Response
DOE recognizes that a substantial amount of titanium would be required for the drip shields. The specific impacts of acquiring the titanium were not examined in the Supplement to the Draft EIS because this material would not be required for almost 100 years. As the repository program continues to evolve, the impacts of acquiring titanium would, as appropriate, be examined in future National Environmental Policy Act documents when further information became available.

7.5.4 BIOLOGY AND SOILS

7.5.4 (341)
Comment - EIS000052 / 0002
Microscopic parasite was discovered in the Yucca Mountain proposed Repository site. Are they harmful to this project?

Response
There are no known microscopic parasites in Yucca Mountain, but there are bacteria. DOE considered the possible effects of bacteria and of microbial communities in general on waste packages in the calculation of rates at which those packages could degrade. This was part of the near-field geochemistry model used to predict long-term performance of the repository in Chapter 5 of the EIS. The environmental consequences of long-term repository performance described in Chapter 5 include the possible effects of microbes on the project, which would be negligible.

7.5.4 (1131)
Comment - EIS000270 / 0014
Factors that give rise to public concerns about and opposition to approval of the Yucca Mountain site include:

Failure to provide for the protection of all components of the biosphere -- of the environment for its own sake -- from radiation-related harm.

Response
Sections 4.1.4 and 5.9 of the EIS examine potential impacts to biological resources for repository operations and for long-term repository performance, respectively. DOE expects impacts to biota to be low or very low. The analyses looked at potential impacts to individual members of threatened or endangered species such as the desert tortoise population and populations of other organisms. Current recommendations from national and international radiation protection advisory organizations (DIRS 157314-NCRP 1991; DIRS 101836-ICRP 1991; DIRS 101075-ICRP 1977) indicate that if humans are protected from radiation, other biota in the same area with similar exposure pathways are also protected. This is based on extensive scientific observations showing that more developed organisms (that is, humans) are more sensitive to radiation than less developed organisms. DOE has determined that radiation effects to plants and animals would be unlikely because the dose in all cases would be much lower than the 100-millirad-per-day level at which there is no convincing evidence that chronic radiation exposure would harm plant or animal populations (DIRS 103277-IAEA 1992).

7.5.4 (1508)
Comment - EIS000505 / 0008
We find many problems with the DEIS, factors that give rise to public concerns about opposition to approval of the Yucca Mountain site for example failure to provide for the protection of all components of the biosphere, of the environment for its own sake, from radiation related harm, failure in dose calculation to account for the addictive, multiplicative and synergistic relationship of radiological and other biologically hazardous pollutant factors and conditions ultimately affecting recipients.

Response
Sections 4.1.4 and 5.9 of the EIS examine potential impacts to biological resources for repository operations and for long-term repository performance, respectively. DOE expects impacts to biota to be low or very low. The analyses looked at potential impacts to individual members of threatened or endangered species such as the desert tortoise population and populations of other species. Current recommendations from national and international radiation protection advisory organizations indicate that if humans are protected from radiation, other biota in the same area

with similar exposure pathways are also protected (DIRS 157314-NCRP 1991; DIRS 101836-ICRP 1991; DIRS 101075-ICRP 1977). This is based on extensive scientific observations showing that more developed organisms (that is, humans) are more sensitive to radiation than less developed organisms. DOE has determined that radiation effects to plants and animals would be unlikely because the dose in all cases would be much lower than the 100-millirad-per-day level at which there is no convincing evidence that chronic radiation exposure would harm plant or animal populations (DIRS 103277-IAEA 1992).

The EIS presents the risks of exposure to ionizing radiation and hazardous chemicals separately, where the potential for these exposures exists. A good scientific foundation for adding the risks of exposure to radiation and chemicals does not exist at present, even if target tissues might be the same, because exposure pathways and cellular and molecular mechanisms of cancer induction can differ. The low levels of exposure to radiation and hazardous substances expected to occur from Yucca Mountain operations (Sections 4.1.2 and 4.1.8 of the EIS) and long-term performance (Sections 5.4 and 5.6 of the EIS) are such that the most likely impacts would be no impacts.

7.5.4 (4090)
Comment - EIS001482 / 0008
And I'm here tonight to speak for the animals, because there are no animals here tonight speaking. We're all talking about humans and human impacts and all that kind of stuff. But the fact of the matter is, there's an incredible population of flora and fauna out there we need to take care of, and if you have an accident it's going to affect the environment. You're going to have human impacts, but you're also going to have impacts to the natural areas and also to the animals as well that never created this waste and never got any benefits from it.

Response
Section 3.1.5.1 of the EIS describes the flora and fauna of the affected environment at Yucca Mountain. Section 4.1.4 of the EIS analyzes impacts that repository construction, operation and monitoring, and closure could have on resident species. The primary impacts of repository construction and operation on desert plants and animals would be the disturbance of about 3 to 7 square kilometers (about 800 to 1,700 acres) of land, the continuation of human presence and activities, including traffic. Those impacts have been thoroughly analyzed based upon a large amount of research and information about the desert environment at Yucca Mountain.

7.5.4 (5523)
Comment - EIS001887 / 0180
Page 3-59; Section 3.1.5 - Biological Resources and Soils

This section only briefly addresses Biological Resources and Soils, referring to the Environmental Baseline Files (TRW 1999k and TRW 1991). The discussion in this section omits the physical environment that, together with the biological components, comprise the ecosystem involved. Ecosystems are not discussed at all, and that level of ecological organization is ignored. The same is true for the discussions of Biological Resources related to transportation on pages 3-107 and 3-127. With respect to ecosystems, the Draft EIS states on page 3-59 that many of its studies for this aspect of the document "....did not use an integrated ecosystem approach and, therefore, are of little value for evaluating impacts of the repository." This deficiency negates the sufficiency and credibility of the biological and ecological aspects of the entire Draft EIS. Further discussion of this matter appears in Westman (1985), Wiesner (1995), Salk and others (1998), Caldwell (1998), Clark and Canter (1997), Ortolano (1997), Gilpin (1997), and Bartlett and Malone (1993), as well as in Attachments D, E, F, and N to these comments.

Response
The physical environment was not included in Section 3.1.5 of the EIS because it is described in Sections 3.1.2, 3.1.3, and 3.1.4 of the EIS. The evaluation of impacts to biological resources concentrated primarily on the species and community levels of ecological organization because the potential impacts on biological resources would be localized and most likely to occur at those levels. Section 4.1.4 of the EIS concluded that the removal of vegetation from the small area required for the Proposed Action and the very small impacts to some species would not affect regional biodiversity or ecosystem function. Section 3.1.5 of the EIS, as cited by the commenter, was revised to clarify that the material summarized is an opposing view expressed by the State of Nevada. DOE disagrees with that view for reasons expressed in Section 3.1.5 of the EIS. DOE has studied the biological resources at Yucca Mountain in detail and has concluded that there is sufficient information available to evaluate potential impacts of repository construction on those resources.

7.5.4 (5582)
Comment - EIS001887 / 0206
Page 4-1; Section 4 - Environmental Consequences of Repository Construction, Operation and Monitoring, and Closure

The fact that DOE did not address the ecosystem level of organization for the Draft EIS renders an accurate interpretation of ecological impact assessment impossible. Attachments [to this comment document] G, F, H, I, J, K, and L discuss this issue, as do Westman (1985), Bartlett and Malone (1993), Salk and others (1998), Wiesner (1995), Caldwell (1998), Clark and Canter (1997), Ortolano (1997), and Gilpin (1997).

An equally important issue is that biological field studies conducted by DOE and used for the EIA process were improperly designed and statistically analyzed, thereby negating much of the information in the Draft EIS, Section 4. Study design and statistics are discussed in Attachments G and Q.

Performance confirmation is not an option. The use of the term "could" is incorrect, and the statement conflicts with the statement in Section 4.1.

Response
The EIS evaluation of impacts to biological resources concentrated primarily on the species and community levels of ecological organization because the potential impacts on biological resources would be localized and most likely to occur at those levels. DOE concluded in Section 4.1.4 that the removal of vegetation from the small area required for the Proposed Action and the very small impacts to some species would not affect regional biodiversity or ecosystem function.

DOE disagrees that biological field studies conducted at Yucca Mountain were improperly designed and analyzed and negate the analysis in Chapter 4 of the EIS. The numerous surveys and studies of biological resources conducted by DOE from 1981 through 1998 provide a detailed understanding of the species composition and community structure at Yucca Mountain. That information is used in Chapter 4 to conclude that there are no rare species or species with restricted distribution at Yucca Mountain that would be unduly affected by the Proposed Action. Results of the studies that were conducted to detect impacts indicate that site characterization had very little effect on biological resources at Yucca Mountain. Although the statistical ability to detect impacts was low for some of those studies, they were not improperly designed for characterizing the site and evaluating the most likely potential effects of site characterization activities. DOE therefore believes that the results of these studies are useful for understanding and predicting possible impacts from similar activities during repository construction and operation and support the conclusion that impacts from repository construction would not jeopardize species, communities, or ecosystems.

DOE agrees that the word "could" is incorrect when referring to performance confirmation and has modified the introduction to Chapter 4 appropriately.

7.5.4 (5756)
Comment - EIS001887 / 0361
Page 10-3; Section 10.1.1.4 - Biological Resources and Soils

This section addresses biological and soil resources for Yucca Mountain. No meaningful or substantive information is given and addressed, so the short section is meaningless.

Response
The purpose of Section 10.1 of the EIS is to identify unavoidable adverse impacts to the Yucca Mountain environment, provided pursuant to regulations from the Council on Environmental Quality (40 CFR 1502.16). Section 4.1.4 of the EIS provides meaningful and substantive information on impacts to biological resources, which DOE used to develop the conclusions in Section 10.1.1.4.

