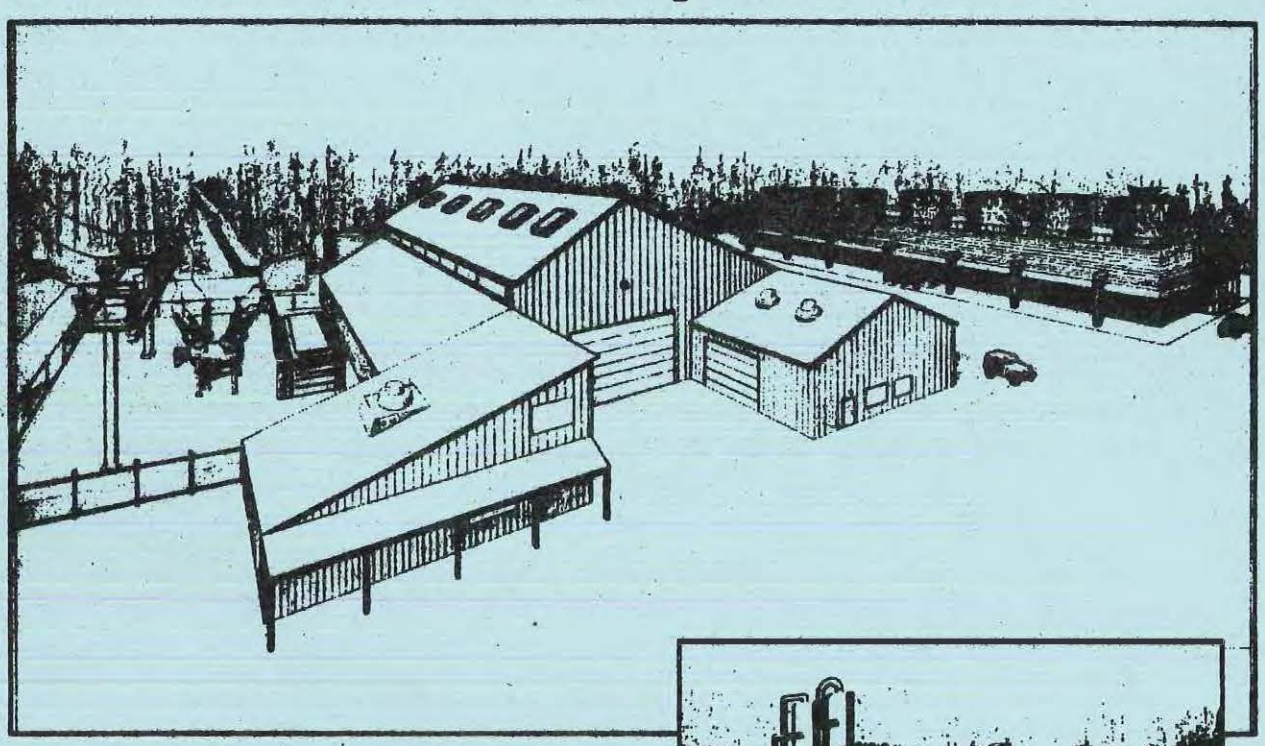
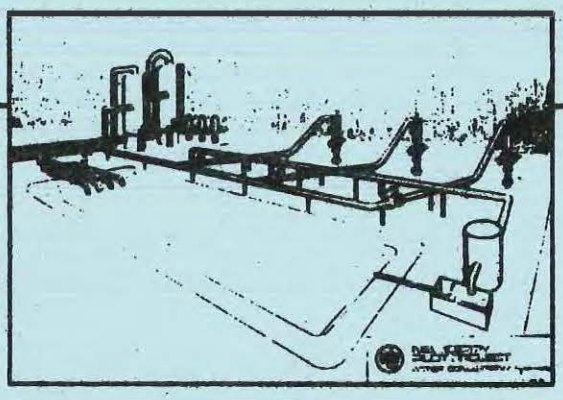
DOE/EIS - 0207
June 1994

Comment Report:
Newberry Geothermal Pilot Project
Final Environmental Impact Statement





CE Exploration Company of Portland, Oregon has submitted a proposal to build and operate a 33-megawatt geothermal power plant in the Deschutes National Forest in Central Oregon. This is the draft version of the environmental analysis of the proposed project, prepared by the U.S. Forest Service, the U.S. Bureau of Land Management, and Bonneville Power Administration.

U.S. Forest Service

Bonneville
POWER ADMINISTRATION

U.S. Bureau
of Land Management

Newberry Geothermal Pilot Project

Final Enviromental Impact Statement

Comment Report

Deschutes National Forest
Deschutes County, Oregon
June 1994

Lead Agency
USDA Forest Service

Cooperating Agencies
Bureau of Land Management, Prineville, Oregon
Bonneville Power Administration, Portland, Oregon

INTRODUCTION

As a part of the Environmental Impact Statement (EIS) public involvement process, 425 copies of the Newberry Geothermal Pilot Project Draft EIS were published and distributed by mail on January 21 - 26 to the interested public for a 45-day review and comment period. A notice of availability to review the draft EIS was published in the Federal Register on February 4, 1994. During this review period a series of four open houses were held in Sunriver, LaPine, and Bend on February 22, 23, and 24 to further acquaint people with the project and the draft EIS and to give them audience with the three agencies' representatives and the project proponents. Copies of the draft EIS and Executive Summary were available at these meetings and written comments were accepted.

The review period concluded on April 18, 1994, and a total of 55 letters were received by the U.S. Forest Service, the lead agency, in response. The letters have been analyzed and categorized by specific individual comments, of which there are 566. Summaries of specific comments are contained in this comment report along with the agencies' responses, to show the manner in which the specific comments or questions are addressed in the Final EIS or otherwise responded to, as appropriate.

The first section of the Comment Report contains comments and responses, grouped by topic. When several comments addressed the same issue they were grouped and responded to collectively.

The second section contains the comments grouped by author. Instructions on how to find the response to a particular comment are found at the beginning of the section. Copies of the original comment letters are on file at the Fort Rock Ranger District.

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02 Implementation, Permits, and Monitoring
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06 Geothermal Resources
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08 Visual Resources
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11 Recreation
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COMMENTS AND RESPONSES

The first section of the Comment Report contains comments and responses, grouped by topic. The number in brackets at the end of the comment identifies the author and the number of their comment. For example, [8.6] after the first comment below shows it was the sixth comment from commentor number eight. When several comments addressed the same issue, they were grouped and responded to collectively. The comments are grouped by author in a later section of the Comment Report.

1 Process

1.1 Comment:

Disappointed because it will be put to the vote of the people who live in the immediate area. [8.6]

Response:

Project approval is not directly subject to a vote of the people who live in the immediate area. The process for approving the project was defined by acts of Congress, including the Geothermal Steam Act and the National Environmental Policy Act (NEPA). As part of the NEPA process, the public does have opportunity to provide input to the analysis and the EIS process.

1.2 Comment:

The public meetings for the Draft EIS should have been held during the summer, when the bulk of local residents are not in Arizona. [8.7]

Response:

The "Regulations for Implementing the Procedural Provisions of The National Environmental Policy Act" require that "...appropriate environmental assessments or statements shall be commenced no later than immediately after the application is received" (section 1502.5). The timing of the public meetings was determined by the date the proposal was received by the federal agencies and the date on which the draft EIS was completed.

1.3 Comment:

Because Vulcan was advised by BLM that it could not propose wells on leases held by CEE, if Vulcan does win the lawsuit, Vulcan will expect, as the majority owner of OR 45506 to use wellsites on OR 45506 without further environmental review, for exploratory drilling. [44.11]

Response:

This DEIS is not the appropriate document or forum for the discussion or resolution of hypothetical lease ownership scenarios which may have no environmental impacts. The ownership issues may need to be addressed by BLM in the future. We are certain that a fair and workable resolution will be found to accommodate any ownership pattern, and that additional environmental review will be completed if appropriate.

1.4 Comment:

The DEIS is premature because a critical report (the USGS monitoring report) has not yet been published. This report should be the basis for constructing an EIS for this project. [50.1] The USGS was requested to collect hydrologic, water-quality

and meteorologic data to provide baseline data for the DEIS. Yet this report, due out in early 1994, is not available and apparently was not used. This DEIS is therefore premature. Also the Dames and Moore report is vital and should have been included in the DEIS. [60.14]

Response:
The USGS designed a hydrologic baseline monitoring program in 1990 and implemented it in 1991. The primary objective of the program is to collect baseline hydrologic and water quality data from primarily within the Newberry caldera. Whereas this program will produce a significant volume of useful data that will be available for incorporation into the hydrologic understanding of the area, it is intended for use as baseline data for monitoring future geothermal development primarily within the caldera. Only data (not interpretation of data) were presented in its 1994 report. Because this report does not interpret the data, it is not appropriate to use as the basis for an EIS. The USGS program and other studies related to hydrology are described in sections 3.3.1 and 3.3.2 of the EIS. The USGS data were available to the preparers of the EIS, and publication in USGS Open-File Report No. 94-122 is expected in mid-1994.

The state WRD study (mentioned in the detailed discussion accompanying the commentor's letter) will not be published until 1996 and will address the area to the north of Benham Falls, significantly north of the project area (Marshall Gannett, USGS, personal communication with Dames and Moore).

Available existing data on the geology and hydrology of the Newberry Volcano and its immediate surrounds is both extensive and comprehensive. The reference section (Section 6.0) of the EIS contains approximately 28 references that directly address either the hydrology or the geothermal potential of the Newberry area. This volume of published literature is far in excess of most other potential geothermal project sites. Newberry is one of the most intensely studied geothermal prospects in the western United States. Many of the published references were authored by USGS personnel. Whereas new data will always aid the understanding of hydrologic characterization of this area, the extent of current knowledge is believed to be adequate to assess environmental impacts in compliance with NEPA requirements.

The Dames and Moore hydrology report was used in the preparation of the EIS. It is approximately 250 pages in length, and is on file at the Fort Rock Ranger District.

1.5 Comment:
It is stated that if assumptions used in the analysis are later shown to be inaccurate, "the project or elements of the project will be re-evaluated." Need more explanation here. Who will do the re-evaluation and what authority will it have to modify operations? [54.17]

Response:
The Forest Service and BLM will do any re-evaluations. If necessary, a supplement will be written to the EIS. The supplement may require additional mitigation measures or changes in operations. The BLM and FS always retain the authority to require modification of operational approvals.

2 Implementation, Permits, and Monitoring

2.1 Comment:

An application for an Air Contaminant Discharge Permit (ACDP) will be required and final action on the application must be taken prior to construction of the facility. Table 1-1 should be corrected to reflect this. [52.1] A Water Pollution Control Facility Permit will be required prior to construction of the facility, and not "Pre-operation" as stated in Table 1-1. [52.2] Based on the information in the DEIS, a Hazardous Waste Permit will not be required for this facility. The power plant is projected to be a small quantity or a conditionally exempt generator of hazardous waste. [Table 1-1 should be corrected accordingly.] [52.3] A stormwater discharge permit (NPDES) needs to be required. [58.25]

Response:

According to OAR 340-28-1700, an ACDP must be obtained prior to construction of a major source. Table 1-1 has been corrected.

2.2 Comment:

Alternative B provides for three power plant sites. Under current [EFSC] rules and policy, the application to [EFSC] must be for a specific site. [49.10]

Response:

The application to the Oregon Energy Facility Siting Council will be for a single site.

2.3 Comment:

The areas over which DOGAMI has regulatory authority should be noted. [10.1]

Response:

The Oregon Department of Geology and Mineral Industries has regulatory authority for well drilling and certain other activities proposed for this project. Section 1.5.3 of the EIS has been revised to include this information, and acknowledgement is added to section 1.4.

2.4 Comment:

The cited Emergency Contingency Plan for accidental spills or discharges should be in place prior to drilling or transportation of hazardous materials. [38.19] The emissions control plan should be in place before the power plant becomes operational. The plan should specify how to cope with "upsets" and breakdown conditions in winter. [38.20]

Response:

The Emergency Contingency Plan for accidental spills or discharges will be in place prior to commencement of operations, as will the emissions control plan. A plan for dealing with upsets and breakdowns will be provided to both the BLM and the state permitting agencies.

2.5 Comment:

The Geothermal Resource Orders are referenced in the DEIS. Some leasing EIS written in the late 1970s and early 1980s included an appendix with them. Most reviewers would not have such documents. Orders pertinent to environmental protection may be a worthwhile appendix. [38.28]

Response:

The Geothermal Resources Operational Orders are somewhat lengthy (about 100

pages), and must be read in conjunction with regulations issued pursuant to the Geothermal Steam Act of 1970 (43CFR Ch. II, Part 3200) to prevent misinterpretation. These documents are available on request from the Bureau of Land Management.

2.6 Comment:
The discussion on page 2-65, last paragraph, appears to add the Forest Service as a permitting agency for drilling permits. While we agree that Alternative B provides CEE more latitude in well siting and alternative power plant sites, we are concerned about adding yet another step to well siting authorizations that may not have been intended by the Newberry national Volcanic Monument legislation. Adding the Forest Service as a permitting agency for each individual well permit could cause unforeseen regulatory problems for a developer and for the Forest Service. The Forest Service should have an opportunity for comment on final selected wellsites, but the approval should come from one federal agency. BLM already has an approval process in place. [44.12]

Response:
The DEIS stated that the agencies (including the USFS) would review and approve. The fact of the NNVM legislation is that the USFS "...shall regulate all surface disturbing activities conducted pursuant to any lease issued..." pursuant to the legislation. The leases in consideration in the DEIS fall under that provision. The BLM and USFS are currently drafting an Interagency Agreement to coordinate review and permitting and they do not foresee other than the BLM issuing drilling permits with USFS approval.

2.7 Comment:
We appreciate the inclusion of the Energy Facility Siting Council and its required permit in Table 1-1. [49.8]

Response:
No response required. Thank you for your comment.

2.8 Comment:
The final EIS needs to clarify how future decisions will be made regarding well pad siting, power plant siting, and the need for additional mitigation (e.g., p. 4-40 and p. 4-45 air quality). Will these decisions be supported by NEPA documentation (environmental assessment)? The final EIS should clarify whether these decisions will have a public involvement component. [59.2]

Response:
Section 1.5.2 discusses the need for further authorizations after the EIS, and sections 2.4.2.1 and 2.4.2.2 contain a rather complete discussion of site authorization and the siting approval process. This analysis provided adequate site-specific information to provide for siting of the facilities within the described study areas without further NEPA analysis, unless environmental conditions change significantly. The decision concerning well pad and power plant siting is being made in the Record of Decision accompanying the Final EIS; therefore further public involvement and NEPA documentation will not be necessary. The site-specific placement of the well pads and power plant will be handled under the Geothermal Resource Operational Orders and the individual permits required for their siting.

The need for additional mitigation will be decided on a case by case basis under an approved Monitoring Plan. The plan will specify the monitoring program to be

instituted, will determine effectiveness of mitigation, and will include benchmark levels of detection which, if they are exceeded, will require mitigation. If the mitigation measures that might be required are significantly different from those measures already discussed in the EIS, then further NEPA documentation may be required for their implementation.

3 Purpose and Need and Background

3.1 Comment:

This is not a pilot project. [4.2] This is a semi-permanent facility, not a "pilot" project. [26.7] DEIS doesn't say too much about the fact that this is a pilot project. Document should describe the BPA pilot program, make clear how much additional development is contemplated and make clear that the scope of this EIS is for 30 MW. [35.20]

Response:

The term "pilot project" describes the first power project at a previously undeveloped reservoir. Examples include the 10-MW Salton Sea Unit 1, which provided design data for the 47.5-MW Unit 3 plant (Newell, David G., Whitescarber, Olin D., and Messer, Phil H., 1989. "Salton Sea Unit 3 — 47.5 MWe Geothermal Power Plant." Geothermal Resources Council BULLETIN. May 1989. pp. 3-5), and the 10-MW Mammoth Unit 1, which was the "pilot" for Units 2 and 3. A pilot project allows the developer to begin earning income through power sales while testing the reservoir and developing design data for additional units (if feasible).

In the context of the BPA Geothermal Pilot Program, the Newberry project is a pilot in the sense that it is intended to initiate production at an undeveloped site. BPA's Geothermal Pilot Program is described in sections 1.3.1 and 1.3.3 of the EIS. A reference giving more information about the program is now cited in section 1.3.1.

The scope of the EIS is stated several times in section 1. Plans for additional development can not be made until exploration drilling and long-term reservoir testing (by operating the initial 33-MW power plant) indicate whether or not more power plants are feasible. Any further development beyond what is examined in the EIS (i.e., beyond 33 MW) will require additional environmental review.

3.2 Comment:

The need for this project is driven by energy needs resulting from our values. [1.1]

Response:

This project is needed to help meet the present and future energy needs of the Pacific Northwest. Increased electricity use is driven by economic and population growth in the region. The Northwest Power Planning Council forecasts the need for up to 2,900 megawatts of new generation and conservation resources by 1997 (Northwest Power Planning Council. 1991. "1991 Northwest Conservation and Electric Power Plan." Vol I. pp. 16 - 19). This project will help establish the extent to which geothermal can be counted on to fill this need.

3.3 Comment:
EIS should make it clear that one objective of the project is to confirm sufficient reserves to support an additional 100 MW of geothermal capacity. [23.4]

Response:
The project involves drilling sufficient wells to supply the 33-MW power plant. It also includes exploratory drilling to define an area containing a 100-MW reserve of producible high temperature geothermal resources to identify the potential extent of the underground resource (see CEE 1992a in the References). Section 1.3.1 of the EIS has been modified to make this clear.

3.4 Comment:
Using 325.7 acres to service 15,000 households is not justified. [27.3]

Response:
For the amount of electricity it produces, geothermal uses very little land compared to other energy resources. Recent analysis by the Worldwatch Institute (Christopher Flavin and Nicholas Lenssen. 1991. "Designing a Sustainable Energy System," in State of the World 1991. pp. 21-38) showed that coal and wind projects, for example, need over 8 and 3 times the land, respectively, to produce the same amount of electricity as a geothermal plant.

3.5 Comment:
Clarify the role of the Bonneville Power Administration in the distribution of electric energy. [35.11]

Response:
The following will be added to section 1.2: The Bonneville Power Administration (BPA) is one of the U.S. Department of Energy's five power marketing agencies. Congress created BPA in 1937 to market and transmit the power produced at Bonneville Dam. Today, BPA markets the power from 30 Federal dams and one non-federal nuclear plant in the Pacific Northwest, and has one of the largest transmission systems in the United States. BPA sells wholesale power to public and private utilities, as well as to some large industries. BPA also exchanges power with utilities in California and Canada.

3.6 Comment:
The proposed geothermal project is just a small component in the context of several federal actions and decisions that preceded the current proposal. To a large extent, the intent of our comments is to encourage the U.S. Forest Service to provide additional background information in order to place the proposed geothermal project in context with a variety of other actions.

It is important to recognize that Congress envisioned geothermal development in the proposed project area when it passed the Newberry National Volcanic Monument Act. That legislation was the product of an innovative public consensus process designed to balance the need for protecting the unique environment at Newberry and our need for geothermal energy resources. Section 8 of the Act affirms Congress' intent to allow geothermal development in the project area. The leases to be developed were in fact compensation leases for other leases issued at the direction of the Monument Act. [39.2]

Response:
A discussion of "How the Project Relates to the Newberry National Volcanic Monument" has been added to the EIS as section 1.6.3.

3.7 Comment:
Although briefly discussed at different points in the Draft EIS, we recommend that the Draft EIS contain a more thorough discussion of the relationship the Draft EIS has to other federal actions that have been, or will be in the future, addressed by environmental impact statements.

For example, the Draft EIS should make it clear that it is based upon determinations contained in the Bonneville Power Administration's Resource Programs Environmental Impact Statement (the "BPA Resource Programs EIS"). In the BPA Resource Programs EIS, geothermal energy was one of several resource acquisition alternatives that was evaluated.

The Draft EIS is also based upon conclusions contained in the Deschutes Forest Plan Environmental Impact Statement and related to the alternatives addressed in the draft Newberry National Volcanic Monument Comprehensive Management Plan Environmental Impact Statement. These documents are important to reference because both documents support the conclusion that the proposed geothermal project is consistent with the Deschutes Land Management Plan and the National Monument plans now under consideration.

Another federal action that should be addressed in the Draft EIS is the Eastside Resource Management Plan. [39.3]

Response:
BPA's Resource Programs Environmental Impact Statement (RPEIS) considered the environmental trade-offs among the various types of energy resources available and the environmental impacts of adding these resources to its existing power system. Resources examined included conservation, hydropower, geothermal, wind, solar, cogeneration, combustion turbines, coal, and nuclear. The analysis in the EIS showed that geothermal is a reliable source of electrical power which can help meet energy needs in the Pacific Northwest. The alternative BPA decided to pursue included the acquisition of all cost-effective conservation and efficiency improvements, supplemented by a mix of renewables (including geothermal energy) and thermal resources. The acquisition of a geothermal resource is consistent with this decision. Reference to BPA's Resources Program EIS has been added to section 1.3.3.

Consistency with the Deschutes Forest Land Resource and Management Plan is noted in section 4.21 and the plan is now cited in section 1.3.4. Consistency with the Newberry Monument Management Plan is also discussed in section 4.21.

The Eastside Management Project will provide guidelines, direction, principles, and processes for management of forest and rangeland ecosystems. It is viewed as a flexible process that accounts for changing biological, social, and economic systems. The EIS will provide strategies for maintaining healthy and functional ecosystems, particularly in terms of sensitive and rare species of plants and animals, watersheds, and riparian areas. Social and economic interactions with the ecosystems will be considered.

The Eastside EIS is currently in progress and is not intended to delay other projects currently being analyzed through NEPA processes. Coordination and communication with the Eastside EIS team has verified that the geothermal project is not in conflict with the strategies and decisions to be made in that programmatic document. This information will be added to section 4.21.

3.8 Comment:
The proposed geothermal project in the Draft EIS is not the only geothermal activity proposed in the Newberry area. For example, we understand that Vulcan Power has submitted a proposed plan of operations for some exploration wells within the approved Newberry Unit and holds leases inside and outside the unit. We believe the Draft EIS should describe in detail how other geothermal lease development will relate to the proposed geothermal project particularly in terms of the unit agreement and the ability of the geothermal projects to share some common facilities. [39.4]

Response:
It is true that Vulcan Power Company submitted a plan of operations for several wells in the area of this proposed project. Beyond public scoping meetings for an Environmental Assessment, nothing has been completed on that proposal since April of 1993 and therefore the proposal is not current. It is felt that a detailed description of potential coordination between this proposed project and any future proposed operations by another operator is beyond the scope of this EIS. However, some general observations on how the Forest Service and the BLM would handle other operations in the area are in order.

There are two main aspects of the agencies concern in the development of the geothermal resource: the environmental effects of producing and utilizing the resource and the geothermal resource itself. In the permitting of many surface disturbing operations, the BLM and Forest Service have great latitude in approving, disapproving, or modifying requested permits. There may be many instances where "rival" geothermal developers may be required to share in the use and development of surface areas such as access roads, pipeline rights-of-way, etc. The Forest Service and BLM will attempt at all times to avoid duplication of facilities and surface disturbances. The only exclusive right that the lease holder is granted by the lease is the exclusive right to "...drill for, extract, produce, remove, utilize, sell, and dispose of geothermal...resources" (Geothermal Lease Form 3200-21, Sec. 17). All other rights are nonexclusive and therefore other companies besides the lessee can be authorized to do operations on the leased lands. As importantly, Sec. 17 Reservations to Lessor on the Geothermal Resources Lease (Form 3200-21) states:

> *"Sec. 17. RESERVATIONS TO LESSOR - All rights in the leased area not granted to the Lessee by this lease are hereby reserved to the Lessor. Without limiting the generality of the foregoing such reserved rights include:...(b) Rights-of-way - The right to authorize geological and geophysical explorations on the leased lands which do not interfere with or endanger actual operations under this lease, and the right to grant such easements or rights-of-way for joint or several use upon, through or in the leased area for steam lines and other public or private purposes which do not interfere with or endanger actual operations or facilities constructed under this lease."*

When it comes to the development of the geothermal resource, since the entire geothermal resource is owned by the federal government (even though leased to different companies), the BLM will require all operators to develop the resource in such a manner as to protect its long term productivity. This is an ongoing procedure which starts when several production wells have been drilled and tested. Based on the information from these well tests, the BLM will make its own analysis of the information and decide upon the best method of properly developing the federal geothermal resources to insure proper resource production

and protection. This resource information review is ongoing throughout the project(s). An example of possible BLM-required coordination between operations could be a requirement to do joint production/injection tests to study impacts to/from adjacent wells. As in approving surface uses on a lease, the agency has great latitude in approving, disapproving, or modifying requested drilling/injection permits and production plans.

3.9 Comment:
Page 1-3, fourth paragraph. The text describes the Draft EIS as being "tiered to the Deschutes National Forest Plan." An explanation of what this means should be provided. [39.9]

Response:
"Tiering" is a way to incorporate by reference a discussion of issues that have been covered in a previous EIS. It allows an agency "to focus on the issues which are ripe for decision and exclude from consideration issues already decided or not yet ripe" (Council on Environmental Quality, 1978. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. Section 1508.28). Tiering is now defined in section 1.2 of the EIS.

3.10 Comment:
Page 1-12, fourth paragraph. In Section 1.3.3, a citation should be added to the statement that "BPA has determined that geothermal power is a renewable, alternative source of electrical power that could help meet future energy needs in the Pacific Northwest." [39.10]

Response:
A 1985 BPA study (Bloomquist, R.G., and others, 1985. "Evaluation and Ranking of Geothermal Resources for Electrical Generation or Electrical Offset in Idaho, Montana, Oregon and Washington." 3 Vol., BPA Document No. DOE/BP-13609) identified 20 sites in the Pacific Northwest (including Newberry Volcano) with the potential for producing cost-effective electricity. These sites have a total minimum potential of at least 1000 MW of electrical generation. Geothermal's potential for meeting a significant portion of Northwest and U.S. energy needs is noted in numerous documents, including the Northwest Power Planning Council's 1986 and 1991 Power Plans and the National Energy Strategy.

A citation will be added to the EIS as requested.

3.11 Comment:
Page 1-13, second paragraph. Citations should be provided for the statements concerning past federal actions that have recognized geothermal potential. [39.11]

Response:
Citations will be added to the actions referred to in section 1.3.4.

3.12 Comment:
Page 1-13, fourth paragraph. The signed BPA Memorandum of Understanding with CEE and EWEB should be included as an appendix to the Draft EIS without the confidential attachments. This would allow an interested party to better understand the relationship between the parties and the proposed geothermal project. [39.12]

Response:
The Memorandum of Understanding has been added as an appendix to the EIS.

3.13 Comment:
Page 1-14, first paragraph. The Hazardous Solid Waste Amendments is not a proper term for a statute. This reference may be to the Solid Waste Disposal Act ("SWDA") as amended. In 1976, Congress significantly amended the SWDA with the Resource Conservation and Recovery Act and again in 1984 with the Hazardous and Solid Waste Amendments. [39.13]

Response:
The reference is to the Solid Waste Disposal Act, as amended. The text has been corrected accordingly.

3.14 Comment:
Page 1-14, first paragraph. The list of federal acts should include the Geothermal Steam Act of 1970 as amended because the Act includes environmental compliance and bonding provisions. In addition, the Water Resources and Department of Geology and Mineral Industries should be referenced under Oregon Revised Statutes. [39.14]

Response:
Section 1.4 in the EIS has been revised to include reference to the Geothermal Steam Act of 1970. The Oregon Departments of Water Resources and Geology and Mineral Industries are also acknowledged.

3.15 Comment:
Page 1-17, Table 1-1. Table 1-1 refers to a "contaminant discharge permit" and a "hazardous waste permit" to be issued by DEQ. These are not correct terms for permits issued by DEQ. Depending on the operational design, the proposed geothermal project may have to obtain a National Pollutant Discharge Elimination System storm water permit and a hazardous waste identification number, both issued by DEQ, in addition to the permits listed in the chart. A footnote should be added that some of the permits listed in the table may not be necessary depending upon final operation design. [39.15]

Response:
Table 1-1 has been corrected and clarified.

3.16 Comment:
Page 1-22, fifth paragraph. The final sentence refers to "other issues" which were not included within the scope of the EIS. CEE recommends that some examples of these "other issues" be provided so that an informed judgment can be made by a reviewer about whether such issues were properly excluded. [39.16]

Response:
An example of an "other issue" is impacts from the pipeline corridor crossing Paulina Creek. This issue is outside the scope of the EIS because no crossing of Paulina Creek is proposed. Another example is the suggestion that EWEB install wind turbines in lieu of constructing this geothermal project. Installing wind turbines would not meet the purpose of demonstrating whether geothermal energy can be developed at Newberry Volcano. These examples will be added to section 1.6.2. Issues that were outside the scope of the EIS are identified in the Scoping Report.

4 Geology

4.1 Comment:

The possibility of induced seismic activity was not discussed sufficiently. The DEIS incorrectly concluded that geothermal fluid induced earthquakes are weak. A 1992 quake in The Geysers that was widely felt for many miles was attributed to fluid/steam withdrawal/injection at a PGE geothermal plant in The Geysers. [36.26] The information regarding the potential for increased seismic activity due to geothermal production is misleading. There are several published articles which discuss induced seismicity and the magnitudes of the resulting events due to fluid withdrawal/injection. [40.12]

Response:

Injection or withdrawal of fluids has induced earthquakes in several places. In most cases, the fluids were injected under high pressures, and the areas were subject to natural earthquakes. That is, the rocks were already under high stress. In these circumstances, the high pressures forced apart fractures and facilitated the stress release through earthquakes. The high stress conditions do not prevail in the area at Newberry Volcano, which has few recorded earthquakes, and the proposed project will inject fluids under low pressure (less than 200 psi). The most this type of injection is likely to produce is "microearthquakes."

The injection and withdrawal of fluids have been documented to cause "microearthquakes" in hydrothermal areas. Microearthquakes have magnitudes less than 1, which is equivalent to the energy release of a small stick of dynamite and can not be detected except with sensitive seismographs. They are related to movement of water and steam through open fractures and are mapped by the geothermal operators to better analyze the flow of fluids within the system.

4.2 Comment:

Page 4-5, Section 4.2.3.2, Volcanic and Geothermal Activity. This section states that the potential to induce volcanic activity by geothermal drilling and development is "not clearly understood." This is a somewhat misleading statement. The possibility of inducing volcanic activity by the drilling and production of geothermal fluids and steam is extremely remote. The movement of magma is controlled by tectonic forces (i.e., the movement of the earth's crustal plates) and lithostatic pressures (i.e., lithostatic pressures being the pressures exerted by the weight of the rock column above the magma chamber). In comparison with these forces, potential changes in hydrostatic pressures (the pressures exerted by fluids in the geothermal reservoir) would have a negligible impact. There is no known instance of geothermal development anywhere in the world ever causing an eruption of lava. Therefore it is not expected that geothermal drilling and production would cause such an eruption at Newberry. The known hydrothermal eruptions related to geothermal development have occurred at sites where near surface hydrothermal vents are present and steam eruptions have occurred at the surface. These steam or hydrothermal eruptions are not volcanic eruptions. The absence of any surface hydrothermal features or highly altered ground in the project area combined with the core holes drilled in the area indicate that the geothermal reservoir is located several thousand feet below the surface. The probability of a hydrothermal eruption occurring is very remote because the hydrothermal pressures would have to overcome the lithostatic pressures of several thousand feet of rock. [39.44]

Response:

Section 4.2.3.2 in the EIS has been revised.

4.3 Comment:
The drilling we presume will require drilling without loss of circulation. Since loss of circulation can occur when drilling reaches voids, what is the likelihood of encountering voids such as lava tubes from ancient flows? What has been the experience of encountering tubes, caves, and other voids in prior wells drilled on the volcano? [38.30]

Response:
The commentor's presumption is incorrect. There will at times be drilling without circulation. Nearly all drilling in volcanic provinces encounters voids of some type, generally interflow zones of high porosity and permeability which will necessitate some drilling without circulation. This is unavoidable and has not created a problem in past drilling at Newberry Volcano.

4.4 Comment:
Why does the DEIS conclude that soils in the area are not susceptible to liquifaction if seismic activity could increase as a result of geothermal exploration and development? [40.7]

Response:
Liquefaction results from the vibration of thick, water-saturated, unconsolidated, fine-grained soils. The soil inventory of the Deschutes National Forest indicates that most of the soils around the crater are excessively well-drained sandy loams and loamy sands. These materials would not be highly susceptible to liquefaction. Moreover, geothermal exploration and development are not likely to increase seismicity beyond the microearthquake level, as described above in the response to comment 36.26.

4.5 Comment:
Page 3-12, first paragraph. Section 3.2.3.4 states that "[s]ubsidence is covered in the environmental baseline requirements of the GRO Orders." We recommend that additional information concerning how subsidence is covered be provided. A description of the GRO should be provided. [39.32]

Response:
As discussed in section 4.2.3.5 of the EIS, a set of benchmarks would be established in the project area and periodically resurveyed to determine elevation changes. If the resurveys detected elevation changes attributable to subsidence, mitigation could be initiated. Subsidence is not anticipated because of the great depth of the geothermal reservoir and the injection of spent fluids. Subsidence monitoring is part of the environmental baseline monitoring requirements of GRO Order No. 4. These requirements are discussed in section 4.1.1 of the EIS.

4.6 Comment:
Page 4-6, Section 4.2.3.5, Subsidence. The first sentence states that land subsidence has occurred in "many areas." We suggest that this be changed to "some areas." The last sentence of this section states that "mitigation measures would be imposed." This sentence should read "mitigation measures could be imposed." [39.45]

Response:
The suggested revisions appear appropriate and will be adopted.

4.7 Comment:
Impacts of an earthquake on the project are not considered. [9.6] How resistant will the plant and wells be to earthquakes. [29.3]

Response:
This concern is covered in the EIS. As noted in section 3.2.3.1, the project area lies in Seismic Zone 2B, and facilities will be designed to meet or exceed Uniform Building Code design methods for that zone.

Wells are seldom affected by earthquakes unless they cross a reactivated fault, in which case they may be ruptured. As noted in section 3.2.3.1, the last known faulting occurred 6,700 years ago.

4.8 Comment:
DEIS states that 2-1 slopes will be allowed. These slopes are too steep and will unnecessarily increase erosion. Slopes of at least 3-1 should be mandated. [36.40]

Response:
This concern is addressed in the EIS. As noted in section 2.4.1.7, cut and fill slopes would be engineered and terraced according to height and compacted and maintained to minimize erosion and provide slope stability. Geotechnical studies would be performed prior to plant construction to ensure site stability. The EIS refers in section 2.4.1.3 to 2:1 slopes for the plant site and for water storage pond and well pad sump embankments.

4.9 Comment:
If the project has heated pipes in wintertime, there will be runoff of melted snow, and resulting erosion that was not discussed in the DEIS. [36.41]

Response:
This concern is addressed in the DEIS. The commentor refers to page 2-49, wherein the paragraphs entitled Winter Provisions indicate that all piping with the potential to freeze (such as sight-level gages, etc.) would be bound with heated wires to prevent freezing. These pipes are located within the well pads and plant site, and any runoff would be accommodated by the stormwater drainage system. As noted in the paragraph entitled Pipelines in section 2.4.1.3, the production (steam supply) pipelines would include insulation to maintain temperature. Section 4.3.3.2 states that due to the highly permeable soils in the project area, runoff occurs only during heavy rainfall or periods of unusually rapid snow melt.

4.10 Comment:
Pages 3-10, bottom, 3-11 top. The discussion of soil compaction on pages 3-10 and 3-11 should just describe the existing soil conditions. This paragraph, however, includes a discussion of the impacts of the proposed action. This discussion of impacts belongs in Chapter 4, not in Chapter 3. [39.31] The discussion of compaction in section 3.2.2 is confusing and seemingly contradictory. [40.4]

Response:
Because soil compaction is a potential impact of the project, discussion of this issue has been moved to section 4.2.3.4. This should help to clarify the concern.

4.11 Comment:
Page 3-12, third paragraph. Section 3.2.3.6 describes the potential frost action. It is unclear, however, what frost action has to do with the proposed action. If frost

action is relevant, there should be a discussion as to why. There should also be a discussion in Chapter 4 concerning the impacts if there are any. [39.33]

Response:
Frost action is limited to the upper few inches of bare soil and accelerates soil creep in these areas(Source: Larry Chitwood, Geologist, Deschutes National Forest. Personal communication with AGI). It presents no structural problems for buildings or sumps. The EIS will be revised to reflect this.

4.12 Comment:
The planning, design, and construction of engineering projects on extrusive igneous rocks — and especially pyroclastic debris — can be complicated and risky. The EIS fails to assess the risk of siting geothermal plants on such terrain and does not discuss whether such soils will have lower strengths and stability when they are remolded after disturbance. [40.1]

Response:
This concern is adequately addressed in the EIS. The risk of siting in a volcanic terrain are the topics of sections 3.2 and 4.2, wherein the volcanic, seismic, landslide, and soil conditions are described and mitigation proposed. Section 3.2.2 has a general description of the local soils. The soils in the project area are described as coarse-grained and less than 4 feet thick overlying basaltic bedrock. They are likely to present few problems to construction.

4.13 Comment:
The Soils section is incomplete. General statements are made about the nature of the soils in the area, but data to support those conclusions are absent. A diagram representing a soil profile for the area should be included to aid reviewers, along with a chart which includes data necessary for describing that profile. The following properties of the soils to be impacted should be described: depth of each soil horizon, color of mottles, consistence of soil particles, texture, structure, clay films, pH, distribution of carbonates, cementation, horizon boundaries, per cent volume of various soil features, etc. Additionally, engineering properties of these soils should be evaluated; strength, sensitivity, compressibility, erodibility, permeability, corrosion, shrink-swell potential and ease of excavation. [40.2] The DEIS needs to consider and include information on soil sensitivity ratings within the proposed development area. Sensitivity to construction, compaction, erosion, etc. is important to siting decisions in order to minimize soil damage, where possible. A map of these ratings should be shown in the document. [54.3]

Response:
The description of soils in section 3.2.2 is general, and more detailed descriptions of individual soil mapping units are available. Some of the requested information is not available, because forest soil surveys are less detailed than those for agricultural soils, due to the low intensity land use and difficulty of access within the forest.

The soils in the Deschutes National Forest are described in a 1976 report entitled "Soil Resource Inventory Deschutes National Forest." Its basic mapping unit is the land type which "...is a definable land system with respect to the soil, vegetation, geology, topography, climate, and drainage situation." The soil descriptions include texture, structure, consistency, pH, and thickness of surface and subsurface layers and are interpreted for, among others, their suitability for road fill, road construction, cutbank erosion potential, cutback sloughing and unraveling, cutbank stability, and fill potential for failure and erosion.

The EIS has been revised to include a new appendix (Appendix K) describing soils for the most common land types within the project area (4A, 7F, 73, and LZ).

4.14 Comment:
The DEIS states that erosion potential is considered to be low to moderate, but that erosion and dustiness are common on unsurfaced roads. The project area will disturb many acres of land. How can you conclude that erosion potential will be low, when you admit there is already an erosion problem? [40.3]

Response:
Section 3.2.2 in the EIS states that dustiness and erosion from wind are common along unsurfaced roads, not for the project area in general. The roads in the project area will be surfaced with cinder or hard rock as needed and, during intervals of high use, will be subject to dust abatement measures. The soils in the project area have a low to moderate soil erosion potential because of their high permeability and low slopes, which inhibit surface runoff.

4.15 Comment:
If the soils are compactable and water is applied, will hydrocompaction and subsidence occur? [40.5]

Response:
Hydrocompaction should not be a problem, because the soils within the project area have a low susceptibility to compaction, as described in section 3.2.3. Ponds will be lined to inhibit seepage, and water applications to gravel-surfaced roads for dust abatement will be insufficient to saturate the underlying soils.

4.16 Comment:
Is bentonite, an unstable, expansive clay, present on the site? [40.6]

Response:
Bentonite is a clay formed by the weathering of volcanic ash in a marine environment. It is not known to occur within the project area.

4.17 Comment:
What is the probability that a mini-lahar (volcanic mudflow) could occur if a 100-year storm event were to occur during surface disturbing activities? [40.8]

Response:
The likelihood of a project-induced lahar is negligible. The concern is based on the description of events on the crater of Mt. Baker. The conditions in the project area differ significantly from those on Mt. Baker.

Mudflows in the project area are unlikely for three reasons: (1) the soils are unlikely to become saturated, because they are coarse-grained and excessively well drained, (2) the areas disturbed by construction are likely to have low slopes which should inhibit failure, and (3) construction should disturb relatively small areas and thus provide a small source for any mudflow should it develop.

4.18 Comment:
The DEIS does a poor job of explaining landslide potential. [40.9]

Response:
This concern is adequately addressed in the EIS. Section 3.2.3.5 indicates that

landslide potential is slight. The slopes within the project area are generally less than 20 percent and are well drained.

4.19 Comment:
There is scant information in the DEIS regarding the possible underground route of reinjected fluids. If water comes into contact with magma, a phreatic explosion can occur. Discuss the probability and consequences of a phreatic explosion. Include information about the possibility that injection wells will pierce the magma chamber. Since the fate of injected fluids is unknown, what assurances can you provide that injected water will not leak into the magma chamber? [40.10]

Response:
These issues are addressed in the EIS, but not all in one place. The possibility of a phreatic explosion is considered to be low. Phreatic explosions can occur in shallow geothermal systems. In these systems, which are only a few hundred feet deep, the weight of overlying rock is low and unable to contain the generated steam. In the proposed project, the spent thermal fluids will be injected under low (less than 1400 kilopascals [200 psi]) pressure at depths between 1800 to 2700 meters (6,000 to 9,000 feet), as described in section 4.3.3.4. At this depth, the weight of overlying rock will suppress any phreatic explosion.

The injected water is unlikely to contact magma. As indicated in section 3.4.3.1, the magma chamber is located at depths greater than 3.3 kilometers (2 miles), approximately 3000 meters (10,000 feet). The proposed injection zone, at depths between 1800 to 2700 meters (6,000 to 9,000 feet), is considerably above the top of the magma chamber. Moreover, under low-pressure injection conditions, the outward flow of injected fluids is limited to open fractures, which are likely to be existing avenues of deep geothermal fluid movement.

4.20 Comment:
It would be useful if the DEIS described the maximum credible seismic event for the site area and the ground response during such an event at each of the three proposed power plant sites. The choice of the site and the design of the power plant should consider this information. [49.11]

Response:
This information is not available. However, it can be estimated from other data. The 500-year earthquake for central Oregon has a magnitude of 6.8, which produces a nominal fraction of horizontal acceleration of gravity at 0.25. The Oregon Department of Transportation has a statewide map showing the distribution of bedrock acceleration coefficient. For the Newberry area, the coefficient is 0.14-g. The three proposed plant sites have similar geologic/soil conditions. They are located in either land type units 73 or 7S of the Deschutes National Forest Soil Resource Inventory. In both land types, hard and competent basaltic or andesitic bedrock is encountered at depths between 61 and 127 centimeters (24 and 50 inches), which should provide a firm foundation for plant facilities. Site 3, the northeastern site, is located closer to the Northwest Rift Zone near some fissures and may have a greater probability of being located near a capable fault.

As is noted in section 2.4.1.7 of the EIS, facilities would be designed to meet or exceed Uniform Building Code standards for seismic design.

4.21 Comment:
Section 3.5.2.4: Rather than make the judgement that "neither Hg nor Rn-222 solid gas values were very high," please let the reader make the judgement. Give a range of soil gas values for different soil types, and give the values detected in the project area. [54.41]

Response:
Mercury (Hg) in the soils around Newberry Crater has a background median value of 75 parts per billion (ppb) with a range of 21 to 1293 ppb. These values are anomalously high when compared to other geothermal areas, such as Yellowstone National Park, where median or background levels are around 20 ppb. However, these values are low when compared to the 500 ppb background levels for soils in the western United States.

The mean value of 501 radon-222 measurements in Newberry Crater is 50.8 picocurries per liter (pCi/l) of soil gas. The worldwide average for radon in soil gas is 80.2 pCi/l.

Section 3.5.2.4 of the EIS has been revised to include these data.

5 Water Resources

5.1 Comment:
Issues on water rights should be resolved before any activities commence. [4.9]

Response:
An application for a groundwater right has been filed with the Oregon Department of Water Resources, as noted in section 4.3.3.4. Any water right issued will be conditioned to avoid infringement on existing senior rights. It would not be necessary to discontinue the EIS and exploration activities that may yield additional hydrology information while the application is being considered.

5.2 Comment:
Statement comparing water use to what is consumed by one golf course is inaccurate and misleading. [25.4] Suggests the estimated annual water consumption of the plant be compared to annual consumption at a typical golf course. [35.12]

Response:
The only reference in the EIS to golf courses is in section 3.3.6, wherein it is noted that they are current users of groundwater. No comparison is made in the EIS between the quantity of water to be used by the proposed project and that used by a golf course.

5.3 Comment:
Concerned about large amounts of water to be used for production. Each well requires from 9,000 to 40,000 gallons of water per day, to be trucked in if necessary. How cost effective is this? And does CEE or anyone have the right to own this large amount of water? [27.6]

Response:
As described in section 2.4.1.2 of the EIS, from 34,000 to 151,000 liters (9,000 to 40,000 gallons) of water per day could be used during drilling of the exploration wells. These are the maximum estimated amounts required for deep wells and for wells in highly fractured rock, and not the estimated needs for the more common

well (11,000 to 19,000 liters [3,000 to 5,000 gallons] per day). The quantity of water to be used on this one-time activity is approximately 87,600 cubic meters (71 acre-feet) (28 exploration wells at 60 days/well at 34,000 liters (9,000 gallons) per day). This quantity is equivalent to pumping one of the proposed water wells in the City of Bend (see section 3.3.6) for 23 days.

An application for a groundwater right has been filed with the Oregon Department of Water Resources, as noted in section 4.3.3.4. Any water right issued will be conditioned to avoid infringement on existing senior rights. The cost of obtaining this water is considered a normal cost of well drilling and will be negligible compared to the overall cost of this project.

5.4 Comment:
On page 3-21, the last paragraph makes two seemingly contradictory statements: (a) that most of the precipitation in the caldera infiltrates into the ground, and (b) that loss of water by evaporation and flow out of Paulina Creek is estimated at 80% of total precipitation. [29.6]

Response:
The comment refers to section 3.3.4.1. Most of the annual precipitation into the Newberry Crater infiltrates the ground. Once in the ground, the water may transpire from plants, evaporate from the soil, or flow as shallow groundwater to the lakes, from which it may have evaporated or discharged through Paulina Creek. These losses account for 80 percent of the precipitation which falls into the crater. The remaining 20 percent of the water that infiltrates the ground is available to recharge the groundwater reservoir.

5.5 Comment:
Are Water Resources Department (WRD) water rights/permits required for the project's water impoundments? How will this issue be reconciled with the information on p. 3-25 that all water rights are appropriated, according to the WRD? [36.48]

Response:
The proposed surface impoundment is for the temporary storage of miscellaneous equipment drainage water, stormwater, and cooling tower water, as described in section 2.4.1.3 of the EIS. It is not a surface water impoundment in the sense of a reservoir, will not affect existing water rights, and will not require a water right. The statement that all water rights are appropriated (it is actually on p. 3-24 of the DEIS) refers to consumptive uses of surface water. All rights to water from Paulina Creek are currently appropriated.

5.6 Comment:
How much groundwater will be withdrawn? What water rights/permits will the operation have to withdraw water from the shallow aquifer? What are potential effects to others who have water rights down-gradient (to the west)? [54.13]

Response:
These issues are addressed in section 4.3.3.4 of the EIS.

5.7 Comment:
It would be useful if the DEIS explained why the project is requesting 2500 acre-feet of groundwater per year when net evaporative water loss is estimated to be 800 acre-feet per year. [49.14] There are discrepancies in the water budget proposed for the geothermal project. [50.3]

Response:
Shallow groundwater generally will be used to provide water for general project needs, such as fire protection, drilling, and dust control. In filing for the rights, CEE assumed a worst case scenario, that is, one which requires the maximum quantity of water. This would occur when shallow groundwater would be used to replace fluid losses to the reservoir. However, it is not anticipated that this total volume would ever be consumed by the project.

The DEIS incorrectly stated evaporative losses in the cooling tower to be 800 acre-feet. The correct quantity is 1.9 million cubic meters (1,581 acre-feet). The water budget in section 4.3.3.4 has been revised accordingly.

5.8 Comment:
The amount of water being used necessitates mitigation. [58.19] Groundwater concerns stem from the withdrawal of 3.08 million cubic feet (2,500 acre feet) of water from the shallow aquifer. This is a small portion of the Deschutes Basin recharge, yet in addition to the many other withdrawals it becomes cumulatively significant. It is close to 20% of the annual flow of Paulina Creek. Additional mitigation is required. [58.24]

Response:
As noted in section 2.4.1.2, a water right application has been filed. The Oregon Department of Water Resources will assess the potential impacts of the proposed withdrawal on senior right holders and surface waters and so condition the permit. Mitigation may be one of the conditions. No surface water withdrawals are proposed.

5.9 Comment:
A simple pay off to residents for polluted water is not acceptable. [26.12] Statement regarding compensation to be provided in the event of groundwater contamination is inadequate. More explicit and firmer measures should be specified. [30.5] More concrete statements are needed regarding compensation if groundwater becomes contaminated. Reference to page 4-15. [35.13] Page 4-15, Section 4.3.6. Some additional explanation is needed about providing private land owners with replacement drinking water supplies. Replacement water supplies is probably a more appropriate description than "compensation of some form." Given the distance between private land owner wells and the geothermal development activities, it is extremely unlikely that well replacement would be needed. [39.48] Compensating individuals/parties once their groundwater is contaminated is farcical. Not allowing contamination to occur is the only reasonable option. [58.22]

Response:
The reference to compensating residents occurs in section 4.3.6. This section also refers to potential contamination of surface waters by mercury deposition. More recent modeling of the effects of mercury deposition in the caldera lakes indicates that the potential for contamination is low. Groundwater is unlikely to become contaminated because all thermal fluids will be injected in the deep hydrothermal reservoir, and non-toxic materials will be used whenever possible.

Section 4.3.6 has been revised to be more specific about the type of compensation envisioned.

5.10 Comment:
How can we be assured contaminants from drilling sludge will not leach into the shallow groundwater aquifers. [26.5] Will the accidents contaminate the groundwater aquifers. [26.11]

Response:
This concern is addressed in the EIS. As described in Table 4.14-1, only non-toxic materials will be used during drilling. Moreover, as described in section 4.3.3.1, drilling fluids would be stored in a clay-lined sump and injected into the deep hydrothermal reservoir.

5.11 Comment:
Questions ability of well casing and cement to remain intact and protect groundwater. [27.4]

Response:
This concern is addressed in the EIS. As described in section 2.4.1.2, all drilling and completion operations would be in compliance with the Geothermal Resources Operational (GRO) Orders, as well as stipulations of federal and state permits, and would be subject to the approval of the BLM to insure that the GRO Orders and adequate safety margins are adhered to. These regulations are the result of many years of experience drilling thousands of oil, gas, and geothermal wells. In addition, continued monitoring of the groundwater in the project area will help to verify the effectiveness of the casing program.

5.12 Comment:
What would be the impact on groundwater if an earthquake ruptured a well pipe. [29.4]

Response:
Rupture of casing during an earthquake is unlikely, because the area has very low seismicity. Rupture will only occur if the casing crosses a reactivated fault. Should it occur, the potential effects on groundwater will depend on the depth of rupture. The proposed production/injection wells have completion depths between 1800 and 2700 meters (6,000 and 9,000 feet), whereas the bottom of the shallow groundwater system probably lies at a depth between 270 and 760 meters (900 and 2,500 feet). Thus, most of the well length will be below the surface aquifers. Little or no effects would result from a rupture below the shallow aquifer.

The impact of a rupture within the aquifer would depend on many factors, including (1) the type of rupture and extent of casing offset, (2) the type of well (injection wells would be turned off), (3) the permeability of the geologic materials at the point of rupture, and (4) pressure differences. The ruptured well would be sealed by new casing across the rupture or by sealing the well with cement, thus limiting the amount of fluids escaping to the adjacent rocks.

5.13 Comment:
The DEIS fails to discuss in detail the probable impacts from accidental releases of brine and return fluid, from sump overflows, and fluid dumping and pipeline ruptures. Several toxins present in the fluids, such as boron, arsenic, and bicarbonate, and sediment, would harm plant life. [36.29] The underlying soils are

highly permeable and groundwater underlies the project location. Any spills or discharges could contaminate this aquifer. [36.38]

Response:
This concern is addressed in section 4.3.3 of the EIS. Geothermal fluids will only be present in pipelines and sumps. Sumps will temporarily contain geothermal fluids for only one to three days during testing and during emergency releases accompanying shutdown. Sumps are very large (up to 3,785,000 liters [1,000,000 gallons] capacity) compared to well flow (about 190,000 liters [50,000 gallons] per hour), and will take several hours to fill. In an emergency, a well can be shut off in a matter of minutes.

Should a sump overflow, the water would flow onto the ground, but is unlikely to flow very far because of the gentle slope of the terrain, the numerous undulations which would encourage slow spread of a spilled fluid, and the highly permeable soils. Thus, the likelihood of impact to vegetation from sump overflow is small.

Pipelines are made of 9.5-mm (0.375-in) thick steel, and will carry low pressure (less than 1400 kilopascals [200 pounds per square inch]) steam and fluid. This pressure is not great enough to split the pipe if punctured. A pipeline leak would result in a pressure drop that would alert the operators, who would then patch the hole. Any resulting fluid discharge would be of short duration and have temporary, localized impacts.

5.14 Comment:
Some geothermal drilling muds contain potentially toxic materials, such as sodium chromate. During well drilling, large amounts of drilling muds are lost into underground formations, potentially polluting groundwater. Dewatering of muds is a widely used method of reducing the volume of this type of waste, and this mitigation of dewatering drilling muds should be mandated for this project. [36.30]

Response:
As noted in Table 4.14.1 in the EIS, non-toxic materials will be used during drilling to minimize the potential for harmful impacts to the aquifer.

