ENVIRONMENTAL ASSESSMENT

NILAND DEVELOPMENT PROJECT
GEOHERMAL LOAN GUARANTY

49-MW (NET) POWER PLANT AND
GEOHERMAL WELL FIELD DEVELOPMENT
IMPERIAL COUNTY, CALIFORNIA

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ABBREVIATIONS AND ACRONYMS

CDFG	California Department of Fish and Game
CDOG	California Department of Oil and Gas
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
DOE	Department of Energy
EA	Environmental Assessment
EIR	Environmental Impact Report
EPA	U.S. Environmental Protection Agency
FEIR	Final Environmental Impact Report
FWS	Fish and Wildlife Service
KGRA	Known Geothermal Resource Area
MEIR	Master Environmental Impact Report
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Health and Safety Administration
SCE	Southern California Edison
SCS	Soil Conservation Service
SHPO	State Historic Preservation Officer
TDS	Total Dissolved Solids

SUMMARY

The proposed federal action addressed by this environmental assessment is the authorization of disbursements under a loan guaranteed by the U.S. Department of Energy for the Niland Geothermal Energy Program. The disbursements will partially finance the development of a geothermal well field in the Imperial Valley of California to supply a 25-MW(e) (net) power plant. Phase I of the project is the production of 25 MW(e) (net) of power; the full rate of 49 MW (net) would be achieved during Phase II.

The project is located on approximately 1600 acres (648 ha) near the city of Niland in Imperial County, California. Well field development includes the initial drilling of 8 production wells for Phase I, 8 production wells for Phase II, and the possible need for as many as 16 replacement wells over the anticipated 30-year life of the facility. Activities associated with the power plant in addition to operation are excavation and construction of the facility and associated systems (such as cooling towers).

Significant environmental impacts, as defined in Council on Environmental Quality regulation 40 CFR Part 1508.27, are not expected to occur as a result of this project. Minor impacts could include the following: local degradation of ambient air quality due to particulate and/or hydrogen sulfide emissions, temporarily increased ambient noise levels due to drilling and construction activities, and increased traffic. Impacts could be significant in the event of a major spill of geothermal fluid, which could contaminate groundwater and surface waters and alter or eliminate nearby habitat. Careful land use planning and engineering design, implementation of mitigation measures for pollution control, and design and implementation of an environmental monitoring program that can provide an early indication of potential problems should ensure that impacts, except for certain accidents, will be minimized.

1. PURPOSE OF AND NEED FOR THE ACTION

The proposed federal action addressed by this environmental assessment (EA) is the authorization of further disbursement under an existing or restructured loan that partially finances a private geothermal development project. As authorized by Title 10, Part 790, of the Code of Federal Regulations (10 CFR Part 790), the U.S. Department of Energy (DOE) has agreed to guaranty a loan to the Niland Geothermal Energy Program for the Phase I development of a geothermal wellfield and construction of associated surface facilities needed to supply 25 MW (net) of electric power near Niland, California. If authorized, additional disbursements under Phase II of the Niland program would partially finance expansion of the wellfield, surface facilities, and power plant to 49 MW (net).

The DOE loan guaranty is intended to encourage and assist the private and public sectors in the development of U.S. geothermal resources by reducing the financial risks associated with new geothermal ventures. Because federal involvement through the DOE loan guaranty program necessitates compliance with the National Environmental Policy Act (NEPA) of 1969 (42 USC 4321 et seq.), an environmental review becomes an integral part of each loan guaranty action.

This EA was prepared to ensure that significant environmental degradation (as defined in the Council on Environmental Quality (CEQ) regulation given in 40 CFR Part 1508.27; see Appendix C) will not result from the Niland project and that environmentally sound practices will be employed. The format and content of this document is in accordance with NEPA, as implemented by the CEQ regulations (40 CFR Parts 1500-1508) and DOE guidelines (45 FR 20694-20701, March 1980; as amended 47 FR 7976-7979, February 1982). The purpose of this EA is to consider and analyze the environmental aspects of the proposed action and all reasonable alternatives and to make such information available to the public prior to official decision-making regarding the Niland Geothermal Energy Program loan guaranty. If it is determined by this EA that significant impacts will occur as a result of the Niland project, an Environmental Impact Statement may be required.

DOE has based its environmental review of the Niland project upon a Final Environmental Impact Report (FEIR) prepared by Imperial County, California, for the Niland project to comply with the California Environmental Quality Act (CEQA) of 1977. This document, *Final Environmental Impact Report (FEIR), Niland Geothermal Energy Program*, has been appended to this EA without revision as Appendix A. The CEQ regulations, Part 1506, provide that an agency may combine "any environmental document in compliance with NEPA . . . with any other agency document to reduce duplication and paperwork" and that "agencies shall cooperate with State and local agencies to the fullest extent possible to reduce duplication between NEPA and State and local requirements, unless the agencies are specifically barred from doing so by some other law."

To this end, DOE actively participated in the planning and scoping processes for the Imperial County FEIR by verbal and written communication and coordination with parties responsible for preparing the document. DOE reviewed the FEIR and provided comments to Parsons Corp., who collected, analyzed, and submitted the environmental data used in the Imperial County FEIR. Upon subsequent review of Parsons' responses to DOE comments, DOE determined that additional analyses and discussion would be necessary to

assure that NEPA requirements were satisfied. Thus, this supplemental EA has been prepared to meet DOE's obligations under NEPA and to provide information related solely to the DOE action.

DOE has accepted the Imperial County FEIR as satisfactory with regard to most of its NEPA requirements. The main text of DOE's EA summarizes and/or condenses portions of the FEIR, describes the DOE action and alternatives, and provides essential supplementary information. For a more complete understanding of the Niland project, the reader is encouraged to review Appendix A in its entirety.

Imperial County recently prepared the *Salton Sea Anomaly Master Environmental Impact Report (MEIR)* to evaluate the generic and cumulative environmental effects of 1400 MW of geothermal development in and around the Salton Sea Known Geothermal Resource Area (KGRA). One of the county's primary purposes for preparing the MEIR was to provide an environmental data base for use in preparing subsequent EIRs on individual geothermal development projects carried out in and around the Salton Sea KGRA. The state EIR guidelines (Sect. 15168) for implementing CEQA provide that whenever a broad scope EIR, such as the MEIR, has been prepared on a program, plan, or policy, and an environmental document is prepared later on an action included within the program, plan, or policy, the subsequent environmental document need only summarize the issues discussed in the broad scope EIR, incorporate discussions from the broad scope EIR by reference, and concentrate on the individual project proposal. Since the MEIR specifically considered the effects of 100 MW of electrical power of generation in the area of the proposed project, the MEIR was used extensively in the FEIR to provide information on potential regional and cumulative environmental impacts associated with the proposed project. The FEIR thus focused on the potential site-specific impacts of the proposed project not contained or adequately presented in the MEIR.

2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 THE PROPOSED ACTION

This section provides background on the federal government's involvement with the project, a brief description of alternatives being considered, and a summary of the objectives, location, and characteristics of the proposed action. A more complete description of project activities can be found in Sect. 1 of Appendix A.

2.1.1 Background

DOE has agreed to guaranty loans for the construction of a 25-MW (net) power plant and geothermal wellfield development that constitute Phase I of the Niland Geothermal Energy Program project. DOE's proposed action addressed in this EA is the authorization of disbursements which would allow completion of Phase I.

The Niland project is designed to accommodate an expansion in Phase II to 49 MW (net). Such expansion will be at the sole discretion and expense of the borrowers. No facility expansion of either the wellfield and associated fluid-handling equipment or the power plant beyond that approved to support the initial 25-MW (net) project will commence without the written consent of DOE. Further, DOE's decision will be made only after 12 consecutive successful months of operation at not less than 80% of rated capacity. Should data acquired during the period of operation indicate to DOE that such expansion would decrease the likelihood for repayment of the loans, consent will be withheld.

Phase I consists of three milestones. Milestones I and II entail the drilling and testing of a small number of wells to determine whether the resource justifies development. Disbursement of funds for these milestones was previously authorized by NEPA Action Memoranda from the Assistant Secretary, Environmental Protection, Safety and Emergency Preparedness, and from the Deputy Assistant Secretary for Renewable Energy. Although the proposed action would allow disbursements only to complete Phase I, this EA addresses the environmental impacts of the expanded 49-MW (net) wellfield and power plant facility because of the likelihood of the eventual completion of Phase II of the project.

2.1.2 Objective

The Niland Geothermal Energy Program is designed to extract steam and hot brine from deep wells in the Imperial Valley of California, at a rate sufficient to generate 49 MW (net) of electrical power. Phase I of the project is the production of 25 MW (net) of power; the full rate would be achieved during Phase II. The produced power will be purchased by the Southern California Edison Company (SCE) for sale to its customers. The Imperial Irrigation District will provide the electrical interconnection between the plant and SCE.

2.1.3 Location

The facility will be located near the community of Niland in Imperial County, California (Fig. 2.1). Approximately 1600 acres (648 ha) in Sects. 8, 16, 17, 20, 21, and

Fig. 2.1. Regional location map for the Niland project.

22 of T.11S, R.14E, are available through lease and ownership for the production wells, power generation facilities, and peripheral injection wells (Fig. 2.2). An area of 240 acres (97 ha) in Sect. 33, T.10S, R.14E (the alternative injection well field area), is also available for brine injection if peripheral injection is inappropriate.

2.1.4 Project Activities

2.1.4.1 Well field development

Eight production wells will be used for Phase I (25 MW). The wells will be drilled approximately 9,000 to 12,000 ft (2750 to 3650 m) deep from four well pads. Each pad will each use up to 4 acres (1.6 ha) of land and will contain one to five wells. Eight additional production wells will be drilled from the four pads for Phase II (49 MW). During the 30-year lifetime of the project, as many as 16 replacement production wells may be needed to extract fluid from different parts of the resource area. These wells will be located on existing pads where possible. Up to three new pads may be needed within the 1600-acre (648-ha) area and are identified in Fig. 2.3. Details of well productivity, fluid characteristics, and fluid transmission appear in Sect. 1.4 of Appendix A.

Each producing well will deliver a two-phase flow of hot brine and steam to the surface. Steam and brine from the most distant well pad will be conveyed separately in insulated pipelines to the next well pad in the direction of the power plant. Fluid from each pad will be added to the pipelines as they proceed to the plant site. After all separate outputs have been combined, the vapor phase and brine will enter the power plant in separate lines. The brine line will have a duplicate line to permit pipe descaling without system shutdown. All pipelines will be installed above ground in rights-of-way of various lengths, the longest being 82 ft (25 m). Horizontal expansion loops will be installed, at the same location for all lines, to relieve thermal expansion stresses.

2.1.4.2 Steam generation

Material balances for Phases I and II are given in Table 2.1. The steam line entering the power production facility will carry vapor composed of approximately 91% steam and 9% noncondensable gases, by weight. Noncondensable gases will be removed from the steam by multistage heat extraction to produce a stream of carbon dioxide with traces of other gases. This gas stream will be vented. Condensate from the noncondensable gas removal process will be reheated to produce clean high-pressure steam, which will be fed to the turbine/generator system.

The brine entering the plant will be flashed in the high-pressure flash vessel to produce steam for the high-pressure steam line. A small percentage of the brine leaving the high-pressure flash vessel will pass through a utility steam flash vessel to produce steam for various uses within the power plant. The remaining brine from the high-pressure flash vessel will enter the low-pressure flash vessel. Low-pressure steam will be used as supplemental feed for the low-pressure section of the turbine. Brine from the low-pressure flash vessel will be transferred to a third flash vessel to produce steam at atmospheric pressure. The remaining brine will be treated in a solids contact clarifier and a thickener tank to concentrate the suspended solids to 30% solids and 70% brine. Part of this underflow will be filtered to produce 65% solid cake for disposal at a commercial landfill.

Fig. 2.2. Specific location map for the Niland project.

Fig. 2.3. Plot plan for the Niland project.

Table 2.1. Material balance for Phases I and II

Stream	Description	Flow rate (lb/h)	
		Phase I	Phase II
1	Total well production	3,330,000	6,660,000
2	Total steam from wells	380,000	760,000
3	Noncondensable vent gas	33,000	65,000
4	Clean steam	315,000	630,000
5	Total brine	2,950,000	5,900,000
6	High-pressure steam	85,000	170,000
7	Utility steam	15,000	30,000
8	Low-pressure steam	250,000	500,000
9	Filter press cake	3,000	7,000
10	Brine to injection	2,661,000	5,322,000
11	Cooling water to condenser	38,500,000	38,500,000
12	Evaporation and drift	625,000	1,250,000
13	Cooling tower blowdown	32,000	64,000

The remaining underflow will be used to control the deposition of silica from the flashing brine.

Clarified effluent will pass through a dual-media filter system to reduce the suspended solids content to less than 5 ppm. The filtered brine will then be injected under pressure into the ground.

2.1.4.3 Power generation

Both high- and low-pressure steam will be used to drive the turbine-generator unit. Spent steam from the turbine discharge will be condensed by direct contact with cooling water from the cooling towers. [Cooling towers were selected as the cooling system for the Niland power plant because they were more economical than the spray pond alternative (Carey 1984).] Condensate will be pumped from the bottom of the condenser back to the cooling tower. Sufficient condensate is available to supply all the makeup water for the tower, replacing the water lost through evaporation and drift. In addition, the constant inflow of condensate to the tower will allow for a blowdown stream from the circulating system sufficient to keep the salinity of the cooling water low. Blowdown water will be sent to the solids contact clarifier for mixing with the brine. Turbines, generators, and cooling towers installed during Phase I will be adequate to meet Phase II requirements and will be limited to the lower production rate by availability of steam and brine treatment facilities during Phase I.

2.1.4.4 Brine injection and waste disposal

An annual average of no less than 80% of the geothermal fluid from the production wells will be returned into the ground through injection wells. Twenty percent of the water will enter the atmosphere as water vapor from the cooling tower. Injection fluid will be

pressurized at the power generation facility and transferred to the injection well in insulated, above-ground pipes. Pipelines will be constructed along one of the alternative pipeline routes shown on Fig. 2.2. In the event that near-field, peripheral injection is not technically feasible, or becomes impractical during project operation, an alternate remote area has been identified which could also be used for injection.

For full production, seven or eight injection wells on the southeast edge of the 1600-acre (648-ha) production area will be used. Three well pads will be used, each approximately 2 acres (0.8 ha) in size. Injection at the remote site would require seven wells on separate pads of about 0.4 acre (0.2 ha) each. Up to seven replacement wells adjacent to the old ones may be needed during the life of the project (Fig. 2.2). For Phase I, only three or four injection wells will be needed to dispose of the brine at the lower flow rate.

Solid geothermal wastes generated in Imperial County, including sludges, are currently disposed of in one of four county-operated Class II-2 (California) landfills or in the IT Corporation's Class II-1 disposal site. The county sites are located in Brawley, Calexico, Holtville, and Salton City. By order of the California Regional Water Quality Control Board, Colorado River Basin Region, these Class II-2 sites can accept only geothermal wastes with a total dissolved solids (TDS) concentration of less than 6000 mg/L and with no hazardous constituents as designated by the State of California Department of Health Services. The Class II-1 disposal site is located west of the city of Westmorland and can accept all geothermal wastes.

The four county-operated Class II-2 landfills currently are well below their design capacities. The expected remaining life of each of these landfills under the county's projected use rates is as follows: Brawley, 10 years; Calexico, 15 years; Holtville, 20 years; and Salton City, 50 years. The county's projection takes into account disposal of acceptable geothermal wastes.

The IT Corporation's Class II-1 disposal site at Westmorland has been in operation for approximately two years and over 95% of its design capacity is still available for use. Based on IT-projected use rates, which take into account an optimistic rate of geothermal development, the IT disposal site should be able to provide continuing service for at least another 70 years.

The solid geothermal wastes generated by the Niland power plant following projected start-up of operations in 1986 are not expected to significantly impact the projected life of any of these facilities (Carey 1984).

2.1.4.5 Power transmission and ancillary facilities

A power line will be constructed to connect the facility to either of two existing circuits operated by the Imperial Irrigation District for delivery to the SCE network. The new line will be mounted on single wooden poles. The preferred route runs 0.5 mile (0.8 km) to the west; the alternative route is 2 miles (3.2 km) to the east (Fig. 2.2.).

A control building, storage facility, parking area, and electrical switchyard will be located contiguous to the power generation area. Approximately 12 acres (4.8 ha) will be used for these facilities including the steam and brine handling and power generation areas. An additional 12 acres (4.8 ha) will be used temporarily during construction for parking and laydown areas.

Liquid storage basins will be constructed adjacent to each well pad and at the brine processing facility. These will be used to temporarily hold the cold brine lifted out of a well during start-up. Liquid in the basins will be injected into the brine line leading to the power generation facility after production starts and will be disposed of along with other brine in the injection wells. The basins will be clay lined to prevent contamination of groundwater and surface waters. A concrete basin at the brine processing facility will be used during start-up, shutdown, and upset conditions. Brine collected in this basin will be subsequently pumped to the clarifier system for eventual injection.

2.2 ALTERNATIVES TO THE PROPOSED FEDERAL ACTION

Alternatives considered by DOE for the Niland geothermal loan guaranty are approval, denial, or conditional approval of the loan disbursement requests for Milestone III, Phase I. The decision will be based upon a number of technical, economic, and environmental considerations. Data to support the decision will be based upon information gathered during Milestones I and II and the DOE NEPA environmental assessment.

The alternative of conditional approval could occur if it is necessary for DOE to ask that certain mitigating measures be taken, in addition to those that may be imposed by regulatory agencies, prior to approval of loan disbursement requests.

No facility expansion of either wellfield and associated fluid-handling equipment or the power plant beyond that approved to support the initial 25-MW (net) project will commence without the written consent of DOE. This decision will be made following 12 consecutive successful months of operation at not less than 80% of rated capacity. Should data acquired during that period of operation indicate to DOE that such expansion would decrease the likelihood for repayment of the loans, consent will be withheld.

Denial of the disbursement request for Milestone III would mean suspension or termination of the project.

3. THE AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS

A detailed description of the affected environment of the Niland project, potential impacts, and mitigation measures is provided in Sect. III of the FEIR (attached as Appendix A to the present document). The following sections are intended to clarify or enhance the discussion in the FEIR, and references to appropriate pages in the FEIR are provided to facilitate comparison with the text that follows.

The FEIR was prepared in accordance with the requirements of the California Environmental Quality Act. The term "significant" occurs frequently in the FEIR in reference to environmental impacts. The reader should be aware that the use of this term does not, however, correspond to the definition of "significant" under NEPA (see 40 CFR Part 1508.27; see Appendix C). In this EA, DOE finds that no significant impacts, as defined by CEQ, will result from the Niland development project.

Potential minor impacts include local degradation of ambient air quality as a result of particulate and/or hydrogen sulfide (H_2S) emissions, temporarily increased ambient noise levels during drilling and construction, and increased traffic with a higher probability of highway accidents. Impacts could be significant in the event of a major spill of geothermal fluid, with potentially detrimental effects on ground- and surface-water quality; on aquatic biota, including a proposed endangered species; and on agricultural productivity of any contaminated soils.

3.1 GEOLOGY

3.1.1 Existing Conditions

3.1.1.1 Stratigraphy (Refer to p. 19 of the FEIR)

The stratigraphy of the reservoir and cap rock are not sufficiently known to provide for a reliable analysis of subsidence (Sect. 3.1.2) caused by the production of geothermal fluid. Porosity and fluid pressure as a function of depth within interbedded and overlying shales have not been adequately characterized. The average and cumulative thicknesses of shale units are also unknown.

3.1.1.2 Reservoir fluid characterization

Chemical characterization of Niland's reservoir fluid is subject to uncertainty. Analyses of noncondensable gas samples at two Niland wells suggest that H_2S concentration in the reservoir fluid will be low (0.02% of the noncondensable gases and 2.4 ppm brine). For comparison, note that H_2S levels at the proposed Brawley site (DOE September 1983) were reported to be an order of magnitude higher (0.14% of noncondensable gases and 23 ppm in the brine, respectively). One cannot rule out the possibility that, as Niland's geothermal well field is developed, H_2S levels could vary over time.

3.1.1.3 Geologic hazards

Seismic groundshaking (Refer to pp. 20-22 of the FEIR)

On page 20 of Appendix A, the FEIR references Layton and Crow's (1980) description of the Niland project site as "relatively aseismic." The use of this terminology may be

misleading. The intent is to indicate that, during the course of seismic monitoring in the project area, fewer microseismic events were located there than in adjacent regions. Many of these events were, nevertheless, felt in the project area, as would be true for all strong earthquakes epicentrally located in adjacent regions.

Thenhaus et al. (1980) provides probabilistic seismic risk analysis for various regions of California. The Niland site appears to be in Thenhaus's Seismogenic Zone 16. If so, the maximum-credible-magnitude earthquake is 7.9 (Modified Mercalli Intensity XI). Table 3.1 provides estimated annual occurrence rates for earthquakes ranging in intensity from VI (slight damage) to XI (severe damage) for Niland and adjacent areas. These values can be converted to probabilities of occurrence during the lifetime of the project by multiplying by 30 years. Adjacent seismic zones (15 and 17) have higher and lower risks, respectively, by an order of magnitude. Uncertainties exist concerning risk estimates, especially near the boundaries between seismic zones. Estimated risks may be off by a factor of two or more. According to the Applied Technology Council (1978) Imperial County is in the highest seismic risk category (7), requiring special earthquake designs for critical structures.

The feature "East Highline Canal Seismicity Lineament" in Fig. 2.1-1 of Appendix A is a misnomer because the use of the word seismicity is incorrect. This feature is actually a basement structural lineament that was discovered during the course of a seismic refraction survey (seismic waves generated artificially by explosives). The earth's continental crust appears to be about 1 km thicker on one side of the lineament than the other. There is *no* surface expression of this lineament and, hence, no evidence of recent (last several million years) fault displacement along it.

In addition, the scale on Fig. 2.1-1 of Appendix A is incorrect. Each square on the grid is a township rather than a section; that is, each square is 9.6 km (6 miles) on a side rather than 1.6 km (1 mile). Thus, the project area is actually about 9.6 km (6 miles) from the Brawley seismic zone.

Table 3.1. Annual occurrence rates as a function of Modified Mercalli Intensity for the Niland and adjacent areas (modified after Thenhaus et al. 1980)

Intensity	VI	VII	VIII	XI	X	XI	XII
Expected damage ^a	Slight		Moderate			Severe	Total destruction
<i>Annual occurrence rate</i>							
Seismic zone							
15	0.53	0.19	0.07	0.02	0.008	0.003	
16 ^b	0.07	0.02	0.007	0.002	0.0006	0.0002	
17	0.009	0.003	0.001	0.0003	0.0002		

^aAssuming reasonably well-constructed but non-earthquake-resistant structures.

^bNiland area.

3.1.2 Impacts

3.1.2.1 Induced subsidence (Refer to pp. 21 and 26 of the FEIR)

The potential for induced subsidence is subject to uncertainty. First, the stratigraphy and reservoir conditions are not well understood (Sect. 3.1.1.1). The assumptions that reservoir shales and overlying confining beds will not dewater significantly may be overly optimistic. Second, the ability of analytical models to correctly predict induced surface subsidence has never been successfully field tested.

A subsidence monitoring system is presently being prepared in cooperation with the California Department of Oil and Gas (CDOG) and Imperial County. These two agencies will determine when subsidence mitigation measures will be necessary. No subsidence limits have been established at this time.

3.1.2.2 Seismicity (Refer to p. 26 of the FEIR)

Ground shaking

In this EA, "significant ground shaking" is considered to be a seismic event capable of causing at least slight damage and possibly a temporary plant shutdown. If Niland is assumed to be in Thenhaus's Seismic Zone 16, the project may experience slight damage twice from earthquakes during its 30-year life, and the probability of severe damage resulting from an earthquake is 0.006. Uncertainty in these probability estimates is demonstrated by the higher probability of severe damage (0.09) to a 30-year project in nearby Seismic Zone 15.

Ground-motion design criteria will be based on information obtained from a foundation soils investigation. This investigation will determine the potential for foundation liquefaction as a function of seismic loading. Construction permits will be issued by Imperial County based on the Uniform Building Code of 1982.

Induced seismicity

A seismic monitoring system is presently being prepared in cooperation with CDOG and Imperial County. These two agencies will determine the limits of induced seismicity requiring mitigation measures.

3.1.3 Mitigation (Refer to p iii of the FEIR)

With regard to the mitigation of geological impacts, the project sponsor has indicated that a thorough geotechnical investigation will *not* be conducted prior to location of pipelines as is planned for location of power plant structures. The sponsor will rely on present knowledge of fault traces when locating pipelines and will implement appropriate mitigation to prevent significant environmental damage where pipelines are located on or across fault traces (Carey 1984).

3.2 HYDROLOGY

3.2.1 Existing Conditions—Surface Water (Refer to pp. 42 and 113 of the FEIR)

3.2.1.1 Project location

Figures 3.1 and 3.2 have been included to indicate the project location relative to surface water bodies. As shown in Fig. 3.2, the alternate injection well field lies adjacent to the East Highline Canal. This canal supplies water to the lateral canals which flow east to west across the project area. The laterals flow along the northern edge of each square-mile section, whereas drainage canals flow along the southern edge of the sections (Fig. 3.2). Thus, drainage from the site flows to the Alamo River (M and N drains) and the Salton Sea (other drains).

Fig. 3.1. Surface water features near the Niland Geothermal Project.

Fig. 3.2. Site drainage from the primary project area.

3.2.1.2 Algae ponds

The commercially operated ponds near the Niland project site (p. 113, FEIR) grow algae for use in animal feed and the production of glycerine (Carey 1984.)

3.2.2 Impacts

3.2.2.1 Groundwater (Refer to pp. 45-47 of the FEIR)

Quality

Shallow groundwater could be contaminated with geothermal fluid by well casing failure, infiltration from surface spills, leakage through clay-lined retention basins, or leakage from the brine holding tank. Aquifers at the project site are protected by Environmental Protection Agency (EPA) groundwater criteria and standards (40 CFR Part 146). The nearest potable well is about 3.2 to 4.8 km (2 to 3 miles) from the project site (Carey 1984). Because the town of Niland is upgradient from the project site (see Fig. 2.2.1, FEIR), it is unlikely that casing leakage or injection of geothermal fluids will affect potable groundwater.

Figure 3.3 is a well completion diagram. Cemented casings will isolate geothermal fluids from shallow groundwater during normal operations. Pressure in the liquid annulus surrounding the hangdown string will be monitored to detect casing failures.

Groundwater will be protected from surface spills by spill prevention control and countermeasures (as developed under Imperial County guidelines). The reinforced-concrete brine holding tank will be monitored for leakage by observing volume loss. Retention basins around the well heads will be clay lined, but they will not have leak detection systems.

Consumptive use

Consumptive use of shallow groundwater resources is not anticipated; however, temporary dewatering will occur during construction. Potable water will be trucked in, and cooling tower makeup water will be supplied by condensed steam from the geothermal resource, augmented by agricultural drain water as needed. Shallow groundwater could conceivably be used if drain water is determined to be unsuitable for cooling tower use. Neither drain water nor shallow groundwater will be required for cooling tower makeup unless total reinjection of the spent geothermal fluid is required to mitigate subsidence.

3.2.2.2 Surface water (Refer to p. 47 of the FEIR)

Appendix A indicates that, while the project's normal operations would be unlikely to cause significant degradation of water quality, major spills of geothermal fluid may cause adverse effects in the drains, the Alamo River, and the Salton Sea. If a spill, blowout, or pipeline break allowed large quantities of geothermal fluid to enter the drainage canals, the effects of heat and high concentrations of salt and trace elements are likely to be toxic to aquatic life in the affected drainage canals. The potential also exists for lethal impacts in the Alamo River and areas of the Salton Sea near discharge points for drainage canals (Sect. 3.4). The following mitigation measures (p. 57, Appendix A) are recommended to

Fig. 3.3. Completion diagram for a Niland geothermal production well.

reduce the probability of major spills: regular pipeline maintenance and inspection, double-piping or heavier grade pipeline for water crossings, protecting pipes from vehicular traffic, diking around the power plant and other potential spill areas, an adequately sized emergency basin, pipeline backflow valves, spill-detection instrumentation, and preparation of a comprehensive Spill Prevention Control and Countermeasures Plan.

As indicated by Fig. 2.3, the power plant will be located adjacent to the P Drain. This area has the greatest potential for both major and minor spills. Details of the design for the drainage system, spill prevention equipment, dikes, and the emergency holding basin and liner are not yet available. These should be closely reviewed by Imperial County and the California Regional Water Quality Control Board.

Although the risk of catastrophic spills can be reduced to acceptable levels by employing appropriate mitigation measures, the impacts of smaller spills must also be considered. Spilled fluids which are not contained most likely would enter the near-surface groundwater. Although these spilled fluids would be diluted, salts from the geothermal fluids would enter drainage canals. This situation would be unlikely to cause major degradation of drain water quality, but chronic addition of salts would increase the TDS entering the Salton Sea. This increase would contribute to the long-term trend of salinization which eventually is expected to destroy the Salton Sea as biological habitat. To evaluate whether the Niland Geothermal Project makes a measurable contribution to the salinization trend, it is recommended that annual or more frequent monitoring be performed of the TDS in the P Drain downstream from the power plant and in a nearby control drain not affected by the project area.

3.3 AIR QUALITY

3.3.1 Existing Conditions (Refer to p. 73 of the FEIR)

The lack of current ambient H₂S monitoring by the Imperial County Air Pollution Control District and the invalidation of historical H₂S monitoring data by the California Air Resources Board make characterization of existing H₂S levels at the proposed Niland site difficult. However, ambient H₂S monitoring data collected near the site of the proposed Brawley geothermal power plant (4–5 miles south of the city of Brawley, Imperial County, California) over the past year indicate that H₂S levels are at or below the detection limit (i.e., concentrations of less than 1 $\mu\text{g}/\text{m}^3$ are frequently encountered). Thus, the assumption of negligible background H₂S levels at Niland is reasonable, assuming that air quality does not differ significantly between the Brawley and Niland sites (Villalon 1984).

3.3.2 Impacts (Refer to pp. 64–78 of the FEIR)

3.3.2.1 Methodology for predictions

The potential impacts of the proposed Niland facility on ambient air quality were estimated using appropriate assumptions on emission rates, meteorological parameters, and using appropriate dispersion modeling techniques. The assumed H₂S emission rates for well drilling and operation were based on an H₂S level of 2.4 ppm in the geothermal brine. This value was obtained from data collected at wells on the proposed site (Morris 1984). Insufficient well monitoring data are available to characterize the distribution of H₂S levels in the fluid (i.e., it is not known if 2.4 ppm represents a maximum or minimum H₂S level at the proposed Niland site). However, according to the Imperial County Air Pollution Control District, the H₂S level used in the emission calculations appears reasonable based on observed values for other geothermal power plants (existing and proposed) in the vicinity of Niland (Villalon 1984).

The emission rates and meteorological parameters given on pp. 64–75 of Appendix A were used as input to the EPA-approved dispersion models PTMAX and PTDIS (Turner and Busse 1973). Projected air quality impacts tend to agree with those presented in Appendix A (i.e., H₂S levels were found to be below the California ambient air quality standard).

It is recommended that the ambient H₂S monitoring referred to in pp. 79–80 of the FEIR be conducted to verify predicted impacts. If monitoring data indicate the need for H₂S abatement, a state-of-the-art method, such as scrubbing the gas with the brine and reinjecting it, would be used (Morris 1984).

3.3.2.2 Particulate emissions

With regard to impacts of particulates emitted by Niland plant, it should be noted that, although the nearest residence is at least 0.5 mile from the plant site, workers in the well field and onsite represent sensitive receptors that could be exposed to particulate matter. It is unlikely that particulates in cooling tower drift will affect these individuals, however, because of "plume shadow"; that is, drift will not reach the ground until some larger distance downwind from the tower.

Predictions of cooling tower drift discussed in the FEIR frequently use the term "average maximum drift." This terminology refers to an estimated 12 lb/d salt level averaged over a 0.5-mile radius centered on the plant site. From this calculation, an annual deposition of 8.7 lb/acre·year is predicted. The FEIR equates this annual level of deposition with the application (to the same 0.5-mile area) of 0.038 in./year of irrigation water containing a high level of dissolved salts (1000 ppm TDS). This value becomes meaningful when it is compared to the average annual volume of such irrigation water applied in the Imperial Valley, which is 16,500 m³/ha [165 cm (65 in.) deep] (McBrayer and Oakes 1982). In other words, annual salt deposition from cooling tower drift emitted from the Niland power plant would be negligible (0.06% of the salts deposited by irrigation water). As stated in the FEIR, unless excessive levels of toxic biocides or rust inhibitors are found in the deposited drift, impacts to the surrounding soil and vegetation would be insignificant.

The FEIR states (Summary, Sect. 2.5.2.1) that "no natural vegetation would be affected [by drift], but crops could suffer some damage if the salt deposition rate is high." The use of the word "high" is inappropriate. A "high" rate of salt deposition cannot be a discrete value without an assessment that considers the variation in susceptibility of different crops to damage by salts. In this EA, it is predicted that the level of salt deposition would have negligible impact on crops under normal operating conditions.

3.4 ECOLOGY

3.4.1 Existing Conditions (Refer to pp. 94 and 96 of the FEIR)

In accordance with Sect. 7 of the Endangered Species Act of 1973, as amended, DOE requested that the Fish and Wildlife Service (FWS) of the U.S. Department of the Interior provide all currently available information regarding listed, proposed, or soon-to-be proposed threatened or endangered species, and/or critical habitat in the area of the project. Communication between DOE and the FWS is reproduced in Appendix B.

The Sacramento Area Office of the FWS has indicated that one species that occurs in the vicinity, the desert pupfish, *Cyprinodon macularius*, has recently been proposed as an endangered species (Swanson 1984). The FWS, which probably will list this fish as endangered in the near future (Lorentzen 1984), published this proposed rulemaking after a response to DOE's March 28, 1984, request for a listing of threatened/endangered

species. At that time FWS classified the desert pupfish as a Category 1 Candidate Species (see Appendix B).

A study conducted in 1978 and 1979 (Black 1980) showed that the desert pupfish occurred in irrigation drains near the project area as well as in other drains, shoreline pools, and creeks along the shore of the Salton Sea. At the time of the study, the drains supported the largest numbers of pupfish. Other residents (and important competitors or predators of desert pupfish) of these drains included sailfin mollies (most numerous), African cichlids, mosquitofish, catfish, sunfish, and minnows. San Felipe Creek, which drains into the southwestern shore, provides the only native habitat in California still supporting a viable pupfish population. Irrigation maintenance operations have threatened pupfish populations in the drains. Nevertheless, the probability that the pupfish still occurs or will occur in the drains on and near the proposed site is considered to be very good (Moore 1984). Planned agricultural and housing developments and exotic fish species have threatened the population and habitat in San Felipe Creek. The FWS has stated its intent to classify San Felipe Creek and two tributaries as critical habitat for the pupfish (Lorentzen 1984; 49 FR 20739-20744).

The FWS also stated that one candidate species, the Orocopia sage (*Salvia greatae*), may occur in the area. The species is believed to be rare and should be considered for listing, but at the present time too little is known about it to justify proposal (Knudsen 1984). Although the sage occurs along dry washes and in other sandy areas, it would not be expected in agricultural areas. Because the project site is agricultural and the species is not scheduled for proposal, no further action is warranted.

The southern bald eagle (*Haliaeetus leucocephalus*) and American peregrine falcon (*Falco peregrinus*) may forage in the nearby Wister area and could occasionally visit the Niland project site (Appendix A, p. 96). The FWS has not, however, expressed concern over these infrequent visits.

3.4.2 Impacts (Refer to pp. 42, 47, 103, and 122 of the FEIR)

The following discussion focuses on potential impacts to the desert pupfish but also applies to aquatic ecosystems in general. The desert pupfish, recently proposed for listing as an endangered species by the FWS (49 FR 20739), may occur in agricultural drains on or downstream of the proposed site. Although the nearest proposed critical habitat of the desert pupfish occurs 30 km (48 miles) to the southwest in San Felipe Creek, this habitat is threatened by water pollution, exotic species, dam construction, streambank erosion and channelization, groundwater pumping, lining and dredging of irrigation drains, and, possibly, geothermal exploration (49 FR 20739-20740). Potential habitat offered by the drains on and near the proposed site, therefore, may be relatively more important than it otherwise would be, especially if pupfish still reside there.