7.5.4 (5916)
Comment - EIS001619 / 0004
I understand that the EIS and the NEPA [National Environmental Policy Act] process is designed to protect the human environment and our role in that environment. Perhaps stepping away from that and speaking on behalf of the animals and the plants of the area, there needs to be more analysis of what will happen to the natural ecosystem, which is, unfortunately, near the Nevada Test Site. So I am sure it's not necessarily untainted, but there needs to be more attention paid to the effects of the actual land area around Yucca Mountain.

In the summary EIS I just have a small passage, surface soil temperatures could increase by as much by as 5.4° Fahrenheit in dry soil at a depth of 3.3 feet, which could affect root growth and the growth of microbes or nutrient availability. Potential impacts from the repository on biological resources would consist of an increase of heat tolerant species and a decrease of less heat tolerant species.

In general, the areas affected by repository heating could experience a loss of shrub species and an increase in annual species. So there needs to be more attention paid to those nonhuman victims of this disaster waiting to happen.

Response
Section 3.1.5 of the EIS describes the flora and fauna of the affected environment, which includes the analyzed land withdrawal area that surrounds Yucca Mountain. Section 4.1.4 analyzes impacts that repository construction, operation and monitoring, and closure could have on resident plant and animal species. The primary impacts of repository construction and operation on desert plants and animals would be the disturbance of about 3 to 7 square kilometers (about 800 to 1,700 acres) of land and the continuation of human presence and activities, including vehicle traffic. Those impacts have been analyzed based upon a large amount of research and information about the desert environment at Yucca Mountain (DIRS 104593-CRWMS M&O 1999). Section 5.9 describes the possible effects on biological resources and soils because of repository heating of near-surface soils. The magnitude of soil temperature increase predicted by models indicates that for most soil conditions, increases are within the range of natural temperature variation experienced by local plant and animal species (DIRS 105031-CRWMS M&O 1999). Because of this, and the small size of the affected area, DOE believes that impacts to biological resources from heat generated by the various repository operating modes would be minimal. DOE believes that the EIS provides sufficient information on the potential impacts of repository heat on biological resources at Yucca Mountain (Section 5.9 of the EIS; DIRS 103618-CRWMS M&O 1999; and DIRS 105031-CRWMS M&O 1999).

7.5.4 (5951)
Comment - EIS001622 / 0053
There is no evaluation of potential long-term impacts to animals and plants. All the long-term evaluations are based upon human health considerations. The DEIS makes the faulty assumption that relatively few predicted latent cancer fatalities will result in no impacts to aquatic, wildlife, and plant populations dependent upon the water resources affected by the project. These resources have taken tens to hundreds of thousands, and millions of years to adapt to their current habitats. These time scales should be considered in determining potential impacts to those resources.

Response
Section 5.9 of the EIS discusses the long-term impacts to plants and animals that were considered in the analysis and were determined to be largely restricted to impacts from heat generated at the repository. DOE did not assume that relatively few predicted latent cancer fatalities would result in no impacts to aquatic, wildlife, and plant populations. Instead, DOE based its conclusion on the results of calculations that estimated dose rates to native species would be less than 100 millirad per day. The International Atomic Energy Agency concluded that chronic dose rates of less than 100 millirad per day are unlikely to cause measurable detrimental effects in populations of even the more radiosensitive species in terrestrial ecosystems (DIRS 103277-IAEA 1992).

7.5.4 (6046)
Comment - EIS001898 / 0012
Additional documentation or analysis should be provided in the FEIS to support the characterization of impacts and the description of environmental parameters in some areas of the FEIS.

The DEIS assessments of impacts on faunal resources in Section 4.1.4 (Environmental Consequences of Repository Construction Operation and Monitoring and Closure-Impacts to Biological Resources and Soils) that are classified as "low," "very small," or "minimal and largely undetectable" are not supported by quantitative data. Individuals of a population that occur near the edge of its range (e.g., desert tortoises in the vicinity of Yucca Mountain) are living in marginal conditions, and therefore environmental stressors caused by the Proposed Action might have amplified effects in these edge areas.

Response
DOE does not believe that quantitative analysis is either missing or required to conclude that the Proposed Action would have little effect on biological resources at Yucca Mountain. As stated in Section 4.1.4 of the EIS, the most important impacts of repository construction and operation on desert plants and animals would be the disturbance of about 3 to 7 square kilometers (about 800 to 1,700 acres) of land and the continuation of traffic and human presence. These activities would occur in a region with few other disturbances and would affect species that are common and widespread throughout the region. DOE based the conclusion that the Proposed Action would have little effect on desert tortoises on detailed site-specific research on the tortoise populations at Yucca Mountain during site characterization. That research confirmed that activities similar to those proposed have little effect on adjacent populations. DOE has modified Sections 4.1.4.1 and 4.1.4.2 of the EIS to better explain its conclusions about impacts to desert tortoises.

The withdrawal of land surrounding the repository would protect a substantial area near the edge of the range of the tortoise from potential stressors that could occur if the land in the withdrawal area was developed for other uses.

7.5.4 (6072)
Comment - EIS000817 / 0182
P. E-16. Could you plant a prairie above the repository? Would there be a benefit to these long-rooted, long lasting grasses and [forbs]? Would they help hold water in the soil?

Response
It would not be possible to establish a successful "prairie" at this site because environmental conditions (precipitation, soils, temperatures, etc.) are not conducive to growth of typical prairie species. For example, annual rainfall in this area averages approximately 12 centimeters (5 inches), which is less than half that required to support prairie vegetation. Native perennial plants at Yucca Mountain are primarily shrubs but include grasses and forbs, and many native annual species are present when higher than average precipitation occurs. Shrubs are generally more deeply rooted and longer lived than grasses or forbs at the site, but all native species that occur there help prevent erosion. Section 9.2.4.2 of the EIS describes mitigation measures being considered to conserve and stockpile topsoil, and when disturbed areas are no longer needed, to spread topsoil over them and revegetate using a seed mixture that includes appropriate native species.

7.5.4 (7104)
Comment - EIS001106 / 0004
Section 3.1.5, page 3-59, only briefly addresses Biological Resources and Soils, referring to the Environmental Baseline Files (TRW 1999k and TRW 1991). The discussion in this section of the DEIS omits the physical environment, which together with the biological components comprise the ecosystem involved. Ecosystems are not discussed at all, and that level of ecological organization is ignored. The same is true for the discussions of Biological Resources related to transportation on page 3-107 and 3-127. With respect to ecosystems, the DEIS states on page 3-59 that many of its studies for this aspect of the document "...did not use an integrated ecosystem approach and, therefore, are of little value for evaluating impacts of the repository." This deficiency negates the sufficiency and credibility of the biological and ecological aspects of the entire DEIS.

Response
The physical environment was not included in Section 3.1.5 of the EIS because it is described in Sections 3.1.2, 3.1.3, and 3.1.4. The evaluation of impacts to biological resources concentrated primarily on the species and community levels of ecological organization because the potential impacts on biological resources would be localized and most likely to occur at those levels. Section 4.1.4 concludes that the removal of vegetation from the small area required for the Proposed Action and the very small impacts to some species would not affect regional biodiversity or ecosystem function. Section 3.1.5, as cited in this comment, has been revised to clarify that the

material summarized is an opposing view expressed by the State of Nevada. DOE disagrees with that view for the reasons expressed in Section 3.1.5. DOE has studied the biological resources at Yucca Mountain in detail and has concluded that there is more than enough information available to evaluate potential impacts on those resources of repository construction.

7.5.4 (7106)
Comment - EIS001106 / 0005
The fact that the DOE did not address the ecosystem level of organization for the DEIS renders an accurate interpretation of ecological impact assessment impossible. It is interesting, however, that the DOE did acknowledge the potentially adverse consequences to the ecosystem from different thermal loading schemes (Table 4-11, page 4-31). The thermal loading issue with respect to biological resources is avoided in Table 4-12, page 4-35, which summarizes overall impacts from the repository by stopping the summary after repository closure and ignoring the critical long-term ecosystem impacts.

Response
The evaluation of impacts to biological resources concentrated primarily on the species and community levels of ecological organization, because the potential impacts on biological resources would be localized, and most likely to occur at those levels. Section 4.1.4 of the EIS concluded that the removal of vegetation from the small area required for the Proposed Action and the very small impacts to some species would not affect regional biodiversity or ecosystem function. Table 4-11 documents that construction activities associated with different operating modes would disturb different amounts of land-cover types. Table 4-12 does not address possible impacts after closure because Section 4.1 focuses on short-term impacts, ad indicated by its title. Section 5.9 addresses potential long-term consequences to biological resources.

7.5.4 (7107)
Comment - EIS001106 / 0006
Biological field studies conducted by the DOE and used for the EIA process were improperly designed and statistically analyzed thereby negating much of DEIS Section 4, Environmental Consequences.

Response
DOE conducted numerous surveys and studies of biological resources from 1981 through 1998 using recognized scientific methods to provide a detailed understanding of the species composition and community structure at Yucca Mountain. That information is used in Chapter 4 of the EIS to conclude that there are no rare species or species with restricted distribution at Yucca Mountain that would be substantially affected by the Proposed Action. Results of the studies that were conducted to detect impacts indicate that site characterization had very little effect on biological resources at Yucca Mountain. Although the statistical power to detect impacts was low for some of those studies, they were not improperly designed for characterizing the site and evaluating the most likely potential effects of site characterization activities. DOE believes that the results of these studies (see Section 3.1.5 of the EIS) are useful for understanding and predicting possible impacts from similar activities during repository construction and operation and support the conclusion that impacts from repository construction would not jeopardize species, communities, or ecosystems.

