



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
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October 1, 2010

## 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 Solar Partners I, LLC, Solar Partners II, LLC, and Solar Partners VIII, LLC 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.). Because BrightSource Energy is a parent company for all Solar Partner Companies, this biological opinion refers to the project proponents collectively as BrightSource. The proposed project involves construction, operation, maintenance, and decommissioning of a 370-megawatt solar thermal power plant and associated infrastructure and facilities on 3,582 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 and translocation strategy obtained from Bureau staff during the formal consultation process. This information includes the biological assessment (CH2MHill 2009a), revised biological assessment (CH2MHill 2010a), draft environmental impact statement and final staff assessment (Bureau and California Energy Commission 2009), supplemental draft environmental impact statement (Bureau 2010), 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), the site plan for management of weeds (CH2MHill 2008c), and additional correspondences regarding modifications to the desert tortoise translocation strategy and mitigation framework (Fesnock

2010a and 2010b, CH2MHill 2010b). A complete record of this consultation is on file in the Ventura Fish and Wildlife Office.

Construction, operation, maintenance, and decommissioning of the ISEGS facility and translocation of desert tortoises do not require activities that would adversely affect the primary constituent elements of critical habitat for the desert tortoise because the actions will not take place within critical habitat or affect the primary constituent elements. 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. On April 26, 2010, we issued a draft biological opinion to the Bureau (Service 2010c). We revised the draft biological opinion based on comments from the Bureau and BrightSource. On July 21, 2010, the Bureau provided us with a revised translocation strategy that required significant revisions to the draft biological opinion (Fesnock 2010c). On September 21, 2010, the Bureau provided additional changes to the translocation strategy, requiring further revisions of the draft biological opinion (Fesnock 2010a). This biological opinion analyzes the effects associated with the reduced project footprint, the revised translocation strategy, and the comments received from the Bureau and BrightSource.

## **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) Ivanpah 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) Ivanpah 2 – construction of the Ivanpah 2 plant (middle site; 1,097 acres); and (3) Ivanpah 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, the revised biological assessment (CH2MHill 2010a), and the supplemental environmental impact statement (Bureau 2010).

## **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.). We have described the measures that BrightSource will implement to avoid or minimize adverse effects to the desert tortoise in a later section.

### *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. Alternatively, BrightSource may install desert tortoise exclusion and security fencing separately. Regardless of the method for fence installation, 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 desert tortoise exclusion fence or a combined exclusion fence and security fence around the entire perimeter of the phase. 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, 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 eastern edge of Ivanpah 3 to a metering station (10 feet by 40 feet) near the middle of its western side. 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 east side of Ivanpah 2. From the Ivanpah 2 metering station, the gas line would continue along the west side of Ivanpah 2 following the asphalt access 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. The Ivanpah 1 and 2 metering stations would use a portion of the Ivanpah 2 solar field 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, 2, and 3. A portion of the gas line 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 about 2.5 gallons per washing for a total use of 10.97 acre-feet per year for Ivanpah 1 and about 12 acre-feet per year for Ivanpah 2 and 3. However, the application rate on Ivanpah 1 may double during construction of Ivanpah 3 due to increased amounts of construction-related dust. During each washing, approximately 0.17 gallon per linear foot of mirror 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. BrightSource has grouped these anticipated maintenance activities into three classes. Any maintenance activities that are outside the approved right-of-way boundary (i.e., the fenced boundary of the project site and the associated perimeter road) for the project will require additional authorizations from the Bureau and additional section 7 consultation.

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 short-term 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 (i.e., Ivanpah 1, followed by Ivanpah 2, Ivanpah 3, and the shared facilities). 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 structures and foundations less than 6-feet deep from the project area, 3) remove all physical components of the generation facility except for the SCE substation, the diversion structure, and asphalt access road, 4) re-contour and decompact soils associated with disturbed areas, 5) implement revegetation procedures using native species, 6) remove all exclusion and security fencing, and 7) 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. The wording of some measures differs from those proposed by the Bureau and BrightSource. We have changed the wording of some measures to improve clarity, but we have not changed the substance of the measures that BrightSource and the Bureau have 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 confine project 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 or desert tortoise monitor 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 or desert tortoise monitor 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 trash associated with the project that could provide subsidies to predators 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 closed tanks to store water for all project site water needs to eliminate an open water source for common ravens.
5. BrightSource will use closed tanks to store water associated with boiler commissioning and emergency outfalls. 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 personnel charged with environmental management responsibilities that will include the following: a) weed 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 weekly inspections during the growing season 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, from March through August, 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 according to the schedule described above (Measure 3) 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.) or 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 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*

The following description of the desert tortoise translocation strategy for the ISEGS project is taken from BrightSource's translocation plan (CH2MHill 2009b) and from modifications made by the Bureau during the formal consultation process (Fesnock 2010a).

