic to mammals and most other vertebrates and is metabolized rapidly by ravens to nontoxic metabolites.
[2]Expressed as days not available for recreation purposes at a specific site
[3] This number would be expected to increase over time. The percentages are desert tortoises that would be expected to survive annually, that would otherwise be expected to be consumed by the raven.
[4]If nesting pairs are removed the nest and any nestlings would also be removed.
[5]The diet of ravens is known to vary greatly from juvenile to adult, from season to season, and from location to location. The impact on other wildlife is expressed here as a weight because of the known variation in diet composition.

3.4.6 Alternative F

Alternative F provides for the phased implementation of Alternatives B, C, and D, as needed.

We would remove common ravens by implementing up to three phases, as needed. The first phase, Alternative B, would remove up to 0.5 percent of the adult common ravens in the California desert, for which we have evidence that they are preying or attempting to prey on desert tortoises. This action would be implemented in combination with reducing human subsidies to ravens. If successful, we would only implement Alternative B. If effectiveness monitoring indicates that our actions are not successful, we would implement the second phase. The second phase, Alternative C, would be to remove up to 5.3 percent of the adult common ravens in the California desert and including removal of ravens in the DTMAs in combination with reducing human subsidies to common ravens. If effectiveness monitoring indicates that our actions are not successful, we would implement the third phase. The third phase would be to remove up to 18.7 percent of the common ravens in the California desert and would include removal of ravens in the DTMAs and raven concentration areas in combination with reducing human subsidies to ravens. We would remove only the minimum number of common ravens; ravens would be removed until there is no evidence of predation on the desert tortoise based on effectiveness monitoring results. Phased implementation with monitoring and adaptive management is necessary to determine the lowest level of removal that is effective in reducing raven predation on the desert tortoise to meet our goals in combination with implementing cultural and mechanical methods to reduce human subsidies to common ravens.

The methodology for determining whether to move to a greater or lesser removal of the common raven (e.g., from Alternative B to C or from Alternative C to B) would be through analysis of 3 years of effectiveness monitoring data. If the data indicate less than a 75 percent reduction in predation by the common raven on the desert tortoise for each year, the next phase or alternative would be implemented. If the data indicate a 90 percent or more reduction in predation by the common raven on the desert tortoise for each year, the previous phase or alternative would be implemented. If the results are between these thresholds, we would continue implementing the current alternative.

3.5 Alternatives Considered and Dismissed

Alternatives identified in the following paragraphs were offered by the public during the public scoping session or were developed by the lead/cooperating agencies. They were researched and/or analyzed, but dismissed from further consideration in this document for the reasons provided as follows:

a. Establish a hunting season and/or bounty for permitted hunters–Common ravens are protected under the MBTA. The MBTA has two designations for listed birds, nongame (which includes the common raven) and game (hunted). The common raven is listed as a nongame migratory bird under the MBTA and California Fish and Game Code; there is no provision under MBTA for the general public to hunt nongame birds. To establish a hunting season for common ravens in California, ravens would need to be moved from the nonhunted list to the hunted list. To do this, the USFWS would propose new regulations to hunt common ravens. The process includes developing the proposed regulations, publishing them in the *Federal Register* and soliciting public comment, complying with NEPA, and then finalizing the regulations depending on information received during the comment period (Mike Green, USFWS, personal communication). Because of the time involved, the workload of the agency, the importance of this action when weighed with other actions, the likelihood of this alternative occurring is unlikely in the near future.

If the change in designation occurred at the federal level, ravens could not be hunted in California until the California Fish and Game Commission approved changes to the state regulations to allow hunting for sport (Mike McBride, CDFG, personal communication).

If the federal and state regulations were changed, establishing a hunting season for ravens would not necessarily achieve the goal of reducing predation of the common raven on the desert tortoise. Not all ravens prey on desert tortoises. A hunting season for ravens would not target the offending birds. Hunting would not occur throughout the desert. Hunting ravens or any other animal is generally not allowed within city limits or near a dwelling in unincorporated areas. This restriction and the ever-changing urban-wildland interface would make it difficult to hunt ravens in many locations in the California desert. Ravens that are actively hunted become more wary of humans and more difficult to hunt or manage. For these reasons, this alternative is not considered realistic or effective and is eliminated from further consideration.

b. Establish an Adopt-a-Raven Program. This alternative would require live-trapping common ravens, locating willing individuals or organizations to adopt and care for the birds and establishing a licensing program to track the placement and care of these birds. The MBTA and California Fish and Game regulations (California Fish and Game Code 3800 and Title 14, Section 671) prohibit the capture and possession of native nongame birds, including common ravens, except under special circumstances of research or education (Michael Green, personal communication; Hank Hodel, CDFG, personal communication). Under the MBTA, wild birds may be held for scientific and educational purposes. An adoption program for the common raven, a nongame bird, would not meet either of these two requirements. Generally, education permits are granted to persons who will use the birds for educational purposes. In these situations, birds are not removed from the wild. Rather, birds that cannot be rehabilitated to the wild are used for educational purposes. Permits under the MBTA are not granted for adoption purposes; there is no provision in the MBTA for that type of permit. For these reasons, this alternative is not considered realistic and will not be evaluated further.

c. Trap and Relocate Ravens–This alternative would require live-trapping common ravens, moving them to another location, and releasing them. Stiehl (1978) recommends that ravens be moved a minimum of 125 miles (200 km) to increase the success of the relocation. Both the USFWS's Office of Migratory Birds and CDFG would need to issue permits prior to trapping and relocating ravens. Concerns about transmitting diseases (e.g., WNV), moving the rising numbers of ravens throughout California, and transferring a predation problem from one location to another were concerns expressed by CDFG. For these reasons, they would not permit this alternative (e-mail dated August 15, 2006). Also, there is little information available that demonstrates that relocation would be successful, that is, that the relocated ravens would remain at their new location. Without approval from the regulatory agencies, this alternative is not possible. This alternative will no longer be considered.

d. Provide Another Food Source for Ravens–The current condition is that new food sources were provided for ravens by humans in the California desert. Common ravens freely eat from waste and garbage associated with human development, animals killed on roads, and water associated with human development. These human subsidies have contributed to increased survival of raven offspring and reduced mortality of adults, leading to the population increase. Continuing to sustain or increase the availability of food and water for ravens would only exacerbate the current predation problem on the desert tortoise, not reduce it. Because this alternative would likely result in increased numbers of ravens and increased predation on the desert tortoise, it would not help achieve the goal and is eliminated from consideration.

e. Implement Visual or Auditory Aversion for Ravens–Visual and auditory aversion usually consists of bright flashes of light, effigies, and loud noises. While visual and auditory aversion training has been used on ravens, its utility was limited to a few territorial birds preying upon a concentrated food source (i.e. least tern eggs in a tern nesting colony, Boarman and Heinrich 1999). Ravens frequently learn to disregard aversion methods such as "hazing" in a short period of time. Shooting to supplement harassment typically enhances the effectiveness of harassment techniques and can help prevent bird habituation to hazing methods (Kadlec 1968).

f. Conditioned Taste Aversion (CTA)–This aversion involves training animals to form an association between particular foods or prey item and a negative consequence. For CTA, this negative consequence is illness. Theoretically, after "teaching" the animal to avoid the food item using CTA, even food items that have not been treated with the aversion agent should be avoided.

This is a form of behavioral modification. The target prey or a close mimic of the target prey is laced with a substance that causes illness when consumed by a common raven. The raven learns that eating the prey or mimic will make it sick. This method has limited application and is unlikely to work given the scale of this project. Aversion training is recommended for use when only a few individuals are the target, a large amount of time can be invested, and the problem area is limited in geographic area. The California desert covers more than 25 million acres. Implementing an aversion program for ravens on this scale of landscape would be extremely expensive, time consuming, labor intensive, and annoying to people. Currently, there are no suitable products registered for CTA use. Using CTA with a carcass or likeness of a prey species may result in adverse effects to nontarget species. Nontarget species may be attracted to the carcass or likeness and consume the illness-causing substance. Problems associated with this method include: locating a suitable mimic for hatchling and juvenile desert tortoises; shielding nontarget individuals and other species from adverse effects; monitoring during the conditioning period; implementing the method on a region-wide or desert-wide area, and implementing a method that has little data to demonstrate its effectiveness and longevity. For these reasons, this method is eliminated from consideration.

g. Introduce a Predator for Ravens–Past wildlife management activities have shown that introducing nonnative predators to an ecosystem greatly upsets the balance of the system and usually leads to undesirable consequences, (i.e., mongoose in Hawaii). Executive Order 13112 directs federal agencies to prevent the introduction of invasive species. For those already present, it provides for their control to minimize the economic, ecological, and human-health impacts that invasive species cause, subject to availability of appropriations. Currently, there are few native predators of the common raven in the California desert. Eggs and nestlings are potential prey for other ravens and a few birds of prey. Adult ravens have no known predators. Because of the large-scale consequences of such actions; the time, expense, and permits required to test this nonnative predator alternative; the requirement to comply with Executive Order 13112 on invasive species; the NEPA compliance requirements; and monitoring requirement following implementation; this alternative was not considered reasonable and was eliminated from further consideration.

h. Implement a Birth Control or Chemical Sterilization Program–Birth control or chemical sterilization programs have shown some promise in some animal pest situations (i.e., Canada geese in urban area). Implementation of an effective birth control method for the common raven could reduce the raven population over time. However, its implementation is not possible at this time. There is no approved contraceptive for the common raven. Administering the proper dose of an approved contraceptive to a wild noncaptive animal would be difficult to do in a safe and effective manner. Underdosing would be ineffective. Overdosing may cause serious health issues for the individual animal. To ensure the contraceptive is administered properly, each adult raven would be trapped, the contraceptive administered seasonally or annually, and the bird marked to ensure that it does not receive multiple doses. If administered on a large scale, this method would eventually reduce the raven population over time. However, it would not remove any of the individual ravens who would continue to prey on juvenile desert tortoise. Since ravens can live 10 to 14 years, the ravens known to prey on juvenile desert tortoises would continue to adversely affect the survival of hatchling and young desert tortoises. We encourage the continued study and development of a contraceptive program, but at this time, it is not a viable option and will not be considered.

i. Allow Diseases (e.g., WNV and Newcastle's Disease) to Reduce the Raven Population–While WNV can have a 95-percent mortality on some corvid species, this level of mortality has not occurred in raven populations in the California desert. This absence of documented mortality in the raven populations in the California desert indicates that WNV will not likely have a large effect on these populations. West Nile Virus also adversely affects horses and humans. The equine community would likely be opposed to this approach as WNV can cause death (Trock et al. 2001). The Centers for Disease Control, State and County Vector Control, and health departments will not allow this disease to "run its course" in the wildlife population because the risk to human health is too great.

Newcastle's disease is cause by a paramyxovirus. An outbreak of the disease rarely occurs in the United States because of strict quarantine requirements for importing birds. Migratory and free-ranging wild birds appear to have little impact on spreading the disease. It is frequently fatal to poultry and is highly regulated by the USDA and other agencies (Wissman and Parsons 2004). Once detected, the USDA and California Department of Food and Agriculture impose strict quarantines on transporting poultry and other birds to and from the quarantine area. Thus, outbreaks of Newcastle's disease are rare and quickly eradicated.

Given the detrimental effects these diseases have on other species, this option is not considered a reliable or reasonable way to achieve the objectives.

j. Control/Reduce Human Population Control–Several citizens stated that the real problem for desert tortoise recruitment is not ravens, but rather humans and human activities and development. The proposed action contains elements to educate the public on the benefits of changing some of its activities that subsidize the common raven, but the lead and cooperating agencies for this document does not have regulatory authority over the expanding human population in the desert and the associated increased human development. It was agreed that reducing or slowing development in and adjacent to the desert would reduce adverse effects to the desert tortoise for several reasons. However, this is only one of a myriad of threats to the desert tortoise (Tracy et al. 2004). All of the alternatives carried forward have incorporated, in part, certain aspects of this alternative.

k. Modify all utility poles and towers to preclude raven perching or nesting–With respect to precluding perching on human-built poles and towers, this alternative was considered, but dismissed for the following reasons:

1) Perch availability does not likely limit raven population size; ravens do not rely on perch sites for hunting like some raptors;

(a) Eliminating human-made perch sites would adversely affect other avian species that use these perches for resting and hunting; and

(b) There are thousands of utility poles and towers in the California desert so modifying these structures would be expensive and take several years to complete.

2) With respect to precluding nesting, this alternative was considered and dismissed for the following reasons:

(a) Eliminating human-built nest sites would adversely affect other avian species that use these sites for nesting;

(b) There are thousands of utility poles and towers in the California desert so the modification would be expensive and take several years to complete;

(c) We would need the cooperation of the utility companies complete this task; and

(d) A study would need to be conducted to determine an effective design prior to successfully modifying the towers and poles.

4.0 ENVIRONMENTAL CONSEQUENCES INTRODUCTION

This section forms the scientific and analytic basis for the comparison of alternatives. It consolidates the discussions of the following elements:

a. The environmental impacts of the alternatives for the proposed action,

b. Any adverse environmental effects which cannot be avoided should the proposal be implemented,

c. The relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

d. Any irreversible or irretrievable commitments of resources which would be involved in the proposal should it be implemented.

Cumulative impacts are discussed for each alternative.

4.1 Significance Criteria (by Resource Area)

In the Council on Environmental Quality's regulations for implementing NEPA (Section 1508.27), "significantly," as used in NEPA, requires considerations of both context and intensity:

a. Context–This means that the significance of an action must be analyzed in several contexts such as society as a whole (human/national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

b. Intensity–This refers to the severity of impact.

Table 4-1 presents the significant criteria that were developed and used to evaluate the various potential impacts to each resource area for each alternative considered.

The impacts of the various alternatives are summarized in Table 4-2.

4.2 Alternative A–(Status Quo Alternative)

4.2.1 Impact on the Target Species (Common Raven) Population

The current program alternative should have negligible to minimal beneficial impacts to the common raven population in the short- and long-term. Although several agencies have implemented efforts to reduce human subsidies of food, water, and nest and roost sites for the common raven, these efforts are localized, small, and are unable to keep up with the increases in these subsidies from the growing human development in the California desert. Ongoing efforts to reduce human subsidies to the common raven have shown little change in raven population levels from the early 1990s to 2004 (Boarman and Kristan 2006). Currently there is no known effort to remove common ravens from the California desert (Craig Coolihan, USDA APHIS, personal communication).

Table 4-1. List of Significance Criteria to Determine the Threshold for Significance Regarding Various Potential Impacts for each Resource Area

Biological Resources and Ecosystems Vegetation and Wildlife	Significance Criteria of the Proposed Action
Listed, proposed plants and animals	Causes mortality, permanent habitat loss, or lowered reproductive success for individuals of state or federally listed threatened or endangered plant or animal species or plants or animals proposed for state or federal listing as threatened or endangered
Candidate species	Causes mortality, permanent habitat loss, or lowered reproductive success for major portions of candidate plant or animal species for state or federal listing or identified by California Native Plant Society (CNPS) as rare, threatened, or endangered in California
Fully protected species	Causes mortality, permanent habitat loss, or lowered reproductive success for wildlife species designated by the state of California as fully protected species
Plant and animal species	Reduces a plant or wildlife species to a level that meets the definition of threatened or endangered
Habitat loss, degradation, biodiversity	Diminishes habitat for fish, wildlife, or plants by the loss of a greater than 10 percent of the available habitat or number of individuals of any plant or animal species (sensitive or nonsensitive species) that could affect the abundance of a species or the biological diversity of an ecosystem beyond normal variability
Activity patterns for listed and candidate species and species of special concern	Causes long-term or permanent disturbance or displacement by human activities of substantial portions of local populations of state or federally listed, proposed, or candidate plant or animal species, or species of special concern including areas used as movement corridors or areas that provide connectivity among populations
Sensitive, unique habitats	Causes the measurable degradation or loss of sensitive or unique habitats
Socioeconomics	**Significance Criteria**
	Places a change of greater than 10 percent of current demand on the services in local communities in the project area
	Causes the population to exceed historic growth rates or substantially affects the local housing market and vacancy rates.
	Causes a substantial increase in out-of-pocket expenses by local communities or individuals
	Decreases or increases the baseline of local employment levels by more than 10 percent or alters substantially the location and distribution of the population within the geographic region of influence
	Prevents continuation of existing authorized off-highway vehicle recreation use
	Prevents continuation of the existing hunting and fishing programs
	Increases or decreases by more than 10 percent the availability of any other recreation resource which results in demand for the remaining facilities to exceed their capacity
Human Health and Safety	**Significance Criteria**
	Exposes people to potential health hazards
	Is inconsistent with existing health and safety regulations

Table 4-2. Comparison of the Environmental Impacts of Each Alternative with Resource Issues

Description	Alternative A (Status Quo)	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Raven Populations	**Minimal Beneficial**, Raven populations would be expected to expand and follow human development in the California desert	**Negligible Adverse**, Raven populations would be decreased by less than 0.5 percent of the existing raven population in the California desert	**Minimal Adverse**, Raven populations would be decreased by about 5 percent in selected areas of the California desert, however, raven populations would still be well above the historic levels for these areas, and be considered viable and self sustaining	**Minor Adverse**, Raven populations would be decreased by about 19 percent across the California desert; however, raven populations would still be well above the historic levels for these areas, and be considered viable and self sustaining	**Negligible Adverse**, Raven populations would be expected to grow or remain steady initially, then decrease slowly in the California desert because only cultural and physical means to manage ravens would be used	**Negligible Adverse to Minor Adverse,** Raven populations would decrease between 0.5 and 19 percent across the California desert; however, increases from ongoing population growth would reduce this rate of decrease; raven population would remain well above historic levels and be considered viable
Desert Tortoise Populations	**Moderate Adverse**, Hundreds of juvenile desert tortoises would continue to be killed by ravens each year and this number would be expected to increase	**Moderate Beneficial**, Numerous Additional hatchling and juvenile desert tortoises would have the opportunity to reach adulthood, increase the size of the population and reproduce	**Moderate Beneficial**, Numerous additional juvenile desert tortoises would have the opportunity to reach adulthood, increase the size of the population, and reproduce	**Moderate Beneficial**, Numerous additional juvenile desert tortoises would have the opportunity to reach adulthood, increase the size of the population, and reproduce	**Minimal Beneficial**, Slowly more juvenile desert tortoises would have the opportunity to reach adulthood, increase the size of the population, and reproduce	**Moderate Beneficial**, Numerous additional juvenile desert tortoises would have the opportunity to reach adulthood, increase the size of the population, and reproduce
Other Wildlife	**Moderate Adverse**, Slow continued predation pressure from a growing raven population, competition for other resources (space and water)	**Minor to Moderate Beneficial**, Populations of prey species for ravens would likely increase with the reduction of predation by the common raven	**Minor to Moderate Beneficial**, Populations of prey species for ravens would likely increase with the reduction in the numbers of predatory ravens	**Minor to Moderate Beneficial**, Population of prey species used by ravens would likely increase with the reduction in the numbers of predatory ravens	**Minimal Beneficial**, Slowly Populations of prey species used by ravens would likely increase with the reduction of predation by the common raven	**Minor to Moderate Beneficial**, Population of prey species used by ravens would likely increase with the reduction in the numbers of predatory ravens
Socioeconomics	**No Change or Non**e, No additional funds would be brought to the area, no change in life style lifestyle in the area	**Negligible Beneficial,** $200K effort, limited to 4 months per year	**Negligible Beneficial,** $400K effort, ravens could be killed anytime	**Negligible Beneficial,** $550K effort, ravens could be killed anytime	**No Change to Negligible Beneficial**, Reduction in food and water subsidies results in reduced water costs	**Negligible Beneficial,** $550K effort, ravens could be killed anytime
Human Health and Safety	**Negligible Beneficial**, Reduction in some unauthorized dumps would reduce possible spread of disease, etc.	**Negligible Adverse and Beneficial**, limited use of fire arms and avicide bait, however, these methods would be conducted by trained professionals and follow all safety regulations; better trash containment and reduction of unauthorized dumps would reduce the possible spread of disease, etc.	**Negligible Adverse and Beneficial**, limited use of fire arms and avicide bait, however, these methods would be conducted by trained professionals and follow all safety regulations; better trash containment and reduction of unauthorized dumps would reduce the possible spread of disease, etc.	**Negligible Adverse and Beneficial**, limited use of fire arms and avicide bait; however, these methods would be conducted by trained professionals and follow all safety regulations; better trash containment and reduction of unauthorized dumps would reduce the possible spread of disease	**None to Negligible Beneficial**, Better trash containment and reduction of unauthorized dumps would reduce the possible spread of disease	**Negligible Adverse and Beneficial**, limited use of fire arms and avicide bait; however, these methods would be conducted by trained professionals and follow all safety regulations; better trash containment and reduction of unauthorized dumps would reduce the possible spread of disease

Table 4-2. Comparison of the Environmental Impacts of Each Alternative with Resource Issues (Concluded)

	Alternative A (Status Quo)	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Recreation	**Negligible Adverse and Beneficial,** Some recreational opportunities may be restricted during illegal dumpsite cleanup; opportunities to view a variety of wildlife species would increase	**Negligible Adverse and Beneficial**, Some recreational opportunities may be restricted on a site specific basis for a short period of time; opportunities to view a variety of wildlife species would increase	**Negligible Adverse and Beneficial**, Some recreational opportunities may be restricted on a site specific basis for a short period of time; opportunities to view a variety of wildlife species would increase	**Negligible Adverse and Beneficial**, Some recreational opportunities may be restricted on a site specific basis for a short period of time; opportunities to view a variety of wildlife species would increase	**Negligible Adverse and Beneficial,** Some recreational opportunities may be restricted during illegal dumpsite cleanup; opportunities to view a variety of wildlife species would increase	**Negligible Adverse and Beneficial**, Some recreational opportunities may be restricted on a site specific basis for a short period of time; opportunities to view a variety of wildlife species would increase

Notes:
1. No Change or None–There are no impacts expected.
2. Negligible–The impacts are very small and possible, but not probable or likely to occur.
3. Minimal–The impacts are not expected to be measurable and are within the capacity of the impacted system to absorb the change, or the impacts can be compensated for with little effort and resources so the impact is not substantial.
4. Minor–The impacts are measurable, but are within the capacity of the impacted system to absorb the change, or the impacts can be compensated with limited effort and resources so the impact is not substantial.
5. Moderate–Potentially adverse impacts that are measurable but do not violate any laws or regulations and are within the capacity of the impacted system to absorb or can be mitigated with effort and/or resources so that they are not significant.
6. Major–Potentially adverse impacts that individually or cumulatively could be significant.

4.2.2 Impact on Nontarget Species

4.2.2.1 Desert Tortoise

The current program alternative would not achieve the purpose of and need for the action. Under this alternative, the impact to desert tortoises would be moderate and adverse for the short- and long-term. Current efforts to reduce human subsidies to the common raven have been localized and scattered. They have shown little change in raven population levels and no increase in the percent of juvenile and hatchling desert tortoises in the California desert. Under this alternative, we expect raven predation to continue to remove hatchling and juvenile desert tortoises at the same or increasing levels because of the current and projected increased human development in the California desert. Recruitment of hatchling and juvenile desert tortoises to the adult population would be minimal to nonexistent in some populations.

4.2.2.2 Other Nontarget Species

The impacts to the Mohave ground squirrel and other native wildlife species (excluding the desert tortoise) that are prey for the common raven would be moderately negative for the short- and long-term. Recent limited efforts to reduce human subsidies of food, water, and nesting/perching sites have shown little change in the population level of the common raven. Common ravens are efficient hunters and scavengers. They prey on birds (eggs, nestlings, and adults), snakes, lizards, rodents, and lagomorphs (rabbits and hares). Under this alternative, we expect raven predation to continue at a similar or increased level on these species.

Under the current program alternative, there are no methods used that directly affect common ravens (e.g., trapping and shooting). The only methods currently implemented are limited actions in the local areas to reduce human subsidies, primarily food and water. Wildlife species that use these human-subsidized food and water sources would be adversely affected by this alternative. The primary species that would be adversely affected would be the coyote (*Canis latrans*). As a scavenger of road kill and garbage, the human-subsidized food source for the coyote would be reduced.

4.2.3 Impact on Socioeconomic Issues

Current efforts to reduce human subsidies, such as food and water, to the common raven have resulted in no changes to human lifestyle or addition of funding or cost to the area. The cleanup of illegal dumps, which has been limited in number and location, would result in no effect on the lifestyle of the human population in the California desert. Efforts to reduce standing water on some federal lands should result in no effect to human lifestyle.

4.2.4 Impact on Recreation

Under the current program, no activities would be conducted in desert tortoise habitat with the exception of cleanup of illegal dumps. These sites are usually small and located near communities. The cleanup activities may deter from the recreation experience in the immediate area for a short time, but the long-term benefits of making the area safe, free of garbage and debris, and restoring the area would greatly outweigh the short-term localized adverse effects of cleanup activities on the recreation experience. This alternative would have negligible adverse impacts to recreation during cleanup and negligible beneficial impacts afterward.

4.2.5 Impact on Human Health and Safety

Measures that would be implemented include removal of illegal dumps and eliminating standing water on some federal lands. Illegal dumps may contain hazardous substances or harbor diseases. Since they are usually easily accessible, the public is at risk of exposure to these hazards. They also contain debris, which can cause injury or death to anyone inspecting or playing at a dumpsite. Some of the measures would provide limited improvement to human health and safety, as their locations are limited in number and size.

Standing water in a warm environment is a breeding habitat for mosquitoes that carry diseases. Encouraging agencies to manage their outside watering to eliminate standing water, which subsidizes the common raven, would also reduce the likelihood of mosquitoes breeding and carrying diseases (WNV). Implementation of this alternative would have a negligible beneficial impact on human health and safety.

4.2.6 Effectiveness/Conclusion

Based on the description of the Need for Action, the current program is not providing an acceptable level of reduced mortality and increased recruitment for the desert tortoise. This alternative would not meet the purpose and objectives of the proposed action. The current program alternative is not expected to be as effective as the other alternatives. It would not allow for the lethal removal of common ravens known to prey on hatchling and juvenile desert tortoises, and it would not implement a large-scale “cultural and physical” program by federal, state, and local agencies and the public. Elevated levels of predation by the common raven on the desert tortoise would continue. There would be no immediate relief to allow desert tortoise populations to begin the 15- to 20-year process of recruiting hatchling and juvenile desert tortoises into the adult population. Without implementation of a large-scale outreach program and “cultural and physical” program by agencies and the public to reduce human subsidies to the common raven, raven predation would continue to remove hatchling and juvenile desert tortoises at a rate similar to or greater than the current rate. The desert tortoise population in the California desert, especially in the Western Mojave Recovery Unit, would continue to decline. If this rate of decline continues, it could result in a decline in status of the desert tortoise in California to that of endangered and a decline toward extinction for the west Mojave population.

4.3 Alternative B–Integrated Predator Management with Limited Removal of Ravens

4.3.1 Impact on the Target Species (Common Raven) Population

In analyzing the impact of this removal action on the common raven population, we used the following process. Under this alternative, we would expect to remove approximately 100 pairs of ravens and their nests and approximately 4 ravens from each of the desert tortoise head starting facilities per year. The population estimate for the common raven in the California desert is about 37,500 birds. Removing about 200 common ravens per year would mean removing about 0.5 percent of the raven population. Because predation on the desert tortoise by common ravens is a learned behavior, not all common ravens prey on desert tortoises.

Removing 100 pairs of ravens and 7 eggs (maximum clutch size) per year, per nest, would mean removing 2.4 percent of the raven population in the California desert. This is a worst-case scenario, as not all nests would have seven eggs, not all eggs would be viable, not all viable eggs would hatch, and not all nestlings would survive to fledge and eventually reproduce. A demographic model of the Mojave raven populations indicated that this level of removal would have no impact on raven population viability because more than 99 percent of the population would remain after implementation (Boarman and Kristan 2005).

Direct impacts to the selective removal of only those ravens with evidence of predation or attempted predation on hatchling and juvenile desert tortoises using trapping, shooting, or the use of toxicants would have negligible adverse impacts to the raven population in the California desert. Raven population numbers would be at historically high levels after selective removal and well above that of the population in the early and mid-twentieth century (Appendix A, Section 2.0). The number of birds removed would depend on several variables: effectiveness of cultural and physical methods to reduce raven predation on the desert tortoise, number of ravens identified as preying on desert tortoises that would be removed, availability of staff, and funding. Trapping, shooting, and use of an avicide would be limited to those locations where nesting ravens were documented as preying on hatchling and juvenile desert tortoises. Given the large numbers of common ravens in the California desert, a new breeding pair would likely take the place of the removed pair. Not all ravens prey on desert tortoises (See Section 1.1.2, and Appendix A, Section 2.7 of the EA).

We anticipate that the removal of 100 pairs of common ravens annually would result in an increase in the raven population in the California desert. Between 1966 and 1999, ravens in the Mojave Desert had an annual population increase of 5.4 percent and 7.1 percent in the Colorado Desert (Liebezeit et al. 2002).

There is the possibility that ravens that do not prey on desert tortoises may be removed. This possibility should be minimal. We would use information on the behavior and biology of the common raven, including the following, to tailor a method to identify and remove common ravens preying or attempting to prey on desert tortoises. Implementing this process should ensure that the appropriate ravens are targeted for removal. Nesting common ravens actively defend their nest territory from other large birds including other ravens, usually to a distance of 2 miles from the nest. The time when tortoise-preying ravens would be identified is during or immediately following the breeding season when they are actively defending their territories. This means that other ravens would not likely enter and remain in these territories. In addition, this process would include identifying desert tortoise remains with evidence of raven predation within ¼ mile of a raven nest. If desert tortoise remains with characteristic signs of raven predation are found within a territory, the conclusion would be that the ravens defending that territory were the ravens responsible for the desert tortoise mortality.

At the desert tortoise head start facilities, only those common ravens that attempt to enter the facilities that hold hatchling and juvenile desert tortoises, and thereby prey on desert tortoises, would be removed.

Indirect impacts would include the implementation of cultural and physical methods. These methods include reducing human subsidies of food, water, and nest and roost sites for the common raven, and removing unoccupied raven nests. The number of unoccupied raven nests that would remove annually is unpredictable at this time. However, we would limit our actions to removing 1,500 unoccupied nests or less per year. This estimate is considered high and is derived from the sampling effort of McIntyre et al. (2006). Its implementation is contingent upon funding and/or availability of staff. The impacts of removing nests on the common raven would not result in the death of ravens or their eggs or nestlings; however, it may increase the expenditure of energy by a raven pair to construct a new nest.

Indirect impacts would include the removal of common raven nests and the reduction in the availability of food, water, and nest and roost sites for the common raven throughout the California desert. As mentioned above, removal of up to 1,500 unoccupied nests would likely increase the amount of energy that a pair of common ravens would use to construct a new nest. It may also result in fewer successful nests and reduced recruitment. Reduction of human-subsidized food, water, and nest and roost sites would likely result in the California desert not being able to support the same high number of common ravens that currently occur in the area.

The level of potential impact from this alternative to common ravens does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.3.2 Impact on Nontarget Species

4.3.2.1 Desert Tortoise

Actions to remove common ravens that prey on desert tortoises should have a moderate beneficial impact on desert tortoise populations in those areas. For declining populations of long-lived animal species, such as the desert tortoise in much of California, annual mortality of juvenile tortoises should not exceed 5 percent to ensure recruitment of new individuals into the breeding population and to help return the population to stable numbers (Congdon et al. 1993). Since nesting common ravens have a greater need for calories and protein in the spring and their hunting territory is limited in size during the nesting season and intensively searched, one pair of common ravens can prey on numerous hatchling and juvenile desert tortoises in a year. McIntyre et al. (2006) determined through recent surveys that 27 and 28 nests, in 2 survey years, had evidence of desert tortoise predation beneath them. While the surveys did not cover the entire California desert, they did represent a sample of the California desert. When applying this rate to the California desert, we estimate that approximately 100 pairs of breeding common ravens annually are responsible for most of the predation on hatchling and juvenile desert tortoises during the breeding season. The removal of these ravens annually should result in an immediate response of hundreds of hatchling and juvenile desert tortoises now having a higher probability of survival, reaching adult size, and reproducing. They would be able to help slow and reverse the dramatic population declines in the west Mojave Desert and contribute to the long-term survival and recovery of the desert tortoise. Implementing actions that would have an immediate and beneficial impact is essential as the population of the desert tortoise has continued to decline.

The increased efforts to reduce human subsidies of food, water, and nest and roost sites for the common raven would eventually indirectly benefit desert tortoise populations, as these methods would require time to implement and to affect the common raven population. Over time, the number of common ravens that prey on hatchling and juvenile desert tortoises would be reduced. The population size for the common raven would decline over time in the California desert. Once the reduction of human subsidies is fully implemented throughout the California desert, the number of hatchling and juvenile desert tortoises that survive to reproductive adult size should increase. We estimate that achieving full implementation would take a minimum of 10 years.

Reducing the availability of human-subsidized food, water, and nest and roost sites for the common raven, would not likely place more predation pressure on the desert tortoise. Historically, common ravens were neither abundant nor resident birds in the California desert as they are today. For ravens to continue as abundant resident birds, all of their life needs (e.g., food, water, shelter, and reproduction needs) must be available and not be difficult to obtain. Reducing one of these life needs means that the common raven must expend additional energy to find new supplies of this life need. Reducing more than one life need compounds the energy expended. The more energy expended, the less likely common ravens would remain at their current location. Moving to a new location may expend less energy than searching for a new food source at the current location, thus common ravens would leave those areas of the California desert that did not provide them with their life needs, based on energy expenditure. For example, reducing or eliminating human-subsidized food sources (e.g., landfills, illegal dumps, open trash cans and dumpsters, and road kill) would force ravens to expend additional energy to hunt for food.

The removal of unoccupied common raven nests would indirectly benefit the desert tortoise. During the breeding season, the number of successful raven nests would be reduced. Some of these ravens would be those that prey on hatchling and juvenile desert tortoises. With no offspring, the adult ravens would not be able to teach their young how to prey on desert tortoises. The increased demand for food to support adult female ravens with developing eggs and hatchling ravens in the spring would be eliminated, but the demand for food to maintain the existing raven population would continue. This reduced demand for food in the spring for common ravens coupled with normal population mortality, would likely mean decreased predation pressure by ravens on desert tortoises during the tortoise's primary activity period. The benefits of decreased predation by the common raven on the desert tortoise population from nest removal, would likely take time before producing measurable results. Reduced predation pressure would eventually result in a greater percentage of hatchling and juvenile desert tortoises recruited to the adult population, thus contributing to recovery.

There is one indirect impact of this alternative that is a potential negative impact to the desert tortoise; it is negligible but possible. Desert tortoises may be injured or killed by vehicles carrying project employees. This possibility would be mitigated by following posted speed limits, driving less than 25 mph on dirt roads, and educating field staff on desert tortoise awareness.

4.3.2.2 Other Wildlife Species

This alternative would have several indirect impacts to other wildlife species and would be similar to impacts to the desert tortoise. Most impacts would be minor to moderate and beneficial. Removing approximately 100 pairs of common ravens annually that prey on other species of wildlife such as small birds, bird eggs, nestlings, lizards, snakes, small mammals and invertebrates would mean that these animals would have a greater likelihood of surviving, reproducing, and contributing to the long-term survival of their respective species.

Methods to reduce human subsidies of food, water, and nest and roost sites are expected to reduce common raven numbers in the long-term; thereby, reducing predation by the raven on other wildlife species in the California desert. Because this alternative focuses on removing common ravens that prey on desert tortoises, it would likely have a beneficial effect on other prey species of the common raven including lizards, snakes, diurnal rodents (including the state threatened Mohave ground squirrel), birds, eggs, and nestlings. The benefits previously described for the desert tortoise should also apply for wildlife species that are prey for the common raven. Removing common raven nests may benefit raptor species, as more undefended locations with nest sites would become available in the California desert.

Reduction of human-subsidized water sources may also reduce water subsidies for other wildlife species such as coyotes, native and nonnative rodents, and some species of native and nonnative birds. The majority of nontarget desert wildlife species are not dependent on human-subsidized sources of water. The locations of most native wildlife are not near human-subsidized water sources. This distance precludes use by native wildlife. This impact would be minimal and adverse.

The removal of unoccupied common raven nests would indirectly benefit other species of wildlife. During the breeding season, the number of successful raven nests would be reduced. All of these ravens would at some time prey on other species of small wildlife. The increased demand for food to support adult female ravens with developing eggs and hatchling ravens in the spring would be eliminated, but the demand for food to maintain the existing raven population would continue. This reduced demand for food in the spring for common ravens coupled with normal population mortality over time would likely mean decreased predation pressure by common ravens on other wildlife species. For many desert wildlife species, spring is their primary activity period. The benefits of decreased predation by the common raven on other wildlife species from nest removal would likely take time before producing measurable results. Reduced predation pressure would eventually result in a greater percentage of young individuals recruited to the adult population, thus contributing to long-term viability.

One potential indirect and adverse impact to other wildlife species is implementation of the removal methods for the common raven (shoot, trap and euthanize, and use of an avian toxicant). However, their implementation should have little probability of removing species other than common ravens as their design and implementation would minimize this possibility. Shooting requires seeing the target animal before discharging the firearm. Common ravens are large birds and easily distinguished from other desert avian species. The location of the avian toxicant would be aboveground where ground or climbing animals would not have access. The selection of eggs as bait would minimize herbivorous and carnivorous species of birds from being attracted to and consuming the bait. The eggs would be "tied down" so common ravens could not cache the bait where it might be found and consumed by other animal species. The avian toxicant (DRC-1339) is not lethal to most birds that might be attracted to the hard-boiled eggs. Most species of birds are nonsensitive to DRC-1339. However, the use of the avian toxicant could accidentally cause illness in other avian egg-eating species such as golden eagles and roadrunners. The possibility of trapping or poisoning nontarget species would be unlikely.

Traps and bait sites would be monitored and modified, if necessary, to ensure that nontarget species do not take the bait. The toxicant is metabolized quickly and would not be lethal to other species that might scavenge raven carcasses (Cunningham et al. 1979).

Another indirect negative impact that is possible, but not likely to occur is injury or death from vehicles carrying project employees. This possibility would be mitigated by following posted speed limits, driving less than 25 mph on dirt roads, and educating field staff on awareness of wildlife species.

The level of potential impact from this alternative to the nontarget species does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.3.3 Impact on Socioeconomic Issues

The indirect impacts to socioeconomics include funding for raven removal, implementation of raven removal, and cooperative efforts among local agencies and others to provide better management of human-subsidized resources. The expenditure of funds to implement removal of common ravens (shooting, trapping and euthanasia, and use of an avian toxicant) that prey or attempt to prey on desert tortoises would provide beneficial impacts to socioeconomic issues. We estimate that implementation of these removal actions would cost about $200,000 per year and would occur during a 4-month period per year. The impact of spending this amount to the economy of the California desert would be beneficial and negligible.

Additional indirect impacts include implementation of the three methods to remove common ravens on nearby human populations. These impacts would be localized. Often these activities would not occur near communities. If they do, their effects would be limited in duration and isolated, and should have minimal impacts on human lifestyle. Shooting would occur during daylight hours, and its occurrence would be minimal with respect to frequency and duration. All laws and regulations regarding discharge of firearms would be strictly followed. Trapping and use of an avian toxicant are not likely to affect the residents of local desert communities directly; these activities would occur in the desert, not within communities or settlements. Trained professionals from APHIS-WS would implement these removal methods.

Part of the proposed action is to work with cities, and encourage counties and the public to implement existing ordinances or develop processes that manage the disposal and storage of solid waste, conserve water, and minimize opportunities for human-created nesting and roost sites (e.g., communication towers, power-line towers, and shade structures) to reduce human subsidies of the common raven. Implementation of these programs would likely indirectly impact human values and lifestyles. The public would be informed about what they can do to help recover the desert tortoise, conserve limited resources such as water, and enjoy and appreciate the associated social and economic benefits of these conservation and management actions (e.g., water conservation, reduced water bills, and reduction in occurrence and cleanup of illegal dumps). They would be encouraged to implement these actions. We anticipate that, over the long-term, there would be changes in human behavior and consequently their actions would result in effective management of solid waste, hazardous materials, water, and vertical structures that would reduce the raven population and benefit the human population. The impacts to socioeconomics of the area, from implementation of Alternative B, would be negligible and beneficial.

The level of potential impact from this alternative to socioeconomics does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.3.4 Impact on Recreation

As stated under the current program alternative, much of the California desert is open to the public for various forms of recreational use. This includes hunting and off-highway vehicle use. Closed areas include private lands and military bases. There are restrictions on methods of access to some of the public use areas (e.g., wilderness). Numerous opportunities exist for various forms of recreation on lands managed by the BLM and NPS.

The implementation of common raven removal would indirectly impact recreation. At removal locations for the common raven, small, localized areas may be unavailable for humans to enter. For example, if APHIS-WS determines that shooting is the best means to remove a predatory raven at a particular location, the area may be closed to human access for part of the day to ensure that no one is accidentally injured of killed. The APHIS-WS would consider any public activity patterns at those areas as part of the decision process to select the method and time to remove identified common ravens. This temporary closure of a localized area would not allow the public to recreate in that area at that time. Most public use for recreation occurs on weekends and holidays. This time period would be avoided. However, the frequency and duration of a closure at a particular location, given the total area available in the California desert for recreation, would be negligible. The USFWS and APHIS-WS would consult with the BLM, NPS, California Department of Parks and Recreation, and the CDFG to minimize adverse impacts on scheduled activities, where appropriate. Effective implementation of this alternative over time would result in greater opportunities for the recreating public to view a desert tortoise and other wildlife species in their natural habitat. The impacts would be negligible and adverse initially and negligible and beneficial over time.

The level of potential impact from this alternative to recreation does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.3.5 Impact on Human Health and Safety

The implementation of this alternative would result in indirect impacts to human health and safety. Measures to avoid adverse impacts to human health and safety are included in the proposed action through use of the *Wildlife Services Decision Model* (Slate et al. 1992). Standard operating procedures used to reduce the risk to human health and safety is listed in Section 3.2.3 of the Wildlife Services Environmental Impact Statement (EIS). Many of the procedures intended to minimize impacts on recreation would also minimize or eliminate risks to human health and safety. For example, if shooting is selected as the method to remove identified ravens, the area would be closed to human access to prevent accidental injury or mortality. If use of an avicide is selected, methods would be implemented that would avoid or minimize risk to humans. For example, the bait station may be designed so it is not readily accessible by people, the area may be posted with warning signs, and the bait station may be monitored when in use.

A formal human risk assessment of currently available APHIS-WS methods, including those proposed for use in the EA, concluded low risks to humans (USDA 1997, revised, Appendix P).

The human risk assessment evaluated potential impacts on APHIS-WS employees and the public. Although some of the materials and methods available for reducing predation by the common raven on the desert tortoise have the potential to present a threat to human health and safety if used improperly, problems associated with their misuse have rarely occurred, and the greatest risk is to the user. Professionals trained in the safe and effective use of each method would conduct the damage management practices. Although this could reduce effectiveness, human safety is the highest priority for all of the agencies concerned. This adverse impact to human health and safety from raven removal is expected to be negligible to none.

There should be indirect beneficial impacts to human health and safety from the reduction in human subsidies of food and water. The cleanup of illegal dumps and better management of permitted landfills and transfer stations would remove garbage and hazardous waste from unsecured locations and ensure that it is properly contained and managed. These actions would reduce the spread of disease and groundwater contamination. Reduction in standing water would reduce the number of breeding sites for mosquitoes, which may carry disease that could infect humans. This beneficial impact to human health and safety would be negligible.

The level of potential impact from this alternative to human health and safety does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.3.6 Effectiveness/Conclusion

The effectiveness of the program can be defined in terms of the increase in the number of hatchling and juvenile desert tortoises in the population and the numbers recruited into the adult population over time. Effectiveness can also be determined by the reduction in the number of common raven nest sites, with evidence of desert tortoise shell remains near them. With respect to removal of common ravens, the wildlife specialist must be able to complete wildlife damage management expeditiously, while minimizing harm to nontarget species and the environment and risks to human health and safety. The wildlife specialist must comply with all regulations on the use of each method, and use methods as humane as possible within the limits of current technology. The U.S. Government Accounting Office (1990) concluded that APHIS-WS was effective overall in preventing and reducing wildlife damage while not significantly impacting nontarget predator populations, the environment, or the public. Many of the details on effectiveness were discussed in the Final EIS on the national APHIS-WS program (USDA 1997, revised) where integrated wildlife damage management was concluded to be the most effective.

Based on the description of the "Purpose and Need," the combined efforts to remove common ravens and implement a "cultural and physical" based program would meet the purpose and objectives of the proposed action. Data were used from McIntyre et al. (2006) on the number of nests or raven pairs preying on desert tortoises annually, for those portions of the California desert that were surveyed. In addition, information was applied on the reproductive needs and behavior of the common raven. The result was that approximately 27 nests or pairs of common ravens would have desert tortoise remains under their nests in a year. From these data, the number of nests or pairs of ravens throughout the California desert that likely prey on juvenile and hatchling desert tortoises, or 100 nests or pairs of common ravens were extrapolated. Therefore, if 100 pairs of common ravens that prey on the desert tortoise were removed, this action would eliminate most of the predation on juvenile and hatchling desert tortoises by breeding common ravens in the California desert. The removal of common ravens should yield both immediate relief to hatchling and juvenile desert tortoises from common raven predation and allow desert tortoise populations to begin the 15- to 20-year process of recruiting hatchling and juvenile desert tortoises into the population. This immediate relief is especially critical for the west Mojave population of the desert tortoise, where populations continue to decline with little to no evidence of juvenile of hatchling animals in the population. This alternative would remove only those common ravens with evidence of predation or attempted predation on desert tortoises; the other ravens in the population would not be removed.

The implementation of the “cultural and physical” based program would provide for long-term reduction of common ravens in the California desert. This reduction would help bring the population numbers of this top predator in balance with the populations of other desert animals. As the common raven population and associated predation pressure on the desert tortoise declines, the level of common raven removal would also decline. Even with the proposed reductions, the population numbers for the common raven would remain above historic levels in the California desert and would not affect the sustainability of the population in the California desert.

4.4 Alternative C–Integrated Predator Management and Removal of Ravens within Desert Tortoise Management Areas

4.4.1 Impact on the Target Species (Common Raven) Population

The direct impacts of this alternative would be greater than that of Alternative B, but still have only minimal adverse impacts to the common raven population in the short- and long-term. The impacts would be greater as approximately 2,000 common ravens or 5.3 percent of the California desert population of ravens would be removed annually at the DTMAs. The number of common ravens removed would depend on several variables: effectiveness of methods to reduce human subsidies of food, water, and nest and roost sites to the common raven, availability of staff, and funding. The wildlife specialist would determine which removal strategy or strategies would be most effective for the removal of the common raven from these areas.

While the number of common ravens removed from trapping, shooting and using an avian toxicant would likely result initially in decreased raven densities within each of the DTMAs, it would not remove ravens from other areas of the California desert such as private lands, state lands outside of DTMAs, many wilderness areas, and some BLM and NPS lands. Common raven population numbers would remain well above the historic levels of ravens for the California desert. We do not anticipate this removal to adversely affect the short- or long-term survivability and sustainability of the common raven or to reduce raven population numbers significantly throughout the desert region of California. Movement of common ravens from adjacent populations into the California desert would still occur.

This alternative would remove up to 2,000 common ravens annually from the DTMAs. Recent data (McIntyre 2006) show that about 5 percent of the common raven nests surveyed in portions of the California desert had evidence of desert tortoise predation under the nests. We anticipate that the removal of 2,000 common ravens annually would result in an increase in the raven population in the California desert. Between 1966 and 1999, ravens in the Mohave Desert had an annual population increase of 5.4 percent and 7.1 percent in the Colorado Desert (Liebezeit et al. 2002).

The indirect impacts from implementation of the actions to reduce human subsidies of food, water, nest sites, and roost sites and remove unoccupied raven nests would be similar to those of Alternative B.

The level of potential impact from this alternative to common ravens does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.4.2 Impact on Nontarget Species

4.4.2.1 Desert Tortoise

The indirect impacts from implementing Alternative C to the desert tortoise would be similar to that of Alternative B, moderate and beneficial. The increased number of common ravens removed from DTMAs would likely lead to an immediate beneficial effect in these locations by reducing all ravens that prey in these essential DTMAs. The reduction of ravens preying on desert tortoises in the DTMAs would allow hatchling and juvenile desert tortoises in these areas to survive, thus increasing the desert tortoise population. It would also allow more desert tortoises to reach adulthood and reproduce, thus contributing to the recovery of the species.

The other part of the alternative, to reduce human subsidies of food, water, nest and roosting sites for the common raven, and to remove unoccupied nests of common ravens would have the same indirect impacts as that in Alternative B. The reduction in human subsidies would eventually reduce common raven population numbers and raven predation on desert tortoises throughout the California desert, thereby increasing desert tortoise population numbers.

Another indirect impact is that desert tortoises may be injured or killed by vehicles carrying project employees. This impact would be similar to that described in Alternative B although the number of employees and vehicle trips would likely be greater. Although we estimate up to a 50 percent increase in number of miles traveled, we consider this risk negligible because of the mitigation measures. The likelihood of this adverse impact occurring is negligible; therefore, the impact is negligible.

4.4.2.2 Other Wildlife Species

This alternative would have similar indirect impacts to other wildlife species as Alternative B. Wildlife species that are prey for the common raven and located within the DTMAs. would experience minor to moderate beneficial impacts with the reduction in numbers of common ravens that prey on these wildlife species. The impacts from implementation of Alternative C for raven removal, reduction of human subsidies, and removal of unoccupied common raven nests would be similar to that of Alternative B although the geographic extent of this impact would be greater.

The level of potential impact from this alternative to nontarget species does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.4.3 Impact on Socioeconomic Issues

The indirect impacts to socioeconomic issues from raven removal and reduction in human subsidies would be similar to those of Alternative B. The efforts to remove (shoot, trap and euthanize, and use an avian toxicant) ravens would cover the DTMAs ,which are large blocks of area located throughout much of the California desert, rather than being scattered throughout. Occasionally these activities would occur near communities. If they do, their effects would be limited in duration. For example, shooting would occur during daylight hours, and its occurrence would be minimal with respect to frequency and duration. All laws and regulations regarding discharge of firearms would be strictly followed including discharge of firearms near dwellings. Trapping and use of an avian toxicant are not likely to affect the residents of local desert communities; these activities would occur in the desert, not within communities or settlements. Implementation of these actions would result in negligible adverse impacts to socioeconomic issues.

Implementation of actions to remove common ravens would likely cost $400,000 per year and could occur at any time during the year. Qualified professionals from APHIS-WS would implement these removal methods. The impact of spending this amount in the economy of the California desert would be negligible and beneficial.

Part of Alternative C is to encourage and work with local cities, counties, and the public to implement existing ordinances and/or develop basic processes that manage the disposal and storage of solid waste, conserve water, and modify structures to reduce human subsidies of food, water, nest and roost sites for the common raven. Implementation of these programs would likely result in minimal changes in human lifestyles, and costs. The public would be informed about what they can do to help recover the desert tortoise, conserve limited resources such as water, and enjoy and appreciate the associated social and economic benefits of these conservation and management actions. They would be encouraged to implement these actions. We anticipate that, over the long-term, there would be changes in human behavior and consequently their actions and would result in effective management of solid waste, water, and nest and roost sites that would reduce the common raven population. This portion of Alternative C should have negligible beneficial impacts on socioeconomic issues.

The level of potential impact from this alternative to socioeconomics does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.4.4 Impact on Recreation

As stated under the current program alternative, much of the California desert is open to the public for various forms of recreational use. Closed areas include private lands and military bases. There are restrictions on methods of access to some of the public use areas (e.g., wilderness). Numerous opportunities are available for various forms of recreation on lands managed by the BLM, NPS, and California Department of Parks and Recreation. Implementation of Alternative C would not affect the continuation of these recreation opportunities.

Implementation of common raven removal and reduction in human subsidies to ravens would indirectly impact recreation in the California desert and would have similar impacts to

Alternative B. At removal locations for the common raven, consideration would be given to public activity patterns in the DTMAs. Most public recreation occurs on weekends and holidays. The USFWS and APHIS-WS would consult with the BLM, NPS, California Department of Parks and Recreation, and CDFG to minimize impacts of raven removal on scheduled recreational activities. At sites where people are likely to be exposed to raven removal activities, emphasis would be placed on education and using tools that would not potentially harm the public. These impacts would be adverse and negligible.

The cleanup of illegal dumpsites and similar activities may detract from the recreation experience for a short time, but the long-term benefits of making the area safe, free of garbage and debris, and restoring the area would greatly outweigh the adverse effects of cleanup activities on the recreation experience. This alternative would have negligible adverse impacts to recreation during cleanup.

Effective implementation of this alternative would over time result in greater opportunities for the recreating public to view a desert tortoise and other wildlife species in their natural habitat. The long-term impacts from implementation of this alternative would be negligible and beneficial.

The level of potential impact from this alternative to recreation does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.4.5 Impact on Human Health and Safety

The implementation of this alternative would have similar indirect impacts as Alternative B. If removal efforts are conducted in the DTMAs, the effects to human health and safety would be unlikely, as DTMAs contain few communities or settlements. Measures to avoid adverse impacts to human health and safety are included in the proposed action through use of the Wildlife Services Decision Model (Slate et al. 1992). Standard operating procedures used to reduce the risk to human health and safety are listed in Section 3.2.2 of the Wildlife Services EIS. Many of the procedures intended to minimize impacts on recreation would also minimize risks to human health and safety.

A formal human risk assessment of currently available APHIS-WS methods, including those proposed for use in this EA concluded low risks to humans (USDA 1997, revised, Appendix P). The risk assessment evaluated potential impacts on APHIS-WS employees and the public. Although some of the materials and methods available for reducing predation by the common raven on the desert tortoise have the potential to present a threat to human health and safety if used improperly, problems associated with their misuse have rarely occurred, and the greatest risk is to the user. Professionals trained in the safe and effective use of each method would conduct the damage management practices. Although this could reduce effectiveness, human safety is the highest priority for all of the agencies concerned. Therefore, the impact to human health and safety from common raven removal is expected to be negligible and adverse.

The reduction in human subsidies to the common raven would have indirect impacts on human health and safety. The cleanup of illegal dumps and better management of permitted landfills and transfer stations would remove garbage and hazardous waste from unsecured locations and ensure that it is properly contained and managed. These actions would reduce the spread of disease and groundwater contamination. Reduction in standing water would reduce the number of breeding sites for mosquitoes, which may carry disease that could infect humans. There should be negligible beneficial impacts to human health and safety from the reduction in human subsidies of food, water, nest sites, and roost sites for the common raven.