5.15 Comment:
We support casing production and injection wells to 2000 foot depth. In addition, the requirement should extend to be below groundwater in case some groundwater strata are below a 2000 foot depth. The casing requirement should be tied to depth, not length of pipe, since some of the wells may be slant drilled. If groundwater should show contaminants from the project, the project must be halted until the problem can be solved. [38.17] If contamination of groundwater or surface water becomes evident the operation needs to shut down. Only after corrective measures have been put in place, assuring no further contamination, should the operation restart. [58.21]

Response:
This comment refers to water resources mitigation described in section 2.4.1.7 of the EIS, which indicates that wells will be cased to "at least 610 meters (2,000 feet) to avoid impacts on groundwater." This statement indicates that casing will extend through the shallow aquifer to depths greater than 610 meters (2,000 feet), should it be necessary. In other words, the casing requirement will be tied to the depth necessary to extend through the shallow aquifer, not length of pipe.

If groundwater contamination attributable to the proposed project is detected, all appropriate responses, including shutting down the project, would be assessed and the one most suited to the circumstances would be selected.

5.16 Comment:
A reference is cited to support the assertion that it is not possible to predict where injected fluids go, so how is it possible to assess the safety of water resources in the area? Will tracer studies be completed to establish the fate of injected fluids? [40.13]

Response:
The comment refers to the movement of fluids injected into the deep hydrothermal system. This system probably has little to no connection with shallow groundwater systems. Section 3.4.4.1 describes the geologic conditions that isolate the shallow and deep groundwater systems, and section 4.4.3.2 describes the well construction features that would preclude contamination. Given the low rate of groundwater flow, tracer studies would not be appropriate.

5.17 Comment:
Of particular concern to us is the scarce water resource in this near-desert land. The sanctity of the groundwater store in the Newberry area is most important. We need ongoing assurance there will be no transfer of thermal fluid into the groundwater reservoir and that the water features within the caldera are not being adversely affected. [53.2]

Response:
This concern is addressed in section 4.4.3.1 in the EIS.

5.18 Comment:
There should be no possibility for contamination of Paulina Creek via overland flow of toxic materials. If necessary, locate pad K-28 further away from the creek. [58.23]

Response:
Non-toxic materials will be used wherever possible, and facilities will be placed on impervious pads to further reduce the potential for contamination. Pad K-28 is over 0.8 kilometers (0.5 miles) from Paulina Creek and topography would direct flow down hill rather than toward the creek, so direct overland flow from the pad to Paulina Creek is unlikely.

5.19 Comment:
Address how septic tank contamination of groundwater and contamination from the proposed plant will be distinguished. [This comment was recorded at a public meeting attended by the agencies. The comment is believed to address the issue of how contamination caused by thermal fluid from the geothermal project would be distinguished from septic tank contamination from other sources such as a well-owner's neighbors.] [35.14]

Response:
The identification of groundwater contamination from the septic leach field could be based on a shallow drilling program that would determine the shape and extent of the contaminant plume, which should include the source of contamination. Also, septage has a chemical signature based on ratios of anions and cations, which can be used to distinguish it from geothermal fluid. As noted in

the response to comment 36.46 below, impacts from the project's sanitary waste will be limited to the immediate vicinity of the power plant.

5.20 Comment:
The DEIS lacks a description of the septic system's effects of wastes infiltrating groundwater, and the system's possible volume of wastes. What is the expected amount of wastes discharged monthly and annually to the septic field? If these site soils are highly permeable, won't the septic field contaminate groundwater? [36.46]

Response:
The proposed septic field would be designed in accordance with state requirements for the site's characteristics. The type of sanitary wastes entering the field would differ little from those derived from a residence, except in quantity. The average quantity of sanitary waste from an industrial site is 160 liters (42.24 gallons) per person per day, which is 5,780 liters (1,521 gallons) for a 3-shift day, and 173,000 liters (45,600 gallons) for a 30-day month. This number increases to 191,000 liters (50,200 gallons) per month if visitors contribute another 10 percent. During the course of a year, the total becomes about 2,320,000 liters (611,000 gallons).

All septic fields locally affect the shallow groundwater. The effluent would move from the leach field through the soils into the shallow aquifer, where it would be mixed with the shallow oxygenated groundwater. During this movement, the bacterial and viral components would be oxidized and destroyed. The inorganic components, such as nitrates and phosphates, would become diluted. This latter impact is likely to be negligible, because neither drinking water wells nor surface waters occur nearby.

5.21 Comment:
The project may contaminate surface water and Paulina Creek. [4.7] It will cause water pollution. [8.3] Hazardous material will go into the water. [9.3] The statement that the project will have "no impacts to rivers or fish habitat" cannot be proven and is likely false. [54.19]

Response:
These concerns are addressed in section 4.3.3 of the EIS.

5.22 Comment:
DEQ is concerned about introduction of contaminants to injection fluids. For example, wastewater streams are not presently well identified, and contaminants introduced to stormwater or other wastewater streams should not be combined and injected. A preferable option would be segregation of wastewaters based upon engineering controls. The Plan of Injection (pre-construction) should reflect adequate consideration to prevent the degradation of "natural water quality" as defined by OAR 340-40-010. Before reinjecting fluids which contain contaminants-of-concern, a quantitative analysis of the fluids should be completed where design and/or engineering controls are not feasible, and DEQ approval should be gained based upon this evaluation. [52.14]

Response:
The injection of any wastewater requires permitting by Oregon DEQ and must consider the potential for degrading natural groundwater quality, which is not allowed in OAR 340. Geothermal fluids are usually not considered wastewater and may be injected. Condensates of these fluids are also not considered

wastewaters in many states and may be injected.

Sections 2.4.1.4, 2.4.1.7, and 4.3.3 of the EIS will be revised to reflect these comments.

5.23 Comment:
DEQ recommends that the Emergency Contingency Plan be submitted to DEQ for review. [52.15]

Response:
The Emergency Contingency Plan will be submitted to DEQ for review. Section 2.4.1.7 of the EIS will be revised accordingly.

5.24 Comment:
A Water Pollution Control Facilities or National Pollutant Discharge Elimination System permit will be required during the exploration phase if mud slurry or other wastewater is to be transported or disposed of off site. The on-site storage and disposal of mud slurry and other wastewater must comply with the Department's rules for degradation of natural surface and groundwater quality for all phases of the project. [52.16]

Response:
Section 2.4.1.2 of the EIS will be revised to reflect these comments.

5.25 Comment:
A National Pollutant Discharge Elimination System (NPDES) storm water permit is required for construction activities including clearing, grading, and excavation activities. The NPDES storm water permit for construction activities requires a DEQ approved erosion control plan prior to beginning any on-site activities. A NPDES storm water permit is required when operating a steam electric generating facility. [52.17]

Response:
Section 4.3.3.2 of the EIS will be revised to reflect these comments.

5.26 Comment:
The DEIS does not adequately discuss the pollution potential of sediment resulting from ground disturbing activity, nor does it outline measures which should be implemented to minimize sediment pollution. [40.11]

Response:
This concern is addressed in several sections of the EIS. Contamination of surface waters by sediment runoff from proposed construction sites is unlikely for three reasons:

(1) Soils are highly permeable and inflitration rapid; thus sediment-bearing surface runoff should not extend long distances, as described in section 3.2.2.

(2) The construction sites are not located near perennial creeks. Perennial drainage is rare because of the rapid infiltration of surface runoff.

(3) Measures to prevent erosion during construction have been proposed (see section 2.4.1.7) and are required under construction and operating permits.

5.27 Comment:
Figure 3.3.1 includes the Sandia well as a monitoring site. Data from that well may have been used baseline, but we understand the well was plugged and abandoned and it is not listed as a monitor well on Table 3.3-1. [44.14]

Response:
Figure 3.3.1 shows the Sandia water well, which the USGS added to the original (1991) monitoring sites. Table 3.3.1 has been revised to show the current monitoring sites. The commentor may be referring to the Sandia Labs RDO-1 well (see section 3.4.3.6), which was plugged and abandoned.

5.28 Comment:
The sentence, "Fresh ground water in the project area flows west toward La Pine Basin" is confusing. Based on statements elsewhere in the document, the groundwater flow is to the north. Need to explain the different depths you are referring to. [54.33]

Response:
The quoted sentence from section 3.3.5 is incorrect and the section will be revised. Fresh groundwater in the shallow aquifer is presumed to flow westward down the flanks of Newberry Volcano toward the Little Deschutes River. Groundwater in the deeper regional aquifer flows generally northward. Its flow direction beneath the volcano is not known.

5.29 Comment:
Wells in the caldera are not all domestic, as indicated in the DEIS. Campground wells are classified for "non-community, transient" use. [54.34]

Response:
The error is noted and the EIS has been revised.

5.30 Comment:
Mercury deposition in Paulina and East Lakes may increase surface concentrations to levels exceeding drinking water standards. Even if pollutants are mixed to deeper depths, they may affect aquatic life and water standards. [4.5] Analysis of trace metals, specifically mercury, in Paulina and East Lakes is seriously flawed. [32.6] Modelling of controlled mercury emissions shows an extreme adverse impact on the caldera lakes; the equalling or exceedance of the water quality standard for mercury. This prospective mercury impact alone should motivate the developer to consider realigning his plant's configuration to avoid degrading these lakes with mercury. [36.20]

Response:
Additional modeling has been done, the results of which are given in Appendix L. Section 4.3.3.6 in the EIS has also been modified. More realistic mixing models were used to assess the potential impact of mercury on the lakes. These models indicated that mercury concentrations in the lakes would be increased by less than 0.00000319 mg/l over the 50-year project duration. The fresh water chronic criteria for mercury is 0.000012 mg/l, which is nearly 4 times greater than the anticipated increase. The federal drinking water standard for mercury is 0.002 mg/l which is 627 times higher than the anticipated increase. Should the mercury concentrations in the lakes be near the USGS detection level of 0.0001 mg/l, the estimated mercury contribution represents about a 3 percent increase.

If the mercury concentrations in the lakes exceed the chronic criteria value

established in Oregon, then a new criteria would be established by the State to account for the elevated natural levels in the lakes. The lakes and Paulina Creek would then be labeled as water quality limited by the State of Oregon, which would require additional protections to minimize any increased inputs to the aquatic system.

The project requires a permit from DEQ for both air emissions and water emissions. Through this permitting process, the determination will be made by DEQ whether any additional mitigation measures are needed to protect the aquatic environment.

It should be noted that the effects of this small an increase are not likely to be significant. Further, it should be emphasized that extremely conservative assumptions were made throughout all aspects of the mercury modeling, therefore the predicted values can be viewed as upper limits of expected impact.

5.31 Comment:

Page 4-14, Section 4.3.3.6, Air Pollution Deposition. The text addresses the potential for pollution deposition having an affect on lake water quality and makes reference to a report by Science Applications International Corporations in Appendix F-5. Modeling results are described and the statement is made that "the predicted concentration of all substances was considerably below the criteria, except for mercury." The text further states that "based on SAIC's analysis, mercury concentrations in the lake waters could rise as a result of depositional effects, to levels in excess of the applicable water quality criteria."

The existing data does not support the DEIS statement regarding water chemistry and this section should be rewritten to more accurately portray the US Geological Survey unpublished data with regard to lake and spring water chemistry and the conclusions of the SAIC report.

The text infers that mercury levels could at times exceed the Oregon Department of Environmental Quality and Environmental Protection Agency standards in some areas of East and Paulina Lakes. The text goes on to further imply whether these levels are accumulating in sufficient amounts in fish to affect biological productivity and other wildlife is not known.

The overall lake chemistry tends to dilute and buffer the contributions for the higher TDS fluids from the hot springs and as a result the average lake water chemistry tends to show from zero to only trace amounts of boron, arsenic and mercury in concentrations that are within the detection limits of the analysis and in general are not detectable in a large number of the samples taken from the lakes.

The SAIC modeling data and US Geological Survey water chemistry data indicates that mercury levels in the lakes are at or below the detectable limits and deposition from the geothermal project would be orders of magnitude below the criteria set by the State of Oregon.

The prediction of the SAIC model of mercury concentrations from power plant emissions depositions in a one-foot thick surface layer of lake water was based on an extremely conservative set of modeling assumptions that tended to overpredict the mercury deposition affect. That very conservative model was run to screen the project's impacts for areas of concern. The model results show the State of Oregon surface water quality fresh carbonic criteria for mercury **will not** be exceeded, and

that the mercury levels were predicted to be well below the Maximum Contaminant Level for drinking water and of surface water quality criteria.

Therefore, the statement on page 4-14 regarding mercury deposition resulting in a "standard exceedance" is incorrect. The analysis conducted by SAIC clearly shows that mercury concentrations, under extremely conservative assumptions, were predicted to be under an extraordinary worst case condition coincidentally identical to the mercury surface water quality chronic criteria value established by the State of Oregon. The model did not predict an exceedance of the chronic criteria value. The SAIC report also states the following regarding the mercury calculation:

"It must be emphasized that the concentration values calculated from the air quality model and deposition theory were very conservative. For example, it was assumed that the mixing depth at East and Paulina was a constant 1 foot throughout the entire year. In actuality, the East and Paulina Lakes are dimictic, i.e., the lake mixing occurs twice a year, once in the fall when the air temperature cools and once in the spring after the ice breaks up. In addition, a well-defined thermocline forms by early summer which stabilizes at a depth of 35 to 40 feet. Based on these data, near surface water mercury content would be one to two orders of magnitude lower than the water quality chronic criteria value depending upon the time of the year." (emphasis added [by commentor]).

The report clearly explains the conservative assumptions of the deposition model. In addition to the conservative mixing depth assumptions, the model makes an extremely conservative gross assumption that all of the elemental deposition would be solubilized. In the SAIC model, the predicted concentrations of selected elements in the top one foot layer of lake water assumes that all elemental emissions from a geothermal development were solubilized or contained in a suspension which flushed to the lake in spring with the snow melt. This, of course, does not happen due to the formation of insoluble compounds and complexes which do not reach the lakes. Metals and other elements tend to accumulate in soils and do so primarily by exchange reactions with organic matter or clays. Organic materials in soil absorb many metals and elements, forming stable complexes. A large percentage of the snow melt in the basin does not flow to the lakes directly but reaches the lake through groundwater flow which would tend to reduce the amount of elemental material reaching the lakes due to the accumulation of the metals in the soils.

CEE requests that the discussion regarding mercury emissions deposition, water quality and biology be reevaluated. [39.47]

Response:
Additional modeling has been done for the agencies by AGI Technologies. The results indicate that the content of this comment is, in general, correct. The AGI model and its results are included as Appendix L in the EIS. Section 4.3.3.6 Air Pollutant Deposition has been revised to reflect the results of this additional information. Also see the response to the previous comment.

5.32 Comment:
Page 4-133, Section 4.12.3.6, Deposition of Airborne Pollutants into Surface Waters. The existing data indicate that the mercury levels in the lakes is not high. The hot springs which contribute minor amounts of mercury to the lake have a slightly elevated mercury level. The data from the US Geological Survey

sampling program does not support the conclusion that there are high background levels. It is also an extremely speculative statement to conclude that the estimated mercury contributions from air emissions deposition could affect the biological food chain. We request that the statements regarding bioaccumulation in fish and fish eaters be rewritten to more realistically reflect the existing and predicted impact conditions. [39.59] It is stated that mercury may exceed drinking water standards if concentrated in the surface water of the lakes. Even if Hg is mixed into the water column, it will accumulate and it is know be bioaccumulated in organisms such as fish. [60.12]

Response:
The referenced report has been used to revise section 4.12.3.6. Modeling of the impact of metals on the Newberry lakes has demonstrated that extremely small incremental increases of all metals can be expected from the proposed geothermal activities. Based on the modeled impacts and existing measurements of background, it can be shown, with the exception of mercury, that the sum of predicted incremental increases and existing background levels will not produce concentrations in excess of standards or threshold values. While the incremental increase of mercury is small, the existing background data are not adequate as compared to the chronic aquatic threshold values to allow comparison of the sum of impacts and background levels with the chronic aquatic threshold values. However it must be emphasized that the predicted incremental impact of mercury after 50 years of plant operation, making extremely conservative assumptions in the modeling process, is a value four times lower than the chronic aquatic threshold value and 627 times lower than the federal drinking water standard.

Current (May 1994) baseline mercury levels in fish in the caldera lakes have been measured and found to contain mercury in varying levels with the concentration of mercury in some fish exceeding the U.S. Food and Drug Administration (USFDA) action level of 1.0 ppm (Table 4.12-2 in the EIS). The deposition modeling performed for mercury indicates that the proposed geothermal power plant could causean increase in mercury concentrations in the lakes. But as previously noted, this increase is extremely small and not likely to be significant in terms of additional bioaccumulation in fish and fish-eaters such as the bald eagle and osprey. However, a fish tissue monitoring program for mercury will be conducted over the course of this project for comparison to baseline mercury levels.

5.33 Comment:
The DEIS states that appropriate technology could be applied to control mercury. This needs to be changed to read, "will be applied to control mercury." This is reinforced by the fact that modeling done with 97.7 percent removal still showed water quality levels coming out above EPA standards. [58.3]

Response:
As noted in the responses to comments 4.5, 39.59, and 39.47, mercury deposition is not anticipated to present a problem. Mercury levels will be monitored at emission points and, should these be higher than anticipated, appropriate additional mitigation actions would be taken; these could include additional removal systems.

As stated in section 4.12.3.6 of the EIS, mitigation measures will be used to reduce mercury emissions from the operating power plant. Mercury in gaseous form will be removed from the power plant emissions prior to release to the atmosphere. Removal is a two-step process involving an activated carbon

adsorption system and a sulferox removal system. Together these systems operate at 98+ percent efficiency using one carbon unit. Additional units can be added, raising this efficiency level if the mercury content of the geothermal resource necessitate this additional mitigation measure. Mercury levels would be monitored at the sulferox stack and at the cooling tower to document levels of mercury emissions.

Modeling did not show mercury levels over U.S. EPA standards.

5.34 Comment:
The DEIS does not figure potential H_2S deposition on the caldera lakes during full-blown well field development. Alternative calculations of H_2S emission rates are given to show that the project could acidify these lakes. [36.16]

Response:
Emissions of H_2S from well field development is not expected to exceed emissions from two wells simultaneously venting to the atmosphere. Emissions from two wells venting were incorporated into the worst case modeling scenario. Discussion of these modeling activities and results are contained in Appendices F-4 and F-5.

5.35 Comment:
I am concerned that mitigation measures, including those listed to remove mercury from emissions are not listed as mandatory, but only "could be applied to Alternatives A or B." I believe Hg emissions, and emissions of other air toxics, should be as small as technologically feasible. USGS sample analysis methods were not sensitive enough to indicate whether Hg levels in the lakes exceed the fresh chronic or fish consumption standards. Any addition of Hg to the lakes or Paulina Creek by deposition from geothermal steam could require a halt to human consumption of fish caught in these waters and could also imperil bald eagle and osprey populations that feed on these fish. These effects need to be disclosed in the EIS. Also need clarification about whether Hg will be screened out at the emission source. [54.47]

Response:
Mercury concern is covered in responses to comments 4.5 and 39.47. Section 4.3.6 has been revised to reflect the results of the lake modeling. The removal of mercury at the power plant is described in Section 4.3.3.6.

5.36 Comment:
USGS samples from the lakes and creek show current background concentrations of arsenic exceed state surface water criteria for protection of human health. Any addition of arsenic could raise levels in fish even higher, which would surely be unacceptable to DEQ. What mitigations can/will be employed to remove arsenic from the geothermal emissions? It needs to be disclosed that increasing levels of arsenic in fish could result in a shut-down of the Paulina and East Lake fishery, and harm the health of eagles and osprey. This should also be discussed in the Wildlife and Recreation sections too. [54.49]

Response:
Arsenic concentrations in water samples collected by the US Geological Survey between October, 1991 and September, 1993 were around 0.015 mg/l in Paulina Lake and Paulina Creek and 0.003 mg/l in East Lake (Crumrine and Morgan 1994). Federal drinking water standards maximum contaminant level (MCL) for arsenic is 0.05 mg/l, and fresh water chronic criteria for arsenic is 0.19 mg/l. The

existing arsenic concentrations are below these standards. However, the 10^{-6} carcinogenic human risk criteria for arsenic has been published as 0.0000022 mg/l. Clearly the existing arsenic levels in water samples, as determined by the USGS, are above this risk criteria. To assess the potential impact of arsenic contributions from the proposed development on the lakes, the anticipated arsenic contribution was uniformly mixed with lake waters in various models to estimate the increased concentration over the 50 year project duration (Appendix L). At the end of 50 years, the maximum increase in arsenic concentration is estimated to be 0.00000113 mg/l for Lake Paulina and 0.000000137 mg/l for East Lake. As can be seen, these incremental increases are insignificant over baseline values and will not adversely affect either the aquatic ecosystem or its fisheries. Section 4.3.3.6 has been revised to reflect the information from the additional studies.

5.37 Comment:

Boron is another potential problem, and not just to vegetation as indicated in the DEIS. Current background levels range from 0.86 to 0.99 ppm (USGS data). There are not standards for boron in water; however, "concentrations exceeding 0.2 ppm likely could impair survival of developmental stages of other (not rainbow trout) species. For the one species of toad studied by Birge and Black (1977, EPA publication), boron levels of 1 ppm in water were associated with a 1% mortality rate of embryos and larvae." While amphibians in the Crater may have adapted to existing levels of boron, any additions due to geothermal emissions could be detrimental to amphibian reproduction and survival. What mitigations are possible to remove boron from emissions at the source? [54.50]

Response:

Boron concentrations in the lakes are between 0.85 and 1.00 mg/l (Crumrine and Morgan 1994). No standards have been set for boron, but the average concentration in surface waters in the U.S. is around 1.0 mg/l, and the maximum concentration is around 5.0 mg/l. The mixing models, similar to those for mercury and arsenic, indicate that boron concentrations should increase by less than 0.0000269 mg/l over the 50 year project life. This amount is so small that boron concentrations in the lakes will remain below the national average. According to these data and calculations, boron contributions from the proposed development are unlikely to pose significant impacts to either the aquatic ecosystem or its fisheries. Based on these predicted low impacts, no additional mitigations for boron are necessary. Section 4.3.3.6 has been revised to reflect the information from the additional studies.

5.38 Comment:

Page 4-10, first full paragraph, fifth sentence. The text reads "Roof drains would be connected directly to the water storage pond." This is not correct. Roof drains are commonly diverted to the local topography as they contain only rain water or snow melt. [39.46]

Response:

The text has been corrected.

6 Geothermal Resources

6.1 Comment:

EIS should acknowledge the possibility that hot springs will be lost as a result of geothermal development. [31.8]

Response:

This concern is addressed in the EIS. Section 4.4.3.1 discusses the possible impacts to the springs and suggests a monitoring program to assess the impacts of the project on the shallow hydrothermal system.

6.2 Comment:

Page 4-18, third paragraph. The text describes the potential for geothermal surface manifestations to vary naturally over time due to natural causes. The text reads "At Newberry Volcano, the natural range of variations is not known because routine monitoring only began in 1991." There is considerable geological evidence in the crater area that hydrothermal activity was significantly greater in the past. Such evidence includes the welded beach and hot springs deposits near Paulina Hot Springs and the alteration of the volcanic tuff ring at East Lake Hot Springs. This geological evidence indicates that both hot springs have been decreasing in activity for considerable time. [39.49]

Response:

The EIS has been revised to address this concern.

6.3 Comment:

Figures 1.3.1 and 1.3.2 are simplifications which acknowledge that ring fractures could be conduits for either groundwater or cold water recharge. They illustrate how little is known about issues such as the location of ring fractures and other volcanic features and their relation to hydrothermal systems at Newberry, if any. [44.5]

Response:

This comment is explanatory and requires no response. The specific details of the geology and hydrogeology of Newberry Caldera are poorly known and will remain so until additional studies are undertaken. The exploratory drilling and baseline monitoring phase of the proposed action will provide additional data.

6.4 Comment:

The DEIS oversimplifies and reinterprets the published information from scientific studies. The EIS should address the impacts of altering the water, heat and chemical flows from the shallow hydrothermal systems on East and Paulina Lakes and other features within the NNVM. [50.2] No data exist at present to determine if drilling will impact the ecology of these pristine lakes. [60.4]

Response:

Aspects of the hydrothermal system at Newberry have been outlined by a number of previous authors, most notably by Carothers et al. (1987), Sammel (1983), and Sammel et al. (1988). The interpretations stated in the EIS do not differ significantly from those published by the authors. There is general agreement that there may be limited connection between shallow and deep geothermal aquifers within the caldera and this is clearly stated in the EIS (section 4.4.3.1).

In the detailed discussion accompanying the comment, the commentors provide only one example to support their statement that "...some important aspects of the

(reinterpretation) have been left out." Figure 1.3-2 of the EIS is intended to give the EIS reader who has little or no background in geothermal systems a conceptual interpretation of how a hydrothermal system may be drilled at Newberry. There has been no attempt to interpret any hydrogeologic data in this figure other than a simplistic representation of the existing water table based on groundwater elevations at lakes and in known wells. The intent was to illustrate the need for "near-surface heat, permeable rock and water" in development of hydrothermal systems (section 1.3.2.1). Therefore, any attempt to indicate that this figure represents the hydrogeologic interpretation of the geothermal system at Newberry is misleading.

Water, heat, and chemical flows from the shallow hydrothermal system will be monitored both prior to and during development to detect any possible impacts from the geothermal project. The USGS Hydrologic Monitoring Program will provide the necessary baseline data and will be continued into the development phase of the project.

Section 1.3.2.1 has been revised to more comprehensively describe the hypothetical hydrothermal systems illustrated in Figures 1.3-1 and 1.3-2.

A figure showing a more detailed cross section through the Newberry area has been added to section 3.3 of the EIS.

6.5 Comment:

Statements in Table S-2 regarding effects of Alternative A on hot springs and fluid loss from the reservoir should also apply to Alternative B. How can effects to hot springs in the caldera be accurately estimated when the hydrology is so poorly understood? It is impossible to determine the likelihood of effects to the hot springs at this time. [54.20]

Response:

Tables S-2 and 2.5-1 will be revised to include a statement relating to geothermal resources in both Alternatives A and B.

The impacts on the shallow hydrothermal system described in section 4.4.3.1 are estimated based on the existing conceptual model presented in section 3.4.4.2. They are not presented as "conclusive" but rather as "approximate." Sections 3.3 and 3.4 have been revised to include more discussion of this issue.

6.6 Comment:

The fact that the thermal waters at hot springs inside the caldera are not similar to the chemical composition of Medicine Lake's deep geothermal fluids is not conclusive evidence to support the assumption in the DEIS that the shallow and deep thermal reservoirs at Newberry are "not directly connected." The DEIS should present a well-balanced picture of the possibilities here, not advocate for one theory that the proponent finds favorable. [54.30] Third paragraph on page 3-35 appears to conflict with pages 3-22 and 3-23. If little of the shallow (meteoric) ground water makes its way into the deep geothermal reservoir, as claimed here, but instead flows out of the caldera region laterally, then this appears to shoot holes in the argument on pages 3-22 and 3-23 that the ring fractures are essentially impermeable barriers. Please explain this apparent inconsistency in logic. [54.36] More exploration is needed to evaluate the possible connections between the shallow hotsprings of Paulina and East Lakes and the deeper hydrothermal features that they propose to exploit. [60.3] Test wells are needed to determine the chemical nature of the geothermal fluids under the caldera. No such

data exists. Test drilling would provide information on the concentrations of possible chemicals such as boron and mercury that are known to be toxic to the biota. We do not accept as the the comparison of fluid chemistry between Medicine Lake and the Newberry hotsprings as good evidence for lack of connections. [60.5]

Response:
The conclusion that the shallow and deep groundwater systems are "not directly connected" is premature for section 3.3.4.3, because the evidence for the conclusion is presented in section 3.4.3. The report on the flow testing of Newberry Well 2 by the USGS (USGS Water Resources Investigation Report 86-4133) indicates that the well was completed in relatively impermeable rocks that delivered steam to the borehole. This observation is consistent with the conceptual model, which has a vapor phase connecting the upper and lower hydrothermal systems.

Sections 3.3 and 3.4 have been revised to present the geologic evidence for the lack of connectivity between the two systems. Also see previous responses in this section of the Comment Report.

6.7 Comment:
The thermal springs are not necessarily just along the lake shores. They apparently occur at various other locations underneath the lakes. A personal communication with Dave Morgan of the USGS is cited by the commentor. [54.32]

Response:
David Morgan confirms that springs occur beneath the water surface of the lakes. Their distribution appears restricted to the vicinity of the shoreline hot springs. Evidence for the submerged springs includes observation of orifices and columns of bubbles. In Paulina Lake, bubbles were observed within approximately 100 feet of shore and in East Lake from depths between 60 and 100 feet (David Morgan, USGS. Personal communication with AGI). These observations are consistent with section 3.3.4.3.

6.8 Comment:
Page 4-17, section 4.4.3.1: Insert "apparently rather" in second to last sentence of first paragraph before the word "weak." Replace "should be slight" with "are likely to be slight." [57.9]

Response:
The EIS has been revised as suggested.

6.9 Comment:
There is a good discussion of possible effects to hot springs, as well as monitoring objectives. The reader is left to assume, however, that no matter what changes to thermal features occur during the life of the geothermal operation, they will be accepted as necessary consequences. If this is true, it should be stated openly. If it is not true, please explain what "triggers" will cause the project to alter or halt its operations. [57.10]

Response:
As noted in section 4.4.3.1, discharge from hot springs may fluctuate from natural causes, controls on lake level in Paulina Lake, and from modifications to the system caused by geothermal development. The proposed monitoring program is

designed to assess the impacts, if any, from geothermal development. Should monitoring prove that geothermal development is severely affecting the shallow hydrothermal system, appropriate mitigation measures would be evaluated and considered by the agencies.

6.10 Comment

Geothermal is non-renewable energy, and this should be considered. If other projects were short-lived due to overuse, how was the level of use chosen for Newberry. [31.3] Resource depletion concerns primarily relate to the corresponding over-dedication of surface public lands if too many plants are built. You should develop slowly so the reservoir will be tapped only for facilities that can be sustained for decades, and no more surface land would be taken than for a sustainable program. [38.4] Page 4-19, third paragraph. The text states "net reservoir depletion could be below 0.5 percent per year." This is a very conservative estimate. CEE calculations indicate the depletion rate would be in the order of .001 percent per year. [39.50] We agree that conservation of the geothermal resource is important. Without appropriate management, geothermal resources will not be a renewable energy source. We appreciate the attention given to this issue in the DEIS and the measures proposed to ensure that power development and utilization will not adversely affect the long-term use of the geothermal resource. [49.5] Geothermal is NOT a renewable energy source on a human lifetime scale and should not be portrayed as such. Give the reader information on the range of lifetimes of geothermal operations. Ten or 15 years is not uncommon. [54.18]

Response:

Geothermal should be considered a renewable resource from a scientific standpoint, and is legally considered a renewable resource. A geothermal power plant extracts heat and water from the earth. The heat is being continuously renewed, mainly by heat released from the decay of radioactive elements within the earth and by heat created by processes associated with the earth's formation (Wright, Phillip M., and others, 1989. "Regional Exploration for Convective-Hydrothermal Resources." Geothermal Science and Technology. Vol. 2, No. 2, p. 70.) Water is also renewed by natural recharge from rain and snow and by injection of fluids after they have been used in the power plant.

However, the rate of recharge of heat and water can be exceeded by the extraction rate. Heat is removed from the fluid in the power plant, and some fluid will be lost to the atmosphere through evaporation in the power plant condensers. As a result, rock and fluid may cool over time. If a balance between extraction and recharge is not achieved, the geothermal reservoir will eventually be depleted of heat and/or fluid. This is similar to drawing down an irrigation or domestic water well by removing too much water too quickly. But when extraction ceases, heat and fluid are restored through natural processes. These processes may take years or decades, depending upon site-specific conditions. They are unlikely to take millions of years, which is the replenishment rate for oil and natural gas.

Perhaps the best-known example of geothermal resource depletion occurred at The Geysers in northern California. This depletion was due to a number of factors, the greatest of which was building too many plants too quickly, before reservoir response to each new plant could be determined (Barker, B.J., and others, 1989. "Geysers Reservoir Performance." Monograph on the Geysers Geothermal Field. Geothermal Resources Council Special Report No. 17, 1991. pp. 167-178.). Other reasons for this problem are given in section 1.3.2.4 of the EIS. However, there have been several reports of flow rate increases in wells after

injection began, indicating steam replenishment (Enedy, S.L., Enedy, K.L., and Maney, J., 1991. "Reservoir Response to Injection in the Southeast Geysers." Monograph on the Geysers Geothermal Field. Geothermal Resources Council Special Report No. 17, 1991. pp. 211-219.).

Several examples can be cited of geothermal reservoirs that have been in use for decades. The Lardarello field in Italy has been generating electricity since 1913, and has produced at a rate of over 100 MW since the early 1940s. The Wairakei field in New Zealand has been in production since 1958 (Armstead, H. Christopher H., 1983. Geothermal Energy, 2nd Ed. New York: E. & F.N Spon. pp. 5 - 6.) A 20-MW plant at Matsukawa, Japan, has been generating continuously since 1968. Production rates have decreased in some wells, but has increased in others, despite the fact that injection of spent fluids was not practiced until 1988 (Hanano, Mineyuki, and others, 1993. "A Quarter Century of Geothermal Power Production at Matsukawa, Japan." Geothermal Resources Council BULLETIN. Feb. 1993, pp. 32-47). Geothermal plants at the Salton Sea in southern California have reported no noticeable drawdown or pressure decline after over a decade of operation.

Tracer tests performed at the 62-MW Dixie Valley, Nevada, facility confirm that injected fluid is being reheated by the earth and used again by the plant. No detectable cooling in any of the production wells had occurred after over two years of operation, and injected fluid was being recycled through one well in a matter of days. Given the experience to date, the wells were "unlikely to experience cooling in a time period of less than decades." (Benoit, Dick., 1992. "A Case History of Injection Through 1991 at Dixie Valley, Nevada. Geothermal Resources Council TRANSACTIONS. Vol. 16, Oct. 1992. pp. 611-620.).

As is stated in section 1.3.2.4 of the EIS, the degree of "sustainability" will not be known until the reservoir has been tested for a period of time by operating the plant. The level of use chosen (33 MW) was considered by CEE to be the minimum size for a commercial-scale facility.

Geothermal is classified as a renewable resource by numerous acts of Congress, including the Pacific Northwest Electric Power Planning and Conservation Act of 1980.

6.11 Comment:
The analysis of emissions and air quality impacts is based on fluid chemistry assumed to be similar to Medicine Lake, California. Fluid chemistry should be established before activities beyond the exploration phase are approved. [4.3] Please explain in more detail what would be done if the geothermal reservoir has more toxics than anticipated in the document. [38.9]

Response:
The analysis in the EIS is based on the range within which the Newberry fluid is expected to fall. This range is shown in a table that has been added to section 2.4.1.4. If Newberry chemistry turns out to fall outside the range, and the effects and analysis are significantly different from those addressed in the EIS, then new analysis and a supplement to the EIS will be required, or mitigation measures will be imposed to reduce emissions to predicted levels before the project is allowed to proceed.

6.12 Comment:
[Commentor believes more water will be injected into the reservoir than will be taken out.] Is this an experimental procedure? What are the side effects? [31.5]

Response:
No plans exist to inject more water into the geothermal reservoir than is removed. The spent hydrothermal fluids will be injected as will sufficient cold water to make up for process losses, as described in section 4.3.3.4.

6.13 Comment:
The DEIS lacks a detailed description of the water quality including TDS, of the blowdown and other injected fluids, except to concede the constituents would be more concentrated than in the brine. [36.27]

Response:
The exact chemical composition of the hydrothermal fluids is unknown, but concentrations of chemical constituents have been estimated based on the chemistry of fluids from a geologically similar site at Medicine Lake, California. This is shown in Table 3.4-2 in the EIS.

A table showing expected chemistry of brine and condensate has been added to section 2.4.

The Oregon Department of Environmental Quality will require analysis of fluid composition before approving the injection of any fluids into the ground.

6.14 Comment:
The DEIS failed to address possible problems caused by high silica content in the fluids which will be reinjected. [36.28]

Response:
Fluids at Newberry are not expected to have a high silica content. High concentrations of silica may cause operational problems from precipitation, but not impacts to the environment. High silica content characterizes the hypersaline brines found in the Salton Sea geothermal field in southern California, where the reservoir rocks are much different (sedimentary) from those found at Newberry (igneous).

6.15 Comment:
A depiction of the Geothermal Resources Study Area is missing from Figure 3.4-1 [44.15]

Response:
Figure 3.4-1 has been corrected.

6.16 Comment:
DEQ would review the injection fluid composition and would be responsible for issuance of necessary injection permits. [52.13]

Response:
Section 2.4.1.4 in the EIS will be revised to reflect these comments. The injection permits referred to in the comment would apply to plant process water only. Injection of geothermal fluids is regulated by the Oregon Department of Geology and Mineral Industries.

6.17 Comment:
The DEIS states that ring fractures may channel mineralized fluids which can reduce fracture permeability. It is then assumed that this does happen and serves to "help isolate the caldera's ground water system from the regional ground water." This seems a leap of faith. I don't recall that Dames and Moore give any direct evidence that this is the case either. Also, the sentence, "The permeability decreases further below the caldera floor" is unclear. How far "below"? Does this apply everywhere under the caldera? Do we know? [54.31] The subject matter in sections 3.3.4.2 and 3.3.4.3 needs to be revised and combined with section 3.4.4. As they stand now, they present the same subject matter in conflicting ways. Section 3.4.4 draws the conclusion that "no appreciable evidence for mixing of deep and shallow geothermal fluids" exists, in spite of the fact that the only available chemical (i.e., isotopic) information exerts that there is a connection. The conclusion of this section could just as truthfully read that "no appreciable evidence for separation of the deep and shallow fluid exists based on current available data." [54.35]

Response:
Aspects of the hydrothermal system at Newberry have been outlined by a number of previous authors, most notably by Carothers et al. (1987), Sammel (1983), and Sammel et al. (1988). The interpretations stated in the EIS do not differ significantly from those published by the authors. There is general agreement that there may be limited connection between shallow and deep geothermal aquifers within the caldera and this is clearly stated in the EIS (section 4.4.3.1).

Sections 3.3.4.3 and 3.4.3 have been revised to present the geologic evidence for the lack of connectivity between the shallow and deep systems.

7 Air Quality

7.1 Comment:
It will cause air pollution. [8.2]

Response:
Air pollution is discussed in section 4.5 of the EIS.

7.2 Comment:
Hazardous material will go into the air. [9.2]

Response:
Air pollution is discussed in section 4.5 of the EIS.

7.3 Comment:
The DEIS failed to comprehensively discuss or model the highly significant and adverse air quality impacts for all pollutants emitted during the well drilling and testing phase of the project. [36.1]

Response:
Emissions of air pollutants from well field development is not expected to exceed emissions from two wells simultaneously venting to the atmosphere. Emissions from two wells venting were incorporated into the worst case modeling scenario. Discussion of these modeling activities and results are contained in section 4.5 and Appendices F-2 and F-4.

7.4 Comment:
Noncondensable gas removal system has not been proven to be safe, efficient, or totally effective. [27.7]

Response:
Liquid redox systems are considered best available control technology by the Great Basin Air Pollution Control Department in Inyo County, California. They have been installed and used successfully at geothermal power plants, oil refineries, and sewage treatment plants worldwide. More information about the gas removal system can be found in the response to comment 35.15 and in (Weres, O. 1988. "Environmental Protection and the Chemistry of Geothermal Fluids." Geothermal Science & Technology. Vol. 1. No. 3. pp. 253-302.).

7.5 Comment:
It should be possible to prevent emissions during start-up and shutdown. [31.7] We are concerned about venting of fluids into the atmosphere, especially during periods when the power plant is shutdown. [60.10]

Response:
Warm startups can occur without venting to the silencer. Longer startups result from a cold system that has to be heat soaked for 24 hours with about 1 MW of steam flowing through the system to allow expansion of the equipment. Once the system is hot, between 1 MW and 5 MW of steam is necessary to get the steam ejectors working to pull a vacuum on the condenser and allow the turbine to accept steam.

It is not possible in all cases to prevent emissions during plant startup and shutdown. Emissions during startup and shutdown occur when there is insufficient steam flow to turn the turbine/generator and steam and entrained noncondensable gas are vented to the plant silencer. During startup, high pressure steam with entrained noncondensable gases are vented to the plant silencer until sufficient steam is in the supply system to start the turbine. Steam is gradually diverted to the turbine from the plant silencer which is gradually shut off. This process can take from one to six hours depending on whether the system is in cold startup. It takes about 1 MW of steam to heat soak the system and get the steam jet ejectors on the condenser to pull a vacuum. It takes about 5 MW of steam flow before steam is fully diverted to the turbine during startup.

Actual start-up scenarios will depend upon drilling results which prove the resource assumptions and final design of the power plant. Final design of the power plant will consider additional technical and economically feasible options to reduce gas venting during start-up, including optimization of a combination of steam jet ejectors and vacuum pumps that would allow venting of steam to the conenser. These measures would significantly reduce start-up emissions.

The applications to Oregon Department of Environmental Quality (ODEQ) for an Air Contaminant Discharge Permit (ACDP) will provide more detailed information based on final engineering design. In summary, start-up venting, in terms of emissions, is less than two wells on test.

During planned shutdown, steam will be diverted from the turbine to the plant silencer only after the turbine has spun down to the point when the generator is taken off line. If the plant has adequate back feed power, the circulating water system and condenser are still operational and no venting will occur. If a shutdown occurs without the benefit of back feed power, the circulating water

system which runs the condenser and noncondensable gas control system is non-operational and steam must be vented due to back pressure. This steam diversion to the silencer during planned shutdowns generally occurs when there is less than 1 MW of steam in the system and steam jet ejectors are not effectively keeping a vacuum on the condenser. This is less than the emissions from one well on test.

The EIS worst case modeling scenarios examine a full plant trip (unscheduled shutdown) with two wells on test. Plant startups and shutdowns were considered equal to the well testing emissions scenario.

Limited steam by-pass of the turbine to the condenser will be considered in the detailed design. A by-pass system may not be feasible given the unknowns in resource production conditions. The proposed design in the Plan of Utilization will work under a large set of resource conditions and provides the most flexibility at this time. Additional methods to conserve steam production and to provide for its efficient utilization within the limits of commercially proven technology, practical designs, and economic constraints will be evaluated in the final design. The EIS adequately models the worst case conditions for air emission impacts that would occur during plant startup and shutdown.

7.6 Comment:
Under no circumstances should the scrubbers be by-passed except during the start-up period or when a line becomes plugged. Weather conditions should be exempt from this requirement. [46.2]

Response:
The emission control system is by-passed when steam is vented to the plant silencer during a start-up, shut-down, break-down or upset condition. The plant piping will also allow for emergency venting of noncondensable gas to the cooling tower if there is a problem with the liquid redox system or the vacuum pumps which causes that system to fail temporarily and gas must be vented to avoid overpressure. The cooling tower is the safest location to vent this gas in emergency situations. Cooling tower venting of the noncondensable gas system would be considered an emergency break down or upset condition subject to the emissions reduction plan for the power plant outlined in the Plan of Operations.

Under emergency situations weather conditions will of course not be a factor in the decision to by-pass the liquid redox system. However, it should be noted that inclement weather (which causes good air dispersion) is one of the most frequent causes for an emergency situation (e.g., downed power line). For planned shut-down, weather causing poor dispersion can to some extent be avoided.

7.7 Comment:
Prevention of H_2S emissions receives cursory treatment. H_2S emissions could cause acid rain. It should be possible to restrict emissions of H_2S and other metals and dissolved solids. [31.9]

Response:
Control of H_2S emissions is discussed in Section 4.5.3.1. Predicted H_2S emission rates are described in Appendix F-4. The total increase in atmospheric H_2S in the Newberry region is not large enough to cause any significant decrease in the pH of precipitation (acid rain). State-of-the-art controls for H_2S and mercury will be used and are discussed in the EIS.

7.8 Comment:
Possible exposure of public visiting developed recreation sites to H_2S and other toxic gases is not acceptable. [26.2] Hydrogen sulfide will not be pleasant to visitors of the Newberry National Volcanic Monument. [60.11]

Response:
The predicted concentrations of H_2S and all other pollutants at developed recreation sites under worst case plant upset, well testing, and weather conditions were below all applicable standards and threshold values which have been established to protect human health. This issue is discussed further in section 4.5.3.2 in the EIS.

7.9 Comment:
The exploration stage could generate about 37,000 lb of H_2S over a four month period of well tests. [36.2]

Response:
A realistic exploration scenario would be the testing of four wells for 30 days each over the course of a four-month period. This would correspond to an estimated total of 3600 kilograms (8,000 pounds) of H_2S. It should be noted that the worst case scenario corresponding to when there was an overlap in the testing of two wells was modeled and shown to have insignificant air quality impact.

7.10 Comment:
H_2S bleeding emissions will total 15,453 lb/year. [36.3]

Response:
There are three types of "bleeding" wells. These are: (1) isolated wells, (2) production and reserve wells bleeding during plant shutdown and (3) the continual bleeding of reserve wells. An estimate of H_2S emissions from the bleeding wells during plant shut down is 450 to 900 kilograms (1,000 to 2,000 lb) per year, for isolated bleeding wells approximately 1,300 kilograms (2,800 lb) per year, and for the continual bleeding of reserve wells the emissions are insignificant. Wells are placed on bleed when they are not in production to keep the well heads hot and reduce the potential for corrosion. Isolated exploration, observation or low production wells are not on the power plant pipeline and are allowed to bleed through 0.64- to 0.95-centimeter (1/4- to 3/8-inch) diameter lines. Based on the H_2S content of the Medicine Lake resource the H_2S emission rate for each isolated bleeding well would be 0.036 kilograms (0.08 lb) per hour as compared to a 1.26 kilogram (2.79 lb) per hour H_2S emission rate for a production well operating at 75-percent capacity. During the geothermal project, it is assumed that no more than four isolated wells will be bleeding at any one time.

All production and reserve wells are allowed to bleed through wellhead silencers during plant maintenance periods (150 to 300 hours per year). The steam and concomitant H_2S emission rates for this shut-down bleeding would be between 1/4 and 1/3 the normal rates for each well.

Reserve wells are tied into the power plant pipe line. A typical 33-MW power plant needs about a 45 MW reserve which corresponds to two reserve wells. These wells bleed into the pipeline. Their steam and associated H_2S go to the power plant and through the emission control equipment. Hence their emissions are insignificant as compared to other activities.

The H_2S impact of plant shut-downs and associated bleeding is more than adequately modeled in the plant upset scenario (scenario 4, Appendix F-4). The H_2S impact from four isolated wells bleeding at any given point in time is insignificant as compared to H_2S emitted form other geothermal activities. It should be noted that the effect of bleeding during shutdown is a short-term, relatively high H_2S impact, whereas the bleeding of isolated wells is a long-term low level impact.

7.11 Comment:
Air quality modeling is deficient because it fails to consider the H_2S contribution from any other wells that are not actively venting, but are bleeding H_2S. [36.7]

Response:
Emission of H_2S from wells that are bleeding was taken into consideration during H_2S impact modeling. See the response to comment 36.3.

7.12 Comment:
The project's emissions of H_2S are frequently above the odor threshold, and will be a seriously adverse and unmitigated impact. [36.8]

Response:
At key air quality receptors, which have been identified and listed in the EIS, the project's H_2S emissions would not likely be detected during normal operation. During upset conditions, the odor may infrequently be detected at the closest receptors for a short period of time (see section 4.5.3.2 and Appendix F-4).

7.13 Comment:
The DEIS should provide additional evidence why Newberry's H_2S emissions during outages would be only 1/4 the Coso emissions. At a minimum, the DEIS modelling should have used the 36 lb/hr for possible Newberry H_2S emissions rather than the 27 lb/hr figure. [36.9]

Response:
The Coso facility has a total capacity of about 250 MW, produced by multiple 33-MW plants. The higher value proposed in the comment was based on data that was measured when more than one 33-MW unit was down at one time at the Coso facility. The value that was used for modeling purposes corresponds to one 33-MW unit being down and Medicine Lake resource chemistry.

7.14 Comment:
In addition to H_2S emissions during power plant outages, start-ups, and shutdowns, there will be constant H_2S emissions from ongoing well exploration drilling and testing which apparently were not figured in the modelling in the DEIS. [36.11]

Response:
H_2S emissions from exploration drilling and testing were considered in the modeling. See Appendix F-4.

7.15 Comment:
We agree that H_2S should not be allowed to escape into the atmosphere. [49.6]

Response:
Emissions of H_2S will be controlled as much as technically and economically

feasible (section 4.5) with state-of-the-art technological and institutional controls. Modeling of H_2S emissions under worst case plant operation, well testing, and weather conditions (see Appendix F-4) has shown that no standards or threshold levels will be exceeded at developed recreation sites.

7.16 Comment:
DEQ will require that H_2S emission control systems meet the Highest and Best Treatment and Control rules (OAR 340-28-600). If it is determined that any significant Emission Rate is predicted to be exceeded, the facility will be subject to the New Source Review rules (OAR 340-28-1900) and Best Available Control Technology may be required. [52.4]

Response:
All emissions from the power plant facility are expected to be well below the Significant Emission Rates described in OAR-340-28-110-(108). The source is predicted to be non-major and therefore not subject to the New Source Review Rules (OAR-340-28-1900(2)). Also, since the source is a non-major source, the Best Available Control Technology regulations (OAR-340-28-1940) do not apply. As with all sources in Oregon, Highest and Best Practicable Treatment and Control Required regulations (OAR-340-28-600) must be followed for all air contaminant pollutants, not just H_2S.

7.17 Comment:
Drill rig set-up and employee vehicle use will result in significant emissions and PM_{10}/TSP. [36.6]

Response:
PM_{10} and TSP emissions from construction and operation were modeled using the U.S. EPA fugitive dust model (FDM). The results are contained in section 4.5.3.1 and Appendix J. The results demonstrated that the PM_{10} and TSP impact at key receptors will not exceed any applicable standards at all sensitive receptors.

7.18 Comment:
The rate of TSP emissions is low compared to what was experienced at other (Heber) plants. This should be explained, and the effect of a larger amount of TSP emissions should be modeled. [36.12]

Response:
The geothermal fluid in the Heber area comes from sedimentary rock formations and contains a high amount of total dissolved solids (TDS) (about 100,000 ppm). The Newberry resource is volcanic in nature and is estimated to be similar to the Medicine Lake geothermal fluid, which contains about 5,000 ppm TDS. Even without knowing the plant sizes and operational practices at the Heber facilities, it is clear that a comparison of TSP emissions between Newberry facilities and Heber facilities would be faulty due to the discrepancy in TDS of the geothermal fluids.

7.19 Comment:
TSP emissions from road dust and site preparation activities will contribute to reduced visibility. Visibility impacts in the immediate project area should be modeled, not just impacts at a distant Class I area. [36.13]

Response:
Some visibility degradation will occur from road dust and site preparation, as will

occur from any construction activity and dirt road travel in dry regions such as central Oregon. However, this will be a localized and short-term effect, not regional. Moreover, visibility reduction due to dust is generally not large since dust is made up predominantly of particles greater then 2.5 microns in aerodynamic diameter. These particles have a lower light scattering coefficient than do smaller particles. Dust particles also do not absorb light as readily as some particles such as soot caused by combustion.

The visibility impact due to TSP produced from the cooling tower and well operations is discussed in Appendix F-3. Appendix F-3 not only models visibility impacts at the nearest class I area but also in the vicinity of the project. Visibility modeling of this type is only strictly required in the Prevention of Significant Deterioration (PSD) process and then only at the nearest class I area. While this facility is not a major source and PSD evaluation is not required, modeling was conducted to evaluate the visibility impact. In addition, the visibility reduction that was documented under worst case plant upset conditions (estimated to occur 0.003-percent of the time) before the plume reached the nearest class I area was also modelled. Visibility degradation was found to be due primarily to H_2S emissions, which were subsequently assumed to be converted to SO_2 and then into fine particulate sulfate in the atmosphere. Based on the modeling it was concluded that the contribution of TSP emissions from the operation of the geothermal plant and associated wells is insignificant in terms of visibility degradation.

7.20 Comment:

Page 4-45, Section 4.5.6, Additional Mitigation Measures. The text suggest that a wheel washing and or road washing program could be implemented for major access points to reduce the source of dirt carry-out onto paved roads. This statement should be deleted because such mitigation is unnecessary. CEE will only use the Road 9735/US 97 intersection where a gravel road intersects with a paved road. This mitigation does not make any sense. This type of mitigation would single out geothermal developers to perform an extraordinary dust abatement program that is not required of the timber industry or recreational users. [39.53]

Response:

Forest Service Road 9735 is gravel, therefore, a wheel washing station is not likely to be necessary at its junction with Highway 97 since minimal carryout will occur.

7.21 Comment:

The air quality classification (Class II) is not appropriate for this site, as it is a pristine region of Oregon adjacent to the National Monument. [4.6]

Response:

Criteria for determining Class I or II areas are located in OAR 340-31-120. Currently, all areas in Oregon are designated as Class II except for 11 wilderness areas and Crater Lake National Park. By definition in OAR 340-31-120(3)(a-b), since the National Monument was established after August 7, 1977, and it is not a National Park or Wilderness Area, it is therefore a Class II area.

The issue of air quality classification for the National Monument was discussed in detail during the consensus meetings of the Monument Citizens Committee, the Congressional Hearings on creation of the National Monument and by the Newberry National Volcanic Monument Advisory Council which was appointed

by the Secretary of Agriculture to advise the Secretary on the development of a management plan for the National Monument. A basic consensus between the parties that created the National Monument was that the Monument was to retain its Class II air quality classification. The Newberry National Volcanic Monument Draft Comprehensive Management Plan Draft EIS, Page III-61 calls for the Monument activities to meet a Class II standard. All of the alternatives presented in the DEIS for the Monument Management Plan call for retention of the Class II air quality classification for the Monument.