### 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 portions of the CLA where ground disturbance would occur, 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. BrightSource may choose to fence all phases of the ISEGS project and the CLA at one time, or it may fence each phase at the time of construction on a given phase.

Within 24 hours prior to the initiation of construction of the desert tortoise-exclusion fence, BrightSource will conduct 2 complete desert tortoise clearance surveys of the fence line segment and associated disturbance right-of-way that will be fenced that day. 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 burrow, an authorized biologist will remove the desert tortoise and place it in a sheltered location outside of the ISEGS project area being fenced. If BrightSource fences a given project phase and does not plan on immediate clearing of that phase, it will leave gaps in the fence in locations where desert tortoise burrows are found in the path of the fence line right-of-way. These gaps will buffer the burrow by a distance of 54.6 yards (i.e., 27.3 yards on each side) and will remain open until the time that BrightSource is ready to commence with clearance surveys. BrightSource will not excavate and clear these burrows until it is ready to perform clearance surveys.

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 1 to May 31) or fall (i.e., September 1 to October 15). For fall clearance surveys, BrightSource may extend this survey window until October 31 for phases in which all desert tortoises will be placed into a quarantine facility (e.g., Ivanpah1 and the CLA) rather than translocated. Regardless of the method used to fence project site boundaries (i.e., at one time versus phased), clearance surveys would proceed according to the schedule described below.

In the fall of 2010, BrightSource intends to clear all desert tortoises from the CLA and Ivanpah 1. In fall 2010, BrightSource also intends to construct temporary desert tortoise exclusion fencing around the Ivanpah 2 power block and the power block access road and clear desert tortoises from these areas. BrightSource would place desert tortoises moved from the Ivanpah 2 power block and power block access route into adjacent habitat on the remainder of Ivanpah 2. BrightSource would not clear desert tortoises from the remainder of Ivanpah 2 or from Ivanpah 3 until construction is ready to commence on those phases.

When performing clearance surveys, authorized biologists and supervised desert tortoise monitors will conduct at least 3 complete clearance sweeps over a given phase 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.

Disease Testing, Quarantine, and Translocation*CLA and Ivanpah 1*

Desert tortoises that BrightSource locates during clearance surveys will undergo varying levels of disease testing and quarantine, depending on their location within the project site. In fall 2010, BrightSource intends to clear all desert tortoises from Ivanpah 1 and the CLA and quarantine them within a portion of the CLA that would not be disturbed by construction activities. BrightSource will collect blood, perform ELISA testing, and do visual health assessments on all project site desert tortoises quarantined at this facility.

The quarantine facility within the CLA will consist of a series of 65.6-foot by 65.6-foot pens to allow separate quarantine of each individual cleared from the CLA and Ivanpah 1. BrightSource will construct each pen with permanent desert tortoise exclusion fencing or other materials that will prevent individuals from digging out or coming into direct contact with other quarantined or wild individuals. Each pen will contain at least two natural or artificially constructed burrows and should contain shrub cover that is similar to that found within the project site phases. In addition to the individual pens, BrightSource will construct a security fence around the entire quarantine facility and install netting over the facility or over the individual pens that contain juvenile desert tortoises to prevent access by desert tortoise predators. BrightSource will use a portable irrigation system and water all desert tortoise pens at a sufficient frequency, duration, intensity, and timing to mimic the rainfall patterns of a good rainfall year for this portion of the Mojave Desert. In addition, BrightSource will maintain a sufficient stock of supplemental feed to allow for additional feeding of quarantined animals, if necessary. BrightSource will develop an animal husbandry plan for the quarantine facility that the Service will review and authorize prior to placement of individuals in the quarantine facility.