The level of potential impact from this alternative to human health and safety does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.4.6 Effectiveness/Conclusion

The effectiveness of the program in relation to accomplishing the purpose and objectives of the proposed action can be defined as the increase in number of hatchling and juvenile desert tortoises that comprise the population in the DTMAs, and the numbers over time that are recruited into the adult population in these areas. Effectiveness can also be determined by the reduction in the number of common raven nest sites with evidence of desert tortoise shell remains near them in the DTMAs. Since this alternative would result in the removal of all ravens in the DTMAs in the California desert, raven removal coupled with reduction in human subsidies would provide a greater level of effectiveness in accomplishing the purpose and objectives of the proposed action in these areas. It would also remove ravens that may not be preying on desert tortoises.

Based on the description of the "Purpose and Need," the combined efforts to remove common ravens and implement a "cultural and physical" based program would meet the purpose and objectives of the proposed action. The removal of common ravens that may, or may not prey on desert tortoises, should yield both immediate relief from raven predation on hatchling and juvenile desert tortoises in the DTMAs and allow desert tortoise populations to begin the 15- to 20-year process of recruiting hatchling and juvenile desert tortoises into the population in these areas. It would provide little relief to those areas outside the DTMAs. The implementation of the "cultural and physical" based program would provide for long-term reduction of common ravens in the California desert. This reduction would help bring the population numbers of this top predator in balance with the populations of other desert animals. Population numbers for the common raven would remain above historic levels in the California desert.

With respect to removal of common ravens in the DTMAs, the wildlife specialist must be able to complete wildlife damage management expeditiously and thoroughly, while minimizing harm to nontarget species and the environment and risks to human health and safety. The wildlife specialist must comply with all regulations on the use of each method, and use methods as humane as possible within the limits of current technology. The U.S. Government Accounting Office (1990) concluded that APHIS-WS was effective overall in preventing and reducing wildlife damage while not significantly impacting target predator populations, the environment, or the public. Many of the details on effectiveness were discussed in the Final EIS on the national APHIS-WS program (USDA 1997, revised) where integrated wildlife damage management was concluded to be the most effective. The effectiveness of methods used, given they are used by trained professionals, would influence the overall effectiveness of this alternative.

4.5 Alternative D–Integrated Predator Management and Removal of Ravens within Desert Tortoise Management Areas and Raven Concentration Areas

4.5.1 Impact on the Target Species (Common Raven) Population

The direct impacts of this alternative would be similar to, but greater than, that of Alternatives B or C, but would still have minor adverse impacts to the common raven population in the California desert in the short- and long-term. The impacts would be greater as approximately 3,000 to 7,000 common ravens or 8 to 18.7 percent of the California desert population of ravens would be removed annually at the DTMAs and concentration areas. The number of common ravens removed would depend on several variables: effectiveness of implementing methods to reduce human subsidies of food, water, and nest and roost sites to the common raven; availability of staff; and funding. The wildlife specialist would determine which removal strategy or strategies would be most effective for removal of the common raven for these areas.

The number of common ravens removed using trapping, shooting, and avian toxicant methods would result in decreased raven densities within the DTMAs and concentration sites. We would not remove ravens from other areas in the California desert such as most private lands, many military installations, state lands outside DTMAs, and some BLM and NPS lands including many wilderness areas. There would be removal of unoccupied raven nests. We anticipate that the removal of 3,000 to 7,000 common ravens annually would result in a slight decrease in the raven population in the California desert. Between 1966 and 1999, ravens in the Mohave Desert had an annual population increase of 5.4 percent and 7.1 percent in the Colorado Desert (Liebezeit et al. 2002). Raven population numbers would remain well above historic levels in the California desert. We do not anticipate that implementation of this alternative would reach the threshold of reducing the common raven in the California desert to a level below self-sustaining (see Table 4-1). Movement of common ravens from adjacent populations into the California desert would still occur.

The indirect impacts from implementation of the actions to reduce human subsidies of food, water, and nest and roost sites and remove unoccupied raven nests would be similar to those of Alternative B.

The level of potential impact from this alternative to common ravens does not reach a level of significance as defined in the Significance Criteria in Table 4-1. However, a minor portion of the population in the California desert would be removed annually.

4.5.2 Impact on Nontarget Species

4.5.2.1 Desert Tortoise

The indirect impacts from implementing Alternative D to the desert tortoise would be similar to Alternative C. The increased number of common ravens removed from the DTMAs and raven concentration sites would lead to a greater immediate beneficial effect than Alternative C. This would occur by removing both ravens that prey and do not prey on desert tortoises in these DTMAs, which are essential for desert tortoise survival and recovery, and reducing the concentrated numbers of potential predatory ravens in desert tortoise habitat near these concentration sites. Raven removal would allow hatchling and juvenile desert tortoises in these and nearby areas to survive and contribute to increased desert tortoise populations. Implementation of this alternative would also allow more desert tortoises to reach adulthood and reproduce, contributing to the recovery of the species.

The other part of Alternative D, reduce human subsidies of food, water, and nest and roost site for the common raven, would have the same impact at Alternative B. The reduction in human subsidies would eventually reduce raven population numbers and raven predation on desert tortoises, thereby increasing desert tortoise population numbers. These impacts would be moderate and beneficial.

A potential negative impact of this alternative is minimal but possible. Desert tortoises may be injured or killed by vehicles carrying project employees. This possibility would be minimized or eliminated by following posted speed limits, driving less than 25 mph on dirt roads, and educating field staff on desert tortoise awareness. Although we estimate up to a 100 percent increase in number of miles traveled above the Alternative B miles, we consider the risk negligible because of the mitigation measures.

4.5.2.2 Other Wildlife Species

The indirect impacts of implementing this alternative would be similar to those of Alternative C. This alternative would have minor to moderate beneficial impacts to wildlife species that are prey for the common raven in the DTMAs and concentration sites. The impacts from implementing Alternative D for raven removal, reduction of human subsidies, and removal of unoccupied raven nests would be similar to that of Alternative C although the geographic area of this impact would be greater as it includes raven concentration areas.

The potential removal methods (trapping and relocation, shooting, trapping and euthanasia, and poisoning) are not likely to affect nontarget species. The actual raven removal effort is not expected to affect other wildlife species.

The level of potential impact from this alternative to nontarget species does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.5.3 Impact on Socioeconomics Issues

The indirect impacts to socioeconomic issues from implementing Alternative D would be similar to Alternative C. The efforts to remove (shoot, trap and euthanize, and use an avian toxicant) ravens would cover a larger area than Alternative C and occur in defined blocks or polygons located throughout the California desert. Occasionally these activities may occur near communities. If they do, their effects would be limited, and should have negligible adverse impacts on socioeconomics. Shooting would occur during daylight hours, and its occurrence would be minimal with respect to frequency and duration. All laws and regulations regarding discharge of firearms would be strictly followed including discharge of firearms near dwellings. Trapping and use of an avian toxicant are not likely to affect the residents of local desert communities; these activities would occur in the desert, not within communities or settlements. We estimate that implementation of these removal actions would cost $550,000 per year and could occur at any time during the year. Qualified professionals from APHIS-WS would implement these removal methods. Implementation of these actions would result in negligible adverse impacts to socioeconomic issues.

Part of Alternative D is to work with federal, state, and local agencies, and the public to develop and/or implement existing authorities and develop basic processes that manage the disposal and storage of solid waste; conserve water; and modify structures to reduce human subsidies of food, water, and nest and roost sites for the common raven in the California desert. Implementation of these programs would likely result in minimal changes in human lifestyles and costs. We would inform the public about what they can do to help recover the desert tortoise, conserve limited resources such as water, and enjoy and appreciate the associated social and economic benefits of these conservation and management actions. They would be encouraged to implement these actions. We anticipate that, over the long-term, there would be changes in human behavior and consequently their actions and would result in effective management of solid waste, water, and nest and roost sites that would reduce the common raven population. This portion of Alternative D should have negligible beneficial impacts on socioeconomic issues.

The level of potential impact from this alternative to socioeconomics does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.5.4 Impact on Recreation

As stated under the current program alternative, much of the California desert is open to the public for various forms of recreational use. Closed areas include private lands and military bases. There are restrictions on methods of access to some of the public use areas (e.g., wilderness). Numerous opportunities are available for various forms of recreation on lands managed by the BLM, NPS, and California Department of Parks and Recreation. Implementation of Alternative D would not affect the continuation of these recreation opportunities.

The indirect impacts to recreation from implementation of Alternative D would be similar to Alternative C. At common raven removal locations (DTMAs and concentration sites), consideration would be given to public recreation activity patterns in these areas. Most public recreation occurs on weekends and holidays. The USFWS and APHIS-WS would consult with the BLM, NPS, California Department of Parks and Recreation, and CDFG to minimize impacts of raven removal on scheduled recreational activities. At sites where people are likely to be exposed to raven removal activities, emphasis would be placed on education and using tools that would not potentially harm the public. This impact would be negligible and adverse.

The cleanup of illegal dumpsites and similar activities may detract from the recreation experience for a short time, but the long-term benefits of making the area safe, free of garbage and debris, and restoring the area would greatly outweigh the adverse effects of cleanup activities on the recreation experience. This alternative would have negligible adverse impacts to recreation during cleanup.

Effective implementation of this alternative would result in greater opportunities over time for the recreating public to view a desert tortoise and other wildlife species in their natural habitat. The long-term impacts from implementation of this alternative would be negligible and beneficial.

The level of potential impact from this alternative to recreation does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.5.5 Impact on Human Health and Safety

The indirect impact to human health and safety from implementation of Alternative D would be similar to Alternative C. Measures to avoid adverse impacts on human health and safety are built into this alternative through use of the Wildlife Services Decision Model (Slate et al. 1992). Standard operating procedures used to reduce the risk to human health and safety is listed in Section 3.1.2 of the Wildlife Services EIS. Many of the procedures intended to minimize impacts on recreation would also minimize or avoid risks to human health and safety.

A formal human risk assessment of currently available APHIS-WS methods, including those proposed for use in this EA concluded low risks to humans (USDA 1997, revised, Appendix P). The risk assessment evaluated potential impacts on APHIS-WS employees and the public. Although some of the materials and methods available for reducing predation by the common raven on the desert tortoise have the potential to represent a threat to human health and safety if used improperly, problems associated with their misuse have rarely occurred, and the greatest risk is to the user. Professionals trained in the safe and effective use of each method would conduct the damage management practices. Although this could reduce effectiveness, human safety is the highest priority for all of the agencies concerned. Therefore, the impact to human health and safety from common raven removal is expected to be negligible and adverse.

The reduction in human subsidies to the common raven would have indirect impacts on human health and safety. The cleanup of illegal dumps and better management of permitted landfills and transfer stations would remove garbage and hazardous waste from unsecured locations and ensure that it is properly contained and managed. These actions would reduce the spread of disease and groundwater contamination. Reduction in standing water would reduce the number of breeding sites for mosquitoes, which may carry disease that could infect humans. There should be negligible beneficial impacts to human health and safety from the reduction in human subsidies of food, water, nest sites, and roost sites for the common raven.

The level of potential impact from this alternative to human health and safety does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.5.6 Effectiveness/Conclusion

The effectiveness of the program in relation to accomplishing the purpose and objectives of the proposed action can be defined as the increase in number of hatchling and juvenile desert tortoises that comprise the population in the DTMAs and areas adjacent to raven concentration areas, and the numbers recruited into the adult population over time in these areas. Effectiveness can also be determined by the reduction in the number of common raven nest sites with evidence of desert tortoise shell remains near them in the DTMAs. Because this alternative would result in the greatest number of common ravens removed in the California desert, many of which may not prey on the desert tortoise, raven removal coupled with reduction in human subsidies and nest removal would provide a similar level of effectiveness in accomplishing the purpose and objectives of the proposed action.

With respect to removal of common ravens in the DTMAs and concentration areas, the wildlife specialist must be able to complete wildlife damage management expeditiously and thoroughly, while minimizing harm to nontarget species and the environment and risks to human health and safety. The wildlife specialist must comply with all regulations on the use of each method, and use methods as humane as possible within the limits of current technology. The U.S. Government Accounting Office (1990) concluded that the APHIS-WS was effective overall in preventing and reducing wildlife damage while not significantly impacting target predator populations, the environment, or the public. Many of the details on effectiveness were discussed in the Final EIS on the national APHIS-WS program (USDA 1997, revised) where integrated wildlife damage management was concluded to be the most effective. The effectiveness of methods used, given they are used by trained professionals, would influence the overall effectiveness of this alternative.

Based on the description of the "Purpose and Need," the combined efforts to remove common ravens and implement a "cultural and physical" based program would meet the purposes and objectives of the proposed action. The removal of common ravens should yield both immediate relief from raven predation on hatchling and juvenile desert tortoises in the DTMAs and areas adjacent to raven concentration sites. It would allow desert tortoise populations to begin the 15- to 20-year process of recruiting hatchling and juvenile desert tortoises into the population. The implementation of the "cultural and physical" based program would provide for long-term reduction of common ravens in the California desert. This reduction would help bring the population numbers of this top predator in balance with the populations of other desert animals. Population numbers for the common raven would remain above historic levels in the California desert.

4.6 Alternative E–Integrated Predator Management Using only Cultural and Physical Methods

4.6.1 Impact on the Target Species (Common Raven) Population

Alternative E would have indirect impacts to the common raven that are similar to those of Alternative B for implementation of cultural and physical methods. Alternative E should have negligible impacts to the common raven population in the short-term. Currently several federal agencies have implemented limited efforts to reduce human subsidies of food, water, and nest and roost sites on federal lands. These efforts would be expanded and integrated across the California desert to gradually reduce the population of common ravens in the California desert.

The long-term "cultural and physical" efforts of reducing human subsidies would result in a gradual reduction of the common raven population in the California desert. The impact of this reduction would be minimal and adverse. The effectiveness of this alternative would depend on the cooperation of federal, state, and local agencies and the public in implementing measures to reduce human subsidies of food, water, and nest and roosts sites for the common raven in the California desert. If this alternative is not implemented completely, the common raven population would continue to increase in the California desert.

The level of potential impact from this alternative to common ravens does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.6.2 Impact on Nontarget Species

4.6.2.1 Desert Tortoise

Because this alternative does not remove any ravens, we anticipate a slowly developing, long-term beneficial impact to desert tortoises that are hunted by the common raven. Until the cultural and physical efforts are fully implemented, we anticipate the population of the desert tortoise to continue to decline. Eventually, the removal of raven nests and increased actions to reduce anthropogenic subsidies (including food, water, and nest and roost sites) would benefit the desert tortoise, but these benefits to the desert tortoise population would not likely occur for several years. Sustained levels of predation by the common raven would likely continue for several years until the cultural and physical efforts were fully implemented by the agencies and the public. For the desert tortoise in the California desert, particularly in the west Mojave Desert, this gradual implementation of cultural and physical efforts and delayed reduction in predation may not be in time to prevent the status of the desert tortoise in California from declining to that of endangered.

4.6.2.2 Other Wildlife Species

Because this alternative does not remove any ravens, we would anticipate a slowly developing, long-term beneficial impact to other wildlife species that are hunted by the common raven. Beneficial impacts would likely occur to birds, reptiles, and small mammals. As ravens are known to be omnivorous, a reduction in their numbers in certain areas would reduce predation on species including, but not limited to: small birds (eggs, nestlings, and adults), eggs, and nestlings of most birds nesting in the desert, snakes, lizards, rodents, and lagomorphs (rabbits and hares). In some specific portions of the project area, minimal benefits to animals would also affect declining, sensitive populations and in a few specific instances (Mohave ground squirrel, and Coachella Valley fringe-toed lizard), listed and/or candidate species would be positively impacted by actions proposed under this plan. Concentrations of common ravens occur near the Edom Hill landfill, an area adjacent to Coachella Valley fringe-toed lizard habitat.

The level of potential impact from this alternative to nontarget species does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.6.3 Impact on Socioeconomics Issues

An integrated effort (using cultural and physical methods) to reduce human subsidies, such as food and water, to the common raven would be expected to result in negligible changes to human lifestyle. The current cleanup of illegal dumps has had no impact on the lifestyle of the human population in the California desert. Efforts to reduce standing water on some lands would likely result in no effect to human lifestyle and a negligible beneficial effect from reduction in water costs.

The level of potential impact from this alternative to socioeconomics does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.6.4 Impact on Recreation

Under Alternative E, activities would be conducted in desert tortoise habitat with the exception of cleanup of illegal dumps. These sites are usually small and located near communities. The cleanup activities may deter from the recreation experience for a short time, but the long-term benefits of making the area safe, free of garbage and debris, and restoring the area would greatly outweigh the adverse effects of cleanup activities on the recreation experience. This alternative would have negligible adverse impacts to recreation during cleanup and negligible beneficial effects afterward.

Effective implementation of this alternative would over time result in greater opportunities for the recreating public to view a desert tortoise and other wildlife species in their natural habitat. The long-term impacts from implementation of this alternative would be negligible and beneficial.

The level of potential impact from this alternative to recreation does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.6.5 Impact on Human Health and Safety

Some of the "cultural and physical" measures would provide limited improvement to human health and safety. These include removal of illegal dumps, better management of transfer stations, and eliminating standing water. Illegal dumps may contain hazardous materials. Since they are usually easily accessible, the public is at risk of exposure to these hazards. They also contain debris, which can cause injury or death to anyone inspecting or playing at a dumpsite.

Standing water in a warm environment is a breeding habitat for mosquitoes that carry diseases. Encouraging agencies and the public to manage their outside watering to eliminate standing water which subsidizes the common raven would also reduce the likelihood of mosquitoes breeding and carrying diseases to humans. Implementation of this alternative would have a negligible beneficial impact on human health and safety.

The level of potential impact from this alternative to human health and safety does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.6.6 Effectiveness/Conclusion

Based on the description of the Need for Action, a "cultural and physical" based program would be expected to slowly reduce mortality and increased recruitment for the desert tortoise after a period of implementation of the program to manage the common raven populations. Alternative E would not be as effective initially or in the long-term as Alternatives B, C, or D. It would not allow for the immediate removal of common ravens known to prey or that may prey on hatchling and juvenile desert tortoises. It would not provide an environment for the survival of hatchling and juvenile desert tortoises in a timely manner. It would not contribute to the recruitment of young animals into the adult population or the survival of the next generation. Elevated levels of predation by the common raven on the desert tortoise would continue for at least the current life span of an adult raven (13 years in the wild) or longer. Ravens that prey on the desert tortoise would remain in the population; other ravens would learn from them how to prey on desert tortoises. This behavioral cycle would continue for the current number of ravens although over time it would eventually be less. There would be no immediate relief to allow desert tortoise populations to begin the 15- to 20-year process of recruiting hatchling and juvenile desert tortoises into the population. This time lag in providing relief from juvenile and hatchling mortality would continue the current one to two decade long period with little or no survival and recruitment of these hatchling and juvenile desert tortoises, especially in the west Mojave Desert, and could eventually result in local or regional extinction. Even with a large-scale outreach program to the federal, state, local agencies, and the public to reduce human subsidies to the common raven, ravens would continue to prey on hatchling and juvenile desert tortoises at a rate greater than historic levels and at a rate greater than the current population can endure. It would likely take several decades after full implementation of the "cultural and physical" based program to meet the purpose and objectives of the proposed action. Given the continued long-term decline of the population of the desert tortoise, such a delay in achieving any measure of success substantially diminishes the potential benefits to the desert tortoise populations.

With respect to determining whether the impacts to the resource areas rise to the level of significance for the alternatives, see Table 4-1. None of the alternatives considered would cause mortality or permanent habitat loss for listed or candidate species or other protected species. Alternative D does remove the largest percentage of the common raven population; however, the remaining population would remain at historically high levels in the California desert.

The socioeconomic impacts of the alternatives analyzed would be well below the 10 percent criteria for significance. None of the alternatives would likely stimulate local area growth rates or change employment levels.

The impacts to recreation from implementation of the alternatives would not prevent the continuation of existing authorized off-highway vehicle recreation use or continuation of existing hunting programs. The availability of any recreation resource would not be increased or decrease by 10 percent or more.

None of the alternatives would expose people to potential health hazards. All are consistent with existing health and safety regulations.

4.7 Alternative F–Phased Implementation of Integrated Predator Management and Removal of Ravens Using a Phased Implementation, as Needed (Alternatives B, C, and D)

4.7.1 Impact on the Target Species (Common Raven) Population

The direct impacts of this alternative would be similar to that of Alternatives B, C, and D, with the greatest degree of impact occurring if Alternative D is implemented. The short- and long-term impacts to the common raven population in the California desert would range from negligible adverse from implementation of Alternative B to minor adverse impacts from implementation of Alternative D. The estimated percent of the population of common ravens that would be removed would range from 0.5 percent from implementation of Alternative B to about 19 percent from implementation of Alternative D. The number of common ravens removed would depend on several variables: effectiveness of implementing methods to reduce human subsidies of food, water, and nest and roost sites to the common raven; availability of staff; and funding. The wildlife specialist would determine which removal strategy or strategies would be most effective for removal of the common raven for these areas. See sections 4.3.1, 4.4.1, and 4.5.1 above for a description of impacts from implementation of this phased approach.

The level of potential impact from this alternative to common ravens does not reach a level of significance as defined in the Significance Criteria in Table 4-1. However, a minor portion of the population in the California desert would be removed annually.

4.7.2 Impact on Nontarget Species

4.7.2.1 Desert Tortoise

The indirect impacts from implementing Alternative F to the desert tortoise would be similar to Alternatives B, C, and D. The increased number of common ravens removed from the DTMAs and raven concentration sites would lead to a greater immediate beneficial effect than Alternative C. This would occur by removing both ravens that prey and do not prey on desert tortoises in these DTMAs, which are essential for desert tortoise survival and recovery, and reducing the concentrated numbers of potential predatory ravens in desert tortoise habitat near these concentration sites. Raven removal would allow hatchling and juvenile desert tortoises in these and nearby areas to survive and contribute to increased desert tortoise populations. Implementation of this alternative would also allow more desert tortoises to reach adulthood and reproduce, contributing to the recovery of the species.

The other part of Alternative F, reduce human subsidies of food, water, and nest and roost site for the common raven, would have the same impact as Alternatives B, C, and D. The reduction in human subsidies would eventually reduce raven population numbers and raven predation on desert tortoises, thereby increasing desert tortoise population numbers. These impacts would be moderate and beneficial.

A potential negative impact of this alternative is minimal but possible. Desert tortoises may be injured or killed by vehicles carrying project employees. This possibility would be minimized or eliminated by following posted speed limits, driving less than 25 mph on dirt roads, and educating field staff on desert tortoise awareness. We consider the risk negligible because of the mitigation measures.

4.7.2.2 Other Wildlife Species

The greatest indirect impacts of implementing this alternative would be similar to those of Alternative D. This alternative would have minor to moderate beneficial impacts to wildlife species that are prey for the common raven in the DTMAs and concentration sites. The impacts from implementing Alternative F for raven removal, reduction of human subsidies, and removal of unoccupied raven nests would be similar to that of Alternative D although the geographic area of this impact would be greater as it includes raven concentration areas.

The potential removal methods (trapping and relocation, shooting, trapping and euthanasia, and poisoning) are not likely to affect nontarget species. The actual raven removal effort is not expected to affect other wildlife species.

The level of potential impact from this alternative to nontarget species does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.7.3 Impact on Socioeconomics Issues

The greatest indirect impacts to socioeconomic issues from implementing Alternative F would be similar to Alternatives D. The efforts to remove (shoot, trap and euthanize, and use an avian toxicant) ravens would cover a larger area than Alternative C and occur in defined blocks or polygons located throughout the California desert. Occasionally these activities may occur near communities. If they do, their effects would be limited, and should have negligible adverse impacts on socioeconomics. Shooting would occur during daylight hours, and its occurrence would be minimal with respect to frequency and duration. All laws and regulations regarding discharge of firearms would be strictly followed including discharge of firearms near dwellings. Trapping and use of an avian toxicant are not likely to affect the residents of local desert communities; these activities would occur in the desert, not within communities or settlements. We estimate that implementation of these removal actions would cost $550,000 per year and could occur at any time during the year. Qualified professionals from APHIS-WS would implement these removal methods. Implementation of these actions would result in negligible adverse impacts to socioeconomic issues.

Part of Alternative F is to work with federal, state, and local agencies, and the public to develop and/or implement existing authorities and develop basic processes that manage the disposal and storage of solid waste; conserve water; and modify structures to reduce human subsidies of food, water, and nest and roost sites for the common raven in the California desert. Implementation of these programs would likely result in minimal changes in human lifestyles and costs. We would inform the public about what they can do to help recover the desert tortoise, conserve limited resources such as water, and enjoy and appreciate the associated social and economic benefits of these conservation and management actions. They would be encouraged to implement these actions. We anticipate that, over the long-term, there would be changes in human behavior and consequently their actions and would result in effective management of solid waste, water, and nest and roost sites that would reduce the common raven population. This portion of Alternative F should have negligible beneficial impacts on socioeconomic issues.

The level of potential impact from this alternative to socioeconomics does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.7.4 Impact on Recreation

As stated under the current program alternative, much of the California desert is open to the public for various forms of recreational use. Closed areas include private lands and military bases. There are restrictions on methods of access to some of the public use areas (e.g., wilderness). Numerous opportunities are available for various forms of recreation on lands managed by the BLM, NPS, and California Department of Parks and Recreation. Implementation of Alternative F would not affect the continuation of these recreation opportunities.

The greatest indirect impacts to recreation from implementation of Alternative F would be similar to Alternative D. At common raven removal locations (DTMAs and concentration sites), consideration would be given to public recreation activity patterns in these areas. Most public recreation occurs on weekends and holidays. The USFWS and APHIS-WS would consult with the BLM, NPS, California Department of Parks and Recreation, and CDFG to minimize impacts of raven removal on scheduled recreational activities. At sites where people are likely to be exposed to raven removal activities, emphasis would be placed on education and using tools that would not potentially harm the public. This impact would be negligible and adverse.

The cleanup of illegal dumpsites and similar activities may detract from the recreation experience for a short time, but the long-term benefits of making the area safe, free of garbage and debris, and restoring the area would greatly outweigh the adverse effects of cleanup activities on the recreation experience. This alternative would have negligible adverse impacts to recreation during cleanup.

Effective implementation of this alternative would result in greater opportunities over time for the recreating public to view a desert tortoise and other wildlife species in their natural habitat. The long-term impacts from implementation of this alternative would be negligible and beneficial.

The level of potential impact from this alternative to recreation does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.7.5 Impact on Human Health and Safety

The indirect impact to human health and safety from implementation of Alternative F would be similar to Alternative D. Measures to avoid adverse impacts on human health and safety are built into this alternative through use of the Wildlife Services Decision Model (Slate et al. 1992). Standard operating procedures used to reduce the risk to human health and safety is listed in Section 3.1.2 of the Wildlife Services EIS. Many of the procedures intended to minimize impacts on recreation would also minimize or avoid risks to human health and safety.

A formal human risk assessment of currently available APHIS-WS methods, including those proposed for use in this EA concluded low risks to humans (USDA 1997, revised, Appendix P). The risk assessment evaluated potential impacts on APHIS-WS employees and the public. Although some of the materials and methods available for reducing predation by the common raven on the desert tortoise have the potential to represent a threat to human health and safety if used improperly, problems associated with their misuse have rarely occurred, and the greatest risk is to the user. Professionals trained in the safe and effective use of each method would conduct the damage management practices. Although this could reduce effectiveness, human safety is the highest priority for all of the agencies concerned. Therefore, the impact to human health and safety from common raven removal is expected to be negligible and adverse.

The reduction in human subsidies to the common raven would have indirect impacts on human health and safety. The cleanup of illegal dumps and better management of permitted landfills and transfer stations would remove garbage and hazardous waste from unsecured locations and ensure that it is properly contained and managed. These actions would reduce the spread of disease and groundwater contamination. Reduction in standing water would reduce the number of breeding sites for mosquitoes, which may carry disease that could infect humans. There should be negligible beneficial impacts to human health and safety from the reduction in human subsidies of food, water, nest sites, and roost sites for the common raven.

The level of potential impact from this alternative to human health and safety does not reach a level of significance as defined in the Significance Criteria in Table 4-1.

4.7.6 Effectiveness/Conclusion

The effectiveness of the program in relation to accomplishing the purpose and objectives of the proposed action can be defined as the increase in number of hatchling and juvenile desert tortoises that comprise the population in the DTMAs and areas adjacent to common raven concentration areas, and the numbers recruited into the adult population over time in these areas. Effectiveness can also be determined by the reduction in the number of common raven nest sites with evidence of desert tortoise shell remains near them in the DTMAs. Since this alternative would result in the greatest number of common ravens removed in the California desert, many of which may not prey on the desert tortoise, raven removal coupled with reduction in human subsidies and nest removal would provide a similar level of effectiveness in accomplishing the purpose and objectives of the proposed action.

With respect to removal of common ravens in the DTMAs and concentration areas, the wildlife specialist must be able to complete wildlife damage management expeditiously and thoroughly, while minimizing harm to nontarget species and the environment and risks to human health and safety. The wildlife specialist must comply with all regulations on the use of each method, and use methods as humane as possible within the limits of current technology. The U.S. Government Accounting Office (1990) concluded that the APHIS-WS was effective overall in preventing and reducing wildlife damage while not significantly impacting target predator populations, the environment, or the public. Many of the details on effectiveness were discussed in the Final EIS on the national APHIS-WS program (USDA 1997, revised) where integrated wildlife damage management was concluded to be the most effective. The effectiveness of methods used, given they are used by trained professionals, would influence the overall effectiveness of this alternative.

Based on the description of the "Purpose and Need," the combined efforts to remove common ravens and implement a "cultural and physical" based program would meet the purposes and objectives of the proposed action. The removal of common ravens should yield both immediate relief from common raven predation on hatchling and juvenile desert tortoises in the DTMAs and areas adjacent to raven concentration sites. It would allow desert tortoise populations to begin the 15- to 20-year process of recruiting hatchling and juvenile desert tortoises into the population. The implementation of the "cultural and physical" based program would provide for long-term reduction of common ravens in the California desert. This reduction would help bring the population numbers of this top predator more in balance with the populations of other desert animals. Population numbers for the common raven would remain above historic levels in the California desert. The implementation of a phased approach would provide the optimum ability to reduce common raven predation on the desert tortoise as needed while minimizing the number of ravens that need to be removed.

4.8 Selection of the Preferred Alternative

Based on the analysis of impacts for the six alternatives, we have selected Alternative F, implementation of a phased approach of Alternatives B, C, and D. Of the alternatives presented, this alternative would implement the proposed action to reduce predation to the desert tortoise immediately (common raven removal) and for the long-term (implementation of the "cultural and physical based program"). It would provide the flexibility needed to adjust management actions to minimize the removal of the common raven and effectively reduce predation on the desert tortoise by the common raven.

4.9 Irreversible and Irretrievable Commitment of Resources

The resources involved with the proposed action include socioeconomics, recreation, common ravens, and nontargeted wildlife species. The maximum commitment of resources and manpower would be: for socioeconomics, the expenditure of up to $550,000 per year and employment of the equivalent of 1.25 full-time positions per year; for recreation, the loss of up to a total of 20 days per year at limited local sites; and for common ravens, the removal of up to 7,000 birds per year. Nontargeted species would experience a positive impact from reduced raven predation.

By implementing the proposed action, the only irreversible and irretrievable commitment of resources would be the removal of up to 7,000 common ravens annually. This would still leave the population at an historic high level.

4.10 Cumulative Impacts

This section of this EA analyzes cumulative impacts associated with the proposed action in the context of other "past, present, and reasonably foreseeable" action in the California desert. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. In analyzing the specific impacts of the alternatives considered to implement the proposed action, the following cumulative analyses were identified. The identified impacts were analyzed in accordance with NEPA (42 USC 4321–4347), Council on Environmental Quality (CEQ) regulation (40 CFR Parts 1500–1508) and CEQ guidelines for conducting cumulative impact analysis (*Considering Cumulative Effects under the National Environmental Policy Act, Executive Office of the President*, January 1997).

4.10.1 Council on Environmental Quality Guidelines

The 1997 CEQ guidelines clarify NEPA requirements for cumulative impact analysis, focusing on issues affected by the proposed action and using resource-based analyses as opposed to activity-based analyses. The recommended CEQ methodology identifies and analyzes other past and present projects and forecasts for future actions that have affected (or will affect) resource or issues in the region. In addition, the 1999 EPA guidance on cumulative impact analysis, as well as the FWS guidance on analyzing threats to endangered species, were utilized in the analysis of the cumulative impacts.

Table 4-3 presents the resources analyzed based on CEQ guidelines and the three levels of analysis performed. Level 1 reflects resources (or issues) that did not have any potential cumulative effects concerns, thus no further analyses were needed. Level 2 analyses were conducted for those resources (or issues) that might be subject to potential cumulative effects. Level 3 analyses were conducted for those resources (or issues) that were identified as having cumulative effects resulting from direct and indirect effects of the potential actions and other past, present, or future actions. Level 3 analyses included a more in-depth review of the combined effects on specific relevant topics within the given resource (or issue).

The impacts to socioeconomics, human health and safety, and recreation from implementation of each of the six alternatives would be negligible to none (Table 4-4). We considered/analyzed this level of impact for these resource issues and did not carry them forward for further discussion/analysis in the Cumulative Impacts section.

Table 4-5 presents the Level 3 analysis as it relates to the common ravens and other wildlife species.

Other than the alternatives proposed in this document, we are unaware of any past, current, or planned future actions that would directly or indirectly impact the common raven with one exception, the BLM's effort about 15 to 20 years ago to remove common ravens. Future actions that may impact the common raven would be continued human development throughout various locations in the California desert. These future actions are beneficial to the common raven and would likely contribute to higher common raven population numbers and increased predation pressure on the desert tortoise and other wildlife species.

Cumulative impacts for the common raven were discussed under Environmental Consequences Section. The worst-case scenarios discussed previously indicate that all alternatives would have minimal or minor cumulative impacts on the common raven population. Since the common raven is a resident bird in the California desert, removal efforts outside the California desert should have little effect on the common raven population in the California desert.

Cumulative impacts on nontarget species are also expected to range from moderate adverse to moderate beneficial. Implementation of the four action alternatives presented in this EA would likely have no to minimal adverse effects on the federal and state threatened desert tortoise and moderate beneficial effects. Actions that are effective in reducing raven predation on the desert tortoise would benefit this species. For other wildlife species, the implementation of the four action alternatives would likely have no to minimal adverse effects and moderate beneficial effects. Actions that are effective in reducing the number of ravens in the California desert would likely benefit these species of small mammals, birds, and reptiles from reduced rates of predation.

4.10.1.1 Comparison of Alternatives under CEQ Guidelines

4.10.1.1.1 Alternative A

Under Alternative A, the current program alternative, the common raven populations would be expected to continue to increase. With larger raven populations, we would expect increased predation of juvenile desert tortoises causing a lesser likelihood of desert tortoise recovery. Without substantially reducing hatchling and juvenile desert tortoise mortality and increasing desert tortoise recruitment, it would be impossible for desert tortoise populations to recover. The current program alternative would continue the status quo in the California desert, which is a continued decline of desert tortoise densities and reduction of its geographic range especially in the Western Mojave Recovery Unit. Without an integrated approach to desert tortoise recovery, including a reduction in predation, the long-term cumulative impact is anticipated to be a continued decline of the desert tortoise populations and other wildlife species in the California deserts and extirpation of the desert tortoise in some locations.

The cumulative impact of implementation of the current outreach program by the Defenders of Wildlife would be limited. We are unaware of any other outreach efforts in the California desert regarding educating the public and local and state agencies about what they can do to reduce human subsidies of food, water, and nest and roost sites for the common raven thereby increasing hatchling and juvenile desert tortoise survival and recruitment. Because of the current limited size of this program, we anticipate minimal adverse impacts to ravens as they would continue to expand in numbers and geographic area following human development in the California desert.

Table 4-3. Level of Analysis for Each Resource Area

Level 1 No Impacts Identified	Level 2 Analysis and Discussion	Level 3 Detailed Analysis
Air Quality	Socioeconomics	Target Species (common raven)
Geology	Recreation	Nontarget Species (desert tortoise and other wildlife species)
Soils	Human Health and Safety	
Floodplains		
Wetlands		
Vegetation		
Aquatic Resources		
Unique Ecosystems		
Park Lands		
Natural or Depletable Resources		
Traffic		
Noise		
Cultural Resources		
Indian Trust Resources		
Urban Quality		
Seismicity		
Environmental Justice		
Protection of Children from Environmental Health and Safety Risks		
Prime and Unique Resources (farmlands)		
Geological Resources (rocks and streambeds)		
Biodiversity and Ecosystems		
Stream Flow Characteristics		
Energy Requirements and Conservation		
Water Quantity		
Minerals		
Ecologically Critical Areas		
Visual Quality		
Sacred Sites		
Wilderness		

Table 4-4. Analysis of Socioeconomics, Recreation, and Human Health and Safety

Socioeconomic Resources
Quick Look Questions

No **Has** the project area undergone any major changes in economic activity or population in the last 10 years as a result of actions similar to the proposed action?

While the California desert has experienced major growth in economic activity and population size, this growth is not the substantial result of similar types of projects. More than 15 years ago, the BLM proposed and implemented for several days a raven management plan. This action would have contributed a negligible amount of socioeconomic activity in the project area.

No **Will the** proposed action contribute to this major growth in economic activity and population size?

The California desert has a million plus population size and economic activity and value in the hundreds of millions of dollars. The proposed action would contribute a few seasonal positions annually to the economy and no contribution to the population.

No Is **additional** cumulative effects analysis needed?

Human Health and Safety
Quick Look Questions

Yes Are **there** any known or suspected contaminated sites that would be affected by the proposed action?

Part of the proposed action is to clean up illegal dumps.

Yes **Would** the proposed action increase the use of existing hazardous materials or involve the use of new hazardous materials?

We will use an avicide that will be administered by certified professionals in handling, use, and disposal of the avicide. Localized in application and used in small amounts

Yes **Are** there any potential health or safety risks to the public from the proposed action?

There are potential risks because of the use of firearms and an avicide. However, these methods would be implemented by qualified professionals who would select the most appropriate method including consideration of human activity in the use area

No Do **any** risks remain that cannot be mitigated?

No Is **additional** cumulative effects analysis needed?

Table 4-4. Analysis of Socioeconomics, Recreation, and Human Health and Safety

Recreation **Quick Look Questions**	
Yes	Are there areas within the project area that are used for access and recreation? *Much of the California desert is used for a variety of types of recreation.*
No	**Does** the proposed action increase the potential for additional recreational activities?
Slight	Does the proposed action have the potential to limit recreational activities? *Proposed action would be limited to small areas for short period of time.*
Yes	Are **there** any limitations to recreation that cannot be mitigated? *There is the possibility that after implementing mitigation for recreation (e.g., considering scheduled recreation events and periods of higher use - weekends and holidays), some activities would occur that would limit recreation in a small area and for a short time. The rest of the California desert would be available for various types of recreation.*
No	Is a detailed cumulative effects analysis needed?

Table 4-5. Level 3 Analysis–Common ravens and Other Wildlife Species (Refer to Table 4-3)

<u>No</u> **<u>Would</u>** any of the alternatives result in significant changes (as defined under NEPA)?

<u>No</u> **<u>Would</u>** the proposed action result in the removal of listed species from the wild?

The proposed action would only result in the removal of the common raven which is not a federal or state-listed species.

<u>Yes</u> Has the project area been surveyed for listed species?

<u>Yes</u> Does **<u>the</u>** proposed action result in the removal from the wild of nonlisted species?

<u>Yes</u> **Will <u>the</u> proposed action take place on sensitive habitats?**

Locations may include desert tortoise critical habitat, BLM lands with special designation such as Areas of Critical Environmental Concern, and NPS lands.

<u>Yes</u> **<u>Will</u>** the proposed action take place near or in designated wilderness?

The proposed action may occur near wilderness but would not likely occur in designated wilderness. Most wilderness areas are mountainous areas and are not considered high quality habitat for the desert tortoise in California. However, if we implement the proposed action in wilderness areas, we would follow all applicable rules for wilderness areas.

<u>Yes</u> Does **<u>the</u>** proposed action involve the use of hazardous or toxic material in association with wildlife species?

An avian toxicant may be used to remove common ravens.

<u>Yes</u> **<u>Are</u>** any state or federal permits or authorization required for the proposed action?

Both state permits and federal authorization are required.

<u>Yes</u> Is **<u>additional</u>** cumulative impact analysis required?

We anticipate the cumulative impacts to socioeconomics, human health and safety, and recreation in the California desert to be negligible. The USFWS and other agencies would not be implementing actions that would create or remove jobs from the area and would not be implementing actions that would likely affect human health and safety or recreation.

4.10.1.1.2 Alternative B

The removal of 100 pairs of common ravens each year is not considered large enough to have a cumulative impact on ravens in the California desert or in the state as a whole. There are other raven depredation activities being conducted within the state and in adjacent states, primarily associated with damage to agricultural and livestock resources, and threats to human health and safety. However, none of these activities are in the California desert. Since the common raven in the California desert is a resident or nonmigratory animal, these depredation activities should not affect the ravens in the California desert. Population levels of the common raven from removal actions would decline but would be greater than they were in the 1960s, 1970s, 1980s, and 1990s.

This alternative would allow for a decrease in hatchling and juvenile desert tortoise mortality, which would provide a positive impact to the desert tortoise population, and would ultimately increase desert tortoise recruitment in the California desert. It would not eliminate predation by the common raven on the desert tortoise and would not eliminate ravens in any part of the California desert. This alternative would allow for enough of a decrease in hatchling and juvenile desert tortoise mortality to provide a positive impact for the desert tortoise. It would also provide a benefit to other wildlife species in the desert upon which the common raven preys by reducing the level of mortality from common raven predation.

The cumulative impact of implementation of a cultural and physical based program, which includes a public education and outreach program by the USFWS and cooperating agencies, would be coordinated with the outreach program recently initiated by the Defenders of Wildlife. We are unaware of any other outreach efforts in the California desert regarding educating the public and local and state agencies about what they can do to reduce human subsidies of food, water, nest sites, and roosts sites for the common raven. Over time, if these actions are fully implemented, they should reduce the size of the common raven population in the California desert thereby reducing the occurrence of common ravens preying on juvenile and hatchling desert tortoises.

We anticipate the cumulative impacts to socioeconomics in the California desert to be minimal. Only a handful of jobs would be created from implementation of this action, and those jobs would be seasonal. Compared to the tens of thousands of people and jobs that are in the California desert, this impact would be negligible.

The cumulative impact from implementation of this alternative to human health and safety would be none to negligible. Implementation would not expose people to potential health hazards. Use of firearms and avicide bait would be by trained professionals and limited to local sites away from communities. The egg bait would be on platforms high above the ground to keep small children from accessing the eggs. The platform would be signed with warnings in English and Spanish. Personnel would be nearby to monitor the avicide sites for human behavior. This alternative is consistent with existing health and safety regulations. Its implementation would have limited beneficial impacts through improved trash containment and reduction of unauthorized dumps which would reduce the possible spread of disease.

The cumulative impacts to recreation would also be minimal. There are numerous types of recreational opportunities available throughout the millions of acres of public land (e.g. BLM, NPS, and California State Parks) in the California desert. Implementation of this action may seasonally restrict the public from fully using a small number of sites. This action would also provide a benefit by increase wildlife viewing opportunities in the future. We are unaware of any other actions that would adversely or beneficially impact recreation opportunities other than those currently implemented by federal, state, and local agencies in their land management plans.

4.10.1.1.3 Alternative C

The removal of 2,000 adult ravens from the California desert annually is not considered large enough to lead to a cumulative negative impact on the common raven population in the California desert or throughout the state. We are unaware of any other raven removal or depredation activities currently planned or conducted in the California desert. There are other raven depredation activities being conducted within the state and in adjacent states, primarily associated with damage to agricultural and livestock resources, and threats to human health and safety. However, none of these activities are in the California desert. Since the common raven in the California desert is a resident or nonmigratory animal, these depredation activities would not affect the ravens in the California desert. Population levels of the common raven from removal actions would still be greater than they were in the 1960s, 1970s, 1980s, and 1990s.

This alternative would immediately decrease hatchling and juvenile desert tortoise mortality from common ravens to provide a positive impact for the desert tortoise and would ultimately improve desert tortoise recruitment. Additionally, because common raven removal would not be limited to only those ravens known to prey upon desert tortoise, we would anticipate a positive cumulative impact for other wildlife species upon which the common raven preys with this reduced level of raven predation.

The cumulative impact of implementation of a cultural and physical based program, which includes a public education and outreach program by the USFWS and cooperating agencies, would be coordinated with the outreach program recently initiated by the Defenders of Wildlife. We are unaware of any other outreach efforts in the California desert regarding educating the public and local and state agencies can do to reduce human subsidies of food, water, nest sites, and roosts sites for the common raven. Over time, if these actions are implemented, they should reduce the size of the common raven population in the California desert thereby reducing the occurrence of common ravens preying on juvenile and hatchling desert tortoises.

We anticipate the cumulative impacts to socioeconomics in the California desert to be minimal. Less than a dozen jobs would be created from implementation of this action. Compared to the tens of thousands of people and jobs that are in the California desert, this impact would be negligible.

The cumulative impact from implementation of this alternative to human health and safety would be minimal. Implementation would not expose people to potential health hazards. Use of firearms and avicide bait would be by trained professionals and within defined geographic areas that are generally away from human populations. It is consistent with existing health and safety regulations. It would have limited beneficial impacts through improved trash containment and reduction of unauthorized dumps which would reduce the possible spread of disease.

The cumulative impacts to recreation would also be minimal. There are numerous types of recreational opportunities available throughout the millions of acres of public land (e.g. BLM, NPS, and California State Parks) in the California desert. Implementation of this action may restrict the public from fully using a small number of sites. This action would also provide a benefit by increase wildlife viewing opportunities in the future. We are unaware of any other actions that would adversely or beneficially impact recreation opportunities other than those currently implemented by federal and state agencies in their land management plans.

4.10.1.1.4 Alternative D

The removal of 3,000 to 7,000 ravens (8 to 18.7 percent) annually is potentially large enough to lead to a minimal negative cumulative impact on raven populations within the California desert region. The annual population growth rate for the common raven from 1966 to 1999 was 5.4 percent in the Mojave Desert and 7.1 percent in the Colorado Desert. We are unaware of any other raven removal or depredation activities currently planned or conducted in the California desert. There are raven depredation activities being conducted within the state and in adjacent states, primarily associated with loss of agriculture and livestock. Since the common raven in the California desert is a resident or nonmigratory animal, these depredation activities should not affect the common ravens in the California desert. Over the long-term, this level of removal would reduce the overall common raven population in the California desert. However, population levels of the common raven after the removal actions would still be greater than they were in the 1960s, 1970s, 1980s, and 1990s. We would not expect the additional raven removal actions proposed in this alternative to have a long-term significant impact on the survival or continuation of the species.

This alternative would decrease hatchling and juvenile desert tortoise mortality to provide a positive cumulative impact for desert tortoise and would ultimately improve desert tortoise recruitment. Additionally, because raven removal would not be limited to only ravens known to prey upon desert tortoise, we would anticipate a positive impact for other wildlife species that are prey for the common raven with this reduced level of predation.

The cumulative impact of a public education and outreach program by the USFWS and cooperating agencies would be coordinated with the outreach program recently initiated by the Defenders of Wildlife. We are unaware of any other outreach efforts in the California desert regarding educating the public and local and state agencies can do to reduce human subsidies of food, water, nest sites, and roost sites for the common raven. Over time, if these actions are fully implemented, they should reduce the size of the common raven population in the California desert thereby reducing the occurrence of common ravens preying on juvenile and hatchling desert tortoises.

We anticipate the cumulative impacts to socioeconomics in the California desert to be negligible. Less than a handful of jobs would be created from implementation of this action.

Compared to the tens of thousands of people and jobs that are in the California desert, this change in socioeconomic benefits impact would be negligible.

The cumulative impact from implementation of this alternative to human health and safety would be minimal. Implementation would not expose people to potential health hazards. Use of firearms and avicide bait would be by trained professionals and within defined geographic areas that are generally away from human populations. It is consistent with existing health and safety regulations. It would have limited beneficial impacts through improved trash containment and reduction of unauthorized dumps which would reduce the possible spread of disease.

The cumulative impacts to recreation would also be minimal. There are numerous types of recreational opportunities available throughout the millions of acres of public land (e.g. BLM, NPS, and California State Parks) in the California desert. Implementation of this action may restrict the public from fully using a small number of sites. This action would also provide a benefit by increasing wildlife viewing opportunities in the future. We are unaware of any other actions that would adversely or beneficially impact recreation opportunities other than those currently implemented by federal and state agencies in their land management plans.

4.10.1.1.5 Alternative E

Under Alternative E, many of the current cultural and physical methods would be used but in an integrated program with a larger scope. The common raven populations would be expected to continue to increase for a few generations, because this is the expected time it would take for the public and agencies to fully implement these methods and produce results. Raven populations would be expected to continue preying on hatchling and juvenile desert tortoises at the current or increased rate. This would contribute to declining desert tortoise populations and cause a lag in desert tortoise recovery. Without substantially reducing hatchling and juvenile desert tortoise mortality and increasing desert tortoise recruitment, it would remain impossible for desert tortoise populations to recover. The need to accomplish this as soon as possible is especially important in the Western Mojave Recovery Unit. The long-term use of cultural and physical methods is anticipated to stabilize and eventually result in reduction of the raven populations, but not below historic levels.

We anticipate the cumulative impacts to socioeconomics, human health and safety, and recreation in the California desert to be none. The USFWS and other agencies would not be implementing actions that would create or remove jobs from the area and would not be implementing actions that would affect human health and safety or recreation.

4.10.1.1.6 Alternative F

The removal of 200 to 7,000 common ravens (0.5 to 18.7 percent) annually is potentially large enough to lead to a minimal negative cumulative impact on raven populations within the California desert region. The annual population growth rate for the common raven from 1966 to 1999 was 5.4 percent in the Mojave Desert and 7.1 percent in the Colorado Desert. We are unaware of any other raven removal or depredation activities currently planned or conducted in the California desert. There are common raven depredation activities being conducted within the state and in adjacent states, primarily associated with loss of agriculture and livestock. Since the common raven in the California desert is a resident or nonmigratory animal, these depredation activities should not affect the common ravens in the California desert. Over the long-term, this level of removal would reduce the overall common raven population in the California desert. However, population levels of the common raven after the removal actions would still be greater than they were in the 1960s, 1970s, 1980s, and 1990s. We would not expect the additional raven removal actions proposed in this alternative to have a long-term significant impact on the survival or continuation of the species. In addition, this alternative provides the flexibility to remove the minimum number of common ravens needed to meet the proposed action.

This alternative would decrease hatchling and juvenile desert tortoise mortality to provide a positive cumulative impact for desert tortoise and would ultimately improve desert tortoise recruitment. Additionally, because raven removal would not be limited to only ravens known to prey upon desert tortoise, we would anticipate a positive impact for other wildlife species that are prey for the common raven with this reduced level of predation.

The cumulative impact of a public education and outreach program by the USFWS and cooperating agencies would be coordinated with the outreach program recently initiated by the Defenders of Wildlife. We are unaware of any other outreach efforts in the California desert regarding educating the public and local and state agencies can do to reduce human subsidies of food, water, nest sites, and roost sites for the common raven. Over time, if these actions are fully implemented, they should reduce the size of the common raven population in the California desert thereby reducing the occurrence of common ravens preying on juvenile and hatchling desert tortoises.

We anticipate the cumulative impacts to socioeconomics in the California desert to be negligible. Less than a handful of jobs would be created from implementation of this action. Compared to the tens of thousands of people and jobs that are in the California desert, this change in socioeconomic impact would be negligible.

The cumulative impact from implementation of this alternative to human health and safety would be minimal. Implementation would not expose people to potential health hazards. Use of firearms and avicide bait would be by trained professionals and within defined geographic areas that are generally away from human populations. It is consistent with existing health and safety regulations. It would have limited beneficial impacts through improved trash containment and reduction of unauthorized dumps which would reduce the possible spread of disease.

The cumulative impacts to recreation would also be minimal. There are numerous types of recreational opportunities available throughout the millions of acres of public land (e.g. BLM, NPS, and California State Parks) in the California desert. Implementation of this action may restrict the public from fully using a small number of sites. This action would also provide a benefit by increasing wildlife viewing opportunities in the future. We are unaware of any other actions that would adversely or beneficially impact recreation opportunities other than those currently implemented by federal and state agencies in their land management plans.

4.10.2 U.S. Environmental Protection Agency (U.S. EPA) Guidance on Cumulative Impacts

The U.S. EPA has identified criteria they use to analyze all aspects of the natural environment when reviewing NEPA documentation. These criteria focus on ecological and evolutionary processes, such as natural disturbance regimes, hydrological processes, nutrient cycles, and biotic interactions. These processes summarize and capture the cumulative effects at the landscape scale. As a practical matter, the guidance suggests that environmental assessments should focus on ecological processes and how they can be affected by various stressors (U.S. EPA 1999).

The 10 ecological processes identified by the U.S. EPA that we evaluated to determine potential cumulative effects on the habitat and ecological resources are discussed as follows:

a. Habitats Critical to Ecological Processes–Loss of keystone habitats, such as desert springs, California native grasslands, Southern California coastal sage scrub, and California riparian forests and wetlands are not expected to be impacted because no construction or ground-disturbing activities are planned as part of this proposed action.

b. Patterns and Connectivity of Habitat Patches–Since no new construction, ground-disturbing activities, or changes in land use are planned, there would be no expected loss of rare habitats or connectivity among habitat patches, or change in homogeneity across the landscape.

c. Natural Disturbance Regimes–No natural disturbance regimes such as fire, flood, or insect infestations, or ground-disturbing activities would be expected to result from the proposed action. Increases to water sources, streams that would increase the vegetation in the desert climate, are not planned; as such additional fire sources or food sources for insects would not be expected.

d. Structural Complexity–Loss or reduction of components that create structural diversity, such as coarse woody debris, Joshua trees, and downed trees; reduced structural complexity in riparian areas; and reduced complexity of micro-site structures are not be anticipated because no new ground-disturbing activities are planned in these areas.

e. Hydrologic Patterns–Changes in water chemistry, including temperature changes, reduced infiltration, increased surface flow, or greater variation in flow frequencies and volumes, would not be expected. Construction activities that might alter the hydrologic patterns are not planned as part of the proposed action.

f. Nutrient Cycling–Because of the limited scope of the proposed action, contact with the habitat would be limited; a disruption of feedback loops that conserve and recycle nutrients, increase leaching of nutrients from the system, or alter levels and normal patterns of variation of nutrients would not be expected.

g. Purification Services–The method by which the ecosystem breaks down waste and detoxifies contaminants and the ability of the system to process waste materials, toxics, or other contaminants would not be affected. Any waste materials generated as part of the proposed action would be managed and disposed following specific federal and state guidelines.

h. Biotic Interactions–Some changes to nontarget species are expected. The current common raven population in the California desert is at a historically high level with an increasing trend for the last few decades. Increasing the survivorship of the desert tortoise is a goal of this proposed action, and the reduced predation pressure is expected to increase the survivorship of hatchling and juvenile desert tortoises. Other wildlife species that are prey for the common raven would also be expected to benefit with increased survivorship.

i. Population Dynamics–Mechanisms that tend to lessen fluctuations in populations, greatly increase populations (equals overpopulation), irruptions, and cause population crashes would not be affected because of the extremely limited contact by professionally training biologists as noted previously.

j. Genetic Diversity–Loss of genotypes, a reduction in generic variation, and genetically based deformities and reproduction dysfunction would not be expected because activities would be very limited, thus minimizing any potential for affecting genetic diversity.