The EIS is correct in referring to this area as Class II. Proposing changes to this classification is beyond the scope of this EIS. The project area is currently used for a variety of purposes, as is illustrated by Figure 3.11-1.

7.22 Comment:
Wind data is inadequate because it was done with only one device at one station. Wind direction away from the site is not considered. [28.3]

Response:
The wind data were obtained from a meteorological station located at the point of the proposed power plant. The meteorological station was sited and operated consistent with "Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)" (EPA-450/4 87-007, May 1987). Frequently, impact assessments are determined from meteorological data collected from stations at considerable distances from a development site. In this case, the data can be considered of high quality and very representative since they were obtained at the site. Because the effective plume height for both the cooling tower and the Sulferox stack is low as compared to most industrial stacks, the highest air quality impacts are relatively close to the plant site. Therefore, wind data measured at the site provides a good basis for the modeling. If high concentrations of pollutants were predicted at greater distances from the plant, other meteorological stations located at sites which would permit the assessment of the effect of terrain on wind might be appropriate.

7.23 Comment:
Under certain adverse, inversion atmospheric conditions, the pollutant plume from the power plant may enter the crater and "fill it up" with air pollutants as if filling a bathtub. The crater rim is only 200 feet above the power plant stack. This possibility was not discussed sufficiently in the DEIS. [36.14]

Response:
Conditions which would cause an inversion within the crater and cause poor dispersion within it, would also, in effect, prevent pollutants from entering the crater. Therefore, the conditions of inversion in the crater and filling up the crater with air pollutants are mutually exclusive. An inversion would effectively form a cap over the crater. Intuitively, there must be conservation of airflow in the crater: For any air and pollutants entering the crater, there must be an equal amount of air leaving the crater, therefore dispersion of pollutants would occur.

7.24 Comment:
The assertion in the DEIS that the project's air quality impacts will not violate air standards is misleading. Air quality can be significantly degraded, and human health harmed, and damage done to animal life and vegetation, particularly near a public campground in a Monument area and a National Forest, without violating standards. [36.17]

Response:
Ambient air quality standards and thresholds stated in the EIS have been developed to protect human heath and are generally very conservative.

7.25 Comment:
Page 4-44, Section 4.5.5, Effects of Alternative B. The first sentence reads "Two alternative power plant sites are considered under Alternative B, which would be expected to have similar meteorological data and modeling results at most receptors." Although this statement is true, additional explanation should be given as to why. The text should also state that the alternative sites have similar topographic elevations, are in the same regional setting and have the same local wind and other climatic conditions influenced by the diurnal air flow in and out of the crater, as the proposed plant site and therefore are expected to have similar meteorological conditions and modelling results. [39.52]

Response:
The comment is generally correct, and section 4.5.5 has been modified.

7.26 Comment:
You really can't say it is "in attainment" of air quality standards because no monitoring has been done to establish this fact. You could say "it has not been identified as a non-attainment area." [54.12]

Response:
According to Merlyn Hough, former nonattainment area coordinator for the Oregon Department of Environmental Quality, all areas in Oregon which have not been determined to be nonattainment are assumed to be in attainment. Areas which have not been monitored for air quality are considered by the department as areas in attainment of all ambient air quality standards. It should be noted that, while monitoring has not been done in the area, based on the characteristics of local emission sources and the geographical area, the area is unquestionably in attainment of all air quality standards. The wording in the EIS has been modified to reflect this.

7.27 Comment:
Background assumptions in section 3.5.2.4 are not reasonable. Newberry is closer to an "urban" source than Crater Lake. Please give a reasonable range of background values that would represent Newberry. If CE is willing to assume that backgrounds are as you present them here, this should be clearly stated in the EIS. [54.40]

Response:
The Crater Lake data are the only air quality data available from a similar geographical, geological, and land use setting. While there will be differences between air quality at Crater Lake and Newberry Crater, the Crater Lake data provide the best estimate of the Newberry area background levels currently available. Baseline monitoring for PM_{10} and/or TSP will be conducted to refine the values for background data at the project site. The suggestion that Newberry

Crater is closer to urban areas than Crater Lake thus causing a difference in background values is difficult to assess since Crater Lake is within 80 km (50 miles) of both Medford and Klamath Falls which have historically had some of the poorest air quality in the state of Oregon. Newberry Crater, by contrast, is within 40 km (25 miles) of Bend. The next closest urban area is Prineville at approximately 75 km (47 miles). By comparison, the air quality in Bend and Prineville is better than in Medford and Klamath Falls.

7.28 Comment:
Were emission inventories from Deschutes County really used to estimate background levels? [57.12]

Response:
Calculations of background air pollutant concentrations were not based on the emission inventory data for Deschutes county. The emission inventory data did provide inferential confirmation that existing sources of air pollutants were identified and that the estimate of background air pollutant levels for the Newberry Volcano site was reasonable.

7.29 Comment:
Table 2 in the Appendix states that the radon standard is 4 pCi/l (Federal indoor air standard). This is the level at which the EPA strongly suggests remedial action be taken. This is different from a standard. Other professional groups in the United States suggest a 1 pCi/l limit for indoor air. By this comparison, the project's emissions will consume more than 1/8 of a suggested safety margin for protection from radon-caused lung cancer. This is a significant adverse impact. [36.23]

Response:
Baseline values of radon from naturally sources were estimated as being 0.13 pCi/l. Incremental increases in radon due to the proposed geothermal activities will be extremely small. For example, the incremental increase of radon activity at the nearest National Volcanic Monument boundary would be 0.000043 pCi/l. Hence, the projects emissions will add insignificantly to baseline values.

7.30 Comment:
The developer should mitigate CO_2 emissions by measures such as providing financial support for public transportation, tree planting, and residential energy efficiency measures which would reduce CO_2 emissions elsewhere. There is no documentation that construction of this project will displace other power plants producing more CO_2. [36.45]

Response:
A tree planting program, although not mandated by Oregon or Federal law, is being considered to offset CO_2 emissions from plant operations.

Table 4.5.3-4 contains detailed information regarding the CO_2 emissions expected for Newberry compared to other fossil fuel power plants.

The output of this project will be used to meet the needs of EWEB and BPA customers. BPA's "1993 Pacific Northwest Loads and Resources Study" (BPA 1993. DOE/BP-2294) forecasts electrical load growth under all but the lowest growth scenario. The preferred alternative in BPA's Resource Programs EIS (BPA 1993. DOE/BP-2074) is to emphasize conservation, but this is coupled with an emphasis on gas-fired combustion turbine resources. A recent analysis of

resource acqusition by Northwest utilities showed that between 1989 and 1994, negotiations were completed for 1,276.5 average MW of new resources. Natural gas-fired generation projects accounted for 84 percent of the total (Conservation Monitor, May 1994, p.4). If this trend continues, there appears to be at least an 84-percent probability that if the Newberry Geothermal Project is not constructed, its output will be replaced by new gas-fired generation emitting five to six times as much CO_2 per MW.

7.31 Comment:
The first sentence in section 3.5.2.6 should be in Chapter 4, not 3. In the second paragraph, replace "Some experts..." with "The vast majority of experts..." [54.42]

Response:
The first sentence in Section 3.5.2.6 pertains to the effect of plant construction and should be moved to Section 4.5.3.3.

Rather than "Some experts ...", perhaps an adjective such as "Many experts ..." would be more appropriate. A definitive statement, such as the one proposed by the commentor, should not be used without supporting documentation.

7.32 Comment:
Page 3-44, first paragraph. Some explanation should be given of why air quality conditions in Klamath Falls have improved dramatically. We understand that the improvement in air quality is largely due to the implementation of wood stove control regulations. [39.35] Since when have K Falls air quality conditions improved dramatically? [54.38]

Response:
The Oregon Air Quality 1992 Annual Report prepared by the Oregon Department of Environmental Quality (pages 8-10) describes the situation in Klamath Falls as follows:

"Klamath Falls had only one exceedance of the PM_{10} standard in 1992. In a national press release, EPA described Klamath Falls' remarkable success with respect to PM_{10}. The area had recorded concentrations among the highest in the nation with levels as much as 5 times greater than the standard and as many as 45 exceedances of the standard in one year. The high concentrations of PM_{10} were attributed to residential use of wood stoves and fireplaces. An aggressive public education program, coupled with a wood burning curtailment program, was initiated by the Klamath County Department of Health Services. Efforts by the local government and cooperation of the citizens paid off with the extraordinary 1992 record. Unlike previous years, the single exceedance recorded in 1992 was not associated with woodsmoke, but rather wind-blown dust. The cooperation of residents and local government is praiseworthy."

7.33 Comment:
Appendix F-2 does not evaluate the project's silica emissions in Table 2. [36.19] The DEIS does not assess the impacts from silica. Impacts to human health from silica should be assessed. What type of air emissions will this material generate during surface disturbing activities? This is a serious issue because silica is a probable carcinogen. [40.14]

Response:
There are several different forms of silica: both crystalline and amorphous. The

silica form from geothermal fluids is composed of greater than 99.9-percent amorphous silica. The acceptable ambient level (AAL) calculated from OSHA standards for amorphous silica is 20 $\mu g/m^3$. Based on the silica content of Medicine Lake total dissolved solids (TDS) (about 16 percent of TDS is SiO_2), the maximum amorphous silica impact at the nearest Monument boundary under maximum upset conditions can be estimated as 1.02 $\mu g/m^3$ which is clearly below the established AAL. This value is calculated from the maximum impact of total suspended particles (TSP) at this receptor.

The amorphous silica impact and AAL has been added to Table 4.5.3-3.

In addition to silica associated with the geothermal fluids, silica is naturally occurring in soils. Increased dust from project activities would increase atmospheric silica concentrations. The Mt. Mazama ash, which makes up the bulk of the soil at the project site, is similar to Mt. St. Helens ash. The National Center for Disease Control has analyzed Mt. St. Helens ash extensively and found it to contain up to 6 percent free silica (mainly cristobalite and free quartz). Free silica is known to cause silicosis in humans and animals. The National Center for Disease Control concluded that even if there were 5 to 10 percent free silica, the expected health hazard to people or animals is extremely small. Exposure to high dust concentrations over a period of years would be necessary before serious effects would be expected to occur.

7.34 Comment:
Page 4-26, Figure 4.5.1. Different cross-hatch markings should be used on this map in order to distinguish between the Newberry National Volcanic Monument and the populated areas of Sunriver and Bend. [39.51]

Response:
Figure 4.5-1 has been modified as suggested.

7.35 Comment:
Several errors are noted in Table 3.5-1. [52.8] Table 3.5-1. For PM_{10}, SO_2, and TSP: "24-hr increment" and 3-hr increment" are unclearly stated. More accurate: "increment for 24-hr max" and "increment for 3-hr max." For PM_{10}, 17 $\mu g/m^3$: delete the first "annual" in the line. For CO and O_3: add "max after "hour." For NO_2: replace "annual increment" with "increment for annual arithmetic mean." [57.1]

Response:
Table 3.5-1 will be modified to correct errors and to make PSD descriptions consistent with wording in OAR 340-31-110 Table 1.

7.36 Comment:
Numerous errors and omissions are noted in Table 4.5.3-2. [52.10]

Response:
Table 4.5.3-2 will be modified to correct errors and omissions. Significant Emission Rates (SER) for criteria pollutants from OAR 340-28-110(108) will be added. SER's for the Hazardous Air Pollutant Interim Program are also listed as they are used as a screening value to assess a facility's potential harmful health effects. If emissions are less than the SER then there is a reasonable certainty that no significant adverse ambient air impact will occur.

7.37 Comment:
Errors in Table 4.5.3-3 are noted. The table should include sensitive receptor areas as suggested [in comment 52.9]. [52.11]

Response:
Table 4.5.3-3 has been modified to include modeled data at the following receptors: (1) North Cove Campground and (2) Warm Spring Campground. Errors identified in "PSD Increment or AAL" column has been corrected.

7.38 Comment:
In the map on page 3-50, cannot distinguish the pattern for "proposed transmission line area" from "partial retention." The map should note the source of these visual zones. These zones do not seem consistent with the Forest Plan allocation of Semi-Primitive in this area. [57.2]

Response:
The source of the displayed visual zones is referenced in the text as U.S. Forest Service data. These classifications are consistent with the Deschutes Land Management Plan. The semi-primitive classification is a ROS inventory only and does not provide direction for these areas.

The "proposed transmission line area" and "partial retention" areas in the referenced maps do contain different fill patterns. Although quite similar, these patterns can be distinguished if studied carefully.

7.39 Comment:
Air quality baseline is in Appendix F-1, not E. It should be noted here that this is an assumed baseline, not a reflection of any baseline data collection for the Newberry area. [57.3]

Response:
No baseline data was acquired for the Newberry area. Appendix F-1 describes the methods and sources for estimating the background data of the Newberry area.

The EIS has been modified to reflect the fact that this is an estimated baseline and to reference the reader to Appendix F-1 for further information.

7.40 Comment:
Modelling fails to consider contributions of additional mercury from mineralized dust emitted by the project's activities, and mercury emitted by the additional engine exhausts from equipment and vehicles associated with the project. [36.22]

Response:
The mercury content of soils in the project area has been measured by the Oregon Department of Geology and Mineral Industries and reported to be below detection limits (i.e., less than 0.099 ppm). The mercury content of exhaust from diesel and gasoline engines is also very low. Mercury impact from dust and tailpipe emissions from the project will be insignificant.

7.41 Comment:
Venting of pollutants during emergency plant shutdowns may cause impacts to air quality, vegetation, and animals. No data is given on the frequency and length of such shutdowns elsewhere.[4.4]

Response:
Impacts due to plant upsets were modelled for all air pollutants at a number of sensitive receptors. With the exception of H_2S levels during the first hour of an unscheduled upset at the nearest sensitive receptor during worst case meteorological conditions all ambient air pollutant levels were found to be below standards and threshold levels at all other times and at all other locations. (The predicted frequency of occurrence is less than 0.014-percent of the time for the extreme H_2S exceedance case). Air standards and acceptable ambient levels have been developed to protect human health and the environment and are very conservative.

7.42 Comment:
The DEIS does not state how many water supply wells will be drilled, or estimate the length of time to drill these wells or describe the equipment and its air emissions to drill these wells. [36.4]

Response:
From one to three water wells will be drilled in the project area. These wells will be drilled with standard water well drill rigs from the local area. Air emissions from these drill rigs will be from their diesel engines. The wells are planned to be shallow (less than 366 meters [1200 feet]) and will take about one to two weeks to drill with the rig operating about 10 hours per day. Location of the water wells would require site approval by the US Forest Service. Air impacts from this activity will be localized and short-termed.

7.43 Comment:
Well drilling will produce significant amounts of SO_x and NO_x pollution. [36.5]

Response:
The source of NO_x and SO_2 associated with the drilling are the Caterpillar D-398 TA Engines. The D-398 Engines produce the electrical power used on the drill rig to run all the equipment.

The NO_x and SO_2 emissions from these types of equipment have been examined by the Great Basin Air Pollution Control District (APCD) for a similar geothermal facility in California and found to be acceptable. The drill rigs will use an average of less than 3,230 liters/day (850 gal/day) of low-sulfur fuel. Air impacts from this activity will be localized and short-termed.

7.44 Comment:
Project may violate emissions standards for beryllium. The DEIS fails to more closely calculate the predicted beryllium concentrations to assure that this standard is not exceeded. [36.18]

Response:
Since Beryllium will be in the particulate phase of emissions, it will impact receptors by a fraction of the TSP impact. This fraction is determined by the ratio of Be emissions to TSP emissions. From Table 1 of Appendix F-2, the Be emission rate is 9.75×10^{-7} g/sec and TSP emissions are 0.0445 g/s. The fraction of TSP

emissions which are Be is therefore 2.19 x 10^{-5} (or 0.00219 percent). The highest hourly impact of Be is then calculated by taking this fraction of the highest hourly TSP impact. While Table 2 in Appendix F-2 is correct in reporting the Be concentration to be less than 0.01 $\mu g/m^3$ the more accurate calculation discussed here shows that the highest hourly Be impact to be 0.00014 $\mu g/m^3$.

7.45 Comment:
DEIS cites conservative modelling as a way to downplay troubling mercury emissions data. Investigations of computer models has found they have a margin of error that may result in underpredicting pollution impacts by 50%. [36.21]

Response:
Predicted atmospheric mercury levels under extreme worst case conservative conditions are many times lower than the acceptable ambient level. Similarly, a more refined evaluation of the mercury impact on the Newberry Crater Lakes (Appendix L) has shown that under a great number of worst-case, conservative assumptions that the mercury impact to the lakes is many times lower than levels that will significantly impact human health or the environment. See section 4.3.3.6 in the EIS for further information.

7.46 Comment:
The analysis could be more useful if more attention were given to impacts during snow cover conditions. For example, deposition of air pollution assumes dry land for the most part. Snow cover produces a different recipient. Snow cover as it melts might convey the pollutants to a different area, perhaps concentrating them. [38.5]

Response:
The deposition factors used were for open lands, forested lands and open water. The fact that there is snowcover on the ground will not influence the factors which are appropriate for use. Since it was determined by the evaluation discussed in Appendix L that mercury will not be an issue in the Newberry Lakes after 50 years of plant operation and assuming all the mercury that impacts both watersheds will be deposited, solubilized, and reach the lakes, it is extremely unlikely that any localized concentration by snow melting will provide mercury concentrations at levels that will be considered environmentally unacceptable.

7.47 Comment:
Will constituents of the fluid become more significant air pollutants because of the high elevation? Is H_2S more perceivable in a thinner atmosphere? Coso's plant was used as a significant indicator. Plants near Reno or in Mono County provide a better indicator under more similar atmospheric conditions. [38.23]

Response:
Constituents of the fluid will not become more significant air pollutants because of the high elevation. Odor perception is a complex physiological process and it is difficult to predict the effect that the site's elevation alone will have on odor perception, other than the effect appears to be minor. If odor perception is assumed to be directly related to the number of molecules of a given chemical per volume of inhaled air, odor perception for a given mass emission rate for a pollutant will produce a less sensitive odor response at higher elevations than at lower elevations.

7.48 Comment:
Regarding Climate and Air Quality: Need to mention potential effects to

ecosystems. These could occur at levels much lower than those set for human health and welfare. [54.21]

Response:
All air quality standards, significant emission rates, and acceptable ambient levels provided for comparison purposes in the EIS represent the best current agreement as to appropriate values to protect human health and the environment. As such they are very conservative. It should be noted that with the exception of H_2S during the first hour of an unplanned plant upset at the nearest sensitive receptor under worst-case meteorological conditions (which is predicted to occur at less than 0.014 percent of the time) all predicted air pollutant impacts are well below these values, in most cases orders of magnitudes below them.

7.49 Comment:
It would be useful if the DEIS included an estimate of the cooling tower drift rate, the chemical composition and concentrations of the drift, and the general dispersion of the drift. [49.15]

Response:
The cooling tower drift rate would be approximately 2.4 mg/sec. (This rate is for suspended particles that would fall out within 500 meters [1,640 feet] of the cooling tower.) A complete discussion of cooling tower emissions, chemical composition, dispersion and impact are contained in appendices F-5 and F-7.

7.50 Comment:
If the facility plans to use stationary fuel burning devices (generator, space heating, etc.) they must be included in the ACDP application. Near the bottom of page 2-51, the DEIS references the use of petroleum. If these products are to be used in stationary devices, fuel usage must be quantified in order to estimate emissions. [52.5]

Response:
The reference on Page 2-51 is to the storage of petroleum products on site, which will be largely for transportation use. There will also be a back up diesel generator at the site for emergency power in case the plant loses all power. This generator will automatically start and provide power for critical instrumentation and motor control valves. The type of generator and the frequency of use and potential emissions will be described in detail in the ACDP application. It is anticipated that the generator will be used for short periods (2 to 6 hours) no more than 12 times per year. Actual use at Coso has been about 40 hours per year when there has been a loss of transmission line back feed and when supplemental power is needed during the plant overhaul which occurs every three years.

7.51 Comment:
DEQ will require, in its permit process, the development of contingency plans and, if practicable the use of controls during periods of high emissions, such as well testing and venting during upsets or when the plant is not operating. [52.6]

Response:
Comment noted.

7.52 Comment:
Although DEQ rules do not include nuisance limits for odors, such as those caused by hydrogen sulfide gas, it is expected that the ACDP would include conditions that would require that contaminant concentrations be maintained at

the lowest possible levels to prevent unacceptable odors at sensitive receptor sites. It is unlikely that the California odor standard, referenced in the EIS for hydrogen sulfide, would be an acceptable criterion to DEQ and thus we would not use this standard to define an acceptable limit for DEQ at this time. [52.7]

Response:
Comment noted. The California standard simply was used to provide a basis for comparison with predicted ambient H_2S levels as it is the most widely accepted H_2S standard and Oregon has no H_2S standard. It, of course, has no regulatory status in Oregon.

7.53 Comment:
We suggest Table 4.5.3-1 include potential receptor sites, outside the NNVM boundary, of maximum concentrations. This could include any known camping and trail areas that are likely to be impacted at greater concentrations than the Paulina Lake Lodge. A number of such receptor sites are described in Section 3.9 of the DEIS. [52.9]

Response:
Additional receptors at known camping and trail areas (from section 3.9) will be added to table. These receptors are (1) North Cove Campground and (2) Warm Spring Campground. While these sites are within the NNVM they provide additional insight into impact levels at camp sites near the facility. There are no other known campgrounds near the facility that are outside of the NNVM which are closer to the proposed facility than the campgrounds on the lake shores. Impacts at campgrounds further from the proposed plant site would be lower than the impacts calculated for these two campgrounds.

Winter Trail 64 passes through the project area and will likely be impacted to similar extent to that of the nearest monument boundary depending on distance from H_2S emission location.

Table 4.5.3-1 has been modified to include these receptors.

7.54 Comment:
It is false to say the "no unresolved environmental issues pertaining to the proposed action have been identified. The effect of air emissions is unknown because the composition of the geothermal fluid is unknown. As one example, it is not resolved whether the mercury deposition occurring during well venting and upset conditions will have detrimental effects to the fishery in the NNVM. [54.15]

Response:
Based on the current and best understanding of resource chemistry, the environmental history of geothermal development in other locations and the description of the proposed action, no unresolved environmental issues pertaining to the proposed action have been identified. In addition, there are contingencies discussed in the EIS to protect the environment in the unlikely event that the resource chemistry is outside the normal range that is typical for similar geothermal resources and what was evaluated in the EIS. The refined mercury evaluation for the mercury impact to the Newberry lakes indicates that no adverse impacts to fisheries will occur (Appendix L).

7.55 Comment:
Please show DEQ's current air toxic guidelines, instead of AAL's, if possible. [54.37]

Response:
There are no current DEQ air toxic guidelines. There are significant emission rates (SER) for hazardous air pollutants provided by DEQ under an interim program, which has not been adopted by rule. These have been provide in the EIS in Table 4.5.3-2. In addition, DEQ has established de minimis emission raties for certain hazardous air pollutants (OAR 340-32-130, Table 1). These rates apply only to major sources of hazardous air pollutants. The project will not be a major source of hazardous air pollutants, and the project's emissions will be several orders of magnitude below the de minimis emission rates.

7.56 Comment:
What is the difference, if any, among "hazardous air pollutants," "criteria pollutants," and "air toxics"? Need consistency of explanation. [54.39]

Response:
OAR 340-28-110 (24): *"Criteria Pollutant" means nitrogen oxides, volatile organic compounds, particulate matter, PM_{10}, sulfur dioxide, carbon monoxide, or lead.*

OAR 340-32-120 (23): *"Hazardous Air Pollutant" (HAP) means an air pollutant listed by the EPA pursuant to section 112(b) of the Federal Clean Air Act (FCAA) or determined by the Commission to cause, or reasonably be anticipated to cause, adverse effects to human health or the environment. Listed in OAR 340-32-130 Table 1.*

The term "air toxics" is not a regulatory term. It is generally used to refer to hazardous air pollutants (as defined above) and other pollutants that are in the atmosphere and more toxic than criteria pollutants.

7.57 Comment:
Section 4.3.3.6 needs to be expanded to include other potentially damaging toxics such as boron and arsenic. Discussions of these should also be included in the wildlife section of Chapter 4. [54.48]

Response:
Boron and arsenic impacts are discussed in detail in Appendix L. Section 4.3.3.6 has been modified to discuss boron and arsenic (see response to comment 39.47) as has section 4.12.3.6 (see response to comment 39.59).

7.58 Comment:
I am convinced that under normal operations the plumes pose no significant health hazard. This problem could be avoided entirely if the operators would simply suspend operations on those infrequent occasions that plumes and odors drift toward populated areas. Perhaps a monitoring system would be appropriate as a first step with an agreement to make operational changes if data indicated that odors are being carried into communities west of the site more than two or three brief periods in one year. Such plumes if extensive will have an impact on observatory operations in Sunriver. I would encourage the Forest Service to establish a monitoring system along the lines of similar systems in use to assess ongoing water quality at the Crosswater golf course. [56.3]

Response:
Suspension of operations is not feasible or warranted. Air quality and visibility impacts are insignificantly small under all meteorological conditions during the normal operation of the plant and under normal well testing scenarios. This is particularly true for the nearest populated areas of Sunriver and LaPine. Only during the initial stages of an unplanned upset might the odor threshold be exceeded at the nearest sensitive receptors (1.7 km [1.1 miles] to 5.3 km [3.3 miles] from the site) and might there be visibility degradation in the vicinity of the plant (out to 12.3 km [7.6 miles]). These two events would occur only if the upset occurred during worst case dispersion (meteorological) conditions. The frequency of visibility degradation occurring to 12.3 km (7.6 miles) from the plant is only 0.003 percent of the time and the frequency of occurrence of the odor threshold being exceeded at the nearest sensitive receptor is 0.014 percent of the time. Consequently an interactive monitoring program is not necessary to protect the air quality of LaPine (18 km [11 miles] west of the proposed site) and the air quality and visibility of Sun River (15 km [9.3 miles] west of the proposed site).

7.59 Comment:
Emissions of Hg, B, As, H_2S and other toxics need to be discussed for upset, as well as normal operating conditions. Possible effects during upset are not adequately addressed. Will these substances be removed from emissions during upset, or will they be vented directly to the atmosphere? It is unacceptable to vent toxic chemicals directly if technology can feasibly remove them or avoid venting altogether. This might require a dual turbine power plant. If so, the preferred alternative should call for one. [57.4] Venting steam directly to the atmosphere — through a well-head silencer or not — is objectionable in terms of potential environmental consequences. [57.14]

Response:
Emissions of Hg, B, As, H_2S and other toxics are discussed in detail for upset as well as normal operating conditions in Appendices F-2 and F-4. The upsets will not produce significant environmental or human health impacts due to their emissions. These substances will not be removed during upsets nor can upsets events be reasonably reduced in number by changing the plant design. Neither environmentally or economically sound methods are available to achieve additional reduction in venting emissions during upsets.

For example, adding additional turbines, or a by-pass system, does not reduce venting significantly as most of the venting upsets are related to the transmission system. Loss of the transmission system results in loss of power to run the condenser system (over 50 percent of the house load of 3 MW) and the emergency back up generators are designed to run instrumentation, fire control, and well head controls and not run the condensing system. A turbine by-pass would

provide very little improvement in venting control compared to the cost required. To be effective, a second transmission line would have to be supplied to the site to provide house power in case of a trip. A very large diesel generator could also provide the back up for the by-pass power requirements but this would only replace one emission with another type of emission and require larger fuel storage on site.

A dual geothermal turbine system (2 x 15 MW or 2 x 30 MW) is not a reasonable approach to reduce venting. As noted, venting most often results from the loss of the power transmission system. The power plant related upsets are often due to over pressure in the noncondensable gas control system or loss of circulating water pumps. An additional turbine does not relieve these most common causes of plant trips. In contrast, a second turbine would increase the opportunity for a plant trip. Installing a second turbine just for the purpose of decreasing plant venting would not be effective and the cost involved would make the project uneconomical.

The treatment of H_2S gas at the plant silencer or at the well field silencers would involve the use of peroxide or other chemicals. This would increase the need for chemical and hazardous waste transportation and is unnecessary given the assumed noncondensable gas flows.

7.60 Comment:
Section 4.3.3.6 needs to address potential effects of heavy metal/toxic deposition to terrestrial plants and animals, as well as to the lake ecosystems. It should be disclosed that little is known about this. [57.5]

Response:
See response to comment 45.8. As with mercury the atmospheric concentrations of other metals/toxic compounds are dramatically below air quality standards and acceptable ambient levels under normal plant and well field activities and consequently their terrestrial deposition and subsequent impact to the terrestrial plants and animals will be insignificant at all sensitive receptors. Section 4.3.3.6 has been modified to reflect this response.

7.61 Comment:
Good explanation of air quality modelling. Does the second full paragraph on page 4-25 mean that all pollutants in Table 3.5-1 were modelled? [57.13]

Response:
Yes.

7.62 Comment:
Reasons for removal of Hg include reducing harmful impacts to the environment, not just providing marketable by-products. [57.16]

Response:
Comment noted. Section 4.5.3.1 has been modified accordingly.

7.63 Comment:
Page 4-118: Last sentence of fourth paragraph is unclear. Does "boron levels" refer to ambient air concentrations? Sixth paragraph" Please give Hg and As levels in micrograms per cubic meter, not just ppm, so they can be compared to the AALs in Table 3.5-1. [57.22]

Response:
The 100-ppm boron level and the 1-ppm value for mercury and arsenic refer to concentrations in the cooling tower water. These concentrations can not be converted into $\mu g/m^3$ in air since they refer to concentrations in water. It is not valid to compare these values to AALs. Section 4.11.3.5 has been clarified.

7.64 Comment:
Section 4.3.6 says mercury levels in Paulina and East Lakes "could" be monitored and mitigation measures "could" be implemented if rising mercury levels are detected in lake waters. The proper terminology needs to be "will." [58.5]

Response:
Words like "could" and "would" imply a contingent condition, in this case approval of the proposed action or an alternative. They were deliberately used throughout the draft EIS to avoid implying that approval of the project is a foregone conclusion and also because the EIS is not a decision document. The Records of Decision are where decisions about the project will appear.

Monitoring of water quality for mercury in East and Paulina Lake will be conducted. Section 4.3.6 will be changed to reflect this. Proposed changes are included as part of response to comment 39.47.

7.65 Comment:
There are also concerns and questions regarding emissions during well venting (for periods up to 90 days) and upset conditions. [58.6]

Response:
The air quality impacts due to well venting have been modeled and discussed. See appendices F-2 and F-4.

8 Visual Resources

8.1 Comment:
Geothermal activity could destroy the beauty of Newberry Crater. [1.2] It will cause visual pollution. [8.5]

Response:
No facilities will be located in Newberry Crater. The analysis in section 4.6 of the EIS indicates the plant site facilities and activities will not be visible from any Key Observation Point (KOP) except Paulina Peak. A steam plume may be visible from a limited number of KOPs at certain times of the year and when wells are being tested. Additionally, the majority of KOPs that view the steam plume are from a distance which significantly reduces the image size, therefore making it subordinate to the characteristic landscape.

Mitigation measures will be taken to reduce the project's visibility. These measures will include siting facilities to maximize topographic shielding and painting the facilities in a way that helps them to blend with the landscape.

8.2 Comment:
Lights from the project may affect views of celestial objects at night. Urges measures be taken to minimize amount of lighting used and to avoid impacts on peoples' ability to view the night sky. [18.1] All lights at the project should be shielded. [35.27] I don't want to see the magnificently dark night skies drowned out by the nearby glow of the proposed power plant. [47.2] The light sources used for site illumination must not be visible from beyond the limits of the site's defined boundary. This requirement would extend to lights mounted on drilling platforms, except those lights necessary for air navigation safety. Such platforms would not meet the present criteria for temporary exemption. [56.1] A major source of sky glow is surface reflection of light. To lessen these effects I would recommend the use of low or non-reflecting surfaces for structures erected on the site. Because of snow at the site, I would further recommend that the grounds around the site be landscaped with multiple species of natural vegetation differing in heights. This will break up smooth surfaces and reduce reflection directly above the site. Low pressure sodium lights are extremely energy efficient and are appropriate for this project. [56.2]

Response:
The power plant is enclosed in a building, and the majority of night lighting requirements for operation and maintenance are enclosed in buildings. Outdoor lighting for other plant operations will involve low pressure sodium lights that will be shielded and directed to shine down and into the plant operating area. A lighting requirements study will be conducted by CEE as part of the detailed design of the power plant. Minimizing excess light glare within safety standards will be a design criteria.

Outdoor lights in the cooling tower stairwells and other equipment area separate from the power plant building will be switch controlled. Photo voltaic switch controlled low pressure sodium lights will be used at the plant entrance, parking, and walkway. These lights will be shielded and will use state of the art low glare lights. Maximizing natural or landscaped vegetation screening in strategic locations will also assist in controlling direct and indirect light.

In the well field, lights will be switch controlled and will use low glare sodium or incandescent lights. All well field maintenance lights and flood lights for major night overhaul work will be switch controlled and use will be very infrequent.

Drill rig lights will be temporary in nature and the intensity of the lights is often directed by safety requirements. Drill rig lights will use low intensity lights whenever practical within safety requirements. Drill rigs operate 24 hours a day and lighting in the upper areas of the mast near the upper work platform and crown block will require some degree of lighting which will be visible above tree tops. Night flood lights associated with the drill rig will be shielded and directed to shine away from sensitive areas and down into the operating area.

8.3 Comment:
Visual depictions should include pictures taken from the plant site in the direction of the KOPs. [30.4] Is it possible to include some pictures from the plant site to some of the other visual points referenced in the document? [35.6] There was one photo mosaic of vegetation from the air. Ground level pictures would help laymen to understand the vegetation categories. Ground level pictures of a plant site and a well pad would help us get a better feel of the sites. Most of your reviewers have not had the benefit of a tour to the project site. References of the site being below

the rim and lakes would be more understandable with pictures from the site towards the caldera or Paulina Peak. [38.22]

Response:
Ground level photos from plant site 1 have been added to the EIS.

8.4 Comment:
It is not clear how the visual simulations were done. Additional information/clarification on methodology for preparing them is needed. [35.5] Most of the plume simulations were of summer conditions. The plumes would be more prominent in winter. Is the lower atmospheric pressure at higher elevations going to lead to more noticeable plumes? Was altitude taken into account in the simulation? [38.14]

Response:
Section 4.6.2 has been rewritten to provide greater detail on the visual simulations. The formation of steam plumes is mainly a function of temperature and relative humidity. Plume size increases as temperature drops and humidity rises. That is why plumes are more visible in the winter. The winter simulation from Highway 97 (Figure 4.6-12) is believed to provide a good sense of plume visibility on cold, clear winter days. Clouds and snow cover typical in the winter tend to obscure the plume. Winter cloud cover at elevated points like Paulina Peak and Mt. Bachelor also tends to reduce visibility from those areas.

Plume size was predicted using a model developed by the Argonne National Laboratory for the Electric Power Research Institute. Elevation is one of the input parameters. More information on the plume modeling has been added to the appendices to the EIS.

8.5 Comment:
Would like a photo simulation from Mt. Bachelor. [35.8]

Response:
Adverse weather conditions prevented the preparers of the EIS from being able to obtain photographs for use in a photo simulation from Mt. Bachelor. However, simulations from other viewpoints are provided. Even though they are from points closer to the proposed project area, they provide a good idea of what the project might look like from Mt. Bachelor. Newberry is not one of the major views from Mt. Bachelor, and a plume would be less visible during the winter because it would blend in with snow and would often be obscured by clouds. This is illustrated by Figures 4.6-11 and 4.6-12. On clear blue days, however, it would be more easily noticed.

From the summit of Mt. Bachelor, there are many spectacular views of lakes and Cascade Mountain scenery in directions other than to the east towards Newberry. Newberry is not one of the major views from Mt. Bachelor. In the summer months when interpretive talks are conducted at the summit for Forest visitors, the steam plume, when it is visible, could be pointed out to the visitors and be an example of multiple uses on the Forest as well as a feature which demonstrates the volcanic nature of the area. In winter, skiers are not usually looking in the direction of Newberry, because they are mostly focused on other more dramatic scenery from the summit and on skiing down the mountain.

8.6 Comment:
Page 4-62. Figure 4.6.8. This simulated view of the proposed project during

summer apparently shows a steam plume from well venting. The label on the photograph should make it clear that this is venting from a well and not from the power plant. [39.55]

Response:
The power plant and well plumes have been labeled in all of the visual simulations to make them easier to interpret.

8.7 Comment:
The visual resources section should provide a close-up view of a geothermal site. A 1975 reference is cited that describes the ugliness of a geothermal plant. If this picture describes the potential situation at Newberry Volcano, the public deserves to know. [40.15] The color photographs showing facilities at similar geothermal plants and the anticipated visual impacts from the proposed project were very useful. [49.4]

Response:
A photo of a geothermal plant is provided in section 2.4.1.2 of the EIS. An artist's depiction of the proposed plant is provided in section 2.4.1.3.

8.8 Comment:
On page 4-52, the turbine building height is stated as 65 feet, and on page 4-55 the height is stated as 75 feet. Verify actual height and edit document. [35.7] Page 4-52, Section 4.6.3.1, Plant Site. The second sentence states that the tallest structure would be 65 feet high. This is incorrect. The structure is 75 feet tall, see page 4-55, Section 4.6.3.6 and the plant elevation drawings at Figure 2.4-11 on page 2-33. [39.54]

Response:
The EIS has been corrected.

8.9 Comment:
Page 3-48, Table 3.6-1, VQO. Table 3.6.1 is difficult to understand. The table should be just an inventory of existing conditions in certain areas The table suggests, however, that there has been an analysis of the visual impacts of the proposed project facilities. Impact analysis belongs in Chapter 4, not in Chapter 3. [39.37]

Response:
The parts of section 3.6.4 relating to project impacts have been integrated into section 4.6.

8.10 Comment:
The Draft EIS states several times in various places that the general condition of the proposed development area is fragmented by areas of clear-cuts and is generally characterized by diseased and dying stands of trees. CEE recommends that the Draft EIS contain a more thorough discussion of the visual impact that the clear-cuts and the diseased trees have on the area's existing visual resources. The current discussion in the Draft EIS treats the visual impacts that the proposed geothermal project will have on the visual resources without a complete discussion of impact the existing clear-cuts and diseased trees already have. [39.6]
Response:
The area in and around the proposed project area has been influenced by commercial timber harvest and natural factors such as lack of fire, insects, and disease. The existing visual characteristics currently include patterns of clearcuts

and partial cut units, roads, and dead, down, or dying stands of lodgepole pine. Refer to Section 3.6.4 and figures 3.6-2, 3.8-2, and 3.11-1, for a representation of the present visual attributes of the area. The visual analysis of the proposed project took the current situation into consideration when evaluating how the facilities might change or blend into what currently exists. The analysis indicates that the facilities and site disturbance, with proper placement and mitigation, is indeed within the Standards and Guidelines and intent set forth in the Deschutes FLMP (as amended) for the Management Allocations MA-8 (General Forest) and MA-9 (Scenic Views) for the project area. (Refer to the 1990 Deschutes FLMP and Forest Plan Interpretations No. D-94-1 and No.D-94-2).

Although it is clear that the on-the-ground facilities are consistent with the FLMP, the Standards and Guidelines did not specifically address steam plumes. It was not clear whether or not the steam plume itself would be consistent with the Forest Plan, when viewed from Paulina Peak. The determination of the Forest Interdisciplinary Team Leader is "Since steam plumes are part of the geothermal development and they commonly appear above the average tree heights, the Standards and Guidelines should be amended in the Forest Plan to allow Geothermal Steam Plumes to exceed the Partial Retention Standard." This amendment is being made to the Forest Plan through the U.S. Forest Service ROD for this EIS. This amendment is being proposed as part of the analysis and decision for this EIS.

8.11 Comment:
Page 3-48, Section 3.6.3. In Section 3.6.3, the Forest Service's visual resource work for the Deschutes National Forest is described. We understand that the visual resource inventory completed in 1976 was extensively revised before the final Deschutes National Forest Management Plan was adopted in 1990. If this is true, reference should be made to the updated and revised inventories. [39.36]

Response:
The visual analyses for the geothermal proposal reflects information from the 1990 Deschutes FLMP, and describes the Visual Quality Objectives currently applied to management of the area. This information has been added to section 3.6.3 of the EIS.

8.12 Comment:
Page 3-48, Table 3.6-1, VQO. Please check the source of the Visual Quality Objective (VQO) standard. We believe this standard is established by the Forest Plan. The footnote should reflect that the VQO is a Forest Plan objective. [39.38]

Response:
The VQO in the Forest Plan Standards and Guidelines refer to the Visual Quality Standards Map published with the FLMP. These are considered as inventory maps and do not provide direction unless specifically referred to for specific Management Areas. The Management Areas of the project area are not included in this group. (Reference Forest Plan Interpretation No. D-94-1. Table 3.6-1 has been modified to include this information.

8.13 Comment:
By focusing on the visibility of the steam plume from several long-distance vantage points, the document also fails to address the visual impacts to recreational users of the National Monument and surrounding area who may be considerably closer. To suggest that "the plume will attract occasional visual interest from hikers..." and that during decommissioning "the steam plume would

be eliminated creating some change in visual diversity..." is fatuous and condescending to those who value the relatively pristine nature of Central Oregon. [48.2]

Response:
As noted in section 4.6.3, except for the steam plume, most project facilities would not be visible from most visual receptors or sensitive visual resources. Visual impacts of the steam plume are emphasized because it will be the most visible feature of the project. Many of the Key Observation Points shown in Table 4.6-1 are within the NNVM.

8.14 Comment:
It would be useful if the DEIS identified and described any adverse impact to visual or scenic areas that have been identified as important or significant in the acknowledged local land use plan for the site and vicinity. [49.16]

Response:
The EIS has identified Key Observation Points (KOPs) (see section 4.6), which includes areas that are considered to be significant, have important visual values for the area, and could be potential effected by the proposed project. Twenty sites (KOPs) were determined to be significant and applicable for this analysis. Even though Federal laws and regulations govern the management of National Forest lands, there are provisions which afford other entities, including state and local governments the opportunity to participate in Federal land management planning as well as project planning. The EIS preparers considered key sites in the central Oregon areas on which the proposed project could potentially have a visual impact — whether they were on or off the Forest — and believe that the key areas have been identified or described.

9 Noise

9.1 Comment:
It will cause noise pollution. [8.4]

Response:
Noise pollution is discussed in section 4.7 of the EIS.

9.2 Comment:
Concerned about noise caused by condensation in gathering system piping. [29.7]

Response:
Noise along pipelines is attenuated by insulation. Separation of steam and fluid in the well field tends to limit the amount of condensation in the steam line which reduces the potential for noise caused by condensation in the gathering system. Noise levels along pipelines are highest near valves which are well below 90 dBA immediately adjacent to the pipeline and valves and well below 65 dBA at 30 meters (100 feet) from the pipeline.

9.3 Comment:
Page 3-49, Section 3.7. We have no suggested changes to this section, however, we do wish to point out that SAIC did record six months of background noise levels at the project site, at the Monument Boundary along the snowmobile trail, and at Paulina Lake Lodge near the bridge over Paulina Creek. SAIC took the

readings approximately every two weeks when they changed the data tapes at the weather station. The information was provided to the US Forest Service with the quarterly reports from SAIC. [39.39]

Response:
Comment noted.

9.4 Comment:
The noise level produced by the operation is estimated at 65 decibels, which is a roar. Located on the side of the mountain the sound could travel a great distance. Therefore when the project is in operation and the noise is a deterrent to the area we would like the requirement of silencers be installed at the well heads. [46.3]

Response:
The project plans call for silencers at each well pad during drilling, well testing, and operations. A silencer is also planned for the power plant steam venting. The BLM rules for geothermal operations are that noise levels in general will not exceed an equivalent sound level (Ldn) of 65 dBA at a distance of 0.80 km (0.5 miles) and will not exceed 65 dBA at the lease boundary. Estimated noise levels for the operations are discussed in Section 4.7 Noise of the EIS. See Table 4.7-2 and Table 4.7-3 of the EIS for evaluations of impacts at various locations. As shown in Table 4.7-3, the predicted sound level at the lease boundary is 45 dBA and sound levels at other receptors are between 5 and 28 dBA. It should be noted that SAIC recorded six months of intermittent sound level recordings in the project area. The lowest sound levels recorded were in the high twenties dBA. Most typical, however, were readings in the mid-thirties to low forties which occurred when slight breezes blew through the trees. Surrounding trees and the varied topography of the area will help shield the noise of the operations.

9.5 Comment:
In addition to the requirements described in Table 4.7-1, the DEQ rules limit new noise sources from increasing the preexisting ambient sound level by any more than 10 dBA in the L_{10} and L_{50} descriptor during any one hour of the day or night. Note that Table 4.7-1 is incorrect in that it refers to this rule as applying to the L_1 descriptor (it only applies to the L_{10} and L_{50} descriptors) and also shows that the regulation allows compliance with the ambient increase rule or the absolute limits. In fact, the facility must meet both rules. It is not clear that the DEIS adequately evaluates the ambient increase rule as it is likely that existing ambient levels of approximately 20 to 25 dBA could be measured during periods of the nighttime. If this is the case, the facility would need to comply with a limit of approximately 30 to 35 dBA and Section 4.7.4-1 should contain an evaluation of this requirement. [52.12]

Response:
Oregon regulation OAR 340-35-035(B) states that both the ambient increase rule and the absolute limits must be adhered to. Table 4.7-1 does include the ambient increase rule but is awkwardly written and will be clarified in the EIS.

9.6 Comment:
It seems that you are making the assumption that noise only affects people inside the Monument. Give quantitative estimates at a range of distances from the plant. [54.22]

Response:
The intensity of sound waves drops off as the inverse square of the distance from

the source. With no attenuation other than the spherical radiation of the sound waves, this equates to about a 6 dB decrease each time the distance to the source is doubled. Natural attenuation does occur and will decrease the sound level even further. It is unlikely that noise will be significant outside an area of about 5 km (3 miles) from the proposed plant.

9.7 Comment:
Statements about what is "significant," especially concerning noise levels during construction, are highly subjective. The word "significant" should be better defined. [57.25]

Response:
The term "significant" appears appropriate based on the evaluation of the available quantitative data as presented in the EIS.

10 Land Use

10.1 Comment:
We are cautious about geothermal development, which represents an industrial intrusion on rural public lands. [38.1]

Response:
Geothermal development is new to National Forests in central Oregon. However, exploration activities have taken place on the Deschutes National Forest in the past. The area surrounding the proposed project can be considered rural, but is typical of most areas within National Forests. The Deschutes National Forest is managed for many different uses, and mineral leasing and development for geothermal resources is one of the authorized uses in this particular area, as analyzed through Forest planning and acknowledged by the NNVM Legislation. Facility design, as described in Chapter 2, with specified mitigation measures, will help make this project be as unobtrusive to the surrounding environment as possible.

10.2 Comment:
Opposes the project because it is an industrial activity that conflicts with the current primary use of the area, recreation. [32.2]

Response:
As stated in sections 3.8 and 3.9 of the EIS, the primary use of the project area is timber production with some occasional dispersed recreation use. The current primary use is not recreation. The Forest Plan allocations governing this area specifically allow for development of geothermal resources.

10.3 Comment:
It would be useful if the DEIS identified and described any visual or scenic areas that have been identified as important or significant in the acknowledged local land use plan for the site and vicinity. [49.12] It is not clear if the proposed project is consistent and/or complies with the statewide planning goals or acknowledged local land use plan for the site. It would be useful if the DEIS addressed this issue. [49.17]

Response:
As stated in section 4.21, the proposed project is consistent with State and local plans. This issue is also addressed in section 3.8. Whereas Federal laws and regulations govern the management of National Forest lands, there are provisions

which afford other entities, including State and local governments the opportunity to participate in Federal land management planning. Local and State governments have been involved in the preparation of the Deschutes LMP (1990) which provides for geothermal activity in this area, and in the EIS process for this particular geothermal proposal. State and local governments, particularly those which have permit authorities for project implementation, will continue to be included in this project. The project will comply with any applicable State and local permit authorities.

10.4 Comment:
The DEIS states that the project is consistent with both DNF LMP and NNVM legislation. I don't understand how siting an industrial facility is consistent with a Semi-Primitive ROS class. The EIS should admit that the land allocation (or at least the existing semi-primitive setting) will have to be changed in the next revision of the Forest Plan. [54.7] Hunters and snowmobilers are not the only recreationists conceivably affected by the project. In any case, the recreation experience would not be "semi-primitive," as it is now. An industrial facility is not consistent with a semi-primitive experience, and this should be disclosed openly. [54.23]

Response:
The ROS (Recreation Opportunity Spectrum) is not a management allocation but an inventory of the broad categories of recreation opportunities on Forest lands. It provides an indication of the kind of experience a recreationist is likely to find in an area. Management area standards and guidelines determine ROS target categories. In the case of the Scenic View Management Area (M9), the ROS target category is normally Roaded Natural. The ROS map in the Forest Plan depicts an inventory and not an allocation. It is an inventory that classifies the type of experience the land is currently providing. That does not mean the classification cannot change if the type of experience the land is providing changes.

Section 4.9.3.1 discusses ROS designations. In this analysis, the project with its mitigation is determined to be consistent with the Roaded Modified or Semi-Primitive Motorized ROS designations described for the project area. The EIS recognizes that the project is consistent with the Deschutes National Forest Land and Resource Management Plan (as amended) allocations that it falls into, which are: M8 - General Forest and M9 - Scenic Views.

10.5 Comment:
Page 3-56, Figure 3.8-1. The map should show the management areas under the forest plan for the entire area shown on the map, not simply the proposed project areas. Otherwise, it is difficult to determine the impact on surrounding areas. [39.40]

Response:
The commentor is referred to the Deschutes National Forest Land Resource and Management Plan for further information about management areas.

10.6 Comment:
Page 3-59, Section 3.8.3. This section does not address the preferred alternative of the NNVM management plan and should be expanded to show the interrelationship between the NNVM Management Plan, adjacent geothermal development, and the use of the Special Management Areas, KGRA lease sales, and other special provisions of the Act. Specifically, this section should address the special relationship set forth in the Monument Act between the Secretary of

Interior and the Secretary of Agriculture with regard to implementation of the Geothermal Steam Act. [39.41] Page 3-59, Section 3.8.3. This section states: "The NNVM Comprehensive Management Plan EIS recognizes this geothermal pilot project proposal." An explanation of what "recognizes" means should be provided. [39.42]

Response:
The preferred alternative for the NNVM Management Plan was not specifically addressed because that Plan was being prepared concurrently with this EIS. Ongoing coordination during preparation of the two documents did occur to ensure that it is not in conflict with any of the potential alternatives that could be selected. Although the NNVM Legislation is referenced in the EIS, it is not described at length. Section 4.21 has been expanded to include a more useful summary. Readers should refer to the NNVM EIS and Comprehensive Management Plan and the Legislation for more information.

The Monument Act gives the Secretary of Agriculture authority to regulate all surface disturbing activities conducted pursuant to any geothermal lease issued under the Monument Act, i.e., leases located in the Special Management Areas (no surface occupancy areas). The Secretaries of Agriculture and Interior share responsibility for managing the Transferal Area, where surface activity for geothermal is allowed.

A section on the Monument Act and how it relates to the geothermal project has been added to section 1 of the EIS.

11 Recreation

11.1 Comment:
Would like a sno-park to be located in the general area of the FS 9735 junction with Road 600. [5.6] Should be more specific about possible snopark and impacts that may result from it. [30.3] More detail is needed regarding the proposed sno-park. Will it conflict with other land use goals specifically related to the NNVM? [35.2] The addition of a sno-park [should be mentioned in Table S-2]. [54.24] No additional recreation development and access (including snowparks) should be associated with this project. The potential geothermal development impacts are so large that they must be seen before any collateral use/development is allowed. [41.16]

Response:
A snow park for winter recreation is being considered as an opportunity to take advantage of additional winter access for dispersed use into an area that already receives some dispersed winter recreation use. Although the geothermal project proposes such a development with funding contributions by CEE, approval would only be considered after further analysis and consideration, and in the context of the recreation program on the Fort Rock District. Specific details or effects of this type of development are not being analyzed with the geothermal proposal.

Table S-2 provides a brief summary of effects for comparison of Alternatives A and B. It is not intended to be all-inclusive. Readers will find discussion of the snow-park in sections 2.4.2.6 and 4.9.5 of the EIS.

11.2 Comment:
No access to snowmobiling, or any other sport in the area, should be affected. [5.4]

Response:
Access for sports and recreation will not be curtailed from current levels. In the case of snowmobile trails No. 2 and 64, the trails will be rerouted if geothermal development hinders continued use.

11.3 Comment:
This area seems to have the potential for development as a winter recreation site. The geothermal plant would conflict with this. There is potential conflict with the present use, as well, via surface and atmospheric pollution. [31.12]

Response:
The project area has no designation which would indicate the potential for development of a winter recreation site. It does presently receive dispersed winter recreation, and this is expected to continue. To the east of the geothermal project is the NNVM, which is being managed for existing and future winter developed recreation uses. No conflict is predicted.

11.4 Comment:
Will the proposed bridges for snowmobiles over the steam pipelines present a hazard when there is no snow? [35.1]

Response:
If any bridges are constructed, they would be all-season structures and designed to not be a hazard to snowmobilers or facility maintenance operations. Most likely, there will be vertical expansion loops in the pipeline allowing for passage of snowmobilers and others under these loops year-round.