Prior to release of the CLA and Ivanpah 1 desert tortoises from the quarantine facility, BrightSource will perform surveys of translocation areas west and north of the ISEGS project to determine density and disease prevalence within the resident population. Surveys would include full coverage surveys of a 500-meter buffer along the western and northern boundaries of the project site and full coverage surveys of the 4 translocation sites identified in the BrightSource's translocation plan (i.e., N1, N2, N3, and N4; CH2MHill 2009b). BrightSource will collect blood for ELISA testing and perform visual health assessments on all desert tortoises identified within these areas. In addition, BrightSource will perform sampling transects of a 3.7-mile buffer of contiguous desert tortoise habitat around these areas. All desert tortoises located during this sampling will be tested for disease using visual health assessments and ELISA testing. BrightSource will transmitter a subset (i.e., at least equal to the estimated project-site population) of the individuals located during these surveys to facilitate post-translocation monitoring of the resident population. Surveys of the 3.7-mile buffer will determine population density and disease prevalence. BrightSource will locate and test a sufficient number of individuals to predict, with a confidence interval of 95 percent, that 5 percent or less of the desert tortoises in this buffer are infected with upper respiratory tract disease. If BrightSource determines that this area has an upper respiratory tract disease prevalence of more than 5 percent among the resident

animals, it will not release individuals into the area west or north of the project site. If BrightSource determines through pre-translocation surveys that the post-translocation density in the translocation area would be more than 21 subadult and/or adult desert tortoises per square mile, it will not release individuals into the area west or north of the project site. If either of these scenarios occurs, BrightSource will contact the Service to address necessary changes in its translocation strategy prior to clearance surveys of additional phases.

Following receipt of ELISA testing results and completion of visual health assessments for the resident and quarantined population, BrightSource will contact the Service regarding the proposed release of each quarantined desert tortoise. The Service will work with BrightSource to identify an appropriate facility to house any quarantined desert tortoises that test ELISA-positive. In addition, the Service may require BrightSource to perform additional testing to confirm disease status of any ELISA-positive desert tortoises before final disposition. Prior to release of individuals into the translocation area, BrightSource will fence Interstate 15 between Nipton Road and Yates Well Road with desert tortoise exclusion fencing to prevent translocated desert tortoises from entering the roadway during long-distance, post-translocation movements.

BrightSource intends to translocate all ELISA-negative desert tortoises from quarantine to the translocation area in spring 2011, but timing of disease testing may push the translocation to the fall 2011. For Ivanpah 1 and the CLA, BrightSource will release all desert tortoises, originally located within 500 meters of the western fence, in areas adjacent to the western fence line. This release will be done in a manner that does not place a translocated individual more than 500 meters from its original capture location. In addition, BrightSource will not translocate a desert tortoise in this category within 1500 meters of a resident individual that has tested positive for disease through ELISA testing or visual health assessments. If BrightSource cannot comply with this buffer without moving the individual more than 500 meters from its original capture location, it will translocate the individual to the translocation area it has identified for Ivanpah 1 and CLA (i.e., N4; CH2MHill 2009b).

BrightSource will release all other desert tortoises into the translocation area that it identified for Ivanpah 1 and the CLA in its translocation plan (i.e., N4; CH2MHill 2009b). BrightSource will attach transmitters to all translocated desert tortoises to facilitate post-translocation monitoring. BrightSource will not translocate a desert tortoise in this category within 3.7 miles of a resident individual that has tested positive for disease through ELISA testing or visual health assessments.

### *Ivanpah 2*

In fall 2010, BrightSource intends to construct a temporary desert tortoise exclusion fence around the Ivanpah 2 power block and the power block access. It will then move all desert tortoises that occupy this enclosure into adjacent habitat on the remainder of Ivanpah 2. BrightSource will ensure that it does not move these desert tortoises more than 500 meters during this clearance.

In spring 2010, BrightSource intends to clear all desert tortoises from Ivanpah 2 that are more than 500 meters from the western fence line and quarantine them within the facility described above for Ivanpah 1 and the CLA. If necessary, BrightSource will construct additional pens to facilitate the quarantine of these animals. BrightSource will collect blood, perform ELISA testing, and do visual health assessments on all project site desert tortoises quarantined at this facility.

Following visual health assessments, BrightSource will translocate all desert tortoises located within 500 meters of the western boundary fence of Ivanpah 2 to areas immediately outside the fence. BrightSource will not translocate a desert tortoise in this category within 1500 meters of a resident individual that has tested positive for disease through ELISA testing or visual health assessments. If BrightSource cannot comply with this buffer without moving the individual more than 500 meters from its original capture location, it will quarantine this individual. Following receipt of ELISA testing results and completion of visual health assessments for the quarantined population, BrightSource will contact the Service regarding the proposed release of each quarantined desert tortoise. The Service will work with BrightSource to identify an appropriate facility to house any quarantined desert tortoises that tests ELISA-positive. In addition, the Service may require BrightSource to perform additional testing to confirm disease status of any ELISA-positive desert tortoises before final disposition.