The proposed project may adversely affect aquatic organisms and their habitats in three principal ways. First, construction activities at the existing bare site may increase sediment loading in the drains by increased erosion and runoff or direct disturbance of drains, such as at pipeline crossings. Increased sedimentation may smother spawning substrate and organisms utilized as food by the fish. Higher suspended-solids concentrations can interfere with respiration and feeding and may promote disease.

Second, spills of various liquids, ranging from small amounts of lubricants to major spills of hot geothermal brines, may enter the drains. If supplemental makeup water is required (though this is unlikely), then cooling tower blowdown may be discharged to the drains. Effects on organisms residing in the drains, in turn, may range from little or no stress to their complete extirpation in the affected drains and long-term destruction of habitat. Local effects of spills on water quality and biota of the Salton Sea, the Alamo River, commercial algal ponds, and wetlands downstream of the project could also be expected.

Third, although the applicant plans to use no surface water (except for a one-time filling of the cooling system with canal water and a small pool of water for cleaning and dust control approved by the Imperial Irrigation District), the CDOG has yet to approve partial reinjection. If 100% reinjection is required, the project will probably use surface water for makeup. Diversion of substantial quantities of water from drains may cause crowding and other adverse effects on aquatic organisms, and some organisms may be entrained with the makeup water. Although not proposed for this project, complete diversion of water from a drain would result in the death of most fish residing there.

Given the proposed endangered status of the pupfish and the rarity and susceptibility of its habitat to geothermal-related impacts, the loss of even a few fish and their habitat from agricultural drains on or downstream of the site could be important. Furthermore, the California Department of Fish and Game (CDFG) maintains that the drains provide good habitat for fish and wildlife in general and that purposeful utilization of drains as catchments for spills would be unacceptable (Moore 1984). If habitat is suitable in the first place, according to CDFG, it would be necessary to maintain that habitat.

The use of irrigation drain water for makeup would also tend to increase the salinity of the Salton Sea, but only to a slight degree as a result of this one proposed project. Cumulative increased salinity and resulting biological effects in the Salton Sea due to surface-water diversions or full development of the Salton Sea KGRA are discussed in Volume I of the *Final Salton Sea Anomaly Master Environmental Impact Report* (Westec Services, Inc. 1981).

Cooling tower blowdown will probably be reinjected with spent geothermal brine. However, utilization of canal, drain, or river water for makeup and surface disposal of blowdown may be necessary if the CDOG does not allow partial reinjection. If so, a new application would be required, and a separate NEPA review conducted. A water appropriations permit from the State Water Resources Board would also be required. If surface disposal is approved, the blowdown may enter the drain system of the Imperial Irrigation District. Disposal of blowdown in this manner would be subject to the conditions of a National Pollutant Discharge Elimination System (NPDES) permit issued by the Colorado River Basin Regional Water Resources Control Board, after consideration of a report of waste discharge prepared and submitted by the applicant. The permit would limit the total quantity of blowdown discharged per day and the concentrations of TDS (probably to less than 4500 mg/L), residual chlorine, and other chemicals toxic to aquatic life. The permit would also require monitoring of the discharge to ensure compliance with permit conditions (Swajian 1983).

3.4.3 Mitigation

The measures for mitigation of potential impacts on surface waters and aquatic ecosystems suggested and/or proposed in Appendix A should be implemented. In addition, these measures should be applied to the protection of agricultural drains and their aquatic resources as well as to other surface waters. The drains should not be considered or used as catchments or conduits for spills of geothermal fluids or other liquids. Prior to construction, the drains should be surveyed for habitat suitable for desert pupfish. In the event blowdown is discharged to the surface, monitoring of water quality and assessment of impacts on resident aquatic communities should be performed. If cooling tower makeup is required from surface waters, it should not be obtained from drains containing pupfish or other wildlife habitat, unless rates of diversion are sufficiently low that no significant impacts on these resources are incurred.

3.5 NOISE (Refer to pp. 81-93 of the FEIR)

Two types of mufflers are planned to be used to reduce noise generated at the proposed Niland facility. Rock mufflers will be used to reduce noise from controlled steam releases at the plant. Noise quieting features will form an integral part of the turbine design. Specifications on equipment will limit maximum levels at 3 ft (1 m) to 85 dB (Morris 1984).

3.6 COMMUNITY RESOURCES

3.6.1 Archaeological and Cultural Resources (Refer to p. 106 of the FEIR)

Pursuant to 36 CFR Part 800, DOE has consulted the California State Historic Preservation Officer (SHPO) regarding the possibility of archaeological or cultural resources at the Niland project site. Correspondence from the SHPO (Appendix B) indicates that this project does not involve National Register or eligible properties and that the probability of archaeological materials occurring is low.

3.6.2 Aesthetics (Refer to p. 163 of the FEIR)

Vertical intrusions that have already modified the natural horizontal aspect of the Niland project area include power transmission lines, farm silos, and the Salton Sea geothermal power plant (Carey 1984).

3.7 LAND USE

3.7.1 Existing Conditions (Refer to pp. 23 and 112 of the FEIR)

Imperial County has zoned land in the project area as either General Agriculture or Rural Residential. Meloland very fine sandy loam has been designated as prime farmland by the U.S. Soil Conservation Service (SCS). Several areas of this soil mapping unit occur within the project boundaries. All other soils on the site are classified as "additional farmland of statewide importance." A copy of correspondence from the SCS appears in Appendix B.

3.7.2 Impacts (Refer to p. 119 of the FEIR)

Application of the recently finalized rule offering guidelines for farmland protection (49 FR 27716-27727) suggests that impacts would not be serious. A few hectares would be disturbed, little or none of which would be prime farmland. Surrounding land uses already include nonagricultural activities. The project would not impede access to land available for agriculture on the site or in the immediate vicinity. It would be difficult or impossible to site the facilities on other, agriculturally less suitable land.

3.7.3 Mitigation

The mitigation measures discussed and recommended on pp. 125-28 of the FEIR should be implemented.

3.8 HEALTH AND SAFETY

Two groups of people are at risk with regard to health and safety hazards common to geothermal projects: the general public, especially individuals who live or work near the geothermal development site or its access routes, and workers, during various stages of project development. (For the Niland project, these stages include exploration, well field development, construction of the power plant and related facilities, and operation.) Specific hazards include gaseous and particulate emissions; brine, wastewater, or chemical spills; contact with chemicals used in pollution control systems or with wastes generated by these systems; noise; equipment failure (e.g., well blowout); fire; and natural occurrences, such as subsidence, earthquakes, and storms. (Refer to Appendix A for details.)

Under normal conditions, implementation of adequate mitigation measures and an effective monitoring network established at DOE's recommendation should ensure that the public risk will be minimal with regard to health and safety hazards and that impacts will be insignificant. Likewise, adherence to applicable regulations of the Occupational Health and Safety Administration (OSHA) will promote worker health and safety through the use of protective clothing (e.g., goggles, gloves, and/or respirators) and procedures designed to minimize exposure to hazards. Personnel safety training will be implemented to assure proper handling of hazardous materials and safe operation of all equipment. Further, the Niland plant has been designed to incorporate common and unique safety features as well as instrumentation for monitoring and recording operational parameters necessary for maintaining industrial safety.

A potential for accidents exists in any major industrial environment such as a power plant. With geothermal projects, the potential is increased by the extraction of geothermal fluids under high-temperature/high-pressure conditions. A casing failure or a well blowout would release significant amounts of pollutants to the environment in an uncontrolled manner (despite the fact that present technology has developed effective blowout prevention devices), threatening air and water quality and local ecosystems. Shutdown of a blown-out well may require drilling a relief well to intercept the bore at depth and effect a plug on the original hole. Because these operations can take weeks to accomplish, impacts can be considerable. The major impacts would include a continuous emission of loud noise, air pollutants (e.g., hydrogen sulfide or fluorides), and water pollutants. If the reservoir is

a source of high-salinity fluids, the release of large quantities of the fluids and their associated toxic substance could pollute nearby streams, ponds, and shallow groundwater aquifers. The ground surface on which these materials fall would also be impacted.

Accident prevention will be encouraged throughout the project's lifetime by incorporation of safety features into the project design and by implementation of safety measures in construction and operating procedures. In the unlikely event of a blowout, all reasonable efforts will be made to regain control of the well. Mitigation would consist of pouring mud, grout, or water into the borehole to kill the uncontrolled flow or, if this failed, drilling of a relief well, which could take several weeks. If necessary, surficial flow would be diverted to existing drains to limit impacts to adjacent agricultural areas. After the blowout was killed, accumulated water at the site would be disposed of by a method acceptable to responsible California and Imperial County agencies.

Mitigation of casing failure would consist of (1) halting drilling, injection, or production of the malfunctioning well and (2) undertaking workover procedures. If the workover is unsuccessful, the well will be plugged and abandoned in accordance with regulations of CDOG.

3.9 CUMULATIVE IMPACTS (Refer to p. 168 of the FEIR)

In addition to its discussion of cumulative impacts of geothermal development (up to 1400 MW) in the Imperial Valley, the Salton Sea Anomaly MEIR summarizes interrelationships among other, nongeothermal projects currently in the planning or development stage (see MEIR, Sect. 3.12). No projects described in the MEIR would be likely to interact with the Niland project to produce impacts. To date, geothermal and other development in the Imperial Valley has not proceeded to a point where cumulative impacts are a problem. The MEIR projects possible future cumulative impacts with regard to increased salinity in the Salton Sea and predicts that water use conflicts will result as development increases. The MEIR recommends the design and implementation of a comprehensive water management plan for the Imperial Valley to avoid or alleviate such future problems.

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4. COORDINATION WITH STATE, LOCAL, AND REGIONAL PLANS

The Niland project creates no known conflicts with the Imperial County goals, policies, and objectives as stated in the General Plan. Development of geothermal resources in the Imperial Valley with concurrent maintenance of environmental quality is a goal of federal, state, and local agencies. Following is a list of organizations consulted with regard to the Niland project. This list was compiled from contacts made by both Imperial County and DOE. Correspondence between DOE and various agencies is presented in Appendix B.

Federal

United States Department of Agriculture,
Soil Conservation Service
United States Department of Energy
United States Department of Interior
United States Fish and Wildlife Service

State of California

Air Resources Board
California Energy Commission
California Resources Agency
Department of Conservation,
Division of Oil and Gas
Department of Fish and Game
Department of Water Resources
Department of Food and Agriculture
Department of Health Services
Department of Parks and Recreation
Department of Transportation
State Lands Commission
Office of Historic Preservation
Office of Planning and Research
Public Utilities Commission
Regional Water Quality Control Board,
Colorado River Basin Region
Solid Waste Management Board
State Water Resources Control Board
Imperial County
Agricultural Department
Air Pollution Control District
Assessor's Office
Fire Department
Environmental Health Services
Imperial County Fish and Game Commission
Parks and Recreation Department

Public Library
Public Works Department
Office of Sheriff-Coroner
Superintendent of Schools

Municipal

City of Brawley
City of Calipatria
City of Holtville
Niland Chamber of Commerce
Niland Volunteer Fire Department
Niland Sanitary District

School Districts

Calipatria Unified School District

Other

California Native Plant Society
Coachella Valley Audubon Society Corporation
Farm Bureau
Imperial Irrigation District
Imperial Valley College Barker Museum
Niland Geothermal Inc.
NPN Partnership
Oak Ridge National Laboratory
Pacific Bell
Salton Sea Fish and Wildlife Club
San Bernadino Valley Audubon Society, Inc.
Southern California Association of Governments
Southern California Chapter of the Wildlife Society
Southern California Edison Company
Southern California Gas Company
Southern Pacific Land Company

5. LIST OF PREPARERS

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APPENDIX A

FINAL
ENVIRONMENTAL IMPACT REPORT

for the

NILAND GEOTHERMAL ENERGY PROGRAM

Prepared by
County of Imperial Planning Department

**FINAL
ENVIRONMENTAL IMPACT REPORT
FOR THE**

**NILAND GEOTHERMAL
ENERGY PROGRAM**

**Prepared by
County of Imperial Planning Department**

Environmental data submitted by:

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July, 1984

**NILAND GEOTHERMAL ENERGY PROGRAM
FINAL ENVIRONMENTAL IMPACT REPORT**

This Final Environmental Impact Report consists of the Draft Environmental Impact Report for The Niland Geothermal Energy Program (NGEP), along with comments received during the public review period, plus responses. The text of the Draft EIR has not been changed subsequent to public review except that: Section 8.0, Comments and Responses, has been added; numbers have been placed at appropriate places in the text which refer to specific comments present in Section 8.0; Appendix G, Comments on Notice of Preparation, has been deleted; and minor correctors made to Figure 1.5-1 and Table 1.5-1.

All comments received have been incorporated, and are thus part of the Final EIR. The extent to which they have been accepted by the County as valid data or as identification of significant impacts, and thus form a basis for influencing the County's decision on the project, is reflected in the responses. Where the comment identifies new significant impacts not previously discussed or designated as such, the response so indicates.

All significant impacts have been identified and are accompanied by suggested mitigation measures. However, these proposed measures do not necessarily exclude other mitigation measures that might accomplish the same degree of mitigation. In addition, it is stated in this Final EIR whether the suggested mitigation reduces the impact to "not significant" or whether a "significant impact" will still remain even if the mitigation is implemented. Also, in some cases measures are suggested to reduce a given impact or minimize the possibility of occurrence of impacts which were not identified as significant. For these cases, regardless of whether these measures are implemented or not, no significant impact will be involved.

EXECUTIVE SUMMARY

Proposed Action

The Niland Geothermal Energy Program (NGEP) applicants have applied to the County of Imperial for a Geothermal Production Permit (GPP) to construct and operate a commercial geothermal power plant and field capable of producing a nominal 49 (net) megawatts of electrical power. The project would initially produce a nominal 25 (net) megawatts in Phase I; Phase II expansion to 49 (net) MW is anticipated after approximately one year's operation.

The primary project area is located on private lands (1,600 acres) approximately 2 miles southwest of the community of Niland in Imperial County, California. The major project components during Phase II include a baseload flashsteam power plant, 16 production wells (total depth 9,000 to 12,000 feet), 7 or 8 peripheral injection wells (total depth 5,000 to 12,000 feet), 16 replacement production wells, 7 replacement injection wells, fluid handling and treatment facilities, and an interconnection line to the existing Imperial Irrigation District and Southern California Edison Company electrical transmission networks. An alternative injection well field area also has been proposed in the event that the peripheral injection well field cannot be developed for technical reasons. The alternative injection well field area is located on private lands (240 acres) approximately 1 mile north of the community of Niland and would consist of 7 or 8 injection wells (total depth 2,500 to 4,500 feet) and 7 replacement injection wells. In addition, several alternative pipeline routes are proposed for the two colocated pipelines between the primary project area and the alternative injection well area. The lands over which these two injection pipelines may be constructed are considered as the alternative injection pipeline corridor.

Environmental Setting

The land within the project area is either in agricultural production or is lying fallow. Most of the land within the project vicinity is also dedicated to agricultural production. Other general land uses include residential, wildlife refuge and management, recreation, and geothermal resource exploration.

There is one residence located within the southeast portion of the primary project area immediately north of an injection well island. Two residences are located immediately outside the boundaries of the primary project area. One residence is located approximately 0.5 miles west and the other is located approximately 1.3 miles southeast of the power plant site. Several other houses are located in an area about 1.0 mile northeast of the power plant site toward the community of Niland. Several residences are located approximately 0.3 to 0.7 miles south of the alternative injection well field area. Another residence is located about 0.5 miles north of this area.

The California Department of Fish and Game's Wister Wildlife Management Area is located about 1 mile northwest of the project area and about 2 miles west of the alternative injection well field area. A number of private duck clubs form an almost continuous band 0.25 to 0.75 miles wide along the eastern and southern boundaries of the Wister Area. The Salton Sea is located over 2 miles west of the project area and at least 3 miles west of the alternative injection well field area.

The project area and vicinity currently are zoned A-2 (General Agriculture) or A-2-R (General Agriculture/Rural). The project area is also within the boundaries of an existing Geothermal Overlay Zone (G-Zone).

Significant Effects/Mitigation Measures

Major environmental effects and mitigation measures for the project include those described briefly below.

Geology

Impacts

The project area will very likely be subjected to at least one occurrence of significant ground shaking during the project's 30-year design life.

Ground rupture resulting from displacement during an earthquake would seriously damage any structures constructed over the fault trace.

The withdrawal of geothermal fluids from the reservoir will result in reservoir pressure decline which could result in reservoir compaction and induce surface subsidence.

Soil liquefaction, differential settlement, and shrink/swell conditions which could adversely effect foundations and structures are likely to exist throughout the project area.

Mitigation Measures

Project facilities should be designed in accordance with provisions of the Uniform Building Code (Seismic Zone 4) by structural engineers experienced in seismic design.

A thorough geotechnical investigation should be conducted at the power plant site, and development should be planned to avoid placing structures on or across any discovered fault traces.

Reservoir pressures and surface subsidence should be monitored periodically. If significant pressure declines or abnormal surface subsidence are detected, measures to increase reservoir pressures or repair the impacts of surface subsidence should be undertaken.

Detailed foundation and soil engineering studies should be undertaken and completed for individual power plant and production facilities.

Hydrology

Impacts

Without mitigation measures, groundwater quality would be adversely impacted from geothermal brine leakage from temporary or permanent storage ponds, from temporary on-site storage of hazardous solid waste, from infiltration of brine from accidental spills, and from injection of the spent brine.

Surface water quality could be adversely effected by a major spill of geothermal brine directly into the agricultural water system or indirectly through the tile drain system.

Mitigation Measures

Geothermal fluid storage basins or ponds should be lined to prevent infiltration, and hazardous geothermal solid wastes should be stored in lined basins or impermeable containers until transported to an approved disposal facility.

Injection wells should be cased and cemented to prevent leakage around the casing, and injection pressures limited to well below the reservoir fracture pressure. Other measures may be necessary to ensure that fluids injected into the alternative injection well field do not migrate vertically or horizontally to contaminate higher quality groundwaters.

Surface and groundwater quality impacts can be mitigated through spill prevention (pipeline inspection and maintenance, heavy pipe or pipeline enclosing at water crossings, pressure-activated emergency well shut-off valves, backflow valves on injection pipelines, etc.) and spill cleanup (berming around sites, spill contingency plans, etc.) measures.

Air Resources

Impacts

Fugitive dust emissions resulting from construction and operation activity would add slightly to the existing high level of particulate concentration in the region.

Hydrogen sulfide gas emissions would increase ambient air concentrations in the immediate project vicinity.

Mitigation Measures

Fugitive dust emissions can be reduced to negligible levels by watering, graveling, or paving roads and sites as appropriate.

The geothermal power plant and fluid handling systems should provide for future abatement of hydrogen sulfide. Monitoring of ambient air for hydrogen sulfide should be conducted.

Acoustical Environment

Impacts

The project will result in a significant, long-term increase in noise levels over existing ambient noise levels at a single residence located at the intersection of English and Hazard Roads, and a short-term significant increase in ambient noise levels for either the residence located at McDonald Road and the Southern Pacific Railroad or the residences located along Wilkens Road.

Mitigation Measures

Engine and steam mufflers should be used on operations conducted within 0.5 miles of any residence. Acoustic shielding could be used to reduce noise from specific power plant and well field components. Appropriate alternative housing could be provided to the occupants of the rental unit on McDonald Road during the term of the most significant impacts.

Biological Resources

Impacts

Drift from the cooling towers could impact vegetation within 500 feet downwind. No natural vegetation would be affected, but crops could suffer some damage if salt deposition rate is high.

Sudden, nonrepetitive operations, such as venting of steam or high-pressure geothermal fluids within the project area, could startle waterfowl present at nearby duck clubs, and possibly the Wister Unit, resulting in mass flights.

There is a potential for electrocution of raptors at transmission lines where conductor separation is less than the wingspan of certain large species.

Waterfowl and shore birds could be injured or killed if they come in contact with, or ingest, highly saline or hot geothermal fluids that are ponded at project facilities or accidentally spilled.

Accidental spills of geothermal fluids could reach the Salton Sea through the agricultural drain system. Toxic components of the geothermal fluid could have adverse effects on the Salton Sea ecosystem.

Mitigation Measures

Cooling tower drift can be minimized by the consistent attainment of a lower droplet emission rate, which should be specified as a performance condition for the selected cooling tower design.

Impulse noise due to such operations as sudden release of steam should be controlled by discharge through a muffler or other effective sound-attenuating system.

The electrical interconnection line should be designed according to generally accepted utility industry standards for prevention of raptor electrocution.

Should ponded geothermal fluid at well sites or the power plant site attract birds, screen covers or bird repellent devices should be used when fluid is being ponded.

Well sites and other project facilities near drains leading to the Salton Sea should be diked to prevent geothermal fluids spilled on-site from entering the aquatic ecosystem. Accidental spills should be cleaned up promptly, and any birds attracted to the spill should be driven away. An emergency response plan should be prepared to deal quickly and effectively with accidental geothermal field spills.

Cultural Resources

Impacts

Because no cultural resources were encountered in the total project area, no related direct or indirect impacts are foreseen.

Mitigation Measures

If any unusual objects of stone, bone, shell, or ceramic materials are uncovered during any drilling or construction activities, then all work in that area should cease until a qualified archaeologist can examine the finds and propose specific mitigation measures as appropriate for the resource encountered.

Land Use

Impacts

The residence located approximately 0.5 miles west of the power plant site will be directly affected by the project operations. Construction and operation of the project would introduce an industrial operation in the area resulting in increased traffic, noise, and level of human activity. The owner and occupant of this residence is one of the applicant's lessors which may decrease their perception of adverse impacts.

Hazardous solid waste generated during power plant operations is currently planned to be transported by truck from the power plant site to the IT Corporation disposal site. Transportation of these wastes on state highways which have high accident rates is considered potentially significant.

A geothermal brine spill within the power plant site or into fields adjacent to the pipelines would impact approximately 10 acres of land under maximum credible conditions. Soil productivity would be reduced significantly, if not entirely, until the deposited salt is reclaimed by leaching with fresh water or by mechanically removing and replacing the impacted soil.

Mitigation Measures

Car-pooling of drilling crews and construction crews should be encouraged to decrease the number of work-day commuting vehicles. On-site provisions for temporary camper/trailer hookups could be provided to further reduce the number of vehicles commuting to the site from nearby population centers. On-site temporary parking facilities should be provided to help relieve congestion problems in the site vicinity by eliminating the need for employee vehicles to park or wait on highways or local roads.

Railroad transport of the heaviest and largest power plant and well field components should be considered to mitigate potentially disruptive impacts of long-hauling such loads. The short haul by truck from the railroad unloading point (most likely Niland or Calipatria) on State Highway 111 to the power plant site will represent a short-term traffic impact which may be mitigated by the conditions of special permits and the use of escorts.

Weekend hauling of hazardous solid wastes from the power plant to the IT Corporation facility near Westmorland should be avoided, if possible, to reduce the mixing of heavy truck traffic with the significant level of weekend recreational vehicle traffic utilizing state highways.

Socioeconomics

Impacts

The project would contribute to the cumulative demand for transient housing facilities in Imperial Valley which could exceed supply if construction coincides with that of other geothermal projects.

Without mitigation measures, additional demand placed on the Niland Fire District would exceed its response capacity, resulting in inadequate fire protection for project facilities.

Mitigation Measures

Establishment of on-site facilities to accommodate camper/trailer hookups for temporary on-site residence, and arrangements with local hotel, motel and trailer park operators for long-term leases for an adequate number of rooms/spaces should be undertaken by the project applicant if significant transient housing shortages are identified.

Demand on local and county fire protection services can be largely mitigated by proper design and supply of on-site fire prevention and extinguishing systems. The proposed project construction plans should be reviewed by the County Fire Marshall prior to commencing construction activities to ensure that all facilities are in accordance with existing fire codes and ordinances. It is also

recommended that an emergency fire response plan be developed in cooperation with the Niland Volunteer Fire Department and the Imperial County Fire Department for the proposed geothermal facilities.

Visual Resources

Impacts

Due to the present visual classification of the area, the proposed project is not anticipated to have a significant, adverse impact on visual resources.

Mitigation Measures

No mitigation measures are proposed.

Unresolved Issues

Geology

If the alternative injection well field is used, there is a potential for induced subsidence which cannot be adequately quantified.

Hydrology

The potential for adverse impacts to groundwater in the alternative injection well field area cannot be adequately evaluated with present data.

Acoustical Environment

At one residence, the project will result in a significant, long-term increase in noise levels over existing ambient noise levels which cannot be completely mitigated.

Land Use

The introduction of industrial operations into the project area will result in unavoidable increased traffic, noise, and level of human activity. This will be a significant change from the existing rural agricultural use of the land.

Visual Resources

Although the proposed project is not anticipated to have a significant, adverse impact on the visual resources of the area, the vent stacks, cooling tower and plume, wellhead separators, turbine-generator structure, and geothermal pipelines will remain in view over the estimated 30-year life of the project. Alteration of the project area visual character to one of an industrialized nature is unavoidable.

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SECTION 1.0

PROJECT DESCRIPTION

1.1 Intended Uses of this Environmental Impact Report

The County of Imperial has received an application for a Geothermal Production Permit (GPP) for the Niland Geothermal Energy Program (NGEP), a proposal to construct and operate a 49 MW (net) geothermal power plant and field development project on private lands located approximately 2 miles southwest of the community of Niland in Imperial County, California. An initial study prepared by the County determined that the proposed project, like other geothermal development projects, has the potential to create a number of environmental impacts. In view of this determination, and the fact that approval of a GPP will represent a discretionary action by the County of Imperial, the California Environmental Quality Act (CEQA) requires the preparation of an environmental impact report.

The County of Imperial recently prepared a major environmental document, the Salton Sea Anomaly Master Environmental Impact Report (MEIR), which evaluated the generic and cumulative environmental effects of 1,400 MW of geothermal development in and around the Salton Sea Known Geothermal Resource Area (KGRA). One of the primary purposes of the County for preparing the MEIR was to provide an environmental data base for use in preparing subsequent EIR's on individual geothermal development projects carried out in and around the Salton Sea KGRA. The State EIR Guidelines (Section 15168) for implementing CEQA provide that whenever a broad scope EIR, such as the MEIR, has been prepared on a program, plan, or policy and an environmental document is prepared later on an action included within the program, plan, or policy, the subsequent environmental document need only summarize the issues discussed in the broad scope EIR, incorporate discussions from the broad scope EIR by reference, and concentrate on the individual project proposal.

Accordingly, this EIR is intended to be a focused EIR and has been prepared in compliance with the County of Imperial's Rules to Implement the CEQA. To solicit guidance as to the scope and content of the environmental information to be included in this EIR, a Notice of Preparation (NOP) was sent to all responsible governmental agencies and interested parties. Comments were received on the NOP by the County of Imperial and are included as Appendix G of this EIR. Since the MEIR specifically considered the effects of 100 MW of electrical power generation in the area of the proposed project, the preparers of this EIR have extensively used the MEIR to provide information on potential regional and cumulative environmental impacts associated with the proposed project. This information has been referenced and briefly summarized in the EIR. Correspondingly, the main focus of the EIR is on potential site-specific impacts of the proposed project not contained or adequately presented in the MEIR.

Because the project applicants are also participating in the U.S. Department of Energy's (DOE) Geothermal Loan Guaranty Program, the proposed project is also subject to National Environmental Policy Act (NEPA) review. Therefore, this EIR has been prepared in accordance with DOE guidelines in order to minimize the preparation and processing time associated with their NEPA-required Environmental Assessment.

In addition to the County of Imperial and the DOE, there are three other responsible agencies which will have discretionary approval power over the proposed project. These agencies include the California Regional Water Quality Control Board, Colorado River Basin Region (CRWQCB), the California Division of Oil and Gas (CDOG), and the Imperial County Air Pollution Control District (ICAPCD). The CRWQCB is the agency of the State of California charged with administering the provisions of both the state Porter-Cologne Water Quality Control Act and the Federal Water Pollution Control Act and Amendments in the NGEPA area. The Board requires the submission of a Report of Waste Discharge which describes the proposed project and proposed discharges. The Board then issues a Waste Discharge Order (WDO) with appropriate requirements. The CDOG is charged with regulating geothermal wells so

as to encourage the wise development of geothermal resources through good conservation and engineering practices. The CDOG enforces statewide geothermal regulations for drilling, blowout prevention, completion, production, injection, subsidence and abandonment. An approved Notice to Drill will be required for each proposed well. The ICAPCD has primary responsibility for control of stationary air pollution sources although its rules, regulations and enforcement practices are subject to review by the statewide California Air Resources Board (CARB). The ICAPCD Rules and Regulations require an approved Authority to Construct for each geothermal well which is to be drilled and/or tested and for each geothermal power plant. An approved Permit to Operate must be obtained for the eventual resource utilization system (i.e., wells, power plant, pipelines, etc.) once it becomes operational. Each of the above responsible agencies is required by CEQA to certify that their decision-making bodies have reviewed and considered the information contained in this EIR prior to acting upon or approving the proposed project.

The Project Description which follows was prepared utilizing the GPP application and additional information supplied by the project applicants, who have reviewed and verified the accuracy of the Project Description.

1.2 Project Objective

The Niland Geothermal Energy Program (NGEP) is designed to extract steam and hot brine from deep wells in the Imperial Valley of California, at a rate sufficient to generate 49 (net) megawatts of electrical power. Phase I of the project is the production of 25 (net) megawatts of power; the full rate would be achieved during Phase II. Expansion to Phase II is anticipated after approximately one year's successful operation at the Phase I level. The produced power will be purchased by the Southern California Edison Company (SCE) for sale to its customers. The Imperial Irrigation District (IID) will provide the electrical interconnection between the plant and SCE.

1.3 Location

The facility will be located near the community of Niland in Imperial County, California (see Figure 1.3-1). Approximately 1,600 acres in Sections 8, 16, 17, 20, 21 and 22 of T.11 S., R.14 E., SBB&M, are available through lease and ownership for the production wells and power generation facilities (see Figure 1.3-2). Peripheral injection of residual brine is also proposed within this area. An area of 240 acres in Section 33, T.10 S., R.14 E. SBB&M, herein referred to as the alternative injection well field area, has been identified which would be used for injection of the brine in the event that peripheral injection is not technically feasible or becomes impractical during project operation.

1.4 Well Field

During Phase I, eight production wells will be used full time. These wells are planned to be drilled into the geothermal reservoir 9,000 to 12,000 feet below the surface from four well pads. Two production wells have already been drilled from separate pads, and drilling of a third production well was commenced in April, 1984 from a third drill pad. The drill pads will each use up to four acres of land and will contain two to five wells each. During Phase II, eight additional production wells will be drilled from the four pads.

Although the productivity of individual wells may vary, the nominal well is expected to produce approximately 400,000 lb/hr of total mass flow at a wellhead temperature of about 400°F at 200 psia pressure and a total dissolved solids content of approximately 250,000 ppm (see Table 1.4-1).

Each producing well is expected to deliver a two-phase flow of hot brine and steam to the surface. Each well will be connected to an individual wellhead separator to separate the steam and noncondensable gases from the hot brine. Each wellhead separator will be approximately 7 feet in diameter

REGIONAL LOCATION MAP

FIGURE 1.3-1

FIGURE 1.3-2
NGEP PROJECT AREA
LOCATION MAP

TABLE 1.4-1

ANTICIPATED BRINE COMPOSITION FOR NILAND RESOURCE

IONIC SALTS

<u>Component</u>	<u>Symbol</u>	<u>Nominal Chemical Composition (ppm) by wt.</u>
Total Dissolved Salts	(TDS)	250,000
Chloride	(Cl)	147,000
Sodium	(Na)	53,000
Calcium	(Ca)	31,000
Potassium	(K)	14,000
Iron	(Fe)	1,800
Manganese	(Mn)	1,400
Zinc	(Zn)	530
Strontium	(Sr)	460
Barium	(Ba)	300
Boron	(B)	270
Lithium	(Li)	260
Bicarbonate	(HCO ₃)	200
Lead	(Pb)	110
Magnesium	(Mg)	100
Bromine	(Br)	10
Silica	(SiO ₂)	560

GASES

<u>Component</u>	<u>Symbol</u>	<u>Nominal Chemical Composition (ppm) by wt.</u>
Carbon Dioxide	(CO ₂)	10,000
Methane	(CH ₄)	89.5
Nitrogen	(N ₂)	32.0
Ammonia	(NH ₃)	3.9
Hydrogen Sulfide	(H ₂ S)	2.4
Benzene	(C ₆ H ₆)	0.02
Others ⁽¹⁾		0.29

(1) The other gases include argon, helium and hydrogen.

Source: G. Austin, Niland Geothermal, Inc.

and 30 feet high. Gaseous flow will be about 45,000 lb/hr from a nominal well. Approximately 355,000 lb/hr of hot brine will exit from the bottom of each wellhead separator.

Steam and brine from the most distant well pad will be conveyed separately in insulated pipelines to the next well pad in the direction of the power plant as shown on Figure 1.3-2. Steam and brine from the second pad's wellhead separators will be added to the pipelines, and the flows continued toward the plant site. After all separator outputs have been combined, the vapor phase and brine will each enter the power plant in individual flow lines. A duplicate parallel pipeline will be installed for alternate use.

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The steam and brine lines will be installed above ground in a single 30-foot right-of-way. Vertical expansion loops about 20 feet high will be installed about every 200 to 300 feet as needed to relieve thermal expansion stresses. All lines will have expansion loops at the same location.

During the 30-year lifetime of the project, as many as 16 replacement production wells will be needed to extract fluid from different parts of the resource area. These wells will be located on existing, or as many as three new, pads within the 1,600 acre area identified in Section 1.3 (see Figure 1.3-2).

1.5 Steam Generation

Flow rates for the steam generation process described below are given for the full Phase II operation. Values for Phase I will be approximately one-half of the flows listed. Composition of the noncondensable gases and brine steam will remain unchanged.

The steam line entering the power production facility will carry approximately 760,000 lb/hr (see Figure 1.5-1 and Table 1.5-1). The vapor will be approximately 91 percent steam and 9 percent noncondensable gases, by weight.

Noncondensable gases will be removed from the steam by multistage heat extraction to produce a vent gas stream of approximately 65,000 lb/hr of carbon dioxide with traces of other gases. (See Table 1.4-1.) The gas will be vented at about 150°F and 150 psia through two stacks, each 6 inches in diameter and a minimum of 80 feet high.

Condensate from the noncondensable gas removal process will be reheated by incoming vapor from the wellhead separators to produce approximately 630,000 lb/hr of clean high pressure steam. This high pressure steam will be fed to the turbine/generator system.

Brine flow to the power plant will be approximately 5,900,000 lb/hr. The brine will be flashed in the high pressure flash vessel to produce approximately 170,000 lb/hr of steam. This steam will be added to the high pressure steam line, resulting in a total high pressure steam feed to the turbine of 800,000 lb/hr.

A small percentage of the brine from the high pressure flash vessel will pass through a utility steam flash vessel where it will produce 16,000 lb/hr of steam for various utility uses within the power plant. This steam will be vented to the atmosphere.

The brine from the high pressure flash vessel will enter the low pressure flash vessel where approximately 500,000 lb/hr of low pressure steam would be produced. Low pressure steam will be used as supplemental feed for the low pressure section of the turbine.

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SIMPLIFIED POWER CONVERSION CYCLE
 (VALUES FOR PHASE II IN THOUSANDS OF POUNDS PER HOUR)

FIGURE 1.5-1

TABLE 1.5-1

MATERIAL BALANCE FOR PHASE I AND II

Stream	Description	Flow Rate (lb/hr)	
		Phase I	Phase II
1	Total Well Production	3,330,000	6,660,000
2	Total Steam from Wells	380,000	760,000
3	Noncondensable Vent Gas	33,000	65,000
4	Clean Steam	315,000	630,000
5	Total Brine	2,950,000	5,900,000
6	High Pressure Steam	85,000	170,000
7	Utility Steam	15,000	30,000
8	Low Pressure Steam	250,000	500,000
9	Filter Press Cake	3,000	7,000
10	Brine to Injection	2,661,000	5,322,000
11	Cooling Water to Condenser	38,500,000	38,500,000
12	Evaporation and Drift	618,000	1,236,000
13	Cooling Tower Blowdown	32,000	64,000

Brine from the low pressure flash vessel will be transferred to an atmospheric flash vessel to produce steam at atmospheric pressure. The brine will contain about 310,000 ppm of dissolved salts and 1 percent suspended solids as it exits the atmospheric flash vessel.

Subsequent treatment of the brine in a solids contact clarifier and a thickener tank will concentrate the suspended solids into a slurry of 30 percent solids/70 percent brine. Part of this underflow will be filtered to produce 7,000 lb/hr of a 65 percent solid cake for disposal at a commercial landfill. The remaining underflow will be used to control the deposition of silica from the flashing brine.