11.5 Comment:
We wonder if your study has sufficiently addressed the conflicts that will be likely when hunters, snowmobilers, timber crews, mushroom pickers, and casual forest visitors enter into the project area and encounter surface piping, maybe superheated, industrial-type sites, and industrial roads. [53.4]

Response:
The pipelines will be heavily insulated to prevent heat loss and wrapped in very tough material for protection. The pipelines can be touched with the bare hand, and although they may feel warm, there is no danger. The pipelines can also withstand gunfire without rupturing. If vandalism becomes a problem, then access to pipelines may need to be restricted. With adequate opportunity to get around pipelines, and limited roads and trails to pipeline areas, conflicts with other forest users are not expected to be a problem in this area.

11.6 Comment:
No data given on current level of hunting. [The commentor appears to be concerned that new or improved roads will result in more hunters in the area, which will have impacts on wildlife and plant site safety.] [30.2] Baseline data on hunting seems minimal. Is there more information available about current use of the area for hunting? [35.3] Road closures could be done/enforced in the area of the plant during hunting season. [35.4]

Response:
There is no baseline data available regarding the number of hunters and activity specific to the project area. ODFW collects hunter data on a broader Game Management Unit basis only. In general, it has been observed that the area currently receives limited dispersed hunting use. This can be attributed in part to the fact that there is limited access to the area

Generally speaking, human activity in the area could increase due to road improvements and additional roads being constructed to facilitate project operations. However, roads to the facilities would be limited to official use only, and would not be open for unrestricted public access. Decisions concerning which roads are open or closed during hunting season will continue to be evaluated in cooperation with the ODFW and the Deschutes NF, as they are for all other areas on the Forest.

Currently there is no cooperative road closure program (such as the Green Dot system) between the Forest Service and Oregon Dept. of Fish and Wildlife in this area Should the need arise, road closures during hunting seasons could be implemented in the future. There will continue to be coordination with ODFW on this issue in this area, as well as with other areas of the Forest.

11.7 Comment:
The main access road and spur roads to well pads would be snow-plowed in winter. What impact will this have on winter recreation, particularly snowmobiling and cross country skiing? A snow park near the project would seem to conflict with the intention to plow roads. Are snowmobiles confined to roads? Why locate recreation access close to an industrial site? [38.12]

Response:
Plowing of the roads could provide additional winter access to this area, mostly at the higher elevations that would tend to be above the snow line. Without additional trails or developed facilities however, it is expected that additional use would be limited to occasional dispersed use, which the area presently receives. If a snow park is developed, after additional analysis and approval, it would be at a site accessed by the plowed road, and would allow dispersed winter recreation use over snow (such as access to trails) from that location. An industrial facility in the area would not preclude such recreation use, and could actually provide opportunities for interpretation of the geothermal facilities.

11.8 Comment:
How was the conclusion made that there will be more game in the area as a result of the development? Furthermore, were hunters surveyed to determine if they prefer hunting in an industrial area rather than a primitive or semi-primitive setting? [58.14]

Response:
There is no specific basis for a conclusion that there will be more game in the

area as a result of the project development. However, observations from other geothermal plants, such as Coso and Mammoth Lakes, indicate that big game animals do use areas around the facilities. This may in part be attributed to site disturbance which creates new forage areas, and travel corridors along pipelines and transmission lines which may make short distance travel easier. Additional water sources that are provided as mitigation may encourage use of the area. Hunters were not surveyed. Section 4.9.3.1 has been revised to remove the implication that increased game is an expected consequence of the facility.

12 Transportation and Traffic

12.1 Comment:

DEIS should address whether some roads that are presently open will be closed to public access when the plant is built. Clarification/explanation of Forest Service policy regarding road closure would be helpful. [35.19]

Response:

This is discussed in section 4.10.3.3 in the EIS. The intent is that roads that are currently open will remain open, and any use restrictions or Forest policy applications will continue to be considered, applied, and administered. However, as mitigation, public access will be restricted on roads leading to the power plant and well pads, as the EIS states. Any new roads leading into the roadless area will be closed to public use. Closed roads would be signed and possibly gated. This mitigation measure will be added to section 4.10.6.

12.2 Comment:

The increase in vehicular traffic on the two roads that flank the west side of the monument is a concern. If and when geothermal drilling takes place, the traffic conflicts [with existing cattle grazing in the Sugarpine C&H grazing allotment next to the NNVM] will increase dramatically. [37.1]

Response:

Traffic use may increase on the west flank whether or not geothermal activity takes place. Vehicles associated with the project will be required to adhere to speed restrictions and to be cautious of other road users and livestock. Any problems due to improper road use by project employees or associated workers can be dealt with through the operator, if necessary. The Fort Rock District will take these concerns into consideration and continue to coordinate with other Forest uses in the course of continuing to manage the Sugarpine Allotment.

12.3 Comment:

If Vulcan and CEE exploratory drilling programs south of Paulina Creek coincide, traffic on Road 21 could become a problem, when combined with recreation traffic. We recommend the alternative routes via Road 22, 2215, and 2225. [44.16]

Response:

No drilling program by Vulcan has been approved or is currently under consideration. Whether or not Vulcan's project coincides, the FS will not want to use Rd. 21 as a primary access for drilling activity. Alternate routes will be designated. Section 4.10.6 has been modified to reflect this.

12.4 Comment:
Why is it necessary to detail which roads will be used [since other hazardous materials are already being transported on most roads]. [35.16]

Response:
The roads are described to provide information about the project, which is of interest to some readers.

12.5 Comment:
How will brine be transported to what suitable offsite locations and in what amounts, and how often. [36.34]

Response:
Brine will not be transported off site. As described in section 2.4.1.4 of the EIS, it will be injected back into the geothermal reservoir.

12.6 Comment:
As transportation impact mitigation measures, all employees should ride company-sponsored busses to work, project roads should be paved at the developer's expense, no more than two wells pads should be constructed simultaneously, and no more than one well should be tested at one time. [36.42]

Response:
As indicated in section 3.10.3, average daily traffic count on Road 21 alone was 327 vehicles in 1991. A count of 200 is usually the threshold for considering a double-lane roadway. As stated in section 4.10.3.2, average daily traffic during the construction period of the project is expected to be 20 trips per day, well below the threshold. This is on the order of a 5-percent increase in the average daily traffic count for all Forest roads on the west side of Newberry. The impact will be temporary. Transportation impacts will certainly be no greater than those caused by past logging operations in the same area. Therefore the suggested transportation mitigation measures are not considered necessary for transportation related impacts from the project at this time. The decision to pave a road will depend on considerations such as smoothness required and maintenance needs, and will be consistent with Forest policy on road and travel management.

12.7 Comment:
The construction of the new 500 road connector is also in question. Why do both road 500 and 600 have to be used as access? The decision should be made to use one or the other. If 600 poses problems for access, then it should be obliterated. Construction of the road 500 connector should be avoided if at all possible. [58.15]

Response:
The comment refers to Figures 4.10-1 and 4.10-2. Road 500 would be used as the primary access to the facilities for Alternative B, and would be restricted to public access. Road 600 would continue to be part of the Forest Service road system, and would continue to access other portions of the general area.

13 Vegetation, Timber, Forest Health

13.1 Comment:

Project will destroy old growth forest. Facilities are only being developed in unlogged areas. [27.1]

Response:

No designated old growth areas have been identified within the project area, except in the "no surface occupancy" area that will not be disturbed by project facilities (see Figure 3.8-1). Mitigation to avoid mixed conifer stands, especially those containing older trees, will be applied where possible. Siting flexibility provided in Alternative B will give the agencies the opportunity to authorize facility siting in previously disturbed areas as much as possible. The intent is to avoid unlogged areas and use areas which have already been harvested or have dead trees.

13.2 Comment:

Page 4-95, Section 4.8.3.2. Section 4.8.3.2 estimates that 166,100 board feet of timber could be harvested from the proposed project area as a result of the project. This timber volume number was estimated based on an assumption that the entire area is forested at the same density as the Fish Hook timber sale in the western project area. Some of the timber has already been removed. We request that this estimate be clarified. Timber that is removed will be salvaged and is expected to be less than 160,000 board feet of dead lodgepole pine. Mixed conifer stands will be avoided whenever possible. [39.56]

Response:

The timber volume estimate discussed in section 4.8.3.2 of the DEIS is in error. Using 30 cubic meters per hectare (5100 board feet per acre) times 119 hectares (295 acres) equals 3,500 cubic meters (1,500,000 board feet). This has been corrected in the EIS.

This calculation of timber to be removed is a maximum estimate for this analysis, using estimates for lodgepole pine stands in the Fishhook Timber Sale. Aerial photos of the area depict a mosaic pattern of vegetation density as well as dead and down material in the project area. This demonstrates that the volume of timber per acre is a worst case estimate and is not uniform throughout the area. During on-the-ground siting, facilities would be located to the greatest extent possible in areas where timber harvesting has already removed the timber. Siting will also be directed to areas of less vegetation and areas with dead stands to reduce impacts to the timber resource. The siting flexibility for locating facilities in Alternative B will allow the Forest Service to minimize the amount of timber that needs to be removed, and locate facilities where there would be the least impact to existing vegetation.

This mitigation measure will be added to section 4.8.6 of the EIS.

13.3 Comment:

The statement in Table S-2 regarding "minimal effects of air pollutants on vegetation" is biased and should be removed. What are the effects? Let readers decide if they are minimal, as you did with the removal of acres of vegetation for construction. [54.25]

Response:

The statement "minimal effects of air pollutants on vegetation" has been replaced

by "no discernible effects on vegetation beyond 500 meters (1600 feet) of the power plant except for the areas immediately adjacent to wells."

13.4 Comment:
Another potential effect to lichens would be decreases in lichen populations near the power plant and well pads. Please describe the possible effects of boron on vegetation. [57.21]

Response:
The reduction in the amount of lichens near the power plant and well pads due to surface disturbance is explained in in section 4.11.3.4 in the EIS. There is also concern that the amount of lichens will be reduced in the vicinity of the power plant due to their sensitivity to air quality impacts. Most notable in regard to near-plant air quality impacts is the concern about the deposition of boron from the cooling tower drift. Boron has been observed to cause leaf burn in trees immediately adjacent to cooling towers in the Geysers geothermal field. It is believed that boron deposited on leaf surfaces will be in the form of boric acid. Boric acid has fungicidal and insecticidal properties and for example is used as a fungicide in citrus orchards and to control ants and fleas in homes. The level at which vegetation is stressed or damaged due to aerial application is not precisely known, but has been estimated conservatively to be one-tenth the toxicity level for irrigation. Toxic effects in irrigation occur at total boron deposition rates of 11 kg/hectare (60 lbs/acre), hence foliar toxicity may be produced from aerial deposition rates of approximately 1 kg/hectare (6 lb/acre).

13.5 Comment:
What biocide will be used in the cooling tower, what are its effects, in what quantities will it be stored and used, and what will be the effect of its drift on affected vegetation? [36.36]

Response:
An algaecide that is acceptable to the Oregon DEQ for use in cooling towers will be used. There are a number of such products on the market including Drew Chemical Biosphere 250 Microbiocide, which is used at the Coso facility. Algaecides are used to prevent algae build up in the cooling tower. The cooling tower is treated once a week for one hour during the warmer months and once a month in the winter. Treatment is usually one-hour in length. During treatment, cooling tower fluids are recirculated and blown down/overflow lines are closed. After treatment, the overflow/blowdown is sent directly to the injection wells for a 24-hour period. The fire protection water storage pond at the plant site is treated, as necessary, by allowing the cooling tower water into the pond during algaecide treatment. Most algaecides have a relatively short half life and are ineffective within 48 hours. As discussed in Appendix F-7 the impacts of the cooling tower drift are principally confined to within 500 meters of the cooling tower. As shown in Appendix H, the facility expects to use approximately 960 gallons of algaecide per year. It will be stored in 275-gallon totes.

14 Wildlife

14.1 Comment:
It will affect wildlife. [9.5] Concerned about impacts on wildlife. [27.9]

Response:
Wildlife resources was identified as an environmental issue during the EIS scoping process. Baseline studies were performed to determine the existing

habitat conditions and wildlife use of the project area (see Section 3.12). The EIS recognizes potential effects to wildlife resources from project construction, operation, and decommissioning and presents a detailed analysis and discussion on the key wildlife issues.

14.2 Comment:
The north end of the lease area is used by elk. The elk habitat continues into the NNVM. If the habitat is reduced outside the Monument, the habitat within the Monument is inevitably impacted. [41.6] Proposed drill pad sites A-11, C-15, O-14, B-14, P-15, D-15, Q-15, E-15, R-21, and F-22 are in the roadless area. Sites A-11, C-15, and O-14 are also in the elk habitat area. [41.9]

Response:
First, the entire lease area is used by elk. During the 1993 site surveys, elk sign (i.e. trails and droppings) was found throughout the lease area but was the most concentrated in the northeast portion of the roadless area (see hatched area, Figure 3.12-1). Elk will likely be impacted, at least in the short term, by increased disturbance and loss of habitat, although to what extent is difficult to predict. Sections 4.12.3 - 4.12.6 discuss potential impacts to big game and address cover and forage habitat losses. Also difficult to determine is potential adverse impacts to elk habitat within the Monument due to project activities. Factors such has elk densities, future cover and forage conditions, carrying capacity, future disturbance levels in the lease area and Monument area, and success of mitigation measures will influence future elk utilization of the lease area and Monument.

It should also be noted that the NNVM may have greater potential to displace elk due to increased use resulting from increased population in central Oregon and from monument status.

Observations from other geothermal plants, such as Coso and Mammoth Lakes, indicate that big game animals do use areas around the facilities. This may in part be attributed to site disturbance which creates new forage areas, and travel corridors along pipelines and transmission lines which may make short distance travel easier. Additional water sources that are provided as mitigation may encourage use of the area.

This concern will be addressed in the proposed wildlife monitoring program by evaluating habitat quality over time within the Monument area. If during the wildlife monitoring program elk habitat quality is determined to be decreasing due to increased elk use from displaced animals, then mitigation measures such as forage enhancement could be administered to help offset these impacts.

14.3 Comment:
To CEE's credit, it presents one plant site in its alternative. The location is also in an area already logged and requiring less road development. Because of the surrounding logging, there is less potential fire danger to the facility. The other plant sites proposed by the Forest Service impact potentially suitable habitat for the black-backed woodpecker, a MIS. Plant site 3 would also be located in a roadless area. [41.14]

Response:
Both plant sites 2 and 3 are located in areas that contains potentially suitable black-backed woodpecker habitat, namely lodgepole pine trees 0.25+ meters (10+ inches) dbh. This impact is discussed in Section 4.12.5. In addition, plant

site 3 is located in the roadless area and impacts are also discussed in Section 4.12.5.

14.4 Comment:
The Oregon Department of Fish and Wildlife has defined four habitat categories and established mitigation goals and policies for each (OAR 635-415-030). It would be useful if the DEIS identified, described and mapped the location of any areas of habitat category 1 or 2. [49.13] It would be useful if the DEIS identified and described any adverse impacts to areas designated habitat category 1 or 2 by the Oregon Department of Fish and Wildlife. [49.18]

Response:
At this time, the Oregon Department of Fish and Wildlife has not designated any habitats within the project area as Category 1 or 2. However, the mixed conifer stands and the high elevation lodgepole pine/white pine habitats (see hatched areas on Figure 3.12-1) could likely be considered Category 2 habitat. Impacts to these habitats and mitigation measures have been discussed in section 4.12 of the EIS.

14.5 Comment:
Several points need correction in the final EIS. The DEIS states "generally lodgepole pine communities (LP, CC, and LPCC) provide only marginal habitats for most wildlife species." We are not quite sure from whence such a conclusion emanated. Regardless of origin it is far from being factual. Lodgepole pine forests can house large and diverse communities of terrestrial and avian fauna, as is illustrated by Table 3-12-1. [58.8]

Response:
The statement "generally lodgepole pine communities (LP, CC, and LPCC) provide only marginal habitats for most wildlife species" in the draft EIS is somewhat misleading. Lodgepole pine habitats provide suitable habitat for many species of wildlife and are even preferred habitat for some species. However, the lodgepole pine forested habitats (LP) found in the project area are mostly dense, even-aged stands of small diameter trees with herbaceous and shrub layers absent or largely undeveloped and scattered. Many trees within these lodgepole stands are dead or weakened by recent insect infestations and drought. The dead wood component (down logs and snags) is abundant but is small diameter (all less than 10-inch and most less than 5-inch diameter) which is not considered optimum for most species that utilize dead wood for foraging and nesting.

The other two lodgepole pine types mentioned (LPCC and CC) were habitats resulting from recent timber harvest activities. LPCC is lodgepole pine forest that was recently harvested in the Fishhook and North Peak timber sales as clearcut or seed-tree regeneration harvests and has not been replanted. The regeneration in these stands is all lodgepole pine, 1 to 4 feet tall, and is a clumpy and scattered distribution. Much of the ground in these harvest units is bare or covered with logging debris. The standing green trees are small diameter (3 to 6-inches dbh) and have a canopy closure of about 1 percent. The CC type is planted even-age lodgepole pine tree plantations that are 2 to 9-feet tall, with an approximate 50-percent canopy. Neither the LPCC or the CC habitat types are providing suitable habitat for many wildlife species due to lack of vegetative structure and diversity.

For these reasons the statement was made regarding the marginal habitat suitability that the lodgepole pine communities found in the project area were

providing for most wildlife species. This was not intended to be a statement about lodgepole pine communities in general.

14.6 Comment:
The statement "Potential fawning habitat is limited to the riparian zone along Paulina Creek" is incorrect. It is true that deer and elk prefer to fawn and calve near a water source. However, the water source does not have to be a lush riparian area with a stream rushing through it. Mule deer fawn in sagebrush steppe habitat much drier than that of the project site. Most of the project area is suitable fawning or calving habitat, although one would not likely find them giving birth in the middle of an intensively cutover area unless it has grown back to some semblance of cover. The plant communities (trees and understory) are far from marginal wildlife habitat. [58.9]

Response:
Optimum fawning habitat is defined in Wildlife Habitats in Managed Forests in the Blue Mountains of Oregon and Washington (1979) as habitat that includes low shrubs or small trees from 0.6 to 1.8 meters (2 to 6 feet) tall under a tree overstory of approximately 50-percent crown closure. Fawning habitats tend to be relatively small and contain sufficient succulent forage to enable the does to produce milk. The area is usually located on slopes of less than 15 percent, where vegetation is succulent and plentiful in June, and where potable water is available within 183 meters (600 feet).

Due to the recent harvest activities, the lack of shrubs and small trees in the understory, limited herbaceous vegetation, and no surface water on the project area, it was concluded that very little of the SO area should be considered as fawning habitat. Thus, the statement in the EIS that "potential fawning habitat is limited to the riparian zone along Paulina Creek." Site surveys in late June found shrub and herbaceous vegetation absent or limited in most of the SO area. This is largely due to the droughty pumice soils.

14.7 Comment:
Proposed drill pad sites A-11, C-15, O-14, B-14, P-15, D-15, Q-15, E-15, R-21, and F-22 are in the roadless area. Sites A-11, C-15, and O-14 are also in the elk habitat area. Directly north of these sites is an area of the Monument identified as having greater than 50% mortality in the Monument's DEIS "Forest Mortality" map. Site I-28 is in a wildlife habitat area probably associated with the Monument butte directly to the south of it and on which we thought was a special nest site. [41.9] Well pads and power plant siting should avoid all the sensitive habitat areas identified. Pad I-28 should be moved as far west as possible to avoid the mixed conifer vegetation altogether. When building pads, cutting larger trees should be avoided totally rather than "to the extent possible." [58.13]

Response:
The 40-acre block of habitat surveyed for the I-28 well pad site documented a mature/old growth mixed conifer stand with a good dead wood component. This mixed conifer stand contains habitat components (e.g. downed logs, large diameter trees, snags, and mixed species) that make it suitable for most of the species of concern. Several comments have been made regarding the impact to this stand and the placement of the well pad. As discussed in the text (Section 4.12.5) only a small portion of the mixed conifer stand is located in the lease SO area, therefore, most of the stand cannot be entered. In addition, the mixed conifer stand is associated with a cinder cone and is on sloped terrain. Well pads are generally located on the most level land as possible, hence, the mixed conifer

portion of the 16.2-hectare (40-acre) block will not be preferred for the pad siting. According to CEE (David McClain, CE Exploration, personal communication with Wildlife Dynamics), the preferred siting of I-28 would be in the flat, recently clearcut area to the east of the mixed conifer stand. This clearcut area is level, requires no tree removal, and is readily accessible.

The raptor nests near I-28 are located in the No Surface Occupancy zone to the southeast of the probable well pad site (see section 4.12.4). If the well pad is located within the clearcut area, no mature vegetation would be cleared during project construction. If vegetation was proposed for clearing, all Forest Plan mandated Standards (LRMP) regarding raptor nests would be used to maintain a buffer around the nest sites.

During construction of well pads, all trees would be removed within a 1.6 to 2.3-hectare (4.4 to 5.5-acre) area. Therefore, any "larger" tree that was in the designated well site would have to be removed. However, most of the potential pad sites are located in lodgepole pine dominated stands that do not contain trees over 0.25 meters (10 inches) dbh. Therefore, larger trees will not be removed during well construction. Surveys of the well pad 16.2-hectare (40-acre) habitat blocks found that only well pads A-11, C-15, and I-28 contain trees that are greater than 0.3 meters (12 inches) dbh. Given the flexibility in the placement of pad sites, larger diameter trees should not be affected.

14.8 Comment:
ODFW needs to be consulted when placement of expansion loops for animals passage is being determined. [58.18]

Response:
Biologists from the Oregon Department of Fish and Wildlife will be consulted prior to determining the placement of expansion loops.

14.9 Comment:
ODFW agrees that mitigation be required for the following: Displacement of wildlife as a result of human disturbance during exploration, development, utilization, and decommission activities. [58.27]

Response:
No response required. Thank you for your comment.

14.10 Comment:
Need to mention potential impacts and changes in behavior due to presence of air pollutants, even if these are not well-understood. Of particular importance are smell, noise, light, and particulate deposition, in addition to H_2S emissions and toxics in sumps and pond. [54.26]

Response:
No effects of air pollutants on wildlife are anticipated. See response to comment 45.6. Noise impact on wildlife behavior is adequately addressed in Section 4.7.4.1. In regards to sumps and ponds see response to comment 58.28.

14.11 Comment:
Potential effects to bald eagles from ingesting mercury-rich fish from the lakes need to be disclosed and addressed. [57.8]

Response:
The incremental increase in mercury in the Newberry Crater lakes due to the proposed geothermal development is insignificant as compared to background levels measured by the USGS. No change in the impacts to bald eagles due to ingesting fish is anticipated due to the geothermal development (see Appendix L and section 4.3.3.6).

14.12 Comment:
Potential effects on wildlife of Radon-222, arsenic, boron, and hydrogen sulfide should be discussed. [57.23]

Response:
No effects on wildlife from Radon-222, arsenic, boron or hydrogen sulfide are anticipated. See response to comment 45.6.

14.13 Comment:
The SAIC analysis predicted mercury concentrations in lake waters could rise as a result of deposition effects to levels in excess of applicable water quality criteria. In reference to whether this standard exceedance would translate into adverse effects on wildlife is referred to Section 4.12 Wildlife. Section 4.12 does not adequately address the potential for contaminating resident waters. ODFW is in firm opposition of any degradation of surface waters from emissions stemming from geothermal activities. The absence of any discussion relative to the fisheries resource in East and Paulina Lakes and Paulina Creek is a major deficiency in the DEIS. The kokanee, brown trout, and rainbow trout caught in the Paulina and East lakes are of extremely high eating quality, rivaling, if not exceeding, that of any other in Central Oregon. [58.2]

Response:
No significant changes are anticipated in mercury concentrations in the Newberry Crater lakes due to the proposed geothermal development (see Appendix L and section 4.12.3.6). A discussion of the fisheries resource in the project area has been added to section 3.12 of the EIS.

14.14 Comment:
Bioaccumulation in fish and fish eaters, including bald eagles, osprey, and man, needs further discussion. In addition to monitoring lichens, regular sampling (including pre-exploration baseline) of fish and small mammals is necessary. The testing needs to be comprehensive. Tracking heavy metal and chemical accumulation in tissues will provide notice to ODFW, DEQ, and USFS if these substances are reaching harmful levels. In addition to fish and fish eaters, goshawk, marten, bats, and other wildlife predators are potential accumulators of emission elements and chemicals. [58.4]

Response:
Bioaccumulation in wildlife is not an anticipated problem due to the proposed geothermal development (see responses to comments 45.6, 45.8, 57.8, and 58.2, also see Appendices F-5 and L and section 4.12.3.6). However monitoring of mercury in tissue from fish collected from the Newberry Crater lakes and monitoring of lichens near the plant site will be conducted.

14.15 Comment:
Off-site impacts can occur during utilization as a result of the deposition of airborne pollutants in nearby waters with effects on fish and fish eating wildlife. Other potential impacts may occur from wildlife contact with waters at sumps and the power water storage pond. [58.28]

Response:
No off-site impacts due to the deposition of airborne pollutants to the nearby waters with effects on fish and fish eating wildlife are anticipated (see responses to comments 57.8 and 58.2, also see Appendices F-5 and L).

As discussed in sections 4.12.3.2 and 4.12.3.5 of the DEIS there are no significant impacts to wildlife due to the sumps and power plant holding pond. The sumps will only be filled with water for a short time period during well drilling. Due to the activity associated with well drilling it is unlikely that the sump will attract significant wildlife. There will also be water in the sumps after a rapid snow-melt event. The water quality under this scenario, of course, would be good and will not pose a risk to wildlife. The plant storage pond is filled with essentially distilled water from the condenser with the exception of a periodic algaecide treatment (see response to comment 36.36). The algaecides proposed for possible use are short-lived in the environment and are of relatively low toxicity to higher animals.

15 Cultural/Heritage Resources

15.1 Comment:
What will happen when unknown cultural resources are encountered during development of the area? Will sites be excavated and scientific info collected prior to destruction of a site? [54.27]

Response:
Section 2.4.1.7 of the EIS states, under mitigation for cultural resources, that "if previously undocumented sites are discovered during construction, activities would be halted until the resources are examined by a professional archaeologist and direction is given on how to proceed."

16 Health and Safety

16.1 Comment:

The section on blowouts (4.14.3.3) erroneously refers to a blowout in Surprise Valley, Nevada. The blowout actually occurred in Stillwater, Nevada, and proper blowout prevention was used. [20.3] What has been the history of successful blowout prevention? By this we mean the number of times that blowout prevention has successfully curtailed an imminent blowout compared to actual blowouts. We are promised the equipment will work. Please bolster the case with a record of successful use. While the overall record seems good, seven blowouts in how many production wells? There is a suggestion that blowouts are a higher risk when a field is first being developed, as for example the blowout on the Puna Coast in Hawaii. [38.10] It would appear prudent to have a blowout management plan as well as a prevention plan. [38.11] Page 4-158, second paragraph, list of sites. The second site listed is incorrect. Surprise Valley is in California. We believe the reference should be to Stillwater, Nevada where the blow out occurred during drilling because the surface casing was set too shallow. The text indicates that proper blow out equipment was not operating. This is not true in the Stillwater case, the casing program was inadequate. [39.60]

Response:

The table and discussion in the draft EIS regarding past blowouts contains errors that have been corrected in the final EIS. Surprise Valley is in California, not Nevada. A blowout that occurred at Stillwater, Nevada, has been added to the examples cited (Zvulun, Yossi. 1989. "Stillwater Geothermal I Project — Blowout and Kill Operation." Geothermal Resources Council BULLETIN. June 1989. pp. 5-8.).

Data on the number of "imminent blowouts" prevented is not collected and therefore not available. Every one of the several thousand exploration and production wells that have been drilled in the U.S. over the last four decades that are not reported in the newspapers are an example of the successful design and use of blowout equipment. This is because the entire drilling, casing and equipment design and operation is part of the overall blowout prevention equipment.

It should be noted that two of the blowouts at The Geysers were actually instances where a well was drilled on what turned out to be an active landslide. The well head was sheared off by earth movement, not a failure in drilling practices. These events occurred before directional drilling technology made it possible to site well pads on more stable ground.

The blowout at Surprise Valley happened in the early 1960s, when regulation was almost non-existent compared to now. Practices were used that would never be allowed today.

A blowout management plan will be prepared and approved prior to drilling.

16.2 Comment:

How will toxic mud slurry from drilling be transported and disposed of. [26.13] Concerned about disposal of hazardous wastes. [27.8] Transportation of toxic substances may present a risk. The DEIS failed to describe adequately the possibility of truck delivery accidents and the consequences, particularly as regards gasoline. [36.24] How will the hazardous materials used at this facility be disposed of and transported in and out of the site. [36.37] The risks of hazardous

truck movements were calculated on U.S.-wide mileage and accident rates. Some of the mileage will be on forest roads which may pose a higher risk. What has been the accident rate for hazardous movement to and from The Geysers power plants? That experience would combine project type mileage and highway mileage to perhaps give a more accurate risk assessment. [38.24]

Response:
Hazardous materials will be disposed of at properly licensed facilities. The possibility of truck accidents is discussed in section 4.14.3.1 of the EIS. As shown in Appendix H, diesel fuel and gasoline will be trucked to the plant site. Diesel fuel will be delivered most frequently, 15,200 liters (4000 gallons) 6 times a year. If spilled in an accident, this small volume would have local, temporary impacts. Trucks delivering fuel to the plant site would not cross Paulina Creek and natural drainage is downslope (rather than laterally toward the creek) so the creek would not be contaminated in the event of an accident.

A study at The Geysers provided data on accident types and rates (Pasqualette, M.J., and Dellinger, M. 1988. "Hazardous Waste from Geothermal Energy: A Case Study." The Journal of Energy and Development. Vol. XIII, No. 2 (Spring 1988), pp. 275 - 295). During a 3-year period (1984-1987), approximately 5200 loads per year of hazardous materials were trucked to or from The Geysers. In 1987, this totaled about 22,500,000 kilograms (25,000 tons). During this period, there were 20 accidents or incidents involving spills. This works out to 2.7 loads per MW and an accident rate of about 0.0013 accidents per load for facilities producing 1900 MW. By proportion, a 33-MW facility would require about 90 loads per year, with an accident rate of 0.116 accidents per year. This equals about 6 accidents for the 50-year life of the facility.

One of the principal measures implemented at The Geysers to reduce accidents involving hazardous waste transport was reducing the amount of hazardous materials consumed and produced. This measure reduced these materials from about 22,500,000 kilograms (25,000 tons) in 1987 to 9,000,000 kilograms (10,000 tons) in 1991. Since the proposed facility at Newberry would use current practices regarding hazardous wastes, there should be proportionately less truck mileage and accidents. A 33-MW facility would need 36 loads per year and have an accident rate of 0.0046 per year, or about 2 accidents during 50 years.

CEE has reevaluated its need for deliveries of material classified as hazardous, with the goal of reducing the number of trips required. The number of trips can be reduced to one per month by increasing the amount of on-site storage. Tables H-1 to H-4 in the EIS have been modified accordingly. Using The Geysers accident rate of 0.0013 accidents per load, this equates to less than one accident in 50 years.

The above estimates may be very conservative for Newberry, because many of the accidents at The Geysers were attributed to brake failure on the steep (up to 26-percent grade), winding roads found in that area. Even the forest roads at Newberry do not pose driving conditions as difficult as The Geysers.

16.3 Comment:
Page 2-52, fourth paragraph. The Draft EIS states that potentially hazardous materials may be used in the facility's laboratory and the suggestion is that these materials will be diluted and injected into wells with the brine. The applicants are committed to complying with all applicable hazardous waste regulations. We are confident that the laboratory wastes can be treated and disposed of by

underground injection pursuant to a Water Pollution Control Facility permit issued by DEQ. If this turns out not to be the case, we will ensure that the laboratory wastes are managed and disposed of at a permitted disposal site. [39.26]

Response:
Section 2.4.1.4 of the EIS has been revised to reflect these comments.

16.4 Comment:
The DEIS fails to discuss the chances of possible adverse impacts from any leaks and spills from fuel tanks which are at each well site. [36.35]

Response:
These concerns are addressed in the EIS. Section 4.3.3.7 indicates that these areas would be bermed with the volume of the secondary containment exceeding 100 percent of the maximum spill volume.

16.5 Comment:
If molten sulfur is transported, this may be a prime risk. What will be the sulfur production rates from the sulfur scrubber? Will it contain vanadium? If sulfur is not marketed, where will it be disposed, and in what quantities? How will it be stored and transported, and in what form? [36.25]

Response:
The sulfur cake produced by the H_2S removal process is a wet powder, not molten sulfur. It will not contain vanadium, because vanadium is not used in the scrubber. If the sulfur cannot be sold, it will be transported to an appropriate licensed disposal facility. About 630,000 kg (700 tons) per year of sulfur will be produced. It will be stored in 9,000-kg (20,000-lb) roll-off steel bins. CEE expects to sell 100-percent of the sulfur cake, and pay a royalty to the federal government (half of which will be returned to Deschutes County) on the revenue it generates.

16.6 Comment:
The needs of the physically challenged should be addressed. [5.5]

Response:
The project will comply with the access and other requirements of the American Disabilities Act and with other applicable laws and codes relating to the physically challenged.

16.7 Comment:
Will "5 expected accidents over 50 years" involve gas emissions that will be hazardous to campers and visitors. [26.10]

Response:
The "5 expected accidents over 50 years" is an estimate based on accident statistics for medium/heavy trucks. The estimate is explained in section 4.14.3.1 of the EIS.

The only materials with hazardous gases that will be used by the project in significant quantities are petroleum products like diesel fuel. Appendix H in the EIS indicates that diesel fuel will be delivered in the greatest quantity (15,200 liters [4000 gallons]) and with the greatest frequency (6 times per year) of the materials that have hazardous gases. Gas emissions from a 15,200-liter (4000-gallon) spill of diesel fuel are not expected to pose a significant hazard to

As noted in section 4.3.3.7 of the EIS, an Emergency Contingency Plan will be established to deal with accidental spills.

16.8 Comment:
The DEIS is very comprehensive in its treatment of hazardous materials. [35.17]

Response:
No response required. Thank you for your comment.

16.9 Comment:
Fire is a danger to lodgepole pine, particularly diseased even aged stands west of the caldera. How will the project be protected against large forest fires? The transmission lines would appear to be particularly vulnerable. Another aspect of fire protection is restricted activity on high fire danger days. We understand some past geothermal exploration on your ranger district was halted in periods of high fire danger. Will the project timetable be affected by fire danger, in the development, construction, or utilization phases? [38.26]

Response:
Fire danger is discussed in section 4.14.3.2 of the EIS. The transmission lines will be as vulnerable as they are any place where fires can occur. The Forest Service may restrict project-related activities in periods of high fire danger. This may affect the project schedule in the development and construction phases, and may affect operations during the utilization phase.

16.10 Comment:
DEQ does believe this facility will be a generator of hazardous waste, albeit a small quantity generator or conditionally exempt generator. These activities may or may not require notification to the Department of hazardous waste activities. [52.20] The hazardous waste generator and used oil management activities are outside the scope of this DEIS comment period and will be evaluated as the facility progresses. [52.21]A few items should be considered (on page 2-52) as it is proposed to manage small quantities of laboratory chemicals by dilution and injection into wells. Deep well injection is not an appropriate disposal option for conditionally exempt generators of hazardous waste. These chemicals would not fall under the associated waste exemption. [52.22] Maintenance wastes (oils, fuels, etc.) and biocides may not all fall under the Part 261 associated waste exemption, and should be managed appropriately. The biocide may be an Oregon-only waste for aquatic toxicity. [52.23] Another potential waste stream that may be generated would be the charcoal filter containing mercury. The filters may fall under exemption; however, best management practices should be explored for exempt wastes that fail a characteristic of a hazardous waste. [52.24] It is likely that the facility will be generating several waste streams that could potentially fail a characteristic of a hazardous waste that have not been addressed in these comments. It will be the responsibility of the facility to determine what these waste streams are and manage the waste in compliance with state and federal regulations. [52.25]

Response:
The project will comply with applicable state and federal regulations.

16.11 Comment:
We would like to take this opportunity to clarify information about two statements in the draft EIS (pp. 2-56 and 4-14) dealing with drilling fluid toxicity limit are

not necessarily non-toxic. EPA does not define any drilling mud/additive system or single mud component as "non-toxic" (40 CFR Subpart A for the Offshore Subcategory or 40 CFR Subpart C for the Onshore Subcategory of the Oil and Gas Extraction Point Source Category). EPA has promulgated an end-of-pipe effluent toxicity limit as a control on the discharge of toxic and non-conventional pollutants (40 CFR Sections 401.15 and 401.16, respectively). (Note — this limit applies only to the Offshore Subcategory, no discharges are allowed from operations in the Onshore Subcategory.) Muds that meet EPA's effluent toxicity limit are not necessarily non-toxic.

EPA Region 10 has emphasized advanced planning of mud/additive systems to ensure that mud discharge toxicities are controlled (by use of lowest concentrations of less toxic additives where possible) and mitigated to the maximum extent. For offshore drilling only water-based muds may be discharged and the discharge of diesel oil (in cases of stuck pipe) is strictly prohibited by rule (40 CFR Subpart A). [59.5]

Response:
Sections 2.4.1.7 and 4.3.3.7 of the EIS have been corrected.

16.12 Comment:
Would workers at the plant or well pads ever be in danger of health effects from H_2S? [57.11]

Response:
The OSHA Permissible Exposure Levels (PEL) are not expected to be exceeded in the operating areas. In California, CEE's parent company CECI must conduct an Air Toxics Testing as part of its compliance with the biannual California AB2588 review. The conclusions of these reports is that the adverse health effects of airborne toxic emissions are insignificant as long as Occupational Safety and Health Administration and ambient air quality standards are not exceeded. The 1993 Coso KGRA, AB2588 Toxics Inventory Report resulted in a finding of no significant adverse health effects.

CECI institutes safety programs at all operations to ensure worker's safety. CECI maintains a safety manual on H_2S for each plant facility. All drilling operations and power plant operations working areas where there is potential for H_2S impacts are equipped with alarm systems which give off both visual (flashing lights) and audio alarms.

Portable air packs are available in these areas for emergency use. Workers are required to use air pack when entering a confined area such as clean out of vessels. Workers in the power plant are required to carry a portable H_2S alarm with them when working in areas with potential for H_2S such as the liquid redox system and noncondensable gas handling equipment areas.

17 Socio-Economics

17.1 Comment:
Out-of-area construction workers will result in a $270,000 per year expense to local school districts. Since the project will not be providing a significant amount of property taxes during the construction phase, this is an unmitigated impact. The developer should make $270,000 in mitigation payments. There will be similar impacts on other public services as a result of imported workers and their families. Affected government entities should be made aware and become

involved in monitoring these possible socio-economic impacts and mitigation payments should be made by the developer to these entities when impacts are identified. Hiring of local construction workers should be mandated to reduce the impacts on public services. [36.43]

Response:
While it is true that the project will not be contributing as significant a share of revenues during construction as compared to the other project phases, there will still be revenues generated to the Bend/LaPine area in terms of materials, equipment, and other supplies being purchased locally as well as through payroll spending. It is not clear how the figures cited above have been derived, but certainly the impacts to the local population are not without compensation to the local area. The local government entities are aware of the project and have been kept apprised of developments throughout this process. The plant will be one of the most significant contributors, if not the single greatest contributor, to the local tax base in the form of an estimated $1,260,000 per year in property taxes. Since the majority of the school budget is derived from this source, it is fair to say that the project will, indeed, be compensating for any impacts to local schools. The county will also be receiving geothermal operating royalties of an estimated $240,000 per year. While the staffing requirements of the project do not involve large numbers of employees, local workers will be utilized in all phases.

17.2 Comment:
Page S-11, second paragraph: The discussion on property taxes and royalties does not indicate that these payments are annual estimates. [39.7]

Response:
The text has been modified for clarity.

17.3 Comment:
Who or what are mentioned taxes and royalties going to? [54.28]

Response:
As is stated in section 4.15.3.6 of the EIS, property taxes will be paid to Deschutes County. Royalties on steam will be paid to the Federal government. Half of these royalties are returned to the state. Oregon passes the state share through to the county of origin (i.e., Deschutes County).

18 Power Sales

18.1 Comment:
The public is subsidizing the project (through BPA) to the benefit of the private sector. [32.3]

Response:
On a long term basis, this project is expected to be cost competitive with other resources available at the time BPA issued the request for pilot project proposals. These other resources include hydropower projects submitted to BPA by customer utilities under its 1990 Billing Credit solicitation. The cost of these customer-developed resources was limited to what BPA expected to pay at that time for resources developed by BPA.

BPA will only pay for energy delivered by the Newberry Project to BPA's transmission system. BPA is not financing the project, guaranteeing repayment of debt, or sharing the dry-hole risk of resource development. Therefore, it is not

accurate to say the public is subsidizing the project.

It should also be noted that the developer (CEE) will be risking millions of dollars during exploration, construction, and the early years of production. If no resource is found, or if it turns out to be inadequate to support a profitable project, CEE will lose its investment. This is a risk borne by CEE, not the public.

If the project is successful, it will be one of the largest taxpayers in the county, and the public (Deschutes County) will benefit from the receipt of almost $1.5 million in property taxes and royalties annually.

18.2 Comment:
The project is relatively short-lived, yet the public assumes the long-term risk to the resources. [32.4]

Response:
The power contract has a term of 50 years, which is long by utility standards. As is noted in section 1.3.2.4 of the EIS, numerous measures have been taken to minimize financial risk to the public (through BPA) and to ensure sustainable use of the geothermal resource and other resources.

18.3 Comment:
The ownership of individual leases within the lease block proposed for development in this DEIS is at issue in unresolved litigation between Vulcan and CEE. An accurate and even handed description is called for in this EIS of interrelated power contract lease ownership and control and related unit control issues. This EIS draft does not address a number of unresolved issues which are central to the very reason for this proposed EIS. Appropriate lease ownership maps depicting the Waters leases and both of the proposed competing geothermal units should be included in the body of the EIS. No unit will be effective at Newberry until after the IBLA decision or an equitable unit agreement and unit operating agreement is in place acceptable to both Vulcan and CEE. [44.6]

Response:
Thank you for your history of the unit process. It was and is still not an issue that we felt needed discussion under NEPA because it outside the scope of this EIS. It is true that an automatic stay of the unit decision occurred when the unit approval was appealed to the Interior Board of Land Appeals.

18.4 Comment:
By "the entire lease block" is the EIS referring to (1) the area described in 2.4.1.1 Project Location on page 2-15, where "'Lease area' refers to Federal geothermal leases held by CEE, which are being considered for geothermal activity in this analysis," or (2) the CEE proposed Deschutes Unit Area in which EWEB and BPA have options for future development, described above? And what is considered control? Would that be ownership or acting as Unit Operator? [44.7]

Response:
"Lease block" as used in section 1.3.2.4 refers to all of the leases dedicated to the project under the power purchase agreements between CEE and BPA and EWEB. All of these leases are owned by CEE and include the leases affected by this EIS. Any leases not covered by this EIS would require environmental review prior to development. The precise definition of "control" is a contractual issue that BPA considers a matter still subject to negotiation. The definition of "lease area" given in section 2.4.1.1 is accurate.

18.5 Comment:
There is a misconception of the effect of having different resource and plant owners. The fact that a geothermal resource and a power plant might have different owners does not contribute to resource depletion. It is the contract provisions, power plant design and operation and the level of cooperation between the two owners that can cause problems. The lesson is not that we should avoid separate wellfield and plant ownership, it is that contracts should provide for efficient use of the resource by the plant owners and resource and plant owners must cooperate to sustain the resource, to the benefit of all involved. [44.8]

Response:
Using less steam to produce the same amount of electricity uses the resource more efficiently, and this promotes reservoir longevity. A 1989 BPA study (Bloomquist, R. Gordon, and others, 1989. Innovative Design of New Geothermal Generating Plants. BPA Document No. DOE/BP-13609-5) concluded that increased conversion efficiency in newer geothermal power plants was encouraged by changes in contracts between resource suppliers and plant operators and changes in wellfield and plant ownership arrangements. When the plant and well field have different owners, which was typical at The Geysers until recently, and the steam supplier is paid based on the amount of electricity produced, there is no incentive for the power plant owner (typically a utility) to use the steam efficiently. The commentor is correct in noting that contracts can be written to avoid this problem, and in fact this was done for the SMUDGEO No. 1 plant at The Geysers. But "level of cooperation between the two owners" is a problem that can be avoided altogether by single ownership of well field and power plant.

At Newberry there are only two significant lease owners and a lone lessor, the Federal government. This does afford much greater control over development policy. The key statement of the commentor is getting the government and the two major leaseholders to agree.

18.6 Comment:
It serves no environmental purpose to include a "contract principle" in an EIS or in a power sales contract that might restrict the rights of a plant owner to sell the facility and continue to provide geothermal resource to the new owners, or to prohibit different resource and plant ownership from the outset. In our opinion, it is most probably unenforceable. BPA does not impose similar ownership requirements on gas-fire power plant owners to assure that the nonrenewable gas is used efficiently, nor do they require the owners of gas or biomass plants to have enough gas or biomass to run a plant for 30-50 years. [44.9]

Response:
BPA's power purchase agreements typically include an assignment clause requiring BPA's approval of any transfer or assignment to another party of contractual rights and responsibilities. BPA considers the assignment clause enforceable. Examination of the terms and conditions of other BPA agreements is outside the scope of this EIS.

18.7 Comment:
If Vulcan becomes the majority owner of OR 45506 which is included in the leases discussed in this EIS, and if a strong resource were demonstrated on the west flank, it is conceivable that a power plant, or at least production wells might be proposed from that lease by Vulcan and any requirement for assurances of

reservoir adequacy for a proposed project on Vulcan leases would be a responsibility of Vulcan, not CEE. [44.10]

Response:
The EIS is not the place to speculate on the outcome of matters currently in civil court. There is not a current proposal from Vulcan and therefore it is difficult to speculate and then analyze what another operator may do in the future.

On June 6, 1994, Judge Hogan of the U.S. District Court of Oregon issued an opinion in Vulcan Power Company v CE Exploration Company, Civ. No. 92-6264-HO, that Vulcan properly exercised an option to purchase lease OR45506, but the decision is still subject to appeal. OR45506 is only one of the leases proposed to be explored and developed by CEE. Even if Vulcan prevails ultimately in the pending litigation, its leases are still subject to unitization.

19 Cumulative Effects

19.1 Comment:
Cumulative impacts of additional development should be considered. [23.5] How likely is project expansion, and will that require a new EIS, or could the present EIS be easily altered to cover an expansion. [29.2] This project is intended to facilitate additional development at the Crater. This project will establish precedence for a larger geothermal facility. [32.5] The cumulative impacts section dealt primarily with accumulation of impacts from one power plant over time. Many in the environmental community will be concerned about cumulative impacts from several plants. Seeing three sites in the preferred alternative leads to a question of whether this will ease the path for the second or third plant. Will there be more power line corridors? Our concern about well pads south of Paulina Creek is related to a feeling this is a foot in the door to make additional power plants inevitable. Additional power facilities were dealt with in very general terms. [38.13] I believe the DEIS is both inadequate misleading because the document only addresses the environmental consequences of building the proposed 33 MW power plant rather than the reasonably foreseeable power plant(s) associated with developing a 100 MW reserve. The scope of the DEIS is inadequately drawn since connected actions which are closely related are not considered together in a single impact statement. I would like to see the FEIS address the full scope of the reasonable foreseeable development of the geothermal resource (namely 100 MW), instead of artificially segmenting the multistage project. [48.1]

Response:
Additional future geothermal development is mentioned in Section 4.16.3.5. Although the potential for future projects is real, it is not possible to reasonably forecast at this time specifically where, when, or the extent of additional development, or what the effects would be of such development. It is prudent, however, to consider potential expansion or development in the design of this proposal in order to reduce effects from potential future development, and this has been done for some aspects of this project. For example in the design of the transmission line, even though the pole design would not change, the conductor proposed for the transmission line has a capacity that could accommodate up to 100 MW. This will reduce the likelihood of additional transmission corridors if future development did occur. Additionally, the contract for power sales between BPA and CEE has clauses which provide for the purchase of up to 130 MW of total output. The fact that these items have been considered in no way means that additional development or power plants is guaranteed or has already been

decided. Additionally, although one aspect of BPA's Pilot Project is to demonstrate that there is a 100 MW reserve, this does not mean it will be developed. Information regarding the quantity and extent of the geothermal reservoir will be valuable in the operation of this 33-MW plant, and increasing our knowledge about the geothermal resource at Newberry. It does not make this a predetermined multi-stage project.

Any development or activity beyond this proposal would need to be evaluated and a new environmental analysis would be done before approving new activities or development. Any decisions to proceed with additional development would be made only after future environmental analyses and NEPA documents were completed. Information from exploration and operation of this 33-MW plant should indeed be useful in future analyses, and would be used to help predict effects. This project's success or failure will play an important role as to whether or not additional projects are proposed, and will be considered in the analysis of future projects.

Any future development would have to be consistent with Forest Service plans and policies at that time. The Monument Legislation and the Deschutes Forest Plan prohibit development in the Crater.

The three potential power plant sites analyzed in the EIS are intended for consideration for this analysis only, and were included to provide a reasonable range of alternatives for plant location for this proposed project. Only one of the three plants would be approved for siting for this project. Any future plant proposals would require a new environmental analysis. Future power plants or well pads associated with other proposals are not connected actions because they do not depend on the implementation of this project and could logically be proposed whether or not this project proceeds.

As land manager, the Deschutes National Forest prefers to consolidate utility lines where possible, and not have multiple corridors. Analyses of any future projects will include utilizing existing power lines or utility corridors. Section 4.16.3.5 has been revised to include this discussion.

Well pads south of Paulina Creek are intended for exploratory drilling purposes to obtain additional information about the size and extent of the underground geothermal reservoir. These well pads would not be connected to the proposed power plant. A power plant in the area south of Paulina Creek is not being considered at this time, and any future proposal for a plant in that area would be subject to a new environmental analysis.

Section 4.16.3.5 erroneously states that a future power plant could be sited in the Transferal Area Adjacent. No surface occupancy is allowed in the Transferal Area Adjacent. The EIS has been corrected.

19.2 Comment:
The DEIS failed to adequately discuss cumulative impacts from the likely foreseeable future. These will include three geothermal plants producing 100 MW in the Newberry Crater area and cumulative pollution impacts from the Fishhook timber sale. [36.15]

Response:
Cumulative impacts for additional development in the future cannot be specifically foreseen at this time. Any development beyond this project will

require an environmental analysis. It is not known if there will be three plants or a total of 100 MW, as the commentor has stated. Logging of the Fishhook timber sale is scheduled to be completed by December 31, 1994, so any pollution impacts from the Fishhook timber sale would be short term and not occur after December 1994.

20 Alternatives: Range of, or Eliminated from Study

20.1 Comment:

Mt. St. Helens should be considered as an alternative site for the project. [27.2]

Response:

This suggestion is outside the scope of this EIS, which is to evaluate geothermal development on CEE leases in the Newberry area.

20.2 Comment:

Page 2-3, second paragraph. Section 2.3 states that "[s]ome of the alternatives considered by others were not given detailed analysis in the DEIS because they would not meet the purpose and need, would go beyond the scope of this analysis, had been considered in another EIS or an Environmental Assessment (EA), would not be technically feasible, or would have greater adverse environmental effects than would the original proposed project." Citations to other EIS's or EA's which address these alternatives should be provided. [39.17]

Response:

Section 2.3 has been reworded. It is intended to refer to alternatives proposed during the public scoping process, not necessarily to alternatives considered in other EISs or EAs. A reference to BPA's Resource Programs EIS appears appropriate in this context, and has been added to the section.

20.3 Comment:

Page 2-5, Section 2.3.3. We recommend that the differences between how the operations of binary plants, single-flash plants, and pure-steam plants affect the environment be briefly described in this section. [39.18]

Response:

The requested description has been added to section 2.3.3 of the EIS.

20.4 Comment:

We object to the inadequate range of alternatives and the failure to provide sufficient specificity as to the only two alternatives presented. [41.1] Location is probably the primary variable around which to develop alternatives for NEPA in a project of this kind. [41.4]

Response:

The range of alternatives is described in chapter 2 of the EIS. The commentor is correct in the statement that location is the main variable for this type of project. Due to the nature of the Purpose and Need, the proposal, the geothermal resource, and the leases, the range of reasonable alternatives are appropriate. The agencies considered that this project and analysis may be different from others that some readers may be accustomed to seeing for other types of proposed activities.

A great deal of specificity has been included in the description of the alternatives, as the length of section 2 attests. The boundaries of fluid chemistry assumptions

are clearly defined, a specific project area has been identified, specific well and power plant sites have been chosen, and specific transmission line routes and designs are specified.

20.5 Comment:
The Preferred Alternative is particularly frustrating in terms of trying to determine the environmental impacts. The twenty potential drill sites are presented ostensibly for flexibility and for protection of the environment, "with additional siting flexibility designed to minimize potential environmental effects." (2-9) Yet there is very little analysis and comparison of these areas in the DEIS so that environmental choices can be made. See 4-130. The DEIS should present alternative site locations and make these environmental choices now. From which of the twenty potential well pad sites will the target 14 be chosen and from which of the 14 will the first four wells be chosen? This uncertainty also exists with the Preferred Alternative's alternative plant sitings: a choice of three different sites. The whole point of having a Preferred Alternative is to make a choice. [41.13]

Response:
The choices will be recorded in the Records of Decision. The environmental impacts of drill pad and power plant sites are discussed in section 4 of the EIS, but the results of the analysis were not summarized in one place. The complexity of Table 4.12-1 attests to the difficulties of trying to compare even one type of impact in tabular form. Except for minor variations in vegetation and wildlife habitat, the well pad and power plant sites and their effects are very similar in most respects. Table 4.11-1 has been modified to clarify the relative impacts of the alternatives on vegetation. Refer to the Records of Decision for identification of the selected alternative and rationale for the decision.

20.6 Comment:
I disagree with the decision not to consider "alternative control technology" in this EIS. This seems counter to the spirit and letter of NEPA to consider a range of reasonable alternatives. [57.18]

Response:
The commentor appears to be referring to a statement in section 4.5.6. Alternative air emission control technologies were not evaluated in the EIS because the proposed technology is considered state of the art and is expected to result in low emissions levels. If emissions are higher than anticipated, measures will be required to reduced them. As stated in the EIS, a monitoring program will be implemented to ensure that if impacts exceed expected levels, appropriate corrective measures will be taken.