BrightSource will translocate all ELISA-negative, healthy desert tortoises from quarantine to the translocation area in spring or fall 2011 depending on the timing of ELISA test results. For Ivanpah 2, BrightSource will release all quarantined individuals in the translocation area it has identified for that phase of the project (i.e., N2 or N3; CH2MHill 2009b). BrightSource will attach transmitters to all translocated desert tortoises to facilitate post-translocation monitoring. BrightSource will not translocate a desert tortoise in this category within 3.7 miles of a resident individual that has tested positive for disease through ELISA testing or visual health assessments:

### *Ivanpah 3*

Following or concurrent with clearance of desert tortoises from Ivanpah 2, BrightSource will perform a clearance level survey of Ivanpah 3 and attach transmitters to all desert tortoises that it locates to facilitate post-translocation monitoring and to allow easy location of individuals prior to translocation. In addition, BrightSource will perform visual health assessments of all desert tortoises on Ivanpah 3. During this survey, BrightSource will translocate all healthy desert tortoises located within 500 meters of the western or northern boundary fences of Ivanpah 3 to areas immediately outside of these fence lines. It will collect blood from all desert tortoises that are more than 500 meters from the western or northern fence line for ELISA testing. BrightSource will quarantine desert tortoises that are more than 500 meters from the western or northern fence line at the CLA quarantine facility. Alternatively, BrightSource may choose to perform *in situ* quarantine with these individuals. If *in situ* quarantine is chosen, BrightSource would attach transmitters to the quarantined animals and leave them at the location of their initial capture to await ELISA test results.

Following receipt of ELISA testing results for the quarantined desert tortoises on Ivanpah 3, BrightSource will contact the Service regarding the proposed disposition of each desert tortoise. If BrightSource chooses to quarantine the individuals in the CLA quarantine facility, it would translocate all ELISA-negative individuals into the translocation area it has identified for this phase of the project (i.e., N1; CH2MHill 2009b) or into the solar exclusion zone north of the Ivanpah 3 project site according to the procedures discussed with the Service. If BrightSource chooses *in situ* quarantine, all desert tortoises that test ELISA negative and are not within 500 meters of an ELISA-positive individual at the time of final clearance will be released into the translocation area it has identified (i.e., N1; CH2MHill 2009b) or into the solar exclusion zone (i.e., portion of the right-of-way excluded from future solar development for rare plant concerns) north of the Ivanpah 3 project site. The Service will work with BrightSource to identify an appropriate facility to house any desert tortoises that test ELISA positive. The Service may require BrightSource to perform or fund additional testing to confirm disease status of any ELISA-positive desert tortoises before final disposition. In addition, BrightSource will quarantine any individual that is located within 500 meters of an ELISA-positive desert tortoise on the Ivanpah 3 project site. This quarantine would occur at the CLA quarantine facility. While in quarantine, BrightSource will conduct an additional ELISA test to confirm disease status prior to translocation. If these individuals test negative on the second ELISA test, BrightSource will release these animals into one of the translocation areas described above.

### Monitoring

BrightSource will provide for the monitoring of desert tortoises cleared from a given phase of the IESGS project site for a period of 3 years following its initial clearance. As discussed above, BrightSource will attach transmitters to all desert tortoises translocated from the project site and to an equal number of resident desert tortoises to facilitate monitoring. Following the completion of the first 3 years of monitoring, BrightSource will perform an additional 2 years of monitoring if directed by the Service.

BrightSource will also attach transmitters to and monitor desert tortoises in a population that will serve as a control group for translocation monitoring. BrightSource would establish the control group prior to release of translocated individuals. When establishing this control group, BrightSource will collect blood samples from all desert tortoises that it transmitters in the control population for ELISA testing. The number of desert tortoises monitored in this population will be equal to the number of desert tortoises translocated from the project site. The location of the control population will be within the Bureau's Ivanpah Desert Wildlife Management Area. The final boundaries of the control population monitoring area will depend on the number of desert tortoises that BrightSource has to transmitter to match the translocated population. BrightSource will ensure that only qualified biologists, authorized by the Service, perform monitoring of these populations.