We looked at these cumulative effects of the six alternatives to these ecological processes and determined that they do not apply.

4.10.3 USFWS Guidance on Analysis of Threats to Listed Species

For the cumulative impacts under the USFWS guidelines, we will focus discussion on the resource issues for target species (the common raven) and nontarget species (the desert tortoise and other wildlife). For these issues we have identified potential cumulative impacts to habitat degradation, habitat loss, exotic species, disease/contaminants, and mortality/reduced reproduction. Tables 4-6a and 4-6b summarize the USFWS guidance on analysis of threats to listed species associated with common raven management projects.

4.10.3.1 Common Raven

4.10.3.1.1 Past Actions

Habitat Degradation/Habitat Loss

In this document, we are defining habitat degradation and habitat loss as the alteration and/or removal of native habitat in the California desert. For the common raven, past federal land management actions that have impacted the common raven through habitat degradation and loss include inadvertently providing increased food, water, and nest and roost sites in the California desert to support the needs of a growing human population in the desert or to support agency missions. While these land management actions have degraded or destroyed native habitat in the California desert, this habitat modification has impacted the common ravens by providing this species with these life requisites previously not present on a sustainable basis in the California desert.

Exotic Species

In the past, there was little knowledge of, recognition of, or concern for the impacts that might result from the introduction of exotic species to the California desert by land management agencies. Regulated management activities provided opportunities for unintentional importation of exotic plant and animal species from outside the California desert as regional and interstate commerce from activities such as grazing and mining promoted the transport of goods into and out of the desert. During the last few decades, federal land management agencies have become aware of this impact and have implemented actions in their management plans to reduce the likelihood of new species being introduced in the future. These unintentional introductions of exotic plant and animal species to the California desert do not appear to have impacted the common raven.

Disease/Contaminants

We are unaware of any disease or contaminant issues associated with common raven management projects in the past. Past actions by the BLM to reduce predation by the common raven in the California desert are discussed in Section 3 of Appendix D. As part of this effort, the avicide DRC-1339 was used for 6 days in 1989 at the Desert Tortoise Natural Area in Kern County and the Marine Corps Air Ground Combat Center near Twenty Nine Palms. Because of

Table 4-6a. Summary of Fish and Wildlife Guidance on Analysis of Threats to Listed Species Associated with Common Raven Management Projects: Common Ravens (Target Species)

Fish and Wildlife Service Concerns	Past	Present	Alternatives Plus Reasonably Foreseeable Action					
			Alternative A (Status Quo)	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Habitat degradation	Increased food, water, and nest resource from human development	Increased food, water, and nest resource from human development	**Minor Beneficial**, Increased food, water, and nest resource from human development	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no proposed ground disturbing activities are	**No Effect**, no ground disturbing activities are proposed
Habitat loss	Increased food, water, and nest resource from human development	Increased food, water, and nest resource from human development	**Minor Beneficial**, Increased food, water, and nest resource from human development	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no ground disturbing activities are proposed	**No Effect**, no ground disturbing activities are proposed
Exotic species	Management activities inadvertently introduced exotic species to California desert (e.g., grazing)	Relative number of new introduced species is low	**No Effect**, Relative number of new introduced species is low; no documentation of impacts to ravens from their occurrence	**No Effect**, No known or anticipated exotic species that would be introduced and impact the raven	**No Effect**, No known or anticipated exotic species that would be introduced and impact the raven	**No Effect**, No known or anticipated exotic species that would be introduced and impact the raven	**No Effect**, No known or anticipated exotic species that would be introduced and impact the raven	**No Effect**, No known or anticipated exotic species that would be introduced and impact the raven
Disease and/or Contaminants	No known disease or contamination issues	Potential for West Nile virus near standing water sources	**Negligible Adverse**, Potential for West Nile virus near standing water sources	**Negligible Adverse**, Less than Alternative A because of better water management practices	**Negligible Adverse**, Less than Alternative A because of better water management practices	**Negligible Adverse**, Less than Alternative A because of better water management practices	**Negligible Adverse**, Less than Alternative A because of better water management practices	**Negligible Adverse**, Less than Alternative A because of better water management practices
Mortality/Reduced Reproduction	No known authorized take in project area except BLM program in 1989	No known authorized take in project area	**No Effect**, no known authorized take in project area	**Minimal Adverse**, Take of approximately 0.5 percent of total population; habitat for food, water, nesting, and roosting would be reduced	**Minimal Adverse**, Take of approximately 5 percent of total population; habitat for food, water, nesting, and roosting would be reduced	**Minor Adverse**, Take of approximately 8 to 19 percent of total population; habitat for food, water, nesting, and roosting would be reduced	**Minimal Adverse**, Habitat for food, water, nesting, and roosting would be reduced	**Minor Adverse**, Take of approximately 8 to 19 percent of total population; habitat for food, water, nesting,

Table 4-6b. Summary of Fish and Wildlife Guidance on Analysis of Threats to Listed Species Associated with Common Raven Management Projects: Desert Tortoise and Other Nontarget Species

Fish and Wildlife Service Concerns	Past	Present	Alternatives Plus Reasonably Foreseeable Action					
			Alternative A (Status Quo)	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Habitat degradation	Historic land management plans have authorized activities that have degraded habitat	Better management plans with limited ability to implement	**Minor Adverse**, Better management plans with limited ability to implement	**No Effect**, no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed
Habitat loss	Historically a small percentage lost because of implementation of land management plans	Existing management plans developed under stricter regulatory requirements	**Minor Adverse**, Existing management plans developed under greater regulatory requirements	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed	**No Effect,** no ground disturbing activities are proposed
Exotic species	Management activities inadvertently introduced exotic species to California desert (e.g., grazing)	Relative number of new introduced species is low	**Minimal Adverse**, Relative number of new introduced species is low	**Minimal Adverse**, Potential inadvertent vehicle transport of nonnative species to the California desert	**Minimal Adverse**, Same as Alternative B but with greater number of vehicle trips	**Minimal Adverse**, Same as Alternative C but with greater number of vehicle trips	**Minimal Adverse**, Same as Alternative B but less vehicle trips Relative number	**Minimal Adverse**, Same as Alternative C but with greater number of vehicle trips
Disease and/or Contaminants	Pre-1990, no standard protocols in management plans to minimize disease transmission; effects of contaminants limited to widely scattered industrial sites	Disease transmission minimized through implementation of protocols; effects of contaminants limited to widely scattered industrial sites with improved industrial practices	**Negligible Adverse,** Disease transmission minimized through implementation of protocols; effects of contaminants limited to widely scattered industrial sites with improved industrial practices	**Negligible Adverse,** Disease transmission is minimized or eliminated through implementation of protocols; implementation of standard operating procedures would minimize potential for dispersal of contaminants; secondary poisoning from eating carcasses unlikely	**Negligible Adverse,** Disease transmission is minimized or eliminated through implementation of protocols; implementation of standard operating procedures would minimize potential for dispersal of contaminants; secondary poisoning from eating carcasses unlikely	**Negligible Adverse,** Disease transmission is minimized or eliminated through implementation of protocols; implementation of standard operating procedures would minimize potential for dispersal of contaminants; secondary poisoning from eating carcasses unlikely	**Negligible Adverse,** Disease transmission is minimized or eliminated through implementation of protocols	**Negligible Adverse,** Disease transmission is minimized or eliminated through implementation of protocols; implementation of standard operating procedures would minimize potential for dispersal of contaminants; secondary poisoning from eating carcasses unlikely

Table 4-6b. Summary of Fish and Wildlife Guidance on Analysis of Threats to Listed Species Associated with Common Raven Management Projects: Desert Tortoise and Other Nontarget Species (Concluded)

Fish and Wildlife Service Concerns	Past	Present	Alternatives Plus Reasonably Foreseeable Action					
			Alternative A (Status Quo)	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Mortality/Reduced Reproduction	Historically management plans allowed some activities that resulted in mortality of wildlife	Existing management plans developed under stricter regulatory requirements	**Minimal Adverse,** Existing management plans developed under stricter regulatory requirements	**Minimal to Minor Beneficial and Negligible Adverse**, reduced raven predation on desert tortoises and other wildlife species; nesting and roosting habitat for large birds reduced	**Minimal to Minor Beneficial and Negligible Adverse**, more ravens removed, therefore less predation that in Alternative B; roosting and nesting habitat for large birds reduced	**Minimal to Minor Beneficial and Negligible Adverse**, more ravens removed, therefore less predation than in Alternatives B and C; nesting and roosting habitat for large birds reduced	**Minimal Beneficial and Negligible Adverse**, reduced raven predation on desert tortoises and other wildlife species but at much slower rate than Alternatives B, C, and D; nesting and roosting habitat for large birds reduced	**Minimal to Minor Beneficial and Negligible Adverse**, range of number of ravens removed as needed (same as Alternatives B, C, and D); reduced raven predation on desert tortoises and other wildlife species; nesting and roosting habitat for large birds reduced

Notes: 1. No Change or None–There are no impacts expected.
2. Negligible–The impacts are very small and possible, but not probable or likely to occur.
3. Minimal–The impacts are not expected to be measurable and are within the capacity of the impacted system to absorb the change, or the impacts can be compensated for with little effort and resources so the impact is not substantial.
4. Minor–The impacts are measurable, but are within the capacity of the impacted system to absorb the change, or the impacts can be compensated with limited effort and resources so the impact is not substantial.
5. Moderate–Potentially adverse impacts that are measurable but do not violate any laws or regulations and are within the capacity of the impacted system to absorb or can be mitigated with effort and/or resources so that they are not significant.
6. Major–Potentially adverse impacts that individually or cumulatively could be significant.

the careful and selective use of this avicide, short time period of use, limited location, and short persistence of this avicide in the environment, we would consider this avicide to be a contaminant with an impact limited to the time period of its application.

Mortality/Reduced Reproduction

Within the California desert, we are not aware of any land management plan or permitted action that authorized the mortality of the common raven in the California desert other than those discussed in Section 3 of Appendix D. Such authorization would have been required under the Migratory Bird Treaty Act and, more recently, the National Environmental Policy Act. The 1989 BLM plan was implemented for 6 days and removed approximately 120 birds.

4.10.3.1.2 Present Actions

Habitat Degradation/Habitat Loss

Present federal land management actions that impact the common raven regarding habitat degradation and loss are similar to those of the past. Development of desert habitat to support the needs of a growing human population in the desert or accomplish agency missions continues to occur. These actions result in a greater increase in food, water, nest sites, and roost sites in the California desert for the common raven. While these human activities continue to degrade or destroy native habitat in the California desert, this habitat modification has impacted the common raven by providing it with life requisites previously not present on a sustainable basis in the California desert. Exotic Species

The current federal land management plans for the California desert include provisions for the implementation of these provisions continues to improve although there are still opportunities for unintentional importation of exotic plant and animal species from outside the California desert through visitors from outside the area and federal agencies conducting business activities. For example, we have the opportunity to introduce and spread exotic species in the California desert through transport of vehicles with seeds or plant parts imbedded in the tread of vehicle tires, trapped in the grills or other crevices of vehicles, or imbedded in mud or dirt on vehicles. These unintentional introductions of exotic plant and animal species to the California desert do not appear to have adversely impacted the common raven or its habitat requirements.

Disease/Contaminants

For disease, there is potential for WNV to adversely impact common ravens. West Nile virus was introduced in North America in 1999. As of 2005, WNV has been documented in desert communities in San Bernardino, Los Angeles, Kern, and Riverside counties. Since the potential exists for common ravens to contact mosquitoes that carry the virus when near standing water sources and the disease is potentially fatal to common ravens, the disease could impact the raven population in the desert by killing a proportion of the population. However, there has been little documentation that the disease has impacted the population through a reduction in population size.

We are not aware of any current contaminants issues in the California desert that would contribute to cumulative impacts to the common raven.

Mortality/Reduced Reproduction

Within the California desert, we are not aware of any land management plan or permitted action authorizing the mortality of the common raven in the California desert. Such action would require authorization under the Migratory Bird Treaty Act and National Environmental Policy Act. We contacted the Office of Migratory Birds and APHIS-WS to determine if a permit has been issued to remove common ravens or if there are current or recent activities to remove common ravens in the California desert. Neither agency has information on the implementation of programs to reduce the number of ravens in the California desert. Raven removal is occurring at other locations in the state and in adjacent states, primarily associated with loss of agriculture and livestock.

4.10.3.2 Comparison of Alternatives under USFWS Guidelines

4.10.3.2.1 Alternative A, Status Quo (Common Raven)

The cumulative impacts to the common raven associated with common raven management projects are expected to be the same as those described above in Present Actions (Common raven), for habitat degradation, habitat loss, exotic species, disease, contaminants, and mortality. We have analyzed these impacts and determined that Alternative A (status quo) results in minor beneficial impacts for habitat degradation and loss, no effect for exotic species, negligible adverse impacts for disease/contaminants, and no effect for mortality/reduced reproduction.

4.10.3.2.2 Alternative B (Common Raven)

We have identified and reviewed federal planning documents for the California desert (Appendix E) and are aware of the general management plans for the counties of Imperial, Inyo, Kern, Los Angeles, Riverside, and San Bernardino. We have identified large-scale land use action that would alter the current land use. The large-scale proposed actions include the expansion of the National Training Center at Ft. Irwin, the residential development of the Sunland area southwest of Barstow, and the agricultural/industrial development in the Harper Lake area (e.g., Harper Lake Dairy Park). Numerous small residential, commercial, industrial, and agricultural developments are proposed throughout the counties listed above and within the city limits of many desert municipalities. For the California desert, however, we were unable to identify any current or proposed plans that are similar to the proposed action in this EA.

Habitat Degradation/Habitat Loss

There would be no alteration or removal of native desert habitat; therefore, there would be no habitat degradation from implementation of raven management activities on federal lands. No new ground disturbance activities are proposed that would contribute to native habitat loss, therefore, there would be no impact from habitat loss.

Exotic Species

The implementation of common raven management projects described under this alternative could result in potential inadvertent transport in vehicles of nonnative species to the California desert. However, current federal land management plans for the California desert include provisions for the consideration of and management to reduce or avoid introduction and establishment of exotic species. Because of the continued opportunity to introduce exotic species to the area, we consider this impact to be minimal and adverse.

Disease/Contaminants

For disease, the impact from this alternative when considered with other raven management projects would be negligible and adverse. There is potential for WNV to adversely impact common ravens. West Nile Virus was introduced in North America in 1999. As of 2005, WNV has been documented in desert communities in San Bernardino, Los Angeles, Kern, and Riverside counties. While the disease is potentially fatal to common ravens, there has been little documentation that the disease has had an adverse impact on the population. This potential would be less than for Alternative A because federal agencies would implement better water management practices to reduce or eliminate standing water from human sources.

The use of an avicide to remove common ravens could be considered a contaminant. However, its placement, monitoring, and limited toxicity over time should minimize its impacts to target individual ravens. We are not aware of any other contaminants issues in the California desert that would contribute to cumulative impacts to the common raven. This impact would be negligible and adverse.

Mortality/Reduced Reproduction

Within the California desert, we would propose to remove a maximum of approximately 0.5 percent of the adult population of common ravens/2.4 percent of the adult and nestling population. We are not aware of any other proposed or existing land management plan or permitted action that authorizes the mortality of the common raven in the California desert. Such action would require authorization under the Migratory Bird Treaty Act and National Environmental Policy Act. We contacted the Office of Migratory Birds and USDA Wildlife Services to confirm this information. Neither agency has information on the implementation of programs to reduce the number of ravens in the California desert. Raven removal is occurring in other locations in the state and in adjacent states, primarily associated with loss of agriculture and livestock. Additional impacts to the common raven would occur from implementation of actions to reduce human subsidies of food, water, nest sites, and roost sites for the raven on federal lands in the California desert and from removing unoccupied raven nests. This should impact the common raven by reducing reproductive success.

4.10.3.2.3 Alternative C (Common Raven)

The cumulative impacts to the common raven associated with common raven management projects are expected to be the similar as those described above in Alternative B (Common Raven), for habitat degradation, habitat loss, exotic species, and disease/contaminants. The impacts would be greater for mortality/reduced reproduction.

Mortality/Reduced Reproduction

Within the California desert, we would propose to remove a maximum of approximately 5.3 percent of the total population of common ravens. We are not aware of any other proposed or existing land management plan or permitted action that authorizes the mortality of the common raven in the California desert. Such action would require authorization under the Migratory Bird Treaty Act and National Environmental Policy Act. We contacted the Office of Migratory Birds and Wildlife Services to confirm this information. Neither agency has information on the implementation of programs to reduce the number of ravens in the California desert. Raven removal is occurring in other locations in the state and in adjacent states, primarily associated with loss of agriculture and livestock. Additional impacts to the common raven would occur from implementation of actions to reduce human subsidies of food, water, nest sites, and roost sites for the raven on federal lands in the California desert and from removing unoccupied raven nests.

4.10.3.2.4 Alternative D (Common Raven)

The cumulative impacts to the common raven associated with common raven management projects are expected to be the similar as those described above in Alternative C (Common raven)**,** for habitat degradation, habitat loss, exotic species and disease/contaminants. The impacts would be greater for mortality/reduced reproduction.

Mortality/Reduced Reproduction

Within the California desert, we would propose to remove a maximum of approximately 8 to 18.7 percent of the total population of common ravens. We are not aware of any other proposed or existing land management plan or permitted action that authorizes the mortality of the common raven in the California desert. Such action would require authorization under the Migratory Bird Treaty Act and National Environmental Policy Act. We contacted the Office of Migratory Birds and Wildlife Services to confirm this information. Neither agency has information on the implementation of programs to reduce the number of ravens in the California desert. Raven removal is occurring in other locations in the state and in adjacent states, primarily associated with loss of agriculture and livestock. Additional impacts to the common raven would occur from implementation of actions to reduce human subsidies of food, water, nest sites, and roost sites for the raven on federal lands in the California desert and from removing unoccupied raven nests. This should impact the common raven by reducing reproductive success.

4.10.3.2.5 Alternative E (Common Raven)

The cumulative impacts to the common raven associated with common raven management projects are expected to be the similar as those described above in Alternative B (Common Raven), for habitat degradation, habitat loss, exotic species, and disease/contaminants. The impacts would initially be less for mortality/reduced reproduction but similar after several years.

4.10.3.2.5.1 Mortality/Reduced Reproduction

Within the California desert, there would be no authorized mortality from federal management actions. We are not aware of any other proposed or existing land management plan or permitted action that authorizes the mortality of the common raven in the California desert. Such action would require authorization under the Migratory Bird Treaty Act and National Environmental Policy Act. We contacted the Office of Migratory Birds and USDA Wildlife Services to confirm this information. Neither agency has information on the implementation of programs to reduce the number of ravens in the California desert. Raven removal is occurring in other locations in the state and in adjacent states, primarily associated with loss of agriculture and livestock. Additional impacts to the common raven would occur from implementation of actions to reduce human subsidies of food, water, nest sites, and roost sites for the raven on federal lands in the California desert and from removing unoccupied raven nests. This should impact the common raven by reducing reproductive success.

4.10.3.2.6 Alternative F (Common Raven)

The cumulative impacts to the common raven associated with common raven management projects are expected to be the similar as those described above in Alternatives B, C, and D (Common Raven)**,** for habitat degradation, habitat loss, exotic species, disease/contaminants, and mortality/reduced reproduction.

4.10.3.3 Desert Tortoise and Other Nontarget Species

4.10.3.1.1 Past Actions

4.10.3.3.1.1 Habitat Degradation/Habitat Loss

Federal historic land management plans have authorized activities that have degraded desert habitat or did not address activities that degraded or destroyed habitat. Habitat management and conservation on federal lands became a regulatory requirement in the 1970s with the passage of several environmental laws. A smaller percentage of the existing habitat was lost because of implementation of land management plans. Lands were needed to implement agency missions and provide for the needs of a small but growing population in the area.

4.10.3.3.1.2 Exotic Species

In the past, there was little knowledge of, recognition of, or concern for the impacts that might result from the introduction of exotic species to the California desert by land management agencies. Regulated management activities provided opportunities for unintentional importation of exotic plant and animal species from outside the California desert as regional and interstate commerce from activities such as grazing and mining promoted the transport of goods into and out of the desert. During the last few decades, federal land management agencies have become aware of this impact and have implemented actions in their management plans to reduce the likelihood of new species being introduced in the future.

4.10.3.3.1.3 Disease/Contaminants

In the past, many wildlife diseases that are known to occur in species in the California desert were not known or had not been transmitted to species in the desert. Prior to the early 1990s, there were no standard protocols in management plans to minimize the transmission of known or unknown diseases from handling desert species. This practice recently changed with the identification of wildlife diseases (e.g., Upper Respiratory Tract Disease, Newcastle's disease, WNV) and development of protocols to minimize the probability of transmission.

The effects of contaminants on the desert tortoise and other wildlife species are limited to industrial sites scattered throughout the California desert. Some of these sites are past mining operations that used contaminants to process materials (e.g., cyanide or other hazardous chemicals) or were found in conjunction with or are byproducts of processing the ore (e.g., arsenic). These contaminants would impact the desert tortoise and other wildlife species in the form of injury, disease, or mortality. These contaminants and their impacts would have occurred on an infrequent basis and scattered throughout the desert.

4.10.3.3.1.4 Mortality/Reduced Reproduction

In the past, activities regulated under land management plans allowed activities that incidentally killed wildlife species. This mortality was not regulated or disclosed until passage of several environmental laws in the 1970s and the listing of the desert tortoise under the Endangered Species Act in 1989. The impacts to wildlife species from this mortality would have been a reduced population size at and near the locations of these activities.

4.10.3.3.2 Present Actions

4.10.3.3.2.1 Habitat Degradation/Habitat Loss

Current federal land management plans have included recent scientific knowledge plus stricter regulatory requirements to manage and monitor for the desert tortoise and other nontarget species. The full implementation of many of these plans has been hampered by reduced funding. The increased demand for land use to support the needs of a growing human population in and adjacent to the desert and accomplish agency missions continues to occur. Thus, habitat degradation and loss continues from both authorized and unauthorized activities with limited ability to monitor and enforce. A smaller percentage of the existing habitat is lost because of implementation of land management plans under stricter regulatory requirements. However, there is no overall coordination in the development of these management plans which results in a patchwork of development actions scattered throughout much of the desert. For the desert tortoise and other wildlife species, this impact from present action continues to result in degradation and loss of native desert habitat.

4.10.3.3.2.2 Exotic Species

The current federal land management plans for the California desert include provisions for the consideration of and management to reduce or avoid introduction and establishment of exotic species. The implementation of these provisions continue to improve although there are still opportunities for unintentional importation of exotic plant and animal species from outside the California desert from visitors from outside the area and federal agencies conducting business activities. Because of the continued opportunity to introduce exotic species to the California desert and the difficulty in managing established exotic species, the impacts to wildlife species including changes in forage species abundance and composition, availability of less nutritious species for food, reduction or loss of shade and cover provided by plants, increased frequency of fire, and type conversion of dominant woody species to other habitat types.

4.10.3.3.2.3 Disease/Contaminants

Currently disease transmission has been minimized or eliminated from the development and implementation of standard protocols. Federal agencies usually require the use of standard protocol in permits and other authorizing documents they issue. The present impact from disease transmission and spread has been greatly reduced or eliminated from implementation of these protocols.

The impacts of contaminants to the desert tortoise and other wildlife species are limited to industrial sites scattered throughout the California desert. Some of these sites are existing mining operations that use contaminants to process materials (e.g., cyanide or other hazardous chemicals) or are found in conjunction with or are byproducts of processing the ore (e.g., arsenic). These contaminants would impact the desert tortoise and other wildlife species in the form of injury, disease, or mortality. These contaminants and their impacts have occurred on an infrequent basis and scattered throughout the desert.

4.10.3.3.2.4 Mortality/Reduced Reproduction

Current land management plans have been developed and are being implemented under environmental legislation that places stricter requirements on minimizing or avoiding mortality to wildlife species. The impacts to wildlife species in the form of mortality should be less on a per project basis than in the past. However, the number of projects currently in place and in process is greater than that in the past. Impacts to the desert tortoise and other wildlife species continue to occur in the form of mortality.

4.10.3.4 Comparison of Alternatives under USFWS Guidelines

4.10.3.4.1 Alternative A (Status Quo)

The cumulative impacts to the desert tortoise and other nontarget species associated with common raven management projects are expected to be the same as those described above in Present Actions (Desert Tortoise and Other Nontarget Species), for habitat degradation, habitat loss, exotic species, disease/contaminants, and mortality/reduced reproduction. We have analyzed these impacts and determined that Alternative A (status quo) results in minor adverse impacts for habitat degradation and loss, minimal adverse impact for exotic species, negligible adverse impacts for disease/contaminants, and minimal adverse impacts to mortality/reduced reproduction.

4.10.3.4.2 Alternative B (Desert Tortoise and Other Nontarget Species)

4.10.3.4.2.1 Habitat Degradation/Habitat Loss

There would be no impact to habitat degradation from implementation of raven management activities on federal lands. No new ground disturbance activities are proposed that would contribute to habitat degradation. No desert habitat loss would occur from implementation of raven management activities. The impacts to habitat loss would be none for the desert tortoise and negligible adverse for other target species. The implementation of actions to reduce human-subsidized food, water, nest sites, and roost sites on federal lands in the California desert would be negligible and beneficial for the desert tortoise and other nontarget species.

4.10.3.4.2.2 Exotic Species

The implementation of common raven management projects described under this alternative could result in potential inadvertent transport in vehicles of nonnative species to the California desert. However, current federal land management plans for the California desert include provisions for the consideration of and management to reduce or avoid introduction and establishment of exotic species. Because of the continued opportunity to introduce exotic species to the area, we consider this impact to be minimal and adverse.

4.10.3.4.2.3 Disease/Contaminants

For disease, the impact from this alternative when considered with other raven management projects would be negligible and adverse. Disease transmission would be minimized or eliminated by implementing standard protocols. Federal agencies would require the use of standard protocol in permits and other authorizing documents they issue. The present impact from disease to desert tortoise and other nontarget species is negligible and adverse.

The use of the avicide to remove common ravens could be considered a contaminant. However, its placement, monitoring, and limited toxicity over time and to most other species would minimize its impact to nontarget species. This impact would be considered negligible and adverse.

4.10.3.4.2.4 Mortality/Reduced Reproduction

Within the California desert, the implementation of management actions would result in the reduction of ravens that prey on the desert tortoises. These ravens would also likely prey on other species of small wildlife so the rate of predation on these species would also be reduced. Reduced predation or reduced mortality would result in a minimal to minor beneficial impact for the desert tortoise and other nontarget species. However, the number of man-made sites available for use by large birds for nesting and roosting would be reduced. This would result in a negligible adverse impact for these species.

4.10.3.4.3 Alternative C (Desert Tortoise and Other Nontarget Species)

The cumulative impacts to the desert tortoise and other nontarget species associated with common raven management projects are expected to be the similar as those described in Section 4.9.3.4.2, *Alternative B (Desert Tortoise and Other Nontarget Species)*, for habitat degradation, habitat loss, and disease/contaminants.

4.10.3.4.3.1 Exotic Species

The implementation of common raven management projects described under this alternative could result in potential inadvertent transport in vehicles of nonnative species to the California desert. This opportunity would be greater than for Alternative B because of the greater number of vehicle trips to the desert to remove a larger number of common ravens. However, current federal land management plans for the California desert include provisions for the consideration of and management to reduce or avoid introduction and establishment of exotic species. Because of the continued opportunity to introduce exotic species to the area, we consider this impact to be minimal and adverse.

4.10.3.4.3.2 Mortality/Reduced Reproduction

Within the California desert, the implementation of management actions would result in the removal of more common ravens than in Alternative B. This action would occur in the Desert Tortoise Management Areas. These ravens would likely prey on the desert tortoise and other species of small wildlife. Removal of these ravens would mean reduced predation or reduced mortality in the DTMAs for all prey species for the common raven. Thus, the impact greater than for Alternative B as more common ravens would be removed; it would be minimal to minor and beneficial for the desert tortoise and other nontarget species.

4.10.3.4.4 Alternative D (Desert Tortoise and Other Nontarget Species)

The cumulative impacts to the desert tortoise and other nontarget species associated with common raven management projects are expected to be the similar as those described in Section 4.10.5.2.3, *Alternative C (Desert Tortoise and Other Nontarget Species)*, for habitat degradation, habitat loss, and disease/contaminants.

4.10.3.4.4.1 Exotic Species

The implementation of common raven management projects described under this alternative could result in potential inadvertent transport in vehicles of nonnative species to the California desert. This opportunity would be greater than for Alternative C because of the greater number of vehicle trip into the desert to remove a larger number of common ravens. However, current federal land management plans for the California desert include provisions for the consideration of and management to reduce or avoid introduction and establishment of exotic species. Because of the continued opportunity to introduce exotic species to the area, we consider this impact to be minimal and adverse.

4.10.3.4.4.2 Mortality/Reduced Reproduction

Within the California desert, the implementation of management actions would result in the removal of ravens at Desert Tortoise Management Areas and raven concentration areas. These ravens would also likely prey on other species of small wildlife. Removal of these ravens would mean reduced predation or reduced mortality in the DTMAs and near concentration areas for desert tortoises and other nontarget wildlife species. Thus, the impact would be minimal to minor and beneficial for the desert tortoise and other nontarget species.

4.10.3.4.5 Alternative E (Desert Tortoise and Other Nontarget Species)

The cumulative impacts to the desert tortoise and other nontarget species associated with common raven management projects are expected to be the similar as those described above in Alternative B (Desert Tortoise and Other Nontarget Species), for habitat degradation and habitat loss.

4.10.3.4.5.1 Exotic Species

The current federal land management plans for the California desert include provisions for the consideration of and management to reduce or avoid introduction and establishment of exotic species. The implementation of these provisions continue to improve although there are still opportunities for unintentional importation of exotic plant and animal species from outside the California desert from visitors from outside the area and federal agencies conducting business activities. We would continue to monitor desert tortoise mortality near common raven nests but there would be no vehicle trips to remove ravens. The number of vehicle trips would be less than for Alternative B. However, there is the continued opportunity to introduce exotic species to the California desert and difficulty in managing established exotic species. The impact would be minimal and adverse.

4.10.3.4.5.2 Disease/Contaminants

For disease, the impact from this alternative when considered with other raven management projects would be negligible and adverse. Disease transmission would be minimized or eliminated by implementing standard protocols. Federal agencies would require the use of standard protocol in permits and other authorizing documents they issue. The present impact from disease to desert tortoise and other nontarget species is negligible and adverse.

No avicide or other potential contaminant would be used therefore there would be no impact from contaminants on nontarget species.

4.10.3.4.5.3 Mortality/Reduced Reproduction

Within the California desert, the implementation of management actions would result in the gradual reduction of ravens in the California desert over time. Some of these ravens would likely prey on desert tortoises. All would likely prey on other species of small wildlife. A reduction in predation would mean a reduction in mortality but this reduction would be slower and smaller than in alternatives B, C, or D. Thus, the impact would be minimal and beneficial for the desert tortoise and other nontarget species.

4.10.3.4.6 Alternative F- (Desert Tortoise and Other Nontarget Species)

The cumulative impacts to the desert tortoise and other nontarget species associated with common raven management projects are expected to be the similar as those described above in Alternatives B, C, and D (Desert Tortoise and Other Nontarget Species), for habitat degradation, habitat loss, exotic species, disease/contaminants, and mortality/reduced reproduction.

4.11 Related Environmental Documents

The following plans that contain similar or related actions concerning raven control and desert tortoise management were identified. Many of the activities recommended in the proposed action can be found in these documents. While all of these plans have addressed desert tortoise declines, the combined effect has not stopped the decline in desert tortoise populations and additional actions are considered necessary.

a. BLM Land Management Plans for the California Desert Conservation Area–The BLM uses the California Desert Conservation Area (CDCA) Plan and Amendments to guide management on the lands it administers. Any decisions made as a result of this EA process would be consistent with the guidance in the CDCA Plan and Amendments and the Federal Land Policy and Management Act of 1976.

b. Death Valley National Park General Management Plan–The subject plan was completed in 2002. This document guides the management of lands administered by the NPS within Death Valley National Park.

c. Joshua Tree National Park General Management Plan–The subject plan was completed in 1994 and amended in 2000. The amended document, Record of Decision Final General Management Plan Amendment EIS/Backcountry and Wilderness Management Plan, guides the management of lands administered by the NPS within Joshua Tree National Park.

d. Mojave National Preserve General Management Plan–The subject plan was completed in 2002. This document guides the management of lands administered by the NPS within the Mojave National Preserve.

e. Programmatic Environmental Impact Statement–The APHIS-WS, formerly called Animal Damage Control (ADC), issued a Final EIS on the national APHIS-WS program (USDA 1997, revised). This EIS addressed an ongoing program of wildlife damage management. Information in the Final EIS that is pertinent to the alternatives in this EA has been incorporated by reference.

f. Master Memorandum of Understanding (MOU) between APHIS and BLM–This MOU specifies that all programs for animal damage management on lands administered by BLM would be coordinated with appropriate state and federal agencies prior to implementation. APHIS-WS would develop and update work plans for animal damage management annually in cooperation with the BLM and other appropriate agencies. APHIS-WS and BLM would identify restrictions for human safety or other mitigation that should be implemented to comply with the BLM's existing Land Management Plans.

g. Integrated Natural Resources Management Plans–Each of the six military installations within the California desert (Naval Air Weapons Station China Lake [NAWS], Edwards Air Force Base, National Training Center [NTC] at Fort Irwin, Marine Corps Logistics Base [MCLB] Barstow, Marine Corps Air Ground Combat Center Twentynine Palms [MCAGCC], and Chocolate Mountains Aerial Gunnery Range) is required to maintain and implement an Integrated Natural Resources Management Plan (INRMP).

The purpose of each INRMP is to develop and follow a prescribed planning process for the management of natural resources on the individual installation. Development and implementation of the INRMP must support military mission readiness by ensuring that lands and airspace are available for sustained use. This process meets statutory requirements under the Sikes Act Improvement Act (SAIA), Public Law 105-85, Div. B Title XXIX, Nov. 18, 1997, 111 Statutes 2017–2019, 2020–2033. This Act requires the Secretaries of the Army, Air Force, and Navy to prepare and implement INRMPs for each military installation, unless exempted due to the absence of significant natural resources.

Each installation coordinates with the USFWS and the CDFG to ensure that each INRMP reflects the mutual agreement of these parties on conserving, protecting, and managing natural resources on each installation. As required by the SAIA, the INRMPs are provided for public comment.

h. County General Plans–California state law requires each county to prepare and adopt a comprehensive and long-range general plan for its physical development (Government Code Section 65300). A comprehensive general plan provides the County with a consistent framework for land use decision-making. Traditionally, the general plan has been organized as a collection of "elements" or subject categories such as land use, housing, conservation, noise, circulation, open space, and safety. The conservation element addresses the conservation, development, and use of natural resources including water, forests, soils, rivers, and mineral deposits. The open-space element details plans and measures for preserving open space for natural resources, the managed production of resources, outdoor recreation, public health and safety, and the identification of intensive agriculture and irrigated pasturelands. For the California desert there are five counties each with a county general plan for these elements. These plans are: Imperial County General Plan, Inyo County General Plan, Kern County General Plan, Los Angeles County General Plan (Antelope Valley), Riverside County General Plan, and San Bernardino County General Plan.

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5.0 REFERENCES

Andren, H. 1992. "Corvid density and nest predation in relation to forest fragmentation: a landscape perspective," *Ecology* 73: 794-804.

Avery, H.W. 1998. "Nutritional ecology of the desert tortoise (*Gopherus agassizii*) in relation to cattle grazing in the Mojave Desert." (Ph.D. Dissertation, University of California, Los Angeles.) 158 pages.

Barrett, S.L. 1990. "Home range and habitat of the desert tortoise (*Xerobates agassizii*) in the Picacho Mountains of Arizona." *Herpetologica* 46:202-206.

Behler, J. and F.W. King. 1979. *The National Audubon Society Field Guide to North American Reptiles and Amphibians.*

Berry, K. 1975. *Desert tortoise relocation project: status report for 1973*. Department of Transportation, State of California. Contract F-9353, III.4. 104 pp.

Berry, K. H. 1978. "Tortoises for tomorrow." *The Nature Conservancy News* 29(6):18-22.

Berry, K.H. 1985. *Avian predation on the desert tortoise* (Gopherus agassizii) *in California*. U.S. Bureau of Land Management, Riverside, California. Report to Southern California Edison Company.

Berry, K.H. 1990. *The status of the desert tortoise in California in 1989*. Draft report to the U.S. Fish and Wildlife Service, Portland, Oregon. Amended to include 1990, 1991, and 1992 data sets. U.S. Bureau of Land Management, Riverside, CA. 98 pages.

Berry, K.H. 2002. :Trends in populations of desert tortoises at long-term study plots in California between 1979 and 2002: The role of diseases," In: *Desert Tortoise Health and Disease Workshop, Soda Springs, California*. 115 pages.

Berry, K.H., A.P. Woodman, and C. Knowles. 1989. "Ten years of monitoring data from the Desert Tortoise natural Area interior, Chuckwalla Bench Area of Critical Environmental Concern, and Chemehuevi Valley." Desert Tortoise Council Proceedings of the 1987–1991 Symposia.

Berry, K.H., M.B. Brown, R. Woodard, and L. Wendland. 2006. "The health status of resident desert tortoises *(Gopherus agassizii)* in the Fort Irwin Translocation Project Area, San Bernardino County, California." 31st Annual Meeting and Symposium of the Desert Tortoise Council. Feb. 17–20, 2006. Tucson, AZ. [Presentation with Abstract].

Berry, K.H., T. Shields, A.P. Woodman, T, Campbell, J. Roberson, K. Bohuski, and A. Karl. 1986. "Changes in desert tortoise populations at the Desert Tortoise Research Natural Area between 1979 and 1985." Desert Tortoise Council Proceedings of the 1986 Symposia:100–123.

Berry, K.H., T. Shields, G. Goodlett, S. Bowland, R. Gumtow, P.R. Knowles, and C. Knowles. 1990. “Continued declines of tortoise populations in the western Mojave Desert: Results of 1989 surveys at the Desert Tortoise Natural Area Interpretive Center and Fremont Peak.” Desert Tortoise Council Proceedings of the 1987–1991 Symposia:219.

Berry, K.H., T.Y. Bailey, and K.M. Anderson. 2006. Attributes of desert tortoise populations at the National Training Center, Central Mojave Desert, California, USA. *Journal of Arid Environments* 67(2006):165–191.

Boarman, W.I. 1993. “When a native predator becomes a pest: a case study.” In *Conservation and Resource Management.* Pgs. 191–206. (S.K. Majumdar, E.W. Miller, D.E. Baker, E.K. Brown, J.R. Pratt, and R.F. Schmalz, eds.). Penn. Acad. Sci., Easton, PA.

Boarman, W.I. 2002a. *Reducing predation by common ravens on desert tortoises in the Mojave and Colorado Deserts.* U.S. Geological Survey, Western Ecological Research Center, Sacramento, CA. Technical Report.

Boarman, W.I. 2002b. *Threats to Desert Tortoise Populations: A Critical Review of the Literature.* U.S. Geological Survey, Western Ecological Research Center, Sacramento, CA. Technical Report.

Boarman, W.I. 2003. “Managing a subsidized predator population: reducing common raven predation on desert tortoises.” *Environmental Management* 32: 205-217.

Boarman, W.I. 2006. “Of Ravens and Tortoises: A Decade of Research,” 30th Annual Meeting and Symposium of the Desert Tortoise Council.

Boarman, W.I., and B. Heinrich. 1999. “Common Raven (*Corvus corax*),” In *The Birds of North America*, No. 476 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Boarman, W.I., and K.H. Berry. 1995. “Common Ravens in the Southwestern United States, 1968 –92.” Pp. 73–75 In *Our Living Resources: a report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems* (E.T. Laroe, ed.). U.S. Dept. of the Interior, National Biological Service, Washington, D.C.

Boarman, W.I., and W. B. Kristan, III. 2006. *Trends in common raven populations in the Mojave and Sonoran deserts: 1968–2004.* Conservation Science Research and Consulting and Department of Biological Sciences, California State University, San Marcos. Report to U.S. Fish and Wildlife Service, Ventura, CA. Contract No. 814405M055. 36 pages.

Brattstrom, B.H. 1965. “Body Temperatures of Reptiles.” *American Midland Naturalist* 73(2):376–422.

Brooks, M. 1998. “Ecology of a Biological Invasion: Alien Annual Plants in the Mojave Desert.” (PhD Dissertation, University of California, Riverside. Riverside, CA).

Brooks, M.L., and T.C. Esque. 2002. "Alien plants and fire in desert tortoise (*Gopherus agassizii*) habitat of the Mojave and Colorado Deserts." *Chelonian Conservation in Biology* 4(2): 330-340.

Bulova, S. J. 1994. "Patterns of burrow use by desert tortoises: Gender differences and seasonal trends." *Herpetological Monographs* 8: 133-143.

Bureau of Land Management. 1989. *Environmental assessment for selected control of the common raven to reduce desert tortoise predation in the Mojave Desert, California.* Bureau of Land Management, U. S. Fish and Wildlife Service, and California Department of Fish and Game.

Bureau of Land Management. 1990a. *Environmental impact statement for the management of the common raven in the California Desert Conservation Area* (draft). U. S. Department of the Interior, Bureau of Land Management, Washington, D.C.

Bureau of Land Management. 1990b. *Raven management plan for the California Desert Conservation Area* (draft). Bureau of Land Management, Riverside, CA.

Bureau of Land Management. 1999. *The California Desert Conservation Area Plan 1980, as amended.* California Desert District, Riverside, CA. 159 pages + map.

Bureau of Land Management. 2005. *The California Desert Conservation Area Plan 1980, as amended.* California Desert District, Moreno Valley, CA.

Burge, B.L. 1977. "Movements and behavior of the desert tortoise (*Gopherus agassizii*)." (M.S. Thesis, University of Nevada, Las Vegas).

Campbell, T. 1983. "Some natural history observations of desert tortoises and other species on and near the Desert Tortoise Natural Area, Kern County, California." Desert Tortoise Council Proceedings Symposium (1983): 80–83.

Chamblin, H. D., and W. I. Boarman. 2004. *Ecology of common ravens at the Marine Corps Air Ground Combat Center, Twentynine Palms, California: Annual progress report covering research conducted between December 9, 2002 and December 13, 2003.* United States Geological Survey, Biological Resources Discipline, San Diego, California.

Chamblin, H.D., and W.I. Boarman. 2005. "Common Raven Ecology at the Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms, California." 30th Annual Meeting and Symposium of the Desert Tortoise Council.

Congdon, J.D., A.E. Dunham, and R.C. Van LobenSels. 1993. "Delayed sexual maturity and demographics of Blanding's turtles (*Emydiodea blandingii*): Implications for conservation and management of long-lived organisms." *Conservation Biology* 7: 826–833.

Coombs, E. 1977. *Wildlife observation of the Hot Desert region, Washington County, Utah, with emphasis on reptilian species and their habits in relation to livestock grazing.* Report prepared for BLM, Cedar City, Utah, and Division of Wildlife Resources, Salt Lake City, Utah.

Corn, S. 1994. "Recent trends of desert tortoise populations in the Mojave Desert." In: *The Biology of North American tortoises.* Pp 85–93. Bury, R.B., and D.J. Germano (eds.). National Biological Service, Washington, D.C.

Council for Agricultural Science and Technology. 1982. *Integrated pest management.* Report Number 93, Council for Agricultural Science and Technology, Washington, D.C.

Cunningham, D.J., E.W. Shafer, and L.K. McConnell. 1979. *DRC-1339 and DRC-2698 Residues in Starlings: Preliminary Evaluation of Their Effects on Secondary Hazard Potential.* Wildlife Damage Management, Internet Center for Bird Control Seminars Proceedings. University of Nebraska, Lincoln, Nebraska.

Doan, L. 2006. "West Nile cases drop as immunities emerge." *Los Angeles Times*, August 19.

Engel, K.A., and L.S. Young. 1989a. "Evaluation of techniques for capturing common ravens in southwestern Idaho." *North American Bird Bander* 14: 5-8.

Engel, K.A., and L.S. Young. 1989b. "Spatial and temporal patterns in the diet of common ravens in southwestern Idaho." *Condor* 91: 372-378.

Engel, K.A., L.S. Young, K. Steenhof, J.A. Roppe, and M.N. Kochert. 1992. "Communal Roosting of Common Ravens in Southwestern Idaho." *Wilson Bulletin* 104(1):105-121.

Esque, T.C. 1993. "Diet selection and habitat use of desert tortoises (Gopherus agassizii) in the northeast Mojave Desert." In: *The 17th Annual Desert Tortoise Council Symposium. Las Vegas, Nevada*, pp. 64 –68, K. Beaman (ed.).

Esque, Todd and Peters. 1994. "Ingestion of bones, stones and soil by desert tortoises." In: *Biology of North American Tortoises*. pp. 105-112. R.B. Bury, and D.J. Germano (eds.). U.S. Department of Interior National Biological Survey, Fish and Wildlife Research 13.

Farrell, J.P. 1991. "Natural history observations of raven behavior and predation on desert tortoises." In: *The Desert Tortoise Council Proceedings of the 1997–1991 Symposia*, Page 168.

Germano, D. 1992. Germano, D. J. 1992. "Longevity and age-size relationships of populations of desert tortoises." *Copeia* 1992:367-374.

Germano, D. 1994. Germano, D. J. 1994. "Comparative life histories of North American tortoises." In: *Biology of North American tortoises.* pp. 175–185. R. B. Bury and D. J. Germano (eds.), National Biological Survey, Fish and Wildlife Research 13.

Grinnell, J. and Miller. 1944. "The distribution of birds of California." *Cooper Ornithological Club, Pacific Coast Avifauna,* No. 27.

Heinrich, B. 1988. "Winter foraging at carcasses by three sympatric corvids, with emphasis on recruitment by the raven, *Corvus corax*." *Behavioral Ecology and Sociobiology* 23: 141-156.

Heinrich, B., D. Kaye, T. Knight, and K. Schaumburg. 1994. "Dispersal and association among common ravens." *Condor* 96: 545-551.

Henen, B.T. 1997. "Seasonal and annual energy budgets of female desert tortoises (*Gopherus agassizii*)." *Ecology* 78(10):283-296.

Houston, C.S. 1977. "Changing patterns of Corvidae on the prairies." *Blue Jay* 35: 149-156.

Jennings, B.W. 1993. "Foraging ecology of the desert tortoise (*Gopherus agassizii*) in the western Mojave Desert, California." *Proceedings of the Eighteenth Annual Symposium 1993*, p. 14. Desert Tortoise Council Publications.

Johnson, D.H., M.D. Bryant, and A.H. Miller. 1948. "Vertebrate animals of the Providence Mountains area of California." *University of California Publications in Zoology* 48:221-376.

Jollie, M. 1976. "Species interrelationships of three corvids." *Biologist* 58: 89-111.

Kadlec, J.A. 1968. "Bird reactions and scaring devices." Appendix 1 Federal Aviation Advisory Cir. 15052009.

Knight, R.L., and J.Y. Kawashima. 1993. "Consequences of human landscape perturbations on two bird species." *Journal of Wildlife Management* 57:266-271.

Knight, R.L., H.L. Knight, and R.J. Camp. 1993. "Raven populations and land use patterns in the Mojave desert, California." *Wildlife Society Bulletin* 21:469–471.

Knight, R. L. 1984. "Responses of nesting ravens to human beings in areas of different human densities." *Condor* 86:345-346.

Kristan, W.B. and W. I. Boarman. 2003. Spatial pattern of risk of common raven predation on desert tortoises. Ecology 84:2432–2443. Journal Article

Kristan, W.B. III, W.I. Boarman, and J. Crayon. 2004. "Diet composition of Common Ravens across the urban-wildland interface of the west Mojave Desert." *The Wildlife Society Bulletin* 32:244-253.

Liebezeit, J.R. and T.L. George. 2002. *A Summary of Predation by Corvids on Threatened and Endangered Species in California and Management Recommendations to Reduce Corvid Predation.* California Department of Fish and Game, Species Conservation and Recovery Program Report 2002-02, Sacramento, CA. 103 pp.

Littlefield, C.D. 1986. "Autumn sandhill crane habitat use in southeast Oregon." *Wilson Bulletin* Vol. 98, no. 1, pp. 131 –137.

Littlefield, C.D. 1995. "Sandhill crane nesting habitat, egg predators, and predator history on Malheur National Wildlife Refuge, Oregon." *Northwestern Naturalist* 76:137-143.

Luckenbach, R. A. 1982. "Ecology and management of the desert tortoise (*Gopherus agassizii*) in California." In: *North American Tortoises: Conservation and Ecology,* pp. 1–37. R. B. Bury (ed.), Wildlife Research Report 12, U.S.D.I. Fish and Wildlife Service, Washington, D.C.

Marlow, R.W. 1979. "Energy relations in the desert tortoise, *Gopherus agassizii*." (Ph.D. Dissertation. University of California, Berkeley.)

Marlow, R.W. and K. Tollestrup. 1982. "Mining and exploitation of natural mineral deposits by the desert tortoise, *Gopherus agassizii*." *Animal Behavior* 30(2):475-478.

Marzluff, J.M. 1988. "Do pinyon jays alter nest placement based on prior experience?" *Animal Behaviour* 36: 1-10.

Marzluff, J.M., K.J. McGowan, R. Donnelly, and R.L. Knight. 2001. "Causes and consequences of expanding American crow populations." In: Avian ecology and conservation in an urbanizing world, pp. 331 –361. _J.M. Marzluff, R. Bowman and R. Donelly, eds. Kluwer Academic Publishers, Norwell, Massachusetts.

Marzluff, J.M., R.B. Boone, and G.W. Cox. 1994. "Historical changes in populations and perceptions of native pest and bird species in the West." *Studies in Avian Biology* 15: 202-220.

McGinnis, S.M., and W.G. Voigt. 1971. "Thermoregulation in the desert tortoise, *Gopherus agassizii*." *Comp. Biochem. Physiology* 40A: 119-126.

McIntyre, B.M. 2006. *Raven nest mapping project.* University of Redlands, Redlands, CA. Report to U.S. Fish and Wildlife Service, Ventura, CA. 6 pages.

McKernan, R.L. 1992a. *Field Observations of Common Raven at Whiskey Pete's California-Nevada Stateline. Fall 1991.* Report to the U.S. Dept. of the Interior, Bureau of Land Management, Needles, CA.

McKernan, R.L. 1992b. *Field Observations of Common Raven at Whiskey Pete's California-Nevada Stateline. Spring 1992.* Report to the U.S. Dept. of the Interior, Bureau of Land Management, Needles, CA.

Murphy, R.W. 2005. *Reproduction Study for the Desert Tortoise at Edwards Air Force Base, California.* Prepared for 95th Air Base Wing, Civil Engineer and Transportation Directorate, Environmental Management Division, Edwards Air Force Base, California. Contract No. F42650-01-C-7218.

Nagy, K., and P.A. Medica. 1986. "Physiological ecology of desert tortoises in southern Nevada." *Herpetologica* 42(1):73-92.

Niblick, H., D. Rostal, and T. Classen. 1994. "Role of male-male interaction and female choice in the mating system of the desert tortoise." *Desert Tortoise Council Proceedings of the 1993 Symposium*, p. 43.

Oftedal, O. T., S. Hillard, and D. Morafka. 2002. "Selective spring foraging by juvenile desert tortoises (*Gopherus agassizii*) in the Mojave desert: Evidence of an adaptive nutrition strategy." *Chelonian Conservation and Biology* 4(2):341–352.

Olson, D.H. 1989. "Predation on breeding western toads." *Copeia* 1989(2): 391-397.

Omland, K.E., C.L. Tarr, W.I. Boarman, J.M. Marzluff, and R.C. Fleischer. 2000. "Cryptic genetic variation and paraphyly in ravens." *Proceedings Royal Society of London* 267: 2475-2482.

Parker, P.G., T.A. Waite, B. Heinrich, and J.M. Marzluff. 1994. "Do common ravens share ephemeral food sources with kin? DNA fingerprint evidence." *Animal Behaviour* 48: 1085-1093.

Rado, T. 1993. "Results of the 1989 pilot raven control program,." In: *Desert Tortoise Council Proceedings of the 1987–1991 Symposia*:266–272

Ray, C., M. Gilpin, C. Biehl, and T. Philippi. 1992. "Modeling raven predation on the desert tortoise: An age and spacestructured approach." *Desert Tortoise Council Proceedings of the 1992 Symposium*:118 –124.

Rich, T.D., C. Beardmore, H. Berlanga, P. Blancher, M. Bradstreet, G. Butcher, D. Demarest, E. Dunn, C. Hunter, E. Inigo-Elias, J. Kennedy, A. Martell, A. Panjabi, D. Pashley, K. Rosenberg, C. Rustay, S. Wendt, and T. Will. 2004. "Partners in flight North American landbird conservation plan." *Partners in Flight*, Ithaca, New York.

Robbins, C.S., D. Bystrak, and P.H. Geissler. 1986. "The breeding bird survey: its first fifteen years, 1965 –1979." (USFWS Resource Publication 157). U.S. Fish and Wildlife Service, Washington, D.C.

Roth, J.E., J.P. Kelly, W.J. Sydeman, M.W. Parker, and S.G. Allen. 1999. *Ecosystem-level management of common ravens on the Point Reyes national seashore.* Report to Point Reyes National Seashore. Point Reyes Bird Observatory, Stinson Beach, CA.

Sauer, J., J. Hines, I. Thomas, J. Fallon, and G. Gough. 1999. *North American Breeding Bird Survey, Results and Analysis 1966–1998*. Version 98.1.

Schamberger, M.L. and F.B. Turner. 1986. "The application of habitat modeling to the desert tortoise (*Gopherus agassizii*)." *Herpetologica* 42:134-138.

Sherman, M.W. 1993. "Activity patterns and foraging ecology of nesting common ravens in the Mojave Desert, California." (M.S. Thesis, Colorado State University, Ft. Collins.) 29 pages.

Slate, D. A., R. Owens, G. Connolly, and G. Simmons. 1992. "Decision making for wildlife damage management." *Trans. North American Wildlife National Resources Conference* 57: 51-62.

Small, A. 1994. *California birds: their status and distribution.* Ibis Publishing Co., Vista, CA.

Spotila, J. R., L.C. Zimmerman, C.A. Binckley, J.S. Grumbles, D.C. Rostal, List, A., Jr., E.C. Beyer, K.M. Phillips, S.J. Kemp. 1994. "Effects of Incubation Conditions on Sex Determination, Hatching

Success, and Growth of Hatchling Desert Tortoises, *Gopherus Agassizii*." *Herpetological Monographs* 8:103-116.