Clarified effluent will pass through a dual media filter system to reduce the suspended solids content to less than 5 ppm. The filtered brine will then be injected under pressure into the ground at a temperature of 230°F and a flow rate of 5,322,000 lb/hr.

1.6 Power Generation

Both high pressure and low pressure steam will be used to drive the turbine-generator unit. Spent steam from the turbine discharge will be condensed by direct contact with cooling water from the cooling towers.

Condensate will be pumped from the bottom of the condenser back to the cooling tower. Sufficient condensate is available to supply all the make-up water for the tower, replacing the water lost through evaporation and drift. In addition, the constant inflow of condensate to the tower will allow for a blowdown stream from the circulating system sufficient to keep the salinity of the cooling water low. Blowdown water will be sent to the solids contact clarifier for mixing with the brine.

Turbines, generators and cooling towers installed during Phase I will be adequate to meet Phase II requirements and will be limited to the lower production rate by availability of steam and brine treatment facilities during Phase I.

1.7 Brine Injection

Approximately 75 to 80 percent of the geothermal fluid from the production wells will be returned into the ground through injection wells. Twenty percent of the water will enter the atmosphere as water vapor from the cooling tower.

For full production, seven or eight injection wells on the south-east edge of the 1,600 acre production area will be used. Three well pads will be used, each approximately two acres in size. Brine will be injected into the ground at a depth between 5,000 and 12,000 feet determined by permeability distribution data now being gathered. Fracture permeability, density and interconnections which affect pressure maintenance and temperature degradation will determine which zone within the ground is best suited for brine injection.

In the event that near-field, peripheral injection is not technically feasible, or becomes impractical during project operation, an alternate area has been identified which has the potential of being used for injection at depths of 2,500 to 4,500 feet below surface. Injection at these depths will require seven well pads of 0.4 acre each with a single well on each pad.

It is expected that continual operation of the injection wells may lead to plugging, which will necessitate the drilling of up to seven replacement wells adjacent to the old ones during the life of the project. (See Figure 1.3-2.)

Injection fluid will be pressurized at the power generation facility to about 375 psia and transferred to the injection wells in two insulated, above ground pipes. The two pipelines will be constructed along one of the alternative pipeline routes shown on Figure 1.3-2, or one of the alternative pipeline routes within the alternative injection well field pipeline corridor also shown on Figure 1.3-2. Vertical expansion loops about 20 feet high will be installed every 200 to 400 feet as needed.

Power production at the Phase I level will result in only half of the amount of brine to be injected. Three or four injection wells will be used to dispose of the brine at the lower flow rate. Only one injection pipeline will be installed for Phase I.

1.8 Power Transmission

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A power line will be constructed to connect the facility to either of two existing circuits operated by the IID for delivery to the SCE network. The new line will be mounted on single wooden poles. The preferred route will run one-half mile to the west; the alternative line will run two miles to the east (see Figure 1.3-2).

1.9 Additional Facilities

A control building, storage facility, parking area and electrical switchyard will be located contiguous to the power generation area. Approximately 12 acres will be used for these facilities including the steam and brine handling and power generation areas. An additional 12 acres will be used temporarily during construction for parking and laydown areas.

Brine storage basins will be constructed adjacent to each well pad. The well pad basins will have a capacity of about 2 acre-feet each, and will be used to temporarily hold the cold brine lifted out of a well during

start up. Liquid in the basins will be injected into the brine line leading to the power generation facility after production starts, and will be disposed of along with other brine in the injection wells. The basins will be clay-lined to prevent contamination of ground and surface waters.

A 10 acre-foot concrete brine storage pond at the brine processing facility will be used during start up, shut down and upset conditions. Brine collected in this pond will be subsequently pumped to the clarifier system for eventual injection.

1.10 Construction Activities

Effective field construction for Phase I will be 15 months beginning in early 1985. Major power plant and well field components will be shipped by rail to Niland or Calipatria and transported to the site by truck.

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SECTION 2.0

EXISTING CONDITIONS/ ENVIRONMENTAL IMPACTS/ MITIGATION MEASURES

This section presents, by discipline, a statement of the existing conditions in the project area and vicinity, an analysis of the significant environmental impacts which would result from the construction and operation of the proposed project, and measures which would mitigate those environmental impacts. Effects which were found not to be significant are also identified by discipline in this section. Potential environmental effects are analyzed in this section at a more detailed level than in the Initial Study (Appendix F). Comments received on the Initial Study and the Notice of Preparation are incorporated where appropriate.

2.1 Geology

2.1.1 Existing Conditions

2.1.1.1 Landform and Topography

The project area lies in the northern end of the Imperial Valley. As described in the MEIR (Section 3.1.1.1), the Imperial Valley is a broad, flat depression which forms the central portion of the Salton Trough. The Imperial Valley, with elevations ranging from +47 feet MSL to -278 feet MSL at the bottom of the Salton Sea, is bounded by mountains of granitic, sedimentary, and metamorphic rock which rise to elevations of over 8,700 feet MSL.

Elevations within the project area range from -202 feet MSL in the southwest corner of the primary project area to -48 feet MSL in the northeast corner of the alternative injection well field area. The southwest-directed slope decreases gradually from 1.7 percent in the northeast to 0.2 percent in the southwest. The proposed power plant location, shown on Figure 1.3-2, lies at an elevation of approximately -191 feet MSL.

2.1.1.2 Stratigraphy

As stated in the MEIR (Sections 3.1.1.2 and 3.1.1.3), the Salton Trough is filled with up to 22,000 feet of late tertiary and quaternary lacustrine and deltaic sands and shales deposited by the Colorado River as it alternated between flowing into the Gulf of California and the Salton Trough. The most recent natural diversion of the Colorado River into the Salton Trough deposited sediments into ancient Lake Cahuilla. Within the deltaic sediments near the center of the Salton Trough are a number of volcanic dikes and intrusives, the surface expressions of which are five small rhyolite domes at the southeast end of the Salton Sea.

The stratigraphy underlying the primary project area is topped by a thick layer (about 2,600 feet) of low-permeability sediments dominated by clays, shales, and claystones with thin stringers of silty-sand. This clay-rich rock forms the "caprock" to the reservoir, preventing upward movement of geothermal fluid to the surface. Below 2,600 feet the stratigraphic sequence consists predominantly of silty sandstones, sandy siltstones, and claystones interbedded with some thicker (20- to 130-foot) channel sands. Electric logs show a steady decrease in porosity and permeability from about 15 percent at 4,500 feet to about 10 percent at 8,000 feet and about 6 to 8 percent from 8,000 to 10,000 feet, the depth penetrated to date. Rock fragments recovered from the production interval (7,500 to 10,000 feet) show the sandstones metamorphosed nearly to quartzite, with the pore spaces between the sand grains naturally cemented so that virtually all original intergranular porosity has disappeared. The low, 6 to 8 percent porosity of the reservoir results from small, near-vertical, interconnected fractures or fracture zones. This is in marked contrast to the stratigraphy described in the MEIR, that of a 3,500-foot thick, high intergranular porosity reservoir topped by only a 1,000-foot thick caprock.

No wells have yet been drilled in the alternative injection well field area, so no direct information is available about the stratigraphy underlying this area. However, based upon extrapolations from surrounding

areas, the stratigraphy below the alternative injection well field area is likely to be similar to that of the primary project area, except that the stratigraphic column is likely to contain more sands with higher porosity below 2,600 feet.

2.1.1.3 Geologic Structure

As described in the MEIR (Sections 3.1.1.2 and 3.1.1.3), the Salton Trough is a geologic structure that was created several million years ago as a result of a rift, or separation, of two of the earth's crustal plates. This rift is continuing to widen, which results in the continued regional subsidence, high heat flow, and seismic activity (earthquakes) observed in the Imperial Valley today. Numerous active, strike-slip faults, trending northwest and associated with the widening rift, are known or inferred within the Imperial Valley.

2.1.1.4 Geologic Hazards

a. Seismic Ground Shaking

As stated in the MEIR (Section 3.1.1.4.a.), the Imperial Valley is one of the most seismically active areas in the United States; more than 12 earthquakes with Richter magnitude greater than 6.0 have occurred in the Salton Trough in this century (Layton and Crow, 1980). Although the project area is located east of the very active Imperial and Brawley faults and is relatively aseismic (Layton and Crow, 1980), it is still near several faults which could produce seismic ground shaking. Based upon the analyses contained in the MEIR (Table 3.1-1) and the South Brawley Unit No. 1 Environmental Impact Report [(South Brawley EIR) Westec, 1983, Table 3.1-1], the proposed power plant site can be expected to experience a maximum bedrock acceleration of 0.6 to 0.7g during the worst-case seismic event.

b. Fault Displacement

Movement along a fault plane can result in displacement or offset of the ground surface on opposite sides of the fault plane. Movement along a fault which intersects a wellbore may also result in displacement or offset of the wellbore. Figure 2.1-1 shows the known and inferred faults in the vicinity of the project area. Although there are no known fault traces within the primary project area, there are a few poorly located, inferred fault traces within one mile of the proposed power plant site, and the alternative injection pipeline corridor crosses two inferred fault traces. None of the inferred faults are known to be active.

c. Liquefaction and Differential Settlement

Soil beneath the project area may contain shallow water tables and, locally, layers which are loosely compacted or capable of being liquified upon shaking (thixotropic). This could result in the differential settling or the liquefaction of the soil under structures during an episode of seismic ground shaking.

d. Subsidence

As stated in the MEIR (Section 3.1.1.4.d and Appendix 3.1), natural subsidence, related to the rifting of the Salton Trough, is widespread throughout the Imperial Valley. This has been a continuing concern to the agricultural industry, which depends upon the stability of the ground surface elevations for proper functioning of the gravity-flow irrigation and agricultural waste water systems. At the town of Niland, over the period 1974 to 1979, natural subsidence occurred at the rate of approximately 1.5 inches per year.

BASE MAP SHOWS POSSIBLE FAULTS AND DISCONTINUITIES INFERRED FROM ELECTRICAL RESISTIVITY SURVEYS. SOURCE: MEIDAY, ET AL, 1976.
 STRIPPED LINES AND HATCHED AREA SHOW FAULTS, SEISMIC ZONES AND SEISMIC LINEMENTS INFERRED FROM SEISMIC REFRACTION SURVEYS.
 SOURCE: ADAPTED FROM FUIS, ET AL, 1982.

FIGURE 2.1-1

KNOWN AND INFERRED
 FAULTS IN THE
 NGEF PROJECT AREA

e. Erosion and Slope Stability

As stated in the MEIR (Section 3.1.1.4.e), the project area has a very low erosion potential, and the project area does not contain any features (such as river channels) which may be subject to slope instabilities.

2.1.1.5 Soils

Specific soil units of the project area and vicinity are shown on Figure 2.1-2. Generally, soils in the primary project production area have been divided into the Imperial group (moderately well drained silty clay) and the Imperial-Holtville-Glenbar group (moderately well drained and well drained silty clay, silty clay loam, and clay loam) (U.S. Department of Agriculture, 1981). The Niland-Imperial Soil group (moderately well drained gravelly sand, fine sand, silty clay, and silty clay loam) dominates in the alternative injection well field area. Soils in the alternative injection pipeline corridor grade between the two areas. All of these soils are generally deep and slightly saline, with a low permeability and high to moderate shrink/swell potential. Although the erosion hazard is low, there is a high potential for blowing soil. The perched water table is high and closely spaced tile drains are installed in much of the area to lower the water table and control salinity. As shown in the MEIR (Figure 3.8-4), the soils in the project area are categorized for their agricultural potential as generally Class III-prime (lowest prime classification) or Class IV-fair.

2.1.1.6 Geologic Resources

As stated in the MEIR (Section 3.1.1.6), there are no known geologic resources (commercial mineral extraction areas, mineral or fossil collecting localities, or unique geomorphic features) within the project area.

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<p> PRIMARY PROJECT AREA</p> <p> GEOTHERMAL ZONE OVERLAY BOUNDARY</p> <p> ALTERNATIVE INJECTION WELL FIELD AREA</p> <p> ALTERNATIVE INJECTION WELL FIELD PIPELINE CORRIDOR</p> <p>SOURCE: USDA, 1981.</p>	<p>103 Carsitas Gravelly Sand, 0 to 5% Slopes</p> <p>104 Fluvaquents, Saline</p> <p>110 Holtville Silty Clay, Wet</p> <p>114 Imperial Silty Clay, Wet</p> <p>115 Imperial-Glenbar Silty Clay Loams, Wet, 0 to 2% Slopes</p> <p>116 Imperial-Glenbar Silty Clay Loams, 2 to 5% Slopes</p> <p>118 Indio Loam, Wet</p> <p>122 Meloland Very Fine Sandy Loam, Wet</p> <p>125 Niland Gravelly Sand, Wet</p>	<p>128 Niland-Imperial Complex, Wet</p> <p>135 Rositas Fine Sand, Wet, 0 to 2% Slopes</p> <p>140 Torriorthents-Rock Outcrop Complex, 5 to 60% Slopes</p>	<p>142 Vint Loamy Very Fine Sand, Wet</p> <p>144 Vint and Indio Very Fine Sandy Loams, Wet</p>
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FIGURE 2.1-2
SOILS OF THE NILAND PROJECT AREA
AND VICINITY

2.1.2 Impacts

2.1.2.1 Landform and Topography

Since the proposed project will require no significant alteration of the existing ground surface, no significant landform or topography impacts are anticipated.

2.1.2.2 Seismicity

a. Groundshaking

As stated above in Section 2.1.1.4.a, the proposed plant site can be expected to experience a maximum bedrock acceleration of 0.6 to 0.7g during a worst-case seismic event. Although the worst-case seismic event (maximum credible earthquake at the minimum distance from the facility) is very unlikely to occur during the life of the project, Section 3.1.2.1.a. of the MEIR makes it clear that the project area will very likely be subjected to at least one occurrence of significant ground shaking during the project's 30-year design life. Peak bedrock acceleration could exceed 0.5g, the effects of which could be magnified by the soils in the area. The Uniform Building Code (UBC), adopted by Imperial County as the County Building Code, places the project area into Seismic Zone 4.

b. Induced Seismicity

As pointed out in the MEIR (Section 3.1.2.1.b. and Appendix 3.1), the likelihood of inducing seismic activity by injection in a given geothermal area is related to the "state of tectonic stress" (as indicated by the past seismicity of the area) and the pore pressure and flow associated with the geothermal operation. Although these relationships are poorly understood, in general the MEIR assumes that induced seismicity is more likely in areas, and at depths, with higher existing

seismicity, and more likely with higher injection pressures. This is substantiated by Layton and Crow (1980). The MEIR (p. 3.1-15) concludes that, "In view of the unlikelihood of significant pressure increases accompanying fluid injection and the relatively shallow depth of the reservoir, there is little reason to expect that fluid injection will cause significant expansion of seismic activity in the Salton Sea area."

The primary injection zone is located in a relatively aseismic area, which reduces the possibility of induced seismicity. The brine will be injected into a zone at a depth between 5,000 and 12,000 feet determined by fracture permeability, density and interconnections which affect pressure maintenance and temperature degradation. The relatively high permeability of this injection zone, combined with low injection pressures proposed by the project, will prevent the significant buildup of pore pressures during injection. This will reduce the possibility of induced seismicity to insignificance.

The alternative injection well field area is also a relatively aseismic area. The alternative injection area zone is assumed by the project applicant to be a high porosity, high permeability reservoir much like that described in the MEIR. If this is demonstrated to be true, and no chemical or physical factors are discovered which would prevent the continued injection of the waste geothermal brine into this zone at low injection pressures, then the potential for induced seismicity from this alternative injection well field would also be low. However, an informed evaluation of the risk of inducing increased seismicity from injection into the alternative injection area is not possible because so little data are available.

Although there has been some concern that the withdrawal of geothermal fluids and heat may also alter the level of seismic activity, calculations attempting to investigate this possibility are subject to extensive conjecture.

2.1.2.3 Fault Displacement

Although there are no known potentially active faults within the primary project area, the alternative injection well field pipeline corridor crosses the inferred surface traces of two fault planes, and previously unknown faults may exist within the area. Ground rupture resulting from displacement during an earthquake could seriously damage any structures constructed over the fault trace.

2.1.2.4 Induced Subsidence

The MEIR (Section 3.1.2.3 and Appendix 3.1) predicted by modeling that the maximum induced surface subsidence under worst-case conditions could range from 4.5 to 35 feet above that naturally occurring as a result of 1,400 MW of staged geothermal development during the next 30 years within the Salton Sea Anomaly. Maximum induced surface subsidence within the NGEP project area under this analysis was predicted to range from 4.5 to 31 feet.

However, many commentators to the MEIR disagreed with the conclusions of this modeling and the assumptions used to reach these conclusions. For example, M.G. Merferd, California State Oil and Gas Supervisor, summarized the California State Division of Oil and Gas's independent analysis of the potential for subsidence in the Salton Sea Anomaly and concluded that, "no detrimental subsidence can be expected as a direct result of 1,400 megawatt, full-field development in the Salton Sea Anomaly over a 30-year period." Because of this disagreement over the amount of anticipated subsidence, an analysis of anticipated induced subsidence from this project was prepared. This analysis is presented in Appendix B, Induced Subsidence Analysis, and is summarized below.

Because no model exists which can accurately predict induced subsidence from a fracture-type reservoir such as the NGEF project reservoir, a qualitative approach was used for this analysis. This consisted of qualitatively comparing the project's estimated potential for reservoir pressure decline with that predicted for two other modeled reservoirs. The analysis then qualitatively compared the potential for estimated pressure declines being translated into reservoir compaction and surface subsidence for each of the reservoirs.

The project reservoir was estimated to have moderately less pressure decline than the two referenced model reservoirs. This is because recharge from the injection wells would be more rapid and substantial natural recharge would be more likely in a fracture reservoir system. The project reservoir, being significantly deeper than either of the reservoirs in the models, is more compacted and lithified than the modeled reservoirs prior to production, and thus was predicted to be less compressible than the modeled reservoirs. The evidence from rock chips that there is essentially no intergranular porosity of the reservoir rock supports this assumption. Also because of its depth, less of the reservoir compaction would likely be translated to the surface as induced surface subsidence than predicted by the two models. As a result of these qualitative comparisons, the analysis predicted that the worst-case induced surface subsidence which would result from the project after 30 years would be less than 1.5 feet, an amount which likely would be undiscernable from the natural subsidence.

For the alternative injection well field, the analysis was more speculative because of the lack of information concerning the stratigraphy of the alternative injection well field and the hydrologic connection between the well field and the production well field. Using a worst-case assumption that none of the injected fluid reaches the production well field, the production reservoir would suffer substantial pressure decline even with significant natural recharge. Because of this, the analysis predicted that on the order of 3.0 feet of induced

surface subsidence could result from the project after 30 years. It should be emphasized, however, that this alternative injection well field analysis is speculative at best since little real data are available. The worst-case induced subsidence would be localized over an area of a few square miles centered around the production area.

2.1.2.5 Soil Liquefaction and Differential Settlement

Potential liquefaction and differential settlement conditions are likely to exist throughout the project area. Remedial engineering measures will be necessary in instances where these conditions occur to provide suitable and stable foundations for structures.

2.1.2.6 Erosion and Slope Stability

Erosion and slope stability impacts will likely be negligible from the project. Since a significant amount of the project area is currently fallow or unused agricultural land, site clearing and grading to prepare for facilities construction will not significantly alter existing ground cover. Rainfall runoff from compacted soil and constructed surfaces would tend to increase erosion at points of concentration, although this will be a very minor problem which can be mitigated. Erosion by wind action could be significant, especially in the alternative injection well field area, but can also be mitigated.

2.1.2.7 Soils

Soils in the project area characteristically have high to moderate shrink/swell potential which could adversely effect inadequately designed and constructed foundations. The chemical characteristics of the project area's soils may also make them corrosive to untreated steel or concrete.

2.1.3 Mitigation Measures

2.1.3.1 Seismicity

a. Groundshaking

As stated in the MEIR (Section 3.1.3.1.a.), the UBC, in addressing seismic design, incorporates the Recommended Lateral Force Requirements published by the Structural Engineers Association of California (SEAOC, 1975). The philosophy underlying the design recommendations of SEAOC is that structures designed in conformance with these design recommendations should, in general, be able to: (1) resist minor earthquakes without damage; (2) resist moderate earthquakes without structural damage, but with some nonstructural damage; and (3) resist major earthquakes, of the intensity or severity of the strongest experienced in California, without collapse, but with some structural as well as nonstructural damage. For Seismic Zone 4, bedrock accelerations as high as .75g are contemplated by the SEAOC recommendations.

The maximum bedrock acceleration the proposed plant site can be expected to experience during a worst-case seismic event is 0.7g. When taken into consideration with the above, design of project facilities in accordance with provisions of the UBC (Seismic Zone 4) should result in structures and plant components adequate to resist, without collapse, the strongest earthquake anticipated. The project design should be carried out by a structural engineer experienced in seismic design.

b. Induced Seismicity

Although the project is not anticipated to induce any detrimental seismic activity, a seismic monitoring program is appropriate. Such a program should consist of both monitoring of seismic activity and injection reservoir fluid pressures. The existing California Institute

of Technology - U.S. Geological Survey Imperial Valley earthquake detection network may be sufficient to detect seismicity induced by project geothermal production and injection operations and isolate it from the naturally occurring seismicity. If not, additional seismographic stations may need to be established. The California Division of Oil and Gas, as the agency responsible for regulating the production (and injection) of geothermal fluids in California, requires geothermal well operators to monitor injection well pressures.

Should these monitoring techniques detect significant changes in the seismic pattern, additional, more intensive monitoring would be appropriate to determine if the changes are attributable to the well field operations. If they are, determination must be made of the appropriate mitigation measures. Mitigation measures to decrease induced seismicity include modification of injection pressures, injection depths, injection well spacing, and/or injection locations. Although unlikely to be necessary, complete cessation of injection operations (and, thus, production operations) is always available as an ultimate mitigation measure.

2.1.3.2 Fault Displacement

A thorough geotechnical investigation at the proposed power plant site should be conducted. As stated in the MEIR (Section 3.1.3.2), "Should any faults be discovered, field development should be planned to avoid placing structures on or across fault traces. Minimum setback distances from identified fault traces should be established by a licensed engineering geologist experienced with mitigating the effects of fault displacement." Likewise, the placement of drilling sites should be such that the possibility of drilling through a fault plane at shallow depth is minimized.

Any pipeline which crosses a known or inferred fault trace should either be designed to accommodate potential offsets or, if accommodation is impractical, designed so that displaced (ruptured) sections can be quickly isolated to prevent significant brine spills. Well locations should be bermed to contain fluids which may be discharged should fault displacement disrupt a well casing.

2.1.3.3 Induced Subsidence

Mitigation measures to deal with the potential for induced subsidence will be of two kinds: those employed to detect or monitor induced subsidence (or its precursors), and those employed to reduce or correct the impacts of induced subsidence once it is detected.

Induced subsidence results from compaction of the reservoir rock, which in turn can be caused by a significant decrease in reservoir fluid pressure. Monitoring of production reservoir pressures and/or production wellhead pressures can provide information which may indicate that reservoir compaction may be occurring. The California Division of Oil and Gas typically requires this monitoring for all development projects.

Since 1971, a substantial amount of data have been collected throughout the Imperial Valley on natural (pre-geothermal production) subsidence rates. These baseline data allow for the detection of induced subsidence through the undertaking of post-geothermal production resurveys. Both the County of Imperial and the California Division of Oil and Gas typically require a project proponent to establish a network of subsidence detection benchmarks throughout the geothermal field and to resurvey the network periodically. If anomalous subsidence is detected by the resurveys, both the County and the Division of Oil and

Gas should evaluate the usefulness of increasing the scope, frequency, or density of the subsidence monitoring network, or undertaking a monitoring program of those surface improvements (concrete canals, paved roads, etc.) which may show the effects of localized differential subsidence through cracking.

The maximum amount of geothermal induced subsidence does not occur instantaneously but develops as a gradual, continuous function of time, depending on production (Lee, et al, 1982). Additionally, as stated in the MEIR (Section 3.1.3.3), the potential for geothermal induced subsidence within the Salton Sea Anomaly would not be uniform over time, but would start relatively small and increase slowly as more and more geothermal power plants became operational and increasingly more fluid was extracted from the Salton Sea Anomaly. This means that if induced subsidence was detected, sufficient time should be available for mitigation measures to be effective before the subsidence created significant impacts.

Other measures which could mitigate the cause of subsidence include increasing the amount of injected fluid, altering injection well locations or spacing, changing injection depths, altering production well locations or spacing, or decreasing the quantity of geothermal fluid withdrawn from the reservoir (including complete cessation of production operations). These measures could be required by the Division of Oil and Gas and/or the County, based upon analysis of the data obtained in monitoring the reservoir (productivity, flow rates, downhole pressure, etc.) and the surface subsidence. Measures which could mitigate the effects of subsidence could include reestablishment of canal, drain, field, or tile drain gradients if they were disrupted, or repairing broken or cracked surface improvements.

2.1.3.4 Soil Liquefaction and Differential Settlement

As stated in the MEIR (Section 3.1.3.4), "It is recommended that detailed foundation investigations be completed for individual power plant or production facilities. If a potential for liquefaction or settlement is identified, appropriate soil preparation and foundation design measures should be incorporated into project design to avoid adverse effects."

2.1.3.5 Erosion and Slope Stability

Erosion due to runoff from compacted soil or constructed surfaces can be easily prevented through proper drainage planning. Erosion by wind action can be prevented by paving, oiling, graveling, or watering roads, yards, and wellsites.

2.1.3.6 Soils

Detailed foundation and soil engineering studies should be undertaken prior to final power plant and major fluid handling facilities design to ensure that any potentially adverse soil characteristics (shrink/swell potential and corrosivity) can be identified and corrected through careful site preparation and foundation design procedures.

2.2 Hydrology

2.2.1 Existing Conditions

2.2.1.1 Groundwater

For the purposes of this assessment, the groundwater resource is considered to be the relatively nonthermal water found below the ground surface and above the geothermal fluids. This groundwater may exist over a wide temperature range, both cooler or warmer than regional surface waters, but in all cases distinctly cooler than the geothermal fluids.

Groundwater studies have been undertaken in the Imperial Valley by various researchers and public agencies (Hardt and French, 1976; Loeltz et al., 1975; Dutcher et al., 1972; and the California Department of Water Resources, 1970). These studies, together with Section 3.2. of the MEIR, form the basis of this discussion.

a. Groundwater Aquifers

As stated in Section 3.2.1.1 of the MEIR, the subsurface geology of the central Imperial Valley consists of a thick upper sequence of predominantly nonmarine lake and playa deposits, including lacustrine silt, sand, and clay, which overlie older sediments. This upper sequence is believed to be several thousands of feet thick and represents the principal groundwater aquifer in the region. The deposits typically have low vertical permeability which can result in isolation of groundwater zones of significantly different chemical composition. The water found in these zones ranges from relatively fresh to highly mineralized.

The extent to which usable groundwater occurs in the project area is unknown. Very little site-specific groundwater information is available and no major groundwater use has been developed in the vicinity of the project. Assuming the local hydrology is consistent with the regional hydrology, then the availability of usable groundwater in the project area is limited.

There are no known water wells in the immediate project area. The nearest water well (W. Ponder, 1983, pers. comm.) is a flowing artesian well located in Section 2, T.11 S., R.14 E, SBB&M on East Mesa approximately 2 miles east of the community of Niland and 3.5 miles northeast of the proposed power plant site (Hardt and French, 1976). Land surface elevation at the well is -30 feet MSL. The well was drilled in 1967 to a depth of 825 feet measured from the land surface. The yield of the well is estimated to be 150 gallons per minute.

A second groundwater well is located approximately 3.5 miles southwest of the primary project area, east of Red Island. As stated in Section 3.2.1.1 of the MEIR, the land surface elevation at the well is -229 feet MSL. A hole was augered to a depth of 152 feet and 2-inch casing installed to a depth of 145 feet. The well flowed naturally approximately 9 gallons per minute from the interval of 145 to 147 feet (Hardt and French, 1976).

Numerous small springs or seeps exist along the northeast side of the Salton Sea in a zone which is roughly parallel to the San Andreas Fault and down gradient of the Coachella Canal. Since many of these springs and seeps postdate completion of the Coachella Canal in 1948, it is assumed that their existence is attributable to seepage from the Canal (Loeltz et al, 1975). These springs or seeps represent an insignificant portion of the groundwater discharge in the project area.

b. Groundwater Levels and Movement

As stated in Section 3.1.1.2 of the MEIR, groundwater movement in the region is generally toward the axis of the Valley. Figure 2.2-1 illustrates the anticipated direction of groundwater movement in the vicinity of the project. Figure 2.2-1 also shows that the piezometric water-level altitudes in the vicinity are above ground surface levels. Thus, there is also a vertical, upward movement of groundwater in all but the northeast corner of the project area.

The steep hydraulic gradients evidenced east of Niland are believed to be attributable to substantial leakage from the Coachella Canal into poorly permeable deposits (Loeltz et al., 1975). Groundwater recharge sources in the region are principally excess irrigation water and canal seepage, both of which originate from the Colorado River. However, seepage of runoff from the Chocolate Mountains northeast of the project area must also contribute to groundwater recharge.

Groundwater discharge in the area is principally into the field and agricultural drains (which have been installed to intercept the upward moving groundwater), the New and Alamo Rivers, or directly into the Salton Sea. Within the irrigated portion of the Valley, most near-surface (5 to 20 feet) groundwater movement is downward to the field drains. The hydraulic altitude contours on Figure 2.2-1 do not reflect the altitude of the drain water.

c. Groundwater Quality

A description of the chemical characteristics of the groundwater from the artesian well located on East Mesa is provided in Table 2.2-1. Numerous similar artesian wells have been drilled in a narrow zone, principally defined by the East Highline Canal on the east and the Alamo River to the west, which extends from 7 to 35 miles south-southeast of the project area (Loeltz et al., 1975). The total dissolved

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TABLE 2.2-1

DATA AND CHEMICAL CHARACTERISTICS OF THE NEAREST WATER WELL
TO PROPOSED PROJECT AREA

Well Location: Section 2, T11S/R14E, SBB&M
 Year Drilled: 1967
 Depth: 825 feet below land-surface datum (LSD)
 Evaluation LSD: 30 feet below main sea level
 Yield of Well: 150 gallons per minute
 Sampling Dates: 1969 - 1972

<u>Chemical Constituent</u>	<u>Average Concentration</u>	
SiO ₂	29	mg/l
Al	<10	mg/l
Fe	0.77	mg/l
Ca	38	mg/l
Mg	25	mg/l
Na	606	mg/l
K	20	mg/l
HCO ₃	594	mg/l
Alkalinity (as CaCO ₃)	488	
SO ₄	261	mg/l
Cl	534	mg/l
F	1.9	mg/l
Br	0.6	mg/l
I	0.3	mg/l
NO ₃	0.00	mg/l
Dissolved NH ₄	5.9	mg/l
Dissolved Ammonia N	4.6	mg/l
Dissolved Solids (Residue at 180°C)	1,789	mg/l
Dissolved Solids (Sum of Constituents)	1,810	mg/l
Hardness (Ca + Mg)	206	mg/l
Noncarbonate Hardness	0	mg/l
Percent Na	66	
Sodium Absorption Ratio (SAR)	18	
Specific Conductance	3,126	micromhos
pH	7.1	
Carbon Dioxide	92	mg/l
Temperature	44.8	degrees Celsius
Dissolved Boron	4.3	mg/l

Source: Hardt and French, 1976.

solids (TDS) content of these wells ranged from 663 mg/l to 5,710 mg/l with most in the 1,000 mg/l to 2,000 mg/l range. Salts in the artesian well water were principally mixtures of sodium bicarbonate and sodium chloride. In most cases, bicarbonate was the dominant anion in wells of relatively low salt concentration with chloride content increasing and surpassing the bicarbonate content in the more concentrated artesian water.

As provided in Table 3.2-1 of the MEIR, the groundwater well located near Red Hill had a TDS content of about 1,600 milligrams per liter. The major salt is sodium chloride. The high hardness (535 milligrams/liter) would be a limiting factor for individual and domestic use.

The other nonartesian wells in the region characterized in the MEIR (Section 3.2.1.2 and Table 3.2-1) are more saline than the artesian waters with TDS content typically in excess of 10,000 mg/l. As such, the quality of these groundwaters are not suitable for most uses.

2.2.1.2 Surface Water

a. Surface Water Systems

The major surface water bodies and conveyance structures located within the project area and vicinity are illustrated on Figure 2.2-1. These include the East Highline Canal, the east-to-west flowing network of laterals and drains, the Alamo River drainage channel, and the Salton Sea.

The East Highline Canal, which is part of the Imperial Irrigation District (IID) water conveyance facilities, extends from the All-American Canal to the northern end of the Imperial Valley, providing water for agriculture, municipal and industrial purposes. The East Highline Canal provides all of the surface water to the project area via a

network of east-to-west flowing lateral canals. The lateral canals are, for the most part, unlined structures located on the north sides of fields. A similar network of drainage canals, located along the south edge of the fields, drains principally east-to-west throughout the project area and vicinity. The "M" and "N" drains empty into the Alamo River drainage channel near the river's Salton Sea outlet, while all of the other drains transecting the project area empty directly into the Salton Sea.

At its closest point, the Alamo River is approximately 2.5 miles southwest of the project site. As stated in Section 3.2.1.2 of the MEIR, the average annual flow of the river near the Salton outlet is about 642,000 acre-feet. Upstream at the border with Mexico, the flow is 1,000 to 1,500 acre-feet annually. The large increase in flow in the downstream direction is largely due to irrigation drainage water.

The Salton Sea is approximately two miles west of the project area. The Salton Sea was formed in the early 1900's when diversion works on the Colorado River failed, allowing most of the river to flow into what was called the Salton Sink. Since that time, the Salton Sea has been sustained by agricultural drainage water. Today, according to information presented in Section 3.2.1.2 of the MEIR, the volume of water in the Salton Sea exceeds 6,000,000 acre-feet. The deepest point is approximately 50 feet deep, although in most places the sea is less than 30 feet deep. As a result of heavy winter rains, the water level of the Sea as of April 4, 1983 was -226.2 feet MSL. This is higher than the year-end (December 31, 1982) level of -227.5 feet MSL. A level of -226.0 feet MSL, the highest since 1925, was reported in April 1984. The Salton Sea water level illustrated on the base maps of this document is the 1975 Salton Sea level of -230 feet MSL.

b. Surface Water Quality

As stated in Section 3.2.1.2 of the MEIR, the total dissolved solids (TDS) concentration for all canal samples taken by the Lawrence Livermore Laboratory (LLL) Imperial Valley Environmental Project (1976-1977) in the Salton Sea KGRA averaged about 970 mg/l. Data published in 1976-77 for TDS content of the Vail 4 Canal, which is located approximately 2.5 miles southwest of the project area, seasonally ranged from 798 mg/l to 3,276 mg/l, with a mean concentration of 945 mg/l. Although no project area-specific data were available, canal water quality in the project area should be similar.

Drain water quality is expected to be significantly more saline. According to data compiled by LLL during their 1976-77 work and summarized in Section 3.2.1.2 and Appendix 3.2 of the MEIR, the TDS concentration in the drains located in the Salton Sea Known Geothermal Resource Area (KGRA) ranged from approximately 2,000 mg/l to over 10,000 mg/l. The trimmed mean (highest and lowest 10 percent of data not used) of the TDS concentration for all samples taken by LLL for agricultural drains in the Salton Sea area was about 4,400 milligrams per liter.

The chemical quality of the Alamo River near the outlet was also sampled by LLL during their 1976-1977 work. According to Appendix 3.2 of the MEIR, the TDS concentration ranged from 2,290 mg/l to 3,320 mg/l, with a trimmed mean of 3,056 mg/l.

The Salton Sea is experiencing the fate of most surface impoundments of water without an outlet: it is becoming increasingly more saline as a result of evaporation and continued salt loading from water recharge sources. According to Section 3.2.1.2 of the MEIR, the TDS concentration in the sea is about 38,400 mg/l. Without a means for removing salt from the Salton Sea, the salinity will continue to rise and the sea will eventually become too saline to support aquatic life.