7.5.4 (7116)
Comment - EIS001106 / 0011
Mitigation Actions: Biological Resources and Soils are addressed in Sections 9.2.3 (page 9-6) and 9.3.4 (page 9-19). In each case the focus is almost exclusively focused on the desert tortoise and not on other components of the ecosystem or on the ecosystem itself. Additionally, there is no consideration of risks associated with mitigation.

Response
The primary focus in Sections 9.2.4 and 9.3.4 of the EIS is the desert tortoise because it is the only Federally listed threatened species at the Yucca Mountain site and because few other impacts to biological resources or the ecosystem identified in the EIS would require mitigation. The proposed mitigation measures have been developed in consultation with the U.S. Fish and Wildlife Service, are commonly used on DOE projects and those of other agencies or have been developed and evaluated during site characterization, and have no known risks that require evaluation in the EIS.

7.5.4 (7117)
Comment - EIS001106 / 0012
Unavoidable, Irreversible, or Irretrievable Impacts: Section 10.1.1.4, page 10-3, addresses biological and soil resources for Yucca Mountain. No meaningful and substantive information is given and addressed, so the short section basically is meaningless.

Response
The purpose of Section 10.1 of the EIS is to identify unavoidable adverse impacts (Council on Environmental Quality regulations at 40 CFR 1502.16) to the Yucca Mountain environment. Previous sections (such as Section 4.1.4) provide meaningful and substantive information on impacts to biological resources, which DOE used to develop the conclusions in Section 10.1.1.4.

7.5.4 (7118)
Comment - EIS001106 / 0013
References: There were 27 references that are important cited in the DEIS regarding biological, ecological, and soil resources. Of these, only three were professional publications reflecting work of the NWPO [Nuclear Waste Project Office], when in fact there are many other NWPO and NWPO-related professional publications not included among the references cited in the DEIS. Among the DOE's 24 references are 10 reports issued by TRW regarding environmental information for the Yucca Mountain Project. Of these, four are Environmental Baseline Files that themselves draw upon additional sources of information. The key DOE citation in the DEIS that is of interest here is: "TRW 1999k. Environmental Baseline File for Biological Resources." In TRW 1999k, Section 4 on Opposing Views and Section 5 on Major Issues and Data Needs are attached to these comments. Section 4 identifies six opposing views to the DOE's field studies raised by NWPO and by NWTRB [the Nuclear Waste Technical Review Board]. These are key DEIS issues regarding the Yucca Mountain biological and ecological programs, and no dispute of them is made in the DEIS. This is consistent with the earlier statement on DEIS page 3-59 that the DOE failed to use an integrated ecosystem approach thereby negating many of its field studies for the biological and ecological resource aspects of the DEIS. There are many publications concerning EIA [environmental impact analysis] and NEPA [National Environmental Policy Act] processes that should have been used as guidance by the DOE, cited, and referenced in the DEIS. Thus, the documentation used for the DEIS was cryptic and poor.

Response
The opposing views identified in Chapter 4 of the Environmental Baseline File for Biological Resources (DIRS 104593-CRWMS M&O 1999) that are applicable to the EIS analysis are identified and discussed in Section 3.1.5. DOE modified that section to clarify that these are opposing views expressed by the State of Nevada and to identify DOE's opinion about those views. DOE did not include one opposing view identified in the Environmental Baseline File (concerning ethics and professional practice) because it is beyond the scope of the EIS.

DOE carefully reviewed relevant publications prepared by the Nevada Nuclear Waste Project Office and concluded that they generally dealt with site characterization studies or were not applicable to the level of analysis appropriate for this EIS.

The Environmental Baseline Files include detailed summaries of existing information on resources, including information developed by the State of Nevada and others. The Environmental Baseline Files are often cited in the EIS instead of original reports to eliminate the need for summarizing reports in the EIS and to make the EIS concise and easier to read.

7.5.4 (7162)
Comment - 010379 / 0003
It is also important to consider impacts on other living organisms in the surrounding ecosystems.

Response
Sections 4.1.4 and 5.9 of the EIS and Section 3.1.4 of the Supplement to the Draft EIS describe the expected impacts to biological resources from the construction, operation and monitoring, closure, and long-term performance of the repository.

7.5.4 (7438)
Comment - EIS001969 / 0001
The Department's [U.S. Department of the Interior] Fish and Wildlife Service (Service) is responsible for protection of trust resources which include species listed as threatened or endangered under the Endangered Species Act of 1973 (ESA), as amended, birds protected under the Migratory Bird Treaty Act, and other biological resources managed under the National Wildlife Refuge (NWR) System. The Service is concerned with possible adverse effects to these and other resources that could result from the operation of the Yucca Mountain facility. Trust resources on or in the vicinity of the proposed waste storage facility include the following:

Yucca Mountain is at the northern edge of the range for the desert tortoise (*Gopherus agassizii*) which is listed as threatened under the ESA. On July 23, 1997, the Service issued a biological opinion to DOE for programmatic activities associated with site characterization studies at Yucca Mountain (File No. 1-5-96-F-307R).

Rainfall runoff accumulating in low lying areas at the NTS such as Frenchman Flat, attract migratory birds to the area.

The Desert National Wildlife Range, located approximately 30 miles to the east of the proposed repository, provides habitat for numerous wildlife species that are unique to the Mojave Desert ecosystem.

The Ash Meadows NWR is located approximately 25 miles south of Yucca Mountain and provides habitat for 12 species listed under the ESA, including the Devils Hole pupfish (*Cyprinodon diabolis*) and Ash Meadows Amargosa pupfish (*Cyprinodon nevadensis mionectes*). Ash Meadows also provides aquatic and riparian habitat essential for other sensitive species of plants and invertebrates and for migratory and resident bird species. These and other wildlife species are dependent upon several free-flowing springs within the boundary of the refuge.

Response
On December 17, 1998, DOE requested a species list from the U.S. Fish and Wildlife Service and initiated consultation to evaluate whether the Proposed Action could affect the threatened desert tortoise or protected species at Ash Meadows, Devils Hole, or along transportation corridors. In a Biological Assessment submitted to the U.S. Fish and Wildlife Service on April 24, 2000, DOE concluded that the Proposed Action would not affect the listed species in the Ash Meadows or Devils Hole areas because these areas are in a different regional groundwater sub-basin from Yucca Mountain. The Fish and Wildlife Service concurred with this conclusion during consultation on the effects of repository construction, operation and monitoring, and closure on threatened and endangered species (see the Fish and Wildlife Service Final Biological Opinion in Appendix O of the EIS). Furthermore, there are no playas in the vicinity of Yucca Mountain where surface water could accumulate and attract migratory birds. The playa at Frenchman Flat is located approximately 35 kilometers (22 miles) east of Yucca Mountain and would be unaffected by the Proposed Action.

DOE did determine that the Proposed Action could affect the desert tortoise and consequently has proposed mitigation measures to minimize effects. If the Secretary of Energy recommends approval of the Yucca Mountain site to the President, and Yucca Mountain is ultimately authorized for the disposal of spent nuclear fuel and high-level radioactive waste, DOE would implement all reasonable and prudent mitigation measures and comply with the terms and conditions of the Final Biological Opinion from the U.S. Fish and Wildlife Service. See Appendix O of the EIS for the Opinion.

The Desert National Wildlife Range, approximately 48 kilometers (30 miles) east of the repository, would be unaffected by the Proposed Action unless the Valley Modified Corridor, which could be on, or adjacent to, the southern boundary of the Range, was selected. With regard to the transportation implementing alternatives in the State of Nevada, DOE believes this EIS is sufficient for the determination of the relative merits and a selection decision among the various corridors and shipment modes discussed in the EIS, but acknowledges additional environmental review would be required to assess the potential impacts of specific route alignment within a corridor. DOE would continue discussions with the U.S. Fish and Wildlife Service pursuant to Section 7 of the Endangered Species Act, as amended, on any corridor or alignment within a corridor determined to require further environmental review and would implement the terms and conditions of any subsequent Biological Opinions.

7.5.4 (7744)
Comment - EIS000817 / 0024
In your summary you refer to bats, tortoises, beetles, etc. -- and your effect on them. Have you evaluated the possible effect of them on your project? Bats for example. What a perfect home for bats I would think. (Ever been to Carlsbad Caverns? -- full of millions of them.) So can bats survive in the repository in later years as things cool down and cave in? What could bats do in there? Effect of bat guano for example? And what happens to bats reproduced after they are irradiated and come out into the public domain? What about other animals -- burrowing things? Lizards, snakes, prairie dogs --whatever you have in Nevada -- and the minute plants and animals (like beetles) that can raise havoc in great numbers? What can happen to species in there over time? Can they dig into the repository? How could it affect them and how could they affect it? Nature loves to fill in spaces with whatever can get in there -- how secure will all openings to the tunnels be? Ventilation systems for example -- once bats get in there -- how would you get them out? These things have to be considered long term when fractures form and rock tunnels cave in and water seeps, etc. There will be cavities formed and new channels to the tunnels. So often it's the unexpected that causes huge problems in such scenarios, especially for such a long time prediction in the future. Considering exotic species come in so easily nowadays with trade all over the world. Who knows what could get started growing or becoming active in those tunnels? Have plant and animal experts done close evaluation and predictions for future possible conditions -- not just for big things like bats -- but for small microscopic worms, or whatever could be in there? We don't want a surprise in 100 years or later that the repository is full of poisonous snakes or something that loves the habitat later on. What is possible?