Stiehl, R.B. 1978. "Aspects of the ecology of the common raven in Harney Basin, Oregon." (Ph.D. Dissertation. Portland State University, Portland, OR.)

Stiehl, R.B., and S.N. Trautwein. 1991. "Variation in diets of nesting common ravens." *Wilson Bulletin* 103: 83-92.

Timm, R. 1984. "Integrated pest management: a useful approach to wildlife damage control?" Pp. 33–36 In: *Proceedings First Eastern Wildlife Damage Control Conference.*

Tracy, C.R., R. Averill-Murray, W.I. Boarman, D. Delehanty, J. Heaton, E. McCoy, D. Morafka, K. Nussear, B. Hagerty, and P. Medica. 2004. *Desert tortoise recovery plan assessment.* Report prepared for U.S. Fish and Wildlife Service, Reno, NV. 254 pages.

Trock, S.C., B.J. Meade, A.L. Glaser, E.N. Ostlund, R.S. Lanciotti, B.C. Cropp, V. Kulasekera, L.D. Kramer, and N. Komar. 2001. "West Nile Virus outbreak among horses in New York State, 1999 and 2000." *Emerging Infectious Diseases* 7(4):745–747.

Turner, F.B. and D.E. Brown. 1982. "Sonoran Desertscrub." In: *Biotic Communities of the American Southwest-United States and Mexico. Desert Plants* 4:181-221. Brown, D. (ed).

Turner, F.B. and Berry, K.H. 1984. *Population ecology of the desert tortoise at Goffs, California. Rosemead, CA.* Southern California Edison Company Research and Development Series 84 RD-4, 63 pages.

Turner, F.B., P. Hayden, B.L. Burge, and J.B. Roberson. 1986. "Egg production by the desert tortoise (*Gopherus agassizii*) in California." *Herpetologica* 42(1): 93-104.

Turner, F.B., P.A. Medica, and C.L. Lyons. 1984. "Reproduction and survival of the desert tortoise (*Scaptochelys agassizii*) in Ivanpah, California." *Copeia* 1984(4): 811-820.

U.S. Department of Agriculture. 1997. *Animal damage control program. Final Environmental Impact Statement - revised.* USDA Animal and Plant Health Inspection Service, Wildlife Services, Riverdale, MD. 3 volumes.

U.S. Environmental Protection Agency. 1999. *Consideration of cumulative impacts in EPA review of NEPA documents.* U.S. Environmental Protection Agency, Office of Federal Activities (2252A) EPA 315-R-99-002/May 1999.

U.S. Fish and Wildlife Service. 1994. *Desert tortoise (Mojave population) Recovery Plan.* U.S. Fish and Wildlife Service, Portland, OR. 73 pp. + Append.

U.S. Government Accounting Office. 1990 . *Wildlife Management: Effects of Animal Damage Control Program on Predators, RCED-90-149*, August.

Wallen, R., C. Arguello, J. Friedman, and D. Baldwin. 1999. *The corvids of Redwood National and State Parks: What is their relative abundance and how does abundance vary relative to human activities in the forest?* Annual progress report for Redwood National and State Parks.

Wallen, R., J. Gordon, and C. Arguello. 1998. *Abundance of corvids in old-growth forest habitats in Redwood National and State Parks.* Annual report of Redwood National and State Parks.

Webb, W. C., W. I. Boarman, and J. T. Rotenberry. 2004. "Common raven juvenile survivorship in a human-augmented landscape." *Condor* 106:517 –528.

Weinstein, M. 1989. *Differential growth rates and shape differences between age classes and sexes in the desert tortoise.* p. 211.

Wilson, D.S., D.J. Morafka, C.R. Tracy, and K.A. Nagy. 1999. "Winter activity of juvenile desert tortoises (*Gopherus agassizii*) in the Mojave Desert." *Journal of Herpetology* 33(3):496-501.

Wissman, M.A., and B. Parsons, 2004. *Exotic Newcastle's disease.* http://www.exoticpetvet.net/dvms/newcastle.html

Woodbury, A. M., and R. Hardy. 1948. "Studies of the desert tortoise, *Gopherus agassizii*." *Ecological Monographs* 18: 145-200.

Woodman, A.P. and S.M. Juarez. 1988. "Juvenile desert tortoises utilized as primary prey of nesting common ravens near Kramer, California." (Paper presented at the 13th Annual Meeting and Symposium of the Desert Tortoise Council, March 26–27, 1988, Laughlin, Nevada.)

Zimmerman, L.C., M.P. O'Connor, S.J. Bulova, J.R. Spotilla, S.J. Kemp, and C.J. Salice. 1994. "Thermal ecology of desert tortoises in the eastern Mojave Desert: seasonal patterns of operation and body temperatures and microhabitat utilization." *Herpetological Monographs* 8(1994): 45-49.

Personal Communication

Coolihan, Craig. USDA Animal and Plant Health Inspection Service.

Green, Michael. U.S. Fish and Wildlife Service.

Hodel, Hank. California Department of Fish and Game.

McBride, Michael. California Department of Fish and Game.

Egan, T. AMEC Earth and Environmental.

Jones, Rebecca . California Department of Fish and Game.

Medica, Phil. U.S. Geological Survey, Biological resources Division.

Nagy, Ken. University of California, Los Angeles.

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APPENDIX A
BIOLOGICAL INFORMATION ON THE
DESERT TORTOISE *(GOPHERUS AGASSIZII)*
AND COMMON RAVEN (*CORVUS CORAX*)

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1.0 DESERT TORTOISE

1.1 Morphology and Genetics

The adult desert tortoise (Figure A-1) is a medium-sized, herbivorous land turtle in the family Testudinidae. The shell is high-domed, light brown to very dark brown in color with brown to orange or yellow in the centers of the scutes, particularly in young animals. The skin is dry and scaly with thick, stumpy, elephantine hind legs. The gular horn is a projection located at the anterior end of the plastron (that portion of the shell on the underside of the desert tortoise) and is more pronounced in adult males than females. Desert tortoises exhibit secondary sexual characteristics only after reaching adult size. These characteristics include a concave plastron, chin glands, a longer gular horn, and a longer tail. Males are usually larger than females. Adult desert tortoises weigh 10+ pounds and maximum length is from 11 to 16 inches (maximum carapace length [MCL]) for females and males (Boarman 2002). The carapace is the top portion of the shell.

Figure A-1. Adult Desert Tortoise (*Gopherus agassizii*)

The desert tortoise exhibits significant morphological and genetic variation throughout its range. Based on genetic and morphological criteria, *G. agassizii* is divided into at least two well-differentiated entities, one south and east of the Colorado River or the Sonoran population, and one north and west of the Colorado River or the Mojave population. The U.S. Fish and Wildlife Service listed the Mojave population of the desert tortoise as threatened (*Federal Register* April 2, 1990). The USFWS also identified six population segments or recovery units in the *Recovery Plan for the Desert Tortoise Mojave Population* (USFWS 1994). Each recovery unit represents significant adaptive variation within the species based on ecology, behavior, morphology, and genetics (Figure A-2).

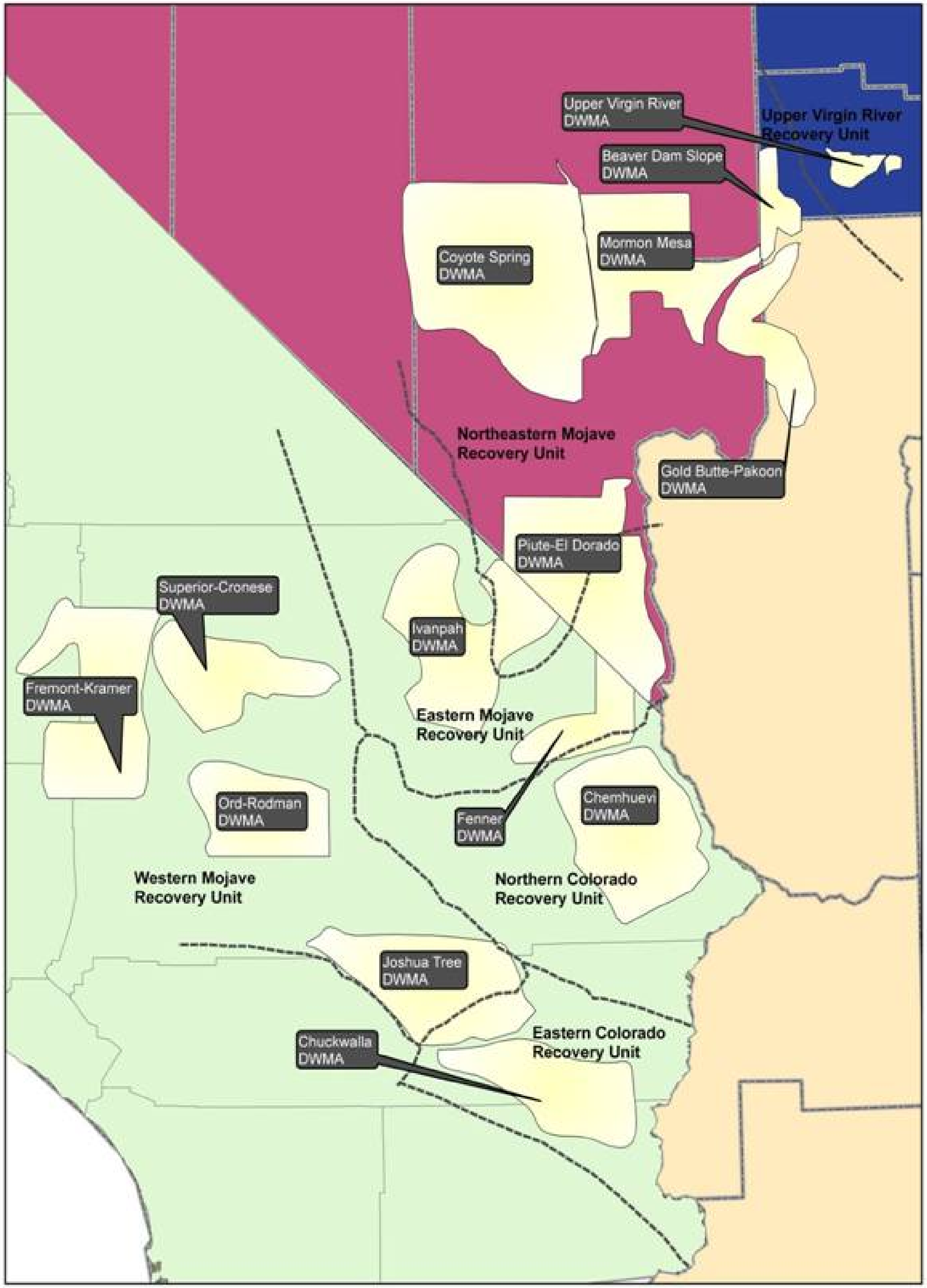

Figure A-2. Map of Recovery Units and Desert Wildlife Management Areas (DWMAs) in the *Recovery Plan for the Desert Tortoise Mojave Population*.

1.2 Range

Desert tortoises occur in suitable habitat in the Mojave and Sonoran deserts from southeastern California, southern Nevada, and extreme southwestern Utah, through western and southern Arizona, western Sonora and Sinaloa, Mexico. In California, desert tortoises occur in the desert from below sea level to an elevation of 7,300 feet, but the most favorable habitat occurs at elevations of approximately 1,000 to 4,000 feet (Luckenbach 1982, Schamberger and Turner 1986). No other land turtle occurs within the range of the desert tortoise.

1.3 Habitat

Habitat for the desert tortoise includes well-drained sandy loam soils of flats, valleys, alluvial fans, rolling hills, and occasionally rocky outcrops and mountain slopes in the California desert. They may also occur along the edges of basaltic flow, other rock outcrops, and lower elevation slopes of mountains. Desert tortoises typically avoid plateaus, playas, sand dunes, and steep slopes. They prefer areas with soils composed of sand and fine gravel versus coarse gravel, pebbles, and desert pavement (Weinstein 1989).

In California, the desert tortoise occurs primarily within the creosote, shadscale, and Joshua tree series of the Mojave desert scrub, and the lower Colorado River Valley subdivision of Sonoran desert scrub. Optimal habitat has been characterized as creosote bush scrub in which precipitation ranges from 2 to 8 inches, diversity of perennial plants is relatively high, and production of native annual plants is high (Luckenbach 1982, Turner and Brown 1982, Schamberger and Turner 1986). In one study in the western Mojave Desert, the greatest population densities of desert tortoises were in creosote bush scrub with lower densities occurring in Joshua tree woodland and Mojave-saltbush-allscale scrub. In the eastern Mojave Desert, desert tortoises showed a preference for woody bottle washer (*Camissonia boothii)*, popcorn flower (*Cryptantha angustifolia)*, desert dandelion (*Malacothrix glabrata)*, beavertail (*Opuntia basilaris)*, desert chicory (*Rafinesquia neomexicana)* and other species (Avery 1998). The native perennial bunchgrass, big galleta (*Hilaria [Pleuraphis] rigida*), is often present where the desert tortoise is most abundant.

Plant density and diversity play important roles in stabilizing soil, providing cover for protection from predators and temperature extremes, and providing adequate nutritional forage and water.

1.4 Reproduction

Desert tortoises are long-lived with delayed sexual maturity. Some individuals begin reproducing at 7.4 inches (180 mm) MCL, which they attain when about 12 to 15 years old. The majority of desert tortoises do not begin reproducing until they reach 8.2 inches MCL (208 mm), at approximately 12 to 20 years old (Turner and Berry 1984, Turner et al. 1986). Maximum longevity in the wild is likely to be about 50 to 70 years, the norm being 25 to 35 years (Germano 1992 and 1994). The average clutch size is 4.5 eggs (range 1 to 8), with 0 to 3 clutches laid per year (Turner et al. 1986). Clutch size and number probably depend on female size, water availability, and annual productivity of high quality forage plants in the current and previous year (Turner et al. 1984 and 1986, Henen 1997).

The life history strategy of the desert tortoise is longevity and ability to reproduce several times during its life. Under natural conditions, this strategy allows the species to persist despite the stresses of an extremely harsh and variable environment in the desert. The interaction of longevity, slow growth and late maturation, and relatively low annual reproductive output means that under the best circumstances desert tortoise populations recover slowly from natural- or human-caused losses in population density (USFWS 1994).

The desert tortoise mating system is probably polygynous (one male mating with many females), and it is polyandrous (one female mating with more than one male) (Murphy 2005). Choice of mate is mediated by aggressive male-male interactions and possibly by female choice (Niblick et al. 1994). Mating usually occurs in April and May when desert tortoises are active, and again in August through October if the right environmental conditions (i.e., temperature and food supply) are present. Most eggs are laid in spring (April through June) and occasionally in fall (September and October). Eggs are laid in sandy or friable soil, often at the mouth of the female's burrow or under a bush. Egg size is 37 to 47 mm by 36 to 46 mm (Berry 1975). The female excavates the nest (a hole in the ground), deposits the eggs, covers them, and urinates on the nest. There is no parental care. Most clutches contain 3 to 7 eggs. Hatching occurs 90 to120 days later, mostly in late summer and fall (mid-August to October). Sex determination of desert tortoises is environmentally controlled; hatchlings develop into females when the incubation temperature is greater than 89.3 degrees Fahrenheit (° F) (31.8 degrees Celsius [° C]) and males when the temperature is below that (Spotila et al. 1994). Mortality increases when incubation temperatures are greater than 95.5° F (35.3° C) or less than 78.8° F (26.0° C). The sensitivity of embryonic desert tortoises to incubation temperature may make populations vulnerable to changes in soil temperature (e.g., changes in vegetation cover or rising temperatures) (Boarman 2002).

Egg size is approximately 1.3 by 1.6 inches (35 mm by 45 mm) (Burge 1977) while hatchling size is slightly larger. Upon hatching underground in the summer or fall, the desert tortoise unfolds and absorbs its external yolk sac through the plastron. The newly hatched desert tortoise digs to the surface to escape the nest. The yolk sac is an initial reserve of nutrients upon which the desert tortoise depends until it is able to find forage; sometimes as long as the following spring. Hatchling desert tortoises resemble tiny versions of adults except they are usually lighter in color and do not have a bony or ossified shell to protect them from predators. They require shelter (e.g., burrows) to survive the desert extremes of temperature and humidity and for protection from predators. Eighty-three percent of hatchling desert tortoises excavated new burrows or enlarged preexisting rodent burrows in their first weeks (Niblick et al. 1994, Turner et al. 1984 and 1986, USFWS 1994).

1.5 Activity Period

Desert tortoises spend most of their time belowground in burrows they excavate, or they modify burrows of other animals. They emerge from their burrows during the day to look for food, regulate their body temperature, and to mate. Desert tortoises, including hatchling and juvenile desert tortoises, are most active in California during the spring and early summer when native annual plants, their food supply, are most common. Although they spend most of their lives underground to escape the extreme temperature and humidity conditions of the desert and for protection from predators, they become active in suitable weather at any time of the year; rainfall, particularly during the summer and early fall, often initiates activity. Desert tortoise activity patterns are primarily controlled by ambient temperature and precipitation (Nagy and Medica 1986, Zimmerman et al. 1994). Adult desert tortoises were aboveground with body temperatures ranging from 77 to 95° F 25 to 35° C. Desert tortoises may also be active during periods of mild or rainy weather in summer and winter. During the spring season in the Mojave Desert, desert tortoises were observed aboveground for 3 hours every fourth day and some tortoises did not feed for several weeks following spring emergence from cover sites (Behler and King 1979). During inactive periods, desert tortoises retreat to their burrows, and spend approximately 98 percent of the time in these cover sites (Marlow 1979, Nagy and Medica 1986). During active periods, they usually spend nights and the hotter or cooler part of the day in their burrows; they may also rest under shrubs or in shallow burrows.

Hatchling desert tortoises emerge from their winter burrows as early as late January to take advantage of freshly germinating annual plants. As plants grow taller during the spring, some species become inaccessible to small desert tortoises. Their greatest period of activity is late winter to spring. Hatchling desert tortoises have been observed aboveground in January with air temperatures below 55° F (13° C). Hatchling and juvenile desert tortoises are more likely to be active in less optimal weather than adults (Wilson et al. 1999).

1.6 Cover Sites

Desert tortoises depend on their burrows to escape the extreme effects of temperature, humidity, and to avoid predators (Brattstrom 1965, McGinnis and Voigt 1971). The desert tortoise usually excavates and uses several burrows per season. Juvenile desert tortoises are particularly prone to excavate multiple burrows (mostly under large shrubs), and use abandoned rodent burrows (Woodbury and Hardy 1948, Luckenbach 1982). Soils must be friable enough for digging of burrows, but firm enough so that burrows do not collapse. In California, desert tortoises are typically associated with gravelly flats or sandy soils with some clay, but are occasionally found in windblown sand or in rocky terrain (Luckenbach 1982). In the Mojave Desert, where a veneer of desert pavement may obscure the sandy loam soils, burrows are most often located in the banks of washes and arroyos under these conditions.

Burrows often extend from 1 to 8 feet in length and have a single opening. Desert tortoises use an average of 7 to 12 burrows at any given time (Barrett 1990, Bulova 1994, Burge 1977); some burrows may be used for relatively short periods and then are replaced by other burrows. Burrows may also collapse with a desert tortoise inside. In this situation, the desert tortoise then must excavate its way out of the collapsed burrow. Desert tortoises sometimes share a burrow with several other desert tortoises (Bulova 1994) or other species such as snakes, scorpions, and kit foxes. For the Mojave Desert, burrows tend to open under a creosote bush (59 to 77 percent of the time) or white bursage shrub (21 percent). Deeper burrows, more properly called dens, are extensive and up to 30 feet in length. These dens are used frequently in winter and are often subject to communal use by several individuals (Woodbury and Hardy 1948, Boarman 2002). These "caliche dens" are located in the sides of washes and below the caliche or calcium carbonate layer in the soil.

1.7 Home Range

Desert tortoise activities are concentrated in core areas, known as home ranges. Since they do not actively defend this entire area, it is considered a home range, not a territory. Annual home range sizes have been measured at 10 to 450 acres (4 to 180 ha) and vary with sex, age, season, and density or availability of resources. There is significant overlap of home ranges of different individuals (USFWS 1994). In years of higher than average precipitation, desert tortoises have larger home ranges than during dry years. During their life span, the size of a desert tortoise's lifetime home range is considerably larger than that of its annual home range. This expansion of home range may be influenced by availability and distribution of food or mates. Adult female desert tortoises also move great distances (e.g., several miles) within a short time and may return within a few months or a few years.

1.8 Food and Nutrition

In general, desert tortoises forage primarily on native winter and summer annual plants, perennial grasses, cacti, and perennial shrubs in descending order of preference. Although they will eat nonnative plants, desert tortoises generally prefer native forbs when available (Jennings 1993, Esque 1993, Avery 1998). The dietary preference may place them at a nitrogen- and water-deficit physiological state that may be exacerbated by drought (Oftadal, Hillard, and Morafka 2002). Optimal diet items include forbs, which are higher in protein, carbohydrates, lipids, calcium, crude fiber, and water and are low in potassium. Forbs known in desert tortoise diets include *Eriogonum inflatum, Astragalus nuttallianus, Plantago insularis, Erodium cicutarium, Krameria parvifolia, Amsinckia* spp., *Camissonia* spp., *Descurainea* spp., *Lotus* spp., *Lupinus* spp., *Malacothrix* spp., *Gilia* spp., *Mentzelia nitens*, and *Nama* spp. Annual grasses in desert tortoise diets are largely nonnatives and include *Bromus rubens, Schismus barbatus, Festuca octoflora*, and the native *Bouteloua barbata*. Perennial grasses provide not only food, but also provide shelter, soil retention, and a longer growing season; these species include *Hilaria (Pleuraphis) rigida, Muhlenbergia porteri*, and *Oryzopsis hymenoides*. *Sphaeralcea ambigua*, a shrub, is regularly ingested by the desert tortoise, and *Opuntia basilaris* buds, flowers, and fruits are also seasonally ingested (Berry 1978). Desert tortoises will eat many species of plants. However, at any time, most of their diet often consists of a few species (Nagy and Medica 1986, Jennings 1993). Additionally, their preferences can change during the course of a season (Avery 1998) and over several seasons (Esque 1993). Possible reasons for desert tortoises to alter their preferences may include changes in nutrient concentrations in plant species, the availability of plants, and the nutrient requirements of individual animals (Avery 1998, Oftedahl et al. 2002).

Desert tortoises may sometimes ingest high-calcium materials such as limestone pebbles, caliche from layers along embankments, soil, and bones. The ingestion of calcium is most frequently observed in adult females and possibly in growing juveniles (Esque and Peters 1994, Marlow and Tollestrup 1982).

1.9 Mortality

Sources of mortality include predation, disease, and malnutrition. Kit foxes (*Vulpes macrotus*) are predators of desert tortoise eggs (Coombs 1977). Coyotes (*Canis latrans*), kit foxes, common ravens, ground squirrels (*Spermopholus* sp.) and native fire ants are known predators of hatchling and juvenile desert tortoises (Ken Nagy, personal communication). Subadult and adult desert tortoises are prey for coyotes, kit foxes, bobcats (*Lynx rufus*), and mountain lions (*Felis concolor*), and domestic dogs (*Canis familiaris*).

Another source of mortality for the desert tortoise is disease. Disease is frequently the result of a suppressed immune system from other stresses in the environment, such as malnutrition. One disease is upper respiratory tract disease (URTD) which can be caused by mycoplasmosis or bacteria from the genus *Mycoplasma*, herpes virus, or other pathogens (Berry et al. 2006). Desert tortoises also suffer from shell disease or cutaneous dyskeratosis.

Human-caused or influenced sources of mortality include elevated levels of predation from common ravens and domestic dogs, shooting and vandalism, collecting, vehicle strikes on roads, and vehicle strikes of desert tortoises above and belowground by off-road vehicles. At certain locations, desert tortoises contain high levels of heavy metals such as mercury or arsenic, the source of which is believed to be nearby mining activities. These high levels of hazardous materials cause or contribute to poor health and mortality for the desert tortoise. Habitat degradation from soil surface disturbance (e.g., urban and agricultural development, mining, livestock grazing, or proliferation of roads) and the introduction of nonnative plant species with poor nutritional quality also cause or contribute to mortality.

A new cause of mortality to the desert tortoise is fire. A fire can kill a desert tortoise by burning the animal or from smoke inhalation. Fire will also destroy the habitat of the desert tortoise and cause the vegetation composition to change from native perennial shrubs and annual plants to nonnative annual plants. This is sometimes referred to as vegetation type conversion. Desert plant communities are not adapted to fire. With unsuitable vegetation present for cover and for forage, desert tortoises in the area die.

1.10 Desert Tortoise Population Trends

Population trend information is available from data collected at site locations and from data compiled across the range of the desert tortoise.

In 1994, the Recovery Plan presented data that showed populations of the desert tortoise in the western extent of the species' range were experiencing significant declines (USFWS 1994, Tracy et al. 2004). With the data available in the early 1990s, no trend in adult densities of desert tortoises was discernable. The population trend of the desert tortoise in the western Mojave Desert continues to decline and a downward trend has been documented for populations in the eastern Mojave Desert (Tracy et al. 2004).

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2.0 COMMON RAVEN

2.1 Morphology and genetics

Common ravens (*Corvus corax*) are the largest of all passerines or song birds (Figure A-3). They are in the same family as crows, jays, and magpies (Corvidae). The common raven is a large black conspicuous bird. It resembles the American crow in appearance, but is easily differentiated by larger body size, larger chisel-like bill, well-developed throat hackles, and a wedge-shaped tail. Sexes are similar in appearance. Life expectancy is 10 to 14 years.

Figure A-3. Adult Common Raven (*Corvus corax*).

There are four recognized subspecies in North America. The northernmost subspecies, *C. c. kamtschaticus* is a resident from northeast Siberia east to the Aleutian Islands and the Alaska Peninsula. *C. c. principalis* is a resident from north Alaska across Canada to Greenland and south to Oregon, northern Wisconsin, and the Appalachian Mountains of northern Georgia. *C. c. sinuatus* is a resident from southeast British Columbia and Montana south through the Great Plains and Great Basin and mainland Mexico to Nicaragua. *C. c. clarionensis* is a resident from northern California south through Baja California, east to southern Nevada and western Arizona. Common ravens occur throughout California, except for some areas of the Central Valley, parts of the central coast, and cultivated valleys of the south east (Small 1994). Common ravens in California are not known to migrate. Recent mitochondrial and microsatellite evidence indicates that common ravens in the southwest United States are genetically distinct from ravens in the rest of their range (Omland et al. 1999).

2.2 Range

Common ravens are found throughout major portions of North America, Europe, Asia, and North Africa (Boarman and Heinrich 1999). Common ravens are widespread throughout North America and can be found in Canada, Alaska, and the contiguous United States (west of the continental divide, and throughout the Appalachian Mountains of the eastern United States (Figure A-4).

2.3 Habitat

Common ravens are found in a wide range of natural habitat types, preferring areas with some vertical relief (e.g. cliffs, trees, or human-made structures) to provide nesting and foraging sites (Boarman and Heinrich 1999). They occur in a broad range of habitats including ice flows and high mountains, deciduous and coniferous forests, tundras, prairies, grasslands and deserts, isolated settlements and cities, and agricultural fields.

The common raven is highly adaptable to a wide range of habitats and foods. Consequently, they often respond positively to human-influenced environments. They thrive in many human-altered habitats (Kristan et al. 2004, Webb et al. 2004), including agricultural areas (Engel and Young 1989a), roadsides and linear rights-of-way (Knight and Kawashima 1993, Sherman 1993), ranches (Rothe et al. 1999), rangelands (Knight 1984), and near campgrounds and picnic areas (Wallen et al. 1998, 1999). They have recently expanded their range in California and are increasing in density in areas already occupied (Boarman and Berry 1995, Boarman 2003, Leibezeit and George 2002).

2.4 Reproduction

Adult common ravens form long-term pair bonds. Little is known about pair formation and nest-site selection for common ravens. Pairs are thought to be monogamous throughout the year, although extra-pair copulations have been observed. Common ravens do not breed until 2 to 4 years of age (Jolie 1976). Nesting substrates are highly variable, ranging from cliffs to trees to powerlines, telephone poles, buildings, and highway overpasses (Boarman and Heinrich 1999). In the California desert, common ravens have been observed nesting in tamarisk trees (*Tamarix* sp.), Joshua trees (*Yucca brevifloria*), on transmission towers, distribution poles, rock outcrops (BLM 1990b) freeway signs (Rebecca Jones, CDFG, personal communication), and abandoned vehicles (Tom Egan, AMEC Earth and Environmental, personal communication). Many common ravens return to the same nest year to year, or build multiple nests (two to four) in close proximity and rotate between them year to year.

Nest construction begins in early to late winter; sticks are the predominant nest building material. Nest construction takes from 1 to 4 weeks. Egg-laying usually occurs in March to April, with clutch size ranging from three to seven eggs. Incubation lasts 20 to 25 days. The nestling stage lasts 5 to 7 weeks, with an average of three chicks produced per nest each year. Fledglings will stay near the nest for 4 to 8 weeks following their first flight, with most nests fledged by mid-June. Females perform most of the nest construction and incubation, while both parents feed the young. If a clutch is lost early in the season, a second clutch may be laid. However, there are few reports of a pair of ravens successfully raising two sets of chicks in a single season (Boarman and Heinrich 1999).

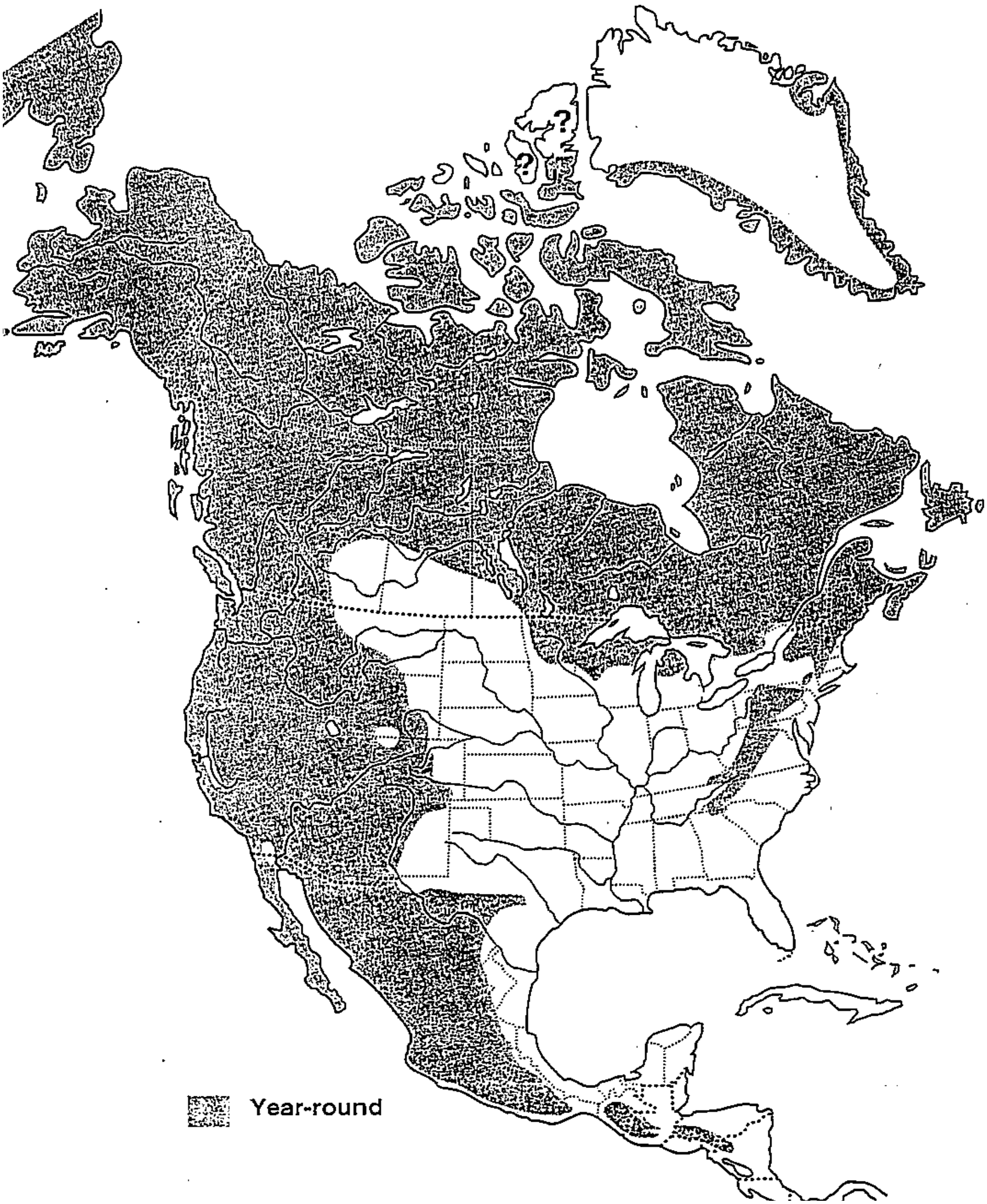

Figure A-4. Range of the Common Raven.

2.5 Activity Period

Common ravens are resident birds and active throughout the year in the California desert during the day.

2.6 Shelter

Nonbreeding ravens typically roost together at night, especially when a concentrated food source is nearby. Ravens generally roost in trees, on telephone poles, on powerlines, or communication towers. Roost size varies from a few birds to several thousand and generally peak in fall and winter (Chamblin and Boarman 2005). Roosts may serve as information centers for food by enabling new birds in a roost to find a previously located food source quickly (Heinrich 1988). Breeding adults usually do not join communal roosts and often roost at the nest site, even when not breeding (Engel et al. 1992).

2.7 Home Range and Territory

Common raven pairs typically occupy a home range in which they forage and nest. They establish territories, smaller areas within their home ranges in which the nest is built, that are nonoverlapping and defended year-round (most vigorously during the breeding season) (Boarman and Heinrich 1999). Unlike territories, home ranges of common ravens may overlap with those of neighboring raven pairs. Nonresident juvenile ravens often wander greater distances than territorial birds, and both resident and nonresident birds gather at sites of abundant food (e.g., landfills) (Heinrich et al.1994). Groups of ravens typically do not form a tight cohesive flock, but mix (Heinrich et al. 1994).

2.8 Feeding Behavior and Nutrition

Common ravens are general omnivores. The variety of food types in their diet often reflect differences within and among individuals, as well as the distribution of food in a given area (Engel and Young 1989a, Stiehl and Trautwein 1991, Kristan et al. 2004). Ravens commonly eat live meat, garbage, carrion, grains, eggs, and fruit. They are accomplished predators and use a variety of methods to attack and acquire food as a single predator or a pair. Prey species include arthropods, amphibians, reptiles, birds (adults, chicks, and eggs, e.g., mourning doves), and small mammals (Stiehl 1978, Sherman 1993, Boarman and Heinrich 1999). The following accounts demonstrate their efficiency as a predator. Ravens preyed on 3 of 15 breeding aggregations of western toads and ate more that 20 percent of the breeding toads at one aggregation (Olson 1989). More than one third of 282 pinyon jay nests were preyed upon by ravens or crows (Marzluff 1988). Ravens preyed on 95 of 647 nests of greater sandhill cranes in Oregon (Littlefield 1986). Common ravens prey on the eggs and young of several endangered species, including the western snowy plover, California least tern, California condor, marbled murrelet, and desert tortoise. While common ravens have been documented hunting and eating desert tortoises, not all ravens prey on desert tortoises.

Breeding common ravens concentrate their foraging activities during the breeding season within their territories (Sherman 1993). In the Mojave Desert, common ravens spend an equal amount of time scavenging and live hunting. Most (75 percent) hunting/food-finding activity takes place within 1,300 feet (400 meters) of the nest (Sherman 1993). Common ravens forage within 1 mile (1.6 km) of linear rights-of-way (roads, railways, transmission powerlines, and telephone lines) and spend 49 percent of the time foraging directly on the linear rights-of-way (Sherman 1993). When human-subsidized food is present, ravens often concentrate their feeding at these food sources and travel distances may be significantly shorter (Engel and Young 1992b).

Common ravens typically concentrate their feeding activity in the morning and late afternoon (Engel and Young 1992a, Sherman 1993), which coincides with the most active desert tortoise times. Nonbreeders, usually juvenile vagrants, often form "crowds" when feeding at concentrated food sources (Heinrich 1988). These crowds lack cohesiveness in membership that most flocking birds exhibit (Heinrich et al. 1994); most members of the crowd are not closely related (Parker et al. 1994). Common ravens often cache food for later use (Heinrich 1988) and are thought to rely mostly on visual cues to detect prey (Littlefield 1995).

2.9 Mortality

Causes of mortality include predation and disease. Predation on raven eggs has never been recorded. Possible predators on nestlings include hawks, owls, and other common ravens (Boarman and Heinrich 1999). Predation on adult common ravens is rarely observed. Possible predators on fledglings before they become proficient at flying include the coyote (Webb et al. 2004).

Disease causes mortality among common ravens. In California, common ravens are susceptible to Newcastle's disease which can be fatal. Newcastle's disease is usually spread by illegal transport of domestic poultry and is fatal to poultry. Hence, when an outbreak of Newcastle's disease is identified, the California department of Food and Agriculture implement stringent immediate measures to contain the disease and remove the infected birds. West Nile virus is another disease that can be lethal to common ravens. West Nile virus is carried by mosquitoes, which infect animals upon which they feed including the common raven. In the California desert there have been few reports of WNV among birds. Most of the available information is on the infection rate of WNV to humans. In August 2006, the number of confirmed cases declined from previous years. This decline has been attributed to increasing immunity in humans and animals. For example, in San Bernardino County, the number of reported cases of WNV was 197 in 2004 and 35 in 2005 (Doan 2006).

2.10 Common Raven Population Trends

Population trend information was derived from museum accounts and the Breeding Bird Surveys (BBS) during the period of 1966 and 2004 (Boarman and Berry 1995, Liebezeit and George 2002, Boarman and Kristan 2006) and the Christmas Bird Count (CBC) database during the period of 1959 to 1999 (Liebezeit and George 2002). Both BBS and CBC data provide a large-scale or regional perspective on bird population trends across North America. Because all surveys are conducted from roadsides, there is a possibility of overestimating corvid numbers. Corvids, in particular common ravens, are often found at higher densities along roadsides than other less disturbed habitats (Knight and Kawashima 1993). However, these data provide a reliable index of corvid population trends in California because most other biases associated with BBS and CBC survey techniques are minimal regarding corvids, and roadside habitat is prevalent across the state. In the Mojave Desert, more than 36,000 miles (57,600 km) of roads cross the landscape (Sherman 1993).

Common ravens were uncommon in the California desert in the first half of the 20th century. In the early 1940s, Eugene Cardiff, Curator of Natural History at the San Bernardino County Museum, searched for 2 years in the western Mojave Desert to locate a specimen for the Museum (BLM 1990a). In the eastern Mojave Desert, Johnson et al. (1948) conducted a survey in the Providence, New York, and Clark mountains and adjacent areas and reported few ravens. They noted that the raven was only present in the summer.

Since that time, common raven populations appear to have increased in the past 50 years in most parts of the west. Prior to this, common ravens were reported as becoming scarcer in settled parts of California because of human persecution (Grinnell and Miller 1944). As early as the 1950s, common ravens showed signs of increasing numbers in some areas of western North America (Houston 1977). Analysis of BBS data from 1969 to 1979 indicate an increase in common raven populations throughout the west, with major increases noted in California (Robbins et al. 1986). Using BBS data from 1966 to 1990, Marzluff et al. (1994) also documented an increase in the common raven populations. The number of common ravens estimated to occur within the 12 western states is greater than one half million. In the Mojave and Colorado deserts of California, the number of common ravens is estimated at 37,500 ± 8,500 (M. Green personal communication.). This population estimate was calculated from BBS data using methods described in Rich et al. 2004. The 30-year population trend for the common raven in California indicates the species is increasing at a rate of 5.4 and 7.1 percent per year in the Mojave and Sonoran Deserts (Sauer et al. 1999, as cited by Liebezeit and George 2002).

From the 1920s to the 1970s, common ravens changed from a summer resident to a permanent resident (BLM 1990a). Between 1966 and 2004, common raven populations increased in the southwestern deserts of California. The BBS data from 1968 to 2004 indicated increases in the raven populations of more than 700 percent in the west Mojave Desert and more than 70 percent in the East Mojave Desert. There were similar increases in the Colorado Desert (Boarman and Kristan 2006). In adjacent areas of the Great Basin Desert of California and Nevada and the southern California basin, raven populations have increased 168 percent and 328 percent, respectively, in 25 years (Boarman and Berry 1995).

The underlying cause of corvid increase throughout California is inextricably linked to the activities of humans. Common ravens are “human commensals” and thrive in highly disturbed habitats including agriculture, suburban, and urban areas (Marzluff et al. 1994). Common ravens are generalist foragers, and readily eat human-produced wastes. A key factor in the common raven population increases is thought to be the availability of human food sources that subsidize raven populations (Boarman 1993, Marzluff et al. 2001). Their reproductive success in the Mojave Desert is enhanced significantly by proximity to human developments (Kristan et al. 2004, Webb et al. 2004). Additionally, water subsidies are thought to be an important factor contributing to raven increase in desert areas of California (Liebezeit and George 2004). Subsidized water sources include cattle watering troughs, irrigation canals, reservoirs, sewage treatment areas, and irrigated agricultural areas. Some have questioned whether artificial wildlife watering sources (e.g., guzzlers) have assisted in providing water for common ravens. Habitat fragmentation has also contributed to an increase in habitat generalists, like common ravens (Andren 1992). Ravens thrive in fragmented landscapes and habitats. Suitable nesting and roosting structures have also allowed common raven populations to expand into areas where natural nesting substrate is limited or absent. The social nature of common ravens improves their ability to exploit human food and water resources and communal roost sites through their flocking behavior. Additionally, human persecution of common ravens has been reduced because of implementation of and education about the *Migratory Bird Treaty Act* in 1918 (Liebezeit and George 2004), which prohibits indiscriminate killing of migratory birds including the common raven.

2.11 Impacts of the Common Raven to the Desert Tortoise

Evidence of common ravens preying on hatchling and juvenile desert tortoises has been recorded numerous times during the past 25 years. Most of this information consists of observations reported by several researchers and field biologists; no standardized survey has been conducted. To develop a standardized method to collect data, a survey was initiated in 2004 and repeated in 2005 (McIntyre 2006, Boarman 2006). The objectives of this study were to ascertain the location of predatory bird nests in the Mojave Desert, determine the number and location of nests that were common raven nests, and locate evidence of hatchling and juvenile desert tortoise predation at nest sites. Using locations of historical raven nests (documented during the preceding 25 years), field workers located and recorded previously known nest locations and recorded the presence of nests at these sites or newly discovered nests along the route (Figures A-5 and A-6). Many of these nests were along transmission line routes. Under each nest area, the ground was searched for evidence of desert tortoise shells.

In summer 2004, 28 of 447 nests in the desert portions of San Bernardino, Kern, and Los Angeles counties were observed with evidence of desert tortoise predation beneath them. In 2005, 27 of approximately 600 nests in the desert portions of Kern, Los Angeles, and San Bernardino counties were observed with evidence of desert tortoise predation beneath them (McIntyre 2006).

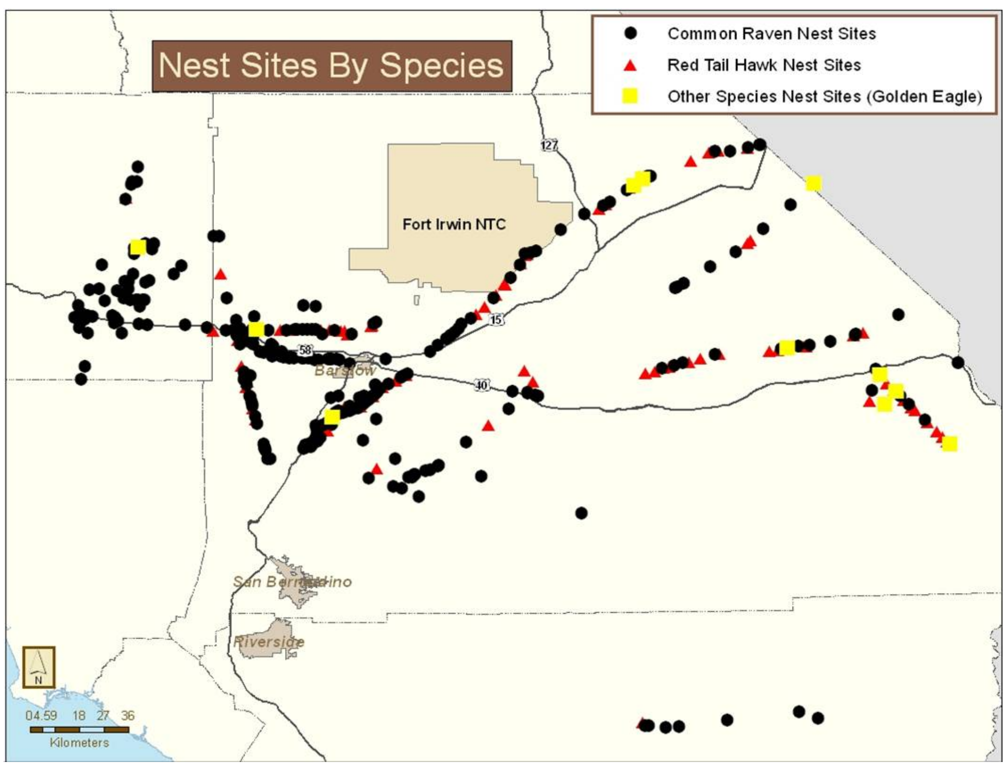

Figure A-5. Nest Sites Observed in 2004 and the Identified Species

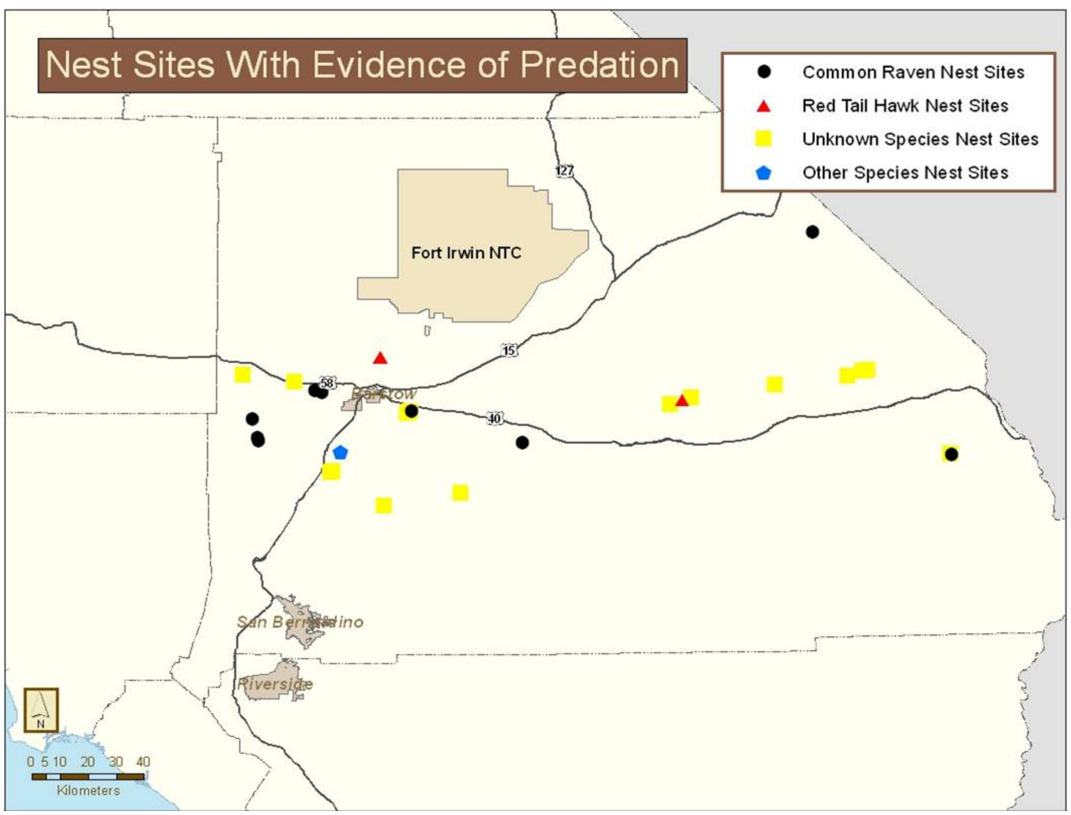

Figure A-6. Locations of Nests Observed in 2004 and Associated Species with Evidence of Desert Tortoise Predation.

APPENDIX B
SUMMARY OF PUBLIC INVOLVEMENT

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1.0 Summary of Public Involvement

The United States and Fish and Wildlife Service (USFWS) followed the *National Environmental Policy Act (NEPA)* and its implementing regulations as developed by the Council on Environmental Quality (CEQ) to encourage public participation in this process. The public involvement and notification process to date are described in the following sections.

1.1 General Process

Various federal and state agencies identified issues related to the proposed action during interagency meetings beginning in 2003.

The USFWS conducted a scoping, or information-gathering phase in which potentially interested groups, individuals, tribes, and agencies were contacted. These individuals and groups included conservation groups, government officials, tribal representatives, and land managers. These entities received letters about the objectives of the action and were asked to respond with any information on methods, concerns, or effects. The scoping effort was also announced to the public through a media release to several newspapers in southern California, including the *Los Angeles Times*, *San Diego Union-Tribune*, *San Bernardino Sun*, *North County Times*, *Desert Sun*, *Victorville Daily Press*, *Desert Dispatch, Daily Independent*, and *Antelope Valley Press*.

The USFWS received comments from 201 entities. Most respondents supported reduction efforts at some level, but some disagreed with the proposed action. The respondents identified various methods to consider in raven management/reduction efforts. These included shooting, removing nests/eggs, implementing an "adopt-a-raven" program, trapping and relocating, establishing a hunting season, implementing aversion training, introducing a predator for the raven, implementing birth control for common ravens, and controlling or reducing the human population and associated development. Some respondents suggested that efforts be directed towards helping the desert tortoise through captive breeding programs, relocation programs, and placing an impenetrable wire ceiling over desert tortoise habitat.

1.2 Tribal Contacts

The USFWS coordinated a separate scoping, or information-gathering effort with the tribes with lands of interest in southeastern California. The USFWS sent letters to 14 tribes and 2 cultural organizations. One response was received from the Agua Caliente Band of Cahuilla Indians. They responded that there was no desert tortoise habitat on their reservation and they did not support nonlethal or lethal management of the common raven.

The Bureau of Indian Affairs (BIA), as the primary trustee safeguarding tribal trust resources, sent letters to 16 tribes in southern California on 2 August 2005. Some of the tribes contacted by BIA were new contacts while many were repeat contacts from the USFWS's earlier effort. The BIA contacted these tribes to inform them of the proposal from the Desert Managers Group to manage the common raven in the California desert to reduce predation on the desert tortoise. The proposed actions would not occur on tribal lands without the tribe's explicit request to implement raven management measures on their reservation. The BIA requested that the tribes respond if they had opposition to the proposal. The BIA received one response from the

Big Pine Reservation. They requested that they be kept informed and sent a copy of the draft NEPA document.

In total, 22 tribes and 2 cultural organizations were contacted by letter during the scoping process.

APPENDIX C
DECISION MODEL

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1.0 DECISION MODEL

Use of a Decision Model for Implementing Removal of the Common Raven. The Decision Model (Slate et al. 1992) is adopted from the United States Department of Agriculture, Animal and Plant health Inspection Service-Wildlife Services (APHIS-WS) decision-making process which is a standardized procedure for evaluating and responding to wildlife damage complaints. The decision model is a description of the thought process used by wildlife specialists, United States Fish and Wildlife Service, and cooperating agencies at each site to develop and implement the most appropriate method to reduce predation by the common raven on the desert tortoise through removal (Figure D-1).

Receive request for assistance
↓
Assess problem
↨
Evaluate removal methods
↨
Formulate removal strategy
↨
Provide assistance
↨
Monitor and evaluate results of removal actions
↓
End of action

Figure D-1. APHIS-WS Decision Model

Agency personnel would evaluate the appropriateness of methods in context of their availability (legal and administrative) and suitability based on the biological, economic, and social considerations. Following this evaluation, the methods determined to be practical for the situation form the basis of a management strategy. After the management strategy has been implemented, monitoring is conducted and an evaluation of the strategy is conducted to assess its effectiveness.

Alternatives B through D, which include common raven removal, would implement safe and practical methods for the reduction of damage caused by common ravens on the desert tortoise based on local problem analysis, environmental and social factors, and the professional judgment of trained personnel.

In selecting a management technique, consideration would be given to the following:

a. Time of day

b. Time of year

c. Other land uses (e.g., proximity to recreational or residential areas and other structures)

d. Feasibility of implementation of various allowed techniques
e. Movement patterns and life cycle of the common raven for that year
f. Status of nontarget species in the area
g. Local environmental conditions (e.g., terrain, weather, and vegetation)
h. Presence of people
i. Potential legal restrictions
j. Humaneness of the available options, and
k. Cost.

APPENDIX D
RELEVANT LAWS AND AUTHORITIES

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1.0 RELEVANT LAWS AND AUTHORITIES

1.1 Compliance with Major Applicable Federal Laws

Several federal laws regulate wildlife damage management. The federal agencies involved in this action must comply with these laws, as well as consult and cooperate with each other and other agencies, as appropriate. The following federal laws are relevant to the actions considered in this environmental assessment (EA):

a. National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [U.S.C.] 4321–4347, Public Law [PL] 91-190)–Environmental documents prepared pursuant to NEPA must be completed before federal actions can be implemented. The NEPA process requires careful evaluation of the need for action, and that federal actions be considered alongside all reasonable alternatives, including the "No Action Alternative." The NEPA also requires that potential impacts on the human environment be considered for each alternative, the alternatives and impacts must be considered by the decision maker(s) prior to implementation, and that the public is to be informed.

This EA has been prepared in compliance with NEPA; the President's Council for Environmental Quality (CEQ) Regulations, 40 Code of Federal Regulations Section 1500–1508; and Department of the Interior's Departmental Manual (DM) for NEPA compliance (516 DM 6, 30 AM 2-3); U.S. Fish and Wildlife Service's (USFWS) directive manual 550 FW 1-3 and 505 FW 1-5; Bureau of Land Management's NEPA handbook H-1790-1; and National Park Service's handbook and Director's Order DO-12. It was also reviewed to comply with Department of Defense requirements including Title 32 Code of Federal Regulations (CFR) Part 989 (Air Force), 32 CFR 651 (Army), Marine Corps Order 5090.2a (Environmental Protection), and 32 CFR 775 (SECNAV Instruction 5090.6). The U.S. Marine Corps is regulated under 32 CFR 775.