2.2.2 Impacts

2.2.2.1 Groundwater

a. Resources

No impact to groundwater resources is anticipated since the project proponents have no plans for utilizing groundwater resources for any phase of the project.

b. Quality

Groundwater within the project area could be adversely impacted from several proposed operations or facilities. These include: (1) use of drill site sumps for the temporary storage of drilling muds and geothermal brines during geothermal field development and maintenance operations; (2) storage of geothermal brine in the plant brine storage pond during emergency power plant operations; (3) temporary on-site solid waste storage during normal operations; (4) infiltration of brine from accidental spills; and (5) injection of the spent brine into subsurface reservoirs.

A total of 47 production and injection wells may be drilled during the life of the project. Drilling fluid and produced brine, which may be temporarily stored in drilling sumps or storage reservoirs at the drill sites, or geothermal brine stored in the concrete brine storage pond at the plant site may contain chemical constituents which could degrade near-surface groundwater. However, the California Regional Water Quality Control Board, Colorado River Basin Region, will require the project applicant to meet minimum design and construction parameters for the drilling sumps and brine storage ponds to prevent groundwater contamination, so no significant impact is expected.

The solids extracted from the produced geothermal fluid will require temporary storage on-site before being transported to a suitable disposal site. These solids will principally consist of amorphous silica but may contain heavy metal contaminants from the brine which could cause degradation of near-surface groundwater if they are able to be leached from the wastes and are allowed to infiltrate the soil surface. Specific facilities for handling these wastes have not yet been designed; however, the project applicant has indicated that the wastes will be contained within the solids removal system or solids dewatering system until they are transferred directly to a vehicle for surface transport to an approved waste depository. No adverse impacts to groundwater are anticipated at the project site from the solid waste residue. Fluids used to wash the solids, and fluids extracted from the solids during dewatering, will be circulated back into the injection fluid treatment system and will not result in an impact to groundwater.

Because the piezometric groundwater level is above the ground surface throughout most of the project area, dissolved solids contained in any geothermal spill fluid would be unable to penetrate more than a few feet of soil before being stopped by the rising groundwater. In areas with tile drains, the spill fluid would infiltrate a minimal distance into the soil before mixing with the near-surface groundwater and moving horizontally to the field drains. As such, no significant long-term impact to groundwater resources is anticipated from a geothermal spill.

The project applicant intends to inject approximately 5.3 million lb/hr of spent brine with a TDS of approximately 310,000 ppm into the geothermal reservoir at a zone between 5,000 feet and 12,000 feet. There could be an upward movement of injected fluid which could contaminate local groundwater if the injection wells were not properly completed, but this is not likely because the injected fluid will be much more dense than the reservoir fluid (it is colder and more saline) and will tend to sink until reheated.

If used, the alternative injection well field would inject this same spent brine into a relatively shallow (2,500 to 4,500 feet) reservoir. Because no wells have been drilled into the alternative injection reservoir, the quality of that water is unknown and the exact nature and degree of impacts are impossible to predict. However, it is almost certain that the salinity of this shallow reservoir is significantly less than that of the spent brine. Thus, the spent brine will mix with existing fluids in the reservoir and the quality of the water in the reservoir will significantly deteriorate. U.S. Environmental Protection Agency (EPA) regulations drafted pursuant to the Safe Drinking Water Act as amended (P.L. 93-523 and P.L. 95-190) generally prohibit the degradation of subsurface reservoirs with a TDS content less than 10,000 mg/l unless they are at a depth or location which makes recovery for drinking water purposes economically or technologically impractical. Although vertical permeability in the upper few thousand feet in the alternative injection well field area is assumed to be poor, it is still possible that any near-surface aquifers will be impacted by the injection program. The anticipated depth of the alternative injection zone is significantly below the depth of known water wells in the region.

2.2.2.2 Surface Water

a. Resources

The project applicant plans to utilize geothermal steam condensate as a replacement for evaporative and operational water losses. As such, external power plant water requirements will be limited to one-time filling of the cooling system with canal water. The estimated water volume required for initial filling of the Phase I facility is approximately 700,000 gallons (2.1 acre-feet). It is expected that the initial fill water will be purchased from the Imperial Irrigation District and withdrawn from either the "P" or "Q" lateral. Additional small volumes of canal water may be purchased for landscape

irrigation, hygienic purposes, and other incidental needs. Bottled water will likely be provided at the site for internal consumption. Because of the minimal quantities of surface water required, the impacts to water resources are considered negligible.

b. Water Quality

1

Minor, temporary sedimentation of surface waters may occur during the construction phases of the proposed project. Sedimentation would be limited principally to the canals and drains in the immediate vicinity of heavy equipment activity which may temporarily increase erosion. The "P" drain is the surface water conveyance nearest the proposed power plant site and would have the most potential to be temporarily impacted by sedimentation.

Minor leaks or spills of geothermal fluid are likely to occur over the life of the project. Minor leaks and spills are defined as temporary, small volume releases of the geothermal production or injection fluids which are: (1) confined to the immediate area of the release; (2) do not have any off-site impact; and (3) do not interfere with on-site operations. These include small pipe and fitting leaks and spills associated with normal equipment cleaning and maintenance. Minor leaks or spills are not considered to have a significant potential for impact to surface water quality.

The most significant potential impact to surface water would be from a major or catastrophic spill of the geothermal fluid. The largest credible fluid spill would likely result from the rupture of a pipeline. The volume of the largest credible geothermal fluid spills is estimated in Appendix C. The maximum potential volume of a credible geothermal production fluid spill is estimated at 5,600 gallons for the Phase I facility and 11,100 gallons for the Phase II facility. The maximum credible potential spill volume from a catastrophic rupture in the injection pipeline(s) would be significantly greater: 244,000 gallons

for Phase I and 488,000 gallons for Phase II assuming the spill occurred in the alternative injection well field pipelines. However, more than 99 percent of the maximum injection fluid spill volume would result from emptying of the injection pipeline(s) by gravity drainage. This release of fluid would occur over a much more protracted period than the relatively instantaneous release of fluid by injection pump pressure.

The maximum credible injection fluid spill within the power plant site or onto fields adjacent to the pipelines would impact the equivalent of 10 acres of land at an infiltration depth of about 1 foot. Vegetation in contact with the brine would initially suffer from the thermal impact of the hot fluid. Salt deposition from the brine would significantly reduce, if not eliminate, soil productivity until reclaimed by leaching the salts with fresh water or mechanically removing and replacing the impacted soils.

Spill fluids which enter the surface agricultural water system directly, or indirectly through the tile drain system, will mix with the canal or drain waters and flow downstream toward the Salton Sea. Unless diverted or removed, these fluids would cause a temporary and localized increase in the total salt concentration and chemical composition of the Salton Sea near the outlet of the surface water conveyance structure. (The chemical composition of the produced geothermal fluid is provided in Table 1.4-1.) Based upon the limited volume of any anticipated spill, it is unlikely that any long term impact to surface water quality will result after dilution of the spill fluids.

2

c. Flooding

The entire project area is well outside the regional Flood Hazard Boundary areas identified by the Federal Emergency Management Agency for the Alamo and New Rivers and the Salton Sea. The project area is also located above the -220 foot MSL contour line, below which

the County requires a flooding easement to receive a building permit. As such, flooding potential is limited to on-site impoundments of fluid as a result of a fluid spill or precipitation, or from runoff of precipitation from the mountains to the northeast. No significant impacts are anticipated from flooding.

2.2.3 Mitigation Measures

2.2.3.1 Groundwater

a. Resources

No mitigation is required.

b. Quality

Mitigation measures to prevent the degradation of groundwater quality include the construction of geothermal fluid storage basins with liners, as required by the California Regional Water Quality Control Board, which will prevent the infiltration of fluid. In addition, geothermal waste solids (from the fluid handling system) should be stored in impermeable containers or lined basins until transported to an approved disposal facility.

Measures required to mitigate the potential groundwater quality impact of the proposed injection of spent brine into the geothermal reservoir, which are typically required by the California Division of Oil and Gas, include proper cementing of casing in the injection wells and limiting the injection pressure to well below the pressure needed to produce vertical fractures in the rock. If the alternative injection well field is used, mitigation of the potential for groundwater quality impacts will likely be more difficult because the reservoir is more shallow, and cannot be adequately discussed at present because no information is available concerning the reservoir.

At a minimum, mitigation measures should include a prohibition on injecting into a reservoir with water of less than 10,000 ppm total dissolved solids, as well as design, construction, and monitoring measures to ensure that injected fluids do not migrate vertically or horizontally to contaminate higher quality groundwaters which are otherwise isolated from the alternative injection reservoir.

2.2.3.2 Surface Water

a. Resources

No mitigation measures are necessary because impacts are negligible.

b. Quality

Paving or graveling heavily utilized access roads and dampening freshly scarified topsoil will mitigate impacts of sedimentation from erosion.

Mitigation of surface water quality impacts resulting from spilled geothermal fluids consists of both spill prevention and spill cleanup measures. Principal spill mitigation efforts should be directed to preventive actions. These should include a regular schedule for pipeline maintenance and inspection, as typically required by Imperial County and the California Division of Oil and Gas. The risk of pipe ruptures spilling fluid directly into a canal or drain can be mitigated by using a heavier grade of pipeline materials in pipeline sections which cross water conveyance structures, or enclosing the pipeline within a second, larger pipe or other structure at water system crossings.

Production and injection pipelines should be constructed to minimize the potential for vehicular collisions which could result in pipeline ruptures and spills. This should include routing through sub-grade culverts where crossing roads, and protective barriers at potentially heavy traffic points. It is also recommended that surface pipelines be brightly painted in areas of anticipated heavy on-site traffic to further minimize the risk of pipeline collisions. Flow pressure sensors should be installed which would instantaneously detect a sudden, significant rise or fall in pipeline pressure and activate emergency well shut-in valves.

The area with the greatest potential for both minor and major spills is the power plant site itself. The drainage system at the site should be reviewed to ensure it is capable of containing the largest credible spills. This would ensure the fluid spill would not flow directly into a canal or drain.

As the largest volume credible potential spill is associated with gravity drainage of the injection pipeline(s), it is recommended that measures be taken to minimize the volume of injection fluid return flow that may be released. This could include incorporating back-flow or other valves intermittently within the pipeline, frequent scheduled maintenance, use of spill detection instrumentation, and other methods.

A spill contingency plan should be developed by the project operators to outline a course of action in the event of either a minor or catastrophic spill. The plan should include a course of action to be taken to contain spills to the land surface and to clean up the spills once they are contained. The plan should also include, if possible, an agreement with the Imperial Irrigation District to coordinate temporary closing of control gates in affected lateral canals or inserting barrier grade boards in affected drains to contain geothermal fluid spills in

the surface water conveyances and prevent the spill from reaching the Salton Sea. These measures will minimize the impact of a catastrophic spill and provide time to implement effective cleanup operations.

c. Flooding

No mitigation is required.

2.3 Air Resources

2.3.1 Existing Conditions

A discussion of the existing climatic conditions and air quality for the Salton Sea Anomaly, and for Imperial County in general, together with the air quality standards, rules and regulations governing air resources within the Imperial Valley is presented in Sections 3.3 and 3.4 of the MEIR. A summary of this information as it relates to the proposed power plant and field development project is provided below. The most recent air quality data published by the California Air Resources Board (CARB) for Imperial Valley was used to supplement the air quality data contained in the MEIR.

2.3.1.1 General Climate

As stated in the MEIR (Sections 3.3.1.2, 3.3.1.3 and 3.3.1.4) mean air temperature within the project area and vicinity ranges from 55°F (13°C) in winter to 93°F (34°C) in summer. On the average, half of all days have temperatures that reach 90°F (32°C), and temperatures drop to freezing seven days per year. The average annual temperature is 74°F (23°C). Rainfall throughout the project area and vicinity is sparse, with the average annual rainfall at Niland being only 1.88 inches. Humidity for the project area and vicinity ranges from 28 percent in summer to 52 percent in winter. During the summer months, nighttime humidities rise to 50 to 60 percent and drop to about 10 percent during the day. Monthly evaporation rates vary in the Niland area from a high of 15 inches in July to a minimum of 4 inches in December and January.

2.3.1.2 Dispersion Climatology

a. Wind Patterns

As indicated in the MEIR (Section 3.3.1.5.a), winds across the Salton Sea Anomaly are influenced by the mountains to the west and northwest, the desert to the east, the Salton Sea to the west, and the Gulf of California to the south. The winds which govern the horizontal transport are usually brisk. Vertical and crosswind dispersions are excellent because strong insolation and rapid soil-thermal response produce large convection cells.

Wind direction frequency distributions for winter and summer for the Niland area are shown on Figure 2.3-1. The dominant wind direction throughout the project area and vicinity is from the Salton Sea to land during the day, and land to the Salton Sea at night. As stated in the MEIR (Section 3.3.1.5.a), daytime winds average 8 to 12 miles per hour; at night winds diminish to an average 3.5 miles per hour.

b. Stability

The stability of the atmosphere is its tendency to resist or enhance vertical motions. Unstable conditions tend to rapidly disperse pollutants, whereas stable conditions yield slow dispersion rates. As stated in the MEIR (Section 3.3.1.5.b), atmospheric stability is usually described by the Pasquill and Gifford typing scheme. This scheme establishes six discrete stability categories based on cloud cover, cloud height, solar altitude and wind speed. Atmospheric stability observations for the Imperial Valley are presented in Table 2.3-1. From the tabulation of these observations, it can be seen that restrictive dispersion conditions do occur in lower atmospheric layers. It should be noted that these results represent stability conditions through a deep

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**SEASONAL WIND DIRECTION FREQUENCY
DISTRIBUTION – NILAND, CALIFORNIA**

FIGURE 2.3-1

SOURCE: GUDIKSEN, ET. AL., 1979

Table 2.3-1

IMPERIAL VALLEY ATMOSPHERIC STABILITY DISTRIBUTION

<u>Stability Class</u>	<u>Annual Frequency of Occurrence Percent</u>
A. Extremely Unstable	3.73
B. Moderately Unstable	14.42
C. Slightly Unstable	13.72
D. Neutral - Daytime	10.49
E. Neutral - Night	15.92
F. Stable	41.72

Source: MEIR (Table 3.3-1)

5b

layer of the atmosphere (usually several thousand feet) and do not necessarily show the unstable conditions found near the ground on most days with strong sunshine.

c. Inversions

As stated in the MEIR (Section 3.3.1.5.b), elevated inversions over the project area, if and when they do form, usually occur at 6,000 to 8,000 feet above the surface, and therefore do not significantly affect air quality. Surface-based temperature inversions, on the other hand, frequently form at night throughout Imperial Valley as cool air settles near the ground. These inversions could locally restrict dispersion from low-level sources and cause localized concentrations of pollutants. These inversions are destroyed by surface heating, typically causing emissions that have accumulated above the surface inversions to mix to the ground.

2.3.1.3 Ambient Air Quality Standards

Ambient air quality standards specified by the CARB, together with the National Ambient Air Quality Standards specified by the federal government, are presented in Table 2.3-2. These standards, formulated to protect the public health (primary) and environment (secondary), set the maximum levels of pollutants permitted in the outside air. The major pollution species of concern for geothermal development is hydrogen sulfide gas (H_2S). California limits the concentration of H_2S in ambient air to 0.03 parts per million (42 micrograms per cubic meter) over a one-hour averaging period. Unlike the other standards, the standard for H_2S is not based on the level where it is generally accepted that health effects may occur, but rather is based on the level at which the odor of H_2S can be detected by most people.

TABLE 2.3-2
AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards		National Standards		
		Concentration	Method	Primary	Secondary	Method
Ozone	1 hour	0.10 ppm (200 ug/m ³)	Ultraviolet Photometry	—	—	—
Ozone	1 hour	—	—	240 ug/m ³ (0.12 ppm)	Same as Primary Standards	Chemiluminescent Method
Carbon Monoxide	12 hour	10 ppm (11 mg/m ³)	Non-Dispersive Infrared Spectroscopy	—	Same as Primary Standards	Non-Dispersive Infrared Spectroscopy
	8 hour	—		10 mg/m ³ (9 ppm)		
	1 hour	40 ppm (46 mg/m ³)		40 mg/m ³ (35 ppm)		
Nitrogen Dioxide	Annual Average	—	Saltzman Method	100 ug/m ³ (0.05 ppm)	Same as Primary Standards	Gas Phase Chemiluminescent
	1 hour	0.25 ppm (470 ug/m ³)		—		
Sulfur Dioxide	Annual Average	—	Conductimetric Method	80 ug/m ³ (0.03 ppm)	—	Passive Method
	24 hour	0.05 ppm (131 ug/m ³)		385 ug/m ³ (0.14 ppm)	—	
	3 hour	—		—	1300 ug/m ³ (0.5 ppm)	
	1 hour	0.5 ppm (1310 ug/m ³)		—	—	
Suspended Particulate Matter	Annual Geometric Mean	60 ug/m ³	High Volume Sampling	75 ug/m ³	60 ug/m ³	High Volume Sampling
	24 hour	100 ug/m ³		260 ug/m ³	150 ug/m ³	
Sulfates	24 hour	25 ug/m ³	AHL Method No. 61	—	—	—
Lead	30 day Average	1.5 ug/m ³	AHL Method No. 54	—	—	—
	Calendar Quarter	—	—	1.5 ug/m ³	1.5 ug/m ³	Atomic Absorption
Hydrogen Sulfide	1 hour	0.03 ppm (42 ug/m ³)	Cadmium Hydroxide Strainer Method	—	—	—
Hydrocarbons (Corrected for Methane)	3 hour (6-9 a.m.)	—	—	160 ug/m ³ (0.24 ppm)	Same as Primary Standards	Flame Ionization Detection Using Gas Chromatography
Vinyl Chloride (Chloroethene)	24 hour	0.010 ppm (28 ug/m ³)	Gas Chromatog- raphy (AAS staff report 78-8-31)			
Ethylene	8 hour	0.1 ppm	—	—	—	—
	1 hour	0.5 ppm				
Visibility Reducing Particles	1 observation	In sufficient amount to reduce the prevailing visibility to less than 10 miles when the relative humidity is less than 70%		—	—	—
APPLICABLE ONLY IN THE LAKE TAHOE AIR BASIN:						
Carbon Monoxide	8 hour	6 ppm (7 mg/m ³)	NDIR	—	—	—
Visibility Reducing Particles	1 observation	In sufficient amount to reduce the prevailing visibility to less than 30 miles when the relative humidity is less than 70%		—	—	—

2.3.1.4 Rules and Regulations

In California, stationary sources of emissions are controlled by the local air pollution control districts, with the CARB maintaining oversight responsibility. The regulations issued by the Imperial County Air Pollution Control District (APCD) to ensure compliance with state and federal standards are primarily directed toward controlling emissions from agricultural and petroleum industries. Those APCD regulations considered relevant to geothermal operations are as follows:

Rule 401 - Opacity of Emissions

Limits opacity of any airborne plant effluent discharge to 20 percent opacity except for condensed vapor plumes.

Rule 403 - Quality of Emissions

Limits particulate loading of emissions to 0.2 grains per cubic foot of gas emitted.

Rule 405 - Sulfur Compounds

Limits sulfur compound emissions to 0.2 percent by volume (2,000 parts per million) at the point of discharge.

Rule 407 - Nuisance

Prohibits emissions that may cause injury, detriment, nuisance or annoyance to any considerable number of people.

In addition to the above regulations is the New Source Review Rule which is embodied in the Imperial County APCD Rules 201 through 212. Currently, this rule applies to emissions from new stationary sources which would result in a net increase of 250 or more pounds during any day of any air pollutant for which there is a national standard. In The Geysers geothermal area of Northern California, the New Source Review process has been expanded to include H₂S limitations

as well. If such a control philosophy is adopted by the Imperial County APCD, it will probably be incorporated within the New Source Review process of obtaining permits to construct and operate the plant.

2.3.1.5 Ambient Air Quality

The most recently available CARB annual air quality data for Imperial Valley is summarized in Table 2.3-3. With agriculture as the major industry in Imperial Valley, the most prevalent airborne pollutant is particulate matter in the form of fugitive dust. The maximum daily concentrations during each month for the past 3 years at Brawley (measurement site closest to project area) were well in excess of the California and federal particulate ambient air standards of 100 and 260 micrograms per cubic meter, respectively. Present proposals (Bureau of National Affairs, Inc., 1984) to change the particulate standard so that it reflects only inhalable particulates would probably reduce these measured violations. The federal standard for ozone of 240 micrograms per cubic meter has been exceeded only once in the last 3 years. Sulfur compounds in the form of sulfur dioxide or sulfate particulates are very low. Lead, an indicator of vehicular activity, is also well below the standard and improving every year.

An extensive air quality and meteorological baseline study was conducted by Lawrence Livermore Laboratories (LLL) from 1976-1978 throughout the Imperial Valley. As stated in the MEIR (Section 3.4.1.3), the LLL study generally characterized the low gaseous pollutants and high dust levels found throughout the Valley today. The study did, however, show some violation of the H_2S standard. The California H_2S standard of 42 micrograms per cubic meter was exceeded at the Niland monitoring station on 4 percent of all days that data were collected between December 1976 and April 1978. The validity of these data has since been questioned by the CARB because of quality control of the monitoring program (Air Resources Board, 1980).

TABLE 2.3-3
IMPERIAL VALLEY
AIR QUALITY SUMMARY

	1979	1980	1981
Ozone - El Centro			
Days with 1 Hour $\geq$ 0.10 ppm	10	14	15
Days with 1 Hour $>$ 0.12 ppm	0	0	1
Maximum Hourly Concentration	0.120 ppm	0.120 ppm	0.180 ppm
Sulfur Dioxide - El Centro			
Days with 1 Hour $\geq$ 0.50 ppm	0	N.D. ⁽¹⁾	N.D.
Days with 24 Hours $\geq$ 0.05 ppm	0	N.D.	N.D.
Maximum Hourly Concentration	0.060 ppm	N.D.	N.D.
Maximum Daily Concentration	0.009 ppm	N.D.	N.D.
Particulate Lead - El Centro			
Months $\geq$ 1.5 $\mu\text{g}/\text{m}^3$ (2)	0/12	0/12	0/12
Maximum Monthly Concentration	0.59 $\mu\text{g}/\text{m}^3$	0.53 $\mu\text{g}/\text{m}^3$	0.52 $\mu\text{g}/\text{m}^3$
Total Particulates - El Centro			
24 Hours $\geq$ 100 $\mu\text{g}/\text{m}^3$ (2)	36/58	30/60	39/58
Maximum Daily Concentration	406 $\mu\text{g}/\text{m}^3$	223 $\mu\text{g}/\text{m}^3$	321 $\mu\text{g}/\text{m}^3$
Total Particulates - Brawley			
24 Hours $\geq$ 100 $\mu\text{g}/\text{m}^3$ (2)	56/57	54/56	56/60
Maximum Daily Concentration	645 $\mu\text{g}/\text{m}^3$	407 $\mu\text{g}/\text{m}^3$	628 $\mu\text{g}/\text{m}^3$
Total Particulates - Calexico			
24 Hours $\geq$ 100 $\mu\text{g}/\text{m}^3$ (2)	56/58	51/55	56/58
Maximum Daily Concentration	520 $\mu\text{g}/\text{m}^3$	438 $\mu\text{g}/\text{m}^3$	577 $\mu\text{g}/\text{m}^3$

Source: California Air Resources Board

(1) No data available.

(2) Expressed as number of violations per number of days or months tested.

2.3.2 Impacts

2.3.2.1 Preoperational Emissions

Activities contributing to preoperational aerial emissions include site construction, well drilling, and well testing. Because emissions associated with these activities are temporary and confined to a limited area, impacts will not affect regional ambient air quality. However, these impacts could have an effect on the local air quality.

a. Fugitive Dust

As discussed in the Section 3.4.2.1 of the MEIR, fugitive dust emissions resulting from construction activity could cause a significant adverse air quality impact due to the high dust levels already present throughout the Valley. According to EPA estimates, each acre of disturbed land lofts about 80 pounds of dust into the air each day. Approximately 50 acres of land will be disturbed during construction activities. If one-half the total acreage required for the project is experiencing construction disturbance at any one time, then about 2,000 pounds of dust would be released each day during construction. If routine watering and other dust control techniques are applied, the generation can be reduced to 1,000 pounds, or less, of dust per day. Compared to current emissions levels of 50 tons or more of fugitive dust per day throughout most of the Valley, the estimated construction emissions are small.

b. Combustion Emissions

Another source of preoperational emissions results from operation of the industrial equipment used during construction and well drilling. These emissions have been characterized in Section 3.3.2.1 of the MEIR. Daily combustion emission rates from industrial equipment and drilling operations would amount to about 400 pounds per day. These

emissions would be made up primarily of oxides of nitrogen (70 percent), with smaller amounts of carbon monoxide (15 percent) and particulates, hydrocarbons, and oxides of sulfur (each approximately 5 percent) also present. The impact from this small and temporary emission of pollutants is considered negligible.

c. Noncondensable Gases

Noncondensable gas emissions released during drilling operations are typically insignificant, since the drilling mud will normally prevent most emissions from escaping to the surface. Small emissions that might occur are the result of gases, most likely (H_2S), becoming entrapped in the drilling mud. The anticipated H_2S content of the geothermal fluid, as presented in Table 1.4-1, is 2.4 parts per million by weight. Assuming the very worst conditions, that an estimated 20 percent of the well production rate is permitted to escape to the surface with the recirculating drilling mud, then, at a maximum production rate of 500,000 pounds per hour of brine, the H_2S emission rate from the well being drilled would be approximately 0.24 pounds per hour. An emission level of this magnitude would represent a temporary and insignificant air pollution impact.

In the event of an accidental release of fluids, such as a well blowout, the resulting aerial noncondensable gas emissions and air quality impacts could be greater than those discussed above. Since the flow rates and other parameters of an accidental release are likely to be very similar to those assumed for well testing, the impact analysis presented in the following paragraphs should be a good indication of air quality impacts which may result due to accidents.

Preoperational emissions of noncondensable gases could be significant during well testing operations where flowing well(s) are permitted to vent to the atmosphere. Noncondensable gas emissions

resulting from the proposed well testing operations were modeled utilizing the meteorological data contained in Section 3.3 of the MEIR and project-specific resource data and process parameters supplied by the project applicants. The model used to simulate these operations was the MPTER model, which is an EPA-approved straight-line Gaussian airflow model. The primary air pollutant modeled was H_2S , although emissions of other gases were evaluated as well. The results of the modeling effort provide the basis for this assessment.

Emissions were modeled for two types of test operations. The first new production well drilled will be tested at a maximum flow rate of approximately 500,000 pounds per hour. This well is to be drilled from the production island nearest to the power plant site. Each production well drilled thereafter was assumed to be tested at a lower flow rate. A rate of 200,000 pounds per hour was used to model these tests. The volume of fluid flashing to steam is estimated to be approximately 25 percent of the total flow rate in both cases. Other input parameters used to initialize the model are provided in Table 2.3-4. It was assumed in all instances that the wind was blowing directly from the well being tested to each receptor.

The concentrations of H_2S under the above conditions were predicted for six "sensitive receptor" sites. The sensitive receptors included three residences located near the project production area, the community of Niland, the Wister Waterfowl Management Area, and the Imperial Waterfowl Management Area. The location of these receptor sites in relationship to the production wells are shown on Figure 2.3-2. Results from the dispersion simulations are presented in Table 2.3-5. The maximum hourly impact from a single well is predicted to be 4.18 micrograms per cubic meter, or 10 percent of the California hourly standard of 42 micrograms per cubic meter. Over shorter time periods of a few minutes, H_2S odors may be detectable during testing, but the hourly H_2S standard will not be violated.

TABLE 2.3-4

INPUT PARAMETERS FOR MPTER MODEL - WELL TESTING OPERATIONS

	Flow Rate	
	<u>500,000 lbs/hr</u>	<u>200,000 lbs/hr</u>
Emission Rate (H ₂ S)	.15g/sec.	.06g/sec.
Stack Diameter	3.0 m	3.0 m
Stack Height	9.1 m	9.1 m
Exit Temperature	380°K	380°K
Exit Velocity	2.85 m/sec.	1.14 m/sec.
Ambient Temperature ⁽¹⁾	307°K	307°K
Ambient Wind Speed ⁽²⁾	4 m/sec.	4 m/sec.
Mixing Layer	2,000 m	2,000 m
Atmospheric Stability	Neutral	Neutral

(1) The average summer temperature was used since it serves as a worst case parameter in terms of dispersion.

(2) The wind speed represents a compromise between high daytime wind speeds and lower nighttime wind speeds.

TABLE 2.3-5
PREDICTED H₂S EMISSIONS - WELL TESTING OPERATIONS

Receptor Number	Receptor Description	Distance From Nearest Well (km)	Maximum Hourly H ₂ S Concentration (ug/m ³)
1	Residence	0.5	4.2
2	Residence	1.3	2.1
3	Residence	0.8	2.6
4	Community of Niland	2.2	1.2
5	Wister Waterfowl Management Area	3.0	0.8
6	Imperial Waterfowl Management Area Headquarters	4.2	0.5
California Ambient Air Quality Standard			42

(1) Refer to Figure 2.3-2.

(2) Represents the higher of the two concentration levels of H₂S predicted for the two differing flow rates of 500,000 lbs/hr and 200,000 lbs/hr.

LEGEND

- PRIMARY PROJECT AREA
- GEOTHERMAL ZONE OVERLAY BOUNDARY
- ALTERNATIVE INJECTION WELL FIELD AREA
- ALTERNATIVE INJECTION WELL FIELD PIPELINE CORRIDOR
- RESIDENTIAL AREAS (LOW TO HIGH DENSITY)
- WILDLIFE REFUGES AND DUCK CLUBS
- AREA OF GREATEST PREDICTED H₂S IMPACT (>20 ug/m³) FROM POWER PLANT OPERATIONS
- EXISTING/PROPOSED REPLACEMENT WELL LOCATIONS
- AIR QUALITY IMPACT EVALUATION POINTS
- INDIVIDUAL RESIDENCES
- PROPOSED POWER PLANT LOCATION

0 ¼ ½ 1 MILE

FIGURE 2.3-2
LOCATIONS OF AIR QUALITY IMPACT
EVALUATION POINTS

The maximum hourly concentrations for other noncondensable gases modeled are presented in Table 2.3-6. The measurable gaseous elements in the noncondensable portion of the steam included carbon dioxide, methane and benzene. The impacts from these noncondensable gas emissions would be insignificant and not in violation of any ambient air quality standard. During the test, ammonia would remain dissolved in the brine fluid and would not add to emissions.

2.3.2.2 Operational Emissions

Airborne emissions of environmental concern resulting from proposed power plant operations include hydrogen sulfide gas (H_2S) and other noncondensable gases from the steam generator vent stacks, cooling tower evaporative losses, and cooling tower drift.

a. Noncondensable Gases

Noncondensable gas emissions were modeled using the EPA approved MPTER model. To predict worst case emissions, it was assumed that all noncondensable gases in the produced geothermal fluid, including ammonia, volatilized and were carried with the steam to the steam generators. There, the flashed steam is to be condensed and the noncondensable gases are to be vented to the atmosphere through two stacks, each 6 inches in diameter and a minimum of 80 feet high. Emissions were modeled for stack heights from 80 to 180 feet. The primary air pollutant modeled was H_2S , although emissions of the other noncondensable gases were examined as well. The anticipated composition of noncondensable gases produced from the production well field are provided in Table 1.4-1. The other input parameters used to initialize the MPTER model are provided in Table 2.3-7. It was assumed in all instances that the wind was blowing directly from the power plant vent stacks to each receptor site.

TABLE 2.3-6

NON-H₂S GAS EMISSIONS - WELL TESTING OPERATIONS ⁽¹⁾

Receptor Number	(2) Maximum Hourly CO ₂ Concentration (ug/m ³)	Maximum Hourly CH ₄ Concentration (ug/m ³)	Maximum Hourly C ₆ H ₆ Concentration (ug/m ³)
1	18,000	410	0.073
2	12,000	270	0.048
3	9,000	100	0.019
4	5,000	60	0.011
5	3,400	52	0.009
6	2,300	27	0.005

(1) Non-H₂S gases include carbon dioxide (CO₂), methane (CH₄) and benzene (C₆H₆).

(2) Refer to Figure 2.3-2.

TABLE 2.3-7

INPUT PARAMETERS FOR MPTER MODEL - POWER PLANT OPERATIONS

5a	Emission Rate per Stack	1 g/sec.
	Stack Diameter	0.15 m
	Stack Height	18-55 m
	Number of Stacks	2
	Volumetric Flow Rate/Stack	2.4 m ³ /sec.
	Exit Temperature	339°K
	Exit Velocity	138 m/sec.
	Ambient Temperature ⁽¹⁾	307°K
	Ambient Wind Speed ⁽²⁾	4 m/sec.
	Mixing Layer	2,000 m
	Atmospheric Stability	Neutral

(1) The average summer temperature was used since it serves as a worst case parameter in terms of dispersion.

(2) The wind speed represents a compromise between high daytime wind speeds and lower nighttime wind speeds.

The results from the dispersion simulations for full Phase II operation under worst-case meteorological conditions are summarized in Tables 2.3-8 and 2.3-9. For a stack height of 80 feet, the maximum hourly H_2S impact predicted is 34 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), this at a distance of approximately 0.8 kilometers (0.5 miles) from the power plant. Maximum concentrations would be 16 $\mu\text{g}/\text{m}^3$ for a 120-foot stack and 9 $\mu\text{g}/\text{m}^3$ for a 160-foot stack. Hourly concentrations greater than 20 $\mu\text{g}/\text{m}^3$ occur within a small band between 0.4 and 1.5 kilometers (0.3 and 0.9 miles) from the power plant for the 80-foot stack, as shown on Figure 2.3-2.

The modeling calculations assume a clean (zero concentration) H_2S background level. Without additional pollution control devices, H_2S background concentrations would increase by a small but measurable amount within a few miles of the plant. As the tables show, the California ambient air quality standard of 42 $\mu\text{g}/\text{m}^3$ would not be exceeded under those conditions; however, it is likely that the odor of H_2S could be occasionally detected by the nearest residents with any of the modeled stack heights.

The predicted maximum hourly concentrations for the other noncondensable gases are presented in Table 2.3-9. The measurable gaseous elements in the noncondensable portion of the steam are carbon dioxide, methane and benzene. The impacts from these noncondensable gas emissions would be insignificant and not in violation of any ambient air quality standard. Additionally, the MEIR (Section 3.4.2.3.a.1) summarizes a detailed analysis performed by Layton which looked at non- H_2S gaseous emissions from a prototype 100 MW Salton Sea KGRA power plant. The conclusion of this analysis was that the air quality impact from such a source would have no potential for adverse health effects. The gaseous species analyzed included ammonia, carbon dioxide, methane, mercury vapor, radon, and benzene.

TABLE 2.3-8

H₂S EMISSIONS - POWER PLANT OPERATIONS

Receptor Number	Receptor Description	Distance From Power Plant (km)	Worst Case Maximum Hourly by Stack Height H ₂ S Concentration (ug/m ³)		
			80 ft	120 ft	160 ft
1	Residence	0.8	34	16	7
2	Residence	2.0	16	13	9
3	Residence	2.3	14	11	9
4	Community of Niland	2.3	14	11	9
5	Wister Waterfowl Management Area	3.2	9	8	6
6	Imperial Waterfowl Management Area Headquarters	6.0	4	3	3
California Ambient Air Quality Standard			42		

(1) Refer to Figure 2.3-2.

TABLE 2.3-9
NON-H₂S GAS EMISSIONS - POWER PLANT OPERATIONS
80-FOOT STACK HEIGHT

Receptor ⁽¹⁾ Number	Maximum Hourly CO ₂ Concentration (ug/m ³)	Worst Case Maximum Hourly CH ₄ Concentration (ug/m ³)	Worst Case Maximum Hourly C ₆ H ₆ Concentration (ug/m ³)
1	70,000	34	0.03
2	33,000	16	0.01
3	28,000	14	0.01
4	28,000	14	0.01
5	18,000	9	0.01
6	7,700	4	0.03

(1) Refer to Figure 2.3-2.

b. Evaporative Losses

Evaporative losses from the power plant's cooling tower will increase the localized relative humidity. The MEIR (Section 3.3.2) estimates that for a typical 50 MW power plant this increase in relative humidity would amount to approximately 4 percent. The MEIR goes on to state that given the dry conditions of the Valley, such an increase may have a slightly beneficial effect on vegetation response by lessening the transpiration stress introduced on vegetation by such a dry climate. The moisture emitted as a result of typical plant operation was estimated to be equivalent to the moisture evaporated from 315 acres of water surface at the annual average Imperial Valley evaporation rate of 100 inches per year. By comparison, the Salton Sea's surface area is approximately 200,000 acres. Since the moisture emitted would be only a fraction of that evaporated from the Salton Sea and nearby irrigated farmlands, the overall effect will be minimal.

c. Drift Emissions

Cooling tower drift may affect vegetation downwind of the cooling tower due to the deposition of salts and chemicals typically dissolved in the drift. The total amount of salt deposited from the drift is primarily dependent upon the salinity of the drift droplets and the amount of drift. The salinity of the drift droplets, which is equal to the salinity of the circulating cooling water, will be relatively low under annual average operating conditions because steam condensate, with an estimated total dissolved solids concentration of 10 parts per million, is to be used for cooling water makeup. Sample emissions calculations presented in Appendix D demonstrate that under annual average operating conditions, the total dissolved solids concentration of the circulating cooling water will be approximately 200 parts per million (plus the very small quantity of materials added to control algae).