During monitoring, BrightSource will collect information on survivorship, mortality rates, health status, body condition, movement of individuals, and predation in all three populations (i.e.,

resident, translocated, and control) 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 in coordination with the Bureau and the Service 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 permanent 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. BrightSource will ensure that health assessments and blood collection for disease testing of desert tortoises are conducted by individuals authorized by the Service to perform these tasks.
5. Following clearance of desert tortoises from 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. If a desert tortoise is identified and found to have clinical signs of disease, BrightSource will contact the Service to determine appropriate disposition of the animal.
6. BrightSource will not perform any clearance surveys or translocation activities when the ambient air temperature is above 95 degrees Fahrenheit or is anticipated to exceed 95 degrees Fahrenheit before handling or processing can be completed. BrightSource will not perform any clearance surveys or translocation activities when ambient air temperature are below 65 degrees Fahrenheit or are anticipated to go below 50 degrees Fahrenheit during the week after release. BrightSource will not release any desert tortoises at translocation sites if the ambient air temperature is 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.

7. An authorized biologist will hydrate all desert tortoises scheduled for translocation within 12 hours prior to release.
8. An authorized biologist will assess all desert tortoises on the project site for clinical signs of disease prior to translocation regardless of whether these animals will receive additional ELISA testing. The 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.
9. BrightSource will only perform clearance surveys during the spring (April 1 to May 31) and fall (September 1 to October 15). If all desert tortoises from a given phase would be placed in a quarantine facility, BrightSource may extend its fall clearance window until October 31 if conditions (i.e., air temperatures) allow. BrightSource will only perform release of cleared desert tortoises into a translocation area during the spring (April 1 to May 31) or early-fall (September 1 and October 1).
10. BrightSource will consider ELISA testing results valid for a period of 1 year on any individual desert tortoise. BrightSource will coordinate with the Service to determine the necessity for re-testing of individuals based on the circumstances of their quarantine and their proposed plan for disposition of the individual. BrightSource will only draw blood for ELISA testing between May 15 and October 31 to ensure accurate ELISA testing results.
11. 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, the location from which it was captured and the location in which it was released, whether animals voided their bladders, diagnostic markings (i.e., identification numbers), results of health assessments, and ELISA-test results.
12. During temporary quarantine (i.e., desert tortoises held for less than one week), an authorized biologist will provide adequate food and water and a temperature-controlled holding area away from other desert tortoises.

13. 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 or blood collection on desert tortoises during clearance and translocation activities. The Service should receive these qualifications at least 30 days prior to the need for the health assessment and blood collection.
14. BrightSource will send all samples for ELISA to a laboratory qualified to perform these tests.
15. For monitoring activities, an authorized biologist will attach radio transmitters to adult desert tortoises using methods described in Boarman et al. (1998).
16. BrightSource will develop an animal husbandry plan for management of the CLA quarantine facility for the Service's review and approval prior to release of individuals into this facility.
17. BrightSource will not release project-site desert tortoises into the translocation area if it determines that post-translocation density will exceed 21 subadult or adult desert tortoises per square mile.
18. BrightSource will not release desert tortoises moved more than 500 meters from their point of capture within 3.7 miles of a resident desert tortoise that has tested ELISA-positive or has shown clinical signs of disease.
19. BrightSource will not release desert tortoises moved less than 500 meters from their point of capture within 1500 meters of a resident desert tortoise that has tested ELISA-positive or has shown clinical signs of disease.

### **Compensation**

The following information was briefly discussed in the revised biological assessment (CH2MHill 2010a) and clarified with more detail in follow up communications with the Bureau (Fesnock 2010a and 2010b). 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 (CDCA) Plan (Bureau 2002). The Bureau will apply a compensation ratio of 1:1, as described in this plan. This compensation will provide for acquisition of up to 3,582 acres of land in the Northeastern Mojave Recovery Unit, or desert tortoise habitat enhancement or rehabilitation activities on existing public land, or some combination of the two. The following is a list of potential habitat enhancement and rehabilitation actions, identified by the Bureau, that could be implemented solely or in combination with land acquisition to fulfill the Bureau's compensation requirements:

1. Install at least 50 miles of desert tortoise exclusion fencing along the following road segments: a) Interstate 15 between Nipton Road and Ivanpah Dry Lake, b) U.S. Highway 95 through Piute Valley from the California-Nevada state line to Goffs Road, c) Nipton Road, between the California-Nevada border and Interstate 15, and d) Ivanpah Road, from Nipton Road through portions of the Mojave National Preserve.
2. Restore habitat, including vertical mulching, of at least 50 routes that the Bureau has designated as closed in the Shadow Valley, Piute Valley, and Ivanpah Valley Desert Wildlife Management Areas.
3. Install three-strand fencing or other suitable fencing around the boundary of the towns of Nipton and Goffs.
4. Remove exotic plant species from areas important to desert tortoises.
5. Identify and clean up destroyed or damaged habitat areas, such as illegal dumpsites and illegal routes, in Shadow Valley, Piute Valley, Ivanpah Valley, and the critical habitat portions of Mojave National Preserve.
6. Fund desert tortoise head start research, if approved by the Service's Desert Tortoise Recovery Office.