Response
Some animals, such as bats, occasionally enter the tunnels at Yucca Mountain, but cause no operational problems. This probably would continue during the operation and monitoring phase of the repository, and standard pest management practices would minimize impacts to operations and to the animals. Steel isolation doors at the emplacement drift entrances would prevent animals from entering the waste disposal areas. During the closure phase, DOE would seal the main drifts and ventilation shafts to prevent all access. The repository would be too deep underground for animals to dig into the tunnels.

7.5.4 (8057)
Comment - EIS002001 / 0004
By putting nuclear waste into Yucca Mountain you're not only hurting people, but wildlife and plants. Think of all that will be damaged by it. Please reconsider putting the nuclear waste in Yucca Mountain.

Response
No significant impacts to people, wildlife or plants were identified, as discussed in Section 4.1.4 of the EIS.

7.5.4 (8654)
Comment - EIS001889 / 0007
The DEIS may have overlooked wilderness values under the potential Caliente-Chalk Mountain rail route. According to your map (Figure 2-48), it looks like the Caliente Rail Corridor would possibly pass through Weepah Spring Wilderness Study Area (WSA). If it does not pass through the WSA, this would be the preferred route of the Ely Field Office.

Response
Section 6.3.2.2.1 of the EIS has been modified to state that the Caliente-Chalk Mountain Corridor is north and east of the Weepah Springs Wilderness Study Area. As suggested in the Foreword to the EIS and Chapter 6, DOE would conduct additional government consultations and would prepare National Environmental Policy Act reviews, if the repository was approved, to consider alternative alignments within any selected corridor. These would include consultations with the Department of the Interior and other Federal agencies as appropriate to ensure that the alignment posed minimal threats to the Weepah Springs Wilderness Study Area and other areas of concern.

7.5.4 (9360)
Comment - 010259 / 0006
Death Valley National Park will be endangered, as will the delicate plant and animal life that can only be found in that region.

Response
The results of analyses reported in the EIS (Chapters 4, 5, 6, and 8) demonstrate with reasonable expectation that the groundwater, surface water, wildlife, air quality, cultural resources, and aesthetics of Death Valley would not be adversely affected by a repository at Yucca Mountain.

7.5.4 (9799)
Comment - EIS001888 / 0385
[Clark County summary of a comment it received from a member of the public.]

One commenter requested that the nature and duration of changes in the surface ecosystem at Yucca Mountain from waste-generated heat and refluxing water vapor be examined in the EIS for each alternative.

Response
DOE estimated surface temperature changes that could occur as a result of residual heat and presented this information in Section 5.9 of the EIS. The analysis assumed the highest heat case. The nature and areal extent of possible changes to the surface ecosystem were summarized from cited references (DIRS 103618-CRWMS M&O 1999; DIRS 105031-CRWMS M&O 1999). Some repository designs could affect larger areas, but the temperature effects would be smaller in those cases.

7.5.4 (10381)
Comment - EIS001927 / 0016
The DEIS does address certain impacts on other living beings, such as wildlife – although far from adequately. However, one impact conspicuous by its absence is the affect of radioactivity from a Yucca Mountain repository on non-human life forms. Perhaps the human embryo is not the most vulnerable living being to radiation's harmful effects –- perhaps the embryo of another animal species is. These kinds of radiation impacts go unaddressed in the DEIS. What ecological affect would radiation have on the gene pool of threatened or endangered species such as the desert tortoise that live close to Yucca Mountain? In addition, what affect will the emplaced waste's high thermal heat have on species such as the desert tortoise, that lay their eggs in the ground, and on plant species that inhabit the surface of the desert land above and near to Yucca Mountain? These are environmental impacts that need to be addressed in an environmental impact statement.

Response
Sections 4.1.4.2 and 5.9 of the EIS discuss the possible impacts of radiation on plants and animals. Releases of radioactive materials, largely noble gases that cannot be incorporated into biological systems, would cause very little exposure to radiation for the plants and animals near the repository (see Section 4.1.4.2). As discussed in Section 5.9 of the EIS, DOE does not expect that the dose rates to plants and animals from groundwater would affect the gene pool or otherwise cause measurable detrimental effects in populations of any species because the rates would be less than 100 millirad per day. The International Atomic Energy Agency concluded that chronic dose rates of less than 100 millirad per day are unlikely to cause measurable detrimental effects in populations of even the more radiosensitive species in terrestrial ecosystems (DIRS 103277-IAEA 1992).

Section 5.9 also discusses the possible ecological changes that could result from increased soil temperatures.

7.5.4 (11780)
Comment - EIS000622 / 0003
There is a proposal for withdrawing 230 square miles for the Yucca Mountain repository, additional to the lands that have already been withdrawn that are bigger than the size of the state of Rhode Island for the Nevada Test Site itself. And as pointed out earlier, there are many, many issues of impacts on plants that are used for medicines and foods, animals that are hunted and used in other ways in the community, things that are used for building, such as willow and that kind of thing, and they seem extremely inadequate. So I would ask that these things be addressed.

Response
Section 4.1.4.2 of the EIS describes the impacts to plants and animals, which would be largely limited to destruction of vegetation and habitat on approximately 3 to 7 square kilometers (about 800 to 1,700 acres) of land within a very large area of similar, undisturbed habitat. None of the plants and animals found at Yucca Mountain are rare or are

restricted to that site, so those resources used for medicines, foods, and other uses still would be widely available at other, more accessible locations.

7.5.4 (11958)
Comment - EIS000851 / 0006
I am against a waste depository at Yucca Mountain because:

Yucca Mountain is the habitat of many endangered species, which will cease to exist if radiation poisoning occurs. Waste sites have historically become toxic wastelands.

Response
As described in Section 3.1.5.1.3 of the EIS, the only threatened or endangered species at Yucca Mountain is the desert tortoise, which is classified as threatened. The primary impacts to this and other species would be the loss of about 3 to 7 square kilometers (about 800 to 1,700 acres) of habitat and the continuation of traffic and human presence. Based on site-specific research, DOE has concluded that construction and operation of the proposed repository would have little effect on the tortoise population in the region, although individuals could be killed. Spent nuclear fuel and high-level radioactive waste would be contained inside facilities and the repository, and would not affect plants and animals or turn the site into a wasteland. DOE and the U.S. Fish and Wildlife Service have completed consultation on the potential effects of repository construction, operation, and closure on threatened and endangered species. In its Biological Opinion, the Fish and Wildlife Service concluded that these actions would not jeopardize the continued existence of the Mojave population of the desert tortoise. See Appendix O for the Final Biological Opinion, which includes an unlimited-take provision of tortoises along roads at Yucca Mountain, in part because deaths due to vehicles are anticipated to be infrequent.

7.5.4 (12015)
Comment - 010244 / 0037
The surface aging facility would require an additional 1,600 acres of habitat disturbed. The increase in land disturbance under the S&ER flexible design would cause additional loss of desert tortoise habitat. Microclimate in the immediate vicinity could be affected. Human activities could result in harmful effects, both intentionally and unintentionally, to those fragile resources in the area. How can DOE be so sure disturbing 150,000 acres for the entire repository will not cripple the biodiversity and ecosystem?

Response
The staging area by itself would not require the disturbance of an additional 6.5 square kilometers (1,600 acres) of land, nor would a total of 61 square kilometers (150,000 acres) be disturbed for development of a repository. The maximum amount of previously undisturbed land that would be cleared of vegetation for construction of a repository (for the lower-temperature operating mode, including a surface aging facility), would be about 3.4 to 6.6 square kilometers (840 to 1,620 acres). Those disturbances would be centered in a 150,000-acre area withdrawn from public access. Most of that withdrawal area would remain undisturbed. As described in Section 3.1.4 of the Supplement to the Draft EIS, and in Section 4.1.4 of this EIS, construction of the surface aging facility and other repository facilities would result in additional losses of desert tortoises and other plant and animal species. However, because these species are widespread throughout the region, and that region has large tracts of undisturbed land, the additional loss of those biological resources would not significantly affect the regional biodiversity or ecosystem.

7.5.4 (12922)
Comment - 010281 / 0007
Uncertainties. The DEIS and the Supplement fail to address the future impact of changes taking place in the biosphere, such as the extinction of species and/or the extension of the range of species.

Response
Changes to the biosphere, such as extinction or expansion in the range of a species, were not considered because such events are very uncertain and would require speculative analyses that would not be meaningful to decisionmakers.

7.5.4.1 Vegetation

7.5.4.1 (118)
Comment - 6 comments summarized
Commenters state that the Draft EIS fails to adequately address the impacts of the Proposed Action on vegetation in affected Nevada counties. Noxious weeds are a major problem in Nevada and the western United States. They threaten the livelihood of everyone who depends on the use of the range. They are easily spread by motor vehicles, humans, wind, and livestock, and they are difficult or impossible to control once established. Disturbed soils are especially vulnerable to colonization by noxious weeds. The EIS fails to include a detailed analysis of potential impacts from the spread of noxious or invasive weeds with regard to the repository, transportation, highway improvements, and other possible activities. In addition, Executive Order 13112 states, in part, that no Federal agency shall authorize, fund, or carry out actions that it believes are likely to cause or promote the spread of invasive weed species unless, pursuant to guidelines that it has prescribed, the benefits of the action outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk or harm be taken in conjunction with the actions.

Commenters also state that the Draft EIS must analyze the potential impacts of the Proposed Action on the spread of noxious weeds, including their potential effects on native flora, during both construction and operation of the repository. Specifically, it must identify vectors that would be created or enlarged for the spread of such weeds, and the consequences of possible infestations. The EIS must also describe the known habitats and sites of rare and sensitive plants and identify potential disturbance during construction and operation as a result of the establishment of access to alternative transportation routes. The EIS must also address efforts to prevent the spread of noxious weeds.