The total amount of drift is a function of the efficiency of the cooling tower drift eliminators and the total circulating cooling water flow rate. Using the project's estimated circulating water flow rate of 38,500,000 pounds per hour, and a conservative estimate that drift emissions will equal 0.01 percent of the circulating water flow, 3,850 pounds of drift will be produced per hour under annual average operating conditions. This will result in approximately 18 pounds of salt per day being emitted from the cooling towers in the form of drift.

A portion of salts released with the drift would remain suspended in air and a portion would fall to the ground near the cooling tower. According to the MEIR (Section 3.4.2.3.a.2), approximately 67 percent of the drift droplet's mass deposits out, while 33 percent remains suspended. This would mean that for annual average operating conditions approximately 12 pounds of salt per day would be deposited out, and approximately 6 pounds of salt per day would be added to the basin particulate level.

Due to the frequent occurrence of downwash from mechanical draft cooling towers, maximum drift deposition rates tend to be within one-half mile of the tower. If all the salt deposited from the drift were to be evenly deposited within this one-half mile area around the plant, the result would then be about 9 pounds of salt deposited per acre per year. One application of 0.3 inches of irrigation water containing 1,000 parts per million of dissolved salts supplies the same amount of salt as one year of average maximum drift. Unless excessive levels of toxic biocides or rust inhibitors are found in the salt deposition, impacts to the surrounding soil and vegetation would be insignificant.

The 6 pounds per day of salt added to the basin particulate level are negligible compared to basinwide total suspended solids emissions estimated to be in excess of 50 tons per day. However, as suggested in the MEIR (Section 3.4.2.3.a.2), should the cooling water

contain any harmful solids, the salt crystallization process does provide a pathway into human and animal lung tissue. While significant amounts of harmful constituents are not anticipated, reasonable precautions and periodic testing are needed to confirm this assumption. It should also be noted that there are no sensitive receptors closer than one-half mile of the power plant site.

The above discussion is based on annual average operating conditions. During the summer months, evaporative losses will increase, and since the amount of steam condensate available for cooling water makeup is essentially fixed, the blowdown rate would most likely have to be reduced. Since the blowdown rate determines the concentration of dissolved solids in the circulating water, a reduced blowdown rate would result in a larger amount of salt being released with the drift.

The worst-case situation for impacts from salt drift emissions would be one where the blowdown rate was reduced to zero and all salt contained in the cooling water makeup was removed with the drift. The amount of salt being added to the cooling towers each hour would remain the same as before (approximately 13 pounds), but the concentration of totally dissolved solids in the drift emissions would then increase to about 3,400 parts per million. The resulting salt dispersal rate would be about 300 pounds per day. Using the same methodology as before, the deposited portion of salt would be approximately 200 pounds per day and the suspended portion would be approximately 100 pounds per day.

The maximum average salt deposition rate occurring within one-half mile of the power plant would be about 150 pounds per acre per year. This is equivalent to the amount of salt per acre contained in about 5 inches of irrigation water containing 1,000 parts per million of dissolved salts. Adverse effects to the soil from salt deposition are not likely because irrigation in the area will tend to leach these salts from the soil. Unless the drift contains substances of higher toxicity

than the chlorides and sulfates normally found in the cooling water, no significant impacts should result under these very conservative operating conditions. The amount of suspended matter added to the basin particulate level would still be considered minimal and the impact insignificant.

2.3.3 Mitigation Measures

2.3.3.1 Preoperational Emissions

Fugitive dust resulting from construction activities can be reduced to a negligible level by spraying water and/or other agents on exposed dirt surfaces of the proposed plant site, well sites, and pipeline easements during the construction phase. Clean gravel (pavement where appropriate) should be applied to finished sites and access roads and maintained throughout the life of the project. Public access to well sites and field access roads should be limited by gates and fences where appropriate. Mitigation measures are not considered necessary for the negligible impacts caused by preoperational combustion emissions and noncondensable gas emissions.

2.3.3.2 Operational Emissions

The noncondensable gas emissions resulting from power plant operations should not in themselves significantly impact the air resources of the project area and vicinity. However, as pointed out in the MEIR (Section 3.4.2.2), multiple power plant development in the Salton Sea Anomaly could possibly lead to future violations of the California standard for H_2S . Therefore, the proposed power plant and geothermal fluid system designs should provide for future abatement of the noncondensable gas emissions should it prove necessary. A stack height of 80 feet would satisfy California Ambient Air Quality Regulations for H_2S ; however, a higher stack height of 120 feet is recommended to provide an adequate margin of safety. Monitoring of ambient

5b

air levels of H_2S should be conducted, as required by the Imperial County APCD, to determine if air standards in the project area and vicinity are being violated and thus require abatement.

Cooling tower drift can be minimized by the consistent attainment of a lower droplet emission rate, which should be specified as a performance condition for the selected cooling tower design. Cooling water should be monitored for boron, biocides, or other potentially toxic elements to ensure that concentrations are well below hazardous levels. Locating the cooling towers on the plant site as far away from the productive fields south of Hazard Road as possible would help minimize deposition of drift water droplets on these lands. Finally, the axis of the cooling towers should be oriented with the dominant wind direction to reduce downwash potential.

2.4 Acoustical Environment

2.4.1 Existing Conditions

2.4.1.1 Ambient Noise Levels

A community noise survey within the Salton Sea Anomaly and in the nearby towns of Niland and Calipatria was carried out by Westec Services, Inc. in January 1981. Measurements of ambient noise levels were made at 26 sites representing a variety of land uses and geographic locations. The results of this survey are presented in Section 3.5.1.2 and Appendix 3.5 of the MEIR.

Noise levels measured in Niland during the Westec survey were relatively high, as would be expected in an urbanized area adjacent to a state highway and railroad line. Typical day-night average sound levels (L_{dn}) ranged from 58 to 68 dB. (All levels referred to are measured in terms of A-weighted decibels, or dB, except where noted.) To the west of Niland, near the Wister Wildlife Management Area, sound levels were lower; values measured at two sites on or near Davis Road were L_{dn} 38 and 39 dB. Previous studies cited in the MEIR (Section 3.5.1.2.6) recorded sound levels in open-space areas of the northern Imperial Valley as ranging from 27 to 50 dB. Most values were below 40 dB, although about one-third were between 41 and 50 dB.

Ambient noise measurements were also recorded by the applicants within the project area on December 21, 1982. These values are typical of agricultural areas in this part of Imperial Valley and are generally consistent with levels reported in other studies. The results of this survey, together with selected measurements from the Westec survey, are presented in Table 2.4-1. The locations of the noise measurement sites in relation to the project area are shown on Figure 2.4-1.

TABLE 2.4-1
 AMBIENT NOISE LEVELS

<u>Measurement Site Location</u>	<u>Location Description</u>	<u>Ambient Noise Levels (dB)</u>
(1)		
1	Open field (under Rainbird irrigation) south side of Gillespie Road, east of English Road.	58
2	Cuff Road, one-half mile south of Coachella Canal Road.	32
3	Wister Waterfowl Management Area; intersection of Davis and Noffsinger Roads.	39
4	Community of Niland; intersection of Highway 111 and N Street.	68
5	Community of Niland; intersection of Niland and Noffsinger Roads.	60
6	Existing Fee No. 1 Wellsite with no operational activity.	35
7	Intersection of English and Hazard Roads.	38
8	Proposed Power Plant Site.	35
9	Existing Britz No. 3 Wellsite with no operational activity.	37
10	Salton Sea National Wildlife Refuge; end of Schrimpf Road	38
11	Near intersection of Schrimpf and English Roads, 100 feet from tractor in operation.	59
12	Sinclair Road on west side of Southern Pacific Railroad Tracks.	42

(1) Refer to Figure 2.4-1.

LEGEND

- PRIMARY PROJECT AREA
- GEOTHERMAL ZONE OVERLAY BOUNDARY
- ALTERNATIVE INJECTION WELL FIELD AREA
- ALTERNATIVE INJECTION WELL FIELD PIPELINE CORRIDOR
- NOISE SENSITIVE AREAS-RESIDENTIAL (LOW TO HIGH DENSITY)
- NOISE SENSITIVE AREAS-WILDLIFE (REFUGES AND DUCK CLUBS)
- EXISTING/PROPOSED REPLACEMENT WELL LOCATIONS
- NOISE MEASUREMENT SITES (APPROXIMATE LOCATIONS)
- NOISE IMPACT EVALUATION POINTS
- INDIVIDUAL RESIDENCES

0 1/4 1/2 1 MILE

FIGURE 2.4-1
LOCATIONS OF NOISE MEASUREMENT SITES AND
NOISE IMPACT EVALUATION POINTS

2.4.1.2 Sensitive Noise Receptors

The locations of potential sensitive noise receptors in the vicinity of the proposed project are shown on Figure 2.4-1. The potential sensitive noise receptors were selected to include both areas inhabited by humans (several nearby rural residences and the community of Niland) and wildlife area (the Wister Waterfowl Management Area and several privately owned duck clubs located near the Salton Sea).

The closest sensitive receptor to the proposed power plant is a residence located about 0.5 miles to the west, near the intersection of Hazard and English Roads. Several other houses are located in an area about 1.0 mile northeast of the power plant site toward Niland. Another residence is located about 1.7 miles to the southeast at the intersection of State Highway 111 and Schrimpf Road. The Wister Waterfowl Management Area and the duck clubs are located at least 1.5 miles from the power plant site.

Three of the proposed production islands are located between 0.4 to 0.7 mile from the residence at Hazard and English Roads. Another proposed production island is located 0.7 mile northwest of the residence located near the intersection of State Highway 111 and Schrimpf Road. The Wister Waterfowl Management Area and all duck clubs are located more than 1 mile from the nearest production island.

The closest residence to an injection well island is located at the corner of McDonald Road and the Southern Pacific Railroad. This residence is approximately 200 feet from the injection well pad. The residence located at the intersection of State Highway 111 and Schrimpf Road is also located approximately 0.7 miles west of the closest injection well site. Several residences are located in an area along Wilkens Road about 0.3 to 0.7 miles from the alternative injection area. Another residence is located about 0.5 miles north of the alternative injection area.

2.4.1.3 Noise Standards

The proposed project would be subject to community noise standards and guidelines set forth by state and federal governmental agencies and the County of Imperial. These regulations are summarized in Section 3.5.1.3 of the MEIR. All regulations, except those of the County, are stated in terms of A-weighted sound levels and in statistical distributions of L_{eq} , L_{dn} , $L_{\%}$ and CNEL.

Sound is normally measured by a meter which is read in decibel (dB) units. Since the human ear is sensitive to high frequencies, an electronic weighting network is used in the meter so it, too, is more sensitive to these high frequencies. Such sound measurements are referred to as A-weighted sound levels, or simply dBA.

In order to compare different noises of varying duration, frequency content, and intensity, a single number rating is used. The most common method of assigning a single number rating to a time-varying noise is to average the noise over a prescribed period of time, such as an hour or a day. The averaging may be of the total noise energy received during the measurement period, which is designated as L_{eq} for "equivalent level". Another way is to state the noise level that is exceeded for a stated percentage of the measurement time. For example, an L_{25} of 52 means that the sound level was above 52 dB for 25 percent of the time.

The L_{dn} is a special form of L_{eq} that is averaged over a 24-hour period, and that adds a 10 dB penalty to all noise occurring at "night" (10 p.m. to 7 a.m.). An earlier form of the day-night level is the community noise equivalent level (CNEL). In this case A-weighted equivalent energy sound level is penalized for evening hours (7 p.m. to 10 p.m.) by 5 dB, while nighttime hours (10 p.m. to 7 a.m.) are penalized by 10 dB.

The U.S. Environmental Protection Agency (EPA) has identified environmental noise levels required to protect against community annoyance and activity interference. An outdoor L_{dn} of 55 dB is proposed as a criterion for residential areas, schools, and hospitals. Imperial County has adopted criteria specifically for noise from geothermal industry sources. Two classes of standards have been established. The Class I noise standards apply to all areas within the County. The Class II noise standards are more restrictive and are applied to those geothermal projects adjacent to or near existing developments (land uses) as determined by the Planning Commission. These noise standards are subdivided by land-use category, with progressively lower noise limits applied to projects adjacent to industrial, commercial, dense residential, normal residential, and open space uses. Because the criteria defining the Class I and Class II noise standards are no longer used to determine EPA standards, it is necessary to translate the county standards into L_{dn} and CNEL indices for reasonable comparisons. Westec Services has performed this exercise and, as stated in the MEIR (Section 3.5.1.3.b), after translation, the geothermal standards were found to exceed most of the EPA standards.

2.4.2 Impacts

2.4.2.1 Noise Levels from Geothermal Development and Operations

Noise sources and expected noise emissions associated with the various stages of a geothermal development project were characterized in the MEIR (Section 3.5.2.2). These stages include drill site preparation, well drilling, well cleanout and flow testing, power plant construction, and power plant operations.

For each stage of development the measured or estimated noise emissions are presented for a distance of 100 feet and are then projected to 10,000 feet. These projections assume sound attenuation only

from geometric spreading and atmospheric absorption. A graphical representation of the projected noise levels for the preoperational and operational stages of development is shown on Figure 2.4-2.

2.4.2.2 Statutory Noise Impacts

The projected noise levels resulting from the preoperational and operational stages of the proposed project at each of the previously identified sensitive areas are presented in Table 2.4-2. When the projected noise levels are compared with ambient noise levels and existing standards, it is possible to estimate the potential noise intrusion into these sensitive areas. The minimum allowable distance needed between each noise source and noise sensitive areas to comply with existing noise standards is presented in Table 2.4-3.

The noise levels projected for the preoperational stages of the proposed project equaled or exceeded the EPA guideline of L_{dn} 55 dB at one noise impact evaluation point each for the peripheral injection plan and the alternative injection plan. For the peripheral injection plan, this point represents the rental unit located along McDonald Road at the Southern Pacific Railroad. The CNR (Community Noise Rating) level for this residence would be "G" which corresponds to threats of community action. The noise levels would greatly exceed the County's Class II standards for normal residential land use. For the alternative injection plan, this point represents several residences located along Wilkins Road. The CNR level would be "E", widespread complaints. The projected noise levels at these residences would also be at least 10 dB above ambient noise levels.

However, in both cases these levels of noise impacts would be temporary, since this preoperational phase of the project would only take from several weeks to several months to complete. Also, the projected noise levels are conservative in that they are based on only

**A-WEIGHTED SOUND PRESSURE LEVELS AS A FUNCTION OF DISTANCE FROM NOISE SOURCE
FOR PREOPERATIONAL PHASES AND OPERATIONAL PHASES OF A
GEOTHERMAL POWER GENERATION PROJECT**

FIGURE 2.4-2

TABLE 2.4-2
PREDICTED NOISE LEVELS

Noise Impact Evaluation Point Location (1)	Distance From Nearest Well Location (ft)	Predicted Preoperation Noise Impact (dBA)	Distance From Power Plant (ft)	Predicted Operational Noise Impact (dBA)
1	2,640	47(2)	21,490	NA(3)
2	1,600	55(2)	17,700	NA(3)
3	7,920	33	11,350	34
4	2,950	46	5,900	43
5	3,960	43	5,900	43
6	4,760	40	7,470	40
7	6,600	35	8,350	38
8	2,110	50	2,640	56
9	2,640	47	7,470	40
10	7,100	34	8,350	38
11	200	75	8,900	37

(1) Refer to Figure 2.4-1. For Noise Sensitive Areas, the evaluation point was selected as point of worst-case noise impact for the area in question and does not represent any one actual receptor.

(2) Applicable only under alternative well field injection scenario.

(3) Not Applicable. Distance of Power Plant (at least 3 miles) from potential receptors precludes any potential noise impact.

Imperial County
Noise Standards for Initial Geothermal Development

Imperial County
Noise Element of the General Plan
Composite Noise Ratings for the Response of Residents
to Community Intruding Noise *

Noise Source	Class I	Class II					to Community Intruding Noise *										Recommended Residential Hospital School	US HUD Residential	Airport Community Residential Standards	Airport Multi-Dwelling Standards
		Ind.	Comm.	Dense Res.	Normal Res.	Open Space	A	B	C	D	E	F	G	H	I					
Drill Site Preparation	300	300	1,000	2,000	3,000	5,000	12,000	10,000	5,000	3,000	2,000	1,000	600	300	200	1,900	800	800	1,700	
Well Drilling	200	400	800	2,000	3,000	4,000	7,300	5,300	3,300	2,000	1,300	800	500	300	150	2,000	800	800	1,800	
Well Cleanout	150	300	300	1,000	2,000	3,000	5,000	4,000	2,500	1,500	800	600	400	150	100	1,400	600	600	1,300	
Well Flow Testing	300	300	800	2,000	3,000	3,000	7,000	5,000	4,000	2,500	1,500	1,000	600	300	200	2,100	800	800	2,000	
10 MW Power Plant	200	600	1,000	2,300	4,000	5,000	7,000	6,000	4,300	3,000	2,000	1,300	800	500	300	2,300	1,100	1,100	2,000	
10 MW Turbine Generation	-	100	150	300	800	1,200	2,000	1,300	1,000	600	400	200	150	100	-	400	150	150	350	
10 MW Condenser/Air Ejector	200	300	800	2,000	3,300	3,000	7,000	6,000	4,000	2,500	1,500	1,000	700	400	300	2,000	850	850	1,000	
10 MW Cooling Tower	50	100	150	300	800	1,300	2,000	1,300	1,000	500	300	200	100	50	-	300	170	170	400	
10 MW Steam Generation Plant	300	600	800	2,000	2,300	4,000	8,000	6,000	4,000	2,500	1,700	1,200	800	700	500	2,000	780	780	1,800	
30 MW Power Plant	600	1,200	2,000	4,000	6,000	7,000	10,000	8,000	7,000	4,500	3,200	2,200	1,600	800	600	4,000	2,000	2,000	3,500	
30 MW Turbine Generation	100	200	300	800	1,300	2,000	3,000	2,300	2,000	1,300	800	600	300	150	100	800	300	300	550	
30 MW Condenser/Air Ejector	400	800	1,300	2,600	3,300	3,000	8,000	6,000	4,000	3,000	2,300	1,800	1,300	700	400	2,800	1,350	1,350	2,500	
30 MW Cooling Tower	50	100	200	400	700	1,200	2,500	1,500	1,000	500	300	200	100	50	-	600	200	200	450	
30 MW Steam Generation Plant	300	1,000	1,300	3,000	3,000	9,000	20,000	15,000	9,000	5,000	3,000	2,000	1,500	800	600	3,500	1,500	1,500	3,000	
Hydro Blaster	400	800	1,200	3,000	3,000	7,000	13,000	12,000	7,000	4,000	3,000	1,500	800	550	300	3,000	1,200	1,200	2,000

NOTE: This chart indicates the minimum distance needed from each noise source to comply with the above noise standards.

MINIMUM ALLOWABLE SEPARATION BETWEEN GEOTHERMAL DEVELOPMENT
AND NOISE SENSITIVE AREAS (FEET)

TABLE 2.4-3

minimal efforts of noise attenuation. Ongoing activities at the injection well sites during the operational life of the project will also create intermittent temporary noise impacts for these receptors. Projected noise levels during preoperational stages for the other evaluation points, including the wildlife habitat areas, were well below the L_{dn} 55 standard and generally within the expected ambient noise level range.

The projected noise levels resulting from power plant operations equaled or exceeded the EPA guideline of L_{dn} 55 at only one noise impact evaluation point. This point represents the single residence located near the intersection of English and Hazard Roads. At this site the projected noise levels would not meet the County's Class II standards for normal residential land use. The CNR level at this site for community response would be level "E" (widespread complaints). At the evaluation point approximately 1 mile northeast of the proposed power plant site on the outskirts of the community of Niland, projected noise levels would meet the County's Class II standards for normal residential land use and the CNR level would be level "D" (sporadic complaints). Noise from the power plant would not be audible at the boundary of the nearest sensitive wildlife habitat, a duck club about 1.4 miles to the northwest of the proposed power plant site. The projected sound level at the duck club property would be about 38 dB, within the expected ambient noise level range in this area. In addition, the proposed power plant operations would meet the County's Class II open space standard.

In summary, the major noise impacts of the proposed project are a significant long-term increase in noise levels over existing ambient noise levels at the single residence located at the intersection of English and Hazard Roads, and: (1) either a short-term, very significant increase and a long-term, intermittent increase in ambient noise levels for the residence located on McDonald Road and the Southern

Pacific Railroad; or (2) a short-term significant increase in ambient noise levels at several residences located south of the project alternative injection area along Wilkens Road.

2.4.3 Mitigation Measures

A detailed description of specific noise mitigation measures which may be applied during preoperational and operational phases of the proposed geothermal development project is provided in Section 3.5.3 of the MEIR, with supplementary figures in Appendix 3.5 of the MEIR. Specific mitigation measures include:

1. Specific "hospital-type" mufflers should be used for diesel engines during wellsite preparation and drilling operations within 0.5 miles of any residences.
2. Portable steam mufflers should be used for wellsites located within 0.5 miles of any residences.
3. Heavy truck traffic and pipe stacking should be limited to the hours between 7:00 a.m. and 7:00 p.m. at wellsites located within 0.5 miles of any residences.
4. An in-line muffler system or rock muffler should be used to reduce power plant steam venting noise.
5. Noise levels at sensitive receptors should be spot-monitored to assure compliance with existing County standards.

Other measures which could be applied should it be demonstrated necessary to further reduce noise impacts include the following:

1. Acoustic shielding could be used to reduce noise from the condenser/air ejector system.
2. The turbine-generator could be shielded or enclosed to reduce noise.
3. The hydroblaster used in descaling operations could be shielded or enclosed to attenuate noise.
4. Appropriate alternative housing could be provided to the occupants of the rental unit on McDonald Road during the term of the most significant impacts.

2.5 Biological Resources

2.5.1 Existing Conditions

2.5.1.1 Vegetation

a. Plant Communities

The plant communities found in the region of the Salton Sea Anomaly have been described and mapped in the MEIR (Section 3.6.1.1.a). Figure 3.6-1 of the MEIR indicates that the proposed project area consists entirely of agricultural land.

A site-specific land use inventory of the project area and vicinity was performed by the applicants in December of 1982. The results of this survey (shown below in the Land Use Section, Figure 2.7-1) confirm that all parcels of land included in the project area are now in agricultural production or have been under cultivation in the past. The project area does not support any undisturbed natural plant communities. However, scattered saltcedar (Tamarix chinensis) and saltbush (Atriplex lentiformis) have become established in parts of the alternative injection well field area that are no longer cultivated. Cattails (Typha sp.) and other common marsh plants may be found in drains and canals throughout the project area and vicinity.

b. Sensitive Plant Species

The MEIR (Section 3.6.1.1.b) lists nine rare or endangered plant species that are known to occur in the Imperial Valley region. There are no records of any of these species in or near the project area. These species are all inhabitants of undisturbed desert plant communities and there is a possibility that some might be found in the Creosote Bush Scrub community north and northeast of Niland near the East Highline Canal. However, as shown on Figure 2.7-1, no suitable

habitat exists in any portion of the alternative injection well field area and it is unlikely that any of these sensitive plant species could occur there.

2.5.1.2 Wildlife

a. Amphibians, Reptiles, and Mammals

The agricultural lands of the Salton Sea Anomaly, including the project area, support a number of common species of amphibians, reptiles, and mammals. These are described and listed in the MEIR (Section 3.6.1.2).

b. Avian Resources

The Salton Sea area is utilized by large numbers of ducks, geese, shorebirds, and other waterbirds. Waterbird populations reach their highest levels during fall and spring migrations and the over-wintering period. The avian species that occur in the region are listed in the MEIR (Appendix 3.6).

Since the project area is located 2 to 3 miles east of the Salton Sea and consists entirely of agricultural land, this area receives little waterbird use. A few bird species typical of agricultural habitats utilize the area for feeding, but few, if any, nest there.

State and federal wildlife management areas total over 6,800 acres of land along the southern and southeastern shores of the Salton Sea (refer to Figure 2.7-1). These areas provide habitat for a large proportion of the over-wintering and migratory birds that are present at the Salton Sea. In addition, there are a number of private duck clubs

in the area which are developed for sport hunting. Many of these duck clubs maintain managed marshlands and grow crops to attract and provide habitat for waterfowl.

The California Department of Fish and Game manages the Wister Wildlife Management Area, which is located about 1 mile northwest of the primary project area and about 2 miles west of the alternative injection well field area (refer to Figure 2.7-1). A number of private duck clubs form an almost continuous buffer zone 0.25 to 0.75 miles wide along the eastern and southern boundaries of the Wister Area (refer to Figure 2.7-1).

The MEIR (Section 3.6.1.2.c.3) summarized available data on waterfowl flight corridors in the region. The major flyway along the shore of the Salton Sea in the Wister Area lies at least 1 mile west of the project area. While short-duration flights of less than 1 mile undoubtedly take place between the Wister Area and adjoining duck clubs, there is no evidence of important avian flight activity over the project area.

c. Sensitive Wildlife Species

According to the MEIR (Section 3.6.1.2.d), several wildlife species listed as rare, threatened, or endangered by the U.S. Fish and Wildlife Service or California Department of Fish and Game have been reported in the Salton Sea region. The Wister Wildlife Management Area provides nesting and feeding habitat for the endangered Yuma clapper rail and probably for the threatened black rail as well. The marsh habitat required by these species is not present within the project area. Two endangered raptors, the southern bald eagle and the American peregrine falcon, may forage occasionally in the Wister Area during migration or over-wintering periods and could visit the project area from time to time.

2.5.1.3 Aquatic Resources

The only aquatic habitat in the project area is the system of lateral canals and drains that serves the agricultural lands. The important aquatic ecosystems of the Salton Sea and the Alamo River lie 2.5 miles to the west and southwest, respectively, of the primary project area. Their biological resources are described in the MEIR (Section 3.6.1.3).

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2.5.1.4 Analysis of Biological Sensitivity

a. Sensitive Habitats

Wildlife habitats within the Salton Sea region have been classified and mapped in the MEIR (Figure 3.6-5) on the basis of their sensitivity to geothermal development. The project area lies entirely within a zone of minimal biological sensitivity; biological constraints are considered to be minimal here for all stages of geothermal development.

b. Sensitive Avian Flyways

The MEIR (Section 3.6.1.4.b) also points out that the placement of electrical transmission lines and other tall structures across flyways used by large numbers of waterfowl and other birds could create a potential hazard. The Wister Area and adjacent duck clubs are considered to be part of a heavily used avian flyway area and thus are mapped as a zone of major sensitivity to transmission line siting. Those portions of the project area within 3 miles of the Salton Sea shoreline are judged to be of moderate sensitivity on the grounds that feeding flights may occur this far inland on occasion.

2.5.2 Biological Impact

2.5.2.1 Vegetation

a. Habitat Loss

9 Construction of the power plant, two additional production islands, and production pipelines will result in the loss of approximately 26 acres of land that is now or has previously been in agricultural production. If replacement production wells are required, up to three additional production islands, together with necessary pipeline easements, may be constructed. This would require conversion of about 15 additional acres of agricultural land.

Construction of the three injection islands and the injection pipeline will result in loss of approximately 13 acres of land that is now in agricultural production. Replacement injection wells, if needed, will be drilled from the existing injection islands.

The alternative injection plan calls for the injection wells to be located on a parcel of land north of Niland that was formerly under cultivation. Each well will require a small cleared area of about 0.4 acre. This may result in a loss of up to 3 acres of land if field access roads are included. There will be no impact to natural vegetation, except for the possible loss of a few native shrubs that have reinvaded this previously cultivated area.

An injection pipeline passing through agricultural lands within the alternative injection well field pipeline corridor will connect the power plant to the alternative injection well field area. The applicant states that the pipeline will be placed along existing rights-of-way and field boundaries. Construction of the alternative injection well field pipeline will displace approximately 15 acres of land dedicated to agricultural use.

b. Sensitive Plant Species

There will be no impact to any sensitive plant species since no habitat suitable for such species exists within the project area.

c. Effects of Geothermal Spills and Cooling Tower Drift

Spills of geothermal fluids in the project area would affect only agricultural land; there would be no impact to natural vegetation. If fluids were accidentally released into an agricultural drain, they could flow into the Salton Sea.

Drift of salt particles from the power plant cooling tower could impact vegetation within 500 feet in the downwind direction. No natural vegetation would be affected, but crops could suffer some damage if the salt deposition rate is high.

2.5.2.2 General Wildlife Resource

a. Habitat Loss

Construction of the power plant, new production islands, injection islands, and pipelines will result in the loss of approximately 55 acres of agricultural land. If the alternative injection well field area is used, then approximately 59 acres of agricultural land will be displaced. In either case, this land provides habitat for a few common wildlife species; it is considered to be of minimal sensitivity to geothermal development. Because of the small area affected and its relatively low value as wildlife habitat, this loss does not constitute a significant adverse impact.

b. Sensitive Wildlife Species

The proposed project will not cause a loss of breeding habitat for any rare, threatened, or endangered wildlife species. There is no direct evidence that sensitive species use the area as foraging habitat, although several species of raptors could visit occasionally. No significant impact to such species would be expected from the conversion of approximately 55 to 59 acres of agricultural land.

2.5.2.3 Avian Resources

a. Habitat Loss

There will be no significant loss of habitat for any bird species.

b. Noise Effects

Geothermal development will cause higher noise levels within the project area. As stated in the MEIR (Section 3.5.2.2), both field development and power plant operation can produce noise levels up to 80 dB at 100 feet. However, noise will attenuate with distance from the sites of geothermal operations. At a distance of 0.5 to 1.0 miles from wellsites and the power plant, noise will usually be equal to or below existing ambient levels.

The nearest sensitive wildlife habitat where large numbers of waterfowl concentrate is the Wister Wildlife Management Area and adjoining privately managed duck clubs. There is a separation of at least 1 mile between this habitat and the closest wellsite. The highest noise levels would occur at this wellsite when flow-testing is carried out. According to projections in Section 2.4.2.1 (Acoustical Environment), resulting noise levels at the edge of the nearest waterfowl habitat would be no higher than 40 dB. This is within the range of ambient

noise levels that have been measured in the Wister Area (Section 2.4.1.2, Acoustical Environment). It should also be pointed out that a geothermal well (Fee #1) has already been drilled and tested at the wellsite closest to the Wister Area.

The power plant site is separated by a distance of 1.4 miles from the nearest sensitive wildlife habitat. Noise from power plant operation would be no higher than 40 dB at the edge of the closest duck club property (refer to Section 2.4.2.2., Acoustical Environment). This is, again, well within existing ambient noise levels.

Thus, although intense noise has the potential to initially startle or repel wildlife, an analysis of noise effects due to the proposed project indicates that there will be no significant adverse impact from the relatively continuous noise emissions associated with well drilling or power plant operation. However, sudden, nonrepetitive operations such as venting of steam or high-pressure geothermal fluids could result in instantaneous noise levels over 80 dB at 100 feet (MEIR, Section 3.6.2.3.b). It is possible that even at distances of 1 mile or more, waterfowl would be startled, resulting in mass flights. Impulse noise can be controlled and the potential for such adverse effects reduced to a minimum (refer to Section 2.5.3, Mitigation Measures).

c. Transmission Line Impacts

Electricity produced by the project will be transmitted from the power plant switchyard over a new interconnection line to either of two existing circuits operated by the IID and then to the SCE network. The interconnection line will consist of a set of conductors carried on wooden poles, much like the rural distribution lines already present in the area. The specific route has not yet been selected, but the alternative preferred by the IID would run west for about 0.5 miles from the power plant to join an existing line that parallels English Road (refer

to Figure 1.3-2). The other alternative would run east for about 2.0 miles from the power plant to join an existing line parallel to and just west of Blair Road.

Although there is always a potential for collision of birds with electrical transmission lines, the proposed interconnection is not expected to create a significant adverse impact. It will parallel an existing road through agricultural lands that are considered to have only moderate sensitivity to the placement of transmission lines (MEIR, Section 3.6.2.3.c). It will involve a relatively short length of new line and the conductors will be placed no higher than those installed on the existing line on English Road. Furthermore, there is no evidence of waterbird concentration areas or heavily used flight paths in the region through which the interconnection line will pass.

There is also a potential for electrocution of raptors at transmission lines where conductor separation is less than the wingspan of certain large species. No significant adverse impact will occur if the interconnection line is designed according to standard utility criteria for the protection of raptors and other large birds.

d. Impact on Refuges and Duck Clubs

There will be no significant adverse impact on the operation of the Wister Wildlife Management Area or of the adjacent duck clubs. No part of the project area is within 0.5 mile of the nearest duck club lands or within 1 mile from the edge of the Wister Area. There will be no effect on waterfowl movements or behavior from placement of transmission lines. Noise from geothermal operations in the project area will ordinarily be at or below existing ambient levels at the boundaries of the nearest duck clubs and of the Wister Area. Loud impulse noise can be controlled to mitigate adverse impact to waterfowl. Accidental spills of geothermal fluid would be highly unlikely to reach the Wister Area or duck club lands through the agricultural canals.

e. Effects of Geothermal Fluid Ponding

As stated in the MEIR (Section 3.6.2.3.e), waterfowl and shore birds could be injured or killed if they come in contact with, or ingest, highly saline or hot geothermal fluids that are ponded at project facilities or accidentally spilled. This is especially true if the ponded or spilled fluid is high in toxic materials and/or organic matter.

2.5.2.4 Aquatic Resources

a. Effects of Increasing Salinity on Salton Sea

No surface water will be used for cooling tower operation or other project requirements. Therefore, the project will have no effect on the salinity of the Salton Sea.

b. Effects of Geothermal Spills

Accidental spills of geothermal fluids could reach the Salton Sea through the agricultural water drain system. Toxic components of the geothermal fluid could have adverse effects on the Salton Sea ecosystem, but the magnitude of the impact would depend on the quantity of material that reached the Salton Sea (MEIR, Section 3.6.2.4). An effective emergency response plan should make it possible to prevent this type of impact (refer to Section 2.5.3, Mitigation Measures).

2.5.3 Mitigation Measures

2.5.3.1 Vegetation

a. Facility Siting

No mitigation measures are required since all proposed project facilities are located on agricultural lands, thus avoiding impact to natural vegetation or sensitive plant species.

2.5.3.2 Wildlife

a. Habitat Protection

The proposed sites of all project facilities are located on agricultural lands of minimal wildlife habitat sensitivity. No significant impact to wildlife habitat was identified and no mitigation measures are necessary.

b. Noise Control

In general, project facilities will be located at a sufficient distance from sensitive habitats so that there will be no significant adverse noise impact to wildlife. However, it is recommended that impulse noise due to such operations as sudden release of steam be controlled by discharge through a muffler or other effective sound-attenuating system. Such mitigation measures need to be used only at project sites within 1 mile of sensitive habitats and only when migratory or over-wintering waterfowl are present in the area.

c. Transmission Line Siting and Design

The proposed routing of the electrical interconnection line avoids completely the Salton Sea shoreline, the Wister Wildlife Management Area, and other habitats that are heavily used as waterbird flyways. However, the interconnection line should be designed according to generally-accepted utility industry standards for prevention of raptor electrocution.

d. Geothermal Fluid Ponding

Should it appear that ponded geothermal fluid at well sites or the power plant is attracting birds, mitigation measures, such as screen covers or bird repellent devices, may be necessary during those periods when fluid is being ponded.

Wellsites and other project facilities near drains leading to the Salton Sea should be diked to prevent geothermal fluids spilled on-site from entering the aquatic ecosystem. Accidental spills should be cleaned up promptly and any waterbirds attracted to the spill area driven away. An emergency response plan should be prepared to deal quickly and effectively with accidental geothermal fluid spills.