Pursuant to NEPA and CEQ regulations, this EA documents the analysis of a proposed federal action, and all reasonable alternatives thereto, including the "No Action" or Status Quo alternative. The EA evaluates impacts anticipated from all alternatives, informs decision-makers and the public, and serves as a decision-aiding mechanism. The EA was prepared using an interdisciplinary approach to address all aspects of the natural and social sciences relevant to the potential impacts of the action. The direct, indirect, and cumulative impacts of the proposed action are analyzed.

b. Animal Damage Control Act of March 2, 1931, as amended (46 Statute [Stat.] 1486: 7 U.S.C. 426–426c); and Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988 (Public Law 100-102, December 1987, Stat. 1329–1331; 7 U.S.C. 426c)–These acts authorize Animal and Plant Health Inspection Service-Wildlife Services, in cooperation with other agencies, to reduce damage caused by wildlife.

c. Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531–1544)–Under the ESA, all federal agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of the ESA (Section 2[c]). Section 7 consultations with the USFWS are conducted to use the expertise of the USFWS to ensure that "any action authorized, funded, or carried out by such an agency...is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species…which is determined to be critical….” “(E)ach agency shall use the best scientific and commercial data available.” (Section 7[a][2]).

c. Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended (7 U.S.C. 136 et seq.; 86 Stat. 975)–This proposal includes the use of the avicide DRC-1339, which is only available for use by certified Animal and Plant Health Inspection Service, Wildlife Services (APHIS-WS) personnel. The FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The United States Environmental Protection Agency (U.S. EPA) is responsible for implementing and enforcing the FIFRA. All chemical methods integrated into any selected program as implemented by APHIS-WS or other cooperating agencies must be registered with and regulated by the U.S. EPA and the California Department of Pesticide Regulation and used in compliance with labeling procedures and requirements.

d. Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703–711; 40 Stat. 755), as amended–The MBTA provides USFWS regulatory authority to protect bird species that migrate outside the United States. This law prohibits the “take” or killing of these species by any entity, unless permitted by the USFWS. People can obtain permits to take migratory birds under this law that are causing damage to resources. The Migratory Bird Treaty Reform Act of 2004 was passed to clarify the original intent of the MBTA, the conservation and protection of migratory birds native to North America. It directed USFWS to establish a list of nonnative bird species found in the United States. Species on this list will not receive MBTA protection. The USFWS has prepared and published this list in the *Federal Register*.

e. National Historic Preservation Act (NHPA) of 1966, as amended (U.S.C. 470 *et seq*.)– The NHPA requires federal agencies to: 1) evaluate the effects of any federal undertaking on cultural resources; 2) consult with the State Historic Preservation Office (SHPO) regarding the value and management of specific cultural, archaeological, and historic resources; and 3) consult with appropriate American Indian tribes to determine whether they have concerns for traditional cultural resources in areas of these federal undertakings.

f. Sikes Act Improvement Act of 1997, as amended–The Sikes Act requires the Department of Defense to manage the natural resources of each of its military reservations within the United States and to provide sustained, multiple use of those resources. To meet these goals, the act requires Integrated Natural Resource Management Plans be prepared for military installations. These plans must be developed in coordination with the USFWS and appropriate state fish and wildlife agency, and reflect the mutual understanding of the parties concerning conservation, protection, and management of fish and wildlife resources.

g. Wilderness Act of 1964 (16 U.S.C. 1131–1136, 78 Stat. 890, and PL 88-577)–The Wilderness Act established a national wilderness preservation system composed of federally owned areas designated by Congress as wilderness areas. The lands in this system must be managed to leave them unimpaired for future use and enjoyment as wilderness. The purpose of the Wilderness Act is to ensure that an increasing human population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the Unites States and its possessions, leaving no lands designated for preservation and protection in their natural condition. It is the policy of Congress to secure for present and future generations the benefits of an enduring resource of wilderness.

Each federal agency with wilderness is responsible for administering the wilderness for the purposes for which it was established (e.g., a national park) and in a manner that preserves its wilderness character. With limited exceptions, no commercial enterprise or permanent road is allowed within a wilderness area. Temporary roads, motor vehicles, motorized equipment, landing of aircraft, structures and installations are only allowed for administration of the area. The use of aircraft may be permitted in wilderness areas where their use has already been established. Measures may be taken to control fire, insects, and disease.

h. California Desert Protection Act of 1994 (16 U.S.C. 410)–The California Desert Protection Act established and expanded Death Valley and Joshua Tree National parks and created Mojave National Preserve. Through this law, Congress declared that appropriate public lands in the California desert must be included within the National Park System and the National Wilderness Preservation System. The purpose of these lands is to preserve their scenic, geologic, and wildlife values; perpetuate their significant and diverse ecosystems; protect and interpret ecological and geological features, maintain wilderness resource values; and promote public understanding and appreciation.

i. Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Executive Order [EO] 12898)–Environmental justice promotes the fair treatment of people of all races, incomes, and cultures with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no person or group of people should endure a disproportionate share of the negative environmental impacts resulting either directly or indirectly from the activities conducted to execute this country's domestic and foreign policies or programs. Environmental justice has been defined as the pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. All federal activities are evaluated for their impact on the human environment and compliance with EO 12898 to ensure environmental justice. Any methods selected to reduce predation by the common raven on the desert tortoise will be used as selectively and environmentally conscientiously as possible.

j. Protection of Children from Environmental Health and Safety Risks (EO 13045)– Children may suffer disproportionately from environmental health and safety risks, including their developmental physical and mental status for many reasons. Because the USFWS makes it a high priority to identify and assess environmental health and safety risks, the USFWS has considered impacts that the alternatives analyzed in this EA might have on children. Reducing predation by common ravens on the desert tortoise, as proposed in this EA, would only involve legally available and approved management methods in situations or under circumstances where it is highly unlikely that children would have the potential for exposure.

k. Migratory Birds (EO 13186)–Executive Order 13186 directs federal agencies to use their programs and authorities to develop memorandums of understanding with the USFWS outlining how each agency will promote conservation of migratory birds. The common raven is designated as a migratory bird by federal legislation and regulation.

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2.0 AUTHORITIES OF FEDERAL AND STATE AGENCIES IN WILDLIFE DAMAGE MANAGEMENT

a. Federal Management Authorities

1) Department of the Interior–The Department of the Interior (DOI) was established in 1849. Its mission is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to American Indian tribes and our commitments to island communities.

(a) USFWS–The mission of the USFWS is to work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. The primary statutory authorities for the USFWS mission are: 16 U.S.C. 1521 et seq.; Endangered Species Act of 1973, as amended; and 16 U.S.C. 703–712, Migratory Bird Treaty Act (MBTA) of 1918, as amended.

(b) Bureau of Land Management (BLM)–The BLM manages it lands in accordance with the Federal Land Policy and Management Act of 1976 (FLPMA). The FLPMA directs BLM to follow 13 policies which include: managing lands on the basis of multiple use and sustained yield; managing lands in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; preserving and protecting certain public lands in their natural condition; providing food and habitat for fish, wildlife, and domestic animals; providing for outdoor recreation and human occupancy; and developing plans for the protection of public land areas of environmental concern.

The California Desert Conservation Area (CDCA) Plan of 1980, as amended, is BLM's planning document to manage BLM lands within the CDCA or southern California desert area. The CDCA Plan has been amended with bioregional plans, whose boundaries were generally established to correspond to the recovery units of the 1994 desert tortoise recovery plan. The bioregional plans are: 1) the Northern and Eastern Colorado Desert Coordinated Management Plan, 2) the Northern and Eastern Mojave Desert Management Plan, 3) the Coachella Valley Plan, 4) the Western Colorado Desert Management Plan, and 5) the West Mojave Plan. Most of these planning documents address the need for control of predation by common ravens on the desert tortoise. All alternatives presented in this document comply with these regulations and management plans.

(c) National Park Service (NPS)–All units managed by the NPS are managed in accordance with the Organic Act of 1916, 16 U.S.C. 1. This law states that the primary purpose of park units is: "...to conserve the scenery and the natural and historic objects and the wildlife therein, and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." In the 1970 General Authorities Act, Congress amended the Organic Act to clarify that all units, regardless of their specific designation, are to be managed under the Organic Act mandate. In 1978, Congress amended the General Authorities Act in the Redwood National Park Act to further clarify the importance of park resources system wide: "The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided for by Congress." In addition to the purpose of national parks as outlined in the NPS's Organic Act, as amended, specific purposes may also be provided in establishing or enabling legislation for each park unit and specific legislation for each NPS unit. Death Valley National Park, Joshua Tree National Park, and Mojave National Preserve must be managed in accordance with the California Desert Protection Act, PL 103-433 (1994). Actions within Death Valley National Park, Joshua Tree National Park, and Mojave National Preserve must comply with the general management plan for each park unit. The Death Valley National Park and Mojave National Preserve General Management Plans were completed in 2002; the Joshua Tree National Park General Management Plan was completed in 1994 and amended in 2000. All alternatives presented in this document comply with these regulations and management plans.

2) Department of Defense (DOD)–The DOD has the mission of protecting the national security of the United States and providing the military forces needed to deter war. The installations cooperating in this EA each have different missions, but all work together to achieve the overall mission of the DOD. Combined, the four installations manage nearly 2 million acres in the Mojave Desert.

(a) Edwards Air Force Base (AFB)–Edwards AFB is located in the Antelope Valley in the western Mojave Desert of California. The base manages 301,000 acres in a three-county area in Los Angeles, Kern, and San Bernardino counties. Approximately 11,000 military and civilian personnel work on Edwards AFB to support the mission of the Air Force Flight Test Center (AFFTC). The AFFTC is the Air Force Materiel Command center of excellence for conducting and supporting research, development, testing, and evaluation of aerospace systems from concept to combat. Test forces at Edwards AFB have played a role in the development of virtually every aircraft to enter the Air Force inventory since World War II. With the center's capability of just-in-time testing, Edwards AFB can provide real-time solutions during combat operations. This combat support establishes the AFFTC's direct and tangible link to the warfighter.

Edwards AFB manages its land under Department of Defense Instruction (DoDI) 4715.3, Environmental Conservation Program, May 1996, and Air Force Instruction (AFI) 32-7064, Integrated Natural Resources Management, 22 July 1994. The Integrated Natural Resources Management Plan, Edwards AFB Plan 32-7064, September 2004, is the primary management tool that incorporates additional federal mandates such as the Endangered Species Act of 1973, as amended; Migratory Bird Treaty Act of 1918, as amended; Federal Noxious Weed Act of 1974; Federal Insecticide, Fungicide, and Rodenticide Act; EO 11990, Protection of Wetlands; and EO 13112, Invasive Species. All alternatives presented in this document comply with these regulations and management plans.

(b) National Training Center (NTC) and Ft. Irwin–The NTC, located at Fort Irwin, California, is the only instrumented training facility in the world that is suitable for force-on-force and live-fire training of heavy brigade-sized military forces. The realistic training provided at the NTC assures soldiers are adequately prepared to protect and preserve US interests here and abroad. Each month the NTC provides 4000-5000 soldiers from other installations the essential training opportunities necessary to maintain and improve military readiness and promote national security. The evolving sophistication of military equipment and advances in technology require a comprehensive battlefield that realistically simulates the tempo, range, and intensity of current and future conflicts. The NTC must provide all the necessary components to achieve world-class training for the U.S. Army. The U.S. Army manages 755,606 acres (1,180 square miles) in the Mojave Desert of California.

The U.S. Army manages all of its installations under the following Army Regulations (AR): AR 200-1, Environmental Protection and Enhancement (February 1997); AR 200-2, Natural Resources–Land, Forests, and Wildlife Management (February 1995); and AR 200-3, Environmental Effects of Army Actions (August 1953). In accordance with the Sikes Act Improvement Act (Fish and Wildlife Conservation and Natural Resources Management Program on Military Reservations), each installation has an Integrated Natural and/or Cultural Resource Management Plan (INRMP/ICRMP). Fort Irwin's INRMP was revised on 15 July 2005 and signed in June 2006 by the USFWS. All alternatives presented in this document comply with these regulations and management plans.

(c) United States Marine Corps (USMC)–The USMC regulations mandate that natural resources under the control of the USMC will be managed to support the military mission, while preserving, protecting, and enhancing these resources. Land use practices and decisions must coincide with the military mission, rely on scientifically sound conservation procedures and techniques, and employ scientific methods and an interdisciplinary approach. Legal requirements by which the USMC abides include: 43 U.S.C. 1701 et seq., Federal Land Policy and Management Act of 1976; 16 U.S.C. 670a–670o , Sikes Act Improvement Act (Fish and Wildlife Conservation and Natural Resources Management Program on Military Reservations); DODI 5000.13, Natural Resources; and Marine Corps Order P5090.2A, Environmental Compliance and Protection Manual. Under Marine Corps Order P5090.2A, stewardship will be recognized as a high priority requirement in retaining control and use of USMC lands for mission needs. The USMC's most relevant plan is the INRMP. All alternatives presented in this document comply with these regulations and management plans.

(d) Marine Corps Air Ground Combat Center (MCAGCC)–The MCAGCC, Twentynine Palms, California, hosts the live-fire Combined Arms training program, which promotes military readiness and allows Marines to coordinate training between forces in the air and on the ground. Artillery, aircraft, armored vehicles, and infantry work together to create a unified force and defend our nation. The MCAGCC manages 596,477 acres (932 square miles) in the Mojave Desert of California. The mission of the MCAGCC, Twentynine Palms, is to develop and conduct the Marine Corps' Combined Arms Training Program and to provide support to the Marine Corps Communication-Electronics School. The following general principles have been identified for MCAGCC:

1) Comply with Federal laws, such as the Sikes Act Improvement Act, Endangered Species Act, Clean Water Act, and Clean Air Act, in such a fashion as to not impede mission activities;

2) Maintain the capability of MCAGCC to support its military mission (Sikes Act) and ensure that lands are continuously available for military training;

3) Manage MCAGCC natural resources consistent with Department of Defense and MCAGCC policies;

4) Participate in regional ecosystem initiatives; and

5) Provide stewardship of public lands.

(e) Marine Corps Logistics Base (MCLB), Barstow–As one of only two logistics bases operated by the USMC, MCLB Barstow is the primary west coast MCLB and Maintenance Center. It is located just east of the city of Barstow and consists of 6,165 acres in the west Mojave Desert. It has two missions: to procure, maintain, store, and issue all classes of supplies and equipment; and to repair and rebuild Marine Corps-owned and other DOD equipment. The MCLB furnishes supplies for the Marine Corps facilities worldwide and is a direct support provider for all installations. The MCLB is also responsible for assuring the technical training of Marines, developing and maintaining their skills, and job efficiency.

All alternatives presented in this document comply with these regulations and management plans as directed by Marine Corps Order MCO5090.2A and the Sikes Act Improvement Act of 1977. The Base Master Plan is also under revision with an expected completion date of September 2006. In all documents, the alternatives presented will comply with the military and civilian regulations and management plans.

3) Department of Agriculture–The United States Department of Agriculture (USDA) was established in 1862. Its mission areas include farm and foreign agricultural services; food, nutrition, and consumer services; food safety; marketing and regulatory programs; natural resources and the environment; research, education, and economics; and rural development.

4) USDA, APHIS-WS–The APHIS-WS is a federal agency authorized by Congress to protect American resources and human health and safety from damage caused by wildlife. The APHIS-WS provides federal leadership and expertise to resolve wildlife conflicts effectively and humanely, using state-of-the-art science and technology. The primary statutory authorities for the APHIS-WS program are the Animal Damage Control Act, which authorized APHIS-WS to reduce damage caused by wildlife in cooperation with other agencies (Animal Damage Control Act of March 2, 1931, as amended [46 Stat. 1486; 7 U.S.C. 426–426c]); and the Rural Development, Agriculture and Related Agencies Appropriations Act of 1988 (PL 100-102, Dec. 22, 1987; Stat. 1329-1331; 7 U.S.C. 426c). The APHIS-WS is a program within the USDA's Animal and Plant Health Inspection Service. It does not manage any land resources. All alternatives presented in this document comply with these regulations and management plans.

b. State Management Authorities

1) California Department of Fish and Game (CDFG)–The CDFG is the state agency with the statutory and common law responsibilities for fish and wildlife resources and habitats. California's fish and wildlife resources, including their habitats, are held in trust for the people of California by CDFG (Fish and Game Code Section 711.7). The CDFG has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitats necessary for biologically sustainable populations of those species (Fish and Game Code Section 1802). The CDFG's fish and wildlife management functions are implemented through its administration and enforcement of the Fish and Game Code (Fish and Game Code Section 702). The CDFG is a trustee agency for fish and wildlife under the California Environmental Quality Act (see CEQA Guidelines, 14 California Code of Regulations, Section 15386[a]). The CDFG is entrusted to protect threatened and endangered species under the California Endangered Species Act (Fish and Game Code Sections 2050–2115.5).

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3.0 PROJECT BACKGROUND AND PREVIOUS PLANNING

The USFWS has worked to recover and conserve the desert tortoise since it was listed in 1989. These efforts include working cooperatively with numerous federal, state, and local agencies with management or regulatory responsibilities in the California desert. Examples of some of these efforts include population surveys, land acquisition, modification of land management plans, designation of critical habitat, development of a recovery plan, and reduction in or consolidation of activities that result in human disturbance to desert tortoise habitat.

In 1989, a multiagency pilot raven control program was initiated by the BLM, USFWS, CDFG, California Department of Parks and Recreation, USMC, and Animal Damage Control (now Wildlife Services) of the USDA (BLM 1989, Rado 1993). The purpose of the pilot program was to reduce raven predation on hatchling and juvenile desert tortoises and gain information necessary to design a long-term raven control program. The BLM prepared an EA to implement the pilot program at two regions: one in the western Mojave Desert from China Lake Naval Air Weapons Station south to Victorville, west to the El Paso Mountains, and east to Barstow; and the second in the eastern Mojave Desert from north and west of Needles south into the Chemehuevi area (BLM 1989). The EA estimated that 500 common ravens would be removed in 1 year. The pilot program consisted of shooting and selective use of the toxicant DRC-1339 in hard-boiled eggs to remove ravens (Rado 1993). An estimated 100 to 110 individual ravens were killed over a 4-day period at the MCAGCC landfill form May 19 through 25, 1989. Eighteen of these birds were shot while the remaining birds were treated with toxicants. In addition, 6 to 10 ravens were treated with toxicants in a 1-day effort on May 24, 1989, at the Desert Tortoise Natural Area (DTNA). The pilot program was halted on May 24, 1989, by a Temporary Restraining Order. The request to halt the pilot program was initiated by the Humane Society of the United States (HSUS) (*HSUS* v. *Manuel Lujan et al*. 1989).[1] The Humane Society's primary concerns were that birds not responsible for preying on desert tortoises would be killed, other species of animals could be harmed by ingesting the avicide, and insufficient data were presented to justify the control efforts. The lawsuit was subsequently settled out of court, but the pilot program was not resumed.

In 1990, as a followup to the aborted pilot program, the BLM and several partner agencies drafted and distributed for public review a Raven Management Plan (BLM 1990b) that proposed a long-term strategy for reducing common raven predation on desert tortoises throughout the CDCA. This Raven Management Plan was presented in an Environmental Impact Statement (EIS) for the Management of the Common Raven in the California Desert Conservation Area (BLM 1990a). The decision to prepare an EIS was based on the regional scope of the project, the long-term duration of the project actions, and the controversial aspect of using lethal forms of raven control. Twenty-six polygons for implementing raven management were identified throughout the CDCA. The Raven Management Plan incorporated basic principles of Integrated Pest Management (Council for Agricultural Science and Technology 1982) as they apply to vertebrate pests (Timm 1984). These include: lethal control with toxicants and shooting; nonlethal control such as nest destruction, hazing, sterilization, and removal of road kills; habitat management such as changing landfill operation methods and altering perch/nest sites; research

[1] *Humane Society of the United States* v. *Manuel Lujan, et al.*, Civil Action 89-1523 (RCL), D.D.C., Settlement Agreement filed June 29, 1989.

into pertinent aspects of common raven and desert tortoise behavior and ecology; and monitoring common raven and desert tortoise populations. Several concerns, including the need to collect additional data on common raven ecology and behavior, explore and adopt effective nonlethal means of raven control, and monitor both common raven and desert tortoise populations, were raised by various groups and individuals during the public comment period.

In response to public concerns, BLM convened a Technical Review Team (TRT) composed mainly of professional, nongovernment biologists, and conservation policy specialists. The TRT members were from the following organizations: HSUS; Natural Resources Defense Council; National Audubon Society; Defenders of Wildlife; Desert Tortoise Council; Washington State Department of Natural Resources; Desert Tortoise Preserve Committee; Southern California Edison; and Dr. Ed Hill, USDA/APHIS-WS. The TRT supported an experimental approach that focused on shooting individual ravens known to prey on desert tortoises and removing all ravens that were foraging within the DTNA. The intent of this effort was to determine the efficacy of shooting rather than using toxicants as a control measure, and to assess the likelihood that removing only known offending birds rather than all birds in a specific area would aid desert tortoise recruitment. The TRT also recommended that research be conducted to address various aspects of raven ecology and management to develop a more focused and effective raven management program.

In 1993 and 1994, the BLM followed the recommendations of the TRT and implemented an experimental common raven removal program. The two primary objectives of the program were: 1) remove ravens known to prey on desert tortoises (identified if three or more desert tortoise shells showing evidence of raven predation were found within their territories); and 2) remove all ravens that were likely foraging within the DTNA. The program was delayed by an appeal, filed on April 27, 1993, with the Interior Board of Land Appeals by the HSUS. The HSUS objected to the removal of ravens with chicks on the nest without evidence that those ravens were eating desert tortoises. The appeal was withdrawn after BLM agreed to only shoot birds if desert tortoise shells were found within their presumed territories. Shooting commenced on May 13, 1993; 49 ravens were subsequently shot and 10 nestlings euthanized during 1993 and 1994.

An additional objective of the experimental program was to determine if shooting is effective at removing all birds from foraging within a specific area. The result of the study showed that shooting can be used to remove nesting pairs, but it is often difficult to kill the second member of the pair. Difficulties were also encountered when removing common ravens from a broad targeted area (e.g., DTNA) because these birds would often forage in flocks; and after one bird was shot, the rest quickly scattered.

APPENDIX E
LAND MANAGEMENT AND PLANNING DOCUMENTS

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LAND MANAGEMENT AND PLANNING DOCUMENTS

Bureau of Land Management (BLM) Land Management Plans for the California Desert Conservation Area–The BLM uses the California Desert Conservation Area (CDCA) Plan and Amendments to guide management on the lands it administers. Any decisions made because of this Environmental Assessment (EA) process will be consistent with the guidance in the CDCA Plan and Amendments and the *Federal Land Policy and Management Act of 1976*.

Death Valley National Park General Management Plan–The subject plan was completed in 2002. This document guides the management of lands administered by the National Park Service within Death Valley National Park.

Joshua Tree National Park General Management Plan–The subject plan was completed in 1994 and amended in 2000. The amended document, Record of Decision Final General Management Plan Amendment Environmental Impact Statement (EIS)/Backcountry and Wilderness Management Plan, guides the management of lands administered by the National Park Service within Joshua Tree National Park.

Mojave National Preserve General Management Plan–The subject plan was completed in 2002. This document guides the management of lands administered by the National Park Service within the Mojave National Preserve.

Programmatic Environmental Impact Statement–Animal and Plant Health Inspection Service-Wildlife Services (APHIS-WS), formerly called Animal Damage Control (ADC), issued a Final EIS on the national APHIS-WS program (USDA 1997, revised). This EIS addressed an ongoing program of wildlife damage management. Information in the Final EIS that is pertinent to the alternatives in this EA has been incorporated by reference.

Master Memorandum of Understanding (MOU) between APHIS and BLM–This MOU specifies that all programs for animal damage management on lands administered by BLM will be coordinated with appropriate state and federal agencies prior to implementation. The APHIS-WS will develop and update work plans for animal damage management annually in cooperation with the BLM and other appropriate agencies. The APHIS-WS and BLM will identify restrictions for human safety or other mitigation that should be implemented to comply with the BLM's existing Land Management Plans.

Integrated Natural Resources Management Plans–Each of the six military installations within the California desert (Naval Air Weapons Station China Lake, Air Force Flight Test Center at Edwards Air Force Base, National Training Center at Fort Irwin, Marine Corps Logistics Base Barstow, Marine Corps Air Ground Combat Center Twentynine Palms, and Chocolate Mountains Aerial Gunnery Range) is required to maintain and implement an Integrated Natural Resources Management Plan (INRMP).

The purpose of each INRMP is to develop and follow a prescribed planning process for the management of natural resources on each installation. Development and implementation of the INRMP must support military mission readiness by ensuring lands and airspace are available for sustained use. This process meets statutory requirements under the *Sikes Act Improvement Act*

(SAIA), Public Law 105-85, Div. B Title XXIX, Nov. 18, 1997, 111 Stat 2017-2019, 2020-2033. This Act requires the Secretaries of the Army, Air Force, and Navy to prepare and implement INRMPs for each military installation, unless exempted due to the absence of significant natural resources.

Each installation coordinates with the USFWS and the California Department of Fish and Game (CDFG) to ensure that each INRMP reflects the mutual agreement of these parties on conserving, protecting, and managing natural resources on each installation. In addition, as required by the SAIA, the INRMPs are provided for public comment.

County General Plans–California state law requires each county to prepare and adopt a comprehensive and long-range general plan for its physical development (Government Code Section 65300). A comprehensive general plan provides each county with a consistent framework for land use decision-making. Traditionally, the general plan has been organized as a collection of elements or subject categories such as land use, housing, conservation, noise, circulation, open space, and safety. The conservation element addresses the conservation, development, and use of natural resources including water, forests, soils, rivers, and mineral deposits. The open-space element details plans and measures for preserving open space for natural resources, the managed production of resources, outdoor recreation, public health and safety, and the identification of intensive agriculture and irrigated pasturelands. For the California desert there, are five counties each with a county general plan for these elements. These plans are: Imperial County General Plan, Inyo County General Plan, Kern County General Plan, Los Angeles County General Plan (Antelope Valley), Riverside County General Plan, and San Bernardino County General Plan.

APPENDIX F
PUBLIC COMMENTS RECEIVED AND RESPONSES

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Cost Allocation Methodology

For

Implementation of the Regional Raven Management Plan

As discussed in the summary document on Raven Predation of Desert Tortoise, the US fish and Wildlife Service (FWS) has estimated the costs of the essential elements for full implementation of the adaptive management approach to reduce predation by common ravens on the federally threatened desert tortoise in the California desert.

In order to determine the equitable contribution for projects that are expected to increase raven presence and predation on the tortoise, the FWS and California Department of Fish and Game (CDFG) took the following approach. By reviewing State, Federal and County Planning documents we estimated the developable/contributing acreage within the implementation area of the Raven EA. We excluded lands we believed to have a “protected status” such as Department of Defense installations, congressionally designated Wilderness Areas, National Park Service Units, State Parks, lands managed by the California Department of Fish and Game, and Bureau of Land Management (BLM) land. As an estimate for the BLM land available for development we used all the current Right of Way Applications for solar and wind projects as of May 2010, and the allowed 1% of the Designated Wildlife Management Areas (DWMAs).

Table 1. Estimated Acres of Potential Development in the Range of the Desert Tortoise in CA.

Category of land	Acreage
Potentially developable acres in CDCA (DT Habitat 2-1)	2,453,600.00
1% of DWMAs	42,232.39
Solar Project Applications	450,000
Wind Project Applications	569,000
TOTAL	3,514,832.39

Since not all of these areas will actually be developed, we assumed that 35% of the total acreage in Table 1 above, i.e. 1,230,191.34 acres, would be developed over the next 30 years.

Since the National Fish and Wildlife Foundation (Foundation) will be holding and managing the funds to carry out the Regional Raven Program, the FWS and CDFG asked them to use their modeling tools to assist us in determining a per acre contribution for projects with life spans of 20 to 30 years.

The Foundation’s methodology consisted primarily of (a) delineating the year-by-year costs of the removal, outreach, and survey activities, from a Summary document provided to the

Foundation by the FWS; (b) inflating those costs over the 20- or 30-year period for inflation, which was assumed at 3%; (c) discounting the inflated cost stream to a "net present value" using an expected rate of return net of administrative/financial fees and expenses (they provided us with an analysis using discount rates of 2%, 3%, 4%, and 5%); and dividing the net present value by the developable/contributing acreage of 1,230,191.33. The resulting "per acre" charge is what a developer would pay up-front in a single lump sum for its contribution to the raven control program, with this charge being multiplied by the number of acres used or impacted by a project to arrive at the total payment amount for that project.

The various discount rates (2%, 3%, 4%, and 5%) are intended to reflect what "net" investment return might be earned on the mitigation funds as they await disbursement. The term "net" here refers to investment return after assessing the Foundation's administrative fees and financial institution investment advisory fees (likely to be roughly 3% in the aggregate). The FWS, in consultation with the CDFG, decided a 3% discount rate would be appropriate for this type of program, based on an estimated 20-30 year implementation period. Table 2 below provides the resulting cost per acre contribution for development projects with a duration of 20 and 30 years. If approvals are granted to extend the term of a renewable energy project past the initial permit term (i.e. 20 to 30 years), the applicable State and/or Federal agencies will re-evaluate the level of implementation of the regional scale Raven Management Plan, and assess any additional costs necessary to continue the program.

Table 2. Per Acre Contribution for Implementation of the Regional Raven Management Plan

Duration of Project	**One-Time, Lump "Per Acre" Fee (@3% Discount)**
20 Years	$64.00
30 years	$105.00

TRANSLOCATION OF DESERT TORTOISES (MOJAVE POPULATION) FROM PROJECT SITES: PLAN DEVELOPMENT GUIDANCE
U.S. Fish and Wildlife Service
August 2010

The following guidance provided by the U.S. Fish and Wildlife Service (USFWS) is based on the best scientific information currently available and will be updated as new information and data are obtained. This guidance is complementary to existing protocols for the desert tortoise (*Gopherus agassizii*) that should be referenced when planning and implementing surveys, translocation plans, and other activities involving this species. To ensure that you are referring to the most current guidance and protocols, contact your local USFWS field office or see http://www.fws.gov/ventura/speciesinfo/protocols_guidelines/, where the following can be accessed: Pre-project Survey Protocol, Desert Tortoise Field Manual (includes Pre-project Survey Protocol, Clearance Survey Guidelines, Handling Guidelines, and Exclusion Fence Specifications), Qualifications and Requirements for Authorized Biologists, and Desert Tortoise Exclusion Fence Specifications. In addition, please refer to the technical paper prepared by USFWS's Desert Tortoise Recovery Office (DTRO) on translocation of desert tortoises (in prep.) for the scientific underpinnings of the recommendations contained herein.

The purpose of this document is to provide guidance for the development of project-specific translocation plans for activities that may impact desert tortoises when avoidance of these impacts is not feasible and adverse effects of the incidental take of desert tortoises associated with the proposed action need to be minimized. Prior to drafting a translocation plan, however, project proponents should identify, review, and consider all potential measures to avoid adverse effects to desert tortoises at the project site. **If translocation can be justified as the most appropriate course of action, this document should be used as an outline that, when combined with project-specific input from the USFWS and other permitting agencies, will facilitate the completion of a translocation plan.**

The implementation of any translocation will necessitate take of desert tortoises in some form. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Section 9 of the Endangered Species Act of 1973, as amended, and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Consequently, translocation of desert tortoises may be undertaken only when authorized by the USFWS through the issuance of an incidental take permit pursuant to section 10(a)(1)(B) of the Act, or if an exemption against the prohibitions against take is granted through the issuance of a biological opinion that contains an incidental take statement under the authorities of section 7(a)(2) of the Act. The translocation plan, after approval by the USFWS, would be incorporated into the project design or included in the terms and conditions of the USFWS's biological opinion or incidental take permit. **In general, activities from Step 6 through Step 10 of this guidance can only be conducted in accordance with an incidental take permit or biological opinion.**

In addition to this guidance, project proponents should confer with the respective State wildlife agencies within the range of the Mojave population of the desert tortoise where compliance with State laws is mandated or different survey and translocation protocols exist. Collection or take permits may also be required by other Federal agencies or by State laws and regulations.

We have summarized the actions associated with translocation in chronological order. There may be different recommendations for projects that expect to translocate desert tortoises a distance greater than 500 meters (m) from the point of collection versus those that expect to release desert tortoises within 500 m of the point of collection. Table 1 below provides a quick reference of the various recommendations based on number of desert tortoises expected to be moved and translocation distance. Because any given project may have unique circumstances, we recommend project proponents and the lead action agency work closely with the appropriate USFWS field office and State wildlife agencies as early in the planning process as possible to determine which of the components and to what degree each of the following should be included in project-specific translocation plans.

1. Determine need for translocation of desert tortoises based of the long-term compatibility of the proposed land use with desert tortoise occurrence (refer to *Translocation of Desert Tortoises (Mojave Population) from Project Sites: A Technical Paper*).

2. Estimate the number of desert tortoises that will be affected at the project site. Conduct desert tortoise surveys according to the most recent USFWS Pre-project Survey Protocol (accessed at the website above) and include data on carcasses observed during surveys. Surveys should be conducted during the desert tortoise's most active periods (*i.e.*, typically April 1 through May 31 or September 1 through October 15 when air temperatures are below 40°C (104°F), which should be verified by activity in the field. Temperature should be measured in the shade and protected from the wind at a height of 5 centimeters above the ground.). These data will be used to estimate the number of desert tortoises expected to be impacted by the project; assist in identifying potential recipient (translocation) sites based on the density estimates; and, if applicable, determine the minimum number of resident and control desert tortoises needed for monitoring purposes. If out-of-season surveys, probabilistic sampling, or non-protocol surveys are proposed for the project site, approval from the USFWS and State wildlife agencies should be obtained prior to conducting any surveys; this increases the likelihood that survey results will be accepted.

3. Identify potential recipient and control sites[1] for projects. Planning should be done in coordination with Federal and State wildlife and land management agencies, and approval from the landowner/manager for use of the sites should be obtained. Recipient sites should be at least equal in size to the project site. The project site and recipient site should be within 40 kilometers (km) of one another with no natural barriers to movement between them, as the desert tortoises at the two sites were likely part of a larger mixing population and similar genetically. In addition, the site should support desert tortoise habitat that is equivalent in type/quality to the project site, suitable for all life stages, have no designated rights-of-way (ROWs) or other encumbrances, and be managed for conservation so that potential threats from future impacts are precluded in perpetuity.

Selection of potential recipient sites should focus on lands where desert tortoise populations have been depleted or extirpated yet still support suitable habitats. These may include lands adjacent to highways or within designated critical habitat or lands identified as Desert Tortoise Conservation Areas (TCAs) in the revised recovery plan for the species (*e.g.*, Desert Wildlife Management Areas, Areas of Critical Environmental Concern, National Park Service lands, designated critical habitat, etc.); lands outside TCAs that are important for maintaining habitat

[1] See Table 1 for circumstances when identification of recipient and control sites is necessary.

and population connectivity and that are not subject to future impacts or are a minimum of 10 km from areas expected to be developed; or lands where management actions are currently being tested. In addition, recipient sites should be at least 15 km from major unfenced roads or highways; distances from roads may be reduced if the proposed action includes provisions to install desert tortoise exclusion fencing as a minimization measure.

Some recipient sites may need to be temporarily or permanently fenced (partially or completely) if adjacent areas (*e.g.*, adjacent to highways) are not protected or desert tortoise movements need to be restricted. We recommend that more than one potential recipient site be identified during planning to ensure that disease status, desert tortoise densities, or other factors do not prevent the use of the potential site(s). As stated above, the selection of the recipient sites should be coordinated with Federal and State wildlife and land management agencies.

Potential control sites should be equivalent in habitat type/quality, desert tortoise population size/structure, and disease status as the recipient sites. Control sites should not have been previously used as a recipient site for other projects and should be a minimum distance of 10 km from the project site if the recipient site is unfenced or no substantial anthropogenic or natural barrier exists to prevent the interaction of control, resident, and translocated desert tortoises.

4. Estimate desert tortoise densities at agreed-upon recipient and control sites[1]. Conduct desert tortoise surveys according to the most recent USFWS Pre-project Survey Protocol and include data on carcasses observed during surveys. Surveys should be conducted during the desert tortoise's most active periods (*i.e.*, typically April 1 through May 31 or September 1 through October 15 when air temperatures are below 40°C (104°F), which should be verified by activity in the field). **Desert tortoises should be closely observed but not handled at this time**.

Projected density after translocation at the recipient sites (residents plus translocated juvenile, subadult, and adult individuals) should not exceed 130% of the mean density detected in the respective desert tortoise recovery unit. In some circumstances it may be most appropriate to use site-specific density information, thus close coordination with Federal and State wildlife and land management agencies is recommended. Contact the USFWS for most current data on desert tortoise densities within each recovery unit.

Any incidental observations of signs of disease should be documented during the surveys of these sites. Signs of infection from upper respiratory tract disease are as follows:

- nasal or moderate-to-severe ocular discharge
- eroded nares
- partially or completely occluded nares

Signs of dried nasal and ocular discharge must be obvious and should not be confused with dried dirt or mud on the beak and nares from recent rain events.

5. Develop the translocation plan in close coordination with USFWS, State wildlife agencies, and land management agencies. Note that the translocation recommendations vary according to the number and distance desert tortoises are expected to be moved and many of the details may be project specific (Table 1). We recommend that the translocation plan and proposed project be approved and permits secured prior to beginning steps 6-10. **Activities requiring the handling of desert tortoises may be conducted only under the authorities of an incidental take permit or biological opinion and applicable State permits.**

6. Confirm desert tortoise densities at the recipient and control sites[1] as *in situ* health assessment sampling is conducted and transmitters are attached. The methods used to confirm desert tortoise densities at the recipient and control sites should be consistent with the USFWS Pre-project Survey Protocol (for very large sites a sampling scheme rather than a complete survey may be designed in coordination with USFWS and State wildlife agencies), and the appropriate level of health assessments should be conducted based on the distance between the point of collection on the project site and the identified recipient site. Desert tortoises that will be monitored should be assigned a unique identifier (provided by USFWS) and fitted with a transmitter. Again, projected density after translocation at the recipient sites should not exceed 130% of the mean density detected in the respective desert tortoise recovery unit or otherwise determined by the Federal and State wildlife and land management agencies.

Health assessments should be performed on all desert tortoises encountered during the surveys at the recipient and control sites. Results from health assessments, including blood work, will be valid for 1 year from the date that the assessment was conducted. Additional health assessments of the recipient and control desert tortoises may be required if desert tortoises are not translocated to the recipient site within 1 year of the original assessment dates. Handling of resident and control desert tortoises in order to perform health assessments and attach transmitters should be done in accordance with protocols in the Desert Tortoise Field Manual; particular attention should be paid to temperature thresholds and eliminating the spread of disease.

When the recipient site will be receiving desert tortoises that will be moved less than 500 m from the point of collection and there are no barriers to impede natural desert tortoise movement between the project site and recipient site, health assessments of the resident desert tortoises should be conducted; however, no disease sampling via blood samples will be necessary. For monitoring purposes, if five or more desert tortoises will be translocated, an equal number of desert tortoises within the recipient site, and an equal number of control desert tortoises should be assigned a unique identifier (provided by USFWS) and be fitted with a transmitter by qualified personnel. If fewer than 5 desert tortoises will be translocated less than 500 m, only the translocated desert tortoises would be monitored.

When the recipient site will be receiving desert tortoises that will be moved greater than 500 m from the point of collection or there are barriers to impede natural dispersal between the project site and recipient site, health assessments of the resident desert tortoises should be conducted and the assessments must include disease testing via blood samples. The activity of the desert tortoise immune system dictates that blood samples be drawn between May 15 and October 31. The activity of the immune system generally corresponds to the active season of the desert tortoise, but desert tortoises are unlikely to be above ground when temperatures exceed 40°C (104°F), making them often unavailable for blood sampling during June through August.

7. Determine if desert tortoises on the project site will be held *in-* or *ex situ*. The translocation plan should identify which of the following interim holding/monitoring arrangements will be used for the desert tortoises on the project site. This step can be conducted concurrently with Step 6 and construction of fencing at the project site under Step 8. Regardless of the option selected, tortoises should be translocated within 18 months of collection.

If 10 or more desert tortoises are expected to be translocated, one of the forms of quarantine should be implemented while a disposition plan is prepared by the proponent and submitted to the USFWS and State wildlife agencies. Disposition plans should articulate the proposed fate of each desert tortoise (*i.e.*, translocated to recipient site or removed from population due to suspected disease) expected to be translocated and include the complete health assessment for each individual. Desert tortoises should not be moved prior to concurrence by the USFWS with the health assessments and disposition plans.

Either of the following options may be selected regardless of the distance tortoises are being moved:

Option 1: *Ex situ* monitoring – Construction of individual quarantine facilities off-site. Tortoises located during protocol clearance surveys (see Desert Tortoise Field Manual at website above) would be transferred to an off-site quarantine facility. The facility design, animal husbandry plan, and operating protocols should be developed by experienced personnel from an accredited American Zoological Association institution and be approved by USFWS and State wildlife agencies. Facilities should be constructed and managed to prevent tortoises from coming into contact with one another, exclude predators, provide ability for appropriate thermoregulation, and allow for necessary husbandry activities by a caretaker that is certified to conduct health assessments and administer care. If this option is selected, quarantine facilities should be constructed to avoid inadvertently capturing any resident desert tortoises within the enclosure. If suitable USFWS and State wildlife agency-approved facilities exist in the area, the project proponent may inquire with facility managers about temporary use; however, these opportunities are currently extremely limited.

Option 2: *In situ* monitoring – Monitoring desert tortoises on the project site via telemetry. As protocol clearance surveys are conducted, health assessments, including blood draws, assignment of unique identifiers (provided by USFWS), and affixing transmitters should be performed on each tortoise as it is located. Telemetry monitoring would then be conducted a minimum of once per month with more frequent monitoring under certain circumstances. Data to be collected will be standardized for all projects.

8. Construct project fencing, conduct protocol clearance surveys of the project site, and perform complete health assessments.

Component Specific

Perimeter Fence: Fence construction may be done during any season; however, any desert tortoises located during clearance surveys of the perimeter fence should be treated as translocatees and moved to the recipient site during the active season (generally between April 1 and May 31 or September 1 and October 15). If clearance of the perimeter fence is conducted outside of the desert tortoise active season, then any desert tortoises located along the alignment should be moved out of harm's way but to the inside of the perimeter fence (*i.e.*, onto the power plant site), be fitted with a transmitter, blocked into an artificial or empty natural burrow and monitored as described below.

Power Plant Site: Clearance surveys, appropriate health assessments, and subsequent translocation should be conducted during the active season.

Linear Facilities (*e.g.*, transmission and buried lines): Clearance surveys may be conducted during any season. Any desert tortoises found during clearance of linear facilities should be moved out of harm's way following clearance and handling procedures outlined in the current FWS Desert Tortoise Field Manual.

General

Any desert tortoises encountered during clearance of the power plant site or the perimeter fence should be given a health assessment prior to being moved to the translocation site or quarantine facility, regardless of the distance the desert tortoise is expected to be translocated. Health assessments for desert tortoises being moved greater than 500 m include blood tests. During the health assessment, desert tortoises will be assigned a unique identifier (provided by USFWS) and a transmitter will be attached for monitoring purposes. If the desert tortoise is being moved to a quarantine facility it will not be fitted with a transmitter until it leaves the quarantine facility. Modifications to marking procedures may be required for small desert tortoises.

Data collected during clearance surveys should include detailed information about the exact point of collection (UTMs from GPS, description of location, etc.) and will be standardized for all projects. For those desert tortoises that will be monitored *in situ*, these data should be collected again on the day of translocation from the project site. Each desert tortoise will be assigned a unique identifier (to be provided by USFWS), which will allow us to link each individual desert tortoise with data obtained during clearance surveys and subsequent health assessments.

The placement of the desert tortoises following the health assessments will depend on the translocation plan (*i.e.*, holding/monitoring option) approved under the incidental take permit or biological opinion. There are four potential outcomes for each desert tortoise:

a. Translocation on the day of collection if the total number of desert tortoises expected to be translocated is less than 10 (see above for translocation of 10 or more desert tortoises). This option may be used for desert tortoises being moved less than 500 m from the point of collection to lands contiguous with the project site (*i.e.*, no barriers to natural dispersal). These individuals do require complete health assessments, but do not require disease testing via blood samples.
b. Transfer of healthy desert tortoises to quarantine facility for holding (*ex situ*). Desert tortoises should not be held in the quarantine facilities for greater than 18 months.
c. Remain on-site for *in situ* monitoring until translocation, pending disease testing results and concurrence with results of complete health assessments (and disposition plan if 10 or more desert tortoises to be translocated). This option may be used for desert tortoises regardless of the distance to the translocation site.
d. Transfer to Desert Tortoise Conservation Center (DTCC) in Las Vegas, Nevada or another agency-approved facility. Transferring desert tortoises to the DTCC or other approved facility is only appropriate for individuals showing clinical signs of infection or have positive blood tests. (See criteria below.)

Health Assessments: Health assessments must be conducted by individuals approved and permitted by the USFWS and State wildlife agencies to conduct such assessments. Individuals should inquire with USFWS about opportunities to receive certification. Because of new health assessment standards and the need for standardized data, certification will not be granted solely on past experience. Training for performing health assessments and drawing blood is currently available at the DTCC on a first come, first served basis. Health assessment training will consist of a 5-day rotation at a cost of approximately $1500, and training for drawing blood will consist of a separate 5-day rotation at a cost of approximately $1800. Depending on one’s previous experience, the opportunity to test out of the respective modules may be available. After an individual has been certified to conduct health assessments and draw blood and has processed desert tortoises for a particular project, a veterinarian should verify the findings submitted by that individual to ensure proper placement of the desert tortoises.

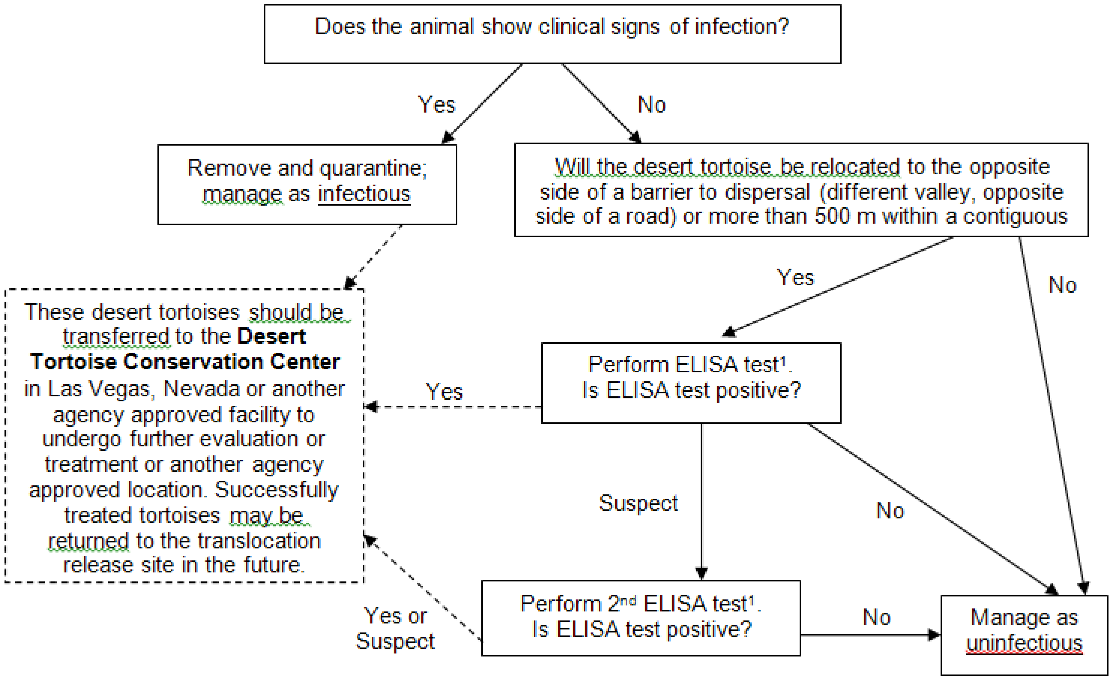
Health assessments will include a physical inspection (*i.e.*, notation of clinical signs of acute disease infection, body mass, and carapace measurements). The need to draw blood from desert tortoises within the project area depends on the presence or absence of clinical signs and the distance that desert tortoises will be translocated (see Step 8 and Table 1). See Pre-translocation disease screening decision tree (Figure 1) for specifics.

If a desert tortoise being monitored *in situ* has a positive blood test result, all desert tortoises with a negative blood test result within 500 m of the positive desert tortoise's initial and current locations should be retested in case they came into contact with the unhealthy individual while initial test results were pending. The desert tortoises showing clinical signs or test positive for disease will not be eligible for translocation and should be removed from the project site and sent to the DTCC or other agency-approved facility as described below.

9. Concurrence with results of complete health assessments and disposition plans and translocation of desert tortoise following results of disease testing. Once health assessments are complete and disease test results received, the disposition of each individual should be proposed and submitted to the USFWS and the State wildlife agencies for review and concurrence. A disposition plan should be submitted in all cases except when the total number of desert tortoises to be translocated is fewer than 10 **and** those desert tortoises are to be moved less than 500 m.

Desert tortoises deemed uninfectious according to the decision tree (*i.e.*, lack of clinical signs and show no antibodies to pathogens) and are of suitable body condition (standards to be provided by USFWS) may be translocated. Translocation should proceed to the selected recipient site(s) in a manner consistent with existing protocols, this guidance, and the project-specific translocation and monitoring plan. Some flexibility may exist for individual projects based on the time of year, local/regional weather patterns, actual weather conditions during the proposed release event, and condition of the donor and recipient sites (*e.g.*, degraded or recently burned). Translocations should occur in spring (April 1 through May 31), but fall (September 1 through October 15) may be considered. In addition, the following conditions should be met for translocation to proceed:

- Releases should occur when temperatures range from 18-30°C (65-85°F) and are not forecasted to exceed 32°C (90°F) within 3 hours of release or 35° (95°F) within 1 week of release. Additionally, forecasted daily low temperatures should not be cooler than 10° C (50°F) for one week post-release. Temperature thresholds for translocation differ from those for handling resident and control desert tortoises because translocated desert tortoises spend more time aboveground subsequent to release as they habituate to unfamiliar surroundings, increasing their susceptibility to stress factors such as temperature extremes.
- Release points for desert tortoises should be pre-selected during visits to the translocation site (configuration of release points is project-specific) and should be at least 2.5 km from any documented seropositive or clinically ill (showing outward signs of disease) resident desert tortoises.



[1]ELISA tests, as developed by the University of Florida, must be conducted for both *Mycoplasma agassizii* and *Mycoplasma testudineum*.

Figure 1. Pre-translocation decision tree.

- Desert tortoises should be transported to their release sites in clean, ventilated protective containers. If re-used, these containers must be disinfected using 10 percent household bleach or other solution approved by USFWS and the State wildlife agency before being used for another desert tortoise.
- Within 12 hours before release, all desert tortoises to be translocated should be hydrated according to existing protocols.
- Desert tortoises should be released at unoccupied shelter sites. Shelters include unoccupied soil burrows, spaces within rock outcrops, caliche caves, and the shade of shrubs.

Desert tortoises determined to be infectious or unhealthy should be sent to the DTCC or other agency-approved facility where they will undergo further assessment, treatment, and/or necropsy; some desert tortoises will be rehabilitated and potentially be eligible for subsequent release. Coordination with the USFWS, State wildlife agencies, and the DTCC should be initiated when clearance surveys commence to facilitate prompt transport of unhealthy desert tortoises, as necessary. The agencies and DTCC staff should be notified of the number of desert tortoises estimated to be removed from the project site to allow for advanced preparation at the DTCC. Project proponents will be charged a flat fee of $9,000 for each desert tortoise sent to the

DTCC commensurate with the cost to provide housing, care, treatment, and other services for 5 years ($3,000 for year 1, $1,500 for years 2 to 5). No additional funds will be requested from project proponents for desert tortoises remaining at the center after 5 years.

10. Implement post-translocation monitoring (5-yr minimum) and adaptive management to evaluate effectiveness of translocation as a take minimization measure. For projects that require translocation of five or more desert tortoises, monitoring will include an equal number of translocated desert tortoises, desert tortoises that are resident at recipient sites, and desert tortoises at control sites. For example, if six desert tortoises are to be translocated, six resident, and six control desert tortoises should also be monitored at even sex ratios (regardless of whether or not the group of translocatees has an even sex ratio), if possible. In situations where fewer resident desert tortoises exist at the recipient site than translocatees being added (likely in targeted depleted areas), all residents should be monitored. For projects that expect to translocate fewer than five desert tortoises, monitoring will include translocatees only.

Frequency of Monitoring: Monitoring refers to pinpointing the exact location of the desert tortoise and attempting to view it without disturbance unless entrapment or a scheduled body condition assessment requires handling.

Desert tortoises confined to an artificial or empty burrow during perimeter fence construction should be monitored as follows:

- Once a day during first week;
- once a week for the following three weeks; then
- twice per month until the clearance survey is conducted.

Translocated desert tortoises should be monitored as follows:

- Once within 24 hours of release; and
- a minimum of twice weekly for the first two weeks after release; and
- a minimum of once a week from March through early November for the 5-year monitoring period; and
- once every other week from November through February starting after the third week of release and for the duration of the 5-year monitoring period.

Resident and control desert tortoises should be monitored for the 5-year monitoring period as follows:

- A minimum of once a week from March through early November; and
- A minimum of once every other week from November through February.

Assessments of condition (*i.e.*, measurements of body mass and carapace, health assessment, calculation of body condition) should be conducted during each year of monitoring; one assessment prior to and one assessment subsequent to over-wintering. Any health problems observed (*e.g.*, rapid declines in body condition, perceived outbreaks of disease, mortality events) should be reported to the USFWS and State wildlife agency such that appropriate actions can be taken in a timely manner. Mortalities should be investigated as thoroughly as possible. Information on health concerns and mortalities, including desert tortoise unique identifier, location, and cause of death (if determined) should be provided to USFWS and State wildlife agency upon discovery (verbally within 48 hours or via email within 5 business days). Fresh carcasses should be submitted for necropsy (details to be provided during project planning and coordination with USFWS) and the cost covered by the proponent.

In addition to monitoring the desert tortoises, we recommend that vegetation transects at representative sampling locations within the recipient site be repeated annually to capture potential changes in habitat characteristics. At a minimum, monitoring of the annual species component is recommended to identify changes in forage diversity and availability. The USFWS will provide additional guidance to project proponents on appropriate methods of vegetation monitoring and sampling during the planning process.

Explicit triggers for implementation of adaptive management will be project specific and developed through coordination with USFWS and State wildlife agencies, as appropriate.

11. Compile and synthesize data throughout duration of translocation. Findings and recommendations will be submitted to appropriate wildlife and/or permitting agencies. The USFWS will provide standardized data fields and database format for use by project proponents; reporting requirements will be determined during the planning process with the appropriate land management and regulatory agencies and incorporated into associated permits and/or biological opinions.