21 Description of A

21.1 Comment:
It is unclear whether four or five small diameter wells will be drilled or their locations. [41.3]

Response:
Four small diameter wells will be drilled. Their locations are shown on Figure 2.4-2 (labeled "TCH").

21.2 Comment:
The EIS states that "drilling up to 4 wells at each of 14 well pad locations, for a total of 56 wells, has been proposed." We believe that, even over a 50 year period,

it is highly unlikely that 56 wells would be needed to supply the plant and confirm a 100 MW reserve. This estimate is apparently reflective of the cautious approach taken in this EIS. [44.4]

Response:
The commentor is correct in noting that it is highly unlikely that 56 wells will be needed. Nevertheless, it is a reasonable possibility, provides a worst case scenario, and thus was addressed in the EIS.

22 Description of B

22.1 Comment:
Do not favor plant site 3 because it requires two miles of new road and is located in a roadless area. [25.2]

Response:
No response required. Thank you for your comment.

22.2 Comment:
Do not favor transmission line route in Alternative B because it requires new surface disturbance and a MIS and State Sensitive woodpecker was observed in the proposed location. [25.3]

Response:
Your comment will be considered.

22.3 Comment:
This is a very strange Preferred Alternative which instead of presenting an alternative presents several alternatives within it. NEPA calls for the development of a Preferred Alternative. In essence, this Preferred Alternative is not an alternative. It avoids making choices. The real reason for this is that these development choices are being left open to maximize the geothermal resource and are premature at this point. [41.15]

Response:
Alternative B analyzes 20 pad locations, but no more than 14 of these 20 would be constructed. With mitigation, any of the 20 are considered to be acceptable as potential sites. Providing this limited flexibility will provide the agencies the most control over facility siting to reduce environmental effects. For instance, road distances could be shortened or timber stands could be avoided by having flexibility in the on-the-ground siting of well pads. Flexibility would also give the agencies control to best use the geothermal resource, because as each well is drilled, additional information is gained about the underground reservoir. Information obtained from the previous well will help determine which area to drill next to make the best use of the resource. If all the production wells turn out to be located in the north part of the project area, siting the power plant nearer the wells will reduce the amount of pipeline required.

This could be viewed by some as being a different approach, but because we are dealing with assumptions of underground features, some assumptions regarding drilling targets may need to be slightly modified during exploration. Because of the incremental nature of geothermal exploration, it is not unusual to have more well pad sites approved than the developer is likely to use. A recent example is the BLM's Environmental Assessment for "up to 10" geothermal exploration wells at Vale, Oregon (BLM Environmental Assessment No. OR-030-93-14, August 1993).

22.4 Comment:
The added flexibility given by Alternative B should go a long way toward removing considerable regulatory risk from the project, minimizing delays that would result from evaluating other alternatives at some later time, and ensuring that the most environmentally acceptable project can be developed. [42.2]

Response:
While it does provide flexibility to the operator in locating the geothermal resource, Alternative B also provides flexibility to the agencies (BLM, FS, as well as State regulators) during implementation to further reduce the potential for environmental impacts. Where needed, siting will be specifically located and approved by the agencies to further reduce impacts. While siting will comply with the requirements set forth in this EIS, this added flexibility allows for "fine tuning" on the ground.

23 Description of A and B

23.1 Comment:
There is some confusion regarding the width of the pipeline corridors with respect to the expansion loops. How wide will the corridors be when there is a loop? How wide without loops? [35.18] How will the pipeline corridors be managed in winter? If not plowed, will the expansion joints for passage be high enough to accommodate animal and people traffic? Will the pipeline be sturdy enough to resist damage from snowmobiles? If not fenced, the pipelines may need something like the snow markers along the Cascade Highway to mark them and indicate possible danger. [38.16] Page 2-10, Table 2.4-1, Pipelines. The table describes the pipeline corridors as 120 feet wide. This is the maximum width for areas of multiple pipes and expansion loops. See pages 2-40, Figure 2.4-14. Typical corridor widths are generally in the range of 90 feet. The table should show a range of "90 to 120 feet." [39.19] Page 2-28, third paragraph. The sentence describing water pipeline routes should clarify that any pipeline locations would have to be approved by federal land managers. [39.22] Page 2-39, fifth paragraph. The discussion of pipeline widths should describe a range of widths from 90 feet to 120 feet consistent with Figure 2.4-14 on page 2-40. [39.24] The pipeline for the production phase are huge and extend over a large area. They will certainly affect the movement of large animals such as elk and deer. What modifications are planned to allow passage of these animals during their migrations? [60.13]

Response:
Supports for vertically stacked pipe would be more costly than what is proposed. The stacked pipes would look like an industrial fence and would be more visible than the horizontal configuration.

Pipeline corridor widths will vary by the size and number of pipes and expansion loop requirements. Each production and injection well pad will be connected to the power plant with a pipeline. As pipelines converge on the power plant, consolidation of pipes into a common corridor will occur, resulting in larger pipes and multiple pipes in a common corridor. As steam lines combine, the pipes get larger and the size of expansion loops also increases.

Figure 2.4-14 in the EIS shows typical pipeline configurations. Both configurations show expansion loops. This may obscure the fact that for most of the length of a single pipeline, the space occupied by the pipelines and roads would be as little as 15 meters (50 feet) (7.6-meter [25-foot] access road on one

side of the pipe, plus a 4.6-meter [15-foot] clear area for access on the other side), with the pipelines following the edge of the access road. The 4.6-meter (15-foot) cleared area between the pipe and the forest would be cropped, not bladed.

In some cases, a single two-phase flow pipeline will be used to connect two or more well pads to a common high pressure separator. This type of pipeline could be placed just outside the ditch of the access road and require a corridor as narrow as 12 meters (40 feet).

Table 2.4-1 in the EIS implies that all corridors will be 37 meters (120 feet) wide, when this is actually the maximum width. The table has been corrected. The statement regarding water pipeline locations will be modified to note the locations require approval of federal land managers.

CEE will plow main access roads in the winter. Access roads along pipeline will not be plowed unless that road is used to access a well pad or steam separator site. Pipeline will be marked with a snow marker with a reflector. Designated snowmobile routes will be marked and a bridge or vertical expansion loop will be provided to allow snowmobile crossing. Pipelines will be sturdy enough to withstand all but the most violent encounters with snowmobiles. Cracked or punctured pipe will be quickly detected at the power plant due to the resultant pressure drop.

Pipelines will be 60 to 120 centimeters (2 to 4 feet) off the ground, and are not expected to be a barrier to animal migration. In areas where large game animal migration or travel occurs, vertical expansion loops and/or taller pipeline supports will be used to facilitate passage of larger animals.

23.2 Comment:
There is not a clear distinction between exploration and production. [4.1]
Exploration and production are not distinctly separated in the DEIS. [60.6]

Response:
Section 2 of the EIS describes the phases of the project in considerable detail. These phases are summarized in Table 2.4-2 and depicted graphically in Figure 2.4-1. Confusion may arise because some activities overlap. For example, exploration drilling to confirm the 100-MW reserve may continue well after the 33-MW power plant has begun to operate. This is shown in Figure 2.4-1. Production occurs during the Utilization phase of the project.

23.3 Comment:
Other sites within this geologic area should be considered. [26.3]

Response:
It is unclear whether "geologic area" refers to the Cascades Geologic Province or to the Newberry Known Geothermal Resource Area (KGRA). The scope of this EIS is to evaluate geothermal development on CEE leases in the Newberry area. Alternate power plant, well pad, and transmission line sites on these leases have been considered under Alternative B, described in section 2.4.2 of the EIS. Other transmission line routes were also considered, as is mentioned in section 2.3.4.2 of the EIS.

23.4 Comment:
A more suitable location with regard to multiple use of pristine National Forest lands and monuments should be considered. [26.9]

Response:
As noted in section 4.21, the project is consistent with the Deschutes National Forest Land and Resource Management Plan (as amended) and will comply with the Newberry National Volcanic Monument Comprehensive Management Plan, when approved. The ability to develop geothermal resources outside the Monument is specifically preserved under the Monument Act.

The project area already sees multiple uses, including timber harvest. The area is not exactly "pristine," as Figure 3.11-1 illustrates.

23.5 Comment:
Fencing will be constructed around the plant and well pad areas. The DEIS does not state the height of the fence or provide assurances that it will be high enough to keep out animals. [36.51] The document mentioned use of fencing around the power plant and well pads. The drawings in the DEIS show them without fences. How high must these fences be to be effective in deep snow conditions? The fences should be able to win an argument with a snowmobile if such an accident happened. [38.15]

Response:
Figures 2.4-10 and 2.4-11 (and the cover of the DEIS) show fences surrounding the power plant. They will be 1.8 meter (6 foot) tall chain link fences, which will be strong and high enough to prevent a snowmobile from accidentally entering the facilities. As noted in section 2.4.1.4, snow accumulates to depths of 1.2 meters (4 feet) at the plant site. The well pads will be fenced with 1.8-meter (6 foot) fiberglass fencing. Details about the fences will be added to section 2.4.1.3.

The primary function of perimeter fencing around the plant site will be to deter access to the general public. Wildlife that climb, fly, or pass through the fence could access the plant site. The plant site facility will consist mostly of building structures, pipes, electrical lines, parking and driving areas, and human activity which should not attract most wildlife species.

The perimeter fence constructed around the well pads will exclude most wildlife that do not climb or fly.

23.6 Comment:
Page 2-11, Table 2.4-1, Power Plant Design, Water Use. The amounts specified are for annual consumption. The table should include the words "per year." [39.20]

Response:
The correction has been made to the EIS and to Table S-1 in the Executive Summary.

23.7 Comment:
Page 2-14, Table 2.4-3. Table 2.4-3 should be expanded to include the time lines for the required state permits. [39.21]

Response:
Table 2.4-3 has been modified to include state permitting activities.

23.8 Comment:
Since fluid chemistry will not be known with certainty until one or more production holes are drilled, these holes should be drilled before deciding to proceed with the full exploratory phase. [31.11] Page 2-34 The assumption is made that the geothermal resource characteristics of the Newberry site are similar to those found at the Medicine Lake geothermal resource. The basis for this assumption is described on page 3-37 among other places. We suggest that the basis for this assumption be described in Chapter 2. Otherwise, a reviewer is unaware of the basis for this assumption until Chapter 3. [39.23]

Response:
Thermal fluid at Newberry is expected to be similar to fluid from geothermal production wells drilled at Medicine Lake, California. The Medicine Lake Volcano is geologically very similar to Newberry. Data from CEE's facility at Coso, California, is used in some instances if it represents a worse case. The analysis in the EIS is based on the range within which the Newberry fluid is expected to fall. If Newberry chemistry turns out to fall outside the range, and the difference significantly affects the analysis in the EIS, then new analysis and a supplement to the EIS will be required. A more detailed explanation of fluid chemistry assumptions and their impact on the analysis has been added to section 2.4.1.4 and Table 2.4-5 has been added to the EIS.

23.9 Comment:
Page 2-49, second paragraph. We recommend the discussion of modified grain silos as winter protection structures for well heads be revised to improve accuracy and clarity. Modified grain silos are one example of the type of structure. Please modify the discussion as follows: "Well heads will be insulated (see example in Figure 2.4-18) for heat retention and may be covered with a prefabricated metal building similar in shape as a small grain silo. Prefabricated metal buildings, which can easily be removed in the summer months, would be provided to cover well pad equipment such as well heads, injection pumps and chemical injection skid areas." [39.25]

Response:
The EIS has been modified as requested.

23.10 Comment:
Why don't the Alternative road maps at 4-113 and 4-114 show where any new roads would run in the roadless area? [41.12]

Response:
The maps referenced only depict the 500 and 600 road system, and not the entire project area. Readers should refer to Figure 2.4-2 and Figure 2.4-21 for a schematic representation of proposed pipeline and road locations for the entire project area.

The titles on Figures 4.10-1 and 4.10-2 have been changed to prevent them from being misleading.

23.11 Comment:
This EIS should address the environmental acceptability of each wellsite area so that a decision can be made whether or not wells are approved to be permitted in that area through a Record of Decision. [44.13]

Response:
The choices will be recorded in the Records of Decision. The environmental impacts of drill pad and power plant sites are discussed in section 4 of the EIS, but the results of the analysis were not summarized in one place. The complexity of Table 4.12-1 attests to the difficulties of trying to compare even one type of impact in tabular form. Except for minor variations in vegetation and wildlife habitat, the well pad and power plant sites and their effects are very similar in most respects. Table 4.11-1 has been modified to clarify the relative impacts of the alternatives on vegetation.

24 Description of C

24.1 Comment:
The negative aspects of Alternative C, especially potential impacts of not developing new energy resources or resources other than geothermal, are not considered sufficiently. [2.4] Alternative C would have significant negative societal impacts because it would result in increased oil or gas fired generation, which have relatively large emissions of SO_2 and NO_x. [20.2] Alternative C is not a viable option, because alternative energy source development is an important substitute to traditional methods. [34.2] Page 2-77. The Draft EIS states that Alternative C is not described in a separate column because the effects associated with construction and operation of the project would not occur. Although Alternative C does not have construction and operational effects on the environment, a discussion of the environmental effects of Alternative C should be included in the Draft EIS. There are actual adverse environmental impacts if the proposed project is not implemented because of the increased reliance on more environmentally harmful forms of energy generation. Accordingly, even though it might not be necessary to include the effects of Alternative C in the table, the analysis of the impacts of Alternative C is inadequate in the current draft. The environmental effects of Alternative C should be discussed in more detail. [39.29]

Response:
The commentors are correct that the No Action Alternative was not considered in great detail. An entire EIS was written for these very comparisons in "BPA Resource Programs Final EIS" (BPA 1993). It would be very difficult to reproduce that analysis here and also difficult to do an adequate summary.

Section 2.3 Alternatives Considered But Eliminated From Detailed Study very briefly looked at this topic in Section 2.3.2.2. Effects of Power Generation Facility that would be built elsewhere.

We still feel that any further discussion is beyond the scope of this EIS and refer readers to the above referenced BPA Resource Programs document.

As stated in section 2.4.3 of the EIS, if the proposed project is not implemented, it is likely that other locations for geothermal development would be considered. If the 30-MW net output of this or another geothermal plant was not available to BPA and EWEB, other resources would be acquired to meet growing demand for electricity. A discussion of resource alternatives is found in the BPA Resource Programs Final EIS (BPA 1993) and in the Northwest Power Planning Council's

1991 Northwest Conservation and Electric Power Plan (Northwest Power Planning Council 1991).

25 Mitigation for B

25.1 Comment:
Page 2-75. In the wildlife discussion, the statement about raptor protection should be qualified by including the words "the extent required by law." [39.28]

Response:
The statement has been amended to read "in compliance with the Forest Plan direction".

25.2 Comment:
We generally agree with the additional mitigation measures proposed for Alternative B. [49.3]

Response:
No response required. Thank you for your comment.

25.3 Comment:
We believe that most of the "additional mitigation measures" described for each resource category provide an additional level of protection and should be included as part of the preferred alternative (Alternative B) in the final EIS and Record of Decision. In particular, EPA strongly supports the additional mitigation measures for air quality, ground water, geothermal resources, noise, and wildlife. [59.3]

Response:
The agencies will consider your suggestion in the preparation of the FEIS and RODs.

26 Mitigation for A and B

26.1 Comment:
The project owner should implement a reforestation project to compensate for the removal of timber lands used by the project facilities. [13.1]

Response:
Although some land will need to be removed from timber production due to the placement of permanent facilities, the agencies do not consider this significant enough to warrant an off-site reforestation project. However, mitigation to replant or revegetate disturbed sites using native grass, forb, shrub, and tree species will be required within the project area.

26.2 Comment:
The developer should be required to provide mitigation for any lost recreation trails, vegetation, recreation area, groundwater, timber, and wildlife habitat. This mitigation should include purchasing and donating to the national forest and parks system equivalent habitat, timberland, and recreation areas. [36.44]

Response:
Mitigation which the agencies feel is necessary for these different resources is discussed in various sections of the EIS. These include sections 2.4.1.7, 2.4.2.6. Each resource section in Chapter 4 contains additional mitigation measures which will or can be applied to the project. These are felt to be commensurate

with the predicted effects of the project. The agencies do not consider donation of land in some other area a necessary mitigation for this project.

26.3 Comment:
Who will pay for the interpretive centers and tutors? [36.50]

Response:
The operator would develop and provide displays in cooperation with the Forest Service, BLM, and BPA. These would be available for public viewing at existing visitor centers and other public locations

26.4 Comment:
The mitigation measures for Alternative A and Alternative B should include a discussion of implementation and enforcement, perhaps through stating stipulations for the permits for the project. Other environmental assessments have included an appendix listing the proposed appropriate conditions. [38.18]

Response:
The agencies will indicate in their Records of Decision which mitigation measures will be implemented. Each agency has different authorities and responsibilities for enforcement and oversight. The stipulations for the permits for the projects will be identified when the permits are issued, but will be consistent with the Records of Decision.

26.5 Comment:
Unforeseen impacts also require mitigation. Oregon Department of Fish and Wildlife asks that 0.5 to 1.0 percent of revenues generated annually be deposited by CEE into a Fish and Wildlife mitigation Trust Fund. The specifics of this can be worked out if the power project is given approval. The Fund should be overseen by a local board or agency and public members. The moneys of the fund will be spent on fish and wildlife restoration and enhancement opportunities throughout Central Oregon. [58.30]

Response:
Specific mitigation measures, including those for wildlife, are described in sections 2.4.1.7, 2.4.2.6, and 4.12.6, and are based on the range of predicted effects from the project. It is not determined to be necessary or reasonable at this time to require a percentage of revenues to go into a fund with no specific objectives or direct connection to the geothermal project. Revenues from the project will already contribute approximately $1.44 million annually to state and local funds. These state and local entities may choose to designate a portion of those revenues to wildlife projects unrelated to the project.

26.6 Comment:
All onsite mitigation activities specified in the DEIS need to be carried out. These include revegetation of disturbed sites, etc. [58.31]

Response:
Mitigation measures to be implemented will be identified in the Records of Decision. The agencies will require these measures to be carried out.

26.7 Comment:
There needs to be a point regardless of investment when the decision is made to shut the operation down if severe or chronic impacts to the environment occur. Running the plant at the expense of the environment cannot be tolerated. New

power generating technologies are welcomed by ODFW. However, the Fish and Wildlife resources of Oregon shall not suffer in the face of technology. [58.32]

Response:
An extensive monitoring program will be implemented with this project. The monitoring program will be summarized in the ROD and detailed in a separate document that will be available to the public. If effects are found to be significantly different (in a negative way) than what is predicted in the EIS, additional mitigation or other measures will be required by the agencies. If these effects cannot be mitigated and are determined to be causing severe environmental impacts, the operations will be shut down until the problem can be corrected. The agencies intend to work with ODFW as well as other State and local entities as the project is implemented.

27 Writing or Editing

27.1 Comment:

All aspects of the project have been addressed. [5.3] The DEIS seems complete and accurate. [10.3] Draft EIS accurately and comprehensively characterizes the proposed project and its environmental effects. [23.3] DEIS very technical and thorough. [25.5] In general, the DEIS is comprehensive and well done. [30.1] DEIS was one of the best documents of its type that I have read. [32.1] The DEIS recognizes there are still unknowns regarding the deep geothermal resource in terms of quantity and quality. With that reservation the document seems well organized. [38.2] The EIS generally does an excellent job of describing a geothermal project and its impacts. The level of detail reveals, overall, a genuine hard look at the issues. [44.1] We found the DEIS very informative. [49.2] The DEIS for the Newberry Geothermal Pilot Project contains much relevant information and portions of the report were complete and carefully prepared. [60.1]

Response:
No response required. Thank you for your comment.

27.2 Comment:

Page 3-2, Figure 3.1-1. The scale on this map needs to be corrected. Each square on the map is a Township or 6 miles across. [39.30] Page 3-40, Figure 3.5-1. The scale on this map needs to be corrected. Each square on the map is a Township or 6 miles across. [39.34] Appendix F, Table 6, page F-72. The corrected table (Table 6) was provided but was not included in the final draft of the DEIS. The corrected table is enclosed as Exhibit C. [39.64] Page S-23: I don't see any of the asterisks mentioned in the Notes. [54.29]

Response:
Changes made as noted. For comment 39.64, Figure 2.4-2 has also been corrected.

27.3 Comment:

There is an error on page 4-174. 2,500 acre-feet does not equal 3.08 cubic meters. [4.8] Page 4-174, Section 4.12.2.5, Water Use. The conversion of 2,500 acre feet to cubic meters is incorrect. [39.61]

The text (it is actually in section 4.16.2.5) has been corrected to read 3.08 million cubic meters.

27.4 Comment:
Where there are "coulds" used in the text, please provide some explanation of "how and where." [35.23]

Response:
Words like "could" and "would" imply a contingent condition, in this case approval of the proposed action or an alternative. They were deliberately used throughout the draft EIS to avoid implying that approval of the project is a foregone conclusion and also because the EIS is not a decision document. The Records of Decision are where conclusions will appear.

We do not agree with the implication that the EIS is short on explanation. A great deal of specificity and detail is included in the EIS, as its length (and comparison with similar documents) attests.

27.5 Comment:
I found the index to be very limited in topics listed and therefore no more useful than the table of contents. The index should be expanded. [54.4]

Response:
The index has been expanded.

27.6 Comment:
The statement that proposed activity is not "particularly controversial" is too subjective and should be dropped. [54.14] Statements [in the Executive Summary] under "Areas of Controversy" and "Issues to be Resolved" are biased towards the proponents of geothermal development. Please present the FACTS and let the reader draw his/her own conclusions. [54.16]

Response:
The preparers of this EIS have made every attempt to develop and present an unbiased, factual document that will assist decision-makers in drawing conclusions based on fact. Because an "Areas of Controversy" discussion would be unavoidably judgemental, the section has been deleted. For the same reason, the first sentence in the "Issues to be Resolved" section has been removed.

28 Decommissioning

28.1 Comment:
The responsibility of the operator at deactivation should be better defined. [7.3] Need further explanation of how proper decommissioning will be funded and accomplished. [17.3] Need greater consideration of decommissioning phase and site condition after removal of facilities. [29.1] Need greater discussion and specificity regarding funding of decommissioning. [30.9] Deconstruction in the event of premature termination of the project is not mentioned. [31.2] A bond should be required to cover the cost of reclamation of the site at termination of activity. [31.13] Clarify who posts the bonds, what the fines/penalties are for the project, and what is included in (covered by) the unit bond. Also clarify what potential dollar amounts the developer has at risk. [35.29]The premise is made that the surface will be restored. Since the developer impacted the surface, the developer should pay for rehabilitation and restoration, not the taxpayer. There should be a bonding requirement to be implemented when the developer receives the needed permits. [38.31] [ODOE] and [EFSC] are also interested in, and will require, acceptable plans for decommissioning and permanent closure of the project prior to termination of operation. [49.9] Since the EIS plans ahead to the

decommissioning sometime off in the future, we would encourage the posting of a bond by the operator to cover the cost of that removal. [53.5] The DEIS did not adequately address the issue of decommissioning and shutdown of operations. [54.5]

Response:
Both the BLM and the Oregon Department of Geology and Mineral Industries (DOGAMI) require a bond to be posted prior to commencement of drilling operations. If the bond posted for the BLM meets DOGAMI's requirements, it does not have to be duplicated. The bond will ensure compliance with the terms and conditions of the lease, including plugging and abandonment of wells and site restoration (43CFR3206; ORS 522.145). If the developer goes bankrupt, the BLM can draw on the bond, as it did recently to plug and abandon temperature gradient wells drilled by GEO-Newberry Inc., which went out of business.

As a condition for obtaining a license for an electrical generating facility, the developer must furnish and maintain a bond of at least $100,000. The bond will be large enough so that, "Upon the relinquishment, expiration, or termination of the license, the licensee shall, if directed by the authorized officer, remove all structures, machinery, and other equipment from the land covered by the license. Removal of such property shall be at the licensee's expense" (43CFR3250.9.c)

"Where land covered by a license has been disturbed, the licensee shall within one year following the relinquishment, expiration, or termination of a license issued under this part restore the land in accordance with the terms and conditions of the license. The bond ...shall not be released until the reclamation has been completed to the satisfaction of the authorized officer [the BLM]" (43CFR3250.9.e).

The amount of the bond covering power plant decommissioning will be determined by the BLM when the final project design has been completed. A more accurate cost estimate for removal and site restoration can be made at that time. The BLM can adjust the bond amount at any time in the future if conditions warrant.

The Oregon Energy Facility Siting Council (EFSC) may also establish requirements for decommissioning as part of the state permitting process. These requirements are developed on a project-specific basis, and are not known at this time.

Further details regarding unit bonds and other bonding requirements can be found in 43CFR Part 3200, available from the BLM. State regulations are available from DOGAMI and EFSC.

Section 2.4.1.5 of the EIS has been expanded to address the issues raised by the commentors.

29 Aesthetics and Quality of Life

29.1 Comment:
It will affect the quality of life for people. [9.4]

Response:
No response required. Thank you for your comment.

29.2 Comment:
Hydrogen sulfide can be smelled for great distances, and I do not want this to devalue my property and life style where I live at the north base of the Paulina volcano. [28.4]

Response:
The analysis in section 4.5 of the EIS indicates that even under worst-case conditions, hydrogen sulfide could not be smelled by humans located 7 km (4.3 miles) away. There would be no detectable smell at this distance during normal operations. Private land on the north boundary of the Deschutes National Forest is at least 24 km (15 miles) from the plant sites.

30 Conflict with NNVM

30.1 Comment:
Industrial use of public lands and the NNVM should be more responsible. [1.5]

Response:
Environmental analyses and EIS's are being completed for the geothermal proposal and for management of the NNVM. Analyses of effects are used to make decisions so that the NNVM and surrounding public lands can be managed responsibly and in compliance with applicable laws and regulations, including those governing multiple use of National Forest lands.

30.2 Comment:
Siting a geothermal power plant in close proximity to a pristine national monument is not acceptable. [26.1] Page 1-3, second paragraph: The Draft EIS states that the proposed project "would occur on national forest lands subject to the Newberry National Volcanic Monument legislation." This should be clarified to explain the extent to which the legislation actually applies to the project area. Although CEE's lease area does not fall within the boundaries of the actual "Monument" lands (as defined by the Newberry National Volcanic Monument Act (the "Act"), a portion of the lease area is within lands designated under the Act as "Special Management Area." Pursuant to Section 2(c) of the Act, the Special Management Area must be managed as if it were part of the monument, except as provided in Section 4 of the Act. Pursuant to Section 4(a)(5), geothermal leases may be issued in the Special Management Area provided surface occupancy does not occur in the Special Management Area and provided the area is entered only by directional drilling from outside the Special Management Area boundaries.

The land where CEE's operations (surface improvements) and drilling will occur is on federal lands outside the National Monument boundaries. Section 8 of the Act provides that

"nothing in this act shall be construed as authorizing or directing the establishment of protective perimeters or buffer zones around the monument or special management area for the purpose of precluding activities outside the monument or special management area boundary which would otherwise be permitted under applicable law. *** The fact that activities or uses outside the Monument and Special Management Areas can be seen, heard, measured, or otherwise perceived within the Monument or Special Management Area shall not, of themselves, limit, restrict, or preclude such activities or uses up to the boundary of the Monument and Special Management Area." [39.8] It is one thing not to preclude developments/activities outside the Monument boundaries, and it is quite

another to conduct outside developments/activities that may require certain management in the Monument to accommodate these outside developments/activities. Section 4(c) of the Monument Act precludes any outside geothermal development that may have this effect on the Monument. To avoid these management conflicts, drilling on the project should be restricted to already roaded and logged areas, and the further from the Monument, the better. [41.8] The draft EIS is well written, insightful into the needs of geothermal development in the proposed area, and sensitive to competing needs and concerns of the area and, in particular, to the newly found Newberry National Monument. [42.1] We appreciate the attention given to direct and indirect impacts on the Newberry National Volcanic Monument. [49.7] Is the project consistent with NNVM legislation? [54.8]

Response:
Sections 1.6 and 4.21 of the EIS have been expanded to include information about the Newberry National Volcanic Monument Act, how it relates to this proposal, and to demonstrate that this project is consistent with the Act. Readers should refer to the Legislation (available from the Forest Service) for more information. As is noted in section 4.21, the project would be consistent with the NNVM legislation and would not conflict with the Monument Management Plan.

30.3 Comment:
Page 4-96, second paragraph. The only mitigation measure described for assuring consistency with the Newberry National Volcanic Monument Management Plan is a statement that there would be consistency. We recommend that a more detailed discussion of how consistency would be achieved be included. [39.57] Page 4-179, Section 4.12. Section 4.12 [the commentor is actually referring to section 4.21] addresses consistency with other plans and policies. CEE recommends that this section be expanded to explain the consistency with the Deschutes Forest Plan in more detail. Specifically, the discussions needs to address coordination with the Newberry National Monument Management Plan and to address the Eastside Ecosystem Management Plan. [39.62]

Response:
In the analysis for the NNVM EIS, potential effects of nearby geothermal development were evaluated and coordination needs with respect to mitigation and monitoring were determined. Consistency with the NNVM Management Plan will be maintained as the Plan and the geothermal project are implemented. The Forest Service has authority to approve Plans of Operation for surface disturbance, along with BLM. The Forest Service's intention in carrying out it's responsibilities include ensuring that surface activities meet requirements as stated in the Act of considering effects on the values for which the Monument and SMA were established. Activities which would adversely affect these values, as well as any that were not in compliance with the EIS, would not be authorized by the Forest Service. Additionally, management of NNVM would be handled by Forest Service staff on the Deschutes National Forest, specifically the Fort Rock Ranger District, who will also be managing the geothermal development. Continuous internal coordination will occur as both programs get underway.

Section 4.21 has been revised to include more information on how the project is consistent with the Deschutes National Forest Land and Resource Management Plan. Refer also to Section 3.8.2.2 for information on management allocations and other designations.

Refer also to Section 4.21 for discussion and clarification about the NNVM Comprehensive Management Plan.

30.4 Comment:
Development on the NNVM boundaries is likely to lead to a requirement that the roadless area be roaded and logged to protect the geothermal development from fire. How much roading and logging would be considered necessary to protect the geothermal facilities? Monument Act provisions for managing risks that threaten serious harm to outside resources applies only to structures/resources in existence at the time of the Act. This issue is not mentioned in the DEIS. [41.7] It is one thing not to preclude developments/activities outside the Monument boundaries, and it is quite another to conduct outside developments/activities that may require certain management in the Monument to accommodate these outside developments/activities. Section 4(c) of the Monument Act precludes any outside geothermal development that may have this effect on the Monument. To avoid these management conflicts, drilling on the project should be restricted to already roaded and logged areas, and the further from the Monument, the better. [41.8]

Response:
There will be no requirement that unrooded areas will need to be roaded and logged to protect the geothermal development from fire. The Monument Legislation states that the Secretary is authorized to take action to the extent practicable to ensure that tree diseases, insect infestations, fire hazards, and fires with the Monument and SMA do not seriously threaten resources outside the Monument and SMA boundaries. This has not been interpreted to apply only to resources or structures in existence at the time of the Act, nor has it been interpreted to apply to a fire risk at the proposed geothermal facility.

The geothermal project has a number of elements in its design and mitigation to keep it as fire safe as possible. These elements are described in section 4.14.3.2 of the EIS.

If a fire occurs on lands adjacent to the facility, fire suppression efforts by the Forest Service and the operator will help limit potential damage to the facilities. Additionally, the geothermal operator will have suppression equipment on-hand and can provide water to help the Forest Service in fire fighting efforts.

31 No Comment

31.1 Comment:
No comments. [6.1] No comments. [19.1]

32 Unavoidable Adverse, Short and Long-Term, Irreversible/Irretrievable, etc.

32.1 Comment:
Project is consistent with Power Council's 1991 Power Plan. [23.2] Project is consistent with 1991 Power Plan and this should be reflected in section 4.21. [23.6]

Response:
Section 4.21 has been amended as requested.

32.2 Comment:
Page 4-180, Mining and Drilling Regulations. This section should make specific

reference to the Oregon Department of Geology and Mineral Industry geothermal drilling rules. There are separate rules for mining. [39.63]

Response:
Section 4.21 has been amended as requested.

32.3 Comment:
The claim made in section 4.18 that this project would have "no impacts on rivers and fish habitat" is false. Basically, we don't know yet. [57.26]

Response:
The analysis has not shown that there would be any significant impacts to rivers or fish habitat as a result of this project. Monitoring of the project will verify this.

32.4 Comment:
Page 4-181: Need to insert "management act" or "Legislation" following "provisions of the NNVM." Would be good to include the Public Law number, too. [57.28]

Response:
Section 4.21 has been revised. The subheading relating to the NNVM will also be corrected.

32.5 Comment:
Long term loss of habitat [can occur] at all stages [of the project]. [58.29]

Response:
As discussed in Section 4.12, Wildlife, up to 41.5 hectares (102.5 acres) of habitat could be lost due to exploratory drilling and associated activities. Each production-sized well pad would require approximately 1.6 to 2.3 hectares (4 to 5.7 acres). Construction of up to 6.4 km (4 miles) of new road could also result in a habitat loss of up to 4.3 hectares (10.7 acres). Construction of the plant site would clear an additional 7.5 hectares (18.5 acres).

32.6 Comment:
The section on unavoidable adverse effects is incomplete. For example, high likelihood impacts should include periodic H_2S odor detectable in the vicinity of Paulina Lake and increases in born and arsenic levels in Paulina and East lakes due to deposition from air emissions. [57.24]

Response:
Comment noted. An additional unmitigated adverse impact which is not listed is the H_2S odor at the Paulina Lake vicinity. This impact has a very low likelihood to occur. It is estimated that for less than 0.014-percent of the time (less than 1.2 hours per year) that a H_2S odor may be detectable within approximately 6 km (3.7 miles) of the power plant due to unplanned upsets occurring during poor meteorological dispersion conditions. A bulleted item will be added to the appropriate list to reflect this comment.

Over the 50 year life of the project the increase in boron and arsenic in the Newberry Crater lakes will be insignificant (see Appendix L) and should not be considered an adverse impact.

32.7 Comment:
The Air and Water Quality section on page 4-180 seems incomplete. Why

mention the Clean Air Act and the not the Clean Water Act? Why is the title of this section only termed "Legislation," not "Regulations"? It would be better to include the appropriate Oregon Administrative Rules as well as the broad ORS designations. [57.27]

Response:
Comment noted. The EIS has been modified to reflect the comment.

33 Supports or Opposes Project, Preferred Alternative, Analysis

33.1 Ten commentors made general statements either supporting the project or supporting both Alternatives A and B.

Alternative A is acceptable. [2.1] Alternative B is acceptable. [2.2] The project should move ahead to development. [3.2] Can find no fault with this proposal. [5.1] Supports Alternative B (and by implication, Alternative A). [10.4] Supports the project. [11.1] Supports the project. [15.1] Well conceived project, which should be approved for development. Either Alternative A or B should be approved. [20.1] Alternatives A and B are equally acceptable. [22.2] Geothermal appears to be one of the most benign ways for the creation of electrical power. Supports the project. [33.1] The development is a worthwhile proposition that would produce little if any adverse effects to the environment. [34.1] I am for the construction of the geothermal power plant. Getting rid of some of the hydroelectric plants will have a real positive effect on the fish population. The fish runs will be able to reach places they haven't been able to since the construction of the many large dams that plague our rivers. The plant will also bring more power to the area. [47.1]

Response:
No response required. Thank you for your comment.

33.2 Six commentors expressed a preference for Alternative B.

Prefer Alternative B. [7.1] Support Alternative B. [16.1] Alternative B is appropriate. [17.1] Supports adoption of Alternative B. [24.1] Soil disturbance and habitat modification on 320 acres of ground seem reasonable for 33 MW of electrical energy for a 50 year lease period. Support adoption of Alternative B with modifications. [25.1] CEE and EWEB support the preferred alternative in the Draft EIS: Alternative B. [39.1]

Response:
No response required. Thank you for your comment.

33.3 One commentor was opposed to Alternative C.

Alternative C is not acceptable. [2.3]

Response:
No response required. Thank you for your comment.

33.4 Five commentors stated a preference for Alternative C, stated they were opposed to the project, or said they were opposed to geothermal.
Against the project. [8.1] Against the project. [9.1] Alternative C is preferred. [26.8] Against geothermal plants in Oregon or Washington. [27.10] Support no action alternative. [37.2] We recommend that this project be postponed (Alternative C) until sufficient data are available to ensure a more complete evaluation of environmental impacts. [60.2]

Response:
No response required. Thank you for your comment.

34 Other Remarks

34.1 Comment:
Not an impartial EIS because it is written by Forest Service personnel who will benefit from the project. [28.1]

Response:
The Forest Service is the land management agency for the lands on which the geothermal project is proposed, and as required by the National Environmental Protection Act (NEPA), has the responsibility to prepare NEPA documents for this project as well as any other project or activity which would take place on National Forest lands.

34.2 Comment:
It is proposed that the developer pay stumpage fees to the Forest Service for cleared, marketable timber. But this practice may violate regulations requiring bidding of timber sales. [36.47]

Response:
The Forest Service has Manual and Handbook provisions that authorize granting a permittee or occupant to purchase timber stumpage without competitive bidding. This process is known as Timber Settlement, and is appropriate to use for this project.

34.3 Comment:
I want to commend you for your efforts and your ability to balance the needs of geothermal development and environmental protection in this most sensitive area. [42.6] The EIS contains very conservative estimates of water use, air emissions, chemicals used in drilling, surface disturbance and traffic. We believe impacts will generally be less than described. [44.2] Geothermal is an excellent source of energy but should not be a trade off of our air quality or natural resources. [46.4]

Response:
No response required. Thank you for your comments.

34.4 Comment:
The Newberry Geothermal Pilot Project draft EIS is an informative, well prepared and comprehensive document. It addresses most of the pertinent issues and potential environmental impacts of project activities very well. In particular the draft EIS has done an excellent job of defining the "study" area for each resource category, describing the methods for analysis, describing the impacts associated with different activities/project components for each phase of the proposed project (exploration, development, utilization, and decommissioning). Of particular note is the emphasis on gathering baseline data. Baseline data are important since an

environmental baseline provides the bases for detecting significant environmental changes in the future as a result of the proposed actions. [59.1]

Response:
No response required. Thank you for your comment.

35 Geothermal Technology or Equipment

35.1 Comment:

Questions 60 hr/year upset condition assumption. Cites recent 6-month period at Coso in which the plant tripped the equivalent of 219 hr/year. Even using the rate given in the DEIS, 11 tons of H_2S would be emitted during outages alone. [36.10] The "upset" history came from Coso. Will the climate and altitude at Newberry increase the risk of upsets? Will upsets be harder to control at Newberry than on the California desert? The quantity of air pollutants at Newberry might be greater if it takes longer to restore normal conditions at Newberry. What has been the "upset" history at Mono and Nevada plants? [38.25] "Upset condition" needs clarification. Just what is an upset condition in respect to geothermal terminology? Is it to be understood that during well venting no emission controls are in place? What are the impacts to the environment from this activity? If no "practical" control technology to abate emissions from steam venting at the power plant silencer, what defines what is practical? Perhaps if plant emissions result in unacceptable environmental impacts, the only "practical" action would be to close the plan until "practical" technology is available or CEE pays research and development costs for its development. [58.7]

Response:
An upset or plant trip is a rapid, unscheduled plant shutdown. It could be caused by mechanical problems or equipment failure in the plant, or by a transmission outage. The term will be defined in the EIS where it first appears, and will be added to the Glossary.

Plant trips occur as a result of an upset condition that requires the plant to vent the high or low pressure steam to the plant silencer prior to the steam passing through the turbine and the condenser. Venting can occur for a number of reasons. One of the most common reasons is a transmission line outage, which causes the generator to trip (like a circuit breaker tripping) and steam to be vented. Other causes of plant trips are loss of a circulating water pump, condensate pumps, or other critical pumps in the condensing or injection systems.

No emission controls are in place during well venting. Depending on the cause of the upset, it may be possible to route the steam directly to the condensers and emission abatement system. The Sulferox H_2S removal system is considered to be state of the art (best available control technology).

Plant trips may be more frequent in the first four to six months of start-up operations, but operations are generally not at the full 33 MW gross output during start-up. The Newberry assumptions of approximately 24 trips a year for 60 hours is high compared to CEE's other operations.

The comment on the number of venting hours at Coso being 219 hr/year vs. the EIS assumption of 60 hr/year is inappropriate. The 219 hr/year venting at Coso was for the BLM East Plant, which at the time was experiencing equipment failure in the compressors used in the air pollution control system. This was a design flaw, and the system was replaced with a Sulferox system. CEE will not be

using the type of compressor that failed at Coso in its operations at Newberry. The Navy Unit 2 operations were considered to be a worst case representation of the equipment performance that could be expected at Newberry. The operation of the Coso plants has improved since installing a Sulferox system.

The operation record of the Coso Unit 9 may be more representative of the Newberry operations, because it is a single 33-MW turbine power plant. The number of hours of down time due to trips is significantly lower than the Navy Unit 2 facility, because the Navy Unit 2 facility does not have a new liquid redox system and still relies on a gas injection technology that results in multiple compressor trips when back pressure occurs in the injection system.

From January 1 to December 31, 1993, Coso Unit 9 tripped 5 times, for a total of 10.2 hours. Virtually all of the down time (9.7 hours) was due to a single transmission line outage.

When the transmission system goes down, it results in a loss of power to run the condenser system. Because the steam cannot be condensed, it must be vented until either the upset condition is corrected or the wells are shut down. The emergency back-up generators are designed to run instrumentation, fire control, and well head controls, but not run the condensing system (which uses over 50-percent of the internal plant load of 3 MW). A diesel generator large enough to supply this load would only replace one type of emission with another (and create other issues related to fuel transportation and storage).

The climate and altitude at Newberry would not increase the chance of upsets. Site characteristics will be accounted for in the engineering design of the facilities. For example, transmission lines in the California desert would be designed to account for greater wind loads and to prevent conductor fatigue damage due to wind-induced vibration. At Newberry, transmission line structures may have to be spaced more closely to account for greater snow loading on the conductors, but wind load would be less of a concern.

The second paragraph on page 4-30 of the Draft EIS discusses well field emissions, not power plant upset frequency. Some unabated emissions occur during well field maintenance, which may occur as frequently as once per year, and as infrequently as once every 10 years.

The plant upset frequency assumptions are given in Appendix F and discussed in section 4.5.3.2 of the EIS. Even if plant upsets occurred very frequently, they would not be cause for concern if they were of short duration and resulted in negligible or no unabated emissions. Therefore, the frequency of plant upsets at other facilities is not particularly important or relevant. Nevertheless, data on geothermal power plants collected by the Oregon Department of Energy show that geothermal plants built in the last decade are extremely reliable, with capacity and availability factors typically in the high 90-percent range.

The "worst case" scenario used in the analysis (plant upset with six wells venting through the plant while two wells vent directly into the atmosphere) is believed to be a very conservative outer boundary on emissions. The environmental impacts resulting from this condition are analyzed in sections 4.5 and 4.6 and elsewhere in the EIS.

Hydrogen sulfide emissions will be continuously monitored at locations to be determined by the BLM and Forest Service, including the plant site and Paulina

Lake Lodge. The monitoring program will be summarized in the ROD and detailed in a separate document that will be available to the public. If these emissions are greater than anticipated in the EIS, the BLM will require measures to reduce them to acceptable levels.

35.2 Comment:
Doesn't understand need for cooling tower or how it works. [31.6] Please explain how having towers parallel with the westerly and easterly trend of winds has less impact on plumes than would towers placed perpendicularly to the predominant wind flow. [38.6] Why are cooling towers necessary. This is not clear and should be explained. [The commentor appears to be referring to the Executive Summary] If an option exists for NOT having cooling towers, it should be included in one of the alternatives to reduce potential for environmental degradation from air emissions from the towers. [54.10] What is "make-up water"? [57.20]

Response:
Steam condenser and cooling tower purpose and operation are described in section 2.4.1.3 of the EIS. The purpose of the cooling towers is to cool the water that flows through the condenser. The purpose of the condenser is to cause spent steam in the turbine to condense to liquid. The cooling water absorbs heat when it changes steam into liquid. Cooling water is continuously reused. Before passing through the condenser again, the temperature of the cooling water must be lowered. This is accomplished by spraying the water through an upward-moving flow of air in a cooling tower. Some water is lost in this process, mainly through evaporation and partly because a small amount of water escapes as "drift" in the air stream. Depending upon ambient air temperature and humidity, the evaporated water may be visible as a plume. The higher the humidity and lower the temperature, the more visible the plume. An alternative to cooling towers would be to flow river or lake water through the condenser.

"Make-up water" is the water that must be supplied to the condenser to replace water lost in the cooling tower. It will normally be supplied by condensed steam from the turbine. In order to inject approximately the same amount of fluid back into the geothermal reservoir (to replenish it) as is withdrawn, groundwater may be used during parts of the year to make up for evaporative losses in the cooling towers.

The reason for placing the longitudinal axis of the cooling towers parallel to the predominant wind flow is to minimize the amount of warmed (by hot water in the cooling tower) air re-entering the bottom of the cooling tower. A certain amount of warm air will be trapped in a downflow on the leeward side of the tower and will recirculate through the tower, reducing its efficiency. When the longitudinal axis of the tower is parallel to the wind , most of the air enters at the sides of the tower, and recirculation is largely limited to the leeward cell. When the cooling tower operates efficiently, the steam plume is minimized. A more detailed discussion can be found in (Elliot, Thomas C., ed. Standard Handbook of Powerplant Engineering. McGraw-Hill Pub. Co., 1989. p. 1.223-1.225).

Additional detail on this topic has been added to section 2.4.1.3 of the EIS.

35.3 Comment:
Greater consideration should be given to the reliability of geothermal compared to other energy resources. The potential for outage and failure in [geothermal] delivery and production systems are minuscule compared to conventional thermal, hydro, atomic, or other renewable sources. [3.1]

Response:
Geothermal plants, especially those installed in the last decade, have shown themselves to be one of the most reliable energy sources available. Capacity Factor — the amount of energy a unit actually generated during a year compared to its maximum rated output — is a measure of plant performance. Newer geothermal plants typically have capacity factors in the high 90-percent range (Oregon Department of Energy, 1994. Geothermal Plant Database). This compares to 46 percent for hydroelectric, 20 percent for wind, 68 percent for new coal-fired units, and 66 percent for nuclear. The average annual capacity factor for all U.S. geothermal plants (both old and new) is 73 percent (Source: Energy Information Administration, 1991. "Annual Outlook for U.S. Electric Power 1991." p. 53-54.).

A discussion of the reliability of geothermal has been added to section 1.3 of the EIS.

35.4 Comment:
[Geothermal] is a proven clean resource in other parts of the United States and foreign countries. [7.2]

Response:
No response required. Thank you for your comment.

35.5 Comment:
Technologies exist to more efficiently utilize the "waste" steam. Why aren't they being utilized. [26.6]

Response:
Steam that has passed through the power plant could be used in a variety of applications. These include space and district heating, aquaculture, greenhouses, and industrial processes. None of these "downstream" uses are part of the proposed project, and are outside the scope of this EIS.

35.6 Comment:
There are to be about half as many reinjection wells as production wells, but about 75% or 80% of the original brine is to be reinjected. This implies a larger flow rate in a reinjection pump than in a production pump. It seems that the outlet of the reinjection pump cannot be directly into the high pressure reservoir, or most of the available energy would be needed for reinjection. Where would the reinjection outlet be, and how would the brine then get into the deep reservoir to replenish it, and not into the upper ground water? [29.5]

Response:
The injection system will have a higher flow rate of fluid per well than the production system. It is a lot easier to get a well to accept injection than to get a well to flow. Injection wells are single phase wells (injecting water only, as opposed to a two-phase water and steam mixture). Two or more injection wells are planned. There could be as many as four to five injection wells depending upon the conditions of the reservoir. There will be a minimum of two injection

wells, so that if one well fails there is at least one injection well left to operate the system at a reduced production level.

CEE would like to have 150-percent capability on injection wells, and spread the injection out with respect to the wellfield. Injection depths will be determined based on drilling results. A Plan of Injection is required under the GRO Orders, and must be approved by the BLM. In general, fluids will be injected near the same depth as production (i.e., thousands of feet below the shallow groundwater zone), but far enough away to allow fluids to reheat before they return to the production wells.

35.7 Comment:
Is this an experimental installation. [31.4]

Response:
This is not an experimental installation. The well field and power plant technologies to be used in this project are proven technologies already in use at numerous sites in the United States and elsewhere.

35.8 Comment:
Explain more clearly how the sulfur-oxidation process works. [35.15]

Response:
The process will reduce the H_2S concentration in the noncondensable gas stream to less than 10 parts per million. This will reduce H_2S emissions from the plant to less than 0.1 lb/hr (0.3 tons/year). The process involves three basic steps: absorption, sulfur recovery, and regeneration.

Absorption. The noncondensable gases will be removed from the condenser by the noncondensable gas removal system and piped to the Sulferox system skid where the gas stream comes in contact with the Sulferox solution, a liquid containing a soluble ferric iron chelate, Fe(III). The H_2S is selectively oxidized to form elemental sulfur and the ferric chelate, Fe(III), is reduced to ferrous chelate, Fe(II).

Absorption: $2Fe(III) + H_2S \rightarrow 2Fe(II) + 2H^+ + S^0$

Sulfur Recovery. The elemental sulfur is filtered from the solution to form a moist sulfur cake (approximately 25-percent water by weight). The remaining gases (primarily carbon dioxide and air) are vented to the atmosphere by dispersing them through the cooling tower.

Regeneration. In order to continually supply the absorption section with a fresh supply of iron in the active Fe(III) form, the operating solution is sent to a regeneration section where the Fe(II) is reoxidized with air back to Fe(III). It is then sent back to the absorption section to be reused.

Regeneration: $2Fe(II) + 2H^+ + \frac{1}{2}O_2 \rightarrow 2Fe(III) + H_2O$

The Sulferox process (and the very similar LoCat process, which is also being considered by CEE) is regarded as the best available control technology for removing H_2S.

35.9 Comment:
The pipelines to the injection wells would be of smaller diameter due to less need for insulation. However, insulation would seem needed to prevent the pipes and injection fluids from freezing in winter. Will the injection fluids have high temperatures that would require insulation to protect workers, wildlife, and the public from injury from hot pipes? [38.29]

Response:
Fluid temperature in the pipes to the injection wells will be in the neighborhood of 100° Celsius (212° F). Therefore, the pipes are very unlikely to freeze. The injection lines will be insulated to prevent injury from contact with hot pipes.

35.10 Comment:
If Alternative A or B is chosen, I would request that uncontrolled venting of geothermal fluids be reduced from what is described currently by using Best Available Control Technologies and a power plant design with two turbines instead of one. With two turbines, the number of instances when unabated venting occurs would be greatly reduced. [54.2] An explanation of the possible alternative control technologies should be given. Another way to reduce emissions that should be mentioned is a redesigned power plant with a dual turbine system. This would allow steam to be redirected to the other turbine if one shuts down. [57.17]

Response:
Redundant turbines would not necessarily reduce the amount of unabated venting. When a turbine fails, the steam can be routed directly to the condenser and no unabated venting will occur. Power outages are the main cause of unabated venting, because electricity is needed to run the pumps. As is noted in section 4.5.6 of the EIS, emission control technologies other than those proposed by CEE were not evaluated because the proposed technologies are expected to result in acceptably low emission levels. If initial test results indicate that emissions of any pollutant are significantly higher than expected, measures will be taken to reduce them to acceptable levels.

35.11 Comment:
Isn't there a technology available that combines a "silencer" with a system to filter out toxics? If so, could this be used also during well testing, maintenance, and upset? Such a technology should be required in the preferred alternative, if it exists. Or, better technology should be required when it becomes available. [57.15]

Response:
It is possible to inject sodium hydroxide or other chemicals into the steam flow to solubilize hydrogen sulfide during well testing and in steam stacking operations (steam venting at the power plant). Removing sulfur at the wellhead has been done on an experimental basis at The Geysers (Source: Alan Hammond, Dow Chemical Co., personal communication with BPA). These technologies will be considered if hydrogen sulfide emissions reach unacceptable levels.

36 Energy Issues and Effects

36.1 Comment:
There is a need for an alternative energy source and that need could be met with geothermal. [5.2] The Northwest should diversify its energy profile, reduce its dependency on fossil fuels, actively pursue alternative, renewable sources of electrical power, and make geothermal energy an essential element of our new

energy portfolio. [22.1] It is important to confirm the cost and availability of alternative power sources.[23.1] Let's encourage the growth of alternative energy sources like the Newberry Project. [33.2] As the need for additional electrical generating capacity grows in our region, we need to develop a broad array of resources to meet that demand. Geothermal is one of the resources that shows very high potential for meeting a portion of that demand. [42.3] Geothermal, together with other renewable resources such as wind, solar, and biomass, can significantly reduce our dependence on imported fossil fuels while at the same time play a major role in reducing the emission of greenhouse gases. [42.4] The geothermal project at Newberry will go a long way to establish the viability of geothermal in this region and confirming previously published estimates of the region's geothermal potential. [42.5] Geothermal power represents an important potential alternative to using fossil fuel to produce electricity. [49.1] Since the traditional sources of electric energy have entailed high costs in environmental degradation, it is of value to explore alternate sources to supply our society's seemingly insatiable appetite for power. Certainly a trial of the geothermal potential at Newberry Crater would be reasonable as a step in exploring alternate resources. We need to keep potential environmental hazards ever in mind. Your DEIS seems to seek out and evaluate possible deleterious effects in this pilot project. [53.1] I would very much like this project to be successful, as alternatives to fossil fuels are necessary to the long-term well-being of this nation and the global community. However, I am concerned that if problems with upsets and environmental damage become apparent with this project, it will be hard to get public acceptance of further geothermal development in the state of Oregon. [57.19]

Response:
No response required. Thank you for your comments.