2.5.3.3 Aquatic Resources

a. Water Usage

No surface water will be used for project operations, thus avoiding adverse impact to the Salton Sea through increased salinity.

b. Geothermal Spills

Wellsites and the power plant sites should be diked to prevent spills of geothermal fluid from entering the agricultural drain system and thus making their way to the Salton Sea. An emergency response plan should be prepared to deal quickly and effectively with accidental spills.

2.6 Cultural Resources

2.6.1 Existing Conditions

A detailed cultural resources report of the Salton Sea Anomaly was included as Appendix 3.7 of the MEIR. This cultural resources report is a synthesis of research conducted over a sixty-year period, along with some field observations. A map of Cultural Resource Sensitivity Regions was generated (Figure 3.7-1 of the MEIR), and the project area is located in regions designated to be of minimum cultural resource sensitivity.

To confirm this lack of sensitivity, a cultural resources survey of the project area (as shown on Figure 1.3-2) was conducted by the Imperial Valley College Barker Museum during March 1983. No evidence of significant prehistoric or historic occupation or land use was detected as a result of the field work. A complete report of this investigation is included as Appendix E.

The project area has been used in the past for agriculture, but much of the lands are currently fallow due to increasing soil salinity and the lack of a tile drain system. The agricultural land use, past or present, has completely disturbed the native landscape and has considerably reduced the potential for locating any cultural and paleontological resources which may have been in the area.

2.6.2 Impacts

Because no cultural resources were encountered in the project area, no related direct or indirect impacts are foreseen..

2.6.3 Mitigation Measures

No cultural resource impacts are expected. However, if any unusual objects of stone, bone, shell, or ceramic materials are uncovered during drilling or construction, all work in that area should cease until a qualified archaeologist can examine the finds and propose appropriate mitigation measures.

2.7 Land Use

2.7.1 Existing Conditions

2.7.1.1 Land Use Plans and Policies

The project area is under the planning jurisdiction of Imperial County. The County has adopted a General Plan made up of several elements for the physical development of the County. Those elements of the General Plan which pertain to the development of geothermal resources are detailed in Section 3.8 and Appendix 3.8 of the MEIR. A summary of this information as it relates to the proposed Phase II power plant and field development project is provided below.

The Ultimate Land Use Plan of Imperial County designates the primary project area and the alternative injection well field area as General Agriculture. This classification includes agriculture and certain agriculture-related industries and could include urban, commercial and industrial type uses upon granting of a Conditional Use Permit by the County. The alternative injection well field pipeline corridor consists of lands designated as General Agriculture and Rural Residential. The Rural Residential classification is designed to allow construction of residences in rural settings.

The Open Space Element of the General Plan defines open space as any land or body of water which is essentially unimproved and devoted to preservation of natural resources, managed production of resources, outdoor recreation, and protection of the public health and safety. Any lands designated General Agriculture or Rural Residential may be considered open space. Approximately 55 acres (3 percent) of the primary project area's 1,600 acres will be improved. The remaining 97 percent will remain open. If the alternative injection well field is developed instead of the near-field injection area, the project acreage will be 1,800 acres. Of this 1,800 acres, approximately 59 acres (3 percent)

will be improved and the remaining 97 percent will remain open. In either case, the improved acreage will be consistent with the open space category of "managed production of resources."

The Conservation Element of the General Plan designates the primary project area and the southern portion of the alternative injection well field pipeline corridor as having Class III, prime agricultural, potential. The alternative injection well field area and the northern portion of the alternative injection well field pipeline corridor have been designated as having Class IV, fair agricultural, potential.

2.7.1.2 Zoning

The project area and vicinity are currently zoned A-2 (General Agriculture) or A-2-R (General Agriculture/Rural), except for a small parcel near the community of Miland which is zoned C-2 (General Commercial). The project area is also within the boundaries of an existing Geothermal Overlay Zone (G-Zone). As expressed in the MEIR (Section 3.8.1.1.6), this zone overlay designation is necessary for the County to accept, process, and approve applications for conditional use permits for geothermal development projects.

2.7.1.3 Land Uses

Most of the land within the project area and vicinity is dedicated to agricultural production. Other general land uses include residential, wildlife refuge and management, recreation, and geothermal resource exploration. A site-specific land use inventory of the project area and vicinity was performed in December 1982. The results of this survey are mapped in Figure 2.7-1 and are discussed below.

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a. Agricultural

The primary land use within the project area and vicinity is agriculture. Much of this land is now fallow. These lands appeared to have been in this idle state for several years. One reason is that many of these fields lack tile drains necessary for control of soil salinity.

b. Residential

There is one residence located within the boundaries of the project area. It is a small rental unit located in a farm storage and maintenance yard on McDonald Road approximately 0.5 mile east of Highway 111 and adjacent to the Southern Pacific Railroad tracks. This residence is currently occupied by a renter who provides security for the yard. The farm owner is one of the project proponents' current lessors. There are two residences located immediately outside the boundaries of the primary project area. One is located to the west at the intersection of English and Hazard Roads, 0.4 mile from the nearest well location and 0.5 mile from the power plant location. The owner and occupant of this residence is currently one of the project proponents' lessors. The other is located to the south at the intersection of Schrimpf Road and State Highway 111, 0.5 mile from the nearest well location and over 1 mile from the power plant location. There are also several residences located in the immediate vicinity of the alternative injection well field area. One residence is located approximately 0.5 miles to the north, and the others are located to the south along Wilkens Road.

The major concentration of homesites in the vicinity of the project is the community of Niland, which is located approximately 2.0 miles to the north of the primary project area and approximately 1.0 mile south of the alternative injection well field area. There are also several residences located on the outskirts of Niland to the south along Highway 111, and to the west along West 4th Street.

c. Wildlife Refuge and Management

A discussion of the wildlife refuge and management use of lands in the vicinity of the proposed project area is presented in Section 2.5 (Biological Resources) of this report.

d. Recreation

The lands immediately surrounding the proposed project are currently dedicated to agricultural uses and are not serving any specific recreational functions. However, located to the west of the proposed project are the Salton Sea, the Wister Waterfowl Management Area, and several private duck clubs. Recreational use of the Salton Sea includes fishing, hunting, camping, boating, and sightseeing. The Wister Waterfowl Management Area is state-managed recreational land. The Wister Unit is used for hunting, fishing, nature study, camping, sightseeing, birding, and frogging. The private duck clubs located on the southeastern boundary of the Wister Unit are used exclusively for sport hunting of waterfowl.

e. Geothermal

There are two geothermal exploratory wells (Fee No. 1 and Britz No. 3) and a temporary pipeline connecting these wells located within the project area. The drilling of a third well (Fee No. 5) began in April 1984.

f. Other

There are commercially operated algae ponds located on 86 acres approximately 1.5 miles southwest of the proposed power plant site. The water supply for these ponds is the "0" Lateral which lies south of, and runs parallel to, McDonald Road. The "0" Lateral also crosses the project area upstream from the algae ponds.

2.7.1.4 Transportation Systems

As stated in the MEIR (Section 3.8.1.2.f), there are four major transportation routes providing access to Imperial Valley from the rest of California, Arizona, and Mexico. Interstate 8 provides primary east-west access into the southern portion of the Imperial Valley, and Interstate 10 provides primary east-west access to the northern portion of the Imperial Valley. State Highway 86 and State Highway 111 provide major north-south access to, and within, the Imperial Valley. The regional project location map (Figure 1.3-1) illustrates the locations of these major routes.

The proposed power plant site is located 0.6 miles west of State Highway 111 and is accessible from Hazard Road. The initial production islands are accessible from State Highway 111 via Pound Road, Hazard Road, and McDonald Road. Access to the injection well islands is from State Highway 111 via McDonald Road, Schrimpf Road, and Simpson Road. Access to the alternative injection well field area is from State Highway 111 via Wilkens Road. Figure 1.3-2 illustrates the locations of these and other major and secondary roads within the project area and vicinity. A classification of these roads is provided in Table 2.7-1.

According to the MEIR (Section 3.8.1.2.f), average daily traffic and peak hour traffic on Highway 111 in the vicinity of the project are well below design capacities. An important characteristic of the traffic on Highways 86 and 111 is the above-average percentage of trucks. This is indicative of their use as farm-to-market facilities. In addition, a large number of recreational vehicles use these highways (particularly Highway 86) on weekends and holidays. The combination of high truck volume during normal workdays and recreation vehicles on weekends and holidays makes passing extremely dangerous. Accident rates on both highways were reported to be above those expected for these

TABLE 2.7-1
PROJECT VICINITY ROADS

<u>Name of Road</u>	<u>Condition</u>	<u>Classification</u>
<u>Project Area</u>		
Simpson Road	Unpaved	-
Schrimpf Road	Unpaved	-
McDonald Road	Unpaved	Collector
Hazard Road	Unpaved	-
Pound Road	Unpaved	Arterial
Alcott Road	Unpaved	-
English Road	Unpaved	Collector
Highway 111	Paved	Arterial
<u>Alternative Injection Area</u>		
I.I.D. ⁽¹⁾ Maintenance Road along "W" Lateral	Unpaved	-
I.I.D. Maintenance Road along "T" Lateral	Unpaved	-
Wilkins Road	Paved	Arterial
I.I.D. Maintenance Road along No. 1 Drain	Unpaved	-
<u>Pipeline Corridor (Alternative Injection Plan)</u>		
Noffsinger Road	Unpaved	-
Beal Road	Unpaved	-
West 4th Street	Unpaved	-
Niento Road	Unpaved	-

⁽¹⁾ Imperial Irrigation District

types of facilities. Another problem is the lack of left turn pockets on these highways (particularly on Highway 111). Many accidents result from vehicles turning onto side roads.

The main rail line of the Southern Pacific Transportation Company traverses the Imperial Valley in a northwesterly direction, entering Imperial County near Yuma and passing along the eastern side of the Salton Sea. A major branch line originating at Niland provides service to Calipatria, Brawley, Imperial, El Centro, and Calexico. Figure 1.3-2 illustrates the location of the railroad in relationship to the project area and vicinity.

2.7.1.5 Waste Disposal

Spent geothermal brines from the proposed 49 MW (net) power plant will be treated and injected underground as discussed in Section 1.7 of the Project Description. A discussion of potential hydrological impacts associated with this proposed activity is provided in Section 2.2 (Hydrology) of this report.

Solid geothermal wastes generated in Imperial County, including sludges, are currently disposed of in one of four County-operated Class II-2 landfills, or in the IT Corporation's Class II-1 disposal site. The county sites are located in Brawley, Calexico, Holtville, and Salton City. By order of the California Regional Water Quality Control Board, Colorado River Basin Region, these Class II-2 sites can accept only geothermal wastes with a total dissolved solids concentration of less than 6,000 milligrams per liter and with no hazardous constituents as designated by the State of California Department of Health Services. The Class II-1 disposal site is located west of the city of Westmorland, and can accept all geothermal wastes.

Drilling muds and cuttings can usually meet the standards established for Class II-2 landfills, provided they have not been contaminated by geothermal brines. A list of mud components and additives which are typically used during drilling operations, and the maximum proportion of each, are provided in Appendix A. Drilling muds and cuttings that have been contaminated by geothermal brines will most likely require disposal at a Class II-1 disposal site. Additionally, the filter press cake from the geothermal brine treatment system will also most likely require disposal at a Class II-1 site. An elemental analysis of the composition of the filter press cake from the Geothermal Loop Experimental Facility at the Salton Sea Anomaly is provided in Table 2.7-2. While the composition of filter press cake may differ somewhat from the analysis presented, Table 2.7-2 indicates that the filter cake will likely be classified as a Group 1 hazardous waste due to the heavy metal content.

The four County-operated Class II-2 landfills currently are well below their design capacities. The expected life of each of these landfills under the County's projected use rates is as follows: Brawley, 10 years; Calexico, 15 years; Holtville, 20 years; and Salton City, 50 years (Rands, 1983, pers. comm.). The County's projection takes into account disposal of acceptable geothermal wastes.

The IT Corporation's Class II-1 disposal site at Westmorland has been in operation for approximately 2 years and over 95 percent of its design capacity is still available for use. Based on IT-projected use rates, which take into account an optimistic rate of geothermal development, the IT disposal site should be able to provide continuing service for at least another 70 years (DiCori, 1983, pers. comm.).

TABLE 2.7-2

ELEMENTAL ANALYSIS OF THE FILTER PRESS CAKE
FROM THE REACTOR-CLARIFIER AT THE GLEF

<u>Constituent</u>	<u>Weight Percent</u>
Sodium	0.26
Potassium	0.27
Silica	74.40
Iron	5.44
Zinc	0.10
Lead	0.10
Manganese	0.35
Barium	4.80
Calcium	2.29
Strontium	3.02
Sulfur (Total)	2.12
Sulfate	6.38
Others	0.41
Total	100.00

Source: MEIR (Table 3.11-4)

2.7.2 Impacts

2.7.2.1 Land Use Plans and Policies

The proposed power plant and field development project is in conformance with the Imperial County goals, policies, and objectives as stated in the General Plan. A discussion of the project area's biological resources, associated potential impacts, and suggested mitigation measures is provided in Section 2.5 (Biological Resources) of this report.

2.7.2.2 Zoning

The proposed power plant and field development project is compatible with all existing zone designations.

2.7.2.3 Land Uses

a. Agriculture

9 The power plant site, production islands, injection islands, and easements for the production pipelines and the injection pipeline between the power plant and injection area will result in the transition of approximately 55 to 59 acres of land dedicated for agricultural uses to geothermal energy production for the duration of the project. Approximately 70 percent of the 55 to 59 acres to be displaced is presently fallow. Moreover, one-half of the 17 acres of producing crop land that will be displaced has only fair agricultural potential, while the other half has Class III prime agricultural potential. This loss of agricultural land will not be a significant adverse effect of the project.

The vertical expansion loops and the wellhead separators may be a hazard to crop dusters. The level of this impact is dependent on the placement of the expansion loops and the flight patterns followed by the planes.

b. Residential

The residence located at the intersection of Hazard and English roads will be directly affected by the project operations. Construction and operation of the geothermal development project would introduce an intensive industrial operation into the area resulting in increased traffic, noise, and level of human activity. Construction activities lasting roughly 24 months will produce the most intense impacts, but these intense impacts will diminish once construction is complete. The residence at the intersection of Schrimpf Road and Highway 111 should experience no adverse land use conflicts as a result of the proposed project operations.

In increasing degree, the residences located to the south of the alternative injection well field area and adjacent to the Southern Pacific Railroad track will be temporarily affected by increased traffic and noise from drilling operations. The residences located to the west of Niland may also experience minor traffic and noise impacts during construction and operation of the injection pipeline. Drilling of the injection wells and construction of the injection pipeline, should this alternative be developed, would last roughly about 9 months, and ongoing operations would consist only of daily inspection tours and infrequent well workover operations.

The community of Niland should experience no land use conflicts as a result of the proposed project. All proposed facilities and operations will be outside the community's sphere of influence, defined by the boundaries of the Niland Sanitary District.

c. Wildlife Refuge and Management

No land use conflicts or impacts to wildlife refuge and management areas should occur as a result of the proposed geothermal development project.

d. Recreation

The distance of the proposed power plant, production and injection wells, and pipelines from the Salton Sea, the Wister Waterfowl Management Area, and the private duck clubs should preclude any adverse land use conflicts. The proposed power plant site will be over 3 miles from the Salton Sea, 2 miles from the Wister Waterfowl Management Area, and at least 1.5 miles from the nearest duck club. All production and injection islands will be at least 2.5 miles from the Salton Sea and at least 1 mile from the Wister Waterfowl Management Area and all duck clubs.

The location of the alternative injection well field will also preclude any adverse land use conflicts. The alternative injection area is at least 3 miles from the Salton Sea and at least 1 mile from the Wister Waterfowl Management area or nearest duck club. The injection pipeline would be constructed no closer than 2.75 miles from the Salton Sea, no closer than 1 mile from the Wister Waterfowl Management Area, and no closer than 0.5 mile from any duck club.

e. Geothermal

The geothermal wells located within the project production area will be used in the proposed project. The temporary pipeline will eventually be removed.

f. Other

An accidental release or spill of geothermal fluid reaching the "0" Lateral could temporarily contaminate the water supply for the algae ponds. If the contaminated water were introduced into the algae ponds, the algae population would likely be significantly impacted.

2.7.2.4 Transportation Systems

Traffic generated by the proposed project will primarily come from workers commuting to the project area during drilling, construction and operation; movement of trucks and heavy equipment into and out of the project area during drilling and construction; and the transport of solid wastes for disposal during drilling operation.

The greatest volume of worker traffic will result during the drilling and construction phases. The estimated peak work force during this time period (approximately 18 to 24 months) will be 244 workers (refer to Section 2.8.2.1). Employee-related trips will constitute a short-term significant impact on local County roads and State Highways 86 and 111. After drilling and construction activities have been completed, worker traffic will be reduced to a crew of 25 workers required for project operation and maintenance. This will have an insignificant affect on the overall traffic volumes in the area.

Truck and heavy equipment movement during the construction phase will add to the already above-average truck traffic on State Highways 86 and 111. Additional truck trips will be required to transport solid waste generated during drilling operations to an approved disposal site. Fourteen additional production wells and six injection wells are to be drilled to support the Phase II power plant capacity. The drilling of these wells will generate approximately 18,000 cubic meters (24,000 yd³) of drilling solid waste (refer to Section 2.7.2.5). If the alternative injection well field area is developed instead of the

primary, near-field injection area, the volume of waste would be reduced to approximately 15,000 cubic meters (20,000 yd³). Most drilling wastes will be hauled to an approved disposal site (most likely the County's Class II-2 facility at Brawley) on an as-needed basis during drilling operations. Assuming 8-cubic-yard trucks are used to transport the waste over the 21-month drilling period, then approximately 4 to 5 round trips per day (3 to 4 round trips if the alternative injection well field area is developed) will be required to transport the solid waste to the disposal site. This will constitute a short-term significant impact for this period.

Over the 30-year estimated project life an additional 23 replacement wells may be drilled. The drilling of these wells would generate approximately 21,000 cubic meters (28,000 yd³) of drilling muds and cuttings. This volume would be reduced to approximately 17,000 cubic meters (23,000 yd³) if the alternative injection well field area is developed instead of the primary, near-field injection well. Using the same assumptions as before, a total of approximately 3,500 truck trips (approximately 3,000 truck trips if the alternative injection well field area is developed) spread over a 30-year period would be required to transport the drilling wastes to an approved disposal site. The impact of this long-term hauling is considered insignificant.

Solid waste generated during power plant operation will also need to be transported to an approved disposal facility. The closest acceptable site for disposal of these wastes is the IT Corporation disposal facility west of Westmorland. The most likely route for transporting the solid waste from the proposed power plant site to the disposal site will be south on State Highway 111 through Calipatria and Brawley, and then west on State Highway 86 through Westmorland. At a solid waste generation rate of approximately 62 cubic yards per day (refer to Section 2.7.2.5), and assuming an 8-cubic-yard truck is used to transport the waste, then approximately 8 round trips per day will be

required. Although the number of round trips per day is less than one percent of the average and peak hour traffic loads now experienced on these highways, the impact of transporting Group 1 wastes on state highways which have high accident rates, due in part to above average truck traffic, is considered significant.

2:7.2.5 Waste Disposal

To drill the 43 additional wells (production, injection, and replacement) that are proposed as part of the full field development plan, approximately 40,000 cubic meters (52,000 yd³) of drilling muds and cuttings will be generated. This figure is based on the following assumptions: (1) all production and injection wells will be drilled to the maximum estimated depth of 10,000 feet, and (2) approximately 30 cubic meters (40 yd³) of drilling solid waste will be generated per 100 meters (328 ft) of drilling depth (USDOE, 1980). If the alternative injection well field area is developed instead of the primary, near-field injection area, the volume of drilling muds and cuttings will be reduced to approximately 33,000 cubic meters (44,000 yd³). This assumes that injection wells will be drilled to the maximum estimated depth of 4,500 feet. The drilling waste will be collected and taken to an approved disposal site, most likely the County Class II-2 facility at Brawley. Based on present County projections, there appears to be adequate Class II-2 landfill volume available for disposal of these wastes for the foreseeable future and thus no direct land use conflicts are anticipated.

The power plant operation will generate an estimated 7,000 pounds per hour of filter press cake from the brine clarification process. Assuming a density of 1,600 kilograms per cubic meter (USDOE, 1980), approximately 62 cubic yards of waste will be generated per day. The filter cake will almost certainly be classified as a Group 1 waste,

and disposal of this waste in a Class II-1 disposal site will be required. The waste will most likely be transported to the IT Corporation's Class II-1 disposal site near Westmorland. Based on present IT Corporation projections, their facility appears to have adequate capacity available for disposal of the waste for the life of this project, and thus no direct land use conflicts are anticipated.

2.7.2.6 Geothermal Brine Spills

As stated in the MEIR (Section 3.11.10.3.a), geothermal brine spills on agricultural land could cause thermal stress leading to destruction of crops and contamination of soil. Based on information presented in Section 2.2.2.2.b (Hydrology) and Appendix C of this report, the maximum credible injection fluid spill within the power plant site or into fields adjacent to the pipelines could impact 10 acres of land by infiltrating about 1 foot into the soil. Salt deposition from the brine would significantly reduce, if not eliminate, soil productivity until reclaimed by leaching the salts with fresh water or mechanically removing and replacing the impacted soils.

A discussion of the potential hydrological and biological impacts which may result from geothermal brine spills are presented in Sections 2.2.2 and 2.5.2 of this EIR, respectively.

2.7.3 Mitigation Measures

The project applicant has proposed a number of engineering and operational measures which reduce some of the identified potential land use conflicts to a level of insignificance. Those measures which have been incorporated in the project design include the following:

1. The power plant and production wellsites have been sited at least 0.5 mile from the community of Niland's sphere of influence; at least one mile from the Wister Waterfowl Management Area and all private duck clubs; and at least 0.25 mile from all known noise-sensitive receptors.
2. Well drilling islands have been located in the corners of agricultural fields and will be constructed to coexist with established irrigation and drainage patterns.
3. Well drilling islands (up to 5 wells per island) will be used for production and injection wells (unless the alternative injection well field area is developed) to minimize the amount of land required.
4. Pipelines will be placed along existing rights-of-way, roadways, canals, and field roads as feasible to minimize the amount of land used.
5. Site-specific geotechnical investigations will be undertaken prior to final power plant site design.
6. Railroad transport of the heaviest and largest power plant and well field components to Niland or Calipatria will mitigate potentially disruptive impacts of hauling such loads on highways.

In addition to the above measures, it is recommended that a drainage plan be prepared for wellsites and the power plant site to prevent potential geothermal brine spills from reaching adjacent agricultural lands. Routine inspection and maintenance of geothermal pipelines should be undertaken to reduce the risk of pipeline ruptures.

Monitoring, alarm, and automatic shut-in equipment should be evaluated for use in minimizing the amount of geothermal fluid escaping the system should a pipeline rupture occur.

A spill contingency plan should be developed by the power plant and geothermal field operators to outline a course of action in the event of a catastrophic geothermal brine spill. The plan should include a course of action to contain and clean up the spills. The plan should also include an agreement with the IID to coordinate temporary closing of control gates in affected lateral canals, or inserting barrier grade boards in affected drains, to contain geothermal fluid spills and prevent them from reaching the Salton Sea. These measures will minimize the impact of a catastrophic spill and provide time to implement effective cleanup operations.

To help mitigate the potentially significant impact of increased traffic volumes on the regional State Highways and local County roads resulting from project operations, the following operational measures, as suggested in MEIR (Section 3.8.3.2.f), are recommended:

1. Car-pooling of drilling crews and construction crews should be encouraged to decrease the number of work-day commuting vehicles.
2. On-site provisions for temporary camper/trailer hookups could be provided to further reduce the number of vehicles commuting to the site from nearby population centers.
3. Weekend hauling of solid wastes from the power plant to the IT Corporation facility near Westmorland should be avoided, if possible, to reduce the mixing of heavy truck traffic with the significant level of weekend recreational vehicle traffic utilizing state highways.

4. On-site temporary and permanent parking facilities should be provided at the power plant and well islands to help relieve traffic congestion problems.

Another recommended mitigation measure, not specifically mentioned in the MEIR, would be for the project applicant to work with Caltrans and the County in establishing left and right turn pockets on Highway 111 at Hazard Road. This measure will reduce the potential traffic hazard associated with project-related traffic traveling to the project area and turning off of Highway 111 onto Hazard Road.

Expansion loops and wellhead separators should be designed and placed after consultation with individuals knowledgeable with the use of planes for crop dusting in the area.

The impacts to the two residences closest to the project area could be mitigated by providing appropriate compensation or alternative housing during the term of the most significant impact. Both residences are owned by individuals or organizations related to the proposed project.

2.8 Socioeconomics

2.8.1 Existing Conditions

A discussion of the socioeconomic factors and community service variables that could be affected within Imperial County as a result of full-scale geothermal development occurring within the Salton Sea Anomaly is presented in Section 3.9 of the MEIR. A summary of this information as it relates to the proposed Phase II power plant and field development project is provided below. The final 1980 Federal Census figures and demographic data compiled by the Imperial County Planning Department, the Southern California Association of Governments, the California Department of Finance, the State Franchise Tax Board, and the California Employment Development Department were used to supplement the information contained within the MEIR.

2.8.1.1 Population

The population of Imperial Valley as of 1981 was 95,300 people (California Employment Development Department, May 1982). During the last census period from 1970 to 1980, the population of Imperial Valley grew 24 percent. By comparison, the State of California during this same time period experienced only a 19 percent population increase.

The major population centers in the vicinity of the project are the communities of Niland and Calipatria. Historical and current population figures for each of these communities, and the other major population centers within Imperial County, are provided in Table 2.8-1.

The population of Imperial County is expected to grow at an average annual rate of 2.2 percent during the 1980's, and then level off to an average annual growth rate of 1.6 percent throughout the 1990's. This information, shown in Table 2.8-2, is based on the most recent

TABLE 2.8-1
POPULATION OF IMPERIAL COUNTY
AND SELECTED CITIES

	<u>1970 (a)</u> <u>Population</u>	<u>1980 (a)</u> <u>Population</u>	<u>Percent</u> <u>Change</u>	<u>1981 (b)</u> <u>Population</u>
Imperial County	74,492	92,110	+24	95,300
Brawley	13,746	14,946	+9	15,600
Callexico	10,625	14,412	+36	15,100
Calipatria	1,824	2,636	+45	2,660
El Centro	19,272	23,996	+25	24,950
Holtville	3,496	4,399	+26	4,580
Imperial	3,094	3,451	+12	3,580
Niland	677	1,042	+54	NA (1)
Westmorland	1,175	1,590	+35	1,620

(1) Not Available.

Sources: (a) Imperial County Planning Department (1980 Federal Census).
(b) California Employment Development Department, May 1982.

TABLE 2.8-2
IMPERIAL COUNTY POPULATION PROJECTIONS

	<u>1970</u>	<u>1980</u>	<u>1990</u>	<u>2000</u>
Recorded Population ^(a)	74,492	92,110		
Projected Population ^(b)			114,000	134,000
<hr style="border-top: 1px dashed black;"/>				
	<u>1970-1980</u>	<u>1980-1990</u>	<u>1990-2000</u>	
Recorded Average Annual Growth Rate	2.1%			
Projected Average Annual Growth Rate		2.2%	1.6%	

Sources: (a) Imperial County Planning Department (1980 Federal Census).
(b) Southern California Association of Governments (1982).

projections provided by the Southern California Association of Governments. It should be noted that these forecasts for Imperial County take into account extensive geothermal development.

According to figures released by the Franchise Tax Board (Annual Report, 1981), the 1981 family median income level for Imperial County was \$15,630. This figure was the lowest of California's 58 counties. The statewide 1981 family median income was \$25,523. Income and poverty data for the major population centers within Imperial County as of 1980 are presented in Table 2.8-3. This information was compiled by the Imperial County Planning Department from the 1980 Federal Census data.

According to the 1980 Federal Census, the County population contains a relatively typical age distribution, reflecting nationwide low birthrates and over 50 percent of the population in the 18 to 64 age group. The community of Niland has a large population of retired residents, with over 30 percent of its population over the age of 65.

The estimated ethnic composition of the population within Imperial County, as reported by the 1980 Federal Census, is as follows: Hispanic, 55.8 percent; Anglo-American, 38 percent; Black, 2.5 percent; all others, 3.7 percent.

2.8.1.2 Housing

According to the 1980 Federal Census and estimates provided by the California Department of Finance, in 1981 there were 32,470 year-round housing units in Imperial Valley. Most of the units (25,060) are single-family units. Approximately 12 percent (3,882) were not occupied. A profile of the existing housing stock within Imperial County and its major population centers for 1980 is presented in Table 2.8-4.

TABLE 2.8-3
IMPERIAL COUNTY INCOME AND POVERTY DATA

	<u>Median Family Income (1979)</u>	<u>Percent Below Poverty (1979)</u> ⁽¹⁾
California	\$ 21,541	11.4
Imperial County	16,658	15.3
Brawley	17,202	15.7
Calexico	13,010	23.8
Calipatria	14,103	16.1
El Centro	18,897	11.5
Holtville	19,702	5.3
Imperial	17,293	7.0
Niland	11,542	16.1
Westmorland	14,489	18.2

(1) Those families whose incomes are less than 50 percent of the County median income.

Source: Imperial County Planning Department (1980 Federal Census).

TABLE 2.8-4
IMPERIAL COUNTY HOUSING DISTRIBUTION (1980)

	<u>Single- Family</u>	<u>Multi- Family</u>	<u>Total Units</u>	<u>Percent of Total</u>
Imperial County	25,060	5,350	30,410	100.0
Brawley	4,025	889	4,914	16.2
Calexico	2,772	779	3,551	11.7
Calipatria	631	116	747	2.5
El Centro	6,069	2,520	8,589	28.2
Holtville	1,208	289	1,497	4.8
Imperial	869	249	1,116	3.7
Niland ⁽¹⁾	NA ⁽²⁾	NA ⁽²⁾	496	1.6
Westmorland	442	46	488	1.6
Unincorporated	9,044	464	9,508	31.3

(1) Total for Niland is included in the Unincorporated total.

(2) Not Available.

Source: MEIR (Table 3.9-7).

The totals provided here are somewhat less than the total housing units estimated for 1981 but should suffice as a general indication of distribution of housing type.

As stated in the MEIR (Section 3.9.1.4.a), sale prices for existing homes can range from \$65,000 to \$200,000, although the majority are in the \$86,000 to \$125,000 range. Rental rates for good-quality apartments in the County range from \$200 for a one-bedroom to \$300 for a two bedroom unit.

A listing of temporary residence opportunities (i.e. hotels, motels, trailer parks) in the project vicinity is provided in Table 2.8-5. There are a total of 60 facilities with a potential availability of 1,512 rooms and 742 trailer (or recreation vehicle) spaces. The major population centers of El Centro and Brawley contain over 70 percent of the total available rooms and spaces. Estimates of the average annual occupancy rate for these facilities was provided by the local Chambers of Commerce and range from 60 to 85 percent. The highest rates of occupancy occur typically in late autumn and winter during harvest, hunting, and tourist seasons.

2.8.1.3 Employment

According to the California Employment Development Department, the Imperial County civilian labor force averaged 44,100 people throughout 1981. Unemployment in 1981 as a percent of the civilian labor force was reported at 25.3 percent or 11,150 people. Civilian labor force data are based on the number of employed and unemployed workers residing in the County. These figures are annual averages as the employment levels tend to vary throughout the year.

As stated in the MEIR (Section 3.9.1.3.a), in recent years the number of employed Imperial County residents has not grown as rapidly as the civilian labor force. Between 1975 and 1980 the number

TABLE 2.8-5
TEMPORARY RESIDENCE OPPORTUNITIES
IN THE PROJECT AREA

<u>Community</u>	<u>Type of Facility</u>	<u>Number of Facilities</u>	<u>Rooms/ RV Spaces</u> ⁽¹⁾
Brawley	Motel	5	200
Brawley	Hotel	1	38
Brawley	Trailer Park	6	64
Calipatria	Trailer Park	1	7
El Centro	Hotel	1	36
El Centro	Motel	20	1,052
El Centro	Trailer Park	15	243
Holtville	Motel	2	66
Imperial	Hotel	1	100
Niland	Motel	1	10
Niland	Trailer Park ⁽²⁾	5	128
Salton City	Motel	1	10
Salton City	Trailer Park	<u>1</u>	<u>300</u>
Total		60	2,254

(1) Overnight spaces only. Does not include permanently occupied trailer spaces.

(2) Includes trailer parks located north of Niland off of State Highway 111.

Source: Facilities as recommended by the respective Chambers of Commerce and/or City Planning Departments, April 1983.

of employed residents increased annually at a rate of 1.5 percent, while the civilian labor force expanded at an average annual rate of 3.1 percent.

The California Employment Development Department estimated the average total wage and salary jobs within Imperial County at 40,150 during 1981. Reflecting the county's labor-intensive agricultural base, the agricultural employment sector accounted for 15,050 jobs or 37.5 percent of the total. The distribution of jobs according to industry for Imperial County is presented in Table 2.8-6.

2.8.1.4 Community Services

According to the MEIR (Section 3.9.1.5), the following public and private agencies are responsible for providing services to the proposed project area and vicinity.

Private

Gas

Southern California Gas Company

Electricity

Imperial Irrigation District

Telephone

Pacific Bell

Water

Southern California Water Company
and Imperial Irrigation District

TABLE 2.8-6
IMPERIAL COUNTY EMPLOYMENT DISTRIBUTION (1981)

	<u>Number of People Employed</u>	<u>Percent of Total</u>
Total, All Industries	40,150	100.0
Agriculture	15,050	37.5
Manufacturing	1,700	4.2
Construction	1,000	2.5
Transportation & Public Utilities	1,200	3.0
Wholesale Trade	1,650	4.1
Retail Trade	6,150	15.3
Finance, Insurance & Real Estate	900	2.2
Services	3,850	9.6
Government	8,650	21.5

Source: California Employment Development Department, May 1982.

Public

<u>Sanitation</u>	Imperial County Sanitation District (Solid Waste); Private Septic Tanks & Niland Sewer District (Liquid Waste)
<u>Fire Protection</u>	Imperial County Fire Department Niland Volunteer Fire Department
<u>Police</u>	Imperial County Sheriff's Department
<u>School</u>	Calipatria Unified School District Imperial Valley Community College
<u>Medical Emergencies</u>	Imperial County Paramedics Pioneers Memorial Hospital

The public agency services are funded by the County's General Fund, district service fees, or special property tax assessment.

2.8.1.5 Public Revenues

The primary revenue sources for Imperial County include property and sales taxes, service charges, and the state and federal reimbursements. In fiscal year 1981-1982, property and sales taxes provided approximately 12 percent, or \$6.9 million, of Imperial County's \$58.1 million fiscal year revenues, while state and federal sources accounted for 56.6 percent or \$32.9 million. All sources of revenue for Imperial County are shown in Table 2.8-7.

The proposed 49 MW (net) power plant and field development project will be located in Imperial County Tax Rate Area 58-003. The 1982 assessed value of this tax rate area was approximately \$37 million.

TABLE 2.8-7
IMPERIAL COUNTY REVENUES FOR FISCAL YEAR 1981-1982

<u>Category</u>	<u>Total</u>	<u>Percent Of Total</u>
Current Property Tax	5,413,000	9.3
Sales and Use Tax	1,510,200	2.6
Other Taxes	1,584,400	2.7
Other Property Tax In Lieu Livestock Tax Miscellaneous		
Licenses and Permits	271,600	.5
Fines, Forfeitures and Penalties	692,000	1.2
Use of Money and Property	1,621,500	2.8
State Government and Federal Government	32,901,700	56.6
Charges for Current Services	3,189,000	5.5
Other	311,700	.6
Carry-Over	10,597,900	18.2
Total	58,093,300	100.0

Source: Imperial County Final Budget 1981-82.

The taxing entities which may be affected by the proposed development include the following: County of Imperial, Imperial Valley Community College District, Pioneers Memorial Hospital, Calipatria Unified School District, and Niland Fire District.

2.8.2 Impacts

2.8.2.1 Population

The proposed project will generate a small and variable population increase during the various phases of the development. As provided by the project applicants and presented in Table 2.8-8, it is anticipated that an average of 150 workers will be required throughout the proposed 30-month project construction period, with the peak number of workers at any one time estimated to be 244. Of the total average number of required workers, approximately 55 percent would be hired from local labor in Imperial County, and the others would be hired from areas outside of Imperial County. It is anticipated that the nonlocal workers on the various project tasks would most likely be skilled craftsmen, and that they will only be short-term residents of the local area. It is also anticipated that few of the workers, if any, will be at the site from start to completion. Thus, population impacts associated with the project development are expected to be temporary and insubstantial.