Upon conclusion of the 5-year monitoring period, health assessments should be performed on all remaining monitored desert tortoises and transmitters should remain attached until the USFWS and State wildlife agencies have determined whether or not further action is warranted at the site.

Literature Cited

Desert Tortoise Recovery Office. In prep. Translocation of Desert Tortoises (Mojave Population) from Project Sites: A Technical Paper. Prepared in support of the USFWS's desert tortoise translocation guidance. Reno, Nevada.

Table 1. Desert tortoise translocation components at a glance based on the number of desert tortoises expected to be translocated and the distance they will be moved. If the number of desert tortoises to be translocated is 10 or more, regardless of the distance they will be moved, the desert tortoises should be held and monitored on- or off-site while a disposition plan is prepared and approved by USFWS.

	# of dt <5; moving < 500m	# of dt <5; moving > 500m	# of dt ≥ 5; moving < 500m	# of dt ≥ 5; moving > 500m
Translocatees: health assessment without blood test	X		X	
Translocatees: health assessment with blood test		X		X
Recipient site required	X	X	X	X
Recipient site density surveys required	X	X	X	X
Recipient desert tortoises: health assessment without blood test	X		X	
Recipient desert tortoises: health assessment with blood test		X		X
Control site required			X	X
Control desert tortoises: health assessment with blood test			X	X
Monitoring of translocatees	X	X	X	X
Monitoring of residents			X	X
Monitoring of controls			X	X

PREPARING FOR ANY ACTION THAT MAY OCCUR WITHIN THE RANGE OF THE MOJAVE DESERT TORTOISE (*Gopherus agassizii*)

The Mojave population of the desert tortoise (*Gopherus agassizii*) was listed by the U.S. Fish and Wildlife Service (USFWS) as threatened on April 2, 1990 (USFWS 1990). Subsequently, proposed actions within the range of the desert tortoise fall under purview of the Endangered Species Act 1973, as amended (ESA), in addition to State regulations. For detailed information on the ecology of the Mojave desert tortoise, please see USFWS (2010).

This protocol provides recommendations for survey methodology to determine presence/absence and abundance of desert tortoises for projects within the range of the species and a standard method for reporting survey results. Information gathered from these procedures will: 1) help determine the appropriate level of consultation with USFWS and the appropriate state agency; 2) help determine the amount of incidental take of desert tortoises resulting from proposed projects as defined by the ESA and appropriate state laws; and 3) help minimize and avoid take.

This guidance includes:

- Site Assessment
- Pre-project Field Survey Protocol for Potential Desert Tortoise Habitats
- USFWS 2010 Desert Tortoise Pre-project Survey Data Sheet

This guidance is subject to revision as new information becomes available. Before initiating the protocols described below, please check with your local USFWS and appropriate state agency office to verify that you are implementing the most up-to-date methods. To ensure quality and reduce the likelihood of nonconcurrence with survey results, we recommend that the names and qualifications of the surveyors be provided to USFWS and appropriate state agency for review prior to initiating surveys.

In Arizona:

U.S. Fish and Wildlife Service
Arizona Ecological Services
323 N. Leroux St., Suite 201
Flagstaff, AZ 86001
(928) 226-0614

In California, for Inyo, Kern, Los Angeles, and San Bernardino Counties:

U.S. Fish and Wildlife Service
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003
(805) 644-1766

In California, for Imperial and Riverside Counties, and Joshua Tree National Park and the San Bernardino National Forest in San Bernardino Co:

U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road
Carlsbad, California 92009
(760) 431-9440

In Nevada:

U.S. Fish and Wildlife Service
Nevada Fish and Wildlife Office
4701 North Torrey Pines Drive
Las Vegas, Nevada 89130
(702) 515-5230

In Utah:

U.S. Fish and Wildlife Service
Utah Ecological Services Field Office
2369 West Orton Circle
West Valley City, Utah 84119
(801) 975-3330

State Agencies

Arizona Game & Fish Department
State Headquarters--Nongame Branch
5000 W. Carefree Highway
Phoenix, AZ 85086
623-236-7767

California Department of Fish and Game (CDFG)
For Kern County:
Central Region Headquarters Office
1234 E. Shaw Avenue
Fresno, CA 93710
(559) 243-4005 ext. 151

For Imperial, Inyo, Riverside and San Bernardino Counties:
Inland Deserts Regional Office
3602 Inland Empire Boulevard, Suite C-220
Ontario, CA 91764
(909) 484-0167

For Los Angeles County:
South Coast Regional Office
4949 Viewridge Avenue
San Diego, CA 92123
(858) 467-4201

Nevada: Department of Wildlife:
Southern Region
4747 Vegas Dr.
Las Vegas, NV 89108
(702) 486-5127

Utah Division of Wildlife Resources:
Southern Region
1470 N Airport Rd
Cedar City, UT 84720
(435) 865-6100

Site Assessment

Use the key below to assess if desert tortoises may be present within or near the action area and determine survey and consultation requirements. The **action area** is defined by regulation as all areas to be affected directly or indirectly and not merely the immediate area involved in the action (50 CFR §402.02). The extent of the action area is not limited to the "footprint" of the action nor is it limited by the authority of the Federal, state, or local agency or any other entity proposing the project; it can and will vary accordingly with each proposed action. The environmental baseline, the analysis of the effects of the action, and the amount or extent of incidental take are based upon the action area. If you cannot access the entire action area during your surveys for some reason (e.g. access to private property is unavailable), please note that in your survey report.

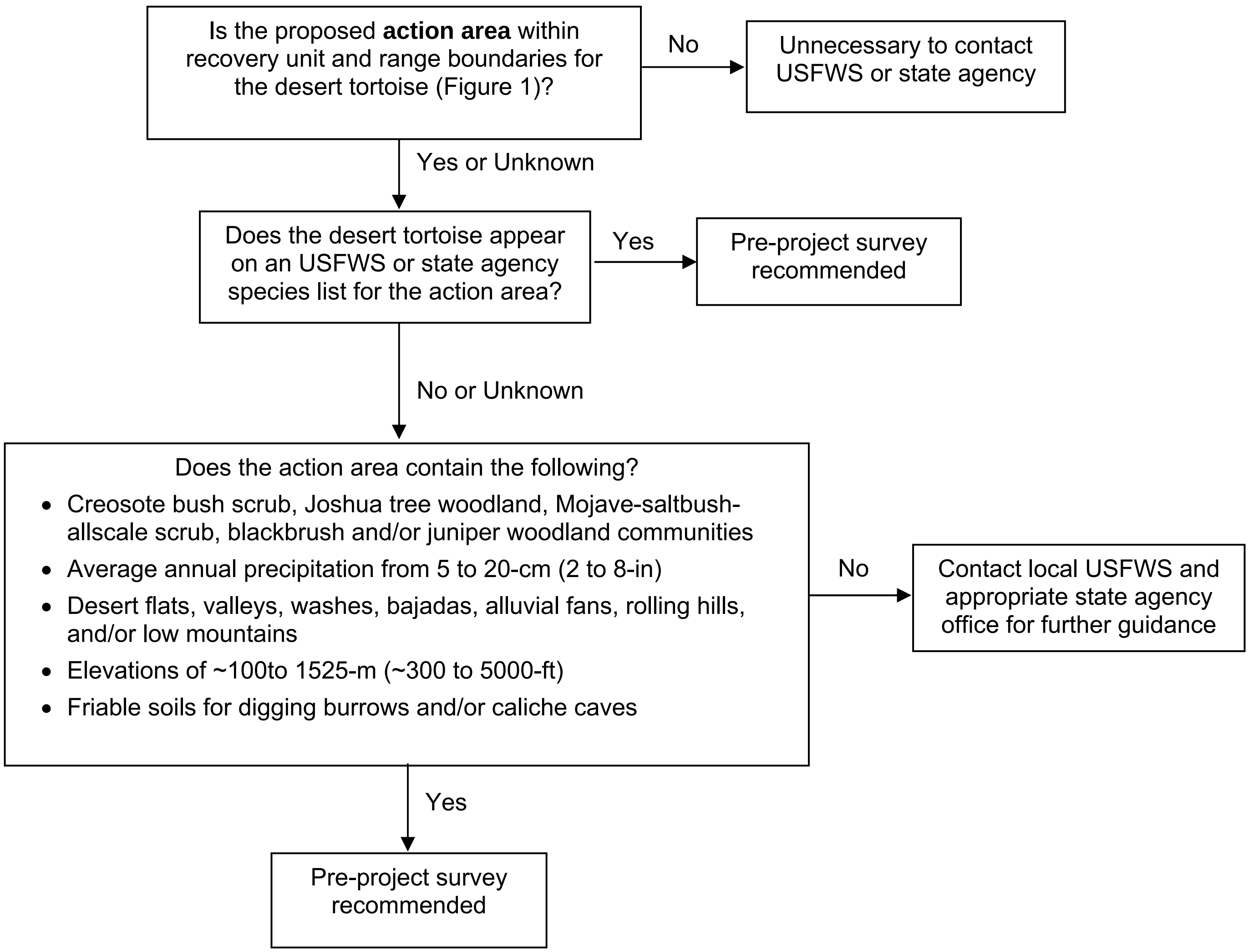


Figure 1. Known range of the desert tortoise (Mojave Population) shown as USGS desert tortoise habitat potential model (Nussear et al. 2009). Boundaries of 2010 revised recovery units are shown, with the North-East Mojave Recovery Unit, split into north and south (as in Table 2).

Pre-project Field Survey Protocol for Potential Desert Tortoise Habitats

Objectives of survey

- Determine presence or absence of desert tortoises within the action area
- Estimate the number of tortoises (abundance) within the action area
- Assess the distribution of tortoises within the action area to inform take avoidance and minimization

See *Frequently Asked Questions* for further definition and discussion of the action area.

Field Methods

This protocol takes into account the fact that not all tortoises within the action area are seen by the surveyor. The following equation accounts for tortoises that are below ground at the time of surveys and for above-ground tortoises that are cryptic and may be missed and should be used to estimate the number of tortoises within the actions area for both 100% coverage and probabilistic sampling.

$$\left(\begin{array}{c}\text{Estimated number of tortoises}\\ \text{within action area}\end{array}\right)=\frac{\left(\begin{array}{c}\text{Number of tortoises}\\ \text{observed above ground}\end{array}\right)}{\left(\begin{array}{c}\text{Probability that}\\ \text{a tortoise is}\\ \text{above ground }(P_a)\end{array}\right)\left(\begin{array}{c}\text{Probability of}\\ \text{detecting a tortoise,}\\ \text{if above ground }(P_d)\end{array}\right)}\left(\frac{\text{Size of action area}}{\text{Size of area surveyed}}\right)$$

- Information to determine presence/absence *and* estimate number of tortoises within the action area is collected during the same survey effort. Surveyed objects include all tortoises that are above ground (both out of burrows and within burrows but still visible), as well as all tortoise sign (burrows, scats, carcasses, etc). Record all locations of tortoises and sign using the USFWS 2010 Desert Tortoise Pre-Project Survey Data Sheet (attached). Please submit a copy of the original datasheets with results of the survey to the local USFWS office within 30 days of survey completion.
- If the action area is large (e.g., 16 hectares [40 acres]) or the project could affect more than 2 or 3 tortoises, surveys should be conducted during the tortoise's most active periods [April through May or September through October when air temperatures are below 40°C (104°F)] (Zimmerman et al. 1994; Frielich et al. 2000; Walde et al. 2003; Nussear and Tracy 2007; Inman 2008). Air temperature is measured ~5-cm from the soil surface in an area of full sun, but in the shade of the observer. Surveys outside these periods may be approved by the local USFWS office when only presence/absence needs to be determined.
- Ten-meter (~30-ft) wide belt transects should be used during surveys. For all projects, surveys which cover the entire project area with the 10-m belt transects (100% coverage) are always an acceptable option. For very large action areas, probabilistic sampling may also be an option, such that the appropriate proportion of the action area is surveyed (Table 2). If probabilistic sampling is an option for the project site, each transect should be chosen either systematically or randomly ensuring that the entire action area has an equal probability of being included in the sample. Transects should be completed in a random order, oriented in a logistically convenient pattern (e.g., lines, squares, or triangles). Any sampling design other than simple systematic or random sampling (e.g. stratification) must be approved by USFWS and appropriate state agency. See *Frequently Asked Questions* for further discussion of 100% coverage and probabilistic sampling.
- USFWS considers the results of a pre-project survey to be valid for no more than one year. If survey results are older than one year, please contact the local USFWS office.

Presence or absence of desert tortoises within the project vicinity

- o Occurrence of *either* live tortoises or tortoise sign (burrows, scats, and carcasses) in the action area indicates desert tortoise presence. If either live tortoises or tortoise sign are observed in the action area, contact the USFWS to determine the best manner in which to comply with the Federal Endangered Species Act.
- o If neither tortoises nor sign are encountered during the action area surveys and the project, or any portion of project, is ≤ 0.8 k^{m2} (200 acres) or linear, three additional 10-m (~30-ft) belt transects at 200-m (~655-ft) intervals parallel to and/or encircling the project area perimeter (200-m, 400-m, and 600-m from the perimeter of the project site) should be surveyed. These transects are only for the presence/absence determination; they are not included in the estimation of tortoise abundance. See *Frequently Asked Questions* for an explanation of why additional surveys are needed.
- o If neither tortoises nor sign are encountered during the action area surveys, as well as project perimeter surveys where appropriate, please contact your local USFWS office. This will allow the USFWS to advise you on how best to demonstrate compliance with the Endangered Species Act. Also contact the responsible state agency to determine compliance with State laws.

Number of tortoises within the action area

The attached Table 3 spreadsheet will estimate the number of adult tortoises (>160 mm MCL) within the action area using the “Number of tortoises within the action area” equation from above.

Enter the requested information into the Table 3 spreadsheet, as follows:

1. Enter the area of the total project.
2. Enter the appropriate value from Table 1 for the term “probability that a tortoise is above ground” (P_a).
3. Enter the number of adult tortoises (>160-mm midline carapace length) found during the survey of the action area for the term “number of tortoises observed above ground” (n).

Table 1. Probability that a desert tortoise is above ground (P_a) relative to the previous winter’s rainfall (October through March)

Use amount of rainfall from the winter preceding the pre-project survey to determine which value of P_a *is appropriate for the project*

To find this amount of rainfall, go to the Western Regional Climate Center site: http://www.wrcc.dri.edu/summary/Climsmsca.html; click on your location and scroll down to “monthly totals”

Previous Winter Rain	Probability (P_a)	Variance(P_a)
<40 mm (~1.5 inches)	0.64	0.08
≥40 mm (~1.5 inches)	0.80	0.05

The estimate for the term “probability of detecting a tortoise if above ground (P_d)” is already included in spreadsheet Table 3 (P_d = 0.63; variance = 0.011). See *Frequently Asked Questions* section below for how P_a and P_d and their associated variances were estimated.

See *Appendix 1* for a detailed description of the method used to estimate desert tortoise abundance.

100% Coverage or Probabilistic Sampling?

100% coverage surveys are always an acceptable option, regardless of the size of the action area. For very large action areas, probabilistic sampling may be an additional option, such that the appropriate proportion of the action area is surveyed as detailed below. Use the boundaries in Figure 1 and numbers provided in Table 2 to determine if probabilistic sampling could be an appropriate option for the proposed action area.

For the 2010 field season, probabilistic sampling may not be an option for desert tortoise pre-project surveys in California due to the requirement of CESA to avoid, minimize, and fully mitigate (CDFG code section 2081). Please contact your local CDFG office (see contact info on page 2).

Table 2. Is probabilistic sampling an appropriate option for the proposed action area?

Is your action area smaller than the area given below for the recovery unit in which the project occurs?

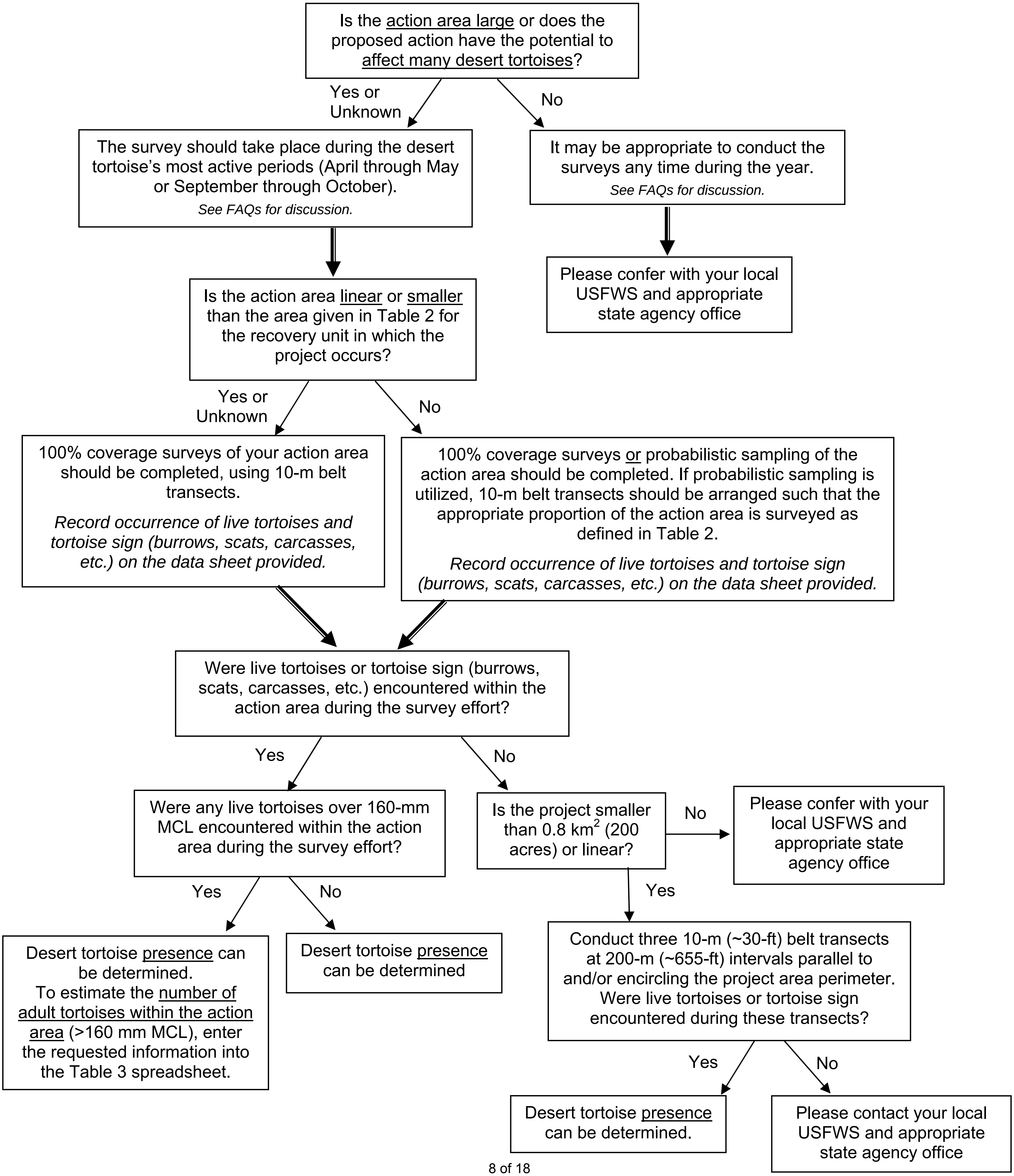
Recovery Unit	Threshold Action Area to Allow Sampling
Western Mojave	4.3 km^2 (1,066 acres)
Colorado Desert	3.3 km^2 (811 acres)
North-East Mojave: North	11.3 km^2 (2,789 acres)
North-East Mojave: South	4.5 km^2 (1,103 acres)
Upper Virgin River	1.1 km^2 (270 acres)

If yes: 100% coverage surveys of your action area must be completed.

If no, total transect lengths that must be surveyed are given below. 100% coverage surveys are also an option, regardless of the size of the project.

Recovery Unit	Total Transect Length (km) to Sample
Western Mojave	431
Colorado Desert	328
North-East Mojave: North	1,129
North-East Mojave: South	446
Upper Virgin River	109

DECISION TREE FOR PRE-PROJECT FIELD SURVEY PROTOCOL FOR POTENTIAL DESERT TORTOISE HABITATS



FREQUENTLY ASKED QUESTIONS: DESERT TORTOISE PRE-PROJECT FIELD SURVEY PROTOCOL

Why did USFWS revise the 1992 USFWS Desert Tortoise Pre-project Survey Protocol?

The 2010 protocol uses the best available science on the desert tortoise to determine presence and abundance. Desert tortoises occur at low densities across most of the Mojave Desert (USFWS 2006). They are cryptic and spend much of their time underground in burrows (Burge 1977; Nagy and Medica 1986; Bulova 1994) and therefore not all animals within an area will be seen by even the best trained surveyors. Tortoises underground in burrows, as well as individuals hidden above ground, need to be included in estimates of abundance.

The 1992 USFWS Desert Tortoise Pre-project Survey protocol was based on a Bureau of Land Management protocol from the mid-1970s, which utilized the best available information at the time, but did not take into account that some tortoises will be underground and missed during the survey effort. The data collected during the USFWS range-wide monitoring program (currently >7,000-km of transects each year; USFWS 2006) have allowed us to improve pre-project survey methods for estimating abundance. Data about the proportion of tortoises underground in burrows, as well as the probability that an above-ground tortoise greater than 160 mm MCL will be observed by the surveyor are included in the estimate of the number of tortoises within the action area (P_a and P_d).

This revised protocol also addresses the potential for using probabilistic sampling when the action area is larger than size limits given in Table 2. 100% coverage surveys are *always* an acceptable option, regardless of size of the action area. For very large action areas, sampling may be an additional option, such that the abundance estimate can be calculated when an appropriate proportion of the action area is surveyed. Estimates of tortoise densities within recovery units have been used to calculate how many km^2 of a project site must be surveyed to produce a statistically robust abundance estimate (Table 2).

Why did you make the change to recommend that the "action area" should be surveyed, as opposed to the "project area? How do I determine the action area?

We recommend that the action area be surveyed to better reflect the scope of an action that USFWS is required to review under the authorities of the Endangered Species Act. When USFWS is considering whether desert tortoises may be affected by a proposed action, we cannot limit our evaluation to the actual footprint of the proposed action; we have to consider all areas that may be affected directly or indirectly by the action. We call this the "action area," which is defined by the implementing regulations for section 7(a)(2) of the Endangered Species Act (50 *Code of Federal Regulations* 402.02), as "areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." (Non-federal actions for which a project proponent has requested an incidental take permit under the authority of section 10(a)(1)(B) of the Endangered Species Act also require consideration of the effects within the action area.)

You can determine the action area by thinking about all components of the proposed action plus desert tortoise ecology, and then calculating the area that may be affected. For example, the proposed action is a 10-acre mine site located adjacent to I-15. From the Harvard Road exit, haul trucks would pull immediately into the mine site. The action area in this case would be the 10-acre mine site. We would not include I-15 in the action area because traffic associated with the mine would not measurably change traffic volume on the freeway.

If the mine operator proposes to conduct blasting activities at the site, the action area includes areas to be affected directly or indirectly by the blasting. If debris moved by the blast, noise, or vibrations would extend beyond the boundaries of the mine site, the area affected by the blasting would become part of the action area. In this case, the delineation of the action area is less than precise; we suggest that you discuss the issue with the project proponent to assess the area that may be affected by the blasting.

As a third example, if the mine site is located 5 miles from Interstate 15 and is accessed by a lightly travelled unpaved road, this unpaved road between the freeway and the mine is part of the action area. We suggest that the access road be treated as a linear project. The road bed itself would not need to be surveyed unless it is so degraded that tortoises would possibly use it for burrowing or shelter; otherwise, place the first transect so that it extends from the edge of the road into the desert, with the second and third transects placed as described in the decision tree. If a new road needs to be built, we recommend that the guidance for a linear project be followed.

If the action area encompasses restricted access private lands, survey the areas for which access is available and note the inaccessible areas in the report. If anything about habitat conditions on the inaccessible areas can be determined (e.g., they support the same type of habitat, are more or less disturbed, etc.), also note that in the report.

What happened to the zone of influence transects recommended in the 1992 protocol?

This revised protocol requires that the entire action area, rather than just the project footprint, be included in the survey effort. The action area provides a more realistic view of where desert tortoises may be affected by the proposed action.

Why is it important to survey during the active period when the action area is large or the proposed action has the potential to affect more than 2 or 3 desert tortoises?

In these cases, USFWS needs more information than just presence/absence to conduct our analyses and determine the extent of the effects on the desert tortoise; we also need a robust estimate of the number of tortoises within the project area, particularly for large projects that involve translocating tortoises >5 km or <5 km. The most expedient way to estimate abundance for tortoises is to conduct surveys when tortoises are most active, when the estimates of the number of tortoises below ground and of the number of tortoises missed during the survey are applicable. As mentioned above, these calculations have been developed from analyses of years of survey data. Abundance estimates will also be useful to the project proponent and lead agencies because it would allow them to conduct their own analyses and assess potential costs of proceeding with the proposed action in this location. The ESA's implementing regulations 50CFR 402 require federal agencies to use the best scientific information which can be obtained during the consultation process, and USFWS to specify the amount or extent of incidental take. Therefore, we have developed this estimate of abundance to comply with these regulations.

What factors does the Service take into consideration when reviewing the results of surveys that are conducted outside the active period?

Surveys outside the active period may be appropriate when only presence/absence is necessary or when the project area is small and only very few tortoises are likely present. We base our determination of whether the results are valid on a whole suite of factors, including but not limited to the type and condition of habitat, the general location of the survey area, the experience of the surveyors, the time and weather when the survey was conducted, the nature of the year in which the survey occurred (i.e., if it rained a lot, desert tortoises are likely to have been active and are more likely to have left evidence of their presence), how much time surveyors spent at the site, and whether they were conducting a focused survey for tortoises or looking for a suite of biological and/or cultural resources. We consider these factors in combination to determine whether the surveyors were likely to have found whatever evidence that desert tortoises were present. Depending on the factors that are present during a survey, the results are more or less likely to represent the true status of the tortoise in that specific area.

What if the pre-project survey was negative (i.e., no desert tortoises or sign) and then a desert tortoise or sign is detected during implementation of the proposed project?

If a tortoise or tortoise sign (shells, bones, scutes, limbs, burrows, pallets, scats, egg shell fragments, tracks, courtship rings, drinking sites, mineral licks, etc.) is found in the action area during implementation of the proposed project, we recommend that all activities that could result in the take of a desert tortoise cease *immediately* and that the USFWS and responsible State agency be contacted. USFWS would need to determine the necessary actions to comply with the ESA; the responsible State agencies would also need to review the situation to ensure their laws are not violated. Please notify the USFWS and appropriate state agency as soon as possible as well as in writing within three days of the discovery. If we determine that desert tortoises are indeed present on site, we would have very limited options for allowing the proposed action to proceed in short order. Consequently, we stress the importance of following USFWS guidance and ensuring that qualified workers conduct the surveys.

How did USFWS determine the values for the "probability that a tortoise is above ground"?

The USFWS range-wide monitoring program estimated the proportion of the desert tortoise population that is visible using telemetered animals from focal areas in spring 2001-2005 (USFWS 2006). This probability is related to the previous winter's rainfall, as illustrated in Table 1. The range of fall above-ground activity is similar to spring numbers, but the variability is much higher (Nussear and Tracy 2007; Inman 2008). Until more robust estimates of fall above-ground activity are available, spring estimates based on the previous winter's rainfall (October through March) are used for surveys conducted in either active period.

How did USFWS establish the value for the "probability of detecting a tortoise, if above ground"?

For the past 5 years, surveyors in the USFWS range-wide monitoring program have undergone training on established transects with artificial tortoises. Trained surveyors detected an average of ~63% of model tortoises that were within 5 m of either side of the transect center-line (USFWS unpublished).

Why are only tortoises over 160-mm MCL used to estimate the number of tortoises within the action area?

The values of P_a and P_d used in the equation to estimate the number of tortoises within the action area are based on USFWS range-wide monitoring data collected for adult tortoises ≥160-mm MCL. Live tortoises of all sizes and tortoise sign are used to determine if tortoises are present within the action are.

What is the purpose of 100% coverage surveys versus probabilistic sampling?

The purpose of surveying is to determine presence/absence and estimate the abundance of desert tortoises within the action area. For 100% coverage surveys, transects are placed across the entire action area; thus, the entire area for which abundance is estimated is surveyed. A probabilistic sampling approach, on the other hand, uses data from randomly or systematically placed transects to draw inferences about locations where surveys are not conducted. All locations for which abundance will be estimated *must* have an equal probability of being included in the sample.

How were the threshold project sizes calculated for determining whether 100% coverage or probabilistic sampling is appropriate?

The validity of probabilistic sampling requires that all locations for which abundance will be estimated have an equal probability of being included in the sample, as well as a minimum expected sample size. Estimating the number of tortoises within the project area using probabilistic sampling is limited by number of tortoises encountered during the survey effort. Therefore, whether or not the project area must be surveyed using 100% coverage or can be probabilistically sampled is based on the area expected to yield a survey count of 20 tortoises (Krzysik 2002). Table 2 uses tortoise densities and detection probabilities estimated from 2004-2009 range-wide line-distance sampling efforts for each tortoise recovery unit (USFWS unpublished) to calculate that area of a project site that must be surveyed to produce a statistically robust estimate. If the project area is large enough to potentially allow probabilistic sampling, Table 2 provides the minimum transect kilometers (10-m wide) that must be surveyed.

What if the minimum length of 10-m wide transect kilometers are completed but 20 tortoises were not found in the action area?

If probabilistic sampling is used and <20 tortoises are found after surveying the total area prescribed by Table 2, the number of tortoises within the action area may be estimated using the number found.

Do I keep surveying if 20 tortoises are found before the minimum transect kilometers that must be surveyed are completed?

If probabilistic sampling was used and the transects have been completed in a random order, project-area surveys may be considered complete when 20 tortoises have been found or the specified number of kilometers have been sampled, whichever happens first. It is okay (even desirable) if more that 20 tortoises are found; this will decrease the width of the confidence interval for the abundance estimate.

Why do small and linear projects where no tortoises were found have to do additional surveys at 200-m (~655-ft) intervals parallel to the project area perimeter?

Even though neither tortoises nor tortoise sign were found within the action area at the time of the survey, the area may be part of an animal's home range. The annual home range of a female desert tortoise averages around 0.15 to 0.16 km^2 (35 to 40 acres), about one third the size of male home ranges, which are variable and can be >2 km^2 (500 acres; O'Conner et al. 1994; Duda et al. 1999; Harless et al. 2009). Therefore, projects that are ≤0.8 km^2 (200 acres) or linear may overlap only part of a tortoise's annual home range and the possibility that a resident tortoise was outside the project area at the time surveys were conducted must be addressed. In these cases, three additional 10-m (~30-ft) belt transects at 200-m (~655-ft) intervals parallel to and/or encircling the project area perimeter (200-m, 400-m, and 600-m from the perimeter of the project site) should be completed. Record any tortoises or sign encountered during these surveys. These transects are only used for the presence/absence determination; they are not included in the estimation of tortoise abundance within the project area.

What does the 95% confidence interval for the number of tortoises within the action area mean?

Confidence intervals are used to indicate the reliability of an estimate. The interval gives an estimated range of values, calculated from a set of sample data, which will include an unknown population parameter (in this case, the true number of tortoises within the action area) at the specified rate (e.g., 95%). A wider confidence interval indicates that less certainty is associated with the estimate (see Appendix 2). The Table 3 spreadsheet calculates the abundance and associated 95% confidence interval for the estimated number of tortoises within the project area (Buckland et al. 2001).

Acknowledgments

The USFWS Desert Tortoise Recovery Office is grateful to the many individuals and agencies that were instrumental in development and review of this revised protocol. Specifically, we thank Jim Nichols (USGS) and Tony Krzysik (Prescott Audubon Society) for assistance with concept design; Alice Karl (independent tortoise biologist) and Andrew Thompson (USFWS) for development discussion, and Lisa Benvenuti (Redlands Institute) for GIS support.

This protocol has undergone extensive review. We would like to thank the 2009/2010 USFWS desert tortoise coordination group (Ashleigh Blackford, Ray Bransfield, Michael Burroughs, Renee Chi, Brian Croft, Tannika Engelhard, Jody Fraser, Judy Hohman, Brian Novosak, Pete Sorenson, Leilani Takano, and Brian Wooldridge) for thoughts and suggestions. We would also like to thank Bob Steidl (University of Arizona), Kathy Ralls (Smithsonian National Zoo), Alice Karl (independent tortoise biologist), Ed LaRue (Circle Mountain Biological Consultants), Bill Boarman (Conservation Science Research & Consulting), Phil Medica (USGS), Paulette Conrad (NDOW), Steve Ferrand (Nevada Biological Consulting), and the California Department of Fish and Game (including Kim Nicol, Julie Vance, Scott Flint, and Becky Jones) for insightful comments on the document.

Literature Cited

Anderson, D.R. and K.P. Burham. 1996. A monitoring program for the desert tortoise. Report to the Desert Tortoise Management Oversight Group. 15pp.

Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers, and L. Thomas. 2001. Introduction to Distance Sampling: Estimating Abundance of Biological Populations. Oxford University Press, Oxford. 432pp.

Bulova, S.J. 1994. Patterns of burrow use by desert tortoises: gender differences and seasonal trends. Herpetological Monographs 8:133-143.

Burge, B.L. 1977. Daily and seasonal behavior, and areas utilized by the desert tortoise, *Gopherus agassizii*, in southern Nevada. Proceedings of the Desert Tortoise Council Symposium 1977:59-94.

Duda, J.J., A.J. Krzysik, and J.E. Freilich. 1999. Effects of drought on desert tortoise movement and activity. The Journal of Wildlife Management 63:1181-1192.

Freilich, J.E., K.P Burnham, C.M. Collins, and C.A. Garry. 2000. Factors affecting population assessments of desert tortoises. Conservation Biology 14:1479-1489.

Germano, D.J., R.B. Bury, T.C. Esque, T.H. Fritz, and P.A. Medica. 1994. Range and habitats of the desert tortoise. Pages 73-84 in R.B. Bury and D.J. Germano, eds. Biology of North American Tortoises. National Biology Survey Technical Report Series, Fish and Wildlife Research 13.

Harless, M.L., A.D. Walde, D.K. Delaney, L.L. Pater, W.K. Hayes. 2009. Home range, spatial overlap, and burrow use of the desert tortoise in the West Mojave Desert. Copeia 2009: 378-389.

Inman, R.D. 2008. How elusive behavior and climate influence the precision of density estimate of desert tortoise populations. Master of Science in Biology Thesis. University of Nevada, Reno.

Krzysik, A.J. 2002. A landscape sampling protocol for estimating distribution and density patterns of desert tortoises at multiple spatial scales. Chelonian Conservation and Biology 4:366-379.

Nagy, K.A., and P.A. Medica. 1986. Physiological ecology of desert tortoises. Herpetologica 42:73-92.

Nussear, K.E. and C.R. Tracy. 2007. Can modeling improve estimation of desert tortoise population densities? Ecological Applications 17:579–586.

Nussear, K.E., T.C. Esque, R.D. Inman, L. Gass, K.A. Thomas, C.S.A. Wallace, J.B. Blainey, D.M. Miller, and R.H. Webb. 2009. Modeling habitat of the desert tortoise (*Gopherus agassizii*) in the Mojave and parts of the Sonoran deserts of California, Nevada, Utah, and Arizona. U.S. Geological Survey Open-file Report 2009-1102. 18 pp.

O'Connor, M.P., L.C. Zimmerman, D.E. Ruby, S.J. Bulova, and J.R. Spotila. 1994. Home range size and movement by desert tortoises, *Gopherus agassizii*, in the eastern Mojave Desert. Herpetological Monographs 8:60-71.

U.S. Fish and Wildlife Service. 1990. Endangered and threatened wildlife and plants; determination of threatened status for the Mojave population of the desert tortoise. Federal Register 55 FR 12178-12191.

U.S. Fish and Wildlife Service. 2006. Range-wide monitoring of the Mojave population of the desert tortoise: 2001-2005 summary report. Report by the Desert Tortoise Recovery Office, U.S. Fish and Wildlife Service, Reno, Nevada. 85pp.

U.S. Fish and Wildlife Service. 2010. Draft Revised Recovery Plan for the Mojave Population of the Desert Tortoise (Gopherus agassizii). U.S. Fish and Wildlife Service Region 8, Sacramento, California.

Walde, A.D., L. Bol, D.K. Delaney, and L.L. Pater. 2003. The desert tortoise: a preliminary analysis of operative and environmental temperatures. A Report by the Construction Engineering Research Laboratory to the U.S. Fish and Wildlife Service. 18 pp.

Zimmerman, L.C., M.P. O'Connor, S.J. Bulova, J.R. Spotila, S.J. Kemp, and C.J. Salice. 1994. Thermal ecology of desert tortoise in the Eastern Mojave Desert: seasonal patterns of operative and body temperatures, and microhabitat utilization. Herpetological Monographs 8:45-59.

Appendix 1. Detailed description of desert tortoise abundance and CI estimation

The estimated abundance of adult desert tortoises within the action area is given by:

$$\begin{pmatrix}\text{Estimated number of tortoises}\\ \text{within action area}\end{pmatrix} = \frac{\begin{pmatrix}\text{Number of tortoises}\\ \text{observed above ground}\end{pmatrix}}{\begin{pmatrix}\text{Probability that}\\ \text{a tortoise is}\\ \text{above ground}\end{pmatrix}\begin{pmatrix}\text{Probability of}\\ \text{detecting a tortoise,}\\ \text{if above ground}\end{pmatrix}}\begin{pmatrix}\dfrac{\text{Size of action area}}{\text{Size of area surveyed}}\end{pmatrix}$$

,

which is equivalent to:

$$\hat{N} = \left[\frac{(n)}{(Table2)(0.63)}\right]\left[\frac{(A)}{(a)}\right],$$

where $\hat{N}$ = estimated abundance within entire action area, n = number of tortoises observed above ground, A = total action area, and a = size of actual area surveyed (= total # km surveyed * 0.01). For 100% coverage surveys, A/a = 1.

Table 3 uses the following equations to calculate the 95% confidence interval for the estimate of tortoise abundance within the action area (Buckland et al. 2001), assuming all replicate transect lines are the same length, 10-km.

$$\hat{\text{var}}(n) = L\sum_{i=1}^{k} l_i\left(\frac{n_i}{l_i} - \frac{n}{L}\right)^2 / (k-1)$$

where $\hat{\text{var}}(n)$ = the spatial variation in the number of tortoises detected through the total transect length L, n_i = the number of tortoises seen on transect i, l_i = the length of individual transect i, and k = total number of transects walked.

Putting the sources of variability together, the variance of density is:

$$\text{var}\,\hat{D} = \hat{D}^2\left[\frac{\text{var}(n)}{n^2} + \frac{\text{var}(\hat{P}_a)}{(\hat{P}_a)^2} + \frac{\text{var}(\hat{P}_d)}{(\hat{P}_d)^2}\right]$$

Because the tortoise density sampling distribution is positively skewed, the confidence interval is calculated using a log-distribution for density and built with division and multiplication, rather than addition and subtraction from the mean as with a symmetrical interval (Buckland et al. 2001).

Thus, the 95% confidence interval for $\hat{N}$ is:

$$\left(\hat{N}/C_N, \hat{N}\cdot C_N\right),$$

where $C_N = \exp\left[z_\alpha\sqrt{\text{var}(\log_e \hat{D})}\right]$ and $\text{var}(\log_e \hat{D}) = \log_e\left[1 + \dfrac{\text{var}(\hat{D})}{\hat{D}^2}\right]$.

Given the simplifying assumptions in this protocol, the 95% confidence interval around the estimated number of tortoises within the action area will be wide (e.g., the estimate of the number of tortoises will be imprecise). While this level of imprecision would not be appropriate for recovery planning and decision making at large scales, this protocol provides estimates at local scales that most efficiently utilize the best information that is available to provide statistically defensible results.

Appendix 2. Example

Project location = near Beatty, NV (within the Eastern Mojave RU)

Action area = 12 km^2 (3,000 acres)

According to this protocol's Site Assessment key, the proposed action is within the known range of the desert tortoise. The local USFWS and appropriate state agency offices were contacted and a species list, which includes the desert tortoise, was obtained for the action area. Therefore, pre-project survey and consultation are necessary.

The project footprint is only 10 km^2, but since the project will include blasting, the reach of the proposed action on listed species extends to 12 km^2. Thus, the action area (and therefore the area which needs to be surveyed for desert tortoises) is 12 km^2 (which is more inclusive than the 10 km^2 project footprint).

According to Table 2 of the pre-project survey protocol, the project size of 12 km^2 is above the threshold project area to allow probabilistic sampling in the Western Mojave RU (10.8 km^2 threshold). Therefore, at a minimum, 1,083 km of transects must be walked. For this example, 108 10-km transects (10-m wide) were placed systematically across the project site and were completed in a random order. Surveys of 100% coverage in which 10-m wide transects were placed across the entire 12 km^2 action area would also have been acceptable.

Transects totaling 1,083 km were conducted and 19 adult tortoises (> 160 mm carapace length) were found (as well as tortoise sign, both of which were catalogued using the USFWS 2010 DT pre-project survey protocol data sheet). If 20 adult tortoises had been encountered before the 1,083 km of transects were completed, and transects were conducted in a random order, then surveys could have been considered complete after the 20th tortoise was catalogued.

Data collected from the108 transects (live animals encountered <160-mm MCL)

Number of tortoises (n_i)	Number of transects on which n_i tortoises were seen
0	93
1	11
2	4

Using the Western Regional Climate Center website, it was determined that the Beatty area had received 97-mm (3.8 inches) of rain in the October through March preceding the survey effort, which is above the 40-mm (1.5 inches) in Table 1. Therefore, P_a of 0.80 will be used in this estimation.

Thus, from

$\hat{N} = \left[\frac{(n)}{(Table2)(0.63)}\right]\left[\frac{(A)}{(a)}\right]$, we get $\hat{N} = \left[\frac{(19)}{(0.80)(0.63)}\right]\left[\frac{(12\,\text{km}^2)}{(10.8\,\text{km}^2)}\right]$, or $\hat{N} = \sim 42$ tortoises

$\text{Density} = \frac{(\hat{N})}{(A)}$, we get $\hat{D} = \frac{(42)}{(12\,\text{km}^2)}$, or $\hat{D} = \sim 3.5$ tortoises/km^2

To calculate the 95% confidence interval for our abundance estimate, we use:

$$\hat{\text{var}}(n) = L\sum_{i=1}^{k} l_i \left(\frac{n_i}{l_i} - \frac{n}{L}\right)^2 / (k-1),$$

we get $\hat{\text{var}}(19) = 1080\left[(93)(10)\left(\frac{0}{10} - \frac{19}{1080}\right)^2 + (11)(10)\left(\frac{1}{10} - \frac{19}{1080}\right)^2 + (4)(10)\left(\frac{2}{10} - \frac{19}{1080}\right)^2\right] / (108-1)$, or

$\hat{\text{var}}(19) = 23.88$

And for,

$\text{var}\,\hat{D} = \hat{D}^2\left[\frac{\text{var}(n)}{n^2} + \frac{\text{var}(\hat{P}_a)}{(\hat{P}_a)^2} + \frac{\text{var}(\hat{P}_d)}{(\hat{P}_d)^2}\right]$, we get $\text{var}\,\hat{D} = 3.5^2\left[\frac{23.88}{19^2} + \frac{0.05}{0.80^2} + \frac{0.011}{0.63^2}\right]$, or $\text{var}\,\hat{D} = 2.107$

Using our log-transformation because the tortoise density sampling distribution is positively skewed,

$\text{var}(\log_e \hat{D}) = \log_e\left[1 + \frac{\text{var}(\hat{D})}{\hat{D}^2}\right]$, we get $\text{var}(\log_e \hat{D}) = \log_e\left[1 + \frac{2.107}{3.5^2}\right]$, or $\text{var}(\log_e \hat{D}) = 0.15$

Then,

$C_N = \exp\left[z_\alpha \sqrt{\text{var}(\log_e \hat{D})}\right]$, we get $C_N = \exp\left[(1.96)\sqrt{0.15}\right]$, or $C_N = 2.18$

And,

$\left(\hat{N}/C_N, \hat{N}\cdot C_N\right)$, we get $\left((42/2.18), (42\cdot 2.18)\right)$, or ~$(19, 92)$.

Summary

Using the Site Assessment key, it was determined that survey and consultation were necessary for the proposed action. Thus, the pre-project field survey protocol was implemented. In this case, probabilistic sampling with equal length transects (10-km long) was used and 19 adult tortoises and tortoise sign were found during the sampling of the action area, indicating presence. Using the equations and data presented in Appendix 1 of this protocol, Table 3 estimated the actual number of tortoises within the project was estimated to be ~42, with a 95% confidence interval of ~(19, 92).

USFWS 2010 DESERT TORTOISE PRE-PROJECT SURVEY DATA SHEET

Please submit a completed copy to the action agency and local USFWS office within 30-days of survey completion

Date of survey: ________________ Survey biologist(s): ______________________________
(day, month, year) (name, email, and phone number)

Site description: ____
(project name and size; general location)

County:____________________ Quad:____________________ Location:____________________
(UTM coordinates, lat-long, and/or TRS; map datum)

Circle one: 100% coverage or Sampling Area size to be surveyed: __________ Transect #: ____ Transect length: _______

GPS Start-point: ______________________ ______________________ Start time: ____________am/pm
(easting, northing, elevation in meters)

GPS End-point: ____ End time: ____________am/pm
(easting, northing, elevation in meters)

Start Temp: _______ºC End Temp: _______ºC

Live Tortoises

Detection number	GPS location Easting	Northing	Time	Tortoise location (*in burrow*: all of tortoise beneath plane of burrow opening, or *not in burrow*)	Approx MCL >160-mm? (*Yes, No or Unknown*)	Existing tag # and color, if present
1						
2						
3						
4						
5						
6						
7						
8						

Tortoise Sign (burrows, scats, carcasses, etc)

Detection number	GPS location Easting	Northing	Type of sign (*burrows, scats, carcass, etc*)	Description and comments
1				
2				
3				
4				
5				
6				
7				
8				

Page: _____of______

Transect number: ______

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

IN REPLY REFER TO:
81440-2010-TA-0267

April 26, 2009

Memorandum

To: District Manager, California Desert District, Bureau of Land Management, Moreno Valley, California

From: Field Supervisor, Ventura Fish and Wildlife Office, Ventura, California

Subject: Draft Biological Opinion on BrightSource Energy's Ivanpah Solar Electric Generating System Project, San Bernardino County, California [CACA-48668, 49502, 49503, 49504] (8-8-10-F-24)

We are providing, for your review and comment, a draft of the biological opinion for the Ivanpah Solar Electric Generating System Project. We based this draft document on the information provided by you and your staff, and other information available in our files. We would appreciate your review of the document in its entirety with emphasis on the description of the proposed action, incidental take statement, and reasonable and prudent measures. Please provide comments to our office within 10 days to facilitate completion of the final biological opinion in a timely manner.

We appreciate the cooperation your staff has provided during development of this biological opinion, and we look forward to working with you to finalize this consultation. If you have any questions, please contact Brian Croft of my staff at (951) 697-5365.

Attachment

Memorandum

To: District Manager, California Desert District, Bureau of Land Management, Moreno Valley, California

From: Field Supervisor, Ventura Fish and Wildlife Office, Ventura, California

Subject: Biological Opinion on BrightSource Energy's Ivanpah Solar Electric Generating System Project, San Bernardino County, California [CACA-48668, 49502, 49503, 49504] (8-8-10-F-24)

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the Bureau of Land Management's (Bureau) proposed issuance of a right-of-way grant to BrightSource Energy for the Ivanpah Solar Electric Generating System (ISEGS) and its effects on the federally threatened desert tortoise (*Gopherus agassizii*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). The proposed project involves construction, operation, maintenance, and decommissioning of a 370-megawatt solar thermal power plant and associated infrastructure and facilities on 3,520 acres of public land managed by the Bureau. Your December 7, 2009 request for formal consultation was received on December 8, 2009.

This biological opinion is based on information that accompanied your December 7, 2009 request for consultation and additional information regarding changes in the project description, obtained from Bureau staff during the formal consultation process. This information includes the biological assessment (CH2MHill 2009a), revised biological assessment (CH2MHill 2010), draft environmental impact statement and final staff assessment (Bureau and California Energy Commission 2009), desert tortoise survey report for the project site (CH2MHill 2008a), biological survey report for the proposed desert tortoise translocation areas (SNEI 2009), desert tortoise translocation plan (CH2MHill 2009b), the management plan for common ravens (CH2MHill 2008b), project site reclamation plan (CH2MHill 2009c), and the site plan for management of weeds (CH2MHill 2008c). A complete administrative record of this consultation is on file in the Ventura Fish and Wildlife Office.

Construction, operation, maintenance, and decommissioning of the ISEGs facility do not require activities that would adversely affect the primary constituent elements of critical habitat for the desert tortoise. Therefore, we do not address critical habitat in this biological opinion.

Consultation History

On December 7, 2009, the Bureau initiated consultation for construction, operation, maintenance, and decommissioning of the ISEGS facility. Following public comment on the Bureau's draft environmental impact statement and the California Energy Commission's final staff assessment, BrightSource modified its project to reduce adverse effects to desert tortoises and rare plant species. The Bureau developed a supplemental document for its final environmental impact statement to describe the changes in the project description. This biological opinion analyzes the effects associated with the reduced project footprint.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Introduction

BrightSource Energy is proposing to construct and operate a solar energy plant approximately 4.5 miles southwest of Primm, Nevada and 1.6 miles west of Ivanpah Dry Lake. The proposed site is 0.5 mile west of the Primm Valley Golf Club. The facility would consist of 3 solar electric generating plants, constructed over a 4-year period as follows: 1) Phase 1 – construction of the Ivanpah 1 plant (southernmost site; 914 acres), construction of shared facilities (i.e., power substation, administrative facilities, water line, power lines, and construction logistics area), and improvement of Colosseum Road ; (2) Phase 2 – construction of the Ivanpah 2 plant (middle site; 1,097 acres); and (3) Phase 3 – construction of the Ivanpah 3 plant (northern site; 1,227 acres). BrightSource Energy would also install a 5.7-mile natural gas distribution line, install a 9.5-mile fiber optic line, and re-route several dirt roads/trails that currently cross the proposed ISEGS site. We summarized the description of the proposed action from your request for consultation and the biological assessment (CH2MHill 2009a).

Construction

Construction of the ISEGS facility would require an average workforce of 474 and a peak workforce of 959. Below, we have provided a detailed description of each stage of project development for the three project sites, the construction logistics area, and other associated infrastructure (i.e., access roads, water wells, water line, gas line and tie-in facility, fiber optic line, etc.).

Construction Logistics Area

BrightSource would develop a construction logistics area (CLA) between the Ivanpah 1 and 2 project sites to accommodate construction support facilities (e.g., temporary construction trailers, construction tool sheds, construction lay down areas, and construction parking), the electrical tie-in substation, water wells, permanent facility parking areas, permanent administrative and warehouse facilities, and wheel wash areas. In addition, the CLA would accommodate a segment of Colosseum Road that BrightSource would re-route through the CLA to avoid the Ivanpah 2 project site.

CLA development would begin with surveying and staking the CLA boundaries and grading of a 10-foot-wide perimeter road along the boundary of the CLA to facilitate fence installation. BrightSource would then install an 8-foot high chain-link security fence with desert tortoise exclusion fencing attached to the bottom around the perimeter of the CLA. All site development and construction activities described for the CLA would occur within this fenced boundary. This includes grading of selected locations and construction or installation of all construction support facilities and permanent operational facilities.

Ivanpah 1, Ivanpah 2, and Ivanpah 3 Project Sites

Each project site would consist of one heliostat (mirror) array constructed around a 459-foot-tall centralized solar power tower. Ivanpah 1 would contain approximately 53,500 heliostats and Ivanpah 2 and 3 would contain approximately 60,000 heliostats each. Each heliostat consists of two 75.8-square-foot mirrors. All three units (Ivanpah 1, 2, and 3) would have their own individual power block; the biological assessment describes the components of the power blocks.

Prior to site development and construction activities for each phase, BrightSource would install a security and desert tortoise exclusion fence around the entire perimeter of the project site. BrightSource would use the same methods described above for the CLA in installation of this fence. Following fence installation, BrightSource would mow all vegetation on the project sites to within 12 to 18 inches of the ground surface, grade a site for the power block, and grade additional areas within the project site for parking areas, construction lay down areas, building pads, and internal roads. During the construction stage, BrightSource would improve internal project-site roads, establish wheel-washing stations, construct the power block, install the heliostat field, install underground piping and wiring, install the generation tie-line, and erect fabrication shops and other construction and administrative buildings. In addition, BrightSource would re-route existing dirt roads/trails around the perimeter of the project site.

Gas Line

In addition to the CLA and the three project sites, BrightSource would construct a 5.7-mile natural gas distribution pipeline. The pipeline would connect to the Kern River Gas Transmission line that traverses Ivanpah Valley 0.5 mile north of the Ivanpah 3 project site. At the point of connection with the Kern River Gas Transmission line, BrightSource would construct a permanent gas metering station (100 feet by 150 feet), requiring a 200-foot by 200-foot temporary construction area. From this metering station, the natural gas line and an 8- to 12-foot-wide access road would head south along the western edge of Ivanpah 3 to a metering station (10 feet by 40 feet) near its southeast corner. From the metering station at Ivanpah 3, the gas line and access road would continue along the eastern edge of Ivanpah 2 to another metering station (20 feet by 40 feet) on the southeast corner of Ivanpah 2. From the Ivanpah 2 metering station, the gas line would be located under or adjacent to the 30-foot-wide paved access road that goes from Colosseum Road to Ivanpah 1. Gas line installation would require a 50-foot-wide construction corridor for access, storage of excavated soil, and pipefitting. In addition, construction of the Ivanpah 3 metering station would require a temporary lay down area within the Ivanpah 3 project site. Ivanpah 1 and 2 metering stations would use a portion of the CLA for construction lay down.

To allow for gas company access, BrightSource would construct the gas line, access road, and metering stations outside of the fenced project sites for Ivanpah 1 and 2. The gas line from the Ivanpah 2 metering station to the Ivanpah 1 project site would be located within the fenced CLA. BrightSource would construct additional spur lines within the fenced project sites to carry gas from the edge of the respective project site to the main power block.

Construction activities related to the metering stations would include grading a pad and installing aboveground and underground gas piping, metering equipment, gas conditioning, pressure regulation, and pigging facilities. The construction contractor would determine which method to use to install the natural gas pipeline. The most common method of pipeline construction includes installation of the pipeline into an open trench approximately 36 inches wide and 3 to 10 feet deep.