The California Energy Commission has already approved the proposed action. In addition to the required compensation described above, the California Energy Commission will require compensation for loss of desert tortoise habitat at a ratio of 2:1. Lands acquired to meet the California Energy Commissions requirements would meet the following criteria:

1. must be as close as possible to the project site,
2. provide good quality habitat for desert tortoises with capacity to regenerate naturally when disturbances are removed,
3. 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,
4. be connected to lands currently occupied by desert tortoise, ideally with populations that are stable, recovering, or likely to recover,
5. not have a history of intensive recreational use or other disturbance that might make habitat recovery and restoration infeasible,
6. not be characterized by high densities of invasive species, whether on or immediately adjacent to the parcels under consideration, that might jeopardize habitat recovery and restoration, and
7. not contain hazardous wastes.

To meet land acquisition requirements, BrightSource will either directly purchase lands, or it will deposit funds with the National Fish and Wildlife Foundation (NFWF). If BrightSource chooses to deposit funds with NFWF, a compensation fee will be assessed based on current fair market appraised value for the specific geographic area in which the acquisition occurs. If BrightSource chooses to provide funds to NFWF, the following conditions will be met: 1) funds will be provided prior to project construction, 2) lands will be acquired prior to completion of project

construction, and 3) lands will be conserved in perpetuity by a legal mechanism agreed to by the Bureau and California Department of Fish and Game. If BrightSource directly acquires the lands rather than providing funds to NFWF, it will acquire the lands prior to completion of project construction and will conserve these lands in perpetuity through a legal mechanism approved by the Bureau and California Department of Fish and Game.

Regardless of the acquisition method (i.e., directly or through NFWF), BrightSource will establish a management fund for the acquired lands to comply with requirements of the California Endangered Species Act. The management fund will consist of an interest-bearing account (as described in the memorandum of agreement between the Renewable Energy Action Team Agencies and NFWF) with the amount of capital commensurate to generate sufficient interest to fund all monitoring, management, and protection of the acquired lands, including reasonable administrative overhead, biological monitoring, improvements to carrying capacity, law enforcement measures, and other actions designed to protect or improve the habitat values of the acquired lands. A Property Analysis Record (PAR) analysis, or comparable method, will be conducted by BrightSource, the Bureau, and the California Department of Fish and Game to determine the management needs and costs described above, which then will be used to calculate the amount of capital needed for the management fund. The management fund will be held and managed by NFWF or another entity approved by the Bureau, Service, and California Department of Fish and Game.

To mitigate this project's portion of the cumulative effect of increasing the number of common ravens in the desert region, the California Energy Commission will also require BrightSource to contribute \$105.00 per acre for the 3,582 acres associated with the project site. These funds will contribute to an account established by the NFWF to carry out a regional management for the common raven. This account was established under a memorandum of agreement between Renewable Energy Action Team agencies (i.e., the Bureau, Service, the California Energy Commission, and the California Department of Fish and Game) and NFWF to manage funds to implement regional common raven management. Activities that would be carried out to reduce common raven predation on desert tortoises include reduction of human-provided subsidies (e.g., food, water, sheltering and nesting sites), education and outreach, removal of common ravens and their nests, and evaluation of effectiveness and adaptive management. The total fee for this project of \$376,110 will fund the project's portion of the regional raven management. BrightSource will make the payment within six months of final project approval.

Implementing control of common ravens and habitat enhancement and rehabilitation to fulfill some of the Bureau's compensation requirements may result in adverse effects to desert tortoises. These actions will require future site-specific Bureau authorizations and future project-specific consultation. Consequently, we will analyze the adverse effects of these actions in a general way, but cannot provide any site-specific analysis for these future actions in this biological opinion.

## ANALYTICAL FRAMEWORK FOR THE 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 (1994a).

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 tortoise females typically produce one to two clutches of 1 to 7 eggs per year (Turner et al. 1986). 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 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 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.