Response
DOE added a description of potential impacts from exotic species or noxious weeds to the Final EIS. Section 3.1.5 identifies exotic species that are present and abundant in the Yucca Mountain area. Sections 4.1.4.2, 6.3.2.1, and 6.3.3.1 identify impacts from construction of a repository, branch rail line, and heavy-haul truck route. Sections 4.1.4.2 and 9.2.4 describe mitigation for preventing or reducing the spread of exotic species or noxious weeds. Sections 4.1.4.2, 6.3.2.1, and 6.3.3.1 contain information about potential impacts on rare and sensitive plants.

7.5.4.1 (4560)
Comment - EIS001521 / 0073
Page 3-61, Figure 3-18--What does the boundary designation “between two individual vegetation coverages” mean? It is not discussed in the text. Why not use the “analyzed land withdrawal area” as noted on page 3-60, first paragraph? Also, the analyzed area on this figure does not match that on page 1-16, Figure 1-6, which was used for other proposed-repository studies--why not?

Response
The land cover types of the analyzed land withdrawal area, as defined in Section 1.4.1 of the Draft EIS, were adapted from two sources referenced in Section 3.1.5.1.1. The “boundary” in Figure 3-21 defined the sources of the land cover types. The land cover types within the boundary and closer to the proposed repository location (adapted from DIRS 104589-CRWMS M&O 1998) were mapped in greater detail than the rest of the land withdrawal area (adapted from DIRS 103670-Utah State University 1996). Land cover types within the boundary have a higher degree of accuracy because of this detail and because they were validated in the field (DIRS 104589-CRWMS M&O 1998). The land withdrawal area is essentially the same in Figures 1-6 and 3-21. In the Final EIS, the boundary line has been removed from this figure to avoid confusion.

7.5.4.1 (5604)
Comment - EIS001887 / 0230
Page 4-31; Table 4-11 - Land cover types in the analyzed land withdrawal area and the amount of each that repository construction and disposal of excavated rock would disturb (square kilometers).

It is interesting that the DOE did acknowledge potentially adverse consequences to the ecosystem from different thermal loading schemes in this table. However, the thermal loading issue with respect to biological resources is avoided in Table 4-12, page 4-35, which summarizes overall impacts from the repository, by stopping the summary

after repository closure and ignoring the critical long-term ecosystem impacts. This is further discussed in Attachments G, F, O, and P.

Response
DOE did not avoid the thermal loading issue in the Draft EIS as described in the comment and elaborated on in the attachments. Chapter 4 of the Draft EIS and the Final EIS describes only impacts from repository construction, operation and monitoring, and closure. Table 4-12 documents the construction activities associated with the thermal loading scenarios that would disturb different amounts of land cover types. Table 4-13 has consistent information. Section 5.9 of the EIS discusses potential long-term impacts to the ecosystem from thermal loading. These sections have been modified in the Final EIS to reflect the flexible design in the supplement to the Draft EIS.

7.5.4.1 (6665)
Comment - EIS001878 / 0043
The DEIS underestimates the difficulty of storing topsoil, returning it to a site, and revegetating disturbed areas in Nevada's arid climate. (p. 4-23)

Response
DOE spent several years during site characterization conducting reclamation feasibility studies designed to identify and improve methods of reclamation in arid environments (DIRS 146287-CRWMS M&O 1999) and understands the difficulties associated with the process. These studies were focused on identifying and improving the techniques for site preparation, revegetation, soil stabilization, and topsoil stockpiling. Methods for maintenance of topsoil viability stockpiled for both short term (up to 6 months) and long term (several years) were examined. From these studies, an array of standard reclamation techniques were identified that could be selected from, and applied to, sites based on type of disturbance, soil type and depth, vegetation community, and topography. DOE has used these techniques to reclaim disturbances caused by site characterization activities in Mojave and Great Basin desert upland plant communities.

7.5.4.1 (12074)
Comment - EIS002311 / 0003
In section 5.9, the DEIS is arguably incorrect about the statement "A shift in plant species composition, if any, would be limited to the area within 500 meters of the repository footprint [that is, as much as 8 square kilometers (2,000 acres)], with greatest change within the central 3 square kilometers (740 acres) for the high thermal load scenario," because it fails to consider that the new heat tolerant plants that out-compete the native species within the aforementioned area, will likely continue to spread beyond this area as its biomass increases, and the chemical reactions carried out by the plant itself could further change the soil composition. This could make it more difficult for native species to thrive.

Response
The EIS does not suggest that there would be "new" heat tolerant plants. The suggested shift in species composition refers to plant species that currently exist and are adapted to naturally warmer and dryer sites (for example, low elevation, south slopes) in the Yucca Mountain area. Many of these are native plant species (DIRS 105031-CRWMS M&O 1999). An increase in heat tolerant species within the affected area does not mean that those species would have a competitive advantage in cooler areas beyond the repository footprint.

7.5.4.1 (12085)
Comment - EIS002307 / 0002
The DEIS is incorrect in saying that there will be few human health impacts from the repository because the effects on vegetation due to temperature changes (cited in Section 5.10 of the DEIS) are not taken into account.

Response
Section 5.9 of the EIS discusses the effects on vegetation due to temperature changes from repository heat. If they occurred, they would be localized to the area just above and adjacent to the repository, an area that would remain remote from human activities. Because there is no reasonable way that possible changes to small areas of native vegetation could affect human health, they were not included in Section 5.10 of the EIS, where DOE concluded that any potential impacts to human health in the future would be dominated by impacts from radioactive materials in the waterborne pathway.

7.5.4.2 Wildlife

7.5.4.2 (39)
Comment - 2 comments summarized
Commenters state that the Draft EIS does not adequately assess possible impacts of the proposed project on desert bighorn sheep in the region. Threats to bighorn sheep include ingesting contaminated water at surface springs in Death Valley and surrounding wetlands and fragmentation of habitat from the transport of spent nuclear fuel and high-level radioactive waste. Currently, there are no major barriers such as roads or fences to movement by bighorn sheep in the area lying north (and west) of Interstate 15 in California, Nevada, Arizona, and Utah. The EIS should evaluate the impacts to bighorn sheep from the creation of barriers and habitat modification or fragmentation caused by the proposed Project. Impacts of increased volumes and speed of traffic should also be examined.

Response
Except for possible upgrading, DOE does not plan to modify existing public highways in California or elsewhere that would be used to transport materials, personnel, or legal-weight truck shipments of spent nuclear fuel and high-level radioactive waste to Yucca Mountain. Therefore, additional information on those routes is not necessary. Transportation-related habitat fragmentation would occur only if a highway in Nevada would have to be upgraded for heavy-haul trucks or during construction of a branch rail line in Nevada. The *Environmental Baseline File for Biological Resources* was used to compile the biological sections of the EIS (DIRS 104593-CRWMS M&O 1999) describes and maps bighorn sheep populations and migration patterns near the routes being considered and Sections 3.2.2.1.4 and 3.2.2.2.4 of the EIS highlight the sheep populations most likely to be affected. DOE acknowledges in Section 9.3.4.2 and elsewhere in the EIS that construction of some transportation routes could disrupt movements of game animals.

DOE agrees that additional, site-specific information would be necessary prior to construction of a branch rail line or road upgrades to support heavy-haul shipping. However, DOE believes that the EIS provides sufficient information on impacts to biological resources to make decisions regarding the basic approaches (for example, mostly rail or mostly truck shipments), as well as the choice among alternative transportation corridors in the State of Nevada. DOE anticipates that the project plan and design would continue to evolve, creating additional opportunities for mitigation and potentially eliminating the need for some mitigation measures currently under consideration. Chapter 9 of the EIS identifies DOE-determined impact-reduction features, procedures and safeguards, and mitigation measures under consideration for inclusion in the project plan and design. Chapter 9 also identifies ongoing studies that could eventually influence mitigation measures related to the project plan and design. As noted in the EIS Foreword, Chapter 6, and elsewhere, if a repository was constructed at Yucca Mountain, DOE would conduct a more detailed assessment of the potential impacts on wildlife habitat and wildlife movements along transportation routes in Nevada. Impacts to bighorn sheep and other wildlife resources would be more fully evaluated at that time and mitigation measures would be developed.

7.5.4.2 (117)
Comment - 4 comments summarized
Commenters stated that the Draft EIS did not sufficiently analyze impacts of repository construction and operation on animals, especially the desert tortoise. The Draft EIS notes that five tortoises were killed on roads during site characterization activities, and that death or displacement of individual members of some animal species, including the desert tortoise, as a result of site clearing and vehicle traffic would be unavoidable. Commenters wanted to know what the impacts would be from an increase in traffic and other activities on desert tortoises and other animals and whether this would cause tortoises to become extinct.

Response
Impacts of repository construction and operation on desert plants and animals would result from the disturbance of about 3 to 7 square kilometers (about 800 to 1,700 acres) of desert habitat, the continuation of human presence and activities, and an increase in traffic to Yucca Mountain. Those impacts have been analyzed based upon a large amount of research and information about the desert environment at Yucca Mountain (DIRS 104593-CRWMS M&O 1999). As summarized in Section 10.1.1.4 of the EIS, adverse impacts on regional populations of animals, including the desert tortoise, would be minimal and largely undetectable in part because the impacts would be restricted to a small area and the animal species found at Yucca Mountain are widespread throughout the region. Traffic and other site characterization activities during about 1991 to 1995 had no detectable effect on populations of

desert tortoises and other animals monitored (DIRS 104593-CRWMS M&O 1999). The U.S. Fish and Wildlife Service issued a Final Biological Opinion that concluded repository construction, operation, and closure would not jeopardize the continued existence of the Mojave population of the desert tortoise (see Appendix O for the Final Opinion).