Fiber-optic Line

To allow for remote monitoring of the new electrical substation, Southern California Edison (SCE) would construct an 8-mile fiber optic line from the Ivanpah substation to an interface point designated by the local telecommunication carrier in Mountain Pass. SCE would use existing distribution line poles for installation. Installation would require use of a bucket truck, four people, and two pick-up trucks. SCE would string out fiber optic cable between the existing poles. Every 10,000 to 20,000 feet, SCE would establish a 40-foot by 60-foot line stringing set. Crews would work within this area to raise the cable and string it tight over the existing poles. SCE estimates that approximately 20 poles are not accessible from the existing dirt service roads. Workers on foot would install the fiber optic line on these poles.

Operation

The ISEGS facility would have an operating life of up to 45 years and would operate 7 days a week for up to 14 hours a day. During operation, approximately 90 full-time employees would work at the site. ISEGS would use a maximum of 100 acre-feet of water per year for operational purposes. Heliostat washing is the only identified activity that we have described in this section because it is the only operational activity with the potential to have some effects on desert tortoise.

To keep heliostats clean, BrightSource would wash some portion of the heliostat field on a nightly basis, so that every heliostat within the 3 project sites is washed once every 2 weeks. The application rate per heliostat would be 2.5 gallons per washing for a total use of 10.97 acre-feet per year for Ivanpah 1 and 2 and 20.75 acre-feet per year for Ivanpah 3. However, the application rate on Ivanpah 1 may double during construction on Ivanpah 3 due to increased amounts of construction- related dust. During each washing, approximately 0.17 gallon would run off onto the ground beneath the mirror.

Maintenance

In addition to regular, day-to-day operation of the ISEGS facility, BrightSource would need to perform a variety of maintenance actions on facilities outside of the fenced portions of the ISEGS facility (e.g., natural gas pipeline, water wells, water pipelines, access roads, and project perimeter fence). BrightSource has grouped these anticipated maintenance activities into three classes.

Class I activities are those maintenance actions that do not result in new surface disturbance. BrightSource would perform these activities by hand or with the use of tools, equipment, and/or vehicles. Class I activities would take place on existing structures or would be staged from existing roads or other disturbed areas. These activities would not include off-road travel. Vehicles used during these activities might include low-boy tractor and trailer, flat bed, utility trucks, forklifts, scissor lifts, cherry pickers, and mechanical hoists. Labor may involve several workers confined to the area in need of maintenance. BrightSource may need to perform these activities on a daily basis.

Class II activities would result in minimal surface disturbance, but would likely require heavy earth moving equipment including motor graders, bulldozers, front-end loaders, backhoes, water trucks, asphalt pavers, and dump trucks. Typical Class II activities would include: 1) underground utility (e.g., water, gas, sewage, electrical, communication, etc.) repairs, upgrades and tie-ins to structures; 2) motor grading and repairs of existing dirt roads, shoulders, and berms; 3) cut or fill of soil surface to re-establish appropriate cover due to soil erosion after rainfall events; 4) maintenance of drainages, fords and culverts for proper flow of water runoff; 5) maintenance of asphalt roads, shoulders and parking lots; 6) security and desert tortoise exclusion fence repairs; and 7) minor natural gas pipeline repairs that require excavation.

Class III includes maintenance activities that result in major surface disturbance. Typical Class III activities would include: 1) installation of a new underground pipeline a distance of 1,000 feet or more and 2) disturbance of an acre or more for construction of new storm water drainage features.

Decommissioning and Restoration

BrightSource would perform restoration work on all sites disturbed during construction, operation, maintenance, and decommissioning of the ISEGS facilities. For temporary disturbances, BrightSource would begin restoration following completion of ground disturbance and would implement the following general steps: 1) decompaction of soils, 2) spreading of topsoil salvaged prior to construction, and 3) seeding of the disturbed area with native plant species. BrightSource would time seeding to avoid drought periods to the extent possible.

Decommissioning of the facility would occur sequentially in the order of construction, with Ivanpah 1, followed by Ivanpah 2, Ivanpah 3, and the shared facilities (e.g., CLA, etc.). Following decommissioning of the ISEGS facility, BrightSource would remove all structures from the project area and begin restoration of all long-term disturbances. Decommissioning and restoration/reclamation would involve the following general activities: 1) rehabilitate access roads by removing asphalt, decompacting soil, and revegetating, 2) remove all physical components of the generation facility except for the SCE substation, 3) re-contour and decompact soils associated with disturbed areas, 4) implement revegetation procedures using native species, 5) remove all exclusion and security fencing, and 5) monitor revegetated areas for success and control non-native weeds.

Minimization Measures

General Protective Measures

To minimize adverse effects to the desert tortoise, BrightSource will implement the following protective measures during construction, operation, maintenance, and decommissioning activities. We have changed the wording of some measures, but we have not changed the substance of the measures that BrightSource has proposed.

1. BrightSource will employ authorized biologists, approved by the Service, and desert tortoise monitors to ensure compliance with protective measures for the desert tortoise. Use of authorized biologists and desert tortoise monitors will be in accordance with the most up-to-date Service guidance and will be required for monitoring of any construction, operation, or maintenance activities that may result in take of the desert tortoise. The current guidance is entitled *Desert Tortoise – Authorized Biologist and Monitor Responsibilities and Qualifications* (Service 2008a).

2. BrightSource will provide the credentials of all individuals seeking approval as authorized biologists to the Bureau. The Bureau will review these and provide the credentials of appropriate individuals to the Service for approval at least 30 days prior to the time they must be in the field.

3. BrightSource will designate a field contact representative who will oversee compliance with protective measures during construction, operation, maintenance, and decommissioning activities that may result in injury or mortality of desert tortoises. If the field contact representative, authorized biologist, or desert tortoise monitor identifies a violation of the desert tortoise protective measures, they will halt work until the violation is corrected.

4. Individuals approved to handle desert tortoises (i.e., authorized biologists and supervised desert tortoise monitors) will do so in compliance with the most up-to-date guidance from the Service. The Service is currently using the *Desert Tortoise Field Manual* (Service 2009a).

5. BrightSource will develop and implement an environmental awareness program for all workers (construction, operation, maintenance, and decommissioning) that will address

the following: a) types of construction activities that may affect the desert tortoise, b) the required desert tortoise protective measures, c) desert tortoise life history and threats, d) legal protections and penalties, and e) reporting requirements.

6. Bright Source will fence the boundaries of the Ivanpah 1, 2, and 3 project sites, the CLA, and Colosseum Road and clear these areas of all desert tortoises prior to construction. We have provided a description of the procedures for clearance, translocation, and monitoring of these animals below.

7. Authorized biologists will perform clearance surveys of unfenced work areas outside of the main project sites and CLA (e.g., gas distribution line, utility right-of way, etc.) immediately prior to the onset of construction, operation, or maintenance activities.

8. BrightSource will employ an appropriate number of authorized biologists and desert tortoise monitors to monitor construction, operation, maintenance, and decommissioning activities that occur in any unfenced work areas. Authorized biologists or desert tortoise monitors will flag all desert tortoise burrows for avoidance in areas adjacent to construction work areas.

9. BrightSource will confine all construction activities, project vehicles, and equipment within the delineated boundaries of construction areas that authorized biologists or designated desert tortoise monitors have identified and cleared of desert tortoises. BrightSource will confine all work areas to the smallest practical area, considering topography, placement of facilities, location of burrows, public health and safety, and other limiting factors. BrightSource will use previously disturbed areas to the extent feasible.

10. Any non-emergency expansion of activities into areas outside of the areas considered in this biological opinion will require Bureau approval and desert tortoise clearance surveys. These expanded activities may require re-initiation of consultation with the Service.

11. BrightSource will prohibit project personnel from driving off road or performing ground-disturbing activities outside of designated areas during construction, operation, maintenance, or decommissioning except to deal with emergencies.

12. During operation and maintenance activities at the completed project site, BrightSource will confine all vehicle parking, material stockpiles, and construction related materials to the permanently fenced project sites and CLA.

13. BrightSource will restrict project-related access to Colosseum Road for construction, operation, maintenance, and decommissioning of the facility. BrightSource will permanently fence this road with desert tortoise exclusion fencing prior to the onset of construction. To reduce the potential for vehicle strikes of desert tortoise on unfenced access roads (i.e., gas line road, fiber optic right-of-way road, etc.), BrightSource will

enforce a 20-mile-per-hour speed limit for project related travel (i.e., construction, operation, maintenance, and decommissioning) in these areas. BrightSource will post speed limit signs along all access routes.

14. With the exception of security personnel, BrightSource will prohibit firearms on the project site.

15. Project personnel who are working outside fenced areas will check under vehicles or equipment before moving them. If project personnel encounter a desert tortoise, they will contact an authorized biologist. The desert tortoise will be allowed to move a safe distance away prior to moving the vehicle. Alternatively, an authorized biologist may move the desert tortoise to a safe location to allow for movement of the vehicle.

16. An authorized biologist or desert tortoise monitor will inspect all excavations that are not within desert tortoise exclusion fencing on a regular basis (several times per day) and immediately prior to filling of the excavation. If project personnel discover a desert tortoise in an open trench, an authorized biologist will move it to a safe location. BrightSource will cover or temporarily fence excavations that are outside of the permanently fenced project areas at the end of each day to prevent entrapment of desert tortoises during non-work hours.

17. When outside of the fenced project areas, project personnel will not move construction pipes greater than 3 inches in diameter if they are stored less than 8 inches above the ground until they have inspected the pipes to determine the presence of desert tortoises. As an alternative, BrightSource may cap all such structures before storing them outside of fenced area.

Management of Common Ravens

BrightSource will implement the following project design features and protective measures to reduce the adverse effects associated with predation of desert tortoises by common ravens (*Corvus corax*). The draft management plan for common ravens (CH2MHill 2008b) contains more detailed information on the following actions:

1. BrightSource will contain all organic and inorganic trash associated with the project in secure, self-closing receptacles to prevent the introduction of subsidized food resources for common ravens.

2. BrightSource will promptly remove and dispose of all road-killed animals on the project site or its access roads.

3. BrightSource will use water for construction, operation, maintenance, and decommissioning (e.g., truck washing, dust suppression, heliostat washing, landscaping, etc.) in a manner that does not result in puddling.

4. BrightSource will use a closed 250,000-gallon tank to store water for all project site water needs to eliminate an open water source for common ravens.

5. BrightSource will cover detention basins and drying beds associated with boiler commissioning and emergency outfalls with netting or metal grating. BrightSource will not use storm-water detention basins in its project design.

6. BrightSource will install generation tie-lines on utility poles designed to be incompatible with nesting of common ravens in accordance with Avian Power Line Interaction Committee guidelines (2006) and will monitor the effectiveness of these deterrence measures. BrightSource will implement alternative measures if the current effort is unsuccessful.

7. All transmission lines associated with the ISEGS facility will be designed in a manner that will reduce the likelihood of nesting by common ravens. BrightSource will monitor all utility lines and other potential nesting structures and remove common raven nests that it identifies following authorization by the Bureau and the Service.

8. BrightSource will monitor the ISEGS facilities to identify frequently used perching locations for common ravens. If it identifies such locations, BrightSource will install bird barrier spikes or other functional equivalent following specific discussion with the Bureau and the Service.

9. BrightSource will coordinate with the Bureau and the Service to implement or fund hazing or lethal removal of problem common ravens. Problem common ravens are individuals that have been shown to prey on desert tortoises through monitoring.

10. BrightSource will monitor the effectiveness of its management plan for common ravens during all 3 phases of construction and for 2 years following completion of the final phase. BrightSource will implement adaptive management measures if monitoring shows that the management plan is not effective in controlling common raven use of the project site. BrightSource will consult with the Bureau and the Service prior to implementing adaptive management changes.

Weed Management

BrightSource will implement the following weed management measures to reduce adverse effects to desert tortoises and their habitat during construction operation and maintenance of the ISEGS facilities:

1. BrightSource will designate an environmental compliance manager to provide oversight of construction practices and ensure compliance with weed management provisions.

2. BrightSource will provide training to all project personnel that will include the following:

a) plant identification, b) impacts of noxious weeds on native vegetation, wildlife, and fire activity, and c) required measures to prevent the spread of noxious weeds on the site.

3. During construction, BrightSource will perform daily inspections of all construction areas, access routes, and equipment cleaning facilities for the presence of noxious weeds and weed seed. Following the completion of construction activities, BrightSource will continue monitoring according to the following schedule: 1) once a month during the first 2 years of the revegetation, 2) quarterly for the third and fourth years, and 3) semi-annually for year 5 through 10.

4. During operation of completed facilities, BrightSource will perform general site monitoring and perform weed control at least every other week during the growing season (March through August) and once a month during the remainder of the year. Weed control will consist of physical control methods (e.g., hand pulling, hoeing, etc.) and herbicide application.

5. BrightSource will apply all herbicides used in weed treatments according to a plan approved by the Bureau and in accordance with the herbicide labels. BrightSource will only use qualified individuals for herbicide application and will suspend herbicide use when any of the following conditions are met: a) wind velocity exceeds 6 miles per hour during application of liquids or 15 miles per hour during application of granular herbicides, b) snow or ice covers the foliage of noxious weeds, c) precipitation is occurring or is imminent, or d) air temperatures exceed 90 degrees Fahrenheit.

6. BrightSource will monitor all locations of weed treatment to ensure that treatments are effective.

7. BrightSource will limit disturbance areas during construction to the minimal required to perform work and will only use defined routes when accessing work areas.

8. BrightSource will use vehicle wash and inspection stations and closely monitor all material brought onto the site to minimize the potential for weed introductions.

9. BrightSource will identify and flag all areas of noxious weed infestation and minimize use of these areas by project personnel until weed treatment of the area has occurred.

10. BrightSource will not import soil to the ISEGS project site and ensure that all materials used for sediment barriers and landscaping mulch are from a source that has been certified to provide weed-free materials.

11. BrightSource will preferentially perform native seed collection for restoration work from areas adjacent to the project site. When it is necessary to use native seeds from commercial vendors, BrightSource will only accept seed that is free of non-native weed seeds.

Desert Tortoise Translocation

Fencing and Clearance Surveys

To minimize adverse effects to the desert tortoise, BrightSource will fence the boundary of the Ivanpah 1, 2, and 3 project sites, the CLA, and Colosseum Road from the Primm Golf Club to the CLA with desert tortoise exclusion fencing. BrightSource will install desert tortoise guards, as described in attachment B of the biological assessment (CH2MHill 2009a), at gated entries to prevent desert tortoises from gaining entry to the project sites or CLA. BrightSource will also fence the construction area for the utility right-of-way (e.g., gas distribution line) with temporary desert tortoise fencing prior to clearance surveys and ground disturbance.

Within 24 hours prior to the initiation of construction of the desert tortoise-exclusion fence, BrightSource will conduct two complete desert tortoise clearance surveys of the proposed fence line and associated disturbance right-of-way. During these surveys, an authorized biologist will inspect all burrows to determine occupancy and collapse all unoccupied burrows. To the extent feasible, BrightSource will make modifications in fence line alignment to fence occupied burrows out of the ISEGS project areas. If the fence line cannot avoid a given desert tortoise burrow, an authorized biologist will remove the individual and place it in a sheltered location outside of the ISEGS project areas.

Following construction of the desert tortoise exclusion fence around a given portion of the ISEGS projects site (i.e., Ivanpah 1, 2, and 3 project sites, the CLA, or Colosseum Road), BrightSource will perform a full clearance survey of the fenced area during the spring (i.e., April to May) or fall (i.e., late August to mid-October). Authorized biologists and supervised desert tortoise monitors will conduct at least 3 complete clearance sweeps over the entire project site with transects no wider than 30 feet. Surveyors will conduct transects for each sweep in different directions to allow for opposing angles of observation. BrightSource will consider the site clear after two complete passes have discovered no new desert tortoises. Authorized biologists will excavate all potential desert tortoise burrows by hand to confirm occupancy status. BrightSource will collect data on all desert tortoises handled and examine all individuals for clinical signs of disease. A detailed list of data that BrightSource will collect on each desert tortoise is provided in its translocation plan.

Translocation

In the translocation plan that BrightSource developed for this project, translocation is defined as movement of desert tortoises more than 3,280 feet and relocation as movement of desert tortoises a distance shorter than that. These definitions were based on Service guidance at the time. The Service is currently referring to all movement of desert tortoises as translocation regardless of the distance. Consequently, in this biological opinion, we have used the term translocation exclusively. Because the areas identified as translocation and relocation areas in BrightSource's plan overlap, we have discussed these areas as a whole and referred to them as the translocation areas throughout the document.

Prior to clearance of the project site, BrightSource will fence Interstate 15 between Nipton Road and Yates Well Road to prevent mortality of translocated desert tortoises that may attempt to enter the roadway. An authorized biologist will move all desert tortoises found during clearance surveys to pre-selected, unoccupied, natural, or artificial burrows outside the fenced site that are the same size and orientation as the original burrow. Desert tortoise translocation will occur to the west of the project site to avoid placing desert tortoises on land proposed for development by another solar company. The new burrow will be at least 300 feet from the outside of the permanently fenced sites and will be of similar size, shape, and orientation to the original burrow.

Authorized biologists will preferentially place desert tortoises in safe locations that are within 3,280 feet of their collection location on the project site, with consideration for the 300-foot buffer described above. If this criterion cannot be met for a given desert tortoise, an authorized biologist will move this individual to a pre-selected translocation area west of the project site. BrightSource will maintain a record of all desert tortoises encountered and translocated during project surveys and monitoring. The record will include the following information for each desert tortoise: the location (narrative, vegetation type, and maps) and dates of observations; burrow data; general conditions and health; measurements; any apparent injuries and state of healing; if moved, the location from which it was captured and the location in which it was released; whether animals voided their bladders; and diagnostic markings (i.e., identification numbers).

BrightSource has proposed one translocation site for each ISEGS project site and one reserve site to use in the event that the Service does not approve one of the first three sites. Each proposed translocation area is approximately 124 acres in size. Prior to clearance surveys on a given project site (i.e., Ivanpah 1, 2, or 3, or the CLA), BrightSource will survey the proposed translocation area closest to that project site to collect the following information: 1) data on habitat characteristics that can be used to compare the proposed translocation sites to the project sites, 2) density and distribution of resident desert tortoises on each translocation site, 3) results of visual health assessment on of resident animals, and 3) presence of desert tortoise predators. BrightSource will provide the results of these surveys to the Service to receive translocation site approval prior to the commencement of clearance surveys on the project site. Because BrightSource will construct the ISEGS project sites in phases over several years, it will follow this procedure of translocation site survey and approval for each project site to gain the most current information on the status of the proposed translocation area for a given phase.

Monitoring

BrightSource will attach transmitters to and monitor all adult and juvenile desert tortoises cleared from the IESGS project sites for a period of 3 years following its initial clearance. During monitoring, BrightSource will collect information on survivorship, health status, movement of individuals, and predation to inform adaptive management of the translocation effort on future phases. If monitoring shows a mortality rate of 10 percent or higher among the desert tortoises moved from the project site, BrightSource will review all data collected to develop a remedial action plan prior to further phased translocation activities.

To minimize adverse effects to the desert tortoise, BrightSource will implement the following protective measures when implementing clearance surveys and desert tortoise translocation:

1. BrightSource will design all desert tortoise exclusion fencing in accordance with the most up-to-date Service guidance. The Service is currently using guidance provided in the *Desert Tortoise Field Manual* (Service 2009a).

2. BrightSource will comply with the most up-to-date guidance for performing clearance surveys and handling desert tortoises. The Service is currently using the *Desert Tortoise Field Manual* (Service 2009a).

3. BrightSource will use authorized biologists for the performance of clearance surveys and for any other activities that require the handling of desert tortoises. If BrightSource uses desert tortoise monitors during clearance surveys or for other activities that require identification of sign or handling of desert tortoises, they will do so under the direct supervision of an authorized biologist.

4. Following clearance of the fenced project sites, CLA, and utility right-of-way, an authorized biologist will be onsite during initial clearing and grading to move any desert tortoises missed during the initial clearance surveys.

5. BrightSource will not perform any clearance surveys or translocation activities when ambient air temperature are above 95 degrees Fahrenheit or are anticipated to exceed 95 degrees Fahrenheit before handling or processing can be completed. BrightSource will not release any desert tortoises at translocation sites if ambient air temperatures are above or are expected to reach 90 degrees Fahrenheit within 3 hours of release. Ambient air temperature will be measured in the shade, protected from wind, at a height of 2 inches above the ground surface.

6. An authorized biologist will hydrate all desert tortoises scheduled for translocation within 12 hours prior to release.

7. An authorized biologist will remove and temporarily quarantine any desert tortoises with clinical signs of disease that are encountered on the ISEGS project sites. Authorized biologists will use the descriptions of clinical signs of disease described in the available scientific literature (Berry and Cristopher 2001, Origgi et al. 2004, Ritchie 2006; all in CH2MHill 2009a), unless the Service provides more appropriate guidance. BrightSource will contact the Ventura Fish and Wildlife Office within 24 hours of collection of an animal to determine the appropriate disposition of animals showing clinical signs of disease. These animals may require more extensive disease testing (e.g., ELISA, Western Blot) prior to determination of their final disposition.

8. During temporary quarantine, an authorized biologist will provide adequate food and water and a temperature-controlled holding area away from other desert tortoises.

9. BrightSource will only use Service-authorized individuals that have experience identifying the clinical signs of upper respiratory tract disease, herpes virus, and cutaneous dyskeratosis for the performance of health assessments. BrightSource will provide the Service with the qualifications of any authorized biologists that it will use to perform health assessments on desert tortoises during clearance and translocation activities.

10. If more extensive disease testing is required, BrightSource will use an individual authorized by the Service to perform blood collection from sick desert tortoises. In addition, BrightSource will send all samples for ELISA or Western Blot tests to a laboratory approved by the Service for performing these tests.

11. If blood collection for ELISA or Western Blot testing is needed, BrightSource will perform this collection between May 15 and October 31.

12. For monitoring activities, an authorized biologist will attach radio transmitters to adult desert tortoises using methods described in Boarman et al. (1998). For juvenile animals, the authorized biologist will use specially designed radio transmitters that are small enough to minimize stress.

Compensation

The Bureau will require BrightSource to compensate for loss of desert tortoise habitat in accordance with the Northern and Eastern Mojave amendment to the California Desert Conservation Area Plan. The Bureau will apply a compensation ratio of 1:1, as described in this plan. In lieu fees may substitute for proof of land acquisition. The Bureau may fund desert tortoise habitat enhancement actions instead of or in addition to land acquisition. The Bureau will use a portion of these funds for regional management programs for the common raven (*Corvus corax*) at a rate of 5 dollars per acre of habitat disturbance. The Bureau will expend all compensation funds for acquisitions or habitat enhancements within the Northeastern Mojave Recovery Unit.

In addition, the California Department of Fish and Game will require compensation for loss of desert tortoise habitat at a ratio of 2:1. The California Department of Fish and Game will expend virtually all of these funds on acquisition and management of desert tortoise habitat on private lands, but not all funds would be spent within the Northeastern Mojave Recovery Unit.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

The jeopardy analysis in this biological opinion relies on four components: (1) the Status of the Species, which describes the range-wide condition of the desert tortoise, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which analyzes the condition of the desert tortoise in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the desert tortoise; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the desert tortoise; and (4) the Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the desert tortoise.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed federal action in the context of the current status of the desert tortoise, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the desert tortoise in the wild.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the desert tortoise and the role of the action area in the survival and recovery of the desert tortoise as the context for evaluation of the significance of the effects of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

STATUS OF THE SPECIES

Basic Ecology of the Desert Tortoise

The desert tortoise is a large, herbivorous reptile found in portions of the California, Arizona, Nevada, and Utah deserts. It also occurs in Sonora and Sinaloa, Mexico. In California, the desert tortoise occurs primarily within the Creosote, Shadscale, and Joshua Tree Series of Mojave Desert Scrub, and the Lower Colorado River Valley subdivision of Sonoran Desert Scrub. Optimal habitat has been characterized as creosote bush scrub in areas where precipitation ranges from 2 to 8 inches, diversity of perennial plants is relatively high, and production of ephemerals is high (Luckenbach 1982, Turner and Brown 1982, Schamberger and Turner 1986). Soils must be friable enough for digging of burrows, but firm enough so that burrows do not collapse. In California, desert tortoises are typically associated with gravelly flats or sandy soils with some clay, but are occasionally occur in windblown sand or in rocky terrain (Luckenbach 1982). Desert tortoises occur in the California desert from below sea level to an elevation of 7,300 feet, but the most favorable habitat occurs at elevations of approximately 1,000 to 3,000 feet (Luckenbach 1982, Schamberger and Turner 1986). Recent range-wide monitoring efforts have consistently documented desert tortoises above 3,000 feet (Service 2006).

Desert tortoises may spend more time in washes than in flat areas outside of washes; Jennings (1997) notes that, between March 1 and April 30, desert tortoises "spent a disproportionately longer time within hill and washlet strata" and, from May 1 through May 31, hills, washlets, and washes "continued to be important." Jennings' paper does not differentiate between the time desert tortoises spent in hilly areas versus washes and washlets; however, he notes that, although washes and washlets comprised only 10.3 percent of the study area, more than 25 percent of the plant species on which desert tortoises fed were located in these areas. Luckenbach (1982) states that the "banks and berms of washes are preferred places for burrows;" he also recounts an incident in which 15 desert tortoises along 0.12 mile of wash were killed by a flash flood. Desert tortoises are most active in California during the spring and early summer when annual plants are most common. Additional activity occurs during warmer fall months and occasionally after summer rain storms. Desert tortoises spend most of their time during the remainder of the year in burrows, escaping the extreme conditions of the desert; however, recent work has demonstrated that they can be active at any time of the year. Further information on the range, biology, and ecology of the desert tortoise can be found in Burge (1978), Burge and Bradley (1976), Hovik and Hardenbrook (1989), Luckenbach (1982), Weinstein et al. (1987), and Service (1994).

Food resources for desert tortoises are dependent on the availability and nutritional quality of annual and perennial vegetation, which is greatly influenced by climatic factors, such as the timing and amount of rainfall, temperatures, and wind (Beatley 1969, 1974, Congdon 1989, Karasov 1989, Polis 1991; all in Avery 1998). In the Mojave Desert, these climatic factors are typically highly variable; this variability can limit the desert tortoise's food resources.

Desert tortoises will eat many species of plants. However, at any time, most of their diet consists of a few species (Nagy and Medica 1986 and Jennings 1993 in Avery 1998). Additionally, their preferences can change during the course of a season (Avery 1998) and over several seasons (Esque 1994 in Avery 1998). Possible reasons for desert tortoises to alter their preferences may include changes in nutrient concentrations in plant species, the availability of plants, and the nutrient requirements of individual animals (Avery 1998). In Avery's (1998) study in the Ivanpah Valley, desert tortoises consumed primarily green annual plants in spring; they ate cacti and herbaceous perennials once the winter annuals began to disappear. Medica et al. (1982 in Avery 1998) found that desert tortoises ate increased amounts of green perennial grass when winter annuals were sparse or unavailable; Avery (1998) found that desert tortoises rarely ate perennial grasses.

Desert tortoises can produce from one to three clutches of eggs per year. On rare occasions, clutches can contain up to 15 eggs; most clutches contain 3 to 7 eggs. Multi-decade studies of the Blanding's turtle (*Emydoidea blandingii*), which, like the desert tortoise, is long lived and matures late, indicate that approximately 70 percent of the young animals must survive each year until they reach adult size; after this time, annual survivorship exceeds 90 percent (Congdon et al. 1993). Research has indicated that 50 to 60 percent of young desert tortoises typically survive from year to year, even in the first and most vulnerable year of life. We do not have sufficient information on the demography of the desert tortoise to determine whether this rate is sufficient to maintain viable populations; however, it does indicate that maintaining favorable habitat conditions for small desert tortoises is crucial for the continued viability of the species.

Desert tortoises typically hatch from late August through early October. At the time of hatching, the desert tortoise has a substantial yolk sac; the yolk can sustain them through the fall and winter months until forage is available in the late winter or early spring. However, neonates will eat if food is available to them at the time of hatching; when food is available, they can reduce their reliance on the yolk sac to conserve this source of nutrition. Neonate desert tortoises use abandoned rodent burrows for daily and winter shelter; these burrows are often shallowly excavated and run parallel to the surface of the ground.

Neonate desert tortoises emerge from their winter burrows as early as late January to take advantage of freshly germinating annual plants; if appropriate temperatures and rainfall are present, at least some plants will continue to germinate later in the spring. Freshly germinating plants and plant species that remain small throughout their phenological development are important to neonate desert tortoises because their size prohibits access to taller plants. As plants grow taller during the spring, some species become inaccessible to small desert tortoises.

Neonate and juvenile desert tortoises require approximately 12 to 16 percent protein content in their diet for proper growth. Desert tortoises, both juveniles and adults, seem to selectively forage for particular species of plants with favorable ratios of water, nitrogen (protein), and potassium. The potassium excretion potential model (Oftedal 2001) predicts that, at favorable ratios, the water and nitrogen allow desert tortoises to excrete high concentrations of potentially toxic potassium, which is abundant in many desert plants. Oftedal (2001) also reports that variation in rainfall and temperatures cause the potassium excretion potential index to change annually and during the course of a plant's growing season. Therefore, the changing nutritive quality of plants, combined with their increase in size, further limits the forage available to small desert tortoises to sustain their survival and growth.

In summary, the ecological requirements and behavior of neonate and juvenile desert tortoises are substantially different from those of subadults and adults. Smaller desert tortoises use abandoned rodent burrows, which are typically more fragile than the larger ones constructed by adults. They are active earlier in the season. Finally, small desert tortoises rely on smaller annual plants with greater protein content; the smaller plant size allows them to gain access to food and the higher protein content promotes growth.

Status of the Desert Tortoise

The Mojave population of the desert tortoise includes those animals living north and west of the Colorado River in the Mojave Desert of California, Nevada, Arizona, southwestern Utah, and in the Colorado Desert in California. On August 4, 1989, the Service published an emergency rule

listing the Mojave population of the desert tortoise as endangered (54 *Federal Register* 32326). In its final rule, dated April 2, 1990, the Service determined the Mojave population of the desert tortoise to be threatened (55 *Federal Register* 12178).
The Service listed the desert tortoise in response to loss and degradation of habitat caused by numerous human activities including urbanization, agricultural development, military training, recreational use, mining, and livestock grazing. The loss of individual desert tortoises to increased predation by common ravens, collection by humans for pets or consumption, collisions with vehicles on paved and unpaved roads, and mortality resulting from diseases also contributed to the Service's listing of this species.

Before entering into a discussion of the status and trends of the desert tortoise in the Northeastern Mojave Recovery Unit where the proposed action is located, a brief discussion of the methods of estimating the numbers of desert tortoises would be useful. Three primary methods have been widely used: permanent study plots, triangular transects, and line distance sampling.

Generally, permanent study plots are defined areas that are visited at roughly 4-year intervals to determine the numbers of desert tortoises present. Desert tortoises found on these plots during the spring surveys were registered; that is, they were marked so they could be identified individually during subsequent surveys. Between 1971 and 1980, 27 plots were established in California to study the desert tortoise; 15 of these plots were used by the Bureau to monitor desert tortoises on a long-term basis (Berry 1999). Range-wide, 49 plots have been used at one time or another to attempt to monitor desert tortoises (Tracy et al. 2004).

Triangular transects are used to detect sign (i.e., scat, burrows, footprints, etc.) of desert tortoises. The number of sign is then correlated with standard reference sites, such as permanent study plots, to allow the determination of density estimates.

Finally, line distance sampling involves walking transects while trying to detect live desert tortoises. Based on the distance of the desert tortoise from the centerline of the transect, the length of the transect, and a calculation of what percentage of the animals in the area were likely to have been above ground and visible to surveyors during the time the transect was walked, an estimation of the density can be made. This density is only represents an estimation of the number of desert tortoises that are greater than 180 millimeters in size. Desert tortoises that are larger than this size are typically classified as subadult or adult desert tortoises.

Each of these methods has various strengths and weaknesses. In general, permanent study plots have been used to estimate the status of desert tortoises across large areas over time. Triangular transects were used to assess the density of desert tortoises on specific sites at a point in time; this method was commonly used to determine how many desert tortoises may be affected by a specific proposed action. In 2001, the Service initiated line-distance sampling to estimate the density of desert tortoises in desert wildlife management areas and critical habitat throughout the range.

Note that, when reviewing the information presented in the following sections, determining the number of desert tortoises over large areas is extremely difficult. The report prepared by the Desert Tortoise Recovery Plan Assessment Committee (Tracy et al. 2004) acknowledges as much. Desert tortoises spend much of their lives underground or concealed under shrubs, are not very active in years of low rainfall, and are distributed over a wide area in several different types of habitat. Other factors, such as the inability to sample on private lands and rugged terrain, further complicate sampling efforts. Consequently, the topic of determining the best way to estimate the abundance of desert tortoises has generated many discussions over the years. As a result of this difficulty, we cannot provide concise estimations of the density of desert tortoises in each recovery unit or desert wildlife management area that have been made in a consistent manner.

Given the difficulty in determining the density of desert tortoises over large areas, the reader needs to understand fully that the differences in density estimates in the recovery plan and those derived from subsequent sampling efforts may not accurately reflect on-the-ground conditions. Despite this statement, the reader should also be aware that the absence of live desert tortoises and the presence of carcasses over large areas of some desert wildlife management areas provide at least some evidence that desert tortoise populations seem to be in a downward trend in some regions.

The following paragraphs provide general information on the status and trends of the desert tortoise population in the Northeastern Mojave Recovery Unit, where the proposed action is located. We have not included detailed information on the status of the desert tortoise in the other recovery units throughout the range of the species in this biological opinion. This omission will not compromise the analysis in the biological opinion because our determination regarding whether a proposed action is likely to jeopardize the continued existence of a species must be conducted at the level of the listed taxon. When the range of the listed taxon is divided into recovery units, our level of analysis begins with the recovery unit; if the effects of the proposed action have the potential to compromise the ability of the species to survive and recover within the recovery unit, the next level of analysis considers how the compromised recovery unit would affect the listed taxon throughout its range (Service 2005). Our analysis can therefore be conducted in a comprehensive manner through an iterative process. The Northeastern Mojave Recovery Unit comprises one of six recovery units for the desert tortoise; consequently, our level of analysis in this biological opinion will begin at this level.

The Northeastern Mojave Recovery Unit is located to the southwest of the Upper Virgin River Recovery Unit and extends through Nevada and into California in Ivanpah Valley. Several critical habitat units and four desert wildlife management areas are located within this recovery unit. Tracy et al. (2004) note that densities of adult desert tortoises for the overall region do not show a statistical trend over time.

The Beaver Dam Slope Desert Wildlife Management Area covers portions of Nevada, Utah, and Arizona. Based on various methods, the recovery plan estimates the density of desert tortoises in this desert wildlife management area as being from 5 to 56 animals per square mile (Service

1994). In 2007, the Desert Tortoise Recovery Office estimated a density for the Beaver Dam Slope Desert Wildlife Management Area of 3.11 desert tortoises per square mile based on line distance sampling transects (Service 2009b).

The Gold Butte-Pakoon Desert Wildlife Management Area covers portions of Nevada and Arizona, generally south of the Beaver Dam Slope Desert Wildlife Management Area. The recovery plan states that densities of desert tortoises in this recovery unit vary from 5 to 56 animals per square mile (Service 1994). In 2007, the Desert Tortoise Recovery Office estimated a density for the Gold Butte-Pakoon Desert Wildlife Management Area of 3.11 desert tortoises per square mile based on line distance sampling transects (Service 2009b).

The Mormon Mesa Desert Wildlife Management Area is located entirely in Nevada, generally west and northwest of the Beaver Dam Slope and Gold Butte-Pakoon desert wildlife management areas, respectively. The recovery plan states that densities of desert tortoises in this recovery unit vary from 41 to 87 subadult and adult animals per square mile (Service 1994). In 2007, the Desert Tortoise Recovery Office estimated a density for the Mormon Mesa Desert Wildlife Management Area of 8.55 desert tortoises per square mile based on line distance sampling transects (Service 2009b).

The Coyote Springs Desert Wildlife Management Area is located entirely in Nevada, generally west of the Mormon Mesa Desert Wildlife Management Area and east of the Desert National Wildlife Refuge. The recovery plan states that densities of desert tortoises in this recovery unit vary from 0 to 90 adult animals per square mile (Service 1994). Kernel analysis for the Coyote Springs Desert Wildlife Management Area showed areas where the distributions of carcasses and living desert tortoises do not overlap (Tracy et al. 2004); this scenario is indicative of a higher than average rate of mortality. (The Desert Tortoise Recovery Plan Assessment Committee used a kernel analysis to examine the distribution of live desert tortoises and carcasses over large areas of the range of the species (Tracy et al. 2004). The intent of this analysis is to determine where large areas with numerous carcasses do not overlap large areas with live animals. Regions where the areas of carcasses do not overlap areas of live animals likely represent recent die-offs or declines in desert tortoise populations.) Because permanent study plots for this region were discontinued after 1996, recent declines in numbers would not be reflected in the kernel analysis if they had occurred. In 2007, the Desert Tortoise Recovery Office estimated a density for the Coyote Springs Desert Wildlife Management Area of 3.6 desert tortoises per square mile based on line distance sampling transects (Service 2009b).

The Ivanpah Desert Wildlife Management Area lies east of the Mojave National Preserve and covers approximately 36,795 acres. It is contiguous with National Park Service lands; note that the National Park Service did not designate desert wildlife management areas within the Mojave National Preserve because it considers that all of its lands are managed in a manner that is conducive to the recovery of the desert tortoise. The permanent study plot in the Ivanpah Valley is located within the Mojave National Preserve and provides information on the status of desert tortoises in this general region. Data on desert tortoises on this permanent study plot were collected in 1980, 1986, 1990, and 1994; the densities of desert tortoises of all sizes per square mile were 368, 393, 249, and 164, respectively (Berry 1996). (Numerous data sets are collected from the study plots and various statistical analyses conducted to provide information on various aspects of trends. We cannot, in this biological opinion, provide all of this information; therefore, we have selected the density of desert tortoises of all sizes per square mile to attempt to indicate trends.) The number of juvenile and immature desert tortoises on the study plot declined, although the number of adult animals remained fairly constant. The notes accompanying this report indicated that the "ill juvenile and dead adult male (desert) tortoises salvaged for necropsy contained contaminants;" it also cited predation by common ravens and the effects of cattle grazing as causative factors in the decline in the number of juvenile and immature desert tortoises on the study plot (Berry 1996). In 2002, workers found 55 desert tortoises on this plot; this number does not represent a density estimate (Berry 2005). In 2007, the Desert Tortoise Recovery Office estimated a density for the Ivanpah Desert Wildlife Management Area of 16.84 desert tortoises per square mile based on line distance sampling transects (Service 2009b). However, the area sampled to determine this estimate includes all portions of the Ivanpah Critical Habitat Unit, which is primarily within the Eastern Mojave Recovery Unit. Only a small portion of the sample area for this estimate is located within the Northeastern Mojave Recovery Unit.

In 2007, the Desert Tortoise Recovery Office estimated an average density of desert tortoises in this recovery unit of 4.4 desert tortoises per square mile, which was a 9 percent decrease from previous estimates in 2005 (Service 2009b). However, this decrease was expected based on a change in sampling design and may not represent a true decline in density for the Northeastern Mojave Recovery Unit.

Recovery Plan for the Desert Tortoise

The recovery plan for the desert tortoise is the basis and key strategy for recovery and delisting of the desert tortoise. The recovery plan divides the range of the desert tortoise into 6 distinct population segments or recovery units and recommends the establishment of 14 desert wildlife management areas throughout the recovery units. Within each desert wildlife management area, the recovery plan recommends implementation of reserve level protection of desert tortoise populations and habitat, while maintaining and protecting other sensitive species and ecosystem functions. The recovery plan also recommends that desert wildlife management areas be designed to follow the accepted concepts of reserve design and be managed to restrict human activities that negatively affect desert tortoises (Service 1994). The delisting criteria established by the recovery plan are:

1. The population within a recovery unit must exhibit a statistically significant upward trend or remain stationary for at least 25 years;

2. Enough habitat must be protected within a recovery unit or the habitat and desert tortoises must be managed intensively enough to ensure long-term viability;

3. Populations of desert tortoises within each recovery unit must be managed so discrete population growth rates (lambdas) are maintained at or above 1.0;

4. Regulatory mechanisms or land management commitments that provide for long-term protection of desert tortoises and their habitat must be implemented; and
5. The population of the recovery unit is unlikely to need protection under the Endangered Species Act in the foreseeable future.

The recovery plan based its descriptions of the six recovery units on differences in genetics, morphology, behavior, ecology, and habitat use over the range of the Mojave population of the desert tortoise. The recovery plan contains generalized descriptions of the variations in habitat parameters of the recovery units and the behavior and ecology of the desert tortoises that reside in these areas (pages 20 to 22 in Service 1994). The recovery plan (pages 24 to 26 from Service 1994) describes the characteristics of desert tortoises and variances in their habitat, foods, burrow sites, and phenotypes across the range of the listed taxon. Consequently, to capture the full range of phenotypes, use of habitat, and range of behavior of the desert tortoise as a species, conservation of the species across its entire range is essential.

The Service has released a revised recovery plan for public review (Service 2008b). The revised recovery plan includes a discussion of reducing the number of recovery units to four, based on information that has been generated since the release of the original document.

Relationship of Recovery Units, Distinct Population Segments, Desert Wildlife Management Areas, and Critical Habitat Units

The recovery plan (Service 1994) recognized six recovery units or evolutionarily significant units across the range of the listed taxon, based on differences in genetics, morphology, behavior, ecology, and habitat use of the desert tortoises found in these areas. The boundaries between these areas are vaguely defined. In some cases, such as where the Western Mojave Recovery Unit borders the Eastern Mojave Recovery Unit, a long, low-lying, arid valley provides a fairly substantial separation of recovery units. In other areas, such as where the Eastern Mojave Recovery Unit borders the Northern Colorado Recovery Unit, little natural separation exists. Because of the vague boundaries, the acreage of these areas has not been quantified. Over the years, workers have commonly referred to the areas as “recovery units;” the term “distinct population segment” has not been in common use.

The recovery plan recommended that land management agencies establish one or more desert wildlife management areas within each recovery unit. As mentioned previously in the Recovery Plan for the Desert Tortoise section of this biological opinion, the recovery plan recommended that these areas receive reserve-level management to remove or mitigate the effects of the human activities responsible for declines in the number of desert tortoises. As was the case for the recovery units, the recovery plan did not determine precise boundaries for the desert wildlife management areas; the recovery team intended for land management agencies to establish these boundaries, based on the site-specific needs of the desert tortoise. At this time, desert wildlife management areas have been established throughout the range of the desert tortoise.

Based on the recommendations contained in the draft recovery plan for the desert tortoise (59 *Federal Register* 5820), the Service designated critical habitat units throughout the range of the desert tortoise. The 14 critical habitat units have defined boundaries and cover specific areas throughout the 6 recovery units.

The Bureau used the boundaries of the critical habitat units and other considerations, such as conflicts in management objectives and more current information, to propose and designate desert wildlife management areas through its land use planning processes. In California, the Bureau also classified these desert wildlife management areas as areas of critical environmental concern, which allows the Bureau to establish management goals for specific resources in defined areas. Through the land use planning process, the Bureau established firm boundaries for the desert wildlife management areas.

Finally, we note that the Department of Defense installations and National Park Service units in the California desert did not establish desert wildlife management areas on their lands. Where the military mission is compatible with management of desert tortoises and their habitat, the Department of Defense has worked with the Service to conserve desert tortoises and their habitat. Examples of such overlap include the bombing ranges on the Navy’s Mojave B and the Chocolate Mountains Aerial Gunnery Ranges; although the target areas are heavily disturbed, most of the surrounding land remains undisturbed. Additionally, the Army has established several areas along the boundaries of Fort Irwin where training with vehicles is prohibited; desert tortoises persist in these areas, which are contiguous with lands off-base. The National Park Service did not establish desert wildlife management areas within the Mojave National Preserve, because the entire preserve is managed at a level that is generally consistent with the spirit and intent of the recovery plan for the desert tortoise.

The following table depicts the relationship among recovery units, desert wildlife management areas, and critical habitat units through the range of the desert tortoise.

Critical Habitat Unit	**Desert Wildlife Management Area**	**Recovery Unit**	**State**	**Size of Critical Habitat Unit (acres)**
Chemehuevi	Chemehuevi	Northern Colorado	CA	937,400
Chuckwalla	Chuckwalla	Eastern Colorado	CA	1,020,600
Fremont-Kramer	Fremont-Kramer	Western Mojave	CA	518,000
Ivanpah Valley	Ivanpah Valley	Eastern Mojave/Northeastern Mojave	CA	632,400
Pinto Mountain	Joshua Tree	Western Mojave/	CA	171,700

Critical Habitat Unit	Desert Wildlife Management Area	Recovery Unit	State	Size of Critical Habitat Unit (acres)
		Eastern Colorado		
Ord-Rodman	Ord-Rodman	Western Mojave	CA	253,200
Piute-Eldorado- CA Piute-Eldorado- NV	Fenner Piute-Eldorado	Eastern Mojave Northeastern Mojave/ Eastern Mojave	CA NV	453,800 516,800
Superior-Cronese	Superior-Cronese Lakes	Western Mojave	CA	766,900
Beaver Dam: NV UT AZ	 Beaver Dam Beaver Dam Beaver Dam	Northeastern Mojave (all)	 NV UT AZ	 87,400 74,500 42,700
Gold Butte-Pakoon NV AZ	 Gold Butte-Pakoon Gold Butte-Pakoon	Northeastern Mojave (all)	 NV AZ	 192,300 296,000
Mormon Mesa	Mormon Mesa Coyote Spring	Northeastern Mojave	NV	427,900
Upper Virgin River	Upper Virgin River	Upper Virgin River	UT	54,600

Nussear et al. (2009) modeled desert tortoise habitat across the range of the desert tortoise. This model, which is based on 3,753 desert tortoise locations, uses 16 environmental variables, such as precipitation, geology, vegetation, and slope. In addition, Nussear et al. used 938 additional occurrence locations to test the model's accuracy. Using this model, we estimate that the Northern and Eastern Mojave Recovery Unit contains approximately 4,853,368 acres of potential desert tortoise habitat (Darst 2010b). Although this analysis likely omits some marginal desert tortoise habitat, it explains the occurrence of 95 percent of the 938 test points used in the Nussear et al. (2009) model. This modeling and mapping analysis does not consider habitat loss, fragmentation, or degradation associated with human-caused impacts; however, it provides a reference point relative to the amount of desert tortoise habitat within the Northeastern Mojave Recovery Unit.

Fires

Since December 2004, numerous wildfires have occurred in desert tortoise habitat across its range. Although we know that some desert tortoises were killed by the wildfires, mortality estimates are not available. We estimate that approximately 300,000 acres of potential desert tortoise habitat burned in the Northeastern Mojave Recovery unit in 2005 (Burroughs 2005). This acreage includes approximately 109,000 acres of critical habitat (Clayton 2005). In total, approximately 136,447 acres of critical habitat burned in the 2005 fires (Clayton 2005).

ENVIRONMENTAL BASELINE

Action Area

The implementing regulations for section 7(a)(2) of the Act define the "action area" as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the purposes of this biological opinion, we consider the action area to include all areas of the proposed project, described in the Description of the Proposed Action, BrightSource's proposed translocation areas, and all contiguous desert tortoise habitat within 6.2 miles of these translocation areas. By including a 6.2-mile buffer around the translocation areas, we are including all areas that desert tortoises could move to in the first year following translocation (Berry 1986, Field et al. 2007, Nussear 2004). The action area defined for this biological opinion is approximately 63,838 acres (Service 2010a).

Habitat Characteristics of the Action Area

We used the U.S. Geological Survey's model of desert tortoise habitat potential (Nussear et al. 2009) to define all contiguous habitat within the 6.2-mile radius. Within the action area, BrightSource provided specific information on vegetation types for the original 4,062-acre ISEGS project site design and areas that would be affected by the proposed translocation, natural gas distribution line, fiber optic line, and Colosseum Road. We summarized the information in the remainder of this paragraph and the next from the biological assessment (CH2MHill 2009a). All features are located on a large, alluvial fan that slopes eastward from the Clark Mountains to Ivanpah Dry Lake at a 3 to 5 percent grade. Numerous ephemeral washes dissect the ISEGS project site with active channels that range in width from 1 to 15 feet. Elevations within the ISEGS project site range from 2,850 to 3,150 feet above sea level. Elevations along the route of the fiber optic line range from 2,850 feet to 5,320 feet.

Creosote bush scrub is the dominant vegetation type on the ISEGS project site, proposed translocation areas, natural gas distribution line, Colosseum Road, and the lower elevation portions of the fiber optic line. Mojave Yucca-Nevada ephedra scrub and Mojave wash scrub also occur on the ISEGS project site. Vegetation at higher elevations along the fiber optic line are characterized by blackbrush, Joshua trees (*Yucca brevifolia*), Utah juniper (*Juniperus osteosperma*), single-leaf pinyon (*Pinus monophylla*), and Mormon tea (*Ephedra* sp.). The northwestern portion of the translocation area contains a vegetation transition zone where blackbrush (*Coleogyne ramosissima*) is present and creosote (*Larrea tridentate*) and white bursage (*Ambrosia dumosa*) are less abundant. BrightSource did not specifically characterize vegetation types on portions of the action area that are not related to a specific project feature.

The action area is within a Bureau-managed cattle grazing allotment and a wild burro herd management area (Bureau and CEC 2009, Bureau 2002). In 2007, the Bureau removed most wild burros from the herd management area (Bureau and CEC 2009). However, given the recent nature of this removal and the persistence of some burros within the action area, adverse effects to habitat are likely to persist. The biological opinion for the California Desert Conservation

Area Plan amendment for this area discussed the potential effects of cattle grazing on desert tortoises (Service 2002).

During surveys of the project site, BrightSource identified numerous non-native plant species, such as Sahara mustard (*Brassica tournefortii*), salt cedar (*Tamarix ramosissima*), red brome (*Bromus madritensis*), Mediterranean grass (*Schismus* spp.), London rocket (*Sisymbrium irio*), and red-stemmed filaree (*Erodium cicutarium*) (CH2MHill 2009a, CH2MHill 2008c). Surveyors observed only one Sahara mustard and a few London rockets during assessment of the project site (CH2MHill 2008c). Surveyors located red brome, red-stemmed filaree, and schismus throughout the project site with schismus having a patchy distribution (CH2MHill 2008c). These species likely occur throughout the remainder of the action area.

In addition to cattle grazing, wild burro use, and non-native species, the habitat within the action area has also been affected by indirect effects associated with one inactive mine, a 640-acre golf course, an interstate highway, a state highway, and 2 utility corridors, containing 3 electrical transmission lines, a natural gas transmission line, and a fiber optic line (CH2MHill 2009a, Bureau 1998, 1999, 2002). The remainder of the action area is crisscrossed by 37 unpaved vehicle routes (Bureau 2002). Of these, 26 are currently designated by the Bureau for open public access and 3 are designated for limited use. The Bureau has designated the remaining routes within the action area as closed.

Status of the Desert Tortoise in the Action Area

From April 9 to June 5 2007, CH2MHill conducted desert tortoise surveys over a 3,870-acre area that included the 3 project sites, CLA, natural gas distribution line, and the zone of influence (CH2MHill 2009a, CH2MHill 2008a). Because of a change in the project description, they surveyed an additional 726 acres from May 20 to May 25, 2008. The 2008 surveys also covered the proposed access route for the ISEGS facility. During the 2007 and 2008 surveys, CH2MHill located 25 live desert tortoises, 97 carcasses, and 214 burrows, with the greatest density of sign occurring on the Ivanpah 1 project site. Of the 25 desert tortoises identified, 20 were within the Ivanpah 1 project site, the CLA, or the natural gas distribution line in 2007, and an additional 3 desert tortoises were within the proposed project expansions in 2008. The remaining two desert tortoises were found on zone-of-influence transects that were outside of the proposed project footprint. The surveys were 100 percent coverage surveys in accordance with the pre-project survey protocols developed by the Service (1992). BrightSource did not perform protocol level surveys of the fiber optic line for desert tortoise, but it confirmed the presence of desert tortoise habitat along the entire route and incidentally found three desert tortoises along the line (CH2MHill 2009a).

Based on the 2007 survey results and the Service's revised pre-project survey protocol (Service 2010b), we estimate that approximately 39.7 desert tortoises occur within the 3,870-acre, 2007 survey area (Darst 2010a). Based on the 2008 survey results, we estimate that approximately 6 desert tortoises occur within the 722-acre 2008 survey area (Darst 2010a). Combining these data, we estimate a population density within the 4,596-acre survey area of 6.31 per square mile

(Darst 2010a). Consequently, we estimate that approximately 35 or 36 subadult or adult desert tortoises are likely to occur within the 3,520-acre ISEGS project site, which includes all 3 project phases, the natural gas distribution line, CLA, and access road. We emphasize that, although our estimate of the number of desert tortoises on the project site is based on the best available information, these numbers represent only an estimate; also, because our formula for estimating densities does not account for smaller desert tortoises, the overall number of animals on site may be somewhat greater.

Using approximately 33-foot-wide transects, BrightSource performed 100 percent coverage surveys of 4 0.5-square kilometer areas within the proposed translocation area in July and August of 2009 (CH2MHill 2009a). Translocation site N1, located west of the Ivanpah 1 project site, contained 77 desert tortoise burrows, 4 carcasses, and 1 adult desert tortoise. Translocation site N2, located west of the Ivanpah 2 project site, contained 50 desert tortoise burrows, 3 adult desert tortoises, and 2 carcasses. Translocation site N3, also located west of the Ivanpah 2 project site, contained 34 desert tortoise burrows and 4 carcasses. Translocation site N4, located west of Ivanpah 3, contained 31 desert tortoise burrows, 1 carcass, and 1 drinking circle (SNEI 2009). Because SNEI performed these surveys in July and August, we cannot derive a population estimate from this data. All four translocation sites contained evidence of coyote use (i.e., scat and tracks).

BrightSource did not perform desert tortoise surveys for the remainder of the action area described in this biological opinion. Given the large area surveyed on the project site and its central location within the action area, desert tortoise densities in the remainder of the action area are likely similar. In addition, the Service estimated the 2007 desert tortoise density for the Ivanpah Critical Habitat Unit, located in the same region as the project site, at 16.84 per square mile (Service 2009b). Although these estimates do not specifically cover the action area for this project, they provide information on the average density that we would expect for this portion of the Mojave Desert. Therefore, we expect desert tortoise densities in portions of the action area not covered by protocol surveys of the ISEGS project site to be between 6.31 and 16.84 per square mile. Based on the maps provided in the biological assessment and these density estimates, we estimate the combined size of the translocation area to be 2,318 acres and the current population size to be between 23 and 61 resident desert tortoises (Waln 2010). In addition, based on our estimated density range and the size of the action area, we estimate that the population within the action area as a whole contains between 629 and 1,680 subadult and adult desert tortoises.