Operation and maintenance of the proposed facility would require approximately 25 permanent personnel. It is projected that approximately 50 percent (13 workers) would be hired locally, while 12 of the workers would need to be hired from outside Imperial County. Assuming that these 12 nonlocal workers have a family size similar to that of the average household in Imperial County (3.25 persons per household), the population that will be permanently added to the area will be approximately 40 people. Given the small size of the relocating

TABLE 2.8-8
ESTIMATED PERSONNEL REQUIREMENTS
(Local and Non-Local Workers)

	Quarter											
	1	2	3	4	5	6	7	8	9	10	11	12
Site Preparation												
Local	4		4	4		4						
Non-Local	0		0	0		0						
Well Drilling ⁽¹⁾												
Local	12		12	12	12	20	20	20				
Non-Local	6		6	6	6	10	10	10				
Well Testing												
Local	10	10	10	10	10	10	10	10	3	3		
Non-Local	0	0	0	0	0	0	0	0	0	0		
Construction												
Local			40	60	85	100	100	100	70	50		
Non-Local			40	60	85	100	100	100	70	50		
Operation ⁽²⁾												
Local										13	13	13
Non-Local										12	12	12
Peak Totals	32	10	112	152	198	244	240	240	143	128	25	25
Local	26	10	66	86	107	134	130	130	73	66	13	13
Non-Local	6	0	46	66	91	110	110	110	70	62	12	12

(1) Assumes that only one drill rig will be used to drill all production wells, and that one additional drill rig will be used to drill all injection wells.

(2) Operation employment continues for life of project (30 years).

Source: Project Proponents, April 1983.

population and the likelihood that it would be dispersed in the communities throughout Imperial Valley, no significant population impacts to the local area would be created.

2.8.2.2 Housing

The impact of the proposed 49 MW (net) power plant and field development project on the area's housing market will be limited to the temporary housing needs of the nonlocal workers making up the various drilling and construction crews over the 30-month construction period and the long-term housing demand that will be generated by the permanent operation and maintenance personnel (12 families). Given the small number of permanently relocating families and the likelihood that they would be dispersed to communities throughout Imperial Valley, no adverse demands upon the local housing market are expected from the operation of the project.

Factors which will affect the temporary housing requirements of nonlocal construction labor, such as commuting habits, the use of campers, and the potential sharing of such accommodations, are not known at this time. However, it can be seen from Table 2.8-8 that the maximum number of nonlocal workers on site at any one time is 110. If it is assumed that all 110 of these workers would seek local, temporary housing, it is expected that this demand would distribute to Niland, Calipatria, Brawley, and possibly Imperial and El Centro. Housing demand during peak construction in the winter months will be compounded by the temporary housing needs of migrant agricultural workers, since the harvest season in Imperial Valley peaks from December to March. Based on the housing opportunities shown in Table 2.8-5, transient housing demand created by all workers should be adequately accommodated by the hotel and motel rooms and trailer spaces available within the project vicinity. However, as pointed out in Section 3.9.2.4 of the MEIR, if construction of a number of geothermal-related projects is ongoing during the same time period, transient housing facilities in the

Imperial Valley are projected to be insufficient to accommodate the anticipated geothermal work force. Thus, although the proposed project itself is not likely to present a significant short-term demand on available transient and rental housing in the area, it could contribute to the cumulative demand and exceed supply if construction coincides with that of other geothermal projects.

2.8.2.3 Employment

The proposed power plant and field development project will create both short-term and long-term employment opportunities. Preliminary plans for the proposed development indicate that drilling and construction activities will require approximately 30 months for completion. The average number of workers required per quarter is approximately 150, with the maximum number of workers required at any one time expected to be 244. The exact extent of local labor utilization is expected to vary according to the tasks to be performed. Notwithstanding this consideration, it is estimated that approximately 55 percent of the work force will be from the local area. The estimated labor requirements for the various phases of the proposed project development are discussed below and shown in Table 2.8-8.

a. Site Preparation

Preparation of the production and injection well islands will involve clearing, grading, and sump construction. Construction time is typically 1 to 2 weeks per site, and typically requires 2 equipment operators and 2 workers to complete the job. It is expected that all 4 workers will be from the local work force.

b. Well Drilling

According to the project applicants, drilling operations typically require 8 to 10 weeks per production well in Imperial Valley. One drill rig will be operated 24 hours a day and will require a staff of approximately 18 workers. The field staff is generally divided into three tours with typically 6 workers on a tour. The tour is comprised of 2 general laborers (roughnecks), a derrick man, a motor man, a driller, and a rig supervisor. Production well drilling is expected to be ongoing for approximately 18 to 21 months.

Drilling operations for the injection wells may require more or less time per well than the production wells depending upon the actual completion depth of each well. At this time drilling operations are expected to be ongoing for approximately 7 to 9 months. It is anticipated that one rig will be used to drill these wells and that a field staff of 18 workers will be required. Similarly, the field staff will be divided into 3 tours.

Drilling activities typically require a small number of skilled individuals who generally travel with the drilling company. However, it is expected that at least one-third of the drilling crews will be hired locally.

c. Well Testing

According to the project applicants, testing of each well is planned and will require approximately 10 workers for various durations over the course of approximately 24 months. The labor force will consist of a superintendent, a foreman, 4 skilled laborers, and 4 general laborers. During plant start-up this force will be reduced and consist only of a Superintendent, a Foreman, and 1 skilled laborer. It is anticipated that all of these positions will be filled by the local labor force.

d. Construction

This phase covers all activities associated with construction of the power plant, and steam and fluid gathering and handling systems. The estimated peak number of construction workers on site at any one time is 200, with an average number of workers per quarter of about 150. These figures include supervisors, as well as all craftsman and laborers. It is anticipated that 50 percent of all workers will be hired locally. It is also anticipated that construction will take approximately 24 months.

e. Operation

The total number of operating and maintenance personnel required for the project's duration is expected to be 25 people. It is anticipated that approximately 50 percent will be hired locally. The estimated life of the proposed project is 30 years. An example of the staff required to maintain the proposed power plant and field is provided below:

- 1 - Manager
- 1 - Supervisor Operations/Maintenance
- 4 - Shift Supervisors
- 4 - Control Room Operators
- 8 - Equipment Operators
- 1 - Maintenance Electrician
- 1 - Instrument Technician
- 2 - Maintenance Mechanics
- 1 - Utility Person
- 1 - Plant Engineer
- 1 - Secretary

The employment generated by all phases of the project development will have a beneficiary impact on local employment opportunities, but it is not anticipated to be of major significance in relationship to

the total available labor supply in Imperial County. Also, induced employment effects in other sectors of the local economy through the increased purchase of equipment, goods and services is anticipated to be beneficial, but likewise not of major significance.

2.8.2.4 Community Services

None of the project's area community services, with the possible exception of fire protection services, should be adversely affected by development and operation of the proposed project. There may be an increased short-term demand in all services (i.e. emergency medical and routine health, police, and general utilities), but this demand should adequately be met by existing facilities and services.

As indicated in the MEIR (Section 3.9.2.5.b), the existing equipment of the Niland Fire District is operable for only several more years under present service conditions. Any additional demand placed on the District could tax the equipment beyond its capacity, thus creating a need for additional equipment investments. Under present County budget constraints, investment in new or improved equipment is unlikely. As a result, adequate fire protection for the proposed geothermal facilities may not be possible. Mitigation of this potential service-impact is discussed in Section 2.8.3.4 of this report. Long-term demand for services other than fire protection will be negligible.

2.8.2.5 Schools

No adverse impacts on the project area's schools are anticipated as a result of the proposed project activities. Drilling crews and construction workers coming from outside of the area are not ordinarily accompanied by their families and would not generate any additional student loads. Approximately 13 of the 25 power plant and field operations personnel are expected to be local, with 12 new permanent residents for the remaining positions. The new families would likely

generate new students for the local schools, but given the likelihood that any new students will be dispersed to a number of the Valley's schools, such project-related student generation is not considered significant.

2.8.2.6 Public Revenues

Major tax revenues directly attributable to the proposed power plant and related facilities primarily involve property taxes. Sales tax on retail goods purchased by project workers and transient occupancy tax on motel and hotel rooms used by project workers will provide additional sources of revenue for the County.

The assessed value of the proposed power plant is estimated by the applicants to be approximately \$96.8 million (1982 dollars). This figure is the net capitalized value of the plant, the steam and fluid transmission lines, and the land on which the plant is located. The assessed value of the proposed field is determined using a much more complex method of computation involving the capitalized present value of the future net income derived from the produced resource. At this time, the data necessary to make this computation are not known; therefore, for the purposes of this analysis the assessed value of the field will be assumed to be \$31.2 million (1982 dollars) or its net capitalized construction value. The total estimated value of the proposed power plant facilities and field is \$128 million. This represents more than a three-fold increase in the 1982 assessed value of the tax rate area the proposed project will be located within. Annual property tax derived from the project would be limited to 1 percent of the project's assessed value. The estimated property tax revenues and how this revenue would be distributed to the various governmental agencies involved is presented in Table 2.8-9. Property tax revenues generated by the proposed facilities would constitute a long-term beneficial impact of the project.

TABLE 2.8-9
ESTIMATED PROPERTY TAX REVENUES

<u>Taxing Entity</u>	<u>Tax Rate</u>	<u>Estimated Annual Revenues</u> ⁽¹⁾
County General Fund	.32386	414.5
County School Service Fund	.00435	5.6
Child Institution Tuition	.00122	1.6
Juvenile Hall	.00040	0.5
Imperial Community College	.08695	111.3
Physically Handicapped	.00599	7.7
Trainable Severely Mentally Retarded	.00221	2.8
Development Center	.00251	3.2
Aurally Handicapped	.00291	3.7
County Library	.04807	61.5
Fire Protection	.01182	13.1
Pioneers Memorial Hospital	.03348	42.9
Calipatria Unified School District	.40882	523.3
Niland Fire District	.06741	86.3
	<u>1.00000</u>	<u>1,280.0</u>

(1) In thousands of dollars.

Source: Steven Hile, Auditors Office, County of Imperial, personal communication, April 1983.

In addition to the one percent property tax assessment accruing to public agencies, the proposed facilities would also have a positive effect on the retirement of general obligation bonds existing during the life of the project. As the various districts' assessed valuations increase, the property tax rate for debt retirement would likely decline, the consequence of which could be a tax rate reduction to the individual tax payer. There are currently two outstanding bond issues for tax rate area 58-003. Based on 1982 tax rates, the increased assessed value of the property within tax rate area 58-003 as a result of the proposed facilities would generate approximately \$80,000 per year additional revenue to be used for retirement of the two outstanding bond issues.

The portion of income spent on goods and services in Imperial County by personnel associated with the proposed project development would be subject to state sales tax. This would result in sales tax revenue being returned to Imperial County through the State Board of Equalization. (The State retains \$0.0475 of the total retail sales tax of \$0.06 per \$1.00 of sales: The remaining \$0.0125 is returned to the place of original sale.)

For the purposes of this analysis, the spending patterns of local and nonlocal workers would be assumed the same. It will also be assumed that the average weekly consumption of retail goods and services per worker will range from \$50 to \$100. From Table 2.8-8, the average number of workers on location throughout the entire 30-month project development period will be 150. Based on the above assumptions and estimates, the average annual sales volume attributable to the project's work force will be approximately \$600,000. This translates into approximately \$7,500 additional sales tax revenue being returned to the County, or a 0.5 percent increase over 1981-82 sales tax revenue. In view of Imperial County's 1981-82 budget total of over \$58 million, this additional short-term sales tax return is considered to be beneficial but not a significant new source of revenue.

A transient occupancy tax is also levied by the local communities on hotel and motel rooms. This tax varies from 4 percent in Holtville to 7 percent in El Centro. This revenue source would be dependent on the number of nonlocal workers staying in hotel and motel rooms. From Table 2.8-9, the average number of nonlocal workers on location throughout the entire 30-month project development period is approximately 67. Assuming that all of the 67 nonlocal workers use motel and hotel facilities, and that the average rate per room per night is \$28, and that rooms are shared by two workers, the resulting transient occupancy tax revenue would be approximately \$13,000 to \$18,000 annually. This revenue would be dispersed among the communities throughout the Valley, and while beneficial, it is not considered a significant new source of revenue for the local communities.

2.8.3 Mitigation Measures

2.8.3.1 Population

The population impacts are not anticipated to be significant and will therefore not require mitigations.

2.8.3.2 Employment

The project applicants should be encouraged to hire local workers and graduates of the Imperial Valley College's Alternative Energy Technician Training Program to the extent possible in order to enhance local employment opportunities in a region characterized by high unemployment.

2.8.3.3 Housing

Temporary housing opportunities may be limited if construction of the proposed project coincides with other major geothermal development projects in the region (particularly if these overlap the

harvest and tourist seasons). The measures listed below (as suggested in the MEIR, Section 3.9.3.2) should be implemented if significant housing shortages are identified:

1. Establishment of on-site facilities to accommodate camper/trailer hookups for temporary on-site residence; and
2. Arrangements with local hotel, motel, and trailer park operators for long-term leases for an adequate number of rooms/spaces.

2.8.3.4 Community Services

Demand on local and county fire protection services can be largely mitigated by proper design and supply of on-site fire prevention and extinguishing systems. The proposed project construction plans should be reviewed by the County Fire Marshall prior to commencing construction activities to ensure that all facilities are in accordance with existing fire codes and ordinances. An emergency fire response plan should be developed in cooperation with the Niland Volunteer Fire Department and the Imperial County Fire Department for the proposed geothermal facilities.

2.8.3.5 Schools

No mitigations are proposed since no short- or long-term adverse impacts are anticipated.

2.8.3.6 Public Revenues

No mitigations are proposed since no short- or long-term adverse impacts are anticipated.

2.9 Visual Resources

The following discussion is primarily based on information contained in Section 3.10 and Appendix 3.10 of the MEIR. The MEIR included discussion of a Visual Resource Inventory and Evaluation which was conducted by WESTEC Services, Inc. in accordance with the U.S. Bureau of Land Management (BLM) Visual Resource Management System (U.S. Department of Interior, 1978). The inventory methodology is specifically discussed in Section 3.10.1.2 and in Appendix 3.10 of the MEIR.

2.9.1 Existing Conditions

The project area is located in the Imperial Valley between the Chocolate Mountains and the Salton Sea. The Imperial, Coachella, and Mexicali Valleys make up the larger physiographic region of the Salton Trough. The region is a flat basin lying primarily below sea level and bounded by: the Chocolate, Orocopia, and Cargo Muchacho Mountains on the east and the Peninsular Range (specifically the Santa Rosa, Fish Creek, Coyote, and Jacumba Mountains) on the west. Most of the Salton Trough is a natural desert, but utilization of Colorado River water for irrigation has allowed the majority of land between the East Highland Canal and the West Side Main Canal to be used for agricultural purposes. Areas north of the Salton Sea and in the Mexicali Valley are also used for agriculture.

The project area is flat and the surrounding land does not vary from the typical flat topography of the Valley floor. The project area has been used in the past for agriculture, although much of the lands are currently fallow due to the increasing soil salinity and the lack of a tile drain system. The surrounding area is generally fallow or used for agriculture. The town of Niland is located approximately two miles northeast of the primary project area, and approximately

1.5 miles south of the alternative injection well field area. Fluid pipelines between the power plant and the alternative injection well field area will pass within one mile of Niland.

Viewsheds from the project area consist of flat agricultural or fallow land, with the following background views: to the west, the Salton Sea (approximately three miles distant) can be seen on a clear day; to the north and the east, the Chocolate Mountains can be seen in the distance; and to the southwest, volcanic domes near the Salton Sea can be discerned on a clear day.

2.9.1.1 Inventory Results

The MEIR (Appendix 3.10) included a visual resource inventory and evaluation for the entire Salton Sea Anomaly. This study was based on the BLM Visual Resource Management System. Briefly, as stated in the MEIR, this method involves three separate components:

1. Scenic Quality - the relative scenic value of a landscape.
2. Visual Sensitivity - the number of observers of a landscape and their attitude towards visual change.
3. Distance Zones - the viewer/landscape distance relationship.

The combination of these components is used to designate visual resource management classes. These identify the overall value of visual resources and are used to determine an acceptable degree of alteration within each landscape.

Scenic quality rating units range from Class A to Class C as follows: areas of high scenic quality are rated Class A; areas with average scenic quality are rated Class B; and areas with little or no scenic quality are rated Class C. A site-specific evaluation of the scenic quality of the project area was conducted for this EIR and resulted in the project area being rated as Scenic Quality Class C. The evaluation is summarized in Table 2.9-1.

Criteria for determining visual sensitivity ratings are user volume (the number of people using an area and its immediate environs) and user attitude towards visual change. Figure 2.9-1, adapted directly from Figure 3.10-2 of the MEIR, shows the final visual sensitivity ratings for the project area and vicinity as determined by the visual resource inventory and evaluation (MEIR, Appendix 3.10). The primary project area and the alternative injection well field area are located in areas designated as low visual sensitivity. The alternative injection well field pipeline corridor contains both medium and high visual sensitivity areas; these areas were so designated primarily because they are immediately adjacent to the town of Niland and were determined to have medium to high user volumes and medium sensitivity to visual change.

The MEIR inventory and evaluation measured distances for the distance zone component of the visual resource analysis from Key Observation Points (KOPs). The KOPs were located within areas of high or moderate sensitivity and were chosen to have a representative view of the area. One of the KOPs, Point No. 6, was located approximately 0.5 mile south of the alternative injection well field area on Highway 111 north of Niland.

The distance zones were combined with the scenic quality ratings and the visual sensitivity ratings to determine the Visual Resource Management (VRM) classes. The BLM system includes five VRM classes, ranging from Class I, areas which would be of such high scenic

TABLE 2.9-1

SCENIC QUALITY EVALUATION OF THE PROJECT AREA

<u>Key Factors</u>	<u>Rating Criteria of Project Site</u>	<u>Rating</u>
LANDFORM	Low rolling hills: flat bottoms, fans, bajadas, playas, washes. Few interesting detailed landscape features.	1
COLOR	Little color variation, contrast or interest: generally muted, uninteresting tones. Harmony of hues not interesting even in low-angle light.	1
WATER	Water present and in view but not a dominant or significant landscape element.	2
VEGETATION	Some variety of vegetation but only one or two major types.	2
UNIQUENESS	Scenery common: much like other places in the region.	1
CULTURAL MODIFICATION	Scenic quality is somewhat depreciated by inharmonious intrusions... (which) add little or no visual variety to the area.	0
INFLUENCE OF ADJACENT SCENERY	Adjacent scenery moderately enhances overall visual quality	2
		<hr/> 9

Classes of Visual Quality:

A = High = 19-33
 B = Medium = 12-18
 C = Low = 0-11

Evaluation criteria from BLM, VRM: A Guide for Environmental Design Analysis, n.d.

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- PRIMARY PROJECT AREA
- GEOTHERMAL ZONE OVERLAY BOUNDARY
- ALTERNATIVE INJECTION WELL FIELD AREA
- ALTERNATIVE INJECTION WELL FIELD PIPELINE CORRIDOR

- HIGH
- MEDIUM
- LOW

ADAPTED FROM SALTON SEA GEOTHERMAL
ANAMOLY MEIR, WESTEC 1981

FIGURE 2.9-1
VISUAL
SENSITIVITY RATINGS

due that any man-made intrusion would have an unacceptable level of impact, to Class V, areas which would not be adversely affected by development.

Figure 2.9-2, which shows Visual Resource Classes in the project vicinity, is adapted directly from Figure 3.10-3 of the MEIR. The primary project area and the alternative injection well field area are located in areas designated as Class IV, or areas which would be affected by development to a low degree of significance. Portions of the alternative injection pipeline corridor well field are located in an area designated Class III, or an area which would be affected by development to a moderate degree.

9.1.2 Designated Scenic Resources

Imperial County has adopted a Scenic Highways Element to the General Plan. The purpose is to provide "a systematic opportunity for enjoying the complete visual, cultural and aesthetic repertoire of Imperial County." Among its major goals is to "preserve, enhance and protect Imperial County's scenic resources." The Scenic Highways Element does not designate any scenic highways in the project vicinity.

9.2. Impacts

Visual impacts from a development project can occur when conditions contrast substantially with the existing landscape. The greater or lesser the contrast, the greater or lesser the impact on visual aesthetics.

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Factors which also influence the impact of development on visual resources are:

1. Distance from which the project will be viewed.
2. Angle of observation.
3. Duration of observation.
4. Relative size of project in relation to surroundings.
5. Seasonal changes.
6. Angle of light.
7. Passage of time since project construction.

Impacts from the various facilities associated with the project are discussed below.

2.9.2.1 Power Plant

The power plant would be the most visually significant element of the project. The plant facilities are expected to disturb 12 acres of land. The largest facilities would be the two noncondensable gas vent stacks, cooling towers, turbine-generator structure, the two solids contact clarifiers, and the concrete brine storage pond structure. The cooling towers will have total dimensions of approximately 60-feet wide by 400-feet long by 50-feet high. The vent stacks would be approximately 80 feet high, the turbine-generator structure will be 30 feet high and topped by a 30-foot high crane. The concrete brine storage pond structure will be 100 feet by 400 feet by 12 feet high. The two solids contact clarifiers will be approximately 24 feet high and 100 feet in diameter.

When the plant is in operation, steam plumes may rise from the top of the cooling towers up to 100 feet or more (depending on atmospheric conditions). The plant will also be lighted at night. Because of the size of the stacks, cooling towers and the steam plumes, the power plant would be a vertical visual element on the flat valley floor. Travellers on Highway 111 and residents of Niland would have full views of the proposed power plant. In addition, the associated steam plumes would be visible from great distances due to the flat valley topography. However, the power plant is located in a Visual Resource Management Class IV, an area that does not constitute a resource of significant visual value. Other vertical intrusions have already modified the natural horizontal aspect of the area and thus reduce the impact of introducing the power plant into the landscape. Though highly visible, the power plant should not represent a significant adverse visual impact.

2.9.2.2 Wells

The proposed production and injection wells will be drilled from well drilling islands containing 2 to 5 wells each. The drilling islands will be approximately 2 to 4 acres in size. Each production well island would also require a storage basin below ground level which would be constructed with two- to four-foot high earthen berms. Wellhead separators about 7 feet in diameter and 30 feet high will be located adjacent to each production well.

The alternative injection plan calls for wells to be drilled from 2-acre, two-well drilling pads. After completion of injection well drilling operations, the impacted area will be returned to its original condition, except for about 0.4 acres per well which will be utilized for operations.

Drilling of each well would be accomplished with the use of metal lattice-work drilling rigs, approximately 110 to 150 feet in height. A warning light for aircraft will be located at the top of the drilling rig and will be in operation at night. The drill rigs would introduce a tall, vertical element into a landscape of flat, horizontal character. The impact of these visual intrusions is reduced by the fact that they are temporary structures that will be removed after the wells are completed. The wellhead separators will be permanent vertical visual elements on the flat landscape and will be clearly visible. However, other vertical intrusions which have already modified the natural horizontal aspect of the area, and the more visually dominating power plant, will reduce the visual impact of the wellhead separators to insignificance. The storage basins would not be visible off-site because of the low height of the berms. Thus, no significant visual impacts are anticipated to be associated with the wells.

2.9.2.3 Pipelines

The production and injection wells will be connected to the power plant by insulated pipelines. Vertical expansion loops approximately 20 feet high will be constructed in the pipelines every 200 to 400 feet as necessary. Unless masked by trees or buildings, the expansion loops will be clearly visible. However, other vertical intrusions have already modified the natural horizontal aspect of the area and, except for the alternative injection pipeline, proximately to the more visually dominating power plant will reduce the impact of introducing pipelines with vertical expansion loops into the landscape. Though highly visible, like the power plant, the expansion loops would not represent a significant adverse visual impact.

2.9.2.4 Access Roads

No new access roads are proposed to be constructed for this project, so no impacts will be caused by road construction.

2.9.2.5 Electrical Transmission Line

4 There are two existing electrical transmission lines in the vicinity of the power plant site (see Figure 1.3-2) which could be used for transmission of electrical energy from the plant. The preferred alternative would require approximately 0.5 mile of new transmission line, and the other alternative would require approximately 2 miles of new line. The connector line would utilize single wood poles. Although the connector transmission line would be a new vertical element in the landscape, the short length of the connector line and the existence of two other large transmission lines in the area indicate that the new transmission line will not be a significant visual impact.

2.9.2.6 Overall Project

Although the proposed project is not anticipated to have a significant, adverse impact on the visual resources of the area, the two vent stacks, the cooling tower and plume, the turbine-generator structure, the solids contact clarifiers, the concrete brine storage pond structure, and pipelines with vertical expansion loops will remain in place over the estimated 30-year life of the project. Alteration of the project area's visual character to a more industrialized is unavoidable.

Some of the project facilities will constitute intrusive cultural modifications to the flat valley floor. The vent stacks, turbine-generator structure, cooling towers and steam plumes would be the most visible components of the project, but would not be significantly disruptive to any designated visual resources. Transmission line connectors, wells, and pipelines would also be visible, but would be generally compatible with existing features of the landscape.

2.9.3 Mitigation Measures

The project applicants have proposed some measures that would minimize the contrast between the proposed facilities and the existing landscape, and other measures exist which could do the same. Those measures which have been incorporated into the project design include the following:

1. Fluid pipelines will be located primarily along existing field boundaries or roads; and
2. Well pads and fluid pipelines have been planned to minimize the amount of surface disturbance required.

Although the proposed project would not significantly impact the visual resources of the project area, other measures could be incorporated into the project design to further reduce visual impacts:

1. The power plant site could be landscaped with vegetation compatible with the existing vegetation;
2. After drilling, unused areas of the wellsite could be reclaimed by revegetating or otherwise reducing the visual disturbance;
3. Exteriors of any power plant buildings could be made of materials or painted with colors that would provide the least amount of contrast with the surrounding landscape;

4. Pipelines in areas where heavy on-site traffic is not anticipated could be painted in colors that would minimize contrast with the surrounding area; and
5. During power plant construction activities, appropriate measures to control fugitive dust should be implemented.

SECTION 3.0

CUMULATIVE IMPACTS

The Salton Sea Anomaly MEIR evaluated the generic and cumulative environmental effects of 1,400 megawatts of geothermal development projected to be operating in and around the Salton Sea KGRA by the year 2000. Since the MEIR specifically considered the effects of 100 megawatts of electrical power generation within the project area, the MEIR provides information on potential cumulative effects associated with the proposed project that are considered significant. This information is summarized below briefly by discipline.

3.1 Geology

Although the proposed project by itself is not likely to induce significant subsidence above that which is occurring naturally, the MEIR (Section 3.1.2.3) states that 1400 MW of geothermal development in and around the Salton Sea Anomaly has the potential to induce subsidence by a significant amount over the rate which is occurring naturally. This proposed project would contribute more or less proportionately to that increased risk. The MEIR emphasized that its induced subsidence estimates were order-of-magnitude estimates only, and that ongoing monitoring would be necessary to document these conclusions. Because the induced subsidence which does occur would be relatively small in the early years, sufficient lead time would be available for mitigation measures to take effect. Major mitigation measures include 100 percent injection of produced fluids, repair of damaged facilities, and restoration of surface gradients.

3.2 Hydrology

The proposed project would contribute proportionately to increasing the risk of ground water and surface water quality degradation due to geothermal fluid spills, the injection of geothermal fluids, leakage of geothermal fluids from geothermal brine holding ponds and drilling mud sumps, and

solid waste disposal. The construction and operation of this project would also increase the risk that some noncondensate source of cooling water would be necessary to support the full 1400 MW of geothermal development predicted in the Salton Sea Anomaly. As evaluated in the MEIR (Section 3.2.2), use of any noncondensate source of cooling water would result in potentially significant impacts.

3.3 Air Resources

6 As pointed out in the MEIR (Section 3.4.2.2), the cumulative effects of hydrogen sulfide gas (H_2S) emissions from multiple power plant development in the Salton Sea Anomaly could lead to violations of the state H_2S standard, especially if no provisions are made for possible future abatement of H_2S emissions resulting from power plant operations. However, the predicted small area and small magnitude of these violations suggest that reasonable control efforts and abatement should be sufficient to allow full-field development with little or no threat to maintenance of the H_2S ambient air quality standard.

3.4 Acoustical Environment

An increase in localized noise levels will result from the project, and the cumulative effect of increased localized noise levels from multiple power plant development in the Salton Sea Anomaly will contribute to an increase in the area's ambient noise level. While measures are available to mitigate the most significant cumulative noise effects on existing residential uses and wildlife habitats, cumulative noise impacts cannot be completely eliminated.

3.5 Biological Resources

Due to the relatively remote location of the proposed project facilities in relation to the Salton Sea, the Wister Waterfowl Management Area, and the private duck clubs, the project will not contribute significantly to any cumulative impact on the area's biological resources from

full-field geothermal development in the Salton Sea Anomaly. The proposed power plant site will be over 3 miles from the Salton Sea, 2 miles from the Wister Waterfowl Management Area, and at least 1.5 miles from the nearest duck club. All production and injection islands will be at least 2.5 miles from the Salton Sea and at least 1 mile from the Wister Waterfowl Management Area and all duck clubs. The alternative injection pipeline would be constructed no closer than 3 miles to the Salton Sea, no closer than 1 mile to the Wister Waterfowl Management Area, and no closer than 0.5 mile from any duck club.

3.6 Cultural Resources

The proposed project will not contribute to any cumulative adverse impacts to archaeological resources as no resources were encountered within the project area.

3.7 Land Use

The major land use impact resulting from the roughly 28 power plant developments projected in the Salton Sea Anomaly by the year 2000 (MEIR, Table 2.5-2) would be transforming the character of the region from a rural agricultural environment to a more urban and industrialized area. The proposed project would contribute proportionately to this cumulative impact. The change in the area's character will probably be largely unmitigatable, and it seems unlikely that the existing character of the area could be completely restored once development proceeded because of the social, economical, and physical changes that would have occurred during full-field development.

If the same portion of land were removed from potential agricultural production on other projects as would be removed on this project (3 percent), resulting cumulative impacts on agricultural land use would be small but significant.

The proposed project will also contribute to an increased cumulative traffic safety hazard. Trucks used to transport solid waste generated by other power plants to the IT Corporation disposal site or other locations will be utilizing highways with already high truck volumes and high accident rates.

3.8 Socioeconomics

Although the proposed project itself will not cause any unavoidable adverse impacts to the social or economic factors within Imperial County, as pointed out in the MEIR (Section 3.9.2.4), the proposed project would contribute to the cumulative demand for transient housing facilities in Imperial Valley which could exceed supply if construction coincides with that of other geothermal projects.

3.9 Visual Resources

Although the proposed project is not anticipated to have a significant adverse impact on the visual resources of the area, the cooling tower and plume, turbine-generator structure, concrete brine storage pond structure, vent stacks, and geothermal pipelines will remain in view over the estimated 30-year life of the project. As one of roughly 28 power plant developments projected in the Salton Sea geothermal resources area during this time period (MEIR, Table 2.5-2), the sheer volume of these facilities would have a significant effect on the visual appearance of the region.

SECTION 4.0

SIGNIFICANT ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

The analysis of potential environmental impacts presented in Section 2.0 of this report indicate that there are areas in which significant environmental impacts are anticipated as a result of construction and operation of the proposed geothermal power plant and field development project. Some of these impacts are expected to occur despite implementation of suggested mitigation measures.

4.1 Geology

The proposed project would not result in significant unavoidable geological impacts. However, use of the alternative injection well field plan has the potential to induce subsidence. The maximum anticipated induced surface subsidence which could result after 30 years using the alternative injection plan under worst-case conditions is on the order of 3 feet. The induced subsidence would be localized over an area of a few square miles centered around the production area. Although measures exist, as presented in Section 2.1.3.3, which would help mitigate the cause and effects of subsidence, avoidance of subsidence from use of the alternative injection well field plan would still not be assured.

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4.2 Hydrology

Because very little is known about the shallow alternative injection well field reservoir, the nature and degree of potential impacts to groundwater quality resulting from the injection of spent brine into the shallow alternative reservoir are also relatively unknown. However, the spent brine will almost certainly degrade the quality of the water in this reservoir, and there is a potential for local, near-surface groundwater to be impacted as well.

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4.3 Air Resources

Airborne emissions resulting from the proposed project will not, by themselves, cause state or federal ambient air quality standards to be exceeded, provided the mitigation measures recommended in Section 2.3.3 are adopted. However, the existing high measured levels of particulates would be unavoidably increased by a slight degree by fugitive dust and vehicular pollutants emitted from construction activities, and particulate matter in the form of drift emitted from the cooling tower. The odor of hydrogen sulfide gas emitted from the steam generators could be occasionally detected by the nearest plant residents.

4.4 Acoustical Environment

Two identified noise-sensitive receptors, individual residences at the intersection of Hazard and English roads and McDonald Road and the Southern Pacific Railroad, will experience a significant short-term and long-term increase in noise levels over existing ambient noise levels.

4.5 Biological Resources

The proposed project will not result in any significant environmental effects to biological resources which cannot be avoided.

4.6 Cultural Resources

The proposed project will not result in any significant environmental effects to cultural resources which cannot be avoided.

4.7 Land Use

Construction and operation of the proposed project will unavoidably affect the residence located at the intersection of Hazard and English Roads and, to a lesser degree, the residence located at the intersection of

McDonald Road and the Southern Pacific Railroad, by introducing an intensive industrial operation into the area resulting in increased traffic, noise, and human activity.

Trucks used to transport solid waste generated during power plant operation from the proposed power plant site to the IT Corporation disposal site or other locations will unavoidably increase traffic on highways with already high truck volumes and high accident rates.

4.8 Socioeconomics

The proposed project will not result in any significant negative effects which cannot be avoided.

4.9 Visual Resources

The proposed project will not result in any significant environmental effects which cannot be avoided.

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SECTION 5.0

GROWTH-INDUCING IMPACTS

The proposed geothermal power plant and field development project, by itself, will not induce significant population or economic growth in Imperial County. As presented in Section 2.8 (Socioeconomics) of this report, the total long-term population that will be added to the County as a result of the proposed project will be approximately 40 people. This figure is less than 2 percent of the expected average annual population growth rate for Imperial County throughout the 1980's. Also presented in Section 2.8 of this report, the projected peak number of workers required at any one time during the planned 30-month construction period is estimated to be 244. However, the total number of operating and maintenance personnel required for the project's estimated 30-year life is expected to be only 25 people. These figures are both less than 2 percent of current unemployed labor force in Imperial County. Growth-inducing impacts to housing, public services and schools resulting from the proposed project are expected to be of similar magnitude. There will be approximately a one percent increase in property tax revenue and approximately 0.5 percent increase in sales tax revenue accruing to the County as a result of the proposed project.

This proposed project, by itself, will not induce significant growth. However, as pointed out in Section 5.0 of the MEIR, long-term development of 1,400 MW of geothermal power within the Salton Sea Anomaly will induce significant growth. The cumulative requirement for approximately 800 construction workers will create an increased need for transient housing facilities and other support-type services. In addition, it would represent a significant increase in income which would be felt within the local economy through increased retail sales. Likewise, the property tax revenues that would be generated by full field development would increase annually and are estimated to be \$23,730,000 in the year 2013. This increase in tax revenues could be a significant factor in increased growth in that at least a part of it would probably be used for improving or expanding public facilities. Less

significant would be the permanent relocation of roughly 350 persons to operate the production facilities at full field development in the year 2013. This permanent work force would create an increase in demand for suitable housing, public services and schools. In addition, the annual salaries received by these operating personnel would constitute a small, additional inducement to growth.

SECTION 6.0

ALTERNATIVES TO THE PROPOSED PROJECT

Reasonable alternatives and alternative design concepts which could feasibly attain the basic objectives of the power plant and field development project are discussed below. Included are discussions of alternative project location and scale, as well as construction, design and operational alternatives. Emphasis has been placed on the evaluation of alternatives potentially capable of reducing or eliminating the adverse environmental effects identified in Section 2.0.

6.1 No Project

Implementation of the "no project" alternative (i.e., not granting the Geothermal Production Permit for the proposed power plant and field development project) would eliminate all the adverse environmental effects described in Section 2.0 (except for those attributable to drilling or flow testing of wells, which could continue under the separate exploratory permits that were previously granted). The projected social and economic benefits of the project would also be eliminated. The project objective of generating 49 MW of electrical power would not be achieved, but depletion of the geothermal resource would be avoided. Not developing the geothermal resource for electricity generation would mean a greater dependence on other energy sources to meet requirements in the region, potentially resulting in increased pollution from these sources. An opportunity to develop an alternate energy source and reduce dependence on oil, a national objective, would be lost.