7.5.4.2 (1847)
Comment - EIS000367 / 0003
The animals, the water in the area, if it does get contaminated, it will affect the pupfish, a very rare species that is in Death Valley, the bighorn sheep that live in the area around that area, and then just the natural people that live in this area, Inyo County, all the way in a big circle, the whole Great Basin.

Response
The flowpath for groundwater beneath Yucca Mountain is described in Section 3.1.4.2.1 of the EIS to be to Jackass Flats, to the Amargosa Desert, and then southward to the primary point of discharge at Alkali Flat southeast of Death Valley Junction. Although the flowpath in the Amargosa Desert is near Ash Meadows and Devils Hole where pupfish occur, these resources would not be effected. However, in this area there is marked decline of 64 meters (210 feet) or more in the water table elevation between Devils Hole and the low axis (Carson Slough) of the Amargosa Desert to the west and south. This elevation decline indicates that the groundwater flow from the carbonate rocks of the Devils Hole Hills is westward across Ash Meadows toward the Amargosa Desert, not the other way around. Therefore, contamination from Yucca Mountain could not discharge to the surface nor contaminate the aquifers at Ash Meadows or Devils Hole.

The calculations in Chapter 5 of the EIS indicate that predicted long-term levels of radionuclide concentration in groundwater and the resulting dose levels at the predicted discharge area in Amargosa Valley, Nevada, would be low. DOE does not expect that the dose rates to plants and animals at that location would cause measurable detrimental effects in populations of any species because the rates would be less than 100 millirad per day. The International Atomic Energy Agency concluded that chronic dose rates of less than 100 millirad per day are unlikely to cause measurable detrimental effects in populations of even the more radiosensitive species in terrestrial ecosystems (DIRS 103277-IAEA 1992). DOE recognizes in the EIS that some groundwater reaching Alkali Flat may bypass this playa area and continue on into the Death Valley basin which would require first moving through the areas of Tecopa and Shoshone. DOE also recognizes that a small fraction of the groundwater flow beneath the Amargosa Desert might flow through fractures in the relatively impermeable Precambrian rocks in the southeastern end of the Funeral Mountains toward spring discharge points in the Furnace Creek Wash area of Death Valley. In either case, any concentrations reaching these areas of Death Valley would be even less than the concentrations presented in Chapter 5 of the EIS for the discharge location at Alkali Flat (Franklin Lake Playa), because concentrations would decline with distance from the proposed repository.

7.5.4.2 (4146)
Comment - EIS001206 / 0001
The discussion of Impacts to Biological Resources and Soils from Performance Confirmation (Section 4.1.4.1) is inadequate because it fails to properly consider and address the regional and rangewide implications of the loss of unique desert tortoise (Gopherus agassizii) populations and the genetic potential of these populations at the northern extremes of this species range. It is inadequate because it fails to properly consider and address the regional and rangewide implications of increases in traffic on unique desert tortoise (Gopherus agassizii) populations at the northern extremes of this species range due to this activity. It is inadequate because it fails to adequately consider and address the regional and rangewide implications of increases in raven populations and their increased levels of predation on unique desert tortoise (Gopherus agassizii) populations at the northern extremes of this species range due to this activity.

The discussion of Impacts to Biological Resources from Construction, Operation, and Monitoring and Closure (Section 4.1.4.2) is inadequate because it fails to properly consider and address the regional and rangewide implications of the loss of unique desert tortoise (Gopherus agassizii) populations and the genetic potential of these populations at the northern extremes of this species range. It is inadequate because it fails to properly consider and address the regional and rangewide implications of increases in traffic on unique desert tortoise (Gopherus agassizii) populations at the northern extremes of this species range due to this activity. It is inadequate because it fails to properly consider and address the regional and rangewide implications of increases in raven populations and their

increased levels of predation on unique desert tortoise (Gopherus agassizii) populations at the northern extremes of this species range due to this activity.

The discussion of Impacts to Biological Resources from Retrieval (Section 4.2.1.2.4.1) is inadequate because it fails to properly consider and address the regional and rangewide implications of the loss of unique desert tortoise (Gopherus agassizii) populations and the genetic potential of these populations at the northern extremes of this species range. It is inadequate because it fails to properly consider and address the regional and rangewide implications increases in traffic on unique desert tortoise (Gopherus agassizii) populations at the northern extremes of this species range due to this activity. It is inadequate because it fails to properly consider and address the regional and rangewide implications of increases in raven populations and their increased levels of predation on unique desert tortoise (Gopherus agassizii) populations at the northern extremes of this species range due to this activity.

The discussion of Consequences to Biological Resources and Soils (Section 4.2.1.2.4.1) is inadequate because it fails to properly consider and address the regional and rangewide implications of the loss of unique desert tortoise (Gopherus agassizii) populations and the genetic potential of these populations at the northern extremes of this species range. It is inadequate because it fails to properly consider and address the regional and rangewide implications of increases in traffic on unique desert tortoise (Gopherus agassizii) populations at the northern extremes of this species range due to this activity. It is inadequate because it fails to properly consider and address the regional and rangewide implications of increases in raven populations and their increased levels of predation on unique desert tortoise (Gopherus agassizii) populations at the northern extremes of this species range due to this activity. It is inadequate because it incorrectly asserts that "Desert tortoises are rare or absent on or around playas..." Recent work by Dave McCullough (pers. com.) in the vicinity of Ivanpah Dry Lake has found the desert tortoises are much more common in Atriplex sp. Communities surrounding playas than was previously believed. Therefore, discharge of radioactive and toxic effluent would pose a more significant threat than is currently being considered.

Response
DOE did consider the regional and rangewide implications of the Proposed Action, the loss of genetic potential, and impacts of traffic and ravens on desert tortoises and concluded in Chapter 4 of the EIS that the loss of a small number of tortoises along roads and at the proposed repository site would not affect the genetic potential or the long-term survival of the local or regional population of this species. In addition, the U.S. Fish and Wildlife Service has issued a Final Biological Opinion that repository construction, operation, and closure would not jeopardize the continued existence of the Mojave population of the desert tortoise (see Appendix O of the EIS for the Final Opinion). Research at Yucca Mountain during site characterization confirms that activities similar to those proposed have little effect on tortoises adjacent to disturbances (DIRS 104294-CRWMS M&O 1999). The abundance of ravens at Yucca Mountain was not influenced by construction activities at Yucca Mountain (DIRS 103195-CRWMS M&O 1998) and ravens were not an important predator of young tortoises in this area (DIRS 102236-CRWMS M&O 1998). Section 4.1.4.1 of the Final EIS has been modified to clarify the conclusion that the Proposed Action would not affect desert tortoise populations.

The Atriplex plant community in Ivanpah Valley is substantially different from plant communities near playas in southern Nye County. Information from surveys of desert tortoises in Nye County show that tortoises are rare or absent near playas in this region (DIRS 101914-Rautenstrauch and O'Farrell 1998).

7.5.4.2 (4351)
Comment - EIS001182 / 0004
What consideration had been given to the impact on desert fauna, reptiles, insects and spiders?

Response
Impacts to all desert fauna known to occur at Yucca Mountain were considered in Sections 4.1.4, 5.9, 6.3.1.1, 8.2.4, and 8.4.2.4 of the EIS. Because these species are widespread throughout the region, DOE concluded that the deaths of a few individuals and loss of 3 to 7 square kilometers (800 to 1,700 acres) of habitat would have little impact on the regional populations of those species.

7.5.4.2 (5752)
Comment - EIS001887 / 0356
Page 9-6; Section 9.2.3 - Biological Resources and Soils

In this section, the focus is almost exclusively on the desert tortoise and not on other components of the ecosystem or on the ecosystem itself. Additionally, there is no consideration of risks associated with mitigation. For these and other reasons (Attachments [to this comment document] D, G, M; Clark and Canter, 1997; Ortolano, 1997; Westman, 1985), the section is inadequate.

Response
DOE does not agree that Section 9.2.3 of the EIS is inadequate, as the comment and attachments contend. The primary focus in Sections 9.2.4 and 9.3.4 of the EIS is the desert tortoise because it is the only federally listed threatened species at the site and because there are few other impacts to biological resources or the ecosystem identified in the EIS that require mitigation. The proposed mitigation measures have been developed in consultation with the U.S. Fish and Wildlife Service. The Service has issued a Final Biological Opinion that repository construction, operation and monitoring and closure would not jeopardize the continued existence of the Mojave population of the desert tortoise (see Appendix O of the EIS for the Final Opinion).

7.5.4.2 (6068)
Comment - EIS001898 / 0011
The DEIS may not adequately bound the uncertainty in the predictions of heat generated from radioactive decay during long-term repository performance and the potential effects of this heat generation on fauna.

Basis:

Although most vertebrate species have genetically fixed sex determination, it is now known that chelonians (tortoises and turtles) undergo temperature dependent sex determination (TSD). Spotila (1994) shows that the desert tortoise (*Gopherus agassizii*), a federally listed threatened species of the Mojave Desert, is subject to this effect. Research shows that the temperature that produces a 50:50 sex ratio is 31.8°C. Desert tortoise eggs have good hatching success between 28 and 33°C, but suffer high mortality at temperatures below 26 or above 35.3°C. Temperatures between 26.0 and 30.6°C produce mostly males (temperatures 28°C and below produce 100 percent males) and temperatures between 32.8 and 35.3°C produce mostly females (temperatures above 33°C produce 100 percent females) (Spotila et al., 1998). Lewis-Winokur and Winokur (1995) confirm that the pivotal temperature is between 31 and 32°C and indicated that a lowering of 1.6°C (from 31 to 29.4°C) resulted in all male hatchlings.