EFFECTS OF THE ACTION

Capture and Translocation of Desert Tortoises within the Action Area

BrightSource will capture and translocate or relocate all desert tortoises from the fenced project areas and any other portion of the action area that is in harm’s way due to project-related activities. BrightSource will move all project site desert tortoises to the west of the proposed project site and preferentially place animals in locations adjacent to the western fenceline, but no closer than 984 feet from the project site to reduce the potential for animals walking the fence or being indirectly affected by construction activities within the project area. If BrightSource has to move an individual desert tortoise more than 3,280 feet from its capture location, it will place these animals in 1 of 4 designated translocation sites. In other locations, where project features involve linear facilities (i.e., fiber optic line, natural gas line, Colosseum Road) outside of the ISEGs project sites, BrightSource would move desert tortoises immediately outside of the project work areas.

BrightSource has proposed numerous measures to minimize injury or mortality of desert tortoises and ensure success of the translocation effort. Because the project would be built in phases over several years, during which time desert tortoise numbers on the project site will likely change, we cannot predict exactly how many desert tortoises will be removed from the project site and other related work areas. However, based on current surveys that cover the project site, CLA, natural gas line, and Colosseum Road, we estimate that BrightSource will have to capture and relocate or translocate approximately 36 subadult and adult desert tortoises from these areas.

BrightSource has indicated that the 8-mile line to Mountain Pass will use existing poles and would require a 40-foot by 60-foot area of disturbance for every 10,000 feet of line. Consequently, we estimate that project work areas for installation of the fiber optic line would total 0.28 acre in size. Based on this estimate and the estimated density for the action area of between 6.31 to 16.84 desert tortoises per square mile, we anticipate that few, if any, desert tortoises are likely to be moved during installation of the fiber optic line.

BrightSource has indicated that Interstate 15 between Nipton Road and Ivanpah Lake will be fenced with desert tortoise exclusion fencing prior to clearance of the project site. BrightSource has not provided specific information on the acreage of disturbance associated with this fencing, so we cannot provide a specific estimate of the number of desert tortoises that are likely to be moved. However, given the location of the fence in close proximity to an interstate highway, we expect the number to be small.

Some potential exists that handling of desert tortoises may cause elevated levels of stress that may render these animals more susceptible to disease or dehydration from loss of fluids. Because BrightSource will use experienced biologists, approved by the Service, and approved handling techniques, collected desert tortoises are unlikely to suffer substantially elevated stress levels during handling.

Following release, we cannot predict the movement patterns that all translocated animals are likely to exhibit. Translocation studies, including a study performed in the Ivanpah Valley, have shown that straight-line movement distances following release can be over 3.73 miles in the first year for some desert tortoises (Berry 1986, Field et al. 2007, Nussear 2004). Mean dispersal distances observed on 3 study plots south of Fort Irwin ranged from 153.1 to 6,168 yards, with maximum dispersal distances of between 13,795 to 25,155.3 yards (Walde et al. 2008). For short distance translocations, data appear to indicate shorter post-translocation dispersal distances

(79.8 to 1610.9 yards) (Walde et al. 2008). Translocated populations can also significantly expand the area they occupy in the first year following translocation (e.g., from 3.9 to 6.9 square miles at a Nevada site; from 0.2 to 10.3 square miles at a Utah site). The degree to which these animals expand the area they use depends on whether the translocated animals are released into typical or atypical habitat; that is, if the translocation area supports habitat that is similar to that of the source area, desert tortoises are likely to move less (Nussear 2004).

Translocated animals appear to reduce movement distances following their first post-translocation hibernation to a level that is not significantly different from resident populations (Field et al. 2007, Nussear 2004). As time increases from the date of translocation, most desert tortoises change their movement patterns from dispersed, random patterns to more constrained patterns, which indicate an adoption of a new home range (Nussear 2004).

We cannot predict the direction that translocated animals are likely to move. In some studies, translocated desert tortoises have exhibited a tendency to orient toward the location of their capture and attempt to move in that direction (Berry 1986), but in other instances, no discernible homing tendency has been observed in translocated animals (Field et al. 2007). Information specific to short-distance translocations indicates that at least some individuals will attempt to return to their former home ranges after release (Stitt et al. 2003, Rakestraw 1997).

Based on this information, at least a portion of the translocated animals are likely to make extensive, long-distance movements during the first year following translocation, and the area that the translocated population occupies is likely to increase significantly. However, because BrightSource will move all desert tortoises a relatively short-distance to clear them from the project site, we anticipate that dispersal distances are unlikely to reach the maximum dispersal distances observed on the Walde et al. (2008) plots. Some of the translocated desert tortoises are likely to attempt to return to the project site, where they would encounter the project site fence and either turn around or walk the fence line. Because the action area for this project includes all contiguous desert tortoise habitat within 6.2 miles of the project site and desert tortoises will be moved a relatively short distance to clear them from the project site, we anticipate that all translocated animals, including those that make long-distance movements, will remain in the action area. Following the first hibernation period after translocation, individuals are likely to significantly reduce movement distances and establish new home ranges.

In one study, the majority of the dispersal movement away from the release site occurred during the first 2 weeks after translocation (Field et al. 2007). During this time and over the period prior to home range establishment, desert tortoises may suffer a higher potential for mortality because they are moving great distances through unfamiliar territory and are less likely to have established cover sites for protection. Desert tortoises that make long-distance movements following translocation can travel for 5 to 10 days and average 671.5 yards per day (Berry 1986). Studies have documented various sources of mortality for translocated individuals, including predation, exposure, fire, disease, crushing by cattle, and flooding (Nussear 2004, Field et al. 2007, Berry 1986, U.S. Army 2009, 2010). Of these, predation appears to be the primary source of mortality in most translocation studies (Nussear 2004, Field et al. 2007, U.S. Army 2009, 2010). Based on the description of the action area in the Environmental Baseline section of this biological opinion, the potential exists for all six sources of mortality within the action area. However, fire is likely to be localized and highly dependent on the abundance of non-native grasses and other weeds. In addition to these threats, the potential exists for desert tortoises to be killed on roads during the period when translocated individuals are seeking new home range locations. However, because Interstate 15 and Colosseum Road, which are the busy roads in the area, will be fenced prior to translocation, road kills are less likely to occur due to translocation on this project.

BrightSource has selected translocation areas in desert tortoise habitat that should serve as suitable recipient sites for these animals based on habitat suitability, proximity to previous home ranges, and density of the resident population. It has proposed numerous protective measures in its translocation plan that are likely to reduce the potential for mortality of translocated individuals. In addition, because construction and translocation will occur in phases and BrightSource has identified a 10 percent mortality threshold for the translocation effort, some potential exists that it can reduce the level of translocation-related take through adaptive management. However, adaptive management measures are not available for our evaluation, so we cannot predict their effectiveness in this biological opinion.

Translocating desert tortoises may also adversely affect resident desert tortoises within the action area due to local increases in population density. Increased densities may result in an increased spread of upper respiratory tract disease, an increased of aggressive interactions between individuals, and an increased incidence of predation that may not have occurred in the absence of translocation. Saethre et al. (2003) evaluated the effects of density on desert tortoises in nine semi-natural enclosures at the Desert Tortoise Conservation Center in Nevada. The enclosures housed from approximately 289 to 2,890 desert tortoises per square mile. Saethre et al. (2003) observed a greater incidence of fighting during the first year of the experiment but did not detect any trends in body condition index, reproduction, or presence of the symptoms of upper respiratory tract disease among the enclosures. Body condition index and reproduction are important indicators of how translocation may affect resident desert tortoises; generally, stress suppresses body condition index and reproduction in desert tortoises. This study did not draw any conclusions regarding density-dependent effects on predation of desert tortoises. Additionally, as discussed previously in this section, desert tortoises tend to move substantial distances from the release sites; this behavior reduces the likelihood of overcrowding in smaller areas.

We anticipate that density-dependent effects on resident populations are likely to be minor for the following reasons: 1) current densities in the translocation area are likely to be low (6.4 to 16.9 desert tortoises per square mile) based on our density estimates for the action area, 2) translocation will result in a dispersed release of individuals, 3) the translocation area is not a confined space, so released individuals would be able to disperse into other areas, and 4) density limits at which adverse effects were observed in previous studies are significantly greater than the post-translocation densities that are likely to be in the action area.

In addition, translocation has the potential to increase the prevalence of diseases, such as upper respiratory tract disease, in a resident population. Stress associated with handling and movement or due to density dependent effects could exacerbate this threat if translocated individuals with subclinical URTD or other diseases begin to exhibit clinical signs of disease due to the stress associated with handling and movement. This conversion of translocated desert tortoises from a non-contagious to contagious state may increase the potential for infection in the resident population above pre-translocation levels.

We cannot reasonably predict the increase in disease prevalence within the resident population that may occur due to translocation. However, the following mitigating circumstances are likely to reduce the magnitude of this threat: 1) BrightSource will use experienced biologists and approved handling techniques that are unlikely to result in substantially elevated stress levels in translocated animals, 2) desert tortoises on the project site are currently part of a continuous population with the resident population and likely share similar pathogens and immunities, 3) BrightSource will move translocated desert tortoises a relatively short distance, which is likely to reduce post-translocation stress associated with long-distance movements, 4) density dependent stress is unlikely to occur for the reasons discussed above.

In a study conducted in Ivanpah Valley, 21.4 percent of 28 translocated desert tortoises died (Field et al. 2007). Other studies have documented mortality rates of 0, 15, and 21 percent in other areas (Nussear 2004, Cook et al. 1978 in Nussear 2004). Nussear (2004) found that mortality among translocated animals was not statistically different from mortality observed in resident populations. This study did not compare mortality rates in resident populations to those in control groups; therefore, we cannot determine if the translocation caused increased mortality rates in the resident population.

Recent work on translocation associated with the expansion of Fort Irwin provided additional insight into the fates of translocated, resident, and control desert tortoises (Army 2009 and 2010). Resident animals were those desert tortoises that were located in areas that received translocated individuals from Fort Irwin. Controls were desert tortoises that were not located in areas where translocation occurred. The following table shows the results of the monitoring effort. Where the numbers for the “Causes of Mortality” do not add up to the total number of desert tortoises, the Army either did not report or did not know the cause of death in the remaining transmittered resident and control desert tortoises. ‘Other’ includes animals reported as: “other,” injured, and removed for necropsy.

Group	Total Transmittered Desert Tortoises	Mortality among Transmittered Desert Tortoises (percent)	Cause of Mortality				
			Canid Predation	Natural Causes	Raven Predation	Vehicle Strike	Other
Translocated	586	167 (28.5)	42	2	1	1	2
Resident	178	54 (30.3)	15	-	-	-	5
Control	187	63 (33.7)	17	3	-	-	8

Based on the information that we have gathered, we estimate that translocated desert tortoises from the ISEGS project site are likely to suffer mortality rates of approximately 30 percent due to one or more of the sources of mortality listed above. Most of this mortality is likely to occur in the first year after release. After the first year, the individuals in the translocated population are likely to settle into new home ranges and mortality is likely to decrease. Consequently, we estimate that approximately 11 translocated desert tortoises may die during the 3-year, post-translocation monitoring period. In addition, we estimate that desert tortoises that are resident to the recipient site (i.e., translocation areas) are likely to suffer a mortality rate of 30 percent. Assuming that approximately 23 to 61 desert tortoises reside within the translocation area identified by BrightSource, we anticipate that between 7 and 19 resident desert tortoises will suffer mortality.

Based on past studies, we cannot currently predict whether the mortality experienced in the resident and translocated population will be elevated above natural mortality rates for the action area. Although comparing the mortality rates associated with resident and translocated populations with that of the control populations from the Fort Irwin studies seems to indicate that translocation does not increase mortality above natural levels, we hesitate to draw a conclusion in this biological opinion because all relevant analyses have not been completed for this project. However, even if we assume that all desert tortoise mortality associated with translocation is caused by the translocation, the total mortality of 17 to 30 translocated and resident desert tortoises is a small fraction of the total population of desert tortoises that are likely to occupy the Northeastern Mojave Recovery Unit based on the amount of modeled desert tortoise habitat (7,583.39 square miles) and the average density (4.4 desert tortoises per square mile) that the Service has estimated for this recovery unit. Even if we subtract the 300,000 acres lost to fire in 2005 and assume that half of the remaining modeled habitat has been lost to human development or degradation, thousands of square miles of suitable desert tortoise habitat are still likely to be occupied at densities similar to the average estimate derived from line distance sampling. This translates to many thousands of desert tortoises within the Northeastern Mojave Recovery Unit. Consequently, the loss of 17 to 30 desert tortoises does not represent a substantial portion of the population within this recovery unit. In reality, some of the mortality experienced after translocation will likely not actually be caused by the translocation, which means the injury and mortality that is actually the result of the project is likely to be an even smaller portion of the total population within the Northeastern Mojave Recovery Unit.

We have estimated that few, if any, desert tortoises may be moved during installation of the fiber optic line. Because disturbance areas on this project are small, movement of desert tortoises immediately outside of the work area is not likely to remove them from their current home ranges. Consequently, any desert tortoise moved from the fiber optic line will likely continue to occupy familiar territory and use known shelter sites and is unlikely to suffer post-translocation mortality associated with displacement from the work area.

Construction of ISEGS Facilities

BrightSource will permanently fence all 3 project phases, Colosseum Road, and the CLA with desert tortoise exclusion fencing and clear all desert tortoises from the 3,520-acre site prior to ground disturbance. During construction of the permanent perimeter fencing and during other ground-disturbing activities that are outside of the permanently fenced facilities (i.e., fiber optic line, highway fence, natural gas distribution line), Bright Source will perform pre-activity clearance surveys and employ monitors to move desert tortoises out of harm's way if they re-enter work areas. For these reasons, we anticipate that construction, including construction access, is unlikely to kill larger desert tortoises. Some potential always exists that surveyors may miss an individual during clearance surveys and construction monitoring. We cannot predict how many adult desert tortoises that clearance surveys and construction monitoring would miss. However, because BrightSource will use qualified biologists, authorized by the Service for clearance surveys, we anticipate that the number is likely to be small.

In addition, juvenile desert tortoises and eggs are difficult to detect during surveys and construction monitoring; therefore, the potential exists that surveyors may miss them and they may remain in the work areas during construction. We cannot predict how many juvenile desert tortoises or eggs surveyors may miss because we cannot predict how many would be in the action area at the time of project implementation.

Operations and Maintenance Activities

Following fencing, operation and maintenance activities within permanently fenced areas are unlikely to directly injure or kill any desert tortoises. However, we have discussed additional indirect effects associated with operation and maintenance of this facility in the Miscellaneous Effects section later in this biological opinion.

Over the 45-year life of this project, BrightSource may perform some ground-disturbing maintenance activities outside of fenced areas. These activities have the potential to injure or kill desert tortoises primarily as a result of vehicles strikes, as workers travel to and from work sites outside of the fenced areas; a limited possibility exists that desert tortoises could be injured or killed by equipment or workers moving around a work site. Because Class I maintenance activities would not result in surface disturbance or loss of habitat and BrightSource would implement protective measures to reduce the potential for effects to desert tortoises, Class I maintenance activities would kill few, if any, desert tortoises.

Class II maintenance activities associated with repair of desert tortoise exclusion fencing would likely kill or injure few, if any, desert tortoises for the following reasons: 1) fence repairs are likely to result in minimal ground disturbance in localized areas, 2) at least a portion of the work area would be on disturbed areas within the previously fenced project site, 3) perimeter roads would exist that would allow access to most repair locations with minimal off-road travel, and 4) BrightSource would implement numerous protective measures to reduce the potential for injury or mortality of desert tortoises. Because we do not have sufficient detail regarding the other types of maintenance activities discussed in the Description of the Proposed Action, we cannot adequately analyze the potential for injury or mortality of desert tortoises; consequently, the Bureau will need to determine whether these future activities may affect desert tortoises at the time it considers authorizing them.

Restoration/Reclamation Activities

Decommissioning or restoration activities within the permanently fenced project area are unlikely to result in injury or mortality of desert tortoises. BrightSource will need to perform restoration of long-term and temporary disturbance associated with the natural gas distribution line and fiber optic line. BrightSource would implement pre-activity clearance surveys and employ desert tortoise monitors to ensure that desert tortoises do not enter restoration work areas. Consequently, restoration activities will injure or kill few, if any, desert tortoises.

Accessing Worksites

BrightSource will fence the primary access road for the ISEGS facility (Colosseum Road) with desert tortoise exclusion fencing, so accessing the main fenced facilities is unlikely to result in injury or mortality of desert tortoises. In the event that the fence is damaged, a small number of desert tortoises could enter the roadway and be injured or killed. In addition, access of project work areas outside of the fenced facilities (i.e., natural gas pipeline, fiber optic line, highway fence) has the potential to injure or kill desert tortoises due to elevated use of existing routes. Because all workers will have undergone an education program about desert tortoises, workers may be less likely to strike desert tortoises than a casual user. We cannot predict how many individuals will be killed or injured because of the variables involved, such as weather conditions, the nature and condition of the road, and activity patterns of desert tortoises at the time the roads are being used.

Loss of Habitat

The biological assessment has defined permanent, long-term, and temporary disturbance as follows:

- Permanent Disturbance: project disturbance that would remain after the project's lifespan.
- Long-term Disturbance: project disturbance that would remain in place for the lifespan of the project, but would be revegetated following closure.
- Temporary Disturbance: project disturbance revegetated within 5 years of the time of the disturbance.

Based on these definitions and the project description provided in the biological assessment, construction of the 3 project phases and the CLA, including installation of exclusion fencing, and improvements to Colosseum Road would result in 3,295.3 and 277.1 acres of permanent/long-term and temporary disturbance, respectively (CH2MHill2009a). Installation of the natural gas distribution line and associated facilities will result in an additional 1.72 and 8.3 acres of new permanent/long-term and temporary disturbance.

The following table, adapted from 2.1-1 of the revised biological assessment, provides details regarding the disturbance associated with each project feature.

Permanent and Long-term Disturbance	**Acres**
Ivanpah 1	913.5
Ivanpah 2	1,097
Ivanpah 3	1,227
CLA and SCE Substation	52.01
Gas Line	1.72
Colosseum Road	5.8
Total	**3297.03**
Temporary Disturbance	
CLA and SCE Substation	282.3
Gas Line	8.3
Colosseum Road	4.7
Credit for Existing Roads within Project Area	-9.9
Total	**285.4**

Based on the definitions above, we estimate that installation of the fiber optic line would result in approximately 0.28 acre of new temporary disturbance. In addition to the disturbances associated with construction of the ISEGS facility, Class II and III maintenance activities are likely to result in additional habitat disturbance over the 45-year life of the project. Based on the information provided, we cannot estimate the amount of disturbance associated with Class II and III maintenance activities over the life of the project.

These disturbances are likely to result in desert tortoise habitat loss that will persist for various periods. Following extensive disturbance and compaction, Mojave Desert soils can take between 92 and 124 years to recover in the absence of active restoration (Webb 2002). In addition, recovery of plant cover and biomass in the Mojave Desert can require 50 to 300 years in the absence of restoration efforts (Lovich and Bainbridge 1999). Although active restoration, including decompaction, seeding, and planting, can reduce the time required to restore desert ecosystems, success is varied and dependent on numerous variables. Based on this information, 3,295.31 acres, currently characterized as permanent/long-term disturbance, are likely to be permanently lost or unsuitable as habitat for several decades following decommissioning of the facilities and commencement of restoration work. Because active restoration will occur, we estimate that BrightSource will restore 285.4 acres of temporary disturbance to desert tortoise habitat prior to decommissioning of the facility. Based on the information provided, we cannot estimate the amount or duration of habitat loss associated with Class II and III maintenance activities.

The Bureau is proposing to collect compensation for loss of habitat associated with this project at a ratio of 1:1 per the provisions of the Northern and Eastern Mojave Plan. Some of the funds collected through this compensation will be used to purchase private lands containing desert tortoise habitat and some will be used to perform habitat restoration projects. The Bureau will perform all acquisitions and habitat enhancements within the Northeastern Mojave Recovery Unit. Although the purchase and protection of suitable desert tortoise habitat will not create new habitat within the recovery unit, it will result in a net increase in the amount of desert tortoise habitat managed for the conservation of this species. In addition, habitat enhancements the Bureau performs with compensation funds will restore habitat values to lands that have been degraded by human activities within areas that are currently being managed for conservation. In addition, the California Department of Fish and Game will collect compensation for loss of desert tortoise habitat at a ratio of 2:1. Although these funds may be spent in locations outside of the Northeastern Mojave Recovery Unit, at least some funds are likely to be expended within the unit; we expect that these funds would be used to implement actions similar to those implemented by the Bureau and would also result in actions that would promote the conservation of the species.

Because we do not have specific information regarding future enhancement projects or acquisitions, we cannot perform a detailed analysis of the benefits provided by these actions. However, given the combined 3:1 mitigation ratio, the management of acquired lands for conservation, the focus of enhancement projects and acquisitions on the Northeastern Mojave Recovery Unit, and the restoration of habitat values in some areas (versus protection of existing habitat), these actions will likely promote conservation of the desert tortoise.

Miscellaneous Effects

Indirect effects associated with construction, operation, maintenance, and decommissioning of the ISEGS facility may injure or kill desert tortoises. These effects include increased predation by common ravens that are attracted to the area because of increased human activity and modification of the habitat and diet of desert tortoises due to the spread of non-native plant species. Ivanpah Valley currently supports numerous facilities that subsidize common ravens (e.g., water sources, trash, road-killed animals, nest and roost sites, etc.); these facilities are associated with established communities (i.e., Primm, Nevada and Nipton, California), golf courses, an interstate highway, and utility lines that are likely to elevate the level of predation of desert tortoises by common ravens within the action area. Construction and operation of the ISEGS facility has the potential to attract additional common ravens and increase predation in the action area. BrightSource has proposed numerous measures to address predation by common ravens associated with the project site. These measures include subsidy control, a monitoring program, and contingencies for removal of problem common ravens. In addition, BrightSource will provide funds for implementation of regional management actions for common ravens.

We cannot reasonably predict the amount of predation by common ravens that construction and operation of this project is likely to add to baseline levels within the action area, but we anticipate that the program proposed by BrightSource is likely to be highly effective in controlling common raven use of the project site. Depending on the location of specific control actions, funding of regional management of common ravens may also aid in reducing the amount of common raven predation on desert tortoises within the action area.

Non-native plant species currently occur on the proposed project site and are likely to occur in other portions of the action area at varying densities. Within Ivanpah Valley, numerous features serve as vectors for infestation of the action area by non-native plant species (e.g., highways, cattle allotment). However, construction and operation of the ISEGS facility has the potential to increase the distribution and abundance of non-native species within the action area due to ground-disturbing activities that favor the establishment of non-native species. In addition, access to the project site and other project features by construction and operations personnel is likely to increase the volume and distribution of non-native seed carried into the action area. The increased abundance in non-native species associated with this project may result in an increased fire risk, which may result in future habitat loss.

BrightSource has proposed numerous measures to address control of non-native plant species within the project site. We cannot reasonably predict the increase in non-native species abundance that this project will create within the action area, but we anticipate that the program proposed by BrightSource will be reasonably effective in reducing the increase in some species. However, BrightSource has not proposed any measures to control species, such as red brome, that are ubiquitous in the area. Increases in the abundance of this species elevate the risk of fire, which, in turn, heightens the risk of future habitat loss.

Summary

Prior to construction of the ISEGS facility, we estimate that BrightSource would capture and translocate or relocate approximately 36 desert tortoises from project worksites. Because they will implement a variety of measures to reduce stress to these animals, we do not anticipate that injury or mortality will result from handling of these animals. Following release of translocated animals, we anticipate that approximately 11 will die due to predation, exposure, fire, disease, crushing by cattle, or flooding. Most of this mortality is likely to occur in the first year after release, during the period that translocated animals are making long-distance movements and attempting to establish new home ranges. In addition, we anticipate that approximately 19 resident desert tortoises in the translocation areas are likely to die due to predation, exposure, fire, disease, crushing by cattle, or flooding. We cannot currently determine if mortality rates in the resident or translocated populations will be above natural mortality levels for the translocation area.

Because BrightSource will surround the majority of its work areas with desert tortoise exclusion fencing, perform clearance surveys on all work areas, and implement numerous measures to prevent injury and mortality of desert tortoises, we anticipate that construction of the ISEGS project site, including use of access routes, is likely to kill or injure few adult desert tortoises. Because of the difficulty detecting them, project implementation may kill or injure some juvenile desert tortoises and destroy some eggs, if any are present. Given the numerous variables discussed in this section, we cannot predict the number of juveniles or eggs with any certainty.

Following construction, we do not anticipate that any operations, maintenance, or restoration/reclamation activities within the permanently fenced portions of the ISEGS facility will injure or kill desert tortoises. This includes regular access of the completed facility along Colosseum Road. Because BrightSource would implement numerous protective measures, restoration activities in unfenced work areas are unlikely to injure or kill desert tortoises. We cannot accurately predict the number of desert tortoises that most Class II maintenance activities would kill or injure outside of the fenced project site because we do not have sufficient information to predict the location, frequency, or magnitude of these actions. However, Class I activities and Class II maintenance activities associated with fence repair would kill or injure few, if any, desert tortoises because of the nature of these activities and the protective measures that BrightSource would implement.

Project development will result in 3,297.03 acres of long-term/permanent disturbance. Although all of this area, except for the permanent facilities (i.e., SCE substation and gas metering stations), will undergo restoration/reclamation work, it is unlikely to serve as suitable desert tortoise habitat for many years following facility closure. We cannot predict the amount of time required to return areas of long-term disturbance to suitable desert tortoise habitat because of numerous variables associated with restoration success, including the timing and amount of rainfall. We estimate that BrightSource will return an additional 285.4 acres of temporary disturbance to suitable desert tortoise habitat by the end of the 45-year project lifespan.

Construction, operation, maintenance, and decommissioning of the ISEGS facility have the potential to increase common raven predation on desert tortoises within the action area. In addition, this project is likely to result in an increased abundance of non-native plant species and a subsequent increase in fire frequency within the action area. The measures proposed by BrightSource to address these threats will reduce the magnitude of these effects, but some level of adverse effect will likely persist. We cannot reasonable predict the number of desert tortoises that these threats will adversely affect.

The compensation required by the Bureau would, to some degree, offset the adverse effects of the proposed solar power facility. All of the actions that would be undertaken as compensation will be consistent with recommendations for recovery of the desert tortoise. However, the lack of specificity with regard to which actions will be implemented, the uncertainty of success of the actions, and the time lag between implementation of the conservation actions and a substantive effect on recovery of the desert tortoise prohibit us from concluding that the compensation measures would completely offset the adverse effects of the solar facility. Because of the long term or permanent loss of approximately 3,297 acres of desert tortoise habitat the project will likely result in a net decrease in desert tortoise habitat.

To conclude, areas disturbed by the proposed solar facility and its ancillary features would no longer support reproduction of desert tortoises. Most of the desert tortoises that currently reside within these areas will likely continue to reproduce after translocation. Consequently, we anticipate that the proposed action will not appreciably diminish the reproductive capacity of the species.

Implementation of the proposed action would not appreciably reduce the number of desert tortoises in the Northeastern Mojave Recovery Unit. Based on the amount of modeled desert tortoise habitat (7,583.39 square miles) and the average density (4.4 desert tortoises per square mile) that the Service has estimated for this recovery unit, we could estimate that approximately 33,367 desert tortoises occur in the Northeastern Mojave Recovery Unit. Because the model does not take into account existing human disturbance, we used a more conservative estimate in which we considered half of the modeled habitat was no longer suitable for desert tortoises because of development or degradation resulting from human activities; we also removed the 300,000 acres lost to fire in 2005. Using this amount of remaining modeled habitat, we estimate that approximately 15,652 desert tortoises reside within the Northeastern Mojave Recovery Unit. Consequently, we conclude that relatively few desert tortoises are likely to be lost as a result of the proposed action.

In previous consultations, we estimated the number of desert tortoises found in the desert wildlife management areas and critical habitat by multiplying the average density of animals found in these areas by their total size. For the numbers of desert tortoises outside of those areas, we used a density value of one-tenth of that estimated within desert wildlife management areas and critical habitat, which we multiplied by the estimated area of available desert tortoise habitat. We did not correct for areas that were unsuitable habitat in either case in these past consultation estimates. Because the method of estimating the number of desert tortoises we use in this biological opinion takes into account a conservative estimate of modeled desert tortoise habitat, we used the same average density across all areas of desert tortoise habitat for our estimate.

The distribution of the desert tortoise would be reduced by approximately 5.15 square miles, based on the amount of long-term and permanent disturbance associated with the proposed action. This loss comprises approximately 0.07 percent of the modeled habitat in the Northeastern Mojave Recovery Unit and approximately 0.15 percent of the modeled habitat if we use the conservative estimate discussed in the previous paragraph. Although this percentage does not constitute a numerically substantial portion of the Northeastern Mojave Recovery Unit, we do not have the ability to place a numerical value on edge effects and overall fragmentation that the proposed action may cause or that occurs in the recovery unit as a whole. Given that, this low percentage of the recovery unit that would be lost likely underestimates the biological value of the area.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The Bureau manages all of the land in the action area with the exception of two 640-acre sections owned by the State of California. There are no proposed, non-federal actions within these parcels.

CONCLUSION

After reviewing its status, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the desert tortoise. We have reached this conclusion because:

1. Project activities are likely to directly kill few desert tortoises because BrightSource will implement numerous measures to reduce the potential that desert tortoises will occupy project work sites (i.e., clearance surveys, exclusion fencing, translocation, qualified biologists, desert tortoise monitors).
2. The number of desert tortoises likely to be injured and killed as a result of translocation will likely to be small relative to the number of desert tortoises that occur within the Northeastern Mojave Recovery Unit, and across the range of the species.
3. BrightSource will implement numerous measures to reduce the potential for increased predation by common ravens and spread of non-native plant species.
4. Current information from permanent study plots and line distance sampling does not document a statistical trend in adult desert tortoise densities in this recovery unit. Therefore, we have no information to indicate that the loss of a small number of individuals as a result of this project would appreciably reduce our ability to reach population recovery objectives for the desert tortoise in the Northeastern Mojave Recovery Unit.
5. This project would not result in loss of desert tortoise habitat in areas that the Bureau or other agencies have designated for intensive management to achieve conservation of desert tortoises.
6. Compensation requirements through the Bureau and California Department of Fish and Game will result in an increase in the amount of existing habitat that is managed for the conservation of the desert tortoise and will likely lead to restoration of lost or degraded habitat within these areas.
7. Regional management actions, proposed by the Bureau, are likely to aid in reducing common raven predation in a portion of the desert tortoise's range.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an incidental take statement.

The measures described in this document are non-discretionary. The Bureau has a continuing duty to regulate the activities covered by the incidental take statement in the biological opinion. If the Bureau fails to include the terms and conditions of this incidental take statement as enforceable conditions of its right-of-way grant, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Bureau must report the progress of its action and its impact on the desert tortoise to the Service as specified in the incidental take statement [50 *Code of Federal Regulations* 402.14(i)(3)].

Translocation of Desert Tortoises

We anticipate that the translocation of approximately 38 subadult and adult desert tortoises from project facilities (i.e., Phase 1, 2, and 3 project sites, the CLA, fiber optic line, and natural gas distribution line) would involve take, in the form of capture, of all of these individuals. We emphasize that these numbers are estimates, based on the best available information. We anticipate that a small number of these individuals are likely to be killed or injured during translocation and monitoring due to stress associated with this activity.

Following capture and translocation, we anticipate mortality of approximately 11 translocated desert tortoises. In addition, we anticipate mortality of up to 19 desert tortoises that are resident to the translocation area as a result of the same mortality sources. Based on the information provided, we cannot determine whether the act of translocation will result in mortality rates that are elevated above existing levels in the translocated or control populations. Consequently, we cannot determine whether the predicted mortality in these populations is natural or caused by the act of moving desert tortoises to a new location. Because translocated animals are more exposed to sources of mortality during the time required to establish new home ranges, we anticipate that at least some of the mortality experienced by the translocated population will be the result of the translocation. However, we cannot reasonably predict what portion of this estimate should be assigned as take associated with the project versus natural mortality attributed to existing causes in the action area

Construction of ISEGS Facilities

Because BrightSource will fence the majority of its work areas with desert tortoise exclusion fencing, perform clearance surveys on all work areas, and implement numerous measures to prevent adverse effects to desert tortoises, we anticipate that construction of the ISEGS project site, including use of access routes, is likely to take few, if any, adult desert tortoises in the form of mortality or injury. Because of the difficulty detecting them, project implementation may injure or kill some juvenile desert tortoises and destroy some eggs that are missed during clearance surveys. Given the numerous variables discussed in this biological opinion, we cannot predict the number of juveniles or eggs that may be taken.

Operation and Maintenance of ISEGS Facilities

Following fencing and construction, operation and maintenance activities, including site access, within permanently fenced areas are unlikely to directly injure or kill any desert tortoises. Class I maintenance activities that are outside of fenced work areas would kill or injure few, if any, desert tortoises because these activities would not result in ground disturbance. In addition, BrightSource would implement numerous protective measures to avoid adverse effects. Class II maintenance activities associated with fence repair would kill or injure few, if any, desert tortoises because the need for this action would be localized and infrequent, access to repair sites would require little if any off-road travel, and BrightSource would implement numerous protective measures to reduce the potential for take.

Because we do not have sufficient information regarding the location or extent of other Class II and Class III maintenance activities that may occur outside of the permanently fenced work areas, we cannot determine the level of take associated with these activities. Consequently, we are not granting an exemption from the prohibitions against take for these activities. These actions will require further site-specific or programmatic consultation.

Decommissioning and Restoration of ISEGS Facilities

Restoration of temporary disturbance within fenced facilities during operation and maintenance or following decommissioning is unlikely to result in take of desert tortoises because BrightSource will clear all fenced areas of desert tortoises prior to construction of facilities. After facility closure, decommissioning activities and restoration of long-term disturbance within fenced areas are unlikely to take desert tortoises for the same reason. Restoration of temporary disturbances and long-term disturbances outside of fenced work areas is likely to kill few, if any, desert tortoises for the following reasons: 1) desert tortoise habitat will either be absent from restoration sites or will be of a substantially degraded nature that it will not attract desert tortoises; 2) BrightSource will implement clearance surveys of any restoration sites where ground-disturbing activities are likely to occur, 3) BrightSource will implement numerous measures to reduce the potential for take on restoration sites (e.g., worker education, desert tortoise monitors, etc.).

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of desert tortoises during the implementation of the ISEGS project:

1. The Bureau must ensure that desert tortoises do not enter fenced project facilities.

2. The Bureau must ensure that the level of incidental take anticipated in this biological opinion is commensurate with the analysis contained herein.

3. The Bureau must ensure that translocation of desert tortoises does not result in injury or mortality of translocated or resident desert tortoises that is substantially elevated above natural injury and mortality rates within the action area.

4. The Bureau must ensure that transmittered desert tortoises are routinely monitored to prevent loss of these animals prior to the removal of transmitters because translocated desert tortoises have the potential to move long distances in a relatively short period of time.

5. The Bureau must ensure that the BrightSource facility does not serve as a subsidy to common ravens.

6. The Bureau must ensure that desert tortoises that exhibit clinical signs of disease are not translocated.

Our evaluation of the proposed action includes consideration of the protective measures described in the Description of the Proposed Action section of this biological opinion. Consequently, any changes in these protective measures may constitute a modification of the proposed action that causes an effect to the desert tortoise that was not considered in the biological opinion and require re-initiation of consultation, pursuant to the implementing regulations of the section 7(a)(2) of the Act (50 Code of Federal Regulations 402.16).

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, the Bureau must comply with the following terms and conditions, which implement the reasonable and prudent measures described in the previous section, or make them enforceable conditions of its right-of-way grant, and the reporting and monitoring requirements. These conditions are non-discretionary.

1. The following term and condition implements reasonable and prudent measure 1:

The Bureau must ensure that BrightSource monitors the integrity of all desert tortoise exclusion fencing at least once a month and following any rain events that result in surface flow of water in washes within the action area.

2. The following terms and conditions implement reasonable and prudent measure 2:

a. To ensure that the measures proposed by the Bureau and BrightSource are effective and are being properly implemented, the Bureau must contact the Service immediately if it becomes aware that a desert tortoise has been killed or injured by project activities. At that time, the Service and the Bureau must review the circumstances surrounding the incident to determine whether additional protective measures are required. Project activities may continue pending the outcome of the review, provided that the proposed protective measures and any appropriate terms and conditions of this biological opinion have been and continue to be fully implemented.

b. If 9 desert tortoises are directly killed or injured as a result of any construction, operation, maintenance, decommissioning, or restoration activities covered by this biological opinion over the life of the ISEGS project, the Bureau must re-initiate consultation, pursuant to the implementing regulations for section 7(a)(2) of the Endangered Species Act at 50 Code of Federal Regulations 402.16, on the proposed action. Because we do not expect that the handling of desert tortoises is likely to result in injury or mortality, we are not establishing a criterion for re-initiation of formal consultation for this activity.

c. If 3 desert tortoises are killed in any 1 year over the life of the project, the Bureau must re-initiate consultation, pursuant to the implementing regulations for section 7(a)(2) of the Endangered Species Act at 50 Code of Federal Regulations 402.16, on the proposed action.

3. The following terms and conditions implements reasonable and prudent measure 3:

a. The Bureau must ensure that BrightSource transmitters and monitors desert tortoises that are resident to the translocation area and desert tortoises that are located in a control population. The number of desert tortoises monitored in each population must be equal to the number of desert tortoises that are translocated from the project site. In addition, the Bureau must ensure that BrightSource transmitters a range of size classes to approximate the size classes that will be monitored in the translocated population. The Bureau must ensure that these desert tortoises are regularly monitored to determine mortality rates, health status, movement patterns, and sources of mortality. The location of the control population must be in habitat similar to that on the translocation area and at least 6.2 miles from the translocation area or in an area that is separated from the translocation area by a physical barrier that prevents desert tortoise movement. The Bureau must ensure that only qualified biologists, authorized by the Service, perform monitoring of these populations.

b. If monitoring of translocated and resident desert tortoises indicates a statistically significant elevation in mortality rates above that observed in control populations, the Bureau must re-initiate consultation, pursuant to the implementing regulations for section 7(a)(2) of the Endangered Species Act at 50 Code of Federal Regulations 402.16, on the proposed action.

4. The following terms and conditions implement reasonable and prudent measure 4:

a. The Bureau must ensure that BrightSource monitors all translocated desert tortoises according to the following schedule: 1) within 24 hours of release, 2) twice weekly for the first 2 weeks after release, 3) starting the third week after release, at least once a week from March 1 to October 31 and once every other week from November 1 to February 28.

b. The Bureau must ensure that BrightSource monitors all transmittered desert tortoises in the resident and control populations at least once a week from March 1 to October 31 and once every other week from November 1 to February 28.

5. The following term and condition implements reasonable and prudent measure 5:

The Bureau must meet with the Service to review data and reports associated with BrightSource's monitoring and adaptive management program for common ravens prior to the cessation of these activities. If the agencies determine that further monitoring and adaptive management are warranted, the Bureau must require BrightSource to extend these activities.

6. The following term and condition implements reasonable and prudent measure 6:

After performance of visual health assessments on project-site desert tortoises, the Bureau must ensure that BrightSource contacts the Ventura Fish and Wildlife Office with the results of the health assessments prior to commencement of translocation. Desert tortoises may be held in temporary holding areas during this period. However, these temporary holding areas must provide animals with access to burrows, forage, and water. Desert tortoises held in this way cannot be held for more than one week or cannot come into contact with one another while being held. Alternatively, desert tortoises can be located on the project site, transmittered, observed for visual signs of disease, and then tracked and translocated after approval of the health assessment findings by the Ventura Fish and Wildlife Office.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. We recommend that the Bureau work with BrightSource and the Service to determine if the transmittered desert tortoises associated with the resident, control, and translocated populations can be used to answer additional research questions related to translocation or desert tortoise biology.

2. We recommend that the Bureau amend the California Desert Conservation Area Plan to prohibit large-scale development (e.g., solar energy facilities, wind development, etc.)

within the area bounded by Interstate 15, the State line, and Clark Mountains. We offer this recommendation because this area will have been used as a recipient site for translocated desert tortoises from the ISEGS project. Additionally, three other projects, the Joint Port of Entry, DesertXpress, and a pipeline extension from the Kern River Gas Transmission Company's line may be built in this valley. Given these activities, the potential exists that this portion of the Ivanpah Valley may be disturbed and fragmented to the extent that desert tortoises and other wildlife populations may be severely compromised.

3. We recommend that the Bureau perform additional wild horse and burro gathers in the former Clark Mountain Herd Management Area to remove remaining burros that may adversely affect habitat within translocation areas.

4. Based upon our review, certain aspects of the weed management plan may result in an inefficient use of resources. We recommend that the Bureau and BrightSource work with the Mojave Resource Conservation District to develop a site-specific weed management plan that would be effective and efficient.

5. We recommend that the Bureau consider alternative configurations for this project that would focus ground disturbance on lands next to Interstate 15 that are likely to have very low desert tortoises densities.

The Service requests notification of the implementation of any conservation recommendations so we may be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats.

REINITIATION NOTICE

This concludes formal consultation on the Bureau's proposal to issue a right-of-way grant to BrightSource Energy for construction of the ISEGS facility in San Bernardino County, California. Reinitiation of formal consultation is required where discretionary federal involvement or control over the action has been retained or is authorized by law and: (a) if the amount or extent of taking specified in the incidental take statement is exceeded; (b) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (c) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or (d) if a new species is listed or critical habitat designated that may be affected by the identified action (50 Code of Federal Regulations 402.16).

If you have any questions regarding this biological opinion, please contact Brian Croft of my staff at (951) 697-5365.

LITERATURE CITED

Avery, H.W. 1998. Nutritional ecology of the desert tortoise (*Gopherus agassizii*) in relation to cattle grazing in the Mojave Desert. Ph.D. Dissertation, Department of Biology, University of California. Los Angeles, California.

Avian Power Line Interaction Committee. 2006. Suggested practices for avian protection on power lines: the state of the art in 2006. Edison Electric Institute, Avian Power Line Interaction Committee, and California Energy Commission. Washington, D.C., and Sacramento, California.

Berry, K.H. 1986. Desert tortoise (*Gopherus agassizii*) relocation: implications of social behavior and movements. Herpetologica 42(1):113-125.

Berry, K.H. 1996. Summary of the results of long-term study plots for the desert tortoise in California. Letter to Molly Brady, Bureau of Land Management, Riverside, California. Dated October 1. Riverside Field Station, U.S. Geological Survey. Riverside, California.

Berry, K.H. 1999. Preliminary report from the 1999 spring survey of the desert tortoise long-term study plot in Chemehuevi Valley and Wash, California. Box Springs Field Station, Western Ecological Research Center, U.S. Geological Survey. Riverside, California.

Berry, K.H. 2005. Electronic mail: information on the number of desert tortoises detected on select permanent study plots in California. Dated February 28. Box Springs Field Station, Western Ecological Research Center, U.S. Geological Survey. Moreno Valley, California.

Boarman, W.I., T. Goodlett, G. Goodlett, and P. Hamilton. 1998. Review of radio transmitter attachment techniques for turtle research and recommendations for improvement. Herpetological Review 29(l):26-33.

Bureau of Land Management. 1998. Surface Management Status – Desert Access Guide: Ivanpah. National Applied Resource Sciences Center. Denver, Colorado.

Bureau of Land Management. 1999. Surface Management Status – Desert Access Guide: Mesquite Lake. National Applied Resource Sciences Center. Denver, Colorado.

Bureau of Land Management. 2002. Final environmental impact statement: proposed Northern and Eastern Mojave Desert Management Plan – amendment to the California Desert Conservation Area Plan. California Desert District. Moreno Valley, California.

Bureau of Land Management and California Energy Commission. 2009. Final staff assessment, draft environmental impact statement, and draft California Desert Conservation Area Plan amendment for the Ivanpah Solar Electric Generating System, San Bernardino County, California. Sacramento, California.

Burge, B.L. 1978. Physical characteristics and patterns of utilization of cover sites by *Gopherus agassizii* in southern Nevada. Proceedings of the 1978 Symposium, Desert Tortoise Council.

Burge, B.L., and W.G. Bradley. 1976. Population density, structure and feeding habits of the desert tortoise, *Gopherus agassizii*, in a low desert study area in southern Nevada. Proceedings of the 1976 Symposium, Desert Tortoise Council.

Burroughs, M. 2005. Electronic mail. Information on recent fires in desert tortoise habitat. Dated August 9. Fish and wildlife biologist, Fish and Wildlife Service. Las Vegas, Nevada.

Congdon, J.D., A.E. Dunham, and R.C. Van Loben Sels. 1993. Delayed sexual maturity and demographics of Blanding's turtles (*Emydoidea blandingii*): implications for conservation and management of long-lived organisms. Conservation Biology 7:826-833.

CH2MHill. 2008a. Biological assessment - Appendix H - 2008 Desert tortoise survey report for additional Ivanpah SEGS Action Area. Sacramento, California.

CH2MHill. 2008b. Biological assessment – Attachment E – Draft raven management plan, Ivanpah Solar Electric Generating System. Sacramento, California.

CH2MHill. 2008c. Biological assessment – Attachment DR13-1A – Weed management plan for the Ivanpah Solar Electric Generating System. Eastern Mojave Desert, San Bernardino County, California. Sacramento, California.

CH2MHill. 2009a. Biological assessment for the Ivanpah Solar Electric Generating System. Prepared for the Bureau of Land Management, California Desert District, Moreno Valley, California. Sacramento, California.

CH2MHill. 2009b. Biological assessment – Attachment D – Desert tortoise translocation/relocation plan for the Ivanpah Solar Electric Generating System. Sacramento, California.

CH2MHill. 2009c. Biological assessment – Attachment A – Closure, revegetation, and rehabilitation plan for the Ivanpah Solar Electric Generating System. Eastern Mojave Desert, San Bernardino, California.

CH2MHill. 2010. Revised biological assessment for the Ivanpah Solar Electric Generating System. Prepared for the Bureau of Land Management, California Desert District, Moreno Valley, California.

Clayton, C. 2005. Desert tortoise acres consumed by fires in 2005. Electronic mail. Dated November 11. Fish and wildlife biologist, Ventura Fish and Wildlife Office, U.S. Fish and Wildlife Service. Ventura, California.

Darst, C. 2010a. Electronic mail: population estimate for the Ivanpah Solar Electric Generating System. Dated March 10. Desert Tortoise Recovery Office. Ventura, California.

Darst, C. 2010b. Electronic mail: estimate of modeled desert tortoise habitat within 1994 desert tortoise recovery units. Dated April 13. Desert Tortoise Recovery Office. Ventura, California.

Field, K.J., C.R. Tracy, P.A. Medica, R.W. Marlow, and P.S. Corn. 2007. Return to the wild: translocation as a tool in conservation of the desert tortoise (*Gopherus agassizii*). Biological Conservation 136: 232-245.

Hovik, D.C., and D.B. Hardenbrook. 1989. Summer and fall activity and movements of desert tortoises in Pahrump Valley, Nevada. Abstract of paper presented at Fourteenth Annual Meeting and Symposium of the Desert Tortoise Council.

Jennings, W.B. 1997. Habitat use and food preferences of the desert tortoise, *Gopherus agassizii*, in the western Mojave Desert and impacts of off-road vehicles. In Van Abbema, J., (Ed.). Proceedings: Conservation, restoration, and management of tortoises and turtles – an international conference. New York Turtle and Tortoise Society. Purchase, New York.

Lovich, J.E., and D. Bainbridge. 1999. Anthropogenic degradation of the Southern California Desert ecosystem and prospects for natural recovery and restoration. Environmental Management 25(3): 309-326.

Luckenbach, R.A. 1982. Ecology and management of the desert tortoise (*Gopherus agassizii*) in California. In: R.B. Bury (ed.). North American Tortoises: Conservation and Ecology. U.S. Fish and Wildlife Service, Wildlife Research Report 12. Washington, D.C.

Nussear, K.E. 2004. Mechanistic investigation of the distributional limits of the desert tortoise *Gopherus agassizii* . Dissertation. University of Nevada. Reno, Nevada.

Nussear, K.E., T.C. Esque, R.D. Inman, L. Gass, K.A. Thomas, C.S.A. Wallace, J.B. Blainey, D.M. Miller, and R.H.Webb. 2009. Modeling habitat of the desert tortoise (*Gopherus agassizii*) in the Mojave and parts of the Sonoran Deserts of California, Nevada, Utah, and Arizona. U.S. Geological Survey Open-File Report 2009-1102.

Oftedal, O.T. 2001. Low rainfall affects the nutritive quality as well as the total quantity of food available to the desert tortoise. Abstract of paper presented at the Twenty-sixth Annual Meeting and Symposium of the Desert Tortoise Council.

Rakestraw, D. L. 1997. Desert tortoise relocation at Yucca Mountain, Nevada. Abstract of paper presented at the 1997 Annual Meeting and Symposium of the Desert Tortoise Council.

Saethre, M.B., T.C. Esque, P.A. Medica, R. Marlow, and C.R. Tracy. 2003. Determining carrying capacity of desert tortoises. Abstract of a paper present at the 28th Annual Meeting and Symposium of the Desert Tortoise Council.

Schamberger, M., and F.B. Turner. 1986. The application of habitat modeling to the desert tortoise (*Gopherus agassizii*). Herpetologica 42(1):134-138.

SNEI. 2009. Ivanpah N1, N2, N3, and N4 desert tortoise (*Gopherus agassizii*) survey report. Prepared for CH2MHill. Las Vegas, Nevada.

Stitt, E.W., C.R. Schwalbe, D.E. Swann, R.C. Averill-Murray, A.K. Blythe. 2003. Sonoran desert tortoise ecology and management: effects of land use change and urbanization on desert tortoises. Final report to Suaguaro National Park.

Tracy, C.R., R. Averill-Murray, W.I. Boarman, D. Delehanty, J. Heaton, E. McCoy, D. Morafka, K. Nussear, B. Hagerty, and P. Medica. 2004. Desert Tortoise Recovery Plan Assessment. Prepared for the U.S. Fish and Wildlife Service. Reno, Nevada.

Turner, F.B., and D.E. Brown. 1982. Sonoran desertscrub. In: D.E. Brown (editor). Biotic communities of the American Southwest - United States and Mexico. Desert Plants 4(1-4):181-222.

U.S. Army. 2009. Fort Irwin annual permit report for 2008. Submitted to the Desert Tortoise Recovery Office, Reno, Nevada. Fort Irwin, California.

U.S. Army. 2010. 2009 Annual reports for Fort Irwin biological opinions and desert tortoise permit for the Fort Irwin translocation project. Submitted to the Desert Tortoise Recovery Office, Reno, Nevada. Fort Irwin, California.

U.S. Fish and Wildlife Service. 1992. Field survey protocol within the range of the desert tortoise. Ventura Office. Ventura, California.

U.S. Fish and Wildlife Service. 1994. Desert tortoise (Mojave population) recovery plan. Portland, Oregon.

U.S. Fish and Wildlife Service. 2002. Biological opinion for the California Desert Conservation Area Plan [desert tortoise] (6840(P) CA-063.50) (1-8-01-F-16). Memorandum to State Director, Bureau of Land Management, Sacramento, California. Dated June 17. From Field Supervisor, Ventura Fish and Wildlife Office. Ventura, California.

U.S. Fish and Wildlife Service. 2005. Guidance on conducting Endangered Species Act (ESA) section 7 consultations on the desert tortoise and other species. Memo from the Assistant Manager, Ecological Services, California Nevada Operations Office, Sacramento, California.

U.S. Fish and Wildlife Service. 2006. Range-wide monitoring of the Mojave population of the desert tortoise: 2001-2005 summary report. Desert Tortoise Recovery Office. Reno, Nevada.

U.S. Fish and Wildlife Service. 2008a. Desert tortoise – authorized biologist and monitor responsibilities and qualifications. http://www.fws.gov/ventura/speciesinfo/protocols_guidelines/docs/dt/DT%20Auth%20Bio%20qualifications%20statement%2010_20_08.pdf

U.S. Fish and Wildlife Service. 2008b. Draft revised recovery plan for the Mojave population of the desert tortoise (*Gopherus agassizii*). Pacific Southwest Region. Sacramento, California.

U.S. Fish and Wildlife Service. 2009a. Desert tortoise field manual. http://www.fws.gov/ventura/speciesinfo/protocols_guidelines/

U.S. Fish and Wildlife Service. 2009b. Range-wide monitoring of the Mojave population of the desert tortoise: 2007 annual report. Desert Tortoise Recovery Office. Reno, Nevada.

U.S. Fish and Wildlife Service. 2010a. Ivanpah Solar Electric Generating System – desert tortoise habitat potential in the Ivanpah Valley within 10 kilometers of the proposed desert tortoise relocation areas. Ventura Fish and Wildlife Office. Ventura, California.

U.S. Fish and Wildlife Service. 2010b. Revised pre-project survey protocols for the desert tortoise (*Gopherus agassizii*). http://www.fws.gov/ventura/speciesinfo/protocols_guidelines/docs/dt/DT%20Pre-project%20Survey%20Protocol_2010%20Field%20Season.pdf

Walde, A.D., A.P. Woodman, and W.I. Boarman. 2008. desert tortoises surveys and research in the southern and western expansion areas of Fort Irwin. 2008 summary report. ITS Corporation. Prepared for the Department of the Army. Fort Irwin, California.

Waln, K. 2010. Electronic mail: Estimated size of the translocation/relocation area identified in BrightSource's translocation/relocation area. Dated April 12, 2010. Ventura Fish and Wildlife Office, Ventura, California.

Webb, R.H. 2002. Recovery of severely compacted soils in the Mojave Desert, California, USA. Arid Land Research and Management 16: 291-305.

Weinstein, M., K.H. Berry, and F.B. Turner. 1987. An analysis of habitat relationships of the desert tortoise in California. A report to Southern California Edison Company. Rosemead, California.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
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APPLICATION FOR CERTIFICATION
FOR THE *IVANPAH SOLAR ELECTRIC GENERATING SYSTEM*

DOCKET NO. 07-AFC-5
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(Revised 11/23/09)

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DECLARATION OF SERVICE

I Sabrina Savala, declare that on August 30, 2010, I served and electronically filed copies of the attached, Energy Commission Staff's Transmittal of Suggested Edits to the Presiding Member's Proposed Decision– Set **1** for the Ivanpah Solar Electric Generating System. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at: [www.energy.ca.gov/sitingcases/ivanpah].

The documents have been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(*Check all that Apply*)

FOR SERVICE TO ALL OTHER PARTIES:

__✔__ sent electronically to all email addresses on the Proof of Service list;

__✔__ by personal delivery or by depositing in the United States mail at Sacramento, California with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses NOT marked "email preferred."

AND

FOR FILING WITH THE ENERGY COMMISSION:

__✔__ sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (***preferred method***);

OR

_____ depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 07-AFC-5
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.state.ca.us

I declare under penalty of perjury that the foregoing is true and correct.

Originally Signed by
Sabrina Savala