36.2 Comment:
Conservation should be pursued more aggressively as an alternative to this project. [1.3]

Response:
Examining more aggressive conservation as an alternative to this project is outside the scope of this EIS. However, studies by the Northwest Planning Council indicate that conservation alone is very unlikely to meet increased energy demand caused by economic and population growth in the Pacific Northwest (Northwest Power Planning Council. 1991. "1991 Northwest Conservation and Electric Power Plan." Vol. 1.) The environmental impacts related to a range of strategies for meeting future demand for electricity is also examined in the Bonneville Power Administration's Resource Programs Environmental Impact Statement (Bonneville Power Administration, 1993. Resource Programs Final Environmental Impact Statement.)

36.3 Comment:
Greater consideration should be given to the true cost of energy use and its production. [1.4]

Response:
This comment is interpreted to relate to efforts to calculate the overall societal costs of energy use and production. This issue is outside the scope of this EIS.

36.4 Comment:
The document should be clearer about where the power produced by the project

will go, what entities it will be sold to, etc. [35.9] Address the growth rate of the area and related impacts on requirements for electrical energy. [35.10]

Response:
Section 1.1 states who will purchase the power. This is repeated in section 1.3. Power produced by the project will reach the BPA transmission grid via a connection to an existing Midstate Electric Cooperative 115-kilovolt transmission line. Strictly speaking, once the electricity is on BPA's system, it will be mixed into the pool of resources available to BPA. In actuality, since central Oregon imports virtually all of its electricity, electricity from the Newberry Project will serve loads in the Bend-La Pine area.

The population of Deschutes County increased from 32,000 to 62,000 between 1970 and 1980. It declined during the 80s, then increased to 70,000 by 1990. In July, 1993, the population was 88,500, with Deschutes County having the highest growth rate in Oregon. The population is now estimated to be over 90,000. The current growth rate is about 4 percent a year. If this trend continues, the population will double in 17 years. The growth rate over the next 15 years is expected to be between 2 and 4 percent a year (George Read, Deschutes County Planning Department, May 13, 1994, personal communication with BPA).

Three utilities — Midstate Electric Cooperative, Central Electric Cooperative, and Pacific Power and Light — serve Deschutes County. In general, Pacific serves the larger cities (such as Bend and Redmond) and the cooperatives serve the rural areas. Midstate and Central currently purchase all of their energy from BPA. The combined energy sales of the two cooperatives totaled 580,240 megawatt-hours (MWh) in 1992, and are expected to reach 696,000 MWh by the year 2000.

The annual output of the geothermal project will be about 261,000 MWh, which is about what Midstate now purchases from BPA.

Sections 3.15 and 4.15 of the EIS will be revised to include this information.

36.5 Comment:
The contrast is noted between the Newberry DEIS and the draft EIS's for BPA's gas-fired projects. The EIS's for the gas-fired projects receive about one-third the analysis of this geothermal EIS, despite the fact that they produce 10 to 15 times more energy and have greater impacts on air and groundwater resources. The gas EIS's don't address the environmental impacts of constructing thousands of miles gas pipelines and of drilling gas wells. Nor do they discuss the negative effects on the Pacific Northwest economy from exporting electricity dollars to Canada for gas imports. [44.3]

Response:
No response required. Thank you for your comment.

36.6 Comment:
While our agency hails new energy technologies, such endeavors should have minimal adverse environmental impacts. Fish and wildlife, along with their habitat, should not be sacrificed for the sake of "power." Oregonians are only too familiar with the impacts of "power" generating dams on the once great runs of Columbia Basin anadramous fish populations. [58.1]

Response:
No response required. Thank you for your comment.

37 Paulina Creek

37.1 Comment:
Paulina Creek flows through the proposed site. Its wild and scenic values would be destroyed by the proposed facility. [26.4]

Response:
The wild and scenic values of Paulina Creek will not be affected by this proposal. There will not be any geothermal activity which would require crossing of Paulina Creek, and no aspect of the project would preclude the future management of Paulina Creek as a wild and scenic river.

37.2 Comment:
The well pad development south of Paulina Creek and Highway 21 would seem to be a separate issue to be addressed in its own document since the three well pads would not be supporting electric plants north of Paulina Creek. Is the "no crossing" of Paulina Creek a settled issue, or is it to be reevaluated in the future if a resource is found south of Paulina Creek, and power plants north of the creek? Also, the well pads south of the creek may give a push towards development there, requiring an additional transmission corridor from the project lands to Highway 97. [38.7]

Response:
Besides completing sufficient production wells to supply a 33-MW power plant, another of CEE's exploration objectives is to define a 100 MW reserve of geothermal resources. This is mentioned in section 1.3.1 of the draft EIS, but will receive greater emphasis in the final EIS. One of the Northwest Power Planning Council's and BPA's goals with this project is to reduce uncertainties regarding future availability of this resource. Defining a 100-MW reserve will help to achieve this goal.

The "no crossing" of Paulina Creek is a settled issue in this EIS. Any proposal to build facilities across Paulina Creek would require additional environmental analysis, including public input. The same applies to any future proposal for a power plant or transmission corridor south of the creek.

38 Transmission Lines

38.1 Comment:
Instead of an above ground transmission line, the line should be placed in conduit on pedestals high enough for wildlife passage, but below the tree line. This would protect the line better from natural hazards, would reduce access roads, and would help prevent fires caused by downed power lines. [14.1]

Response:
BPA considers the proposed design alternative to be impractical in achieving the goals identified and the needs of the project. BPA has demonstrated over 50 years of designing, constructing, and maintaining 115-kV transmission lines that these lines visually blend in well with surrounding terrain, withstand natural hazards such as extreme wind, ice, and earthquake, and that they are an insignificant hazard as sources of fires. Access road requirements for the proposed design alternative are expected to exceed the requirements of the overhead option.

38.2 Comment:
Prefers Alternative B transmission line design, and believes EIS should point out that it has capacity to handle additional load. [30.7] We find Alternative B transmission line corridor and towers preferable to Corridor A. Whichever corridor is used, the single pole facility is preferred, providing it is able to move electricity from more than one plant. If Corridor B had to be supplemented with additional widening (a new line, etc.) its superiority to Corridor A would be diminished. [38.8]

Response:
Section 1.3.2.2 of the EIS notes that the transmission line is sized to allow future expansion to about 100 MW without rebuilding the line. This is true of both transmission line alternatives. This information will be repeated in sections 2.4.1.3 and 2.4.2.5 for clarity.

38.3 Comment:
I like the fact that the Alt. B transmission corridor route will not intrude in the area of suitable wildlife habitat identified on Fig. 4.12-1. What are other impacts of shifting transmission corridor in Alternative B south. [30.8] Clarify whether one of the goals in moving the transmission lines (Alternative B as opposed to Alternate A) was to avoid a protected wildlife area. [35.30]

Response:
Neither transmission line route passes through a protected wildlife area. Both routes pass through "suitable habitat for all species of concern," as is shown in Figure 4.12-1. The main goal of the Alternative B transmission line route is to reduce its visibility from Road 9735.

38.4 Comment:
The DEIS fails to compare the maintenance costs, reliability, and the effects of disrupting from wind and snow and rain on overhead transmission lines, compared to repair costs and downtime on underground lines. Disputes the DEIS claim that buried lines are not used in rural areas, citing Timothy Lake hydroelectric project near Mt. Hood and Bornite mining project east of Salem as instances where buried lines have been mandated in sensitive areas. [36.39]

Response:
Since underground systems are not affected by weather conditions, they can be

more reliable than overhead lines. However, when underground lines have to be repaired or replaced, these activities take much longer than with overhead lines. If repairs require excavation or replacement, impacts could be equivalent to construction activities. Reasons why underground designs were not examined in more detail are given in section 2.3.4 of the EIS. More information on underground cables can be found in Underground Cable Systems: Potential Environmental Impacts (report prepared for the Bonneville Power Administration, 1981). The DEIS does not claim that buried lines are not used in rural areas. It states, accurately, in section 2.3.4.3 that underground lines are normally used in congested urban settings, and that rural applications are rare and less cost-effective than overhead lines.

38.5 Comment:
The proposed alternative transmission line route appears to pass to the north of a rock outcrop in section 24, T22S, R11E, and then curve southeast to follow the "proposed new access road 500 and 600 interconnection." It appears that it would be shorter if this route departed from the proposed route in section 23 and followed a smooth curve to the south of the rock outcrop to join the proposed new access road corridor. This would also move the route further from the rock outcrop. [49.19]

Response:
This will be taken into consideration, along with other site-specific considerations during actual on-the-ground layout and siting.

38.6 Comment:
What is an "underbuild"? [54.11]

Response:
As stated in section 2.4.2.5 and illustrated in Figure 2.4-24, an underbuild is a second string of conductors, underneath the 115-kV conductors, that transmits electricity at a lower voltage.

38.7 Comment:
Transmission lines need to be designed to avoid death and injury to raptors. [58.16]

Response:
Death and injury to raptors from transmission lines may occur when the lines cross migratory paths such as rivers. The transmission line for this project will not cross any rivers or known migratory paths, and most conductors will be at or below treetop level in both line design alternatives. Conductors will be spaced far enough apart to prevent electrocution from wings touching two conductors.

39 Monitoring

39.1 Comment:
The evaluation of long-term environmental impacts for the fifty-some years of the project's life is lacking, since no mechanisms are discussed as to how the project will be monitored and regulated. A monitoring system should be established to ensure continued environmental protection over the life of the project. Describe how the project will be regulated and what the agencies' roles are with respect to monitoring. [17.2] The monitoring program should be pulled together into a separate section. Public should be told how to access monitoring data on an ongoing basis. [30.6] Explain which agencies are responsible for monitoring

specific facets of the project. [35.21] Are there specific plans for baseline monitoring? Add specifics to document regarding when and where baseline monitoring occur. [35.22] It is not clear what additional baseline monitoring (besides ground water monitoring) will be done. Suggest that the monitoring requirements be consolidated into one part of the document. [35.24] Provide explanation of how interested people can access records on monitoring activities and results. [35.25] Address a 50-year monitoring plan. [35.26] Suggest the Forest Service consider forming an advisory group to monitor the project on an on-going basis. [35.28] The geothermal development must not be allowed to produce irreversible changes to Paulina and East Lakes. It is vital to monitor the lakes for changes. If harm occurs, the project should be stopped until the problem can be cured. [38.3] Mercury levels should be monitored at Paulina Lake and East Lake as well as at the H_2S removal stack and cooling tower. The lakes are popular fishing holes, and are also used by raptors as a food supply. [38.21] Monitoring is mentioned in various parts of the document. The monitoring programs should be gathered in an appendix specifying what will be checked, by whom, how often, and how the public can review the effort. [38.27] It is our understanding that only one monitoring station will be installed and it will be located to the south of the project inside the crater. With the predominant wind currents from the southwest it will be on rare occasions that a good reading will be made. The other concern is that only sulfur dioxide will be monitored and the pollutants estimated by percentages of that reading. We believe that another monitoring station should be positioned north or northeast of the project and a semi-annual check of all major pollutants should be made. [46.1] DEQ believes that it will be important to monitor regional groundwater both from a baseline basis as well as documenting operationally-induced changes/influences as tentatively proposed. In the unlikely case where geothermal fluids were accidentally introduced to shallower aquifers through wellbore failure, it would be necessary to predict contaminant fate and transport. [52.18] DEQ concurs that monitoring for effects on regional hydrology from geothermal utilization is desirable. The DEIS and supporting documentation suggest that at least two areas of concern have been identified as (1) impact on caldera hydrology, and (2) impact on shallow aquifer systems downstream of project area. Implicit to these ideas is the possibility of multiple locations for monitoring wells as additional monitoring controls. DEQ thinks that specific selection criteria should be developed and proposed which details the monitoring plan objectives and specifies how the additional monitoring will be implemented. Baseline monitoring databases should be integrated into any proposed strategy for instituting additional monitoring control with respect to these identified potential impacts of geothermal utilization on regional hydrology. [52.19] We would like to see "possible" monitoring and mitigating steps implemented. We need assurance that if any of these conditions are identified as the plant is in operation that modifications or plant closure would be swiftly required of the operator. This monitoring activity should include an on-going appraisal of possible build-ups of mercury levels in East and Paulina Lakes due to plant emissions. [53.3] The EIS needs to include a comprehensive monitoring plan for environmental effects. This monitoring is required by the NNVM legislation, yet it is unclear who is to pay for this monitoring. The EIS needs to make clear how monitoring will be funded, and the proponent should be obligated to pay into a fund for an impartial party to carry out the monitoring. [54.6] Does it provide for monitoring of all resources inside NNVM that could be affected by the development of a geothermal facility? These questions are left unanswered in this DEIS. [54.9] The DEIS states that the leaseholder must collect data concerning the existing air and water quality for at least one year prior to production. This is not in keeping with GRO Order No. 5, which states that "The baseline data collection program should begin as soon as potentially producible resource has been identified," and GRO Order No. 4, which

directs the developer to "conduct exploration and development in a manner that provides maximum protection of the environment." I believe it is preferable that a baseline for air quality, in particular, be conducted for at least one year prior to any groundbreaking (well-drilling) activities. [54.43] The DEIS doesn't adequately address what would be done by the developer if water levels do drop in the caldera. What effects will be considered acceptable? What triggers would require a shut-down or slow-down of geothermal operations? [54.45] Mixing of geothermal fluids with regional groundwater aquifers is of great concern. Monitoring and sampling measures mentioned in section 4.4.6 should definitely be implemented. Sampling and testing should be done by sources independent of CEE. All monitoring results should be available upon request by the general public and government agencies. The results should not be housed by CEE. Monitoring needs to be carried out by an independent contractor which has agency approval. [58.20] Monitoring potential impacts is essential. Emissions, surface and groundwater quality, bioaccumulation, effectiveness of sump and power plant enclosures all require tracking. The hydrologic monitoring program needs to be continued and expanded to include toxic elements. Waters of Paulina Creek need to be included in the sampling. Monitoring of lichens needs to be required. Monitoring sites need to be strategically located to assure full coverage of the area of potential geothermal effects. Consultation with ODFW biologists is needed in all phases of monitoring potential impacts to fish and wildlife habitats and populations. Monitoring needs to be carried out by an independent contractor which has agency approval. [58.26] Many of the additional mitigation measures include additional monitoring. A well designed monitoring plan will address how well the preferred alternative resolves issues and concerns by measuring the effectiveness of the mitigation measures in controlling or minimizing adverse effects. A well defined monitoring plan provides the basis for the feedback mechanisms which will use monitoring results to adjust standards and guidelines, BMP's, standard operating procedures, and monitoring intensity at first detection of unexpected, adverse effects. This ensures that mitigation strategies will improve in the future and that unforeseen adverse effects are identified and minimized. [59.4]

Response:
Section 4.1.1 of the EIS describes the requirements for collecting data to document the existing (baseline) condition of the environment. Federal regulations require this data to be collected for at least one year prior to production. Baselines have already been established for hydrology, air quality, biology, and noise.

The BLM, in coordination with the U.S. Forest Service, must approve the monitoring plan for the geothermal project and will oversee its implementation. Because the Forest Service is required by the NNVM legislation to establish an environmental monitoring program for the Monument, the BLM will coordinate geothermal monitoring with the Forest Service.

The geothermal monitoring program is described in a separate document that will be available to the public from the BLM. The program will be paid for by CEE and implemented by independent contractors, consultants, or government agencies approved by the BLM in consultation with the U.S. Forest Service. The program will include annual review of monitoring data by an interdisciplinary (ID) team with members from Federal and state agencies. Annual data reports will be available to the public from the BLM.

If, in the judgement of the ID team, the project is causing unacceptable

environmental impacts or significant adverse impacts not addressed in the EIS, the BLM and the Forest Service will require mitigation, plant modifications, or other measures — including shutting down the project — to reduce impacts. Additional environmental analysis will be done if needed. It should be noted that oversight through environmental monitoring is in addition to requirements that will be imposed and overseen by other government agencies. These agencies are listed in Table 1-1 of the EIS, and include the Oregon State Departments of Geology and Mineral Industries, Environmental Quality, and Fish and Wildlife.

Mercury levels at Paulina Lake and East Lake and toxic elements such as arsenic and boron were measured as part of the USGS hydrologic monitoring program discussed in section 3.3.2 of the EIS.

39.2 Comment:
Page 2-73. A statement is made regarding geothermal resources that the existing hydrology monitoring program will be continued or a similar program will be implemented. We believe that, in fact, a similar program should be chosen, rather than continuing the existing program. [39.27] Page 4-3, last paragraph. The text addresses the need for the applicants to prepare a Plan of Baseline Data Collection. The BLM has requested that CEE submit a Plan of Baseline Data Collection prior to drilling. Please see letter from BLM attached as Exhibit A. [39.43]

Response:
A draft Plan of Baseline Data Collection was submitted by CEE to the BLM for consideration, and development of this plan will continue.

40 Roadless Area

40.1 Comment:
Drilling and use of the roadless areas north and west of the crater should be done only when all the other areas are used up. [28.2] CEE believes that the Draft EIS should include a detailed description of how the proposed action will impact the North Paulina Roadless Area. At a minimum, the Draft EIS should provide an analysis of whether significant irreversible environmental consequences will result to the North Paulina Roadless Area from the proposed geothermal project. [39.5] To the greatest extent possible, the integrity of the roadless area should be protected. [41.5] If drilling/roads are designed for the roadless area, they should be restricted to use by CEE, its contractors, and the agencies. This is not only to keep at a minimum the impacts on the roadless area and wildlife, but also to reduce the risk of human-caused fire. The same restrictions should apply if the resources are developed and the plant built, plus the roads should be gated to further limit access. [41.10] If the resource is not developed, the new roads should be ripped up as stated in the DEIS. Our concern is that even if geothermal development does not occur, the Forest Service will leave the roads open to log the roadless area and to allow recreation access.[41.11] For ecosystem management and ecosystem restoration purposes, ONRC completely opposes any entry into Newberry Roadless Areas, as is consistent with our position for the last few years. All roadless areas are critically important as core natural areas to any ecosystem restoration plans for eastside National Forests. [43.1] ODFW recommends against siting the power plant at site 3 which borders on the roadless area. [58.11] Alternatives for siting pads A-11 and C-15 should be considered. This should include initiating exploratory wells outside the roadless area first, moving into the roadless areas last, if it remains an option. Minimizing intrusion into the roadless portion of the project should be emphasized to lessen overall

impacts to wildlife populations. [58.12] We do not favor use of pristine, wild, roadless areas for industrial development. [60.15]

Response:
The roadless areas identified in the EIS are areas that were previously under consideration for official Federal designation as a Roadless Area (RA) in the Roadless Area Evaluation I and II (RARE I and II) processes. Neither of these reviews found the areas to be suitable for wilderness designation. According to the Oregon Wilderness Act of 1984, these lands are to be managed for multiple use in accordance with the Forest's Land Management Plan. The 1990 Deschutes National Forest Land and Resource Management Plan does not have a separate allocation or management designation for these roadless areas. Instead, they have been allocated as General Forest (Management Allocation 8), and Scenic Views (Management Allocation 9), and are available for multiple use management, in accordance with the Standards and Guides for these allocations, except for scheduled timber harvest. The Forest Plan addresses the potential for geothermal exploration and development at Newberry. The proposed geothermal activities are consistent with direction in the Forest Plan for these areas.

Appendix C of the FLMP describes the unroaded areas. For the North Paulina Roadless Area, it indicates: 85% of the area are lodgepole pine communities, the majority of which are over-mature, and are heavily infected by the mountain pine beetle from epidemic to catastrophic proportions; the vast majority of the RA away from the boundaries is in a natural state and unaffected by human influences, however the ecology and natural succession has been altered by the control of wildfire; the RA is part of the summer range for mule deer who winter to the east near Pine Mountain, and the area is also summer range for a few elk; cover to forage ratios and arrangements for big game indicate an over-abundance of cover, with less than optimum forage quality; overall, the area provides a moderate opportunity for solitude; overall, the opportunity for primitive recreation is low; the area is given a "rare" rating for its ability to offer challenging experiences, due to its relatively small size and lack of water; and the potential for Wilderness is very low.

For the South Paulina RA, Appendix C of the FLMP indicates: half of the forested areas are lodgepole pine, and show significant amounts of mountain pine beetle mortality; some deer use the area for summer range, although densities are not particularly high due to lack of moist plant communities or bitterbrush; a few Roosevelt elk summer here in small family units, primarily in the mixed conifer and mountain hemlock stands; the RA is not large enough to sufficiently buffer influences from adjacent recreational developments and influences, especially noise, and logging activities in the western portion of the area have an influence on the apparent naturalness; the opportunity for solitude is low; the area has a high geothermal potential; the opportunities for primitive recreation are moderate; the opportunities for a challenging experience are rare; and the Wilderness potential of the area is low.

In response to public comments received on the DEIS, the EIS for this project has been revised to include the following additional mitigation measures for siting facilities within the North Paulina Roadless Area to further reduce any potential impacts, maintain the overall integrity of the unroaded area, and to locate proposed activities in areas already disturbed or influenced by Forest management as much as possible:

- *Minimize site disturbance by keeping well pads and facilities as small as possible, and by limiting roads to only the minimum standard needed for access and operations in these areas. This will be done regardless of where the facilities are located, but extra care will be taken in the roadless area.*

- *Site activities and facilities in areas of dead and down lodgepole pine as much as possible, rather than in live stands.*

- *Gate any new roads into the unroaded areas, and limit use only to authorized access to the geothermal facilities*

Refer to the RODs for this EIS for a description of the decisions to be made.

40.2 Comment:
While impacts from removal of 131 hectares of vegetation is significant, roading of 485.6 hectares of unroaded habitat is very significant. The disturbance associated with exploration and utilization of the geothermal resource over the entire project area including the roadless area will be even more significant. There was no discussion or alternative entertaining the possibility of not entering the roadless area. [58.10]

Response:
The acreage figures quoted correspond to the amount of gross lease area within the unroaded area, not the amount of land that could be actually disturbed. This will be clarified in Section 4.8.3.1 of the EIS. Physical site disturbance for facilities could be between 65 to 91 hectares. Actual impacts will depend on the number of wells sited, amount of pipeline and roads needed, and whether or not the power plant is sited in that area. Refer to comment response 40.1 for additional mitigation measures and discussion.

41 Staged Development

41.1 Comment:
All road building and construction of all (14+) pads will occur before it is determined if the site will support a profitable installation. A step-by-step process would be much more feasible. [31.1]

Response:
Project development will, in fact, be a step-by-step process. All 14 potential well pads will not be built simultaneously, but will be done one or a few at a time as exploration drilling progresses. This is illustrated in the project schedule in Table 2.4-3. Initially, one big and one small drill rig would probably be mobilized. Data from this drilling will be used to choose the sites for the next wells. If the initial drilling is very discouraging, it is possible that no more wells will be drilled. It is also possible that only one well or up to 14 well pads will be needed to support the project. But in any case, exploration will be an incremental process. No more than 14 well pads will be approved at this time.

41.2 Comment:
The decision-making process is not logical or appropriate. It should be a two-step process — exploration followed by development. The DEIS attempts to make decisions on the second stage without finding out from the first stage the necessary facts needed to create meaningful alternatives for the second stage. This combination of analyses does not work. Only after exploration should we have to decide on locations. While it is appropriate to have this DEIS for drilling on the

north area, subsequent decisions on plant, production well, road, and power line locations should be made later. [41.2] The proposed development presents an "all or nothing" plan. A better approach would be to drill exploratory wells to investigate the issue of connection between the shallow and deep aquifers. This would also allow the fluid-composition to be determined and the completion of studies to support evaluation of the project. [50.5] This DEIS does not appear to offer a range of reasonable alternatives. Alternatives A and B are quite similar, in that they both propose to approve a full sequence of activity from exploration through production and reclamation of the site. I believe the decision-maker should be given another Alternative, D, which would provide the opportunity to approve the exploration stage only, so that the geothermal fluids can be sampled and environmental effects analyzed in a more educated, less speculative manner than what is presented in the current document. [54.1]

Response:
It is hard to see how the results of the analysis would be changed by further segmenting the decision-making process. It is true that fluid composition is not known precisely at this time, but a range has been defined based on the chemistry at a geologically similar site or on explicit assumptions. If the concentration of any important chemical constituent of the actual fluid turns out to be outside this range, and if this would alter the analysis in the EIS, then new analysis and a supplement to the EIS would be required.

It is common and appropriate for more well pad sites to be proposed and approved than will be used, because only well drilling can determine the correct sites. The location of successful wells will dictate the appropriate plant site. It would appear to do a lot of good — and certainly no harm — to identify possible plant sites in advance and to analyze their environmental impacts. The same goes for the transmission line routes. This allows the federal agencies and the public to evaluate impacts of the entire project, not just pieces of it.

It would, on the contrary, seem illogical for the agencies to allow a developer to spend millions of dollars on exploration drilling if no acceptable plant site or transmission line route were available.

The environmental effects are not analyzed in a speculative manner. The boundaries of fluid chemistry assumptions are clearly defined, a specific project area has been identified, specific well and power plant sites have been chosen, and specific transmission line routes and designs are specified.

Exploratory wells will not necessarily answer all the questions about a possible connection between deep and shallow aquifers. Effects on the shallow system, if any, may not be apparent until the geothermal plant has operated for several years. The hydrologic monitoring network established by the U.S. Geological Survey for the agencies should identify any impacts that occur.

42 Sumps

42.1 Comment:
Sumps should be placed into native soil on the cut side of drill pads. [10.2]

Response:
Sumps are placed on the fill side of the drill pad because the fill is an engineered compacted fill. As long as it is an engineered fill, the Oregon Department of Geology and Mineral Industries expects a sump on the fill side of the drill pad to

be acceptable (Olmstead, Dennis, 1994. Oregon Department of Geology and Mineral Industries. Personal communication with BPA). Sumps are placed in natural material when fill is not required.

42.2 Comment:
Sumps are not visually pleasing and may contain hazardous materials. [27.5] Sumps should be synthetically lined. Clay lined sumps may allow seepage of pollutants into the extremely permeable soils of the area, and may be damaged by frost heave. Leak detection systems should be mandated. [36.31] Where will sediment from water storage ponds be disposed of, and in what amounts, and how will sediments be tested? [36.49] Clay lined sumps are inadequate for this project. The DEIS fails to discuss problems encountered with clay. Sumps should be lined with double layers of 80 mill plastic liners along with a leak detection system to assure leak detection and prevention. This is especially important because many references are made in the DEIS to the high permeability of the soils. Additionally, sumps and holding ponds should be designed to withstand 100-year storm events and seismic activity. [40.16] Clay acts as a filter and attracts heavy metals and other contaminants. If these sumps are planned for further use, then the clay lining should be removed and hauled away to a hazardous waste facility. Contaminated clay linings should not be allowed to remain on-site. [40.18] Suggest you specify bentonite clay liners for the sumps to safeguard against leaks. It is clear that fluids in the ponds will be polluted because they contain condensate from geothermal steam. This should be stated more clearly in the document. All ponds should use the best available technology to prevent entry by wildlife. For example, very fine gauge netting might be required to keep out bats and rodents. [54.44]

Response:
The analysis in section 4.6.3 of the EIS indicates that except for the steam plume, most project facilities would not be visible from most visual receptors or sensitive visual resources.

The power plant water storage pond will be synthetically lined, but this is mainly to discourage vegetation growth. The power plant water storage pond will contain mainly excess condensate and cooling tower overflow. This fluid is essentially condensed steam (distilled water) containing small amounts of dissolved gases, and is low in dissolved solids. Excess condensate and cooling tower blowdown can also be sent directly to the injection wells. Water stored in this pond will be used for fire control protection and as make-up water for the cooling tower during high evaporation periods (which also occur during fire season). The plant will not routinely dump geothermal fluid into this pond. Any overflow from this pond would be considered a spill and a violation of permits.

Well pad sumps will be lined with bentonite clay. Clay liners provide adequate protection against excessive seepage while being easier to maintain than synthetic liners. Synthetically lined sumps are susceptible to tearing, making them difficult to work with during drilling and well field operations and impossible to clean out without damaging the liner. CEE operations at Roosevelt, Coso, and Desert Peak are located in areas that experience extreme low temperatures, and frost heave has not affected sump seals. Clay lined sumps tend to reseal minor cracks that may result from drying or freezing.

This experience is confirmed by the Oregon Department of Geology and Mineral Industries, which has no documented cases of clay liners leaking, but does have documented experience of synthetic liners being ruptured. Although it is possible

that some clays may react with geothermal brines and thus become less expansive, by the time geothermal fluids are introduced into the sumps, the compacted liner will be protected by a layer of drilling muds (Dennis Olmstead, DOGAMI, April 29, 1994, personal communication with AGI).

The contents of well pad sumps, including clay liners, will be tested for hazardous material levels prior to reclamation of the sump. If the contents are found to be hazardous, then the material will be disposed of at an approved licensed disposal facility. Quantities of sediments will depend on fluid chemistry (which is likely to vary somewhat between wells), how long wells are tested, the number of wells using each sump, and other factors that are not known at this time, but will be determined during the course of exploration. Multiple sump samples taken at Glass Mountain, Coso, Desert Peak, Roosevelt, and other hydrothermal resource sites throughout the Basin and Range and Cascade provinces have shown that sump contents are non-hazardous even after multiple years of use. The contents of these sumps are not expected to warrant a leak detection system or a lead detection system. The detection and liner systems suggested may be appropriate for sanitary landfills, which are many orders of magnitude larger than sumps. Problems with differential slippage between clay and native soil are unlikely, as are ruptures by unacceptably large ground movements (from landslides or earthquakes).

A minimum of three feet of freeboard will be required. The well pad sumps will not contain fluid most of the time, and will be pumped down prior to winter snow, and again to remove snow melt in the spring. Sumps will be bermed to direct storm water and snow melt away from the sumps, and the three feet of freeboard is sufficient to withstand a 100-year storm. Storm runoff from equipment operating areas will be directed into the sumps, whereas runoff from non-operating areas will be directed into natural drainages. A 750,000-gallon sump can accommodate 5 inches of runoff from a 5.5-acre pad, if the sump is empty at the time of the storm (as noted above, only a portion of the pad's runoff will be directed to the sump). The maximum recorded daily precipitation at Bend, Oregon, is 2.7 inches in October 1970.

Fluids stored in sumps will be injected or used for other approved uses such as road watering and construction compaction watering. These secondary (non-injection) uses will depend upon fluid chemistry and will require approval by the Forest Service and Oregon Department of Environmental Quality.

In the event of a power outage, the injection pumps would quit working. Fluid would continue to flow to the injection wells, or if necessary to the injection well sumps, until the production wells could be shut in. This would prevent geothermal fluid from being spilled onto the ground.

Biocides used in the cooling tower to prevent algae buildup will occasionally be allowed into the water storage pond for the same purpose. CEE will use biocides that break down rapidly in sunlight, that require high concentrations and long exposures to be toxic to fish and wildlife, and that have been approved by the Oregon Department of Environmental Quality. Cooling tower treatment generally occurs once per month in summer and once every three months in winter. During the winter and during periods of cooling tower treatment, cooling tower overflow is sent directly to the injection system.

The fluids in the power plant water storage pond are not expected to have high amounts of dissolved solids, and will therefore have only minor sedimentation. If

the ponds are cleaned to remove sediment build-up, these sediments will be tested to determine if they are hazardous. It is not known at this time how often this will be, if ever. If the contents are found to be hazardous, then the material will be disposed of at an approved land fill.

42.3 Comment:
Failure to cover or net sumps may endanger wildlife. Netting should be required. [36.32] Sumps must be equipped with netting and fencing to preclude access by animals and birds. The claim of ignorance [of impacts to wildlife because fluid content is unknown at this time] is unacceptable. [40.17] The EIS should make it clear to the reader that sump fluids will likely be harmful or fatal to wildlife that ingest them. It is not clear if a mitigation for this is incorporated into the plan, or if monitoring and/or netting sumps is an optional step. Wildlife should be prevented from drinking water at any sump. [57.6] Sumps need to be completely fenced and netted to prevent any possibility of death or injury to animals and birds. [58.17] All ponds should be fenced and netted. [60.9]

Response:
Well pad sumps will be used during well construction and testing, and will not contain fluid most of the time. During development, the sumps at the drill pads would contain geothermal water for the 1- to 3-day duration of the test, as described in section 2.4.1.5 of the EIS. Well pads will be fenced with 1.8-meter (6-foot) fiberglass fencing to keep out humans and animals.

When a well pad sump is in use, it may contain hot fluid. Non-toxic drilling muds will be used. Even though fluid chemistry is not known precisely at this point, it is expected to be relatively benign based on fluids found at other sites (particularly Medicine Lake) with similar geology, and certainly will not be comparable to the highly saline brines found in the Imperial Valley.

There will be human activity at the well pads during well construction and testing, the main periods when the sumps will contain fluid. This will also discourage animals from drinking at the sumps. Thermal fluid at Newberry is not expected to be a hypersaline brine, and it is speculative to assert that it will be harmful to animals. If there is evidence that animals are being injured by temporary exposure to liquids in the well pad sumps, netting or other measures will be required.

The power plant water storage pond will normally contain condensate, not thermal fluid, and should not be a hazard to animals that somehow manage to drink from it. This water will periodically be treated with a biocide to prevent algae growth (see section 4.14). The biocide to be used breaks down rapidly in sunlight and requires high concentrations and long exposure to be toxic to fish and wildlife. The power plant area will be fenced with a 1.8-meter (6-foot) chain link fence. Again, if there is evidence that animals are being injured by exposure to liquids in the power plant water storage pond, netting or other measures will be required.

42.4 Comment:
Overflow from sumps could lead to groundwater pollution. It should be possible to construct a system without sumps or to isolate sump discharge. [31.10] Since it is doubtful that evaporation will empty the sumps year-round, what will be done with excess brines and liquids? [36.33] The fluid storage ponds are too small, especially considering the large volume of fluid flowing through the plant and the fluid's chemical composition. More buffer in fluid handling is necessary to

prevent contamination of the land and ground waters by geothermal fluids. [50.4] It is unacceptable to have the water in the ponds (sumps) overflow to the ground surface at any time, as described here. Such overflows could contaminate groundwater and would violate GRO Order No. 4. [54.46] A better mitigation measure [for impacts of the sumps on wildlife] would be to have enclosed holding tanks. This would prevent both wildlife poisoning and accidental overflow and contamination of groundwater. [57.7] If geothermal fluids are extracted for production of power, as well as from ground water, the problem of storage and disposal of the large quantities of fluids has not been adequately addressed. Volumes of these fluids are 6-8 millions of cubic meters per year. [60.7] Toxic substances will be piped to the overflow ponds which have comparatively small capacity. Probabilities seem high that overflow of the pond could contaminate groundwater or surface drainage fields will occur, with perhaps serious environmental consequences. [60.8]

Response:
As is stated in section 2.4.1.3 of the EIS, excess fluid in the plant water storage pond and the sump ponds would be pumped to the injection wells. Each production well is expected to produce approximately 180,000 kilograms (400,000 pounds) of fluid and steam per hour. If the entire flow is fluid (this is a worst case — about a quarter of it will actually be steam), this will be about 190,000 liters (50,000 gallons) per hour. The well pad sumps will hold 2,850,000 to 3,800,000 liters (750,000 to 1,000,000 gallons) of fluid, and thus will take 15 or more hours to fill. Since a well can be shut down manually in two hours or less, the well pad sumps should be more than adequate to contain the flow.

The worst case for a possible fluid spill at the plant would occur during a plant upset due to a power outage. Steam would be vented through the rock box. Liquid would flow to the injection wells or, if necessary, to the injection well sumps, which will have the similar capacities to other well pad sumps. If there are only three injection wells (three to five are planned), and six wells feeding the power plant at 190,000 liters (50,000 gallons) per hour, it will take the sumps 10 hours to fill, assuming no fluids are injected. Again, there is more than adequate capacity to avoid an overflow.

Sumpless drilling has been used primarily at dry steam fields like The Geysers, where they can use air drilling techniques and don't have to deal with large quantities of liquid. Sumpless drilling using steel tanks will involve multiple tanks and transfer of fluids between tanks. This will increase the probability of a spill. Tanks would have overflow devices, and breakdown of an injection well would lead to immediate discharge to the ground.

It should be pointed out that sumps are a safety measure in the unlikely event of a well blowout. Cool fluid in the sump can be pumped down the well to kill the steam flow so the well can be brought under control.

Geothermal Resources Operational Order No. 4 states that "the lessee shall not contaminate any natural waters and shall minimize adverse effects on the environment." Measures will be taken as noted above and in the EIS to comply with this requirement.

42.5 Comment:
Page 4-137, top paragraph. The applicants object to requiring netting of sumps and ponds. Geothermal drilling sumps do not contain toxic fluids The sumps do contain, on occasion, drilling muds and hot geothermal fluids. When the sumps

contain muds and hot fluids, it would be impractical to have netting. The sumps associated with the proposed project do not represent the same risks as with sumps located at a mining operation. Imposing a mitigation measure borrowed from heap leach mining is unnecessary, expensive, impractical and will be ineffective. The use of netting on drilling sumps has never been required at any other geothermal project developed in Nevada, Utah or California. Geothermal facilities in the Imperial Valley are located adjacent to natural wildlife refuges. Other projects are located along migrating fly ways. Avian or bat kills from use of geothermal sumps for watering has not been documented at other sites.

As a practical matter, netting would be in the way during drilling when muds and produced fluids are discharged into the sumps. The netting would most likely be damaged or need to be removed for safety reasons. During well testing when hot fluids are temporarily stored in the sumps, netting would deteriorate from the temperature and it would be impractical to maintain. It has been our observation that animals do not use the sumps when the drill pad is occupied by a drill rig and they do not use the sump when hot water is present. When the sump contains cooler water, this water, although high in total dissolved solids, is relatively benign and most likely nontoxic to all forms of life.

We request that the concept of netting sumps as a mitigation be dropped from further consideration unless it can be documented that a problem exists, in which case netting may be appropriate. [39.58]

Response:
Netting of sumps will be considered as a mitigation measure if warranted by circumstances.

COMMENTS GROUPED BY AUTHOR

The following written comments were received regarding the draft Environmental Impact Statement for the Newberry Geothermal Pilot Project. The comments are reproduced verbatim or summarized below, depending on their length and content. The original comment letters are available for inspection at the Fort Rock Ranger District.

A number has been assigned to each comment and appears to the left of the comment (for example, 1.1 is the comment number assigned to the comment, "The need for this project ..." shown below). The number in brackets following each comment indicates where the response to the comment appears. For example, the response to comment 1.1 can be found under category **3, Purpose and Need and Background,** in the Comment Report. The comment categories are listed in the front of the report.

1. James R. Delp, M.D.
   Bend, Oregon
   - 1.1. The need for this project is driven by energy needs resulting from our values. [03]
   - 1.2. Geothermal activity could destroy the beauty of Newberry Crater. [08]
   - 1.3. Conservation should be pursued more aggressively as an alternative to this project. [36]
   - 1.4. Greater consideration should be given to the true cost of energy use and its production. [36]
   - 1.5. Industrial use of public lands and the NNVM should be more responsible. [30]

2. James C. Carnahan, P.E.
   Bend, Oregon
   - 2.1. Alternative A is acceptable. [33]
   - 2.2. Alternative B is acceptable. [33]
   - 2.3. Alternative C is not acceptable. [33]
   - 2.4. The negative aspects of Alternative C, especially potential impacts of not developing new energy resources or resources other than geothermal, are not considered sufficiently. [24]

3. Richard G. Bowen
   Portland, Oregon
   - 3.1. Greater consideration should be given to the reliability of geothermal compared to other energy resources. The potential for outage and failure in [geothermal] delivery and production systems are minuscule compared to conventional thermal, hydro, atomic, or other renewable sources. [35]
   - 3.2 The project should move ahead to development. [33]

4. William G. Pearcy
   Philomath, Oregon
   - 4.1. There is not a clear distinction between exploration and production. [23]
   - 4.2. This is not a pilot project. [03]
   - 4.3. The analysis of emissions and air quality impacts is based on fluid chemistry assumed to be similar to Medicine Lake, California. Fluid chemistry should be established before activities beyond the exploration phase are approved. [06]
   - 4.4. Venting of pollutants during emergency plant shutdowns may cause impacts to air quality, vegetation, and animals. No data is given on the frequency and length of such shutdowns elsewhere.[07]

4.5. Mercury deposition in Paulina and East Lakes may increase surface concentrations to levels exceeding drinking water standards. Even if pollutants are mixed to deeper depths, they may affect aquatic life and water standards. [05]
4.6. The air quality classification (Class II) is not appropriate for this site, as it is a pristine region of Oregon adjacent to the National Monument. [07]
4.7. The project may contaminate surface water and Paulina Creek. [05]
4.8. There is an error on page 4-174. 2,500 acre-feet does not equal 3.08 cubic meters. [27]
4.9. Issues on water rights should be resolved before any activities commence. [05]

5. Marilyn Peterson
District Director, District #4
Oregon State Snowmobile Association
Bend, Oregon
5.1. Can find no fault with this proposal. [33]
5.2. There is a need for an alternative energy source and that need could be met with geothermal. [36]
5.3. All aspects of the project have been addressed. [27]
5.4. No access to snowmobiling, or any other sport in the area, should be affected. [11]
5.5. The needs of the physically challenged should be addressed. [16]
5.6. Would like a sno-park to be located in the general area of the FS 9735 junction with Road 600. [11]

6. Daniel N. Schochet
Ormat Inc.
Sparks, Nevada
6.1. No comments. [31]

7. J. Pat Metke
Bend, Oregon
7.1. Prefers Alternative B. [33]
7.2 [Geothermal] is a proven clean resource in other parts of the United States and foreign countries. [35]
7.3. The responsibility of the operator at deactivitation should be better defined. [28]

8. Nancy Bartch
8.1. Against the project. [33]
8.2. It will cause air pollution. [07]
8.3. It will cause water pollution. [05]
8.4. It will cause noise pollution. [09]
8.5. It will cause visual pollution. [08]
8.6. Disappointed because it will be put to the vote of the people who live in the immediate area. [01]
8.7. The public meetings for the Draft EIS should have been held during the summer, when the bulk of local residents are not in Arizona. [01]

9. Charles Bartch
LaPine, Oregon
9.1. Against the project. [33]
9.2. Hazardous material will go into the air. [07]
9.3. Hazardous material will go into the water. [05]
9.4. It will affect the quality of life for people. [29]
9.5. It will affect wildlife. [14]
9.6. Impacts of an earthquake on the project are not considered. [04]

10. Dan E. Wermiel
Oregon Department of Geology and Mineral Industries
Portland, Oregon
10.1. The areas over which DOGAMI has regulatory authority should be noted. [02]
10.2. Sumps should be placed into native soil on the cut side of drill pads. [42]
10.3. DEIS seems complete and accurate. [27]
10.4. Supports Alternative B (and by implication, Alternative A). [33]

11. Roy H. Peterson, D.V.M.
Tillamook, Oregon
11.1. Supports the project. [33]

13. Terrance M. Shine
Redmond, Oregon
13.1. The project owner should implement a reforestation project to compensate for the removal of timber lands used by the project facilities. [26]

14. Dana Longbotham
Bend, Oregon
14.1. Instead of an above ground transmission line, the line should be placed in conduit on pedestals high enough for wildlife passage, but below the tree line. This would protect the line better from natural hazards, would reduce access roads, and would help prevent fires caused by downed power lines. [38]

15. Alfred F. Lang
Corvallis, Oregon
15.1. Supports the project. [33]

16. H.T. and Ruth Schassberger
Bend, Oregon
16.1. Support Alternative B. [33]

17. Stanley O. Shepardson, M.D.
Bend, Oregon
17.1. Alternative B is appropriate. [33]
17.2. The evaluation of long-term environmental impacts for the fifty-some years of the project's life is lacking, since no mechanisms are discussed as to how the project will be monitored and regulated. A monitoring system should be established to ensure continued environmental protection over the life of the project. Describe how the project will be regulated and what the agencies' roles are with respect to monitoring. [39]
17.3. Need further explanation of how proper decommissioning will be funded and accomplished. [28]

18. Jerry Niehuser
Central Oregon Astronomical Society
Bend, Oregon
18.1. Lights from the project may affect views of celestial objects at night. Urges measures be taken to minimize amount of lighting used and to avoid impacts on peoples' ability to view the night sky. [08]

19. Eugene L. Lehr
Chief, Environmental Division
U.S. Department of Transportation
Washington, DC
19.1. No comments. [31]

20. Daniel N. Schochet
Ormat Inc.
Sparks, Nevada
20.1. Well conceived project, which should be approved for development. Either Alternative A or B should be approved. [33]
20.2. Alternative C would have significant negative societal impacts because it would result in increased oil or gas fired generation, which have relatively large emissions of SO_2 and NO_x. [24]
20.3. The section on blowouts (4.14.3.3) erroneously refers to a blowout in Surprise Valley, Nevada. The blowout actually occurred in Stillwater, Nevada, and proper blowout prevention was used. [16]

22. Janet M. Hillman
Sherwood, Oregon
22.1 The Northwest should diversify its energy profile, reduce its dependency on fossil fuels, actively pursue alternative, renewable sources of electrical power, and make geothermal energy an essential element of our new energy portfolio. [36]
22.2. Alternatives A and B are equally acceptable. [33]

23. Jeffrey C. King
Senior Resource Analyst
Northwest Power Planning Council
Portland, Oregon
23.1. It is important to confirm the cost and availability of alternative power sources. [36]
23.2. Project is consistent with Power Council's 1991 Power Plan. [32]
23.3. Draft EIS accurately and comprehensively characterizes the proposed project and its environmental effects. [27]
23.4. EIS should make it clear that one objective of the project is to confirm sufficient reserves to support an additional 100 MW of geothermal capacity. [03]
23.5. Cumulative impacts of additional development should be considered. [19]
23.6. Project is consistent with 1991 Power Plan and this should be reflected in section 4.21. [32]

24. Earl Nichols
Bend, Oregon
24.1. Supports adoption of Alternative B. [33]

25. Cheryl A. Greenstreet
Central Oregon Motorcycle & A.T.V. Club
Bend, Oregon
25.1. Soil disturbance and habitat modification on 320 acres of ground seem reasonable for 33 MW of electrical energy for a 50 year lease period. Support adoption of Alternative B with modifications. [33]
25.2. Do not favor plant site 3 because it requires two miles of new road and is located in a roadless area. [22]
25.3. Do not favor transmission line route in Alternative B because it requires new surface disturbance and a MIS and State Sensitive woodpecker was observed in the proposed location. [22]

25.4. Statement comparing water use to what is consumed by one golf course is inaccurate and misleading. [05]
25.5. DEIS very technical and thorough. [27]

26. Sandra Moilanen
Clatskanie, Oregon
26.1. Siting a geothermal power plant in close proximity to a pristine national monument is not acceptable. [30]
26.2. Possible exposure of public visiting developed recreation sites to H_2S and other toxic gases is not acceptable. [07]
26.3. Other sites within this geologic area should be considered. [23]
26.4. Paulina Creek flows through the proposed site. Its wild and scenic values would be destroyed by the proposed facility. [37]
26.5. How can we be assured contaminants from drilling sludge will not leach into the shallow groundwater aquifers. [05]
26.6. Technologies exist to more efficiently utilize the "waste" steam. Why aren't they being utilized. [35]
26.7. This is a semi-permanent facility, not a "pilot" project. [03]
26.8. Alternative C is preferred. [33]
26.9. A more suitable location with regard to multiple use of pristine National Forest lands and monuments should be considered. [23]
26.10. Will "5 expected accidents over 50 years" involve gas emissions that will be hazardous to campers and visitors. [16]
26.11. Will the accidents contaminate the groundwater aquifers. [05]
26.12. A simple pay off to residents for polluted water is not acceptable. [05]
26.13. How will toxic mud slurry from drilling be transported and disposed of. [16]

27. Pat Herbert
Seattle, Washington
27.1. Project will destroy old growth forest. Facilities are only being developed in unlogged areas. [13]
27.2. Mt. St. Helens should be considered as an alternative site for the project. [20]
27.3. Using 325.7 acres to service 15,000 households is not justified. [03]
27.4. Questions ability of well casing and cement to remain intact and protect groundwater. [05]
27.5. Sumps are not visually pleasing and may contain hazardous materials. [42]
27.6. Concerned about large amounts of water to be used for production. Each well requires from 9,000 to 40,000 gallons of water per day, to be trucked in if necessary. How cost effective is this? And does CEE or anyone have the right to own this large amount of water? [05]
27.7. Noncondensable gas removal system has not been proven to be safe, efficient, or totally effective. [07]
27.8. Concerned about disposal of hazardous wastes. [16]
27.9. Concerned about impacts on wildlife. [14]
27.10. Against geothermal plants in Oregon or Washington. [33]

28. Kenyon Thompson
Bend, Oregon
28.1. Not an impartial EIS because it is written by Forest Service personnel who will benefit from the project. [34]
28.2. Drilling and use of the roadless areas north and west of the crater should be done only when all the other areas are used up. [40]
28.3. Wind data is inadequate because it was done with only one device at one station. Wind direction away from the site is not considered. [07]

28.4 Hydrogen sulfide can be smelled for great distances, and I do not want this to devalue my property and life style where I live at the north base of the Paulina volcano. [29]

29. Edward B. Meservey
Eugene, Oregon
29.1. Need greater consideration of decommissioning phase and site condition after removal of facilities. [28]
29.2. How likely is project expansion, and will that require a new EIS, or could the present EIS be easily altered to cover an expansion. [19]
29.3. How resistant will the plant and wells be to earthquakes. [04]
29.4. What would be the impact on groundwater if an earthquake ruptured a well pipe. [05]
29.5. There are to be about half as many reinjection wells as production wells, but about 75% or 80% of the original brine is to be reinjected. This implies a larger flow rate in a reinjection pump than in a production pump. It seems that the outlet of the reinjection pump cannot be directly into the high pressure reservoir, or most of the available energy would be needed for reinjection. Where would the reinjection outlet be, and how would the brine then get into the deep reservoir to replenish it, and not into the upper ground water? [35]
29.6. On page 3-21, the last paragraph makes two seemingly contradictory statements: (a) that most of the precipitation in the caldera infiltrates into the ground, and (b) that loss of water by evaporation and flow out of Paulina Creek is estimated at 80% of total precipitation. [05]
29.7. Concerned about noise caused by condensation in gathering system piping. [09]

30. James W. Mahoney
Bend, Oregon
30.1. In general, the DEIS is comprehensive and well done. [27]
30.2. No data given on current level of hunting. [From his remarks at COGWG, I believe he is concerned that new or improved roads will result in more hunters in the area, which will have impacts on wildlife and plant site safety.] [11]
30.3. Should be more specific about possible snopark and impacts that may result from it. [11]
30.4. Visual depictions should include pictures taken from the plant site in the direction of the KOPs. [08]
30.5. Statement regarding compensation to be provided in the event of groundwater contamination is inadequate. More explicit and firmer measures should be specified. [05]
30.6. The monitoring program should be pulled together into a separate section. Public should be told how to access monitoring data on an ongoing basis. [39]
30.7. Prefers Alternative B transmission line design, and believes EIS should point out that it has capacity to handle additional load. [38]
30.8. I like the fact that the Alt. B transmission corridor route will not intrude in the area of suitable wildlife habitat identified on Fig. 4.12-1. What are other impacts of shifting transmission corridor in Alternative B south. [38]
30.9. Need greater discussion and specificity regarding funding of decommissioning. [28]

31. W. Scott Overton
Philomath, Oregon
31.1 All road building and construction of all (14+) pads will occur before it is determined if the site will support a profitable installation. A step-by-step process would be much more feasible. [41]

31.2 Deconstruction in the event of premature termination of the project is not mentioned. [28]
31.3 Geothermal is non-renewable energy, and this should be considered. If other projects were short-lived due to overuse, how was the level of use chosen for Newberry. [06]
31.4 Is this an experimental installation. [35]
31.5 [Author believes more water will be injected into the reservoir than will be taken out.] Is this an experimental procedure? What are the side effects? [06]
31.6 Doesn't understand need for cooling tower or how it works. [35]
31.7 It should be possible to prevent emissions during start-up and shutdown. [07]
31.8 EIS should acknowledge the possibility that hot springs will be lost as a result of geothermal development. [06]
31.9 Prevention of H_2S emissions receives cursory treatment. H_2S emissions could cause acid rain. It should be possible to restrict emissions of H_2S and other metals and dissolved solids. [07]
31.10 Overflow from sumps could lead to groundwater pollution. It should be possible to construct a system without sumps or to isolate sump discharge. [42]
31.11 Since fluid chemistry will not be known with certainty until one or more production holes are drilled, these holes should be drilled before deciding to proceed with the full exploratory phase. [23]
31.12 This area seems to have the potential for development as a winter recreation site. The geothermal plant would conflict with this. There is potential conflict with the present use, as well, via surface and atmospheric pollution. [11]
31.13 A bond should be required to cover the cost of reclamation of the site at termination of activity. [28]

32. Joseph M. Ellers
Corvallis, Oregon
32.1 DEIS was one of the best documents of its type that I have read. [27]
32.2 Opposes the project because it is an industial activity that conflicts with the current primary use of the area, recreation. [10]
32.3 The public is subsidizing the project (through BPA) to the benefit of the private sector. [18]
32.4 The project is relatively short-lived, yet the public assumes the long-term risk to the resources. [18]
32.5 This project is intended to facilitate additional development at the Crater. This project will establish precedence for a larger geothermal facility. [19]
32.6 Analysis of trace metals, specifically mercury, in Paulina and East Lakes is seriously flawed. [05]

33. Stephen Dynice
Bend, Oregon
33.1 Geothermal appears to be one of the most benign ways for the creation of electrical power. Supports the project. [33]
33.2 Let's encourage the growth of alternative energy sources like the Newberry Project. [36]