The modeling of surface soil temperature for the proposed site produces uncertain results. TRW Environmental Safety Systems, Inc. (1999, page 44) states "...current predictions are somewhat uncertain due to uncertainties in the thermal properties of the soil, particularly thermal conductivity and, hence, thermal diffusivity." This source further states that "analyses based on conventional soil heat-conduction models indicate that the original time scale of the measurements collected at the site (weekly to monthly) could not be used to accurately estimate the soil thermal conductivity for the sampling depths chosen (15, 30 and 45 cm)." However, substantial temperature effects on desert tortoise sex determination have been shown to occur within a range of plus or minus 3°C. Therefore, it is important for the FEIS to clarify the range of soil temperatures associated with the geologic repository and discuss impacts, if any, on protected or endangered species.

Recommendation:

The assessment of the contribution of thermal loading on increased soil temperature should be refined in the FEIS. Soil temperature modeling should take into account the substantial uncertainties in thermal conductivity in Yucca Mountain soils thereby enabling an assessment of the potential impacts to the desert tortoise from increased soil temperatures.

References:

Lewis-Winokur, V., and R.M. Winokur. *Incubation temperature affects sexual differentiation, incubation time, and posthatching survival in desert tortoises [Gopherus agassizi(sic)]. Canadian Journal of Zoology* 73(11):2091-2097. 1955.

Spotilla, J.R., L.C. Zimmerman, C.A. Binckley, J.S. Grumbles, D.C. Rostal, A. List, Jr., E.C. Beyer, K.M. Philips, and S.J. Kemp. *Effects of incubation conditions on sex determination, hatching success, and growth of hatchling desert tortoise, Gopherus agassizii. Herpetological Monographs* 8: 103-116. 1994.

TRW Environmental Safety Systems, Inc. *Impact of Radioactive Waste Heat on Soil Temperatures.* BA0000000=01717-5700-00030. Revision 0. Las Vegas, NV: TRW Environmental Safety Systems, Inc.: 37-44. 1999.

Response
The statement in the Draft EIS on page 5-47, "There is considerable uncertainty in the estimates of soil temperature increases due to uncertainties in the thermal properties of the soil…" is misleading. There are some uncertainties in the thermal properties of the soil but these do not cause "considerable uncertainty" in the estimates of soil temperature increase. DOE has revised the text of the EIS to reflect this. While the Department acknowledges that some uncertainties exist in thermal properties of Yucca Mountain soils, the EIS modeling effort used the best available information for predicting average soil temperature increases. The model did not use the weekly to monthly soil temperatures to which the commenter refers because the time scale "could not be used to accurately estimate the soil thermal conductivity" (DIRS 103618-CRWMS M&O 1999). Rather, it used only hourly soil temperature measurements, which allowed the use of diurnal fluctuations to estimate the thermal diffusivity of the soil and provided a calibration for the thermal diffusivities modeled for wet, dry, and nominal soils. The thermal diffusivity obtained from the hourly soil temperature measurements was similar to that estimated for soils under wet conditions. Therefore, the thermal diffusivity estimated for dry soil represents a conservative value on predicted soil temperature increase, and the "available data suggest very modest temperature rises due to repository heat effects" (DIRS 103618-CRWMS M&O 1999). DOE has revised the EIS to clarify the reasons why dry soil thermal conductivity provides a conservative prediction of soil temperature increase. Temperature changes used to evaluate impacts were based on dry soils, and therefore cover the range of possible effects of soil warming on desert tortoises and other biological resources.

As described in Section 5.9 of the EIS, based on these conservative calculations, the predicted increase in soil temperature at the shallow depth at which tortoises lay eggs would be very small compared to the range of natural variation in soil temperatures at Yucca Mountain (DIRS 105031-CRWMS M&O 1999) and the range of temperatures at which desert tortoise eggs have been successfully incubated. This small change in temperature, therefore, should have no adverse affect on tortoise eggs. Because of this and the small size of the affected area [about 3 square kilometers (740 acres)], DOE believes that impacts to the desert tortoise from heat generated by the proposed repository would be minimal.

7.5.4.2 (6542)
Comment - EIS001632 / 0039
Page 4-33: DOE should plan to construct the evaporation ponds with side slopes or a ramp to facilitate wildlife use.

Response
DOE would consider providing escape ramps from trenches, including ponds and basins, as a mitigation measure (see Section 9.2.3.2 of the EIS).

7.5.4.2 (6543)
Comment - EIS001632 / 0040
Page 4-35: While the impact on the threatened desert tortoise population is unclear (see comment on section 6.3.1.1), EPA [Environmental Protection Agency] questions whether the impact should be rated as low or very low. Some federally listed desert tortoises were killed during site characterization and more will likely be killed during construction, operation and monitoring, and closure. With increased human activity and traffic over the life of the

project, the increases may be significant. EPA notes that DOE is obtaining a Biological Opinion from the Fish and Wildlife Service (page 4-33); any mitigation/conditions for protecting the tortoise should be listed in the final EIS.

Response
The loss of a small number of tortoises along roads and at the repository site would not affect the long-term survival of the local or regional population of desert tortoises. Tortoises are widespread throughout the region and large tracts of undisturbed tortoise habitat surround Yucca Mountain. Research at Yucca Mountain during site characterization confirms that activities similar to those proposed would have little effect on adjacent populations (DIRS 104294-CRWMS M&O 1999). Only five Desert Tortoise deaths have been attributed to site characterization activities. The rate of tortoise mortality would remain comparable to that observed during site characterization because the amount of traffic would be similar. Under the legal-weight truck scenario, the repository would receive about 40 shipments a day of supplies, materials, and equipment (Section J.3.6.1 of the EIS), and up to six shipments of spent nuclear fuel or high-level radioactive waste (Section J.1.2.1 of the EIS). During site characterization, the daily average number of vehicles passing traffic counters in 1993 and 1994 was between 40 and 55 (DIRS 104294-CRWMS M&O 1999). DOE and the U.S. Fish and Wildlife Service have completed consultation on the potential effects of repository construction, operation, and monitoring and closure on threatened and endangered species. In its Biological Opinion, the Fish and Wildlife Service concluded that these actions would not jeopardize the continued existence of the Mojave population of the desert tortoise. That Opinion includes an unlimited take provision of tortoises along roads at Yucca Mountain, in part because deaths due to vehicles are anticipated to be infrequent. (See Appendix O of the EIS for the Biological Opinion.) Section 4.1.4 of the Final EIS has been modified to better explain the conclusion that the Proposed Action would not affect the tortoise population.

7.5.4.2 (7741)
Comment - EIS002016 / 0002
The wildlife will be exposed since you are going to store it in Yucca Mountain.

Response
DOE anticipates that some bats and other animals could use the tunnels as they are excavated; however, after emplacement of materials, the tunnels would be sealed and exposure of wildlife to the emplaced materials would be inconsequential. Releases of radioactive materials, largely noble gases that cannot be incorporated into biological systems, would cause very little exposure to radiation for the plants and animals near the repository (see Section 4.1.4.2 of the EIS). Furthermore, DOE does not expect that the dose rates to plants and animals would cause measurable detrimental effects in populations of any species because the rates would be less than 100 millirad per day. The International Atomic Energy Agency concluded that chronic dose rates of less than 100 millirad per day are unlikely to cause measurable detrimental effects in populations of even the more radiosensitive species in terrestrial ecosystems (DIRS 103277-IAEA 1992).

7.5.4.2 (7926)
Comment - EIS002004 / 0002
I am concerned about the nuclear waste that is going to be stored at Yucca Mountain, which is located nearby.

The wildlife and water supply could be [severely] damaged by this.

Response
DOE does not anticipate that the dose rates to plants and animals would cause measurable detrimental effects in populations of any species because those rates would be less than 100 millirad per day. The International Atomic Energy Agency concluded that chronic dose rates of less than 100 millirad per day are unlikely to cause measurable detrimental effects in populations of even the more radiosensitive species in terrestrial ecosystems (DIRS 103277-IAEA 1992). As summarized in Chapter 5 of the EIS, calculations indicate that predicted long-term levels of radionuclide concentrations in groundwater, and the resulting dose levels, would be very low. As stated in Section 3.1.4.2.1 a small amount of groundwater might move beyond the primary groundwater discharge point at Alkali Flat (Franklin Lake Playa) and continue into the Death Valley basin via the areas of Tecopa and Shoshone. It is also recognized in the EIS that a small fraction of the groundwater beneath the Amargosa Desert might flow through fractures in the relatively impermeable Precambrian rocks in the southeastern end of the Funeral Mountains toward spring discharge points in the Furnace Creek Wash area of Death Valley. In either case, any concentrations reaching these areas of Death Valley would be even less than the concentrations presented in Chapter 5 for the discharge

location at Alkali Flat (Franklin Lake Playa), because concentrations would decline with distance from the proposed repository.

7.5.4.2 (9373)
Comment - EIS001888 / 0079
The Clark County Desert Conservation Plan is administered by the Environmental Division of the Department of Comprehensive Planning. The Environmental Division, the scientific community and other stakeholders are deeply concerned about any activity that may threaten the species' survival in the wild and its recoverability. Comments[1] submitted by the Environmental Division reflects the opinions regarding potential impacts on the desert tortoise of conservation and biological experts.

This group pointed out the insufficiency of the DEIS due to the lack of consideration of the well-being of the desert tortoise during various phases of repository construction, operation, monitoring and closure. Potential effects on the desert tortoise due to transportation by rail or highway were also discussed. A copy of this document is included to this report as Attachment A and is incorporated by reference to the present comments.

[1]Cannon Center for Survey Research. Quality of Life in Las Vegas. Report. City of Las Vegas, Nevada, 1999.