34. Rick I. Johnson
De Minimis Inc.
Portland, Oregon
34.1 The development is a worthwhile proposition that would produce little if any adverse effects to the environment. [33]
34.2 Alternative C is not a viable option, because alternative energy source development is an important substitute to traditional methods. [24]

35. Kenneth D. Beeson
Eugene Water & Electric Board
Eugene, Oregon

35.1 Will the proposed bridges for snowmobiles over the steam pipelines present a hazard when there is no snow? [11]

35.2 More detail is needed regarding the proposed sno-park. Will it conflict with other land use goals specifically related to the NNVM? [11]

35.3 Baseline data on hunting seems minimal. Is there more information available about current use of the area for hunting? [11]

35.4 Road closures could be done/enforced in the area of the plant during hunting season. [11]

35.5 It is not clear how the visual simulations were done. Additional information/clarification on methodology for preparing them is needed. [08]

35.6 Is it possible to include some pictures from the plant site to some of the other visual points referenced in the document? [08]

35.7 On page 4-52, the turbine bulding height is stated as 65 feet, and on page 4-55 the height is stated as 75 feet. Verify actual height and edit document. [08]

35.8 Would like a photo simulation from Mt. Bachelor. [08]

35.9 The document should be clearer about where the power produced by the project will go, what entities it will be sold to, etc. [36]

35.10 Address the growth rate of the area and related impacts on requirements for electrical energy. [36]

35.11 Clarify the role of the Bonneville Power Administration in the distribution of electric energy. [03]

35.12 Suggests the estimated annual water consumption of the plant be compared to annual consumption at a typical golf course. [05]

35.13 More concrete statements are needed regarding compensation if groundwater becomes contaminated. Reference to page 4-15. [05]

35.14 Address how septic tank contamination of groundwater and contamination from the proposed plant will be distinguished. [This comment was recorded at a public meeting attended by the agencies. The comment is believed to address the issue of how contamination caused by thermal fluid from the geothermal project would be distinguished from septic tank contamination from other sources such as a well-owner's neighbors.] [05]

35.15 Explain more clearly how the sulfur-oxidation process works. [35]

35.16 Why is it necessary to detail which roads will be used (since other hazardous materials are already being transported on most roads. [12]

35.17 The DEIS is very comprehensive in its treatment of hazardous materials. [16]

35.18 There is some confusion regarding the width of the pipeline corrdors with respect to the expansion loops. How wide will the corridors be when there is a loop? How wide without loops? [23]

35.19 DEIS should address whether some roads that are presently open will be closed to public access when the plant is built. Clarification/explanation of Forest Service policy regarding road closure would be helpful. [12]

35.20 DEIS doesn't say too much about the fact that this is a pilot project. Document should describe the BPA pilot program, make clear how much additional development is contemplated and make clear that the scope of this EIS is for 30 MW. [03]

35.21 Explain which agencies are responsible for monitoring specific facets of the project. [39]

35.22 Are there specific plans for baseline monitoring? Add specifics to document regarding when and where baseline monitoring occur. [39]

35.23 Where there are "coulds" used in the text, please provide some explanation of "how and where." [27]

35.24 It is not clear what additional baseline monitoring (besides ground water monitoring) will be done. Suggest that the monitoring requirements be consolidated into one part of the document. [39]
35.25 Provide explanation of how interested people can access records on monitoring activities and results. [39]
35.26 Address a 50-year monitoring plan. [39]
35.27 All lights at the project should be shielded. [08]
35.28 Suggest the Forest Service consider forming an advisory group to monitor the project on an on-going basis. [39]
35.29 Clarify who posts the bonds, what the fines/penalties are for the project, and what is included in (covered by) the unit bond. Also clarify what potential dollar amounts the developer has at risk. [28]
35.30 Clarify whether one of the goals in moving the transmission lines (Alternative B as opposed to Alternate A) was to avoid a protected wildlife area. [38]

36. John Williams, United Association of Plumbers and Pipefitters
Local #290, United Association of Plumbers and Pipefitters
Portland, Oregon
36.1 The DEIS failed to comprehensively discuss or model the highly significant and adverse air quality impacts for all pollutants emitted during the well drilling and testing phase of the project. [07]
36.2 The exploration stage could generate about 37,000 lb of H_2S over a four month period of well tests. [07]
36.3 H_2S bleeding emissions will total 15,453 lb/year. [07]
36.4 The DEIS does not state how many water supply wells will be drilled, or estimate the length of time to drill these wells or describe the equipment and its air emissions to drill these wells. [07]
36.5 Well drilling will produce significant amounts of SO_x and NO_x pollution. [07]
36.6 Drill rig set-up and employee vehicle use will result in significant emissions and PM_{10}/TSP. [07]
36.7 Air quality modeling is deficient because it fails to consider the H_2S contribution from any other wells that are not actively venting, but are bleeding H_2S. [07]
36.8 The project's emissions of H_2S are frequently above the odor threshold, and will be a seriously adverse and unmitigated impact. [07]
36.9 The DEIS should provide additional evidence why Newberry's H_2S emissions during outages would be only 1/4 the Coso emissions. At a minimum, the DEIS modelling should have used the 36 lb/hr for possible Newberry H_2S emissions rather than the 27 lb/hr figure. [07]
36.10 Questions 60 hr/year upset condition assumption. Cites recent 6-month period at Coso in which the plant tripped the equivalent of 219 hr/year. Even using the rate given in the DEIS, 11 tons of H_2S would be emitted during outages alone. [35]
36.11 In addition to H_2S emissions during power plant outages, start-ups, and shutdowns, there will be constant H_2S emissions from ongoing well exploration drilling and testing which apparently were not figured in the modelling in the DEIS. [07]
36.12 The rate of TSP emissions is low compared to what was experienced at other (Heber) plants. This should be explained, and the effect of a larger amount of TSP emissions should be modeled. [07]
36.13 TSP emissions from road dust and site preparation activities will contribute to reduced visibility. Visibility impacts in the immediate project area should be modeled, not just impacts at a distant Class I area. [07]
36.14 Under certain adverse, inversion atmospheric conditions, the pollutant plume from the power plant may enter the crater and "fill it up" with air pollutants as if filling a bathtub. The crater rim is only 200 feet above the power plant stack. This possibility was not discussed sufficiently in the DEIS. [07]

36.15 The DEIS failed to adequately discuss cumulative impacts from the likely foreseeable future. These will include three geothermal plants producing 100 MW in the Newberry Crater area and cumulative pollution impacts from the Fishhook timber sale. [19]

36.16 The DEIS does not figure potential H_2S deposition on the caldera lakes during full-blown well field development. Alternative calculations of H_2S emission rates are given to show that the project could acidify these lakes. [05]

36.17 The assertion in the DEIS that the project's air quality impacts will not violate air standards is misleading. Air quality can be significantly degraded, and human health harmed, and damage done to animal life and vegetation, particularly near a public campground in a Monument area and a National Forest, without violating standards. [07]

36.18 Project may violate emissions standards for beryllium. The DEIS fails to more closely calculate the predicted beryllium concentrations to assure that this standard is not exceeded. [07]

36.19 Appendix F-2 does not evaluate the project's silica emissions in Table 2. [07]

36.20 Modelling of controlled mercury emissions shows an extreme adverse impact on the caldera lakes; the equalling or exceedance of the water quality standard for mercury. This prospective mercury impact alone should motivate the developer to consider realigning his plant's configuration to avoid degrading these lakes with mercury. [05]

36.21 DEIS cites conservative modelling as a way to downplay troubling mercury emissions data. Investigations of computer models has found they have a margin of error that may result in underpredicting pollution impacts by 50%. [07]

36.22 Modelling fails to consider contributions of additional mercury from mineralized dust emitted by the project's activities, and mercury emitted by the additional engine exhausts from equipment and vehicles associated with the project. [07]

36.23 Table 2 in the Appendix states that the radon standard is 4 pCi/l (Federal indoor air standard). This is the level at which the EPA strongly suggests remedial action be taken. This is different from a standard. Other professional groups in the United States suggest a 1 pCi/l limit for indoor air. By this comparison, the project's emissions will consume more than 1/8 of a suggested safety margin for protection from radon-caused lung cancer. This is a significant adverse impact. [07]

36.24 Transportation of toxic substances may present a risk. The DEIS failed to describe adequately the possibility of truck delivery accidents and the consequences, particularly as regards gasoline. [16]

36.25 If molten sulfur is transported, this may be a prime risk. What will be the sulfur production rates from the sulfur scrubber? Will it contain vanadium? If sulfur is not marketed, where will it be disposed, and in what quantities? How will it be stored and transported, and in what form? [16]

36.26 The possibility of induced seismic activity was not discussed sufficiently. The DEIS incorrectly concluded that geothermal fluid induced earthquakes are weak. A 1992 quake in The Geysers that was widely felt for many miles was attributed to fluid/steam withdrawal/injection at a PGE geothermal plant in The Geysers. [04]

36.27 The DEIS lacks a detailed description of the water quality including TDS, of the blowdown and other injected fluids, except to concede the constituents would be more concentrated than in the brine. [06]

36.28 The DEIS failed to address possible problems caused by high silica content in the fluids which will be reinjected. [06]

36.29 The DEIS fails to discuss in detail the probable impacts from accidental releases of brine and return fluid, from sump overflows, and fluid dumping and pipeline ruptures. Several toxins present in the fluids, such as boron, arsenic, and bicarbonate, and sediment, would harm plant life. [05]

36.30 Some geothermal drilling muds contain potentially toxic materials, such as sodium chromate. During well drilling, large amounts of drilling muds are lost into underground formations, potentially polluting groundwater. Dewatering of muds is a widely used method of reducing the volume of this type of waste, and this mitigation of dewatering drilling muds should be mandated for this project. [05]

36.31 Sumps should be synthetically lined. Clay lined sumps may allow seepage of pollutants into the extremely permeable soils of the area, and may be damaged by frost heave. Leak detection systems should be mandated. [42]

36.32 Failure to cover or net sumps may endanger wildlife. Netting should be required. [42]

36.33 Since it is doubtful that evaporation will empty the sumps year-round, what will be done with excess brines and liquids? [42]

36.34 How will brine be transported to what suitable offsite locations and in what amounts, and how often. [12]

36.35 The DEIS fails to discuss the chances of possible adverse impacts from any leaks and spills from fuel tanks which are at each well site. [16]

36.36 What biocide will be used in the cooling tower, what are its effects, in what quanitities will it be stored and used, and what will be the effect of its drift on affected vegetation? [13]

36.37 How will the hazardous materials used at this facility be disposed of and transported in and out of the site. [16]

36.38 The underlying soils are highly permeable and groundwater underlies the project location. Any spills or discharges could contaminate this aquifer. [05]

36.39 The DEIS fails to compare the maintenance costs, reliability, and the effects of disrupting from wind and snow and rain on overhead transmission lines, compared to repair costs and downtime on underground lines. Disputes the DEIS claim that buried lines are not used in rural areas, citing Timothy Lake hydroelectric project near Mt. Hood and Bornite mining project east of Salem as instances where buried lines have been mandated in sensitive areas. [38]

36.40 DEIS states that 2-1 slopes will be allowed. These slopes are too steep and will unnecessarily increase erosion. Slopes of at least 3-1 should be mandated. [04]

36.41 If the project has heated pipes in wintertime, there will be runoff of melted snow, and resulting erosion that was not discussed in the DEIS. [04]

36.42 As transportation impact mitigation measures, all employees should ride company-sponsored busses to work, project roads should be paved at the developer's expense, no more than two wells pads should be constructed simultaneously, and no more than one well should be tested at one time. [12]

36.43 Out-of-area construction workers will result in a $270,000 per year expense to local school districts. Since the project will not be providing a significant amount of property taxes during the construction phase, this is an unmitigated impact. The developer should make $270,000 in mitigation payments. There will be similar impacts on other public services as a result of imported workers and their families. Affected government entities should be made aware and become involved in monitoring these possible socio-economic impacts and mitigation payments should be made by the developer to these entities when impacts are identified. Hiring of local construction workers should be mandated to reduce the impacts on public services. [17]

36.44 The developer should be required to provide mitigation for any lost recreation trails, vegetation, recreation area, groundwater, timber, and wildlife habitat. This mitigation should include purchasing and donating to the national forest and parks system equivalent habitat, timberland, and recreation areas. [26]

36.45 The developer should mitigate CO_2 emissions by measures such as providing financial support for public transportation, tree planting, and residential energy efficiency measures which would reduce CO_2 emissions elsewhere. There is no

documentation that construction of this project will displace other power plants producing more CO_2. [07]

36.46 The DEIS lacks a description of the septic system's effects of wastes infiltrating groundwater, and the system's possible volume of wastes. What is the expected amount of wastes discharged monthly and annually to the septic field? If these site soils are highly permeable, won't the septic field contaminate groundwater? [05]

36.47 It is proposed that the developer pay stumpage fees to the Forest Service for cleared, marketable timber. But this practice may violate regulations requiring bidding of timber sales. [34]

36.48 Are Water Resources Department (WRD) water rights/permits required for the project's water impoundments? How will this issue be reconciled with the information on p. 3-25 that all water rights are appropriated, according to the WRD? [05]

36.49 Where will sediment from water storage ponds be disposed of, and in what amounts, and how will sediments be tested? [42]

36.50 Who will pay for the interpretive centers and tutors? [26]

36.51 Fencing will be constructed around the plant and well pad areas. The DEIS does not state the height of the fence or provide assurances that it will be high enough to keep out animals. [23]

37. Keith and Janet Nash
Redmond, Oregon

37.1 The increase in vehicular traffic on the two roads that flank the west side of the monument is a concern. If and when geothermal drilling takes place, the traffic conflicts [with existing cattle grazing in the Sugarpine C&H grazing allotment next to the NNVM] will increase dramatically. [12]

37.2 Support no action alternative. [33]

38. Fred Hirsch
Geothermal Coordinator
Sierra Club, Oregon Chapter
Corvallis, Oregon

38.1 We are cautious about geothermal development, which represents an industrial intrusion on rural public lands. [10]

38.2 The DEIS recognizes there are still unknowns regarding the deep geothermal resource in terms of quantity and quality. With that reservation the document seems well organized. [27]

38.3 The geothermal development must not be allowed to produce irreversible changes to Paulina and East Lakes. It is vital to monitor the lakes for changes. If harm occurs, the project should be stopped until the problem can be cured. [39]

38.4 Resource depletion concerns primarily relate to the corresponding over-dedication of surface public lands if too many plants are built. You should develop slowly so the reservoir will be tapped only for facilities that can be sustained for decades, and no more surface land would be taken than for a sustainable program. [06]

38.5 The analysis could be more useful if more attention were given to impacts during snow cover conditions. For example, deposition of air pollution assumes dry land for the most part. Snow cover produces a different recipient. Snow cover as it melts might convey the pollutants to a different area, perhaps concentrating them. [07]

38.6 Please explain how having cooling towers parallel with the westerly and easterly trend of winds has less impact on plumes than would towers placed perpendicularly to the predominant wind flow. [35]

38.7 The well pad development south of Paulina Creek and Highway 21 would seem to be a separate issue to be addressed in its own document since the three well pads would not be supporting electric plants north of Paulina Creek. Is the "no

crossing" of Paulina Creek a settled issue, or is it to be reevaluated in the future if a resource is found south of Paulina Creek, and power plants north of the creek? Also, the well pads south of the creek may give a push towards development there, requiring an additional transmission corridor from the project lands to Highway 97. [37]

38.8 We find Alternative B transmission line corridor and towers preferable to Corridor A. Whichever corridor is used, the single pole facility is preferred, providing it is able to move electricity from more than one plant. If Corridor B had to be supplemented with additional widening (a new line, etc.) its superiority to Corridor A would be diminished. [38]

38.9 Please explain in more detail what would be done if the geothermal reservoir has more toxics than anticipated in the document. [06]

38.10 What has been the history of successful blowout prevention? By this we mean the number of times that blowout prevention has successfully curtailed an imminent blowout compared to actual blowouts. We are promised the equipment will work. Please bolster the case with a record of successful use. While the overall record seems good, seven blowouts in how many production wells? There is a suggestion that blowouts are a higher risk when a field is first being developed, as for example the blowout on the Puna Coast in Hawaii. [16]

38.11 It would appear prudent to have a blowout management plan as well as a prevention plan. [16]

38.12 The main access road and spur roads to well pads would be snow-plowed in winter. What impact will this have on winter recreation, particularly snowmobiling and cross country skiing? A snow park near the project would seem to conflict with the intention to plow roads. Are snowmobiles confined to roads? Why locate recreation access close to an industrial site? [11]

38.13 The cumulative impacts section dealt primarily with accumulation of impacts from one power plant over time. Many in the environmental community will be concerned about cumulative impacts from several plants. Seeing three sites in the preferred alternative leads to a question of whether this will ease the path for the second or third plant. Will there be more power line corridors? Our concern about well pads south of Paulina Creek is related to a feeling this is a foot in the door to make additional power plants inevitable. Additional power facilities were dealt with in very general terms. [19]

38.14 Most of the plume simulations were of summer conditions. The plumes would be more prominent in winter. Is the lower atmospheric pressure at higher elevations going to lead to more noticeable plumes? Was altitude taken into account in the simulation? [08]

38.15 The document mentioned use of fencing around the power plant and well pads. The drawings in the DEIS show them without fences. How high must these fences be to be effective in deep snow conditions? The fences should be able to win an argument with a snowmobile if such an accident happened. [23]

38.16 How will the pipeline corridors be managed in winter? If not plowed, will the expansion joints for passage be high enough to accommodate animal and people traffic? Will the pipeline be sturdy enough to resist damage from snowmobiles? If not fenced, the pipelines may need something like the snow markers along the Cascade Highway to mark them and indicate possible danger. [23]

38.17 We support casing production and injection wells to 2000 foot depth. In addition, the requirement should extend to be below groundwater in case some groundwater strata are below a 2000 foot depth. The casing requirement should be tied to depth, not length of pipe, since some of the wells may be slant drilled. If groundwater should show contaminants from the project, the project must be halted until the problem can be solved. [05]

38.18 The mitigation measures for Alternative A and Alternative B should include a discussion of implementation and enforcement, perhaps through stating

stipulations for the permits for the project. Other environmental assessments have included an appendix listing the proposed appropriate conditions. [26]

38.19 The cited Emergency Contingency Plan for accidental spills or discharges should be in place prior to drilling or transportation of hazardous materials. [02]

38.20 The emissions control plan should be in place before the power plant becomes operational. The plan should specify how to cope with "upsets" and breakdown conditions in winter. [02]

38.21 Mercury levels should be monitored at Paulina Lake and East Lake as well as at the H_2S removal stack and cooling tower. The lakes are popular fishing holes, and are also used by raptors as a food supply. [39]

38.22 There was one photo mosaic of vegetation from the air. Ground level pictures would help laymen to understand the vegetation categories. Ground level pictures of a plant site and a well pad would help us get a better feel of the sites. Most of your reviewers have not had the benefit of a tour to the project site. Referenoes of the site being below the rim and lakes would be more understandable with pictures from the site towards the caldera or Paulina Peak. [08]

38.23 Will constituents of the fluid become more significant air pollutants because of the high elevation? Is H_2S more perceivable in a thinner atmosphere? Coso's plant was used as a significant indicator. Plants near Reno or in Mono County provide a better indicator under more similar atmospheric conditions. [07]

38.24 The risks of hazardous truck movements were calculated on U.S.-wide mileage and accident rates. Some of the mileage will be on forest roads which may pose a higher risk. What has been the accident rate for hazardous movement to and from The Geysers power plants? That experience would combine project type mileage and highway mileage to perhaps give a more accurate risk assessment. [12]

38.25 The "upset" history came from Coso. Will the climate and altitude at Newberry increase the risk of upsets? Will upsets be harder to control at Newberry than on the California desert? The quantity of air pollutants at Newberry might be greater if it takes longer to restore normal conditions at Newberry. What has been the "upset" history at Mono and Nevada plants? [35]

38.26 Fire is a danger to lodgepole pine, particularly diseased even aged stands west of the caldera. How will the project be protected against large forest fires? The transmission lines would appear to be particularly vulnerable. Another aspect of fire protection is restricted activity on high fire danger days. We understand some past geothermal exploration on your ranger district was halted in periods of high fire danger. Will the project timetable be affected by fire danger, in the development, construction, or utilization phases? [16]

38.27 Monitoring is mentioned in various parts of the document. The monitoring programs should be gathered in an appendix specifying what will be checked, by whom, how often, and how the public can review the effort. [39]

38.28 The Geothermal Resource Orders are referenced in the DEIS. Some leasing EIS written in the late 1970s and early 1980s included an appendix with them. Most reviewers would not have such documents. Orders pertinent to environmental protection may be a worthwhile appendix. [02]

38.29 The pipelines to the injection wells would be of smaller diameter due to less need for insulation. However, insulation would seem needed to prevent the pipes and injection fluids from freezing in winter. Will the injection fluids have high temperatures that would require insulation to protect workers, wildlife, and the public from injury from hot pipes? [35]

38.30 The drilling we presume will require drilling without loss of circulation. Since loss of circulation can occur when drilling reaches voids, what is the likelihood of encountering voids such as lava tubes from ancient flows? What has been the experience of encountering tubes, caves, and other voids in prior wells drilled on the volcano? [04]

38.31 The premise is made that the surface will be restored. Since the developer impacted the surface, the developer should pay for rehabilitation and restoration, not the taxpayer. There should be a bonding requirement to be implemented when the developer receives the needed permits. [28]

39. David W. McClain
CE Exploration Company
Portland, Oregon

39.1. CEE and EWEB support the preferred alternative in the Draft EIS: Alternative B. [33]

39.2. The proposed geothermal project is just a small component in the context of several federal actions and decisions that preceded the current proposal. To a large extent, the intent of our comments is to encourage the U.S. Forest Service to provide additional background information in order to place the proposed geothermal project in context with a variety of other actions.

It is important to recognize that Congress envisioned geothermal development in the proposed project area when it passed the Newberry National Volcanic Monument Act. That legislation was the product of an innovative public consensus process designed to balance the need for protecting the unique environment at Newberry and our need for geothermal energy resources. Section 8 of the Act affirms Congress' intent to allow geothermal development in the project area. The leases to be developed were in fact compensation leases for other leases issued at the direction of the Monument Act. [03]

39.3. Although briefly discussed at different points in the Draft EIS, we recommend that the Draft EIS contain a more thorough discussion of the relationship the Draft EIS has to other federal actions that have been, or will be in the future, addressed by environmental impact statements.

For example, the Draft EIS should make it clear that it is based upon determinations contained in the Bonneville Power Administration's Resource Programs Environmental Impact Statement (the "BPA Resource Programs EIS"). In the BPA Resource Programs EIS, geothermal energy was one of several resource acquisition alternatives that was evaluated.

The Draft EIS is also based upon conclusions contained in the Deschutes Forest Plan Environmental Impact Statement and related to the alternatives addressed in the draft Newberry National Volcanic Monument Comprehensive Management Plan Environmental Impact Statement. These documents are important to reference because both documents support the conclusion that the proposed geothermal project is consistent with the Deschutes Land Management Plan and the National Monument plans now under consideration.

Another federal action that should be addressed in the Draft EIS is the Eastside Resource Management Plan. [03]

39.4. The proposed geothermal project in the Draft EIS is not the only geothermal activity proposed in the Newberry area. For example, we understand that Vulcan Power has submitted a proposed plan of operations for some exploration wells within the approved Newberry Unit and holds leases inside and outside the unit. We believe the Draft EIS should describe in detail how other geothermal lease development will relate to the proposed geothermal project particularly in terms of the unit agreement and the ability of the geothermal projects to share some common facilities. [03]

39.5. CEE believes that the Draft EIS should include a detailed description of how the proposed action will impact the North Paulina Roadless Area. At a minimum, the

Draft EIS should provide an analysis of whether significant irreversible environmental consequences will result to the North Paulina Roadless Area from the proposed geothermal project. [40]

39.6. The Draft EIS states several times in various places that the general condition of the proposed development area is fragmented by areas of clear-cuts and is generally characterized by diseased and dying stands of trees. CEE recommends that the Draft EIS contain a more thorough discussion of the visual impact that the clear-cuts and the diseased trees have on the area's existing visual resources. The current discussion in the Draft EIS treats the visual impacts that the proposed geothermal project will have on the visual resources without a complete discussion of impact the existing clear-cuts and diseased trees already have. [08]

39.7. Page S-11, second paragraph: The discussion on property taxes and royalties does not indicate that these payments are annual estimates. [17]

39.8. Page 1-3, second paragraph: The Draft EIS states that the proposed project "would occur on national forest lands subject to the Newberry National Volcanic Monument legislation." This should be clarified to explain the extent to which the legislation actually applies to the project area. Although CEE's lease area does not fall within the boundaries of the actual "Monument" lands (as defined by the Newberry National Volcanic Monument Act (the "Act"), a portion of the lease area is within lands designated under the Act as "Special Management Area." Pursuant to Section 2(c) of the Act, the Special Management Area must be managed as if it were part of the monument, except as provided in Section 4 of the Act. Pursuant to Section 4(a)(5), geothermal leases may be issued in the Special Management Area provided surface occupancy does not occur in the Special Management Area and provided the area is entered only by directional drilling from outside the Special Management Area boundaries.

The land where CEE's operations (surface improvements) and drilling will occur is on federal lands outside the National Monument boundaries. Section 8 of the Act provides that

"nothing in this act shall be construed as authorizing or directing the establishment of protective perimeters or buffer zones around the monument or special management area for the purpose of precluding activities outside the monument or special management area boundary which would otherwise be permitted under applicable law. *** The fact that activities or uses outside the Monument and Special Management Areas can be seen, heard, measured, or otherwise perceived within the Monument or Special Management Area shall not, of themselves, limit, restrict, or preclude such activities or uses up to the boundary of the Monument and Special Management Area." [30]

39.9. Page 1-3, fourth paragraph. The text describes the Draft EIS as being "tiered to the Deschutes National Forest Plan." An explanation of what this means should be provided. [03]

39.10. Page 1-12, fourth paragraph. In Section 1.3.3, a citation should be added to the statement that "BPA has determined that geothermal power is a renewable, alternative source of electrical power that could help meet future energy needs in the Pacific Northwest." [03]

39.11. Page 1-13, second paragraph. Citations should be provided for the statements concerning past federal actions that have recognized geothermal potential. [03]

39.12. Page 1-13, fourth paragraph. The signed BPA Memorandum of Understanding with CEE and EWEB should be included as an appendix to the Draft EIS without the confidential attachments. This would allow an interested party to better understand the relationship between the parties and the proposed geothermal project. [03]

39.13. Page 1-14, first paragraph. The Hazardous Solid Waste Amendments is not a proper term for a statute. This reference may be to the Solid Waste Disposal Act ("SWDA") as amended. In 1976, Congress significantly amended the SWDA with the Resource Conservation and Recovery Act and again in 1984 with the Hazardous and Solid Waste Amendments. [03]

39.14. Page 1-14, first paragraph. The list of federal acts should include the Geothermal Steam Act of 1970 as amended because the Act includes environmental compliance and bonding provisions. In addition, the Water Resources and Department of Geology and Mineral Industries should be referenced under Oregon Revised Statutes. [03]

39.15. Page 1-17, Table 1-1. Table 1-1 refers to a "contaminant discharge permit" and a "hazardous waste permit" to be issued by DEQ. These are not correct terms for permits issued by DEQ. Depending on the operational design, the proposed geothermal project may have to obtain a National Pollutant Discharge Elimination System storm water permit and a hazardous waste identification number, both issued by DEQ, in addition to the permits listed in the chart. A footnote should be added that some of the permits listed in the table may not be necessary depending upon final operation design. [03]

39.16. Page 1-22, fifth paragraph. The final sentence refers to "other issues" which were not included within the scope of the EIS. CEE recommends that some examples of these "other issues" be provided so that an informed judgment can be made by a reviewer about whether such issues were properly excluded. [03]

39.17. Page 2-3, second paragraph. Section 2.3 states that "[s]ome of the alternatives considered by others were not given detailed analysis in the DEIS because they would not meet the purpose and need, would go beyond the scope of this analysis, had been considered in another EIS or an Environmental Assessment (EA), would not be technically feasible, or would have greater adverse environmental effects than would the original proposed project." Citations to other EIS's or EA's which address these alternatives should be provided. [20]

39.18. Page 2-5, Section 2.3.3. We recommend that the differences between how the operations of binary plants, single-flash plants, and pure-steam plants affect the environment be briefly described in this section. [20]

39.19. Page 2-10, Table 2.4-1, Pipelines. The table describes the pipeline corridors as 120 feet wide. This is the maximum width for areas of multiple pipes and expansion loops. See pages 2-40, Figure 2.4-14. Typical corridor widths are generally in the range of 90 feet. The table should show a range of "90 to 120 feet." [23]

39.20. Page 2-11, Table 2.4-1, Power Plant Design, Water Use. The amounts specified are for annual consumption. The table should include the words "per year." [23]

39.21. Page 2-14, Table 2.4-3. Table 2.4-3 should be expanded to include the time lines for the required state permits. [23]

39.22. Page 2-28, third paragraph. The sentence describing water pipeline routes should clarify that any pipeline locations would have to be approved by federal land managers. [23]

39.23. Page 2-34 The assumption is made that the geothermal resource characteristics of the Newberry site are similar to those found at the Medicine Lake geothermal resource. The basis for this assumption is described on page 3-37 among other places. We suggest that the basis for this assumption be described in Chapter 2. Otherwise, a reviewer is unaware of the basis for this assumption until Chapter 3. [23]

39.24. Page 2-39, fifth paragraph. The discussion of pipeline widths should describe a range of widths from 90 feet to 120 feet consistent with Figure 2.4-14 on page 2-40. [23]

39.25. Page 2-49, second paragraph. We recommend the discussion of modified grain silos as winter protection structures for well heads be revised to improve accuracy

and clarity. Modified grain silos are one example of the type of structure. Please modify the discussion as follows: "Well heads will be insulated (see example in Figure 2.4-18) for heat retention and may be covered with a prefabricated metal building similar in shape as a small grain silo. Prefabricated metal buildings, which can easily be removed in the summer months, would be provided to cover well pad equipment such as well heads, injection pumps and chemical injection skid areas." [23]

39.26. Page 2-52, fourth paragraph. The Draft EIS states that potentially hazardous materials may be used in the facility's laboratory and the suggestion is that these materials will be diluted and injected into wells with the brine. The applicants are committed to complying with all applicable hazardous waste regulations. We are confident that the laboratory wastes can be treated and disposed of by underground injection pursuant to a Water Pollution Control Facility permit issued by DEQ. If this turns out not to be the case, we will ensure that the laboratory wastes are managed and disposed of at a permitted disposal site. [16]

39.27. Page 2-73. A statement is made regarding geothermal resources that the existing hydrology monitoring program will be continued or a similar program will be implemented. We believe that, in fact, a similar program should be chosen, rather than continuing the existing program. [39]

39.28. Page 2-75. In the wildlife discussion, the statement about raptor protection should be qualified by including the words "the extent required by law." [25]

39.29. Page 2-77. The Draft EIS states that Alternative C is not described in a separate column because the effects associated with construction and operation of the project would not occur. Although Alternative C does not have construction and operational effects on the environment, a discussion of the environmental effects of Alternative C should be included in the Draft EIS. There are actual adverse environmental impacts if the proposed project is not implemented because of the increased reliance on more environmentally harmful forms of energy generation. Accordingly, even though it might not be necessary to include the effects of Alternative C in the table, the analysis of the impacts of Alternative C is inadequate in the current draft. The environmental effects of Alternative C should be discussed in more detail. [24]

39.30. Page 3-2, Figure 3.1-1. The scale on this map needs to be corrected. Each square on the map is a Township or 6 miles across. [27]

39.31. Pages 3-10, bottom, 3-11 top. The discussion of soil compaction on pages 3-10 and 3-11 should just describe the existing soil conditions. This paragraph, however, includes a discussion of the impacts of the proposed action. This discussion of impacts belongs in Chapter 4, not in Chapter 3. [04]

39.32. Page 3-12, first paragraph. Section 3.2.3.4 states that "[s]ubsidence is covered in the environmental baseline requirements of the GRO Orders." We recommend that additional information concerning how subsidence is covered be provided. A description of the GRO should be provided. [04]

39.33. Page 3-12, third paragraph. Section 3.2.3.6 describes the potential frost action. It is unclear, however, what frost action has to do with the proposed action. If frost action is relevant, there should be a discussion as to why. There should also be a discussion in Chapter 4 concerning the impacts if there are any. [04]

39.34. Page 3-40, Figure 3.5-1. The scale on this map needs to be corrected. Each square on the map is a Township or 6 miles across. [27]

39.35. Page 3-44, first paragraph. Some explanation should be given of why air quality conditions in Klamath Falls have improved dramatically. We understand that the improvement in air quality is largely due to the implementation of wood stove control regulations. [07]

39.36. Page 3-48, Section 3.6.3. In Section 3.6.3, the Forest Service's visual resource work for the Deschutes National Forest is described. We understand that the visual resource inventory completed in 1976 was extensively revised before the

final Deschutes National Forest Management Plan was adopted in 1990. If this is true, reference should be made to the updated and revised inventories. [08]

39.37. Page 3-48, Table 3.6-1, VQO. Table 3.6.1 is difficult to understand. The table should be just an inventory of existing conditions in certain areas. The table suggests, however, that there has been an analysis of the visual impacts of the proposed project facilities. Impact analysis belongs in Chapter 4, not in Chapter 3. [08]

39.38. Page 3-48, Table 3.6-1, VQO. Please check the source of the Visual Quality Objective (VQO) standard. We believe this standard is established by the Forest Plan. The footnote should reflect that the VQO is a Forest Plan objective. [08]

39.39. Page 3-49, Section 3.7. We have no suggested changes to this section, however, we do wish to point out that SAIC did record six months of background noise levels at the project site, at the Monument Boundary along the snowmobile trail, and at Paulina Lake Lodge near the bridge over Paulina Creek. SAIC took the readings approximately every two weeks when they changed the data tapes at the weather station. The information was provided to the US Forest Service with the quarterly reports from SAIC. [09]

39.40. Page 3-56, Figure 3.8-1. The map should show the management areas under the forest plan for the entire area shown on the map, not simply the proposed project areas. Otherwise, it is difficult to determine the impact on surrounding areas. [10]

39.41. Page 3-59, Section 3.8.3. This section does not address the preferred alternative of the NNVM management plan and should be expanded to show the interrelationship between the NNVM Management Plan, adjacent geothermal development, and the use of the Special Management Areas, KGRA lease sales, and other special provisions of the Act. Specifically, this section should address the special relationship set forth in the Monument Act between the Secretary of Interior and the Secretary of Agriculture with regard to implementation of the Geothermal Steam Act. [10]

39.42. Page 3-59, Section 3.8.3. This section states: "The NNVM Comprehensive Management Plan EIS recognizes this geothermal pilot project proposal." An explanation of what "recognizes" means should be provided. [10]

39.43. Page 4-3, last paragraph. The text addresses the need for the applicants to prepare a Plan of Baseline Data Collection. The BLM has requested that CEE submit a Plan of Baseline Data Collection prior to drilling. Please see letter from BLM attached as Exhibit A. [39]

39.44. Page 4-5, Section 4.2.3.2, Volcanic and Geothermal Activity. This section states that the potential to induce volcanic activity by geothermal drilling and development is "not clearly understood." This is a somewhat misleading statement. The possibility of inducing volcanic activity by the drilling and production of geothermal fluids and steam is extremely remote. The movement of magma is controlled by tectonic forces (i.e., the movement of the earth's crustal plates) and lithostatic pressures (i.e., lithostatic pressures being the pressures exerted by the weight of the rock column above the magma chamber). In comparison with these forces, potential changes in hydrostatic pressures (the pressures exerted by fluids in the geothermal reservoir) would have a negligible impact. There is no known instance of geothermal development anywhere in the world ever causing an eruption of lava. Therefore it is not expected that geothermal drilling and production would cause such an eruption at Newberry. The known hydrothermal eruptions related to geothermal development have occurred at sites where near surface hydrothermal vents are present and steam eruptions have occurred at the surface. These steam or hydrothermal eruptions are not volcanic eruptions. The absence of any surface hydrothermal features or highly altered ground in the project area combined with the core holes drilled in the area indicate that the geothermal reservoir is located several thousand feet below the surface. The probability of a hydrothermal eruption occurring is very

remote because the hydrothermal pressures would have to over come the lithostatic pressures of several thousand feet of rock. [04]

39.45. Page 4-6, Section 4.2.3.5, Subsidence. The first sentence states that land subsidence has occurred in "many areas." We suggest that this be changed to "some areas." The last sentence of this section states that "mitigation measures would be imposed." This sentence should read "mitigation measures could be imposed." [04]

39.46. Page 4-10, first full paragraph, fifth sentence. The text reads "Roof drains would be connected directly to the water storage pond." This is not correct. Roof drains are commonly diverted to the local topography as they contain only rain water or snow melt. [05]

39.47. Page 4-14, Section 4.3.3.6, Air Pollution Deposition. The text addresses the potential for pollution deposition having an affect on lake water quality and makes reference to a report by Science Applications International Corporations in Appendix F-5. Modeling results are described and the statement is made that "the predicted concentration of all substances was considerably below the criteria, except for mercury." The text further states that "based on SAIC's analysis, mercury concentrations in the lake waters could rise as a result of depositional effects, to levels in excess of the applicable water quality criteria."

The existing data does not support the DEIS statement regarding water chemistry and this section should be rewritten to more accurately portray the US Geological Survey unpublished data with regard to lake and spring water chemistry and the conclusions of the SAIC report.

The text infers that mercury levels could at times exceed the Oregon Department of Environmental Quality and Environmental Protection Agency standards in some areas of East and Paulina Lakes. The text goes on to further imply whether these levels are accumulating in sufficient amounts in fish to affect biological productivity and other wildlife is not known.

The overall lake chemistry tends to dilute and buffer the contributions for the higher TDS fluids from the hot springs and as a result the average lake water chemistry tends to show from zero to only trace amounts of boron, arsenic and mercury in concentrations that are within the detection limits of the analysis and in general are not detectable in a large number of the samples taken from the lakes.

The SAIC modeling data and US Geological Survey water chemistry data indicates that mercury levels in the lakes are at or below the detectable limits and deposition from the geothermal project would be orders of magnitude below the criteria set by the State of Oregon.

The prediction of the SAIC model of mercury concentrations from power plant emissions depositions in a one-foot thick surface layer of lake water was based on an extremely conservative set of modeling assumptions that tended to overpredict the mercury deposition affect. That very conservative model was run to screen the project's impacts for areas of concern. The model results show the State of Oregon surface water quality fresh carbonic criteria for mercury will not be exceeded, and that the mercury levels were predicted to be well below the Maximum Contaminant Level for drinking water and of surface water quality criteria.

Therefore, the statement on page 4-14 regarding mercury deposition resulting in a "standard exceedance" is incorrect. The analysis conducted by SAIC clearly shows that mercury concentrations, under extremely conservative assumptions,

were predicted to be under an extraordinary worst case condition coincidentally identical to the mercury surface water quality chronic criteria value established by the State of Oregon. The model did not predict an exceedance of the chronic criteria value. The SAIC report also states the following regarding the mercury calculation:

"It must be emphasized that the concentration values calculated from the air quality model and deposition theory were very conservative. For example, it was assumed that the mixing depth at East and Paulina was a constant 1 foot throughout the entire year. In actuality, the East and Paulina Lakes are dimictic, i.e., the lake mixing occurs twice a year, once in the fall when the air temperature cools and once in the spring after the ice breaks up. In addition, a well-defined thermocline forms by early summer which stabilizes at a depth of 35 to 40 feet. Based on these data, near surface water mercury content would be one to two orders of magnitude lower than the water quality chronic criteria value depending upon the time of the year." (emphasis added [by commentor]).

The report clearly explains the conservative assumptions of the deposition model. In addition to the conservative mixing depth assumptions, the model makes an extremely conservative gross assumption that all of the elemental deposition would be solubilized. In the SAIC model, the predicted concentrations of selected elements in the top one foot layer of lake water assumes that all elemental emissions from a geothermal development were solubilized or contained in a suspension which flushed to the lake in spring with the snow melt. This, of course, does not happen due to the formation of insoluble compounds and complexes which do not reach the lakes. Metals and other elements tend to accumulate in soils and do so primarily by exchange reactions with organic matter or clays. Organic materials in soil absorb many metals and elements, forming stable complexes. A large percentage of the snow melt in the basin does not flow to the lakes directly but reaches the lake through groundwater flow which would tend to reduce the amount of elemental material reaching the lakes due to the accumulation of the metals in the soils.

CEE requests that the discussion regarding mercury emissions deposition, water quality and biology be reevaluated. [05]

39.48. Page 4-15, Section 4.3.6. Some additional explanation is needed about providing private land owners with replacement drinking water supplies. Replacement water supplies is probably a more appropriate description than "compensation of some form." Given the distance between private land owner wells and the geothermal development activities, it is extremely unlikely that well replacement would be needed. [05]

39.49. Page 4-18, third paragraph. The text describes the potential for geothermal surface manifestations to vary naturally over time due to natural causes. The text reads "At Newberry Volcano, the natural range of variations is not known because routine monitoring only began in 1991." There is considerable geological evidence in the crater area that hydrothermal activity was significantly greater in the past. Such evidence includes the welded beach and hot springs deposits near Paulina Hot Springs and the alteration of the volcanic tuff ring at East Lake Hot Springs. This geological evidence indicates that both hot springs have been decreasing in activity for considerable time. [06]

39.50. Page 4-19, third paragraph. The text states "net reservoir depletion could be below 0.5 percent per year." This is a very conservative estimate. CEE calculations indicate the depletion rate would be in the order of .001 percent per year. [06]

39.51. Page 4-26. Figure 4.5.1. Different cross-hatch markings should be used on this map in order to distinguish between the Newberry National Volcanic Monument and the populated areas of Sunriver and Bend. [07]

39.52. Page 4-44. Section 4.5.5. Effects of Alternative B. The first sentence reads "Two alternative power plant sites are considered under Alternative B, which would be expected to have similar meteorological data and modeling results at most receptors." Although this statement is true, additional explanation should be given as to why. The text should also state that the alternative sites have similar topographic elevations, are in the same regional setting and have the same local wind and other climatic conditions influenced by the diurnal air flow in and out of the crater, as the proposed plant site and therefore are expected to have similar meteorological conditions and modelling results. [07]

39.53. Page 4-45. Section 4.5.6. Additional Mitigation Measures. The text suggest that a wheel washing and or road washing program could be implemented for major access points to reduce the source of dirt carry-out onto paved roads. This statement should be deleted because such mitigation is unnecessary. CEE will only use the Road 9735/US 97 intersection where a gravel road intersects with a paved road. This mitigation does not make any sense. This type of mitigation would single out geothermal developers to perform an extraordinary dust abatement program that is not required of the timber industry or recreational users. [07]

39.54. Page 4-52. Section 4.6.3.1. Plant Site. The second sentence states that the tallest structure would be 65 feet high. This is incorrect. The structure is 75 feet tall, see page 4-55, Section 4.6.3.6 and the plant elevation drawings at Figure 2.4-11 on page 2-33. [08]

39.55. Page 4-62. Figure 4.6.8. This simulated view of the proposed project during summer apparently shows a steam plume from well venting. The label on the photograph should make it clear that this is venting from a well and not from the power plant. [08]

39.56. Page 4-95. Section 4.8.3.2. Section 4.8.3.2 estimates that 166,100 board feet of timber could be harvested from the proposed project area as a result of the project. This timber volume number was estimated based on an assumption that the entire area is forested at the same density as the Fish Hook timber sale in the western project area. Some of the timber has already been removed. We request that this estimate be clarified. Timber that is removed will be salvaged and is expected to be less than 160,000 board feet of dead lodgepole pine. Mixed conifer stands will be avoided whenever possible. [13]

39.57. Page 4-96, second paragraph. The only mitigation measure described for assuring consistency with the Newberry National Volcanic Monument Management Plan is a statement that there would be consistency. We recommend that a more detailed discussion of how consistency would be achieved be included. [30]

39.58. Page 4-137, top paragraph. The applicants object to requiring netting of sumps and ponds. Geothermal drilling sumps do not contain toxic fluids. The sumps do contain, on occasion, drilling muds and hot geothermal fluids. When the sumps contain muds and hot fluids, it would be impractical to have netting. The sumps associated with the proposed project do not represent the same risks as with sumps located at a mining operation. Imposing a mitigation measure borrowed from heap leach mining is unnecessary, expensive, impractical and will be ineffective. The use of netting on drilling sumps has never been required at any other geothermal project developed in Nevada, Utah or California. Geothermal facilities in the Imperial Valley are located adjacent to natural wildlife refuges. Other projects are located along migrating fly ways. Avian or bat kills from use of geothermal sumps for watering has not been documented at other sites.

As a practical matter, netting would be in the way during drilling when muds and

produced fluids are discharged into the sumps. The netting would most likely be damaged or need to be removed for safety reasons. During well testing when hot fluids are temporarily stored in the sumps, netting would deteriorate from the temperature and it would be impractical to maintain. It has been our observation that animals do not use the sumps when the drill pad is occupied by a drill rig and they do not use the sump when hot water is present. When the sump contains cooler water, this water, although high in total dissolved solids, is relatively benign and most likely nontoxic to all forms of life.

We request that the concept of netting sumps as a mitigation be dropped from further consideration unless it can be documented that a problem exists, in which case netting may be appropriate. [42]

39.59. Page 4-133, Section 4.12.3.6, Deposition of Airborne Pollutants into Surface Waters. The existing data indicate that the mercury levels in the lakes is not high. The hot springs which contribute minor amounts of mercury to the lake have a slightly elevated mercury level. The data from the US Geological Survey sampling program does not support the conclusion that there are high background levels. It is also an extremely speculative statement to conclude that the estimated mercury contributions from air emissions deposition could affect the biological food chain. We request that the statements regarding bioaccumulation in fish and fish eaters be rewritten to more realistically reflect the existing and predicted impact conditions. [05]

39.60. Page 4-158, second paragraph, list of sites. The second site listed is incorrect. Surprise Valley is in California. We believe the reference should be to Stillwater, Nevada where the blow out occurred during drilling because the surface casing was set too shallow. The text indicates that proper blow out equipment was not operating. This is not true in the Stillwater case, the casing program was inadequate. [16]

39.61. Page 4-174, Section 4.12.2.5, Water Use. The conversion of 2,500 acre feet to cubic meters is incorrect. [27]

39.62. Page 4-179, Section 4.12. Section 4.12 addresses consistency with other plans and policies. CEE recommends that this section be expanded to explain the consistency with the Deschutes Forest Plan in more detail. Specifically, the discussions needs to address coordination with the Newberry National Monument Management Plan and to address the Eastside Ecosystem Management Plan. [29]

39.63. Page 4-180, Mining and Drilling Regulations. This section should make specific reference to the Oregon Department of Geology and Mineral Industry geothermal drilling rules. There are separate rules for mining. [32]

39.64. Appendix F, Table 6, page F-72. The corrected table (Table 6) was provided but was not included in the final draft of the DEIS. The corrected table is enclosed as Exhibit C. [27]

40. Carolyn Brown
Ontario, Oregon

Larry Tuttle
ONRC
Portland, Oregon

40.1 The planning, design, and construction of engineering projects on extrusive igneous rocks — and especially pyroclastic debris — can be complicated and risky. The EIS fails to assess the risk of siting geothermal plants on such terrain and does not discuss whether such soils will have lower strengths and stability when they are remolded after disturbance. [04]

40.2 The Soils section is incomplete. General statements are made about the nature of the soils in the area, but data to support those conclusions are absent. A diagram representing a soil profile for the area should be included to aid reviewers, along with a chart which includes data necessary for describing that profile. The following properties of the soils to be impacted should be described: depth of each soil horizon, color of mottles, consistence of soil particles, texture, structure, clay films, pH, distribution of carbonates, cementation, horizon boundaries, per cent volume of various soil features, etc. Additionally, engineering properties of these soils should be evaluated; strength, sensitivity, compressibility, erodibility, permeability, corrosion, shrink-swell potential and ease of excavation. [04]

40.3 The DEIS states that erosion potential is considered to be low to moderate, but that erosion and dustiness are common on unsurfaced roads. The project area will disturb many acres of land. How can you conclude that erosion potential will be low, when you admit there is already an erosion problem? [04]

40.4 The discussion of compaction in section 3.2.2 is confusing and seemingly contradictory. [04]

40.5 If the soils are compactable and water is applied, will hydrocompaction and subsidence occur? [04]

40.6 Is bentonite, an unstable, expansive clay, present on the site? [04]

40.7 Why does the DEIS conclude that soils in the area are not susceptible to liquifaction if seismic activity could increase as a result of geothermal exploration and development? [04]

40.8 What is the probability that a mini-lahar (volcanic mudflow) could occur if a 100-year storm event were to occur during surface disturbing activities? [04]

40.9 The DEIS does a poor job of explaining landslide potential. [04]

40.10 There is scant information in the DEIS regarding the possible underground route of reinjected fluids. If water comes into contact with magma, a phreatic explosion can occur. Discuss the probability and consequences of a phreatic explosion. Include information about the possibility that injection wells will pierce the magma chamber. Since the fate of injected fluids is unknown, what assurances can you provide that injected water will not leak into the magma chamber? [04]

40.11 The DEIS does not adequately discuss the pollution potential of sediment resulting from ground disturbing activity, nor does it outline measures which should be implemented to minimize sediment pollution. [05]

40.12 The information regarding the potential for increased seismic activity due to geothermal production is misleading. There are several published articles which discuss induced seismicity and the magnitudes of the resulting events due to fluid withdrawal/injection. [04]

40.13 A reference is cited to support the assertion that it is not possible to predict where injected fluids go, so how is it possible to assess the safety of water resources in the area? Will tracer studies be completed to establish the fate of injected fluids? [05]

40.14 The DEIS does not assess the impacts from silica. Impacts to human health from silica should be assessed. What type of air emissions will this material generate during surface disturbing activities? This is a serious issue because silica is a probable carcinogen. [07]

40.15 The visual resources section should provide a close-up view of a geothermal site. A 1975 reference is cited that describes the ugliness of a geothermal plant. If this picture describes the potential situation at Newberry Volcano, the public deserves to know. [08]

40.16 Clay lined sumps are inadequate for this project. The DEIS fails to discuss problems encountered with clay. Sumps should be lined with double layers of 80 mill plastic liners along with a leak detection system to assure leak detection and prevention. This is especially important because many references are made in the

DEIS to the high permeability of the soils. Additionally, sumps and holding ponds should be designed to withstand 100-year storm events and seismic activity. [42]

40.17 Sumps must be equipped with netting and fencing to preclude access by animals and birds. The claim of ignorance [of impacts to wildlife because fluid content is unknown at this time] is unacceptable. [42]

40.18 Clay acts as a filter and attracts heavy metals and other contaminants. If these sumps are planned for further use, then the clay lining should be removed and hauled away to a hazardous waste facility. Contaminated clay linings should not be allowed to remain on-site. [42]

41. Paul Dewey, Executive Director
Sisters Forest Planning Committee
Sisters, Oregon

Susan Crosby, Vice President
Dave Ledder, President
Central Oregon Audubon
Bend, Oregon

Tim Lillebo
Oregon Natural Resources Council
Bend, Oregon

41.1 We object to the inadequate range of alternatives and the failure to provide sufficient specificity as to the only two alternatives presented. [20]

41.2 The decision-making process is not logical or appropriate. It should be a two-step process — exploration followed by development. The DEIS attempts to make decisions on the second stage without finding out from the first stage the necessary facts needed to create meaningful alternatives for the second stage. This combination of analyses does not work. Only after exploration should we have to decide on locations. While it is appropriate to have this DEIS for drilling on the north area, subsequent decisions on plant, production well, road, and power line locations should be made later. [41]

41.3 It is unclear whether four or five small diameter wells will be drilled or their locations. [21]

41.4 Location is probably the primary variable around which to develop alternatives for NEPA in a project of this kind. [20]

41.5 To the greatest extent possible, the integrity of the roadless area should be protected. [40]

41.6 The north end of the lease area is used by elk. The elk habitat continues into the NNVM. If the habitat is reduced outside the Monument, the habitat within the Monument is inevitably impacted. [14]

41.7 Development on the NNVM boundaries is likely to lead to a requirement that the roadless area be roaded and logged to protect the geothermal development from fire. How much roading and logging would be considered necessary to protect the geothermal facilities? Monument Act provisions for managing risks that threaten serious harm to outside resources applies only to structures/resources in existence at the time of the Act. This issue is not mentioned in the DEIS. [30]

41.8 It is one thing not to preclude developments/activities outside the Monument boundaries, and it is quite another to conduct outside developments/activities that may require certain management in the Monument to accommodate these outside developments/activities. Section 4(c) of the Monument Act precludes any outside geothermal development that may have this effect on the Monument. To avoid these management conflicts, drilling on the project should be restricted to already roaded and logged areas, and the further from the Monument, the better. [30]

41.9 Proposed drill pad sites A-11, C-15, O-14, B-14, P-15, D-15, Q-15, E-15, R-21, and F-22 are in the roadless area. Sites A-11, C-15, and O-14 are also in the elk habitat area. Directly north of these sites is an area of the Monument identified as having greater than 50% mortality in the Monument's DEIS "Forest Mortality" map. Site I-28 is in a wildlife habitat area probably associated with the Monument butte directly to the south of it and on which we thought was a special nest site. [14]

41.10 If drilling/roads are designed for the roadless area, they should be restricted to use by CEE, its contractors, and the agencies. This is not only to keep at a minimum the impacts on the roadless area and wildlife, but also to reduce the risk of human-caused fire. The same restrictions should apply if the resources are developed and the plant built, plus the roads should be gated to further limit access. [40]

41.11 If the resource is not developed, the new roads should be ripped up as stated in the DEIS. Our concern is that even if geothermal development does not occur, the Forest Service will leave the roads open to log the roadless area and to allow recreation access.[40]

41.12 Why don't the Alternative road maps at 4-113 and 4-114 show where any new roads would run in the roadless area? [23]