Response
DOE did consider the regional and rangewide implications of the Proposed Action, the loss of genetic potential, and impacts of traffic and ravens on desert tortoises. This analysis was based on a large amount of site-specific information on the desert tortoise population at Yucca Mountain. DOE therefore disagrees that the analysis of effects on desert tortoises is insufficient. Sections 4.1.4.1 and 4.1.4.2 of the Final EIS was modified in response to comments by the Clark County Department of Comprehensive Planning to better explain DOE's conclusions about the potential impacts of traffic, habitat loss, and ravens on tortoises at Yucca Mountain and add references to reports summarizing research on desert tortoises. Section 6.1.2.4 of the Final EIS was modified to acknowledge that the Proposed Action would affect some individual desert tortoises but would not negatively affect regional populations of desert tortoises, jeopardize the continued existence of the species, or result in adverse modification of designated critical habitat.

7.5.4.2 (9801)
Comment - EIS001888 / 0387
[Clark County summary of comments it has received from the public.]

Commenters stated that the EIS, based on field surveys prior to further ground disturbance, should thoroughly examine the impacts to biological/natural resources during all phases of repository development. Commenters suggested that the analyses address: (1) critical habitats for threatened, endangered, and sensitive species, including impacts from radiation exposure during accident-free operations and from accidents.

Response
DOE considered impacts to biological resources during all phases of repository development and provides a summary of those impacts in Table 4-13 of the EIS. No critical habitats for threatened, endangered, or other sensitive species would occur at the repository location. Information presented in Section 3.1.4.2.1 indicates that differences in water table elevations show the Amargosa Desert groundwater, which includes flow from beneath the Yucca Mountain area, does not flow toward Ash Meadows and Devils Hole (rather, the flow is in the opposite direction). Therefore, no contamination from Yucca Mountain could flow into these areas and threaten listed species or their critical habitat. As discussed in Section 5.9 of the EIS, DOE does not anticipate that the radiological dose rates to plants and animals would cause measurable detrimental effects in populations of any species because the dose rates would be less than 100 millirad per day. The International Atomic Energy Agency concluded that chronic dose rates of less than 100 millirad per day are unlikely to cause measurable detrimental effects in populations of even the more radiosensitive species in terrestrial ecosystems (DIRS 103277-IAEA 1992).

7.5.4.2 (10717)
Comment - EIS000715 / 0002
Threatened species are defined as plants and animals whose numbers are very low or decreasing rapidly, so it is imperative to the tortoise's survival that it be protected in all proposals concerning Yucca Mountain.

The DEIS notes that from 1989 to 1998, five (5) tortoises were killed by vehicles on roads in the Yucca Mountain region as a result of site characterization activities. However, the DEIS makes light of the fact that several thousand trucks could potentially be travelling on current and new roads in the Yucca Mountain region if the repository is built. If five tortoises were killed in a period of relatively light activity, how many more tortoises will be killed if Yucca Mountain is licensed as a repository, and there are more roads, cars, and trucks? Once again the DEIS has failed to adequately address environmental impacts.

The desert tortoise could also be affected by an increase in soil temperature. Desert tortoises burrow into the soil in order to escape the great heat of the desert. If the temperature of the soil increases (because of the heat generated by the nuclear waste), the tortoise's ability to survive may be compromised. The DEIS also notes that nest temperature determines whether desert tortoise's hatchlings will be male or female. If the temperature of the soil around the repository increases, the sex ratio of the species could be affected, thus compromising the ability of the species to thrive and survive. The DOE admits, "little is known about the effects that minor alterations in habitat would have on desert tortoise population dynamics (p. 5-48)."

The DOE also admits that not much is known about the thermal properties of the soil at Yucca Mountain, particularly thermal conductivity, and so that there is considerable uncertainty in the estimates of soil temperature changes from the repository. The possibility that the repository could cause an unforeseen effect on heating up the desert soil to a dangerous level coupled with the increased risk of death from vehicles could lead to severe consequences for the desert tortoise. Yet, the DEIS does not characterize these potential effects clearly or take them seriously.

Response
In Section 4.1.4.2 of the EIS, DOE concluded that the loss of a small number of desert tortoises along roads and at the repository site would not affect the long-term survival of the local or regional population of this species. In addition, the U.S. Fish and Wildlife Service has issued a Final Biological Opinion stating that repository construction, operation and monitoring, and closure would not jeopardize the continued existence of the Mojave population of the desert tortoise (see Appendix O of the EIS for the Final Opinion). The rate of tortoise mortality would remain comparable to that observed during site characterization because the amount of traffic would be similar. Under the legal-weight truck scenario, the repository would receive about 40 shipments a day of supplies, materials, and equipment (Section J.3.6.1 of the EIS), and six shipments of spent nuclear fuel or high-level radioactive waste (Section J.1.2.1 of the EIS). During site characterization, the daily average number of vehicles passing traffic counters in 1993 and 1994 was between 40 and 55 (DIRS 104294-CRWMS M&O 1999). Section 4.1.4 of the Final EIS has been modified to better explain conclusions about impacts to desert tortoises.

To account for uncertainties in the thermal properties of soil at Yucca Mountain, the predicted temperature changes used to evaluate impacts on biological resources were calculated based on the properties of dry soils, which have a lower thermal conductivity than soil conditions measured at Yucca Mountain (see EIS Section 5.9 of the EIS). These predictions therefore bound the possible effects of soil warming on desert tortoises and other biological resources. Section 5.9 has been modified to clarify the discussion of uncertainty.

As described in Section 5.9 of the EIS, the predicted increase in soil temperature at the shallow depth that tortoises lay eggs would be very small compared to the range of natural variation in soil temperatures at Yucca Mountain (DIRS 105031-CRWMS M&O 1999) and the range of temperatures at which desert tortoise eggs have been successfully incubated. This small change in temperature therefore should have no adverse effects on tortoise eggs. Because of this and the small size of the affected area [about 3 square kilometers (740 acres)], DOE believes that impacts to the desert tortoise from heat generated by the repository would be minimal.

7.5.4.3 Wetlands

7.5.4.3 (6667)
Comment - EIS001878 / 0044
The discussion of the floodplain and wetlands assessment of transportation options (p. 4-24) is in the wrong section of the DEIS.

Response
This comment refers to Section 4.1.3.2 of the EIS, which describes possible alterations of the natural surface-water drainages in the area if the project was to proceed. The floodplain/wetlands assessment mentioned in this section is an appropriate reference to the full assessment in Appendix L.

7.5.4.4 Soils

7.5.4.4 (8884)
Comment - EIS001834 / 0025
The DOE admits that not much is known about the thermal properties of the soil at Yucca Mountain, particularly thermal conductivity, and so that there is considerable uncertainty in the estimates of soil temperature changes from the repository. The possibility that the repository could cause an unforeseen effect of heating up the desert soil to a dangerous level coupled with the increased risk of death from vehicles could lead to severe consequences for the desert tortoise. Yet, the DEIS does not characterize these potential effects clearly or take them seriously.

The desert tortoise and other plants and animals could also be affected by an increase in soil temperature. Desert tortoises burrow into the soil in order to escape the great heat of the desert. If the temperature of the soil increases (because of the heat generated by the nuclear waste), the tortoise's ability to survive may be compromised. The DEIS also notes that nest temperature determines whether desert tortoise hatchlings will be male or female. If the temperature of the soil around the repository increases, the sex ratio of the species could be affected, thus compromising the ability of the species to thrive and survive. The DOE admits, "…little is known about the effects that minor alterations in habitat would have on desert tortoise population dynamics (p. 5-48)." More research needs to be done in order to accurately predict the potential impacts on this threatened species.

Response
To account for uncertainties in the thermal properties of soil at Yucca Mountain, DOE calculated predicted temperature changes used to evaluate impacts on biological resources based on the properties of dry soils, which have a lower thermal conductivity than soil conditions measured at Yucca Mountain (see Section 5.9 of the EIS). These predictions, therefore, cover the range of the possible effects of soil warming on desert tortoises and other biological resources. DOE has modified Section 5.9 to clarify the discussion of uncertainty.

As described in Section 5.9 of the EIS, soil would not heat to dangerous levels. The predicted increase in soil temperature at the shallow depth tortoises lay eggs would very small compared to the range of natural variation in soil temperatures at Yucca Mountain (DIRS 105031-CRWMS M&O 1999) and the range of temperatures at which desert tortoise eggs have been successfully incubated. This small change in temperature, therefore, should have no adverse effects on tortoise eggs or tortoises in burrows. Because of this and the small size of the affected area [about 3 square kilometers (740 acres)], DOE believes that impacts to the desert tortoise from heat generated by the proposed repository would be minimal.

The rate of tortoise mortality due to vehicles would remain comparable to that observed during site characterization because the amount of traffic would be similar. Under the legal-weight truck scenario, the repository would receive about 40 shipments a day of supplies, materials, and equipment (Section J.3.6.1 of the EIS), and six shipments of spent nuclear fuel or high-level radioactive waste (Section J.1.2.1 of the EIS). During site characterization, the daily average number of vehicles passing traffic counters in 1993 and 1994 was between 40 and 55 (DIRS 104294-CRWMS M&O 1999).

7.5.5 CULTURAL RESOURCES

7.5.5 (225)
Comment - 11 comments summarized
A number of commenters noted that the "Programmatic Agreement Between the U.S. Department of Energy and the Advisory Council on Historic Preservation for the Nuclear Waste Deep Geologic Repository, Yucca Mountain, Nevada" is 10 years old. They noted that the existing agreement does not reflect new standards that emphasize public involvement and alternative data recovery as a mitigation measure. Commenters also noted that the existing programmatic agreement does not address linear transportation (rail and heavy-haul truck) routes or intermodal transfer stations.