41.13 The Preferred Alternative is particularly frustrating in terms of trying to determine the environmental impacts. The twenty potential drill sites are presented ostensibly for flexibility and for protection of the environment, "with additional siting flexibility designed to minimize potential environmental effects." (2-9) Yet there is very little analysis and comparison of these areas in the DEIS so that environmental choices can be made. See 4-130. The DEIS should present alternative site locations and make these environmental choices now. From which of the twenty potential well pad sites will the target 14 be chosen and from which of the 14 will the first four wells be chosen? This uncertainty also exists with the Preferred Alternative's alternative plant sitings: a choice of three different sites. The whole point of having a Preferred Alternative is to make a choice. [20]

41.14 To CEE's credit, it presents one plant site in its alternative. The location is also in an area already logged and requiring less road development. Because of the surrounding logging, there is less potential fire danger to the facility. The other plant sites proposed by the Forest Service impact potentially suitable habitat for the black-backed woodpecker, a MIS. Plant site 3 would also be located in a roadless area. [14]

41.15 This is a very strange Preferred Alternative which instead of presenting an alternative presents several alternatives within it. NEPA calls for the development of a Preferred Alternative. In essence, this Preferred Alternative is not an alternative. It avoids making choices. The real reason for this is that these development choices are being left open to maximize the geothermal resource and are premature at this point. [22]

41.16 No additional recreation development and access (including snowparks) should be associated with this project. The potential geothermal development impacts are so large that they must be seen before any collateral use/development is allowed. [11]

42. R. Gordon Bloomquist, Ph.D.
Olympia, Washington

42.1 The draft EIS is well written, insightful into the needs of geothermal develoment in the proposed area, and sensitive to competing needs and concerns of the area and, in particular, to the newly found Newberry National Monument. [30]

42.2 The added flexibility given by Alternative B should go a long way toward removing considerable regulatory risk from the project, minimizing delays that would result from evaluating other alternatives at some later time, and ensuring that the most environmentally acceptable project can be developed. [22]

42.3 As the need for additional electrical generating capacity grows in our region, we need to develop a broad array of resources to meet that demand. Geothermal is one of the resources that shows very high potential for meeting a portion of that demand. [36]

42.4 Geothermal, together with other renewable resources such as wind, solar, and biomass, can significantly reduce our dependence on imported fossil fuels while at the same time play a major role in reducing the emission of greenhouse gases. [36]

42.5 The geothermal project at Newberry will go a long way to establish the viability of geothermal in this region and confirming previously published estimates of the region's geothermal potential. [36]

42.6 I want to commend you for your efforts and your ability to balance the needs of geothermal develoment and environmental protection in this most sensitive area. [34]

43. Tim Lillebo
Oregon Natural Resources Council
Bend, Oregon

43.1 For ecosystem management and ecosystem restoration purposes, ONRC completely opposes any entry into Newberry Roadless Areas, as is consistent with our position for the last few years. All roadless areas are critically important as core natural areas to any ecosystem restoration plans for eastside National Forests. [40]

44. Steve Munson, CEO
Vulcan Power Company
Eugene, Oregon

44.1 The EIS generally does an excellent job of describing a geothermal project and its impacts. The level of detail reveals, overall, a genuine hard look at the issues. [27]

44.2 The EIS contains very conservative estimates of water use, air emissions, chemicals used in drilling, surface disturbance and traffic. We believe impacts will generally be less than described. [34]

44.3 The contrast is noted between the Newberry DEIS and the draft EIS's for BPA's gas-fired projects. The EIS's for the gas-fired projects receive about one-third the analysis of this geothermal EIS, despite the fact that they produce 10 to 15 times more energy and have greater impacts on air and groundwater resources. The gas EIS's don't address the environmental impacts of constructing thousands of miles gas pipelines and of drilling gas wells. Nor do they discuss the negative effects on the Pacific Northwest economy from exporting electricity dollars to Canada for gas imports. [36]

44.4 The EIS states that "drilling up to 4 wells at each of 14 well pad locations, for a total of 56 wells, has been proposed." We believe that, even over a 50 year period, it is highly unlikely that 56 wells would be needed to supply the plant and confirm a 100 MW reserve. This estimate is apparently reflective of the cautious approach taken in this EIS. [21]

44.5 Figures 1.3.1 and 1.3.2 are simplifications which acknowledge that ring fractures could be conduits for either groundwater or cold water recharge. They illustrate how little is known about issues such as the location of ring fractures and other volcanic features and their relation to hydrothermal systems at Newberry, if any. [06]

44.6 The ownership of individual leases within the lease block proposed for development in this DEIS is at issue in unresolved litigation between Vulcan and CEE. An accurate and even handed description is called for in this EIS of interrelated power contract lease ownership and control and related unit control issues. This EIS draft does not address a number of unresolved issues which are

central to the very reason for this proposed EIS. Appropriate lease ownership maps depicting the Waters leases and both of the proposed competing geothermal units should be included in the body of the EIS. No unit will be effective at Newberry until after the IBLA decision or an equitable unit agreement and unit operating agreement is in place acceptable to both Vulcan and CEE. [18]

44.7 By "the entire lease block" is the EIS referring to (1) the area described in 2.4.1.1 Project Location on page 2-15, where "'Lease area' refers to Federal geothermal leases held by CEE, which are being considered for geothermal activity in this analysis," or (2) the CEE proposed Deschutes Unit Area in which EWEB and BPA have options for future development, described above? And what is considered control? Would that be ownership or acting as Unit Operator? [18]

44.8 There is a misconception of the effect of having different resource and plant owners. The fact that a geothermal resource and a power plant might have different owners does not contribute to resource depletion. It is the contract provisions, power plant design and operation and the level of cooperation between the two owners that can cause problems. The lesson is not that we should avoid separate wellfield and plant ownership, it is that contracts should provide for efficient use of the resource by the plant owners and resource and plant owners must cooperate to sustain the resource, to the benefit of all involved. [18]

44.9 It serves no environmental purpose to include a "contract principle" in an EIS or in a power sales contract that might restrict the rights of a plant owner to sell the facility and continue to provide geothermal resource to the new owners, or to prohibit different resource and plant ownership from the outset. In our opinion, it is most probably unenforceable. BPA does not impose similar ownership requirements on gas-fire power plant owners to assure that the nonrenewable gas is used efficiently, nor do they require the owners of gas or biomass plants to have enough gas or biomass to run a plant for 30-50 years. [18]

44.10 If Vulcan becomes the majority owner of OR 45506 which is included in the leases discussed in this EIS, and if a strong resource were demonstrated on the west flank, it is conceivable that a power plant, or at least production wells might be proposed from that lease by Vulcan and any requirement for assurances of reservoir adequacy for a proposed project on Vulcan leases would be a responsibility of Vulcan, not CEE. [18]

44.11 Because Vulcan was advised by BLM that it could not propose wells on leases held by CEE, if Vulcan does win the lawsuit, Vulcan will expect, as the majority owner of OR 45506 to use wellsites on OR 45506 without further environmental review, for exploratory drilling. [01]

44.12 The discussion on page 2-65, last paragraph, appears to add the Forest Service as a permitting agency for drilling permits. While we agree that Alternative B provides CEE more latitude in well siting and alternative power plant sites, we are concerned about adding yet another step to well siting authorizations that may not have been intended by the Newberry national Volcanic Monument legislation. Adding the Forest Service as a permitting agency for each individual well permit could cause unforeseen regulatory problems for a developer and for the Forest Service. The Forest Service should have an opportunity for comment on final selected wellsites, but the approval should come from one federal agency. BLM already has an approval process in place. [02]

44.13 This EIS should address the environmental acceptability of each wellsite area so that a decision can be made whether or not wells are approved to be permitted in that area through a Record of Decision. [23]

44.14 Figure 3.3.1 includes the Sandia well as a monitoring site. Data from that well may have been used baseline, but we understand the well was plugged and abandoned and it is not listed as a monitor well on Table 3.3-1. [05]

44.15 A depiction of the Geothermal Resources Study Area is missing from Figure 3.4-1 [06]

44.16 If Vulcan and CEE exploratory drilling programs south of Paulina Creek coincide, traffic on Road 21 could become a problem, when combined with recreation traffic. We recommend the alternative routes via Road 22, 2215, and 2225. [12]

46. Glenn E. Reed, Chairman
Clean Air Committee of Bend
Bend, Oregon

46.1 It is our understanding that only one monitoring station will be installed and it will be located to the south of the project inside the crater. With the predominant wind currents from the southwest it will be on rare occasions that a good reading will be made. The other concern is that only sulfur dioxide will be monitored and the pollutants estimated by percentages of that reading. We believe that another monitoring station should be positioned north or northeast of the project and a semi-annual check of all major pollutants should be made. [39]

46.2 Under no circumstances should the scrubbers be by-passed except during the start-up period or when a line becomes plugged. Weather conditions should be exempt from this requirement. [07]

46.3 The noise level produced by the operation is estimated at 65 decibels, which is a roar. Located on the side of the mountain the sound could travel a great distance. Therefore when the project is in operation and the noise is a deterrent to the area we would like the requirement of silencers be installed at the well heads. [09]

46.4 Geothermal is an excellent source of energy but should not be a trade off of our air quality or natural resources. [34]

47. Mike Strayer
Bend, Oregon

47.1 I am for the construction of the geothermal power plant. Getting rid of some of the hydroelectric plants will have a real positive effect on the fish population. The fish runs will be able to reach places they haven't been able to since the construction of the many large dams that plague our rivers. The plant will also bring more power to the area. [33]

47.2 I don't want to see the magnificently dark night skies drowned out by the nearby glow of the proposed power plant. [08]

48. Quent Gillard
Bend, Oregon

48.1 I believe the DEIS is both inadequate misleading because the document only addresses the environmental consequences of building the proposed 33 MW power plant rather than the reasonably foreseeable power plant(s) associated with developing a 100 MW reserve. The scope of the DEIS is inadequately drawn since connected actions which are closely related are not considered together in a single impact statement. I would like to see the FEIS address the full scope of the reasonable foreseeable development of the geothermal resource (namely 100 MW), instead of artificially segmenting the multistage project. [19]

48.2 By focusing on the visibility of the steam plume from several long-distance vantage points, the document also fails to address the visual impacts to recreational users of the National Monument and surrounding area who may be considerably closer. To suggest that "the plume will attract occasional visual interest from hikers..." and that during decommissioning "the steam plume would be eliminated creating some change in visual diversity..." is fatuous and condescending to those who value the relatively pristine nature of Central Oregon. [08]

49. David A. Stewart-Smith, Administrator
Facility Regulation Division

Oregon Department of Energy
Salem, Oregon

49.1 Geothermal power represents an important potential alternative to using fossil fuel to produce electricity. [36]

49.2 We found the DEIS very informative. [27]

49.3 We generally agree with the additional mitigation measures proposed for Alternative B. [25]

49.4 The color photographs showing facilities at similar geothermal plants and the anticipated visual impacts from the proposed project were very useful. [08]

49.5 We agree that conservation of the geothermal resource is important. Without appropriate management, geothermal resources will not be a renewable energy source. We appreciate the attention given to this issue in the DEIS and the measures proposed to ensure that power development and utilization will not adversely affect the long-term use of the geothermal resource. [06]

49.6 We agree that H_2S should not be allowed to escape into the atmosphere. [07]

49.7 We appreciate the attention given to direct and indirect impacts on the Newberry National Volcanic Monument. [30]

49.8 We appreciate the inclusion of the Energy Facility Siting Council and its required permit in Table 1-1. [02]

49.9 [ODOE] and [EFSC] are also interested in, and will require, acceptable plans for decommissioning and permanent closure of the project prior to termination of operation. [28]

49.10 Alternative B provides for three power plant sites. Under current [EFSC] rules and policy, the application to [EFSC] must be for a specific site. [02]

49.11 It would be useful if the DEIS described the maximum credible seismic event for the site area and the ground response during such an event at each of the three proposed power plant sites. The choice of the site and the design of the power plant should consider this information. [04]

49.12 It would be useful if the DEIS identified and described any visual or scenic areas that have been identified as important or significant in the acknowledged local land use plan for the site and vicinity. [08]

49.13 The Oregon Department of Fish and Wildlife has defined four habitat categories and established mitigation goals and policies for each (OAR 635-415-030). It would be useful if the DEIS identified, described and mapped the location of any areas of habitat category 1 or 2. [14]

49.14 It would be useful if the DEIS explained why the project is requesting 2500 acre-feet of groundwater per year when net evaporative water loss is estimated to be 800 acre-feet per year. [05]

49.15 It would be useful if the DEIS included an estimate of the cooling tower drift rate, the chemical composition and concentrations of the drift, and the general dispersion of the drift. [07]

49.16 It would be useful if the DEIS identified and described any adverse impact to visual or scenic areas that have been identified as important or significant in the acknowledged local land use plan for the site and vicinity. [08]

49.17 It is not clear if the proposed project is consistent and/or complies with the statewide planning goals or acknowledged local land use plan for the site. It would be useful if the DEIS addressed this issue. [10]

49.18 It would be useful if the DEIS identified and described any adverse impacts to areas designated habitat category 1 or 2 by the Oregon Department of Fish and Wildlife. [14]

49.19 The proposed alternative transmission line route appears to pass to the north of a rock outcrop in section 24, T22S, R11E, and then curve southeast to follow the "proposed new access road 500 and 600 interconnection." It appears that it would be shorter if this route departed from the proposed route in section 23 and followed a smooth curve to the south of the rock outcrop to join the proposed new

access road corridor. This would also move the route further from the rock outcrop. [38]

50.0 Robert W. Collier
Jack Dymond
Corvallis, Oregon

50.1 The DEIS is premature because a critical report (the USGS monitoring report) has not yet been published. This report should be the basis for constructing an EIS for this project. [01]

50.2 The DEIS oversimplifies and reinterprets the published information from scientific studies. The EIS should address the impacts of altering the water, heat and chemical flows from the shallow hydrothermal systems on East and Paulina Lakes and other features within the NNVM. [06]

50.3 There are discrepancies in the water budget proposed for the geothermal project. [05]

50.4 The fluid storage ponds are too small, especially considering the large volume of fluid flowing through the plant and the fluid's chemical composition. More buffer in fluid handling is necessary to prevent contamination of the land and ground waters by geothermal fluids. [42]

50.5 The proposed development presents an "all or nothing" plan. A better approach would be to drill exploratory wells to investigate the issue of connection between the shallow and deep aquifers. This would also allow the fluid composition to be determined and the completion of studies to support evaluation of the project. [41]

52. Stephanie Hallock
Eastern Region Adminstrator
Oregon Department of Environmental Quality
Bend, Oregon

52.1 An application for an Air Contaminant Discharge Permit (ACDP) will be required and final action on the application must be taken prior to construction of the facility. Table 1-1 should be corrected to reflect this. [02]

52.2 A Water Pollution Control Facility Permit will be required prior to construction of the facility, and not "Pre-operation" as stated in Table 1-1. [02]

52.3 Based on the information in the DEIS, a Hazardous Waste Permit will not be required for this facility. The power plant is projected to be a small quantity or a conditionally exempt generator of hazardous waste. [Table 1-1 should be corrected accordingly.] [02]

52.4 DEQ will require that H_2S emission control systems meet the Highest and Best Treatment and Control rules (OAR 340-28-600). If it is determined that any significant Emission Rate is predicted to be exceeded, the facility will be subject to the New Source Review rules (OAR 340-28-1900) and Best Available Control Technology may be required. [07]

52.5 If the facility plans to use stationary fuel burning devices (generator, space heating, etc.) they must be included in the ACDP application. Near the bottom of page 2-51, the DEIS references the use of petroleum. If these products are to be used in stationary devices, fuel usage must be quantified in order to estimate emissions. [07]

52.6 DEQ will require, in its permit process, the development of contingency plans and, if practicable the use of controls during periods of high emissions, such as well testing and venting during upsets or when the plant is not operating. [07]

52.7 Although DEQ rules do not include nuisance limits for odors, such as those caused by hydrogen sulfide gas, it is expected that the ACDP would include conditions that would require that contaminant concentrations be maintained at the lowest possible levels to prevent unacceptable odors at sensitive receptor sites. It is unlikely that the California odor standard, referenced in the EIS for hydrogen

sulfide, would be an acceptable criterion to DEQ and thus we would not use this standard to define an acceptable limit for DEQ at this time. [07]

52.8 Several errors are noted in Table 3.5-1. [07]

52.9 We suggest Table 4.5.3-1 include potential receptor sites, outside the NNVM boundary, of maximum concentrations. This could include any known camping and trail areas that are likely to be impacted at greater concentrations than the Paulina Lake Lodge. A number of such receptor sites are described in Section 3.9 of the DEIS. [07]

52.10 Numerous errors and omissions are noted in Table 4.5.3-2. [07]

52.11 Errors in Table 4.5.3-3 are noted. The table should include sensitive receptor areas as suggested [in comment 52.9]. [07]

52.12 In addition to the requirements described in Table 4.7-1, the DEQ rules limit new noise sources from increasing the preexisting ambient sound level by any more than 10 dBA in the L_{10} and L_{50} descriptor during any one hour of the day or night. Note that Table 4.7-1 is incorrect in that it refers to this rule as applying to the L_1 descriptor (it only applies to the L_{10} and L_{50} descriptors) and also shows that the regulation allows compliance with the ambient increase rule or the absolute limits. In fact, the facility must meet both rules. It is not clear that the DEIS adequately evaluates the ambient increase rule as it is likely that existing ambient levels of approximately 20 to 25 dBA could be measured during periods of the nighttime. If this is the case, the facility would need to comply with a limit of approximately 30 to 35 dBA and Section 4.7.4-1 should contain an evaluation of this requirement. [09]

52.13 DEQ would review the injection fluid composition and would be responsible for issuance of necessary injection permits. [06]

52.14 DEQ is concerned about introduction of contaminants to injection fluids. For example, wastewater streams are not presently well identified, and contaminants introduced to stormwater or other wastewater streams should not be combined and injected. A preferable option would be segregation of wastewaters based upon engineering controls. The Plan of Injection (pre-construction) should reflect adequate consideration to prevent the degradation of "natural water quality" as defined by OAR 340-40-010. Before reinjecting fluids which contain contaminants-of-concern, a quantitative analysis of the fluids should be completed where design and/or engineering controls are not feasible, and DEQ approval should be gained based upon this evaluation. [05]

52.15 DEQ recommends that the Emergency Contingency Plan be submitted to DEQ for review. [05]

52.16 A Water Pollution Control Facilities or National Pollutant Discharge Elimination System permit will be required during the exploration phase if mud slurry or other wastewater is to be transported or disposed of off site. The on-site storage and disposal of mud slurry and other wastewater must comply with the Department's rules for degradation of natural surface and groundwater quality for all phases of the project. [05]

52.17 A National Pollutant Discharge Elimination System (NPDES) storm water permit is required for construction activities including clearing, grading, and excavation activities. The NPDES storm water permit for construction activities requires a DEQ approved erosion control plan prior to beginning any on-site activities. A NPDES storm water permit is required when operating a steam electric generating facility. [05]

52.18 DEQ believes that it will be important to monitor regional groundwater both from a baseline basis as well as documenting operationally-induced changes/influences as tentatively proposed. In the unlikely case where geothermal fluids were accidentally introduced to shallower aquifers through wellbore failure, it would be necessary to predict contaminant fate and transport. [39]

52.19 DEQ concurs that monitoring for effects on regional hydrology from geothermal utilization is desirable. The DEIS and supporting documentation suggest that at least two areas of concern have been identified as (1) impact on caldera hydrology, and (2) impact on shallow aquifer systems downstream of project area. Implicit to these ideas is the possibility of multiple locations for monitoring wells as additional monitoring controls. DEQ thinks that specific selection criteria should be developed and proposed which details the monitoring plan objectives and specifies how the additional monitoring will be implemented. Baseline monitoring databases should be integrated into any proposed strategy for instituting additional monitoring control with respect to these identified potential impacts of geothermal utilization on regional hydrology. [39]

52.20 DEQ does believe this facility will be a generator of hazardous waste, albeit a small quantity generator or conditionall exempt generator. These activities may or may not require notification to the Department of hazardous waste activities. [16]

52.21 The hazardous waste generator and used oil management activities are outside the scope of this DEIS comment period and will be evaluated as the facility progresses. [16]

52.22 A few items should be considered (on page 2-52) as it is proposed to manage small quantities of laboratory chemicals by dilution and injection into wells. Deep well injection is not an appropriate disposal option for conditionally exempt generators of hazardous waste. These chemicals would not fall under the associated waste exemption. [16]

52.23 Maintenance wastes (oils, fuels, etc.) and biocides may not all fall under the Part 261 associated waste exemption, and should be managed appropriately. The biocide may be an Oregon-only waste for aquatic toxicity. [16]

52.24 Another potential waste stream that may be generated would be the charcoal filter containing mercury. The filters may fall under exemption; however, best management practices should be explored for exempt wastes that fail a characteristic of a hazardous waste. [16]

52.25 It is likely that the facility will be generating several waste streams that could potentially fail a characteristic of a hazardous waste that have not been addressed in these comments. It will be the responsibility of the facility to determine what these waste streams are and manage the waste in compliance with state and federal regulations. [16]

53. Kent Gill, Chair
Juniper Group, Sierra Club
Bend, Oregon

53.1 Since the traditional sources of electric energy have entailed high costs in environmental degradation, it is of value to explore alternate sources to supply our society's seemingly insatiable appetite for power. Certainly a trial of the geothermal potential at Newberry Crater would be reasonable as a step in exploring alternate resources. We need to keep potential environmental hazards ever in mind. Your DEIS seems to seek out and evaluate possible deleterious effects in this pilot project. [36]

53.2 Of particular concern to us is the scarce water resource in this near-desert land. The sanctity of the groundwater store in the Newberry area is most important. We need ongoing assurance there will be no transfer of thermal fluid into the groundwater reservoir and that the water features within the caldera are not being adversely affected. [05]

53.3 We would like to see "possible" monitoring and mitigating steps implemented. We need assurance that if any of these conditions are identified as the plant is in operation that modifications or plant closure would be swiftly required of the operator. This monitoring activity should include an on-going appraisel of

possible build-ups of mercury levels in East and Paulina Lakes due to plant emissions. [39]

53.4 We wonder if your study has sufficiently addressed the conflicts that will be likely when hunters, snowmobilers, timber crews, mushroom pickers, and casual forest visitors enter into the project area and encounter surface piping, maybe superheated, industrial-type sites, and industrial roads. [11]

53.5 Since the EIS plans ahead to the decommissioning sometime off in the future, we would encourage the posting of a bond by the operator to cover the cost of that removal. [28]

54. Lisanne Pearcy-Scott
Bend, Oregon

54.1 This DEIS does not appear to offer a range of reasonable alternatives. Alternatives A and B are quite similar, in that they both propose to approve a full sequence of activity from exploration through production and reclamation of the site. I believe the decision-maker should be given another Alternative, D, which would provide the opportunity to approve the exploration stage only, so that the geothermal fluids can be sampled and environmental effects analyzed in a more educated, less speculative manner than what is presented in the current document. [41]

54.2 If Alternative A or B is chosen, I would request that uncontrolled venting of geothermal fluids be reduced from what is described currently by using Best Available Control Technologies and a power plant design with two turbines instead of one. With two turbines, the number of instances when unabated venting occurs would be greatly reduced. [35]

54.3 The DEIS needs to consider and include information on soil sensitivity ratings within the proposed development area. Sensitivity to construction, compaction, erosion, etc. is important to siting decisions in order to minimize soil damage, where possible. A map of these ratings should be shown in the document. [04]

54.4 I found the index to be very limited in topics listed and therefore no more useful than the table of contents. The index should be expanded. [27]

54.5 The DEIS did not adequately address the issue of decommissioning and shutdown of operations. [28]

54.6 The EIS needs to include a comprehensive monitoring plan for environmental effects. This monitoring is required by the NNVM legislation, yet it is unclear who is to pay for this monitoring. The EIS needs to make clear how monitoring will be funded, and the proponent should be obligated to pay into a fund for an impartial party to carry out the monitoring. [39]

54.7 The DEIS states that the project is consistent with both DNF LMP and NNVM legislation. I don't understand how siting an industrial facility is consistent with a Semi-Primitive ROS class. The EIS should admit that the land allocation (or at least the existing semi-primitive setting) will have to be changed in the next revision of the Forest Plan. [10]

54.8 Is the project consistent with NNVM legislation? [30]

54.9 Does it provide for monitoring of all resources inside NNVM that could be affected by the development of a geothermal facility? These questions are left unanswered in this DEIS. [39]

54.10 Why are cooling towers necessary. This is not clear and should be explained. [The commentor appears to be working off the Summary] If an option exists for NOT having cooling towers, it should be included in one of the alternatives to reduce potential for environmental degradation from air emissions from the towers. [35]

54.11 What is an "underbuild"? [38]

54.12 You really can't say it is "in attainment" of air quality standards because no monitoring has been done to establish this fact. You could say "it has not been identified as a non-attainment area." [07]

54.13 How much groundwater will be withdrawn? What water rights/permits will the operation have to withdraw water from the shallow aquifer? What are potential effects to others who have water rights down-gradient (to the west)? [05]

54.14 Statement that proposed activity is not "particularly controversial" is too subjective and should be dropped. [27]

54.15 It is false to say the "no unresolved environmental issues pertaining to the proposed action have been identified. The effect of air emissions is unknown because the composition of the geothermal fluid is unknown. As one example, it is not resolved whether the mercury deposition occurring during well venting and upset conditions will have detrimental effects to the fishery in the NNVM. [07]

54.16 Statements [in the Executive Summary] under "Areas of Controversy" and "Issues to be Resolved" are biased towards the proponents of geothermal development. Please present the FACTS and let the reader draw his/her own conclusions. [27]

54.17 It is stated that if assumptions used in the analysis are later shown to be inaccurate, "the project or elements of the project will be re-evaluated." Need more explanation here. Who will do the re-evaluation and what authority will it have to modify operations? [01]

54.18 Geothermal is NOT a renewable energy source on a human lifetime scale and should not be portrayed as such. Give the reader information on the range of lifetimes of geothermal operations. Ten or 15 years is not uncommon. [06]

54.19 The statement that the project will have "no impacts to rivers or fish habitat" cannot be proven and is likely false. [05]

54.20 Statements in Table S-2 regarding effects of Alternative A on hot springs and fluid loss from the reservoir should also apply to Alternative B. How can effects to hot springs in the caldera be accurately estimated when the hydrology is so poorly understood? It is impossible to determine the likelihood of effects to the hot springs at this time. [06]

54.21 Regarding Climate and Air Quality: Need to mention potential effects to ecosystems. These could occur at levels much lower than those set for human health and welfare. [07]

54.22 It seems that you are making the assumption that noise only affects people inside the Monument. Give quantitative estimates at a range of distances from the plant. [09]

54.23 Hunters and snowmobilers are not the only recreationists conceivably affected by the project. In any case, the recreation experience would not be "semi-primitive," as it is now. An industrial facility is not consistent with a semi-primitive experience, and this should be disclosed openly. [10]

54.24 The addition of a sno-park [should be mentioned in Table S-2]. [11]

54.25 The statement in Table S-2 regarding "minimal effects of air pollutants on vegetation" is biased and should be removed. What are the effects? Let readers decide if they are minimal, as you did with the removal of acres of vegetation for construction. [13]

54.26 Need to mention potential impacts and changes in behavior due to presence of air pollutants, even if these are not well-understood. Of particular importance are smell, noise, light, and particulate deposition, in addition to H_2S emissions and toxics in sumps and pond. [14]

54.27 What will happen when unknown cultural resources are encountered during development of the area? Will sites be excavated and scientific info collected prior to destruction of a site? [15]

54.28 Who or what are mentioned taxes and royalties going to? [17]

54.29 Page S-23: I don't see any of the asterisks mentioned in the Notes. [27]

54.30 The fact that the thermal waters at hot springs inside the caldera are not similar to the chemical composition of Medicine Lake's deep geothermal fluids is not conclusive evidence to support the assumption in the DEIS that the shallow and deep thermal reservoirs at Newberry are "not directly connected." The DEIS

should present a well-balanced picture of the possibilities here, not advocate for one theory that the proponent finds favorable. [06]

54.31 The DEIS states that ring fractures may channel mineralized fluids which can reduce fracture permeability. It is then assumed that this does happen and serves to "help isolate the caldera's ground water system from the regional ground water." This seems a leap of faith. I don't recall that Dames and Moore give any direct evidence that this is the case either. Also, the sentence, "The permeability decreases further below the caldera floor" is unclear. How far "below"? Does this apply everywhere under the caldera? Do we know? [06]

54.32 The thermal springs are not necessarily just along the lake shores. They apparently occur at various other locations underneath the lakes. A personal communication with Dave Morgan of the USGS is cited by the commentor. [06]

54.33 The sentence, "Fresh ground water in the project area flows west toward La Pine Basin" is confusing. Based on statements elsewhere in the document, the groundwater flow is to the north. Need to explain the different depths you are referring to. [05]

54.34 Wells in the caldera are not all domestic, as indicated in the DEIS. Campground wells are classified for "non-community, transient" use. [05]

54.35 The subject matter in sections 3.3.4.2 and 3.3.4.3 needs to be revised and combined with section 3.4.4. As they stand now, they present the same subject matter in conflicting ways. Section 3.4.4 draws the conclusion that "no appreciable evidence for mixing of deep and shallow geothermal fluids" exists, in spite of the fact that the only available chemical (i.e., isotopic) information exerts that there is a connection. The conclusion of this section could just as truthfully read that "no appreciable evidence for separation of the deep and shallow fluid exists based on current available data." [06]

54.36 Third paragraph on page 3-35 appears to conflict with pages 3-22 and 3-23. If little of the shallow (meteoric) ground water makes its way into the deep geothermal reservoir, as claimed here, but instead flows out of the caldera region laterally, then this appears to shoot holes in the argument on pages 3-22 and 3-23 that the ring fractures are essentially impermeable barriers. Please explain this apparent inconsistency in logic. [06]

54.37 Please show DEQ's current air toxic guidelines, instead of AAL's, if possible. [07]

54.38 Since when have K Falls air quality conditions improved dramatically? [07]

54.39 What is the difference, if any, among "hazardous air pollutants," "criteria pollutants," and "air toxics"? Need consistency of explanation. [07]

54.40 Background assumptions in section 3.5.2.4 are not reasonable. Newberry is closer to an "urban" source than Crater Lake. Please give a reasonable range of background values that would represent Newberry. If CE is willing to assume that backgrounds are as you present them here, this should be clearly stated in the EIS. [07]

54.41 Section 3.5.2.4: Rather than make the judgement that "neither Hg nor Rn-222 solid gas values were very high," please let the reader make the judgement. Give a range of soil gas values for different soil types, and give the values detected in the project area. [04]

54.42 The first sentence in section 3.5.2.6 should be in Chapter 4, not 3. In the second paragraph, replace "Some experts..." with "The vast majority of experts..." [07]

54.43 The DEIS states that the leaseholder must collect data concerning the existing air and water quality for at least one year prior to production. This is not in keeping with GRO Order No. 5, which states that "The baseline data collection program should begin as soon as potentially producible resource has been identified," and GRO Order No. 4, which directs the developer to "conduct exploration and development in a manner that provides maximum protection of the environment."

I believe it is preferable that a baseline for air quality, in particular, be conducted for at least one year prior to any groundbreaking (well-drilling) activities. [39]

54.44 Suggest you specify bentonite clay liners for the sumps to safeguard against leaks. It is clear that fluids in the ponds will be polluted because they contain condensate from geothermal steam. This should be stated more clearly in the document. All ponds should use the best available technology to prevent entry by wildlife. For example, very fine gauge netting might be required to keep out bats and rodents. [42]

54.45 The DEIS doesn't adequately address what would be done by the developer if water levels do drop in the caldera. What effects will be considered acceptable? What triggers would require a shut-down or slow-down of geothermal operations? [39]

54.46 It is unacceptable to have the water in the ponds (sumps) overflow to the ground surface at any time, as described here. Such overflows could contaminate groundwater and would violate GRO Order No. 4. [42]

54.47 I am concerned that mitigation measures, including those listed to remove mercury from emissions are not listed as mandatory, but only "could be applied to Alternatives A or B." I believe Hg emissions, and emissions of other air toxics, should be as small as technologically feasible. USGS sample analysis methods were not sensitive enough to indicate whether Hg levels in the lakes exceed the fresh chronic or fish consumption standards. Any addition of Hg to the lakes or Paulina Creek by deposition from geothermal steam could require a halt to human consumption of fish caught in these waters and could also imperil bald eagle and osprey populations that feed on these fish. These effects need to be disclosed in the EIS. Also need clarification about whether Hg will be screened out at the emission source. [05]

54.48 Section 4.3.3.6 needs to be expanded to include other potentially damaging toxics such as boron and arsenic. Discussions of these should also be included in the wildlife section of Chapter 4. [07]

54.49 USGS samples from the lakes and creek show current background concentrations of arsenic exceed state surface water criteria for protection of human health. Any addition of arsenic could raise levels in fish even higher, which would surely be unacceptable to DEQ. What mitigations can/will be employed to remove arsenic from the geothermal emissions? It needs to be disclosed that increasing levels of arsenic in fish could result in a shut-down of the Paulina and East Lake fishery, and harm the health of eagles and osprey. This should also be discussed in the Wildlife and Recreation sections too. [05]

54.50 Boron is another potential problem, and not just to vegetation as indicated in the DEIS. Current background levels range from 0.86 to 0.99 ppm (USGS data). There are not standards for boron in water; however, "concentrations exceeding 0.2 ppm likely could impair survival of developmental stages of other (not rainbow trout) species. For the one species of toad studied by Birge and Black (1977, EPA publication), boron levels of 1 ppm in water were associated with a 1% mortality rate of embryos and larvae." While amphibians in the Crater may have adapted to existing levels of boron, any additions due to geothermal emissions could be detrimental to amphibian reproduction and survival. What mitigations are possible to remove boron from emissions at the source? [05]

56. Larry Pratt
Observatory Director
Sunriver Nature Center
Sunriver, Oregon

56.1 The light sources used for site illumination must not be visible from beyond the limits of the site's defined boundary. This requirement would extend to lights mounted on drilling platforms, except those lights necessary for air navigation

safety. Such platforms would not meet the present criteria for temporary exemption. [08]

56.2 A major source of sky glow is surface reflection of light. To lessen these effects I would recommend the use of low or non-reflecting surfaces for structures erected on the site. Because of snow at the site, I would further recommend that the grounds around the site be landscaped with multiple species of natural vegetation differing in heights. This will break up smooth surfaces and reduce reflection directly above the site. Low pressure sodium lights are extremely energy efficient and are appropriate for this project. [08]

56.3 I am convinced that under normal operations the plumes pose no significant health hazard. This problem could be avoided entirely if the operators would simply suspend operations on those infrequent occasions that plumes and odors drift toward populated areas. Perhaps a monitoring system would be appropriate as a first step with an agreement to make operational changes if data indicated that odors are being carried into communities west of the site more than two or three brief periods in one year. Such plumes if extensive will have an impact on observatory operations in Sunriver. I would encourage the Forest Service to establish a monitoring system along the lines of similar systems in use to assess ongoing water quality at the Crosswater golf course. [07]

57. Lisanne Pearcy-Scott
Bend, Oregon

57.1 Table 3.5-1. For PM_{10}, SO_2, and TSP: "24-hr increment" and 3-hr increment" are unclearly stated. More accurate: "increment for 24-hr max" and "increment for 3-hr max." For PM_{10}, 17 $\mu g/m^3$: delete the first "annual" in the line. For CO and O_3: add "max after "hour." For NO_2: replace "annual increment" with "increment for annual arithmetic mean." [07]

57.2 In the map on page 3-50, cannot distinguish the pattern for "proposed transmission line area" from "partial retention." The map should note the source of these visual zones. These zones do not seem consistent with the Forest Plan allocation of Semi-Primitive in this area. [07]

57.3 Air quality baseline is in Appendix F-1, not E. It should be noted here that this is an assumed baseline, not a reflection of any baseline data collection for the Newberry area. [07]

57.4 Emissions of Hg, B, As, H_2S and other toxics need to be discussed for upset, as well as normal operating conditions. Possible effects during upset are not adequately addressed. Will these substances be removed from emissions during upset, or will they be vented directly to the atmosphere? It is unacceptable to vent toxic chemicals directly if technology can feasibly remove them or avoid venting altogether. This might require a dual turbine power plant. If so, the preferred alternative should call for one. [07]

57.5 Section 4.3.3.6 needs to address potential effects of heavy metal/toxic deposition to terrestrial plants and animals, as well as to the lake ecosystems. It should be disclosed that little is known about this. [07]

57.6 The EIS should make it clear to the reader that sump fluids will likely be harmful or fatal to wildlife that ingest them. It is not clear if a mitigation for this is incorporated into the plan, or if monitoring and/or netting sumps is an optional step. Wildlife should be prevented from drinking water at any sump. [42]

57.7 A better mitigation measure [for impacts of the sumps on wildlife] would be to have enclosed holding tanks. This would prevent both wildlife poisoning and accidental overflow and contamination of groundwater. [42]

57.8 Potential effects to bald eagles from ingesting mercury-rich fish from the lakes need to be disclosed and addressed. [14]

57.9 Page 4-17, section 4.4.3.1: Insert "apparently rather" in second to last sentence of first paragraph before the word "weak." Replace "should be slight" with "are likely to be slight." [06]

57.10 There is a good discussion of possible effects to hot springs, as well as monitoring objectives. The reader is left to assume, however, that no matter what changes to thermal features occur during the life of the geothermal operation, they will be accepted as necessary consequences. If this is true, it should be stated openly. If it is not true, please explain what "triggers" will cause the project to alter or halt its operations. [06]

57.11 Would workers at the plant or well pads ever be in danger of health effects from H_2S? [16]

57.12 Were emission inventories from Deschutes County really used to estimate background levels? [07]

57.13 Good explanation of air quality modelling. Does the second full paragraph on page 4-25 mean that all pollutants in Table 3.5-1 were modelled? [07]

57.14 Venting steam directly to the atmosphere — through a well-head silencer or not — is objectionable in terms of potential environmental consequences. [07]

57.15 Isn't there a technology available that combines a "silencer" with a system to filter out toxics? If so, could this be used also during well testing, maintenance, and upset? Such a technology should be required in the preferred alternative, if it exists. Or, better technology should be required when it becomes available. [35]

57.16 Reasons for removal of Hg include reducing harmful impacts to the environment, not just providing marketable by-products. [07]

57.17 An explanation of the possible alternative control technologies should be given. Another way to reduce emissions that should be mentioned is a redesigned power plant with a dual turbine system. This would allow steam to be redirected to the other turbine if one shuts down. [35]

57.18 I disagree with the decision not to consider "alternative control technology" in this EIS. This seems counter to the spirit and letter of NEPA to consider a range of reasonable alternatives. [20]

57.19 I would very much like this project to be successful, as alternatives to fossil fuels are necessary to the long-term well-being of this nation and the global community. However, I am concerned that if problems with upsets and environmental damage become apparent with this project, it will be hard to get public acceptance of further geothermal development in the state of Oregon. [36]

57.20 What is "make-up water"? [35]

57.21 Another potential effect to lichens would be decreases in lichen populations near the power plant and well pads. Please describe the possible effects of boron on vegetation. [13]

57.22 Page 4-118: Last sentence of fourth paragraph is unclear. Does "boron levels" refer to ambient air concentrations? Sixth paragraph" Please give Hg and As levels in micrograms per cubic meter, not just ppm, so they can be compared to the AALs in Table 3.5-1. [07]

57.23 Potential effects on wildlife of Radon-222, arsenic, boron, and hydrogen sulfide should be discussed. [14]

57.24 The section on unavoidable adverse effects is incomplete. For example, high likelihood impacts should include periodic H_2S odor detectable in the vicinity of Paulina Lake and increases in born and arsenic levels in Paulina and East lakes due to deposition from air emissions. [32]

57.25 Statements about what is "significant," especially concerning noise levels during construction, are highly subjective. The word "significant" should be better defined. [09]

57.26 The claim made in section 4.18 that this project would have "no impacts on rivers and fish habitat" is false. Basically, we don't know yet. [32]

57.27 The Air and Water Quality section on page 4-180 seems incomplete. Why mention the Clean Air Act and the not the Clean Water Act? Why is the title of this section only termed "Legislation," not "Regulations"? It would be better to include the appropriate Oregon Administrative Rules as well as the broad ORS designations. [32]

57.28 Page 4-181: Need to insert "management act" or "Legislation" following "provisions of the NNVM." Would be good to include the Public Law number, too. [32]

58. Ted Wise
Habitat Protection Biologist
Oregon Department of Fish and Wildlife
Bend, Oregon

58.1 While our agency hails new energy technologies, such endeavors should have minimal adverse environmental impacts. Fish and wildlife, along with their habitat, should not be sacrificed for the sake of "power." Oregonians are only too familiar with the impacts of "power" generating dams on the once great runs of Columbia Basin anadramous fish populations. [36]

58.2 The SAIC analysis predicted mercury concentrations in lake waters could rise as a result of deposition effects to levels in excess of applicable water quality criteria. In reference to whether this standard exceedance would translate into adverse effects on wildlife is referred to Section 4.12 Wildlife. Section 4.12 does not adequately address the potential for contaminating resident waters. ODFW is in firm opposition of any degradation of surface waters from emissions stemming from geothermal activities. The absence of any discussion relative to the fisheries resource in East and Paulina Lakes and Paulina Creek is a major deficiency in the DEIS. The kokanee, brown trout, and rainbow trout caught in the paulina and East lakes are of extremely high eating quality, rivaling, if not exceeding, that of any other in Central Oregon. [14]

58.3 The DEIS states that appropriate technology could be applied to control mercury. This needs to be changed to read, "will be applied to control mercury." This is reinforced by the fact that modeling done with 97.7 percent removal still showed water quality levels coming out above EPA standards. [05]

58.4 Bioaccumulation in fish and fish eaters, including bald eagles, osprey, and man, needs further discussion. In addition to monitoring lichens, regular sampling (including pre-exploration baseline) of fish and small mammals is necessary. The testing needs to be comprehensive. Tracking heavy metal and chemical accumulation in tissues will provide notice to ODFW, DEQ, and USFS if these substances are reaching harmful levels. In addition to fish and fish eaters, goshawk, marten, bats, and other wildlife predators are potential accumulators of emission elements and chemicals. [14]

58.5 Section 4.3.6 says mercury levels in Paulina and East Lakes "could" be monitored and mitigation measures "could" be implemented if rising mercury levels are detected in lake waters. The proper terminology needs to be "will." [07]

58.6 There are also concerns and questions regarding emissions during well venting (for periods up to 90 days) and upset conditions. [07]

58.7 "Upset condition" needs clarification. Just what is an upset condition in respect to geothermal terminology? Is it to be understood that during well venting no emission controls are in place? What are the impacts to the environment from this activity? If no "practical" control technology to abate emissions from steam venting at the power plant silencer, what defines what is practical? Perhaps if plant emissions result in unacceptable environmental impacts, the only "practical" action would be to close the plan until "practical" technology is available or CEE pays research and development costs for its development. [35]

58.8 Several points need correction in the final EIS. The DEIS states "generally lodgepole pine communities (LP, CC, and LPCC) provide only marginal habitats for most wildlife species." We are not quite sure from whence such a conclusion emanated. Regardless of origin it is far from being factual. Lodgepole pine forests can house large and diverse communities of terrestrial and avian fauna, as is illustrated by Table 3-12-1. [14]

58.9 The statement "Potential fawning habitat is limited to the riparian zone along Paulina Creek" is incorrect. It is true that deer and elk prefer to fawn and calve near a water source. However, the water source does not have to be a lush riparian area with a stream rushing through it. Mule deer fawn in sagebrush steppe habitat much drier than that of the project site. Most of the project area is suitable fawning or calving habitat, although one would not likely find them giving birth in the middle of an intensively cutover area unless it has grown back to some semblance of cover. The plant communities (trees and understory) are far from marginal wildlife habitat. [14]

58.10 While impacts from removal of 131 hectares of vegetation is significant, roading of 485.6 hectares of unroaded habitat is very significant. The disturbance associated with exploration and utilization of the geothermal resource over the entire project area including the roadless area will be even more significant. There was no discussion or alternative entertaining the possibility of not entering the roadless area. [40]

58.11 ODFW recommends against siting the power plant at site 3 which borders on the roadless area. [40]

58.12 Alternatives for siting pads A-11 and C-15 should be considered. This should include initiating exploratory wells outside the roadless area first, moving into the roadless areas last, if it remains an option. Minimizing intrusion into the roadless portion of the project should be emphasized to lessen overall impacts to wildlife populations. [40]

58.13 Well pads and power plant siting should avoid all the sensitive habitat areas identified. Pad I-28 should be moved as far west as possible to avoid the mixed conifer vegetation altogether. When building pads, cutting larger trees should be avoided totally rather than "to the extent possible." [14]

58.14 How was the conclusion made that there will be more game in the area as a result of the development? Furthermore, were hunters surveyed to determine if they prefer hunting in an industrial area rather than a primitive or semi-primitive setting? [11]

58.15 The construction of the new 500 road connector is also in question. Why do both road 500 and 600 have to be used as access? The decision should be made to use one or the other. If 600 poses problems for access, then it should be obliterated. Construction of the road 500 connector should be avoided if at all possible. [12]

58.16 Transmission lines need to be designed to avoid death and injury to raptors. [38]

58.17 Sumps need to be completely fenced and netted to prevent any possibility of death or injury to animals and birds. [42]

58.18 ODFW needs to be consulted when placement of expansion loops for animals passage is being determined. [14]

58.19 The amount of water being used necessitates mitigation. [05]

58.20 Mixing of geothermal fluids with regional groundwater aquifers is of great concern. Monitoring and sampling measures mentioned in section 4.4.6 should definitely be implemented. Sampling and testing should be done by sources independent of CEE. All monitoring results should be available upon request by the general public and government agencies. The results should not be housed by CEE. Monitoring needs to be carried out by an independent contractor which has agency approval. [39]

58.21 If contamination of groundwater or surface water becomes evident the operation needs to shut down. Only after corrective measures have been put in place, assuring no further contamination, should the operation restart. [05]

58.22 Compensating individuals/parties once their groundwater is contaminated is farcical. Not allowing contamination to occur is the only reasonable option. [05]

58.23 There should be no possibility for contamination of Paulina Creek via overland flow of toxic materials. If necessary, locate pad K-28 further away from the creek. [05]

58.24 Groundwater concerns stem from the withdrawal of 3.08 million cubic feet (2,500 acre feet) of water from the shallow aquifer. This is a small portion of the Deschutes Basin recharge, yet in addition to the many other withdrawals it becomes cumulatively significant. It is close to 20% of the annual flow of Paulina Creek. Additional mitigation is required. [05]

58.25 A stormwater discharge permit (NPDES) needs to be required. [02]

58.26 Monitoring potential impacts is essential. Emissions, surface and groundwater quality, bioaccumulation, effectiveness of sump and power plant enclosures all require tracking. The hydrologic monitoring program needs to be continued and expanded to include toxic elements. Waters of Paulina Creek need to be included in the sampling. Monitoring of lichens needs to be required. Monitoring sites need to be strategically located to assure full coverage of the area of potential geothermal effects. Consultation with ODFW biologists is needed in all phases of monitoring potential impacts to fish and wildlife habitats and populations. Monitoring needs to be carried out by an independent contractor which has agency approval. [39]

58.27 ODFW agrees that mitigation be required for the following: Displacement of wildlife as a result of human disturbance during exploration, development, utilization, and decommission activities. [14]

58.28 Off-site impacts can occur during utilization as a result of the deposition of airborne pollutants in nearby waters with effects on fish and fish eating wildlife. Other potential impacts may occur from wildlife contact with waters at sumps and the power water storage pond. [14]

58.29 Long term loss of habitat [can occur] at all stages [of the project]. [32]

58.30 Unforeseen impacts also require mitigation. Oregon Department of Fish and Wildlife asks that 0.5 to 1.0 percent of revenues generated annually be deposited by CEE into a Fish and Wildlife mitigation Trust Fund. The specifics of this can be worked out if the power project is given approval. The Fund should be overseen by a local board or agency and public members. The moneys of the fund will be spent on fish and wildlife restoration and enhancement opportunities throughout Central Oregon. [26]

58.31 All onsite mitigation activities specified in the DEIS need to be carried out. These include revegetation of disturbed sites, etc. [26]

58.32 There needs to be a point regardless of investment when the decision is made to shut the operation down if severe or chronic impacts to the environment occur. Running the plant at the expense of the environment cannot be tolerated. New power generating technologies are welcomed by ODFW. However, the Fish and Wildlife resources of Oregon shall not suffer in the face of technology. [26]

59. Joan Cabreza, Chief
Environmental Review Section
U.S. Environmental Protection Agency
Seattle, Washington

59.1 The Newberry Geothermal Pilot Project draft EIS is an informative, well prepared and comprehensive document. It addresses most of the pertinent issues and potential environmental impacts of project activities very well. In particular the draft EIS has done an excellent job of defining the "study" area for each resource

category, describing the methods for analysis, describing the impacts associated with different activities/project components for each phase of the proposed project (exploration, development, utilization, and decommissioning). Of particular note is the emphasis on gathering baseline data. Baseline data are important since an environmental baselines provides the bases for detecting significant environmental changes in the future as a result of the proposed actions. [34]

59.2 The final EIS needs to clarify how future decisions will be made regarding well pad siting, power plant siting, and the need for additional mitigation (e.g., p. 4-40 and p. 4-45 air quality). Will these decisions be supported by NEPA documentation (environmental assessment)? The final EIS should clarify whether these decisions will have a public involvement component. [02]

59.3 We believe that most of the "additional mitigation measures" described for each resource category provide an additional level of protection and should be included as part of the preferred alternative (Alternative B) in the final EIS and Record of Decision. In particular, EPA strongly supports the additional mitigation measures for air quality, ground water, geothermal resources, noise, and wildlife. [25]

59.4 Many of the additional mitigation measures include additional monitoring. A well designed monitoring plan will address how well the preferred alternative resolves issues and concerns by measuring the effectiveness of the mitigation measures in controlling or minimizing adverse effects. A well defined monitoring plan provides the basis for the feedback mechanisms which will use monitoring results to adjust standards and guidelines, BMP's, standard operating procedures, and monitoring intensity at first detection of unexpected, adverse effects. This ensures tht mitigation strategies will improve in the future and that unforeseen adverse effects are identified and minimized. [39]

59.5 We would like to take this opportunity to clarify information about two statements in the draft EIS (pp. 2-56 and 4-14) dealing with drilling fluid toxicity limit are not necessarily non-toxic. EPA does not define any drilling mud/additive system or single mud component as "non-toxic" (40 CFR Subpart A for the Offshore Subcategory or 40 CFR Subpart C for the Onshore Subcategory of the Oil and Gas Extraction Point Source Category). EPA has promulgated an end-of-pipe effluent toxicity limit as a control on the discharge of toxic and non-conventional pollutants (40 CFR Sections 401.15 and 401.16, respectively). (Note — this limit applies only to the Offshore Subcategory, no discharges are allowed from operations in the Onshore Subcategory.) Muds that meet EPA's effluent toxicity limit are not necessarily non-toxic.

EPA Region 10 has emphasized advanced planning of mud/additive systsems to ensure that mud discharge toxicities are controlled (by use of lowest concentrations of less toxic additives where possible) and mitigated to the maximum extent. For offshore drilling only water-based muds may be discharged and the discharge of diesel oil (in cases of stuck pipe) is strictly prohibited by rule (40 CFR Subpart A). [16]

60. Inge King, Conservation Chair
Audubon Society of Corvallis
Corvallis, Oregon

60.1 The DEIS for the Newberry Geothermal Pilot Project contains much relevant information and portions of the report were complete and carefully prepared. [27]

60.2 We recommend that this project be postponed (Alternative C) until sufficient data are available to ensure a more complete evaluation of environmental impacts. [33]

60.3 More exploration is needed to evaluate the possible connections between the shallow hotsprings of Paulina and East Lakes and the deeper hydrothermal features that they propose to exploit. [06]

60.4 No data exist at present to determine if drilling will impact the ecology of these pristine lakes. [06]

60.5 Test wells are needed to determine the chemical nature of the geothermal fluids under the caldera. No such data exists. Test drilling would provide information on the concentrations of possible chemicals such as boron and mercury that are known to be toxic to the biota. We do not accept as the the comparison of fluid chemistry between Medicine Lake and the Newberry hotsprings as good evidence for lack of connections. [06]

60.6 Exploration and production are not distinctly separated in the DEIS. [23]

60.7 If geothermal fluids are extracted for production of power, as well as from ground water, the problem of storage and disposal of the large quantities of fluids has not been adequately addressed. Volumes of these fluids are 6-8 millions of cubic meters per year. [42]

60.8 Toxic substances will be piped to the overflow ponds which have comparatively small capacity. Probabilities seem high that overflow of the pond could contaminate groundwater or surface drainage fields will occur, with perhaps serious environmental consequences. [42]

60.9 All ponds should be fenced and netted. [42]

60.10 We are concerned about venting of fluids into the atmosphere, especially during periods when the power plant is shutdown. [07]

60.11 Hydrogen sulfide will not be pleasant to visitors of the Newberry National Volcanic Monument. [07]

60.12 It is stated that mercury may exceed drinking water standards if concentrated in the surface water of the lakes. Even if Hg is mixed into the water column, it will accumulate and it is know be bioaccumulated in organisms such as fish. [05]

60.13 The pipeline for the production phase are huge and extend over a large area. They will certainly affect the movement of large animals such as elk and deer. What modifications are planned to allow passage of these animals during their migrations? [23]

60.14 The USGS was requested to collect hydrologic, water-quality and meteorologic data to provide baseline data for the DEIS. Yet this report, due out in early 1994, is not available and apparently was not used. This DEIS is therefore premature. Also the Dames and Moore report is vital and should have been included in the DEIS. [01]

60.15 We do not favor use of pristine, wild, roadless areas for industrial development. [40]