6.2 Alternative Locations

6.2.1 Power Plant and Production Wells

An alternative location could be selected for construction of the proposed power plant and/or production well field. Because the geothermal plant must be colocated with the geothermal production well field, the power plant cannot be moved any significant distance without also needing to move the production well field. However, relocation of the well field to another location would mean significant investment of time and money to drill new wells to verify that a viable resource is available. Relocating to another area would also require the purchase or lease of additional lands other than those where the existing exploratory wells have been drilled and where some impacts due to testing operations have already occurred. The purchase or lease of additional property for project development might also divert additional lands dedicated to agricultural use to geothermal use. In addition, since no significant impacts have been identified which are specific to this particular power plant and production well field area site, no significant reduction of adverse impacts would likely be achieved under this alternative.

6.2.2 Injection Wells

The project proponents have proposed an alternative injection plan which consists of relatively shallow wells in an area approximately 3 miles from the primary project area. This alternative is evaluated in Section 2.0 of this document. Additional alternative locations for the injection wells may be possible, although the issues addressed in Section 6.2.1 regarding alternative locations for the production well field are also applicable to alternative injection well field locations. The less separation between production and injection areas, the less risk there would be of induced subsidence and, because of shorter pipelines, the less potential for geothermal fluid spills and visual

impacts. However, the risk of premature cooling of the geothermal resource and the concentration of impacts in the production/injection area increases with decreased separation between production and injection areas.

6.3 Alternative Capacity

Development of the proposed project at a reduced capacity would decrease the magnitude of environmental impacts associated with capacity. These impacts include induced subsidence, geothermal spills, fugitive dust emissions, noise, and loss of land dedicated to agricultural uses. Other potential impacts would not be affected significantly. A reduction in the proposed project capacity would cause the project to be less economical as the unit cost per kilowatt of output would increase. However, if one assumes that 1400 MW of capacity will be developed in the Salton Sea Anomaly area, reducing the size of the project will likely increase the cumulative, per-megawatt environmental impacts.

Development of the proposed project at an increased capacity could increase the magnitude of impacts associated with capacity. However, as pointed out in the MEIR (Section 2.6.1), a plant capacity greater than 49 MW is not likely because of the existing government permit process.

6.4 Alternative Design

6.4.1 Binary Conversion Cycle

The proposed power plant is being designed to utilize a flashed steam generating cycle. Although from a technical standpoint the geothermal resource underlying the proposed project area is better suited to flash technology due to its high temperature and salinity, as stated in the MEIR (Section 7.6.1), a design alternative is the binary

conversion cycle. In the binary system, the hot geothermal brine heats an easily volatilized hydrocarbon (e.g., isobutane), the vapor from which is used to drive the turbines. An outside source of cooling water is then used to condense the hydrocarbon. The working system is essentially closed, with no transfer of materials to the atmosphere.

According to the MEIR (Section 7.6.1), the principal advantage of the binary system is that it will have a lesser impact on air quality than the flash cycle, since the binary cycle does not result in the release of noncondensable gases to the atmosphere. The disadvantages include greater construction and operation costs, the need for an outside source of cooling water (see below Section 6.4.3), and increased fire hazard and disaster potential.

6.4.2 Total Injection of Produced Fluids

The project description calls for the injection of from 75 to 80 percent of the produced fluid into a zone of the geothermal reservoir peripheral to the production well field, or alternatively, into a more removed, shallow reservoir. Injecting instead essentially 100 percent of the produced fluid (less that portion lost through venting of noncondensable gases) might decrease the potential for induced subsidence. However, this alternative would require the use of a source of cooling water other than condensate since there would no longer be any condensate (see Section 6.4.3).

6.4.3 Water Use

6.4.3.1 Water Requirements

The project applicant proposes to use wet, forced-draft towers to cool the circulating water through evaporation. The water lost through evaporation, as well as that lost through drift and blow-down (that water removed from the system to manage the salinity of the

cooling water), must be replaced by makeup water. Makeup water for the project is proposed to be supplied from steam condensate. However, if regulatory agencies require 100 percent injection of produced fluids, or a binary conversion cycle is used, an alternative source of water will be necessary for either cooling (if the condensate is injected) or injection (if the condensate is used for cooling). Water sources potentially available for either cooling water or injection fluid makeup include canal water, river or drain water, Salton Sea water, and East Mesa groundwater.

The amount of makeup water required for cooling is primarily dependent upon the salinity of the water. The more saline the makeup water, the more blowdown is required to maintain salinity of the cooling water below an acceptable level. If the cooling water blowdown is to be discharged to the drains or rivers, then the salinity of the blowdown cannot exceed the approximately 4,000 mg/l salinity of these bodies (MEIR, Section 3.2.2.2). However, if the blowdown is discharged to evaporation ponds or injected, then the salinity of the cooling water can rise to 6,000 to 8,000 mg/l and less makeup water is necessary. If the blowdown can be safely combined with the spent geothermal brine and injected, the total amount of makeup water required for either cooling or injection is equal only to the amount lost by evaporation and drift.

Cooling water blowdown from sources other than condensate can probably be combined with the spent geothermal fluid without chemical reaction problems as long as the ratio of blowdown to spent geothermal fluid remains small. The use of external (noncondensate) water sources for injection makeup water creates a spent brine-to-makeup water ratio of about 4-to-1 (80 percent), and therefore may create technical problems and increased costs. Were this mixing necessary, extensive testing would be required to determine how to handle the fluids to prevent significant scaling and injection well plugging or fouling.

6.4.3.2 Water Sources

a. Canal Water

As stated in the MEIR (Section 3.2.2.2) the use of canal water for cooling water makeup would result in the lowest treatment and disposal costs, and require the least amount of makeup water, of the alternative water sources. However, use of agricultural water for cooling or injection makeup for commercial geothermal power plants is discouraged by Imperial County, and the Imperial Irrigation District (IID) would have to specifically allocate water for this use. Although at present the IID may have water available for allocation to the facility, this may not be true even in the near future. If this agricultural water would not have otherwise come into the Imperial Valley, and the blowdown is not discharged into the drains, then there will be no appreciable environmental impact. If the blowdown is discharged to the drains, then there will be a very small decrease in Salton Sea salinity and very small increase in Salton Sea level.

b. River or Drain Water

Extensive treatment would be required prior to use of river or drain water for cooling water, and blowdown from the cooling towers could probably not be discharged back to the drains (MEIR, Section 3.2.2.2). In addition, the location of the project is such that the only reliable source of drain water is the Alamo River approximately three and one-half miles away. Use of the Alamo River water for water makeup would be expensive, and would result in a very small increase in Salton Sea salinity and decrease in level. Once-through (nonevaporative) cooling using the Alamo River may be theoretically possible, but would be very expensive because of the distance over which the water would need to be pumped.

c. Salton Sea

Use of Salton Sea water in cooling towers is not considered feasible because of significant corrosion, scaling, blowdown, and salt drift problems (MEIR, Section 3.2.2.2). Use of Salton Sea water for once-through cooling is technically and environmentally feasible, but would be prohibitively expensive because of the distance over which the water would have to be pumped. Use of Salton Sea water for injection makeup would be somewhat less expensive than using it for cooling water since significantly less water would be pumped, but as stated above, the technical feasibility of injecting Salton Sea water is unknown. Use of Salton Sea water for injection would result in a small decrease in both salinity and level of the sea.

d. East Mesa Groundwater

According to the MEIR (Section 3.2.2.2), the quality of groundwater beneath East Mesa varies substantially, but in some areas it approaches the composition of canal water. However, a groundwater exploration program is necessary to fully evaluate this potential source of water. In order to use this water for cooling water, rights to the water must first be obtained, wells must be drilled, and then the water transported to the project area. Exploitation of East Mesa groundwater could result in adverse hydrologic, wildlife, visual, cultural resource, and habitat impacts. It also may be very expensive to pipe to the project facilities.

6.4.4 Cooling Water Systems

6.4.4.1 Wet-Dry Cooling Towers

One design alternative to the proposed wet mechanical-draft cooling tower is a wet-dry cooling tower. Wet-dry cooling towers combine evaporative and dry cooling of the circulating water. The dry

portion handles essentially all the cooling load when dry-bulb temperatures are low, and the wet portion serves as supplemental capacity when needed, such as in summer months when dry-bulb temperatures are high.

The primary benefit of the wet-dry process is the volume of cooling water which could potentially be saved. According to the MEIR (Section 7.4.2), the system could be designed to reduce the rate of water consumption anywhere from 33 to 66 percent of that required for a wet cooling tower. A second benefit that would potentially be realized is a decrease in the amount of salt deposition resulting from cooling tower drift.

Disadvantages to the wet-dry cooling tower include the following: higher capital cost due to the greater surface areas required for the dry portion of the cooling tower than would be the case for the same cooling capacity in a wet cooling tower; (2) potentially increased noise impacts since the dry portion would generate a higher sound level than a wet cooling tower; and (3) greater visual impact as a result of the wet-dry cooling tower being larger than a wet cooling tower.

As stated in the MEIR (Section 7.6.2), it is unknown whether the environmental benefits outweigh the impacts and the additional investment required. However, if availability of makeup water becomes a significant constraint, it would be possible at a later time to incorporate a dry component into a wet cooling system.

6.4.4.2 Spray Pond

Another alternative to the wet mechanical-draft cooling tower for heat dissipation is the spray pond. This method involves circulating water through a pond and, at regularly spaced intervals, spraying a portion of the water to be cooled into the air. The cooling process, which is about 80 percent by evaporation and 20 percent by convection,

is essentially the same process which takes place in a cooling tower except that it occurs in the open atmosphere and the air flow is not induced, as in a tower.

The advantages of a spray pond over a mechanical-draft cooling tower are primarily a reduction in noise and visual impact. In addition, drift deposition resulting from the spray pond operation will occur within a smaller area than would be the case with a cooling tower. Disadvantages of the spray pond include a greater amount of drift, the potential of the spray ponds to attract and injure waterfowl, and the proportionately larger amount of land required for spray ponds over cooling towers.

6.4.5 Alternative Pipeline Expansion Designs

The project applicants propose the use of fluid pipelines with vertical expansion loops. Both horizontal expansion loops and in-line mechanical expansion devices are potential design alternatives. Either alternative would reduce the project's visual impact and impact on agricultural crop duster operations. However, horizontal expansion loops would increase the amount of land required for pipeline rights-of-way by about 6 acres for the proposed injection plan, and 9 acres for the alternative injection plan (assuming an extra 20-foot right-of-way is needed). In-line mechanical expansion devices do not increase the land use impacts over vertical expansion loops, but are much more expensive and prone to problems, which may lead to increased project costs and spills of geothermal fluids.

6.5 Alternative Uses of the Geothermal Resource

Potential alternative uses for the geothermal resource consist of various agricultural, industrial and community applications. Such applications include the following: greenhouse cultivation; using

geothermal fluid for space heating, soil heating and/or direct irrigation; crop drying; food processing; industrial processes involving refrigeration and/or low-temperature heating; fertilizer manufacturing; and space heating of community structures or heating of domestic water supplies with the heat distributed via a public utility system. The economic and technical feasibility of implementing such alternative uses is dependent upon complex engineering, physical and market factors. Similarly, the impacts associated with these applications vary with the specific nature and magnitude of the proposed use. In the absence of site-specific market data and engineering criteria relative to each use, a determination of the economic and technical feasibility, as well as the environmental effects, of developing alternative applications for the Niland resource, is speculative at this time. It appears that the high temperature, high salinity, deep brine at Niland is best suited for electrical generation. However, production of geothermal resources for the proposed project may encourage the development of other geothermal resources for these uses, and may allow for use of the spent geothermal brine for these purposes.

SECTION 7.0

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7.1

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Environmental Impact Report, Volumes I and II.

WESTEC Services, Inc., 1983, South Brawley Unit Number 1
Draft Environmental Impact Report.

7.2 Organizations Consulted

7.2.1 Federal

United States Department of Energy
United States Department of Agriculture
United States Department of Interior
United States Fish and Wildlife Service

7.2.2 State of California

Air Resources Board
California Energy Commission
California Resources Agency
Department of Conservation
Department of Fish and Game
Department of Water Resources
Department of Food and Agriculture
Department of Health Services
Department of Parks and Recreation
Department of Transportation
Division of Oil and Gas
State Lands Commission
Office of Historic Preservation
Office of Planning and Research
Public Utilities Commission
Regional Water Quality Control Board,
 Colorado River Basin Region
Solid Waste Management Board
State Water Resources Control Board

7.2.3 County of Imperial

Agricultural Department
Air Pollution Control District
Assessor's Office
Fire Department
Environmental Health Services
Imperial County Fish and Game Commission
Parks and Recreation Department
Public Library
Public Works Department
Office of Sheriff-Coroner
Superintendent of Schools

7.2.4 Municipal

City of Brawley
City of Calipatria
City of Holtville
Niland Chamber of Commerce
Niland Volunteer Fire Department
Niland Sanitary District

7.2.5 School Districts

Calipatria Unified School District

7.2.6 Other

California Native Plant Society
Coachella Valley Audubon Society Corporation
Farm Bureau
Imperial Irrigation District
Imperial Valley College Barker Museum
Oak Ridge National Laboratories
Pacific Bell
Salton Sea Fish and Wildlife Club
San Bernardino Valley Audubon Society, Inc.
Southern California Association of Governments
Southern California Chapter of the Wildlife Society
Southern California Edison Company
Southern California Gas Company
Southern Pacific Land Company

7.3 Report Contributors

This environmental impact report was prepared by the County of Imperial Planning Department with environmental data collected,

analyzed, and submitted under the direction of Miland Geothermal, Inc. and NPM Partnership. Individuals directly involved in report preparation, their areas of contribution, and their organization affiliation (IC - Imperial County, ES - Engineering Science, RGI - Republic Geothermal, Inc., NGI - Miland Geothermal Inc., SE - Self Employed) are listed below.

Lead Agency Direction and EIR Coordination and Critical Review .	Richard D. Mitchell Planning Director (IC)
	Phillip Shafer Geothermal Planner (IC)
	R. Keith Julian Geothermal Consultant (SE)
Program Environmental Coordinator .	Phillip J. Morris, B.S., M.B.A., P.E. (ES)
EIR Project Managers	Dwight L. Carey, B.S., M.S., D.Env. (RGI) William C. Hass, B.S., M.P.A. (RGI) Richard E. Burke, B.S., M.S. (ES)
Project Description	Dwight L. Carey, D. Env. (RGI) Michael Webb, B.S., P.E. (ES) Gordon Austin, B.S., M.S., M.E.A., P.G. (NGI) Tom Seesee, B.S., M.S., P.E. (NGI)
Geology	Dwight L. Carey, D.Env. (RGI) Courtney F. Isselhardt, M.A. (RGI) Charles W. Morris, Ph.D. (RGI)
Hydrology	Terry R. Thomas, D.Env. (RGI) Dwight L. Carey, D.Env. (RGI)
Air Resources	William C. Hass, B.S., M.P.A. (RGI) Richard E. Burke, B.S., M.S. (ES)
Acoustical Environment.	Phillip Leitner, Ph.D. (SE) William C. Hass, B.S., M.P.A. (RGI)
Biological Resources.	Phillip Leitner, Ph.D. (SE)
Cultural Resources.	Tawna J. Nicholas, B.S. (RGI)
Land Use.	William C. Hass, B.S., M.P.A. (RGI)
Socioeconomics.	William C. Hass, B.S., M.P.A. (RGI)

Visual Resources. Tawna J. Nicholas, B.S. (RGI)

Sections 3.0 - 7.0 William C. Hass, B.S., M.P.A. (RGI)
Dwight L. Carey, D. Env. (RGI)
Richard E. Burke, B.S., M.S., (ES)

Technical Editing Dwight L. Carey, D.Env. (RGI)
William C. Hass, B.S., M.P.A. (RGI)
Richard E. Burke, B.S., M.S. (ES)
Louis B. McNary, B.S., M.S. (ES)
Gordon Austin, B.S., M.S., M.E.A., P.G. (NGI)
Tom Seesee, B.S., M.S., P.E. (NGI)

Graphics. Barry W. Monroe (RGI)
Casey P. Carter (RGI)

Word Processing Linda J. Brandis (RGI)
Rhonda G. Carey (RGI)
Trudy M. Fierros (RGI)

Clerical Support. Cindy L. Johnson (RGI)
Lynne E. Davis (RGI)
Adele C. Wainer (RGI)

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SECTION 8.0
COMMENTS AND RESPONSES

8.1 COMMENTS

Written comments concerning the Draft Environmental Impact Report for the Niland Geothermal Energy Program were received by the Imperial County Planning Department during the public comment period from the following sources:

California Office of Planning and Research
Imperial Irrigation District
Imperial County Air Pollution Control District
California Department of Transportation, District 11
Niland Geothermal, Inc.
Imperial County Public Works Department
California Department of Health Services, Environmental
Health Division
California Regional Water Quality Control Board,
Colorado River Basin, Region 7
United States Bureau of Land Management, El Centro Resource Area

These written comments are reproduced on the pages which follow. The numbers added to the margins of the letters identify specific comments for which responses have been prepared. Corresponding numbers have also been numbers placed in the margins of the text to identify the information subject to a specific comment. Comments without margin numbers required no response.

ICE OF PLANNING AND RESEARCH

ENTH STREET
MENTO, CA 95814

July 9, 1984

RECEIVED

JUL 11 1984

**IMPERIAL COUNTY
PLANNING DEPARTMENT**Mr. Phil Shafer
Imperial County
Courthouse
El Centro, CA 92243

Subject: SCH #82091950, Niland Development Project

Dear Mr. Shafer:

The State Clearinghouse submitted the above named draft Environmental Impact Report (EIR) to selected state agencies for review. The review period is closed and the comments of the individual agency(ies) is(are) attached. If you would like to discuss their concerns and recommendations, please contact the staff from the appropriate agency(ies).

When preparing the final EIR, you must include all comments and responses (CEQA Guidelines, Section 15132). The certified EIR must be considered in the decision-making process for the project. In addition, we urge you to respond directly to the commenting agency(ies) by writing to them, including the State Clearinghouse number on all correspondence.

In the event that the project is approved without adequate mitigation of significant effects, the lead agency must make written findings for each significant effect and it must support its actions with a written statement of overriding considerations for each unmitigated significant effect (CEQA Guidelines Section 15091 and 15093).

If the project requires discretionary approval from any state agency, the Notice of Determination must be filed with the Secretary for Resources, as well as with the County Clerk. Please contact Christine Goggin at (916) 445-0613 if you have any questions about the environmental review process.

Sincerely,

A handwritten signature in cursive script, appearing to read 'John Ohanian'.

John B. Ohanian
Chief Deputy Directorcc: Resources Agency
attachment

IMPERIAL IRRIGATION DISTRICT

OPERATING HEADQUARTERS • IMPERIAL, CALIFORNIA 92251

RECEIVED

May 31, 1984

JUN 01 1984

IMPERIAL COUNTY
PLANNING DEPARTMENT

Mr. Richard R. Mitchell
Imperial County Planning Department
939 Main Street
El Centro, CA 92243

Attention: Mr. Phil Shafer, Geothermal Planner

Subject: Draft Environmental Impact Report for the Niland Geothermal Energy Program

Dear Mr. Mitchell:

Imperial Irrigation District first commented on this project by letter dated September 20, 1982. The following comments are further to that letter and in response to your May 16, 1984, letter inviting additional review. The document has been reviewed by staff, and the following exceptions or inaccuracies are called to your attention:

2.2.2.2. Surface Water

b. Water Quality

Paragraph 1 "Minor, temporary sedimentation of surface waters may occur during the construction phases of the proposed project. Sedimentation would be limited principally to the canals and drains in the immediate vicinity of heavy equipment activity which may temporarily increase erosion. The "P" Drain is the surface water conveyance nearest the proposed power plant site and would have the most potential to be temporarily impacted by sedimentation."

Construction phase of the proposed project shall not affect the water quality in canal adjacent to the construction site.

Paragraph 5 "Spill fluids which enter the surface agricultural water system directly, or indirectly through the tile drain system, will mix with the canal or drain waters and flow downstream toward the Salton Sea. Unless diverted or removed, these fluids could cause a temporary and localized increase in the salt concentration and chemical composition of the Salton Sea near the outlet of the surface water conveyance structure. (The chemical composition of the produced geothermal fluid is provided in Table 1.4-1.) Based upon the limited volume of the anticipated spill, it is unlikely that any long-term impact to surface water quality will result after dilution of the spill fluids."

May 31, 1984

2 *Spill fluids shall not enter or mix with canal water.*

2.7.3 Migration Measures

It 4 "Pipelines will be placed along existing rights-of-way, roadways, ca
ls and field roads as feasible to minimize the amount of land used."

3 *Pipeline on or across IID facilities right-of-way will be by prior
approval and encroachment permits.*

Statements in Sections 1.8, 2.5.2.3.c and 2.9.2.5 are no longer accurate. It
should read:

4 *A new line will be constructed to connect the facility to an existing
36 -KV line located 1/2 mile to the west, which line will be upgraded
to 2-KV from point of intersection north to Niland substation.*

Accordingly, figure 1.3.2 should be revised.

Yours truly,

CHARLES L. SHREVES
General Manager

CLAUDE M. FINNELL
COMMISSIONER - DIRECTOR - APCO

DARRELL E. BYRD
CHIEF DEPUTY COMMISSIONER - DIRECTOR
ASSISTANT APCO

COURTHOUSE
939 MAIN STREET
EL CENTRO, CALIFORNIA 92243
(619) 339-4314

IMPERIAL COUNTY

OFFICE OF
AGRICULTURAL COMMISSIONER
DIRECTOR OF WEIGHTS AND MEASURES
AIR POLLUTION CONTROL OFFICER

RECEIVED

June 29, 1984

JUL 02 1984

IMPERIAL COUNTY
PLANNING DEPARTMENT

Phil Shafer, Geothermal Planner
Planning Department
Courthouse
El Centro, CA 92243

Dear Mr. Shafer:

RE: Draft EIR for the Niland Development Project

A review of the draft has been completed by our office. As usual in geothermal projects our main concern is emissions of hydrogen sulfide (H_2S).

The H_2S emissions (Table 2.3-7 Page 72) of 1 gram/sec per stack for a total of 2 gram/sec or 15.9 lbs/hr is in the range to be expected. The proposed mitigation measures mentioned in Section 2.3.3.2 Page 79 will adequately cover any problems with H_2S emissions which may be encountered from this plant.

5a

However, we have other H_2S concerns. Table 2.3-1 Page 58 shows the annual occurrence of different stability classes. 41.72% of the time the atmosphere is stable (Stability Class F). The draft claims no H_2S ambient standard exceedences will occur. We would like to point out that cumulative effects caused by adjacent power plants planned within the same general area as this project will most likely trigger H_2S ambient standard exceedences. See the enclosed map. Given the stable atmospheric conditions and the planned clustering of geothermal facilities within each KGRA dispersion of air emissions will be difficult 41.72% of the time.

5b

As the development of geothermal resources accelerates, four or five within the next year, cumulative effects of H_2S emissions will be most prominent. We suggest multi-point air modeling be conducted to estimate air impacts caused by clustered sources.

6

Mr. Phil Shafer
June 29, 1984
Page 2

If you wish to discuss our comments, please contact Harry or Carlos
at your convenience.

Sincerely,

Claude M. Finnell
Air Pollution Control Officer

A handwritten signature in cursive script that reads "Carlos Villalón".

Carlos Villalón
Air Pollution Control Engineer I

CV/ni

Enc.

EXISTING/PROPOSED
POWER PLANTS

NILANDE

MAGMA
UNION

Memorandum

Mrs. Terry Roberts
Manager, State Clearinghouse
Office of Planning and Research

Date: June 28, 1984

File: 11-Imp-111
P.M. 39.0

DEPARTMENT OF TRANSPORTATION
District 11

SCH#82091950, Niland Geothermal Energy Program

Caltrans District 11 comments on the draft EIR are as follows:

Page 128 wisely recommends left and right turn mitigations on State Route 111 at the Hazard Road intersection. Such mitigation measures generally require funding by project proponents or local government.

In addition to funding, there is a need to arrange for the design and scheduling of the proposed highway work. Our contact for that purpose is Sheldon Craig, District Project Management Engineer, (619)237-6708.

The EIR should address any significant impacts attributable to the off-site highway work or clarify that there are none, if that is the case. It is possible, for example, that there might be biological or archaeological resources present which could delay or prevent implementation of the recommended mitigation measures. The eventual Notice of Determination should also be filed with the Secretary for Resources as indicated in Section 15094(c) of State CEQA Guidelines.

James T. Cheshire, Chief
Environmental Planning Branch

MO:jk

RECEIVED
JUL 06 1984
State Clearinghouse

NILAND GEOTHERMAL INC.

100 WEST WALNUT STREET
PASADENA, CALIFORNIA 91124
(213) 440-2000
Telex WH 675-336

9 July 1984

RECEIVED

Imperial County Planning Department
Courthouse
El Centro, California 92243

JUL 13 1984

**IMPERIAL COUNTY
PLANNING DEPARTMENT**

Attention: Phil Shafer

Subject: Draft Environmental Impact Report for the
Niland Geothermal Energy Program

Dear Mr. Shafer:

Staff members of Niland Geothermal, Inc., have reviewed the draft EIR and offer the following comments.

1. Pipeline expansion loops

Cross country pipelines between well pads and the main power plant will require loops to absorb thermal expansion. These pipelines will also be required to cross roads, laterals and drains. NGI's present preferred piping arrangement is to use horizontal expansion loops rather than vertical ones. Use of horizontal loops would improve seismic stability, lessen visual impacts, improve processing of materials, and decrease hazards for crop dusting.

9

2. Road and Ditch Crossings

NGI's preferred method of road and ditch crossings is to install vertical pipe loops overhead with a minimum of 16 feet head room. This type of crossing allows traffic and water to flow uninterrupted during construction and would be more economical and less environmentally disruptive than crossings which pass underneath. This method also provides better maintenance access. The loops would be designed to minimize interference with crop dusting operations and the visual landscape.

10

NILAND GEOTHERMAL INC.

9 July 1984
Mr. Phil Shafer
Page two

3. It has been brought to our attention that the desert pupfish, which inhabits drains near the Salton Sea, is proposed for inclusion on the U.S. Fish and Wildlife Service (USFWS) list of endangered species. It is also our understanding that no members of this species have been found in canals in the area, or would be in any other way potentially affected by this project. As the project applicant, NGI welcomes comments and communication from the USFWS, and other responsible agencies, to ensure that this compatibility continues.

11

Sincerely,

H. O. Richmond
Director
NILAND GEOTHERMAL INC.

HOR/REB:hw

cc: P.J. Morris
Engineering-Science

"The Largest Irrigated District in the World"

S. HARRY ORFANOS
DIRECTOR OF PUBLIC WORKS
COUNTY ROAD COMMISSIONER
COUNTY SURVEYOR
COUNTY ENGINEER

TELEPHONE
619-339-4461

RECEIVED

JUL 13 1984

IMPERIAL COUNTY
PLANNING DEPARTMENT

DEPARTMENT OF PUBLIC WORKS
COURTHOUSE
EL CENTRO, CALIFORNIA 92243-2853
July 13, 1984

Richard Mitchell
Planning Director
Imperial County Planning Department
Courthouse
El Centro, CA 92243

SUBJECT: Comments on the Draft Environmental Impact Report
for the Niland Geothermal Energy Program

Dear Mr. Mitchell:

We have reviewed the above cited EIR and submit the following comments.

1. Section 2.1.3.3, Induced Subsidence, Paragraph 3, Sentence 4: In the event that anomalous subsidence is detected by production site surveys, the appropriate action would be to evaluate the situation to determine what actions should be taken. Appropriate response could include increased scope, frequency, or precision of data collection, as is suggested in this paragraph, or measures to mitigate the cause or effect of subsidence, as is discussed in paragraph 5 of this section. The present wording of the sentence suggests that the appropriate action would be additional data collection only. (12)
2. Section 4.1, Geology: The discussion of potential geologic impacts should be expanded to note those effects discussed in Section IV of the MEIR. This section addresses only the potential for induced subsidence if the alternative injection plan is used. It seems that the evaluation of the potential impacts of the alternative injection well field plan is over emphasized. This EIR noted in preceeding sections that data regarding the alternative plan is inadequate to support a reliable analysis. It is our understanding that further study and environmental analysis would be necessary before this alternative could be utilized. (13)

July 13, 1984

14

3. Section 4.2, Hydrology, also attempts to evaluate the alternative injection well field, but notes that insufficient data is available. The discussion should be expanded to note other potentials for degradation of surface and ground water quality as is discussed in Section 4.2 of the MEIR.

In general, we believe this document will prove to be satisfactory in evaluating the potential impacts of the Niland Development Project. Thank you for the opportunity to comment on this project.

Sincerely yours,

S. HARRY ORFANOS
Director of Public Works

BY:

MARGARET J. RANDS
Geothermal Coordinator

kk

Memorandum

Terry Roberts
STATE CLEARINGHOUSE
1400 Tenth Street, Room 121

Date : June 21, 1984

Subject: Niland Development Project -
SCH #82091950

From : ENVIRONMENTAL HEALTH DIVISION
714 P Street, Room 430
322-2308

The Department has reviewed the subject environmental document and offers the following comments.

Unfortunately, Westec's Master EIR was not available during review of the subject EIR. Consequently, the Department is unable to verify the estimated noise levels. Insofar as those estimates are correct, the EIR provides a reasonable analysis of the noise effects of the project.

If you have any questions or need further information concerning these comments, please contact Dr. Jerome Lukas of the Noise Control Program, Office of Local Environmental Health Programs, at 2151 Berkeley Way, Room No. 613, Berkeley, CA 94704, 415/540-2665.

Harvey F. Collins, Ph.D., Chief
ENVIRONMENTAL HEALTH DIVISION

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN • REGION 7**

271 HIGHWAY 111, SUITE 21
IMPERIAL DESERT, CALIFORNIA 92260
Tel: (619) 346-7491

July 2, 1984

Christine Goggin
State Clearinghouse
1400 Tenth Street, Rm 121
Sacramento, CA 95814

Re: Draft Environmental Impact Report for the Niland Geothermal Energy
Program - Imperial County SCH 82091950

The Regional Board staff has reviewed subject EIR and has no comments thereon.

W.C. PONDER
Senior WRC Engineer

WCP/dh

RECEIVED
JUL 5 1984
OFFICE OF PLANNING
& RESEARCH

IN REPLY
REFER TO:
3200
(C-067.28)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
El Centro Resource Area
333 South Waterman Avenue
El Centro, California 92243

RECEIVED

JUL 06 1984

IMPERIAL COUNTY
PLANNING DEPARTMENT

JUL 05 1984

Mr. Phil Shafer, Geothermal Planner
Imperial County Planning Dept.
940 Main Street
El Centro, CA 92243

Dear Mr. Shafer:

Thank you for allowing this office an opportunity to review and comment on the draft EIR for the Niland Development Project. The document is well written and adequately addresses the pertinent environmental issues.

Thank you for keeping this office informed of geothermal issues on private land.

Sincerely,

Roger D. Zortman
Area Manager

8.2 RESPONSES

Following are responses to each of the specific written comments identified in Section 8.1. The numbers correspond to the numbers placed in the margins of the comments.

1. We concur. The measures described in Section 2.2.3.2(b) of this Environmental Impact Report (EIR) will mitigate these potential impacts of sedimentation on surface water quality.
2. We concur. The mitigation measures described in Section 2.2.3.2(b) of this EIR will minimize the risk of spill fluids reaching canal waters.
3. Although this comment addresses the project rather than its impacts, the comment is noted. The applicant has indicated that where permits are required for pipeline crossings, they will be obtained from the appropriate organizations.
4. The comment is noted. Although this comment addresses the project, not an environmental impact, the applicant has indicated their desire to keep open the option of locating the transmission line as described in this EIR. The actual location of the transmission will result from agreements between the applicant and the Imperial Irrigation District (IID).
- 5a. Comment noted. No response necessary.
- 5b. The potential for cumulative air quality impacts exists with the development of other plants. Section 2.3.3.2 of this EIR notes that plant design ". . . should provide for surface abatement of the noncondensable gas emissions should it prove necessary." We do not agree that a new significant impact has been identified. Engineering-Science air quality analysts

modeled the effect of H_2S emissions from the plant using worst case meteorologic assumptions. For receptors located within about four miles of the plant, where maximum H_2S concentrations would be reached, the neutral (D) atmospheric stability class gives the highest concentrations, not the stable (F) stability class. The reason a stable condition produces less impact is that when the atmosphere has less turbulence, the emission plume is less disbursed toward the ground.

6. Comment noted. The impact of cumulative H_2S emissions from multi-point sources of geothermal developments in the area are modeled in the final Salton Sea Anomaly Master Environmental Impact Report (MEIR), which has been incorporated in this EIR by reference.
7. The commentor agrees with the mitigation measure recommended in the EIR.
8. Although not part of the project description, the applicant has indicated their intention to improve Hazard Road from the plant site to Highway 111. No significant impacts beyond those already identified in the EIR from construction activities will result.
9. We concur. As stated in Section 6.4.5 of this EIR, use of horizontal expansion loops would increase the amount of land required for pipelines by about six acres, but would decrease potential seismic, visual, and aviation impacts. The use of horizontal loops will have a net reduction in impacts.
10. The commentors preference is noted. However, additional impacts, not described in this EIR, would occur if vertical crossings occurred over rights-of-way used by the public. The

optimal alternative for roadway and ditch crossings will be chosen on a case-by-case basis taking into account public safety and other environmental considerations.

11. In this comment, no significant impact beyond those discussed in this EIR are identified. No other comments received by the County in response to this EIR addressed the Desert Pupfish. Miland Geothermal, Inc.'s invitation to interested parties is noted.
12. Actions, other than increased data collection, to reduce detected subsidence are described on page 34, paragraph 3, of this EIR. "Data collection only. . ." is not the intent of the suggested mitigation measures. Conditions regularly imposed on permits for geothermal power plants include the suggested range of " . . . appropriate response."
13. This EIR incorporates the MEIR and the full discussion requested by these comments. This EIR concludes that significant subsidence could be avoided using the proposed (near field) injection plan, but might not be avoidable using the alternative (remote) injection plan. The commentor is correct in stating that more study would be required if the latter plan were chosen.
14. As noted above, the full discussion is provided in the MEIR.

APPENDIX A
TYPICAL GEOTHERMAL WELL DRILLING
AND TESTING OPERATIONS

APPENDIX A

TYPICAL GEOTHERMAL WELL DRILLING AND TESTING OPERATIONS

REPUBLIC GEOTHERMAL, INC.

Standard procedures for drilling, casing, cementation, and blowout prevention, as prescribed and regulated by the California Division of Oil and Gas, will be followed during proposed drilling operations. Specific information for each new well to be drilled will be submitted to the Division of Oil and Gas with the Notice of Intention to Drill a Geothermal Resources Well.

Drilling operations typically take 8 to 10 weeks for each well. A rotary drilling rig is typically used on each site. A drilling crew of 6 to 8 people is normally on-site with a maximum of about 23 people at any given time. Water for drilling is usually obtained from the Imperial Irrigation District via nearby irrigation canals. Electric power is provided on-site by a portable diesel generator. No permanent structures are generally erected on-site; however, portable sanitary facilities and bottled drinking water are available.

Conventional oil/gas drilling techniques are employed using drilling mud as a circulation medium. Drilling mud is used primarily to cool the drill bit and to carry cuttings to the surface from the bottom of the hole. Following is a list of mud components and additives which are generally used during proposed drilling operations. Also included is the maximum proportion of each material that would typically be used.

Bentonite, or colloidal clay	4.0%
Wyoming Bentonite plus 0.1% of acrylic acid, or sepiolite	11.62%
Mica	Trace

Lignite or leonardite brown coal	1.7%
Tannic acid	Trace
Caustic soda	Trace
Cane fiber	0.5%
Ground nutshells	0.5%
Lime	Trace
Barium sulphate	1.5%
Cypan	0.5%
Bit lube	0.14%
Thread dope	Trace
Pipelax	Trace
Diesel oil	0-20%
Detergent	0.17%
Sodium Bicarbonate	0.7%
Sodium Tetraphosphate	0.085%
Sodium carbonate	0.017%
Sodium chloride	0-10%
Blown asphalt	0-5%

The balance of drilling mud mixture is water.

Bentonite or sepiolite are the main drilling mud components. The other substances are additives and may or may not be used, depending on the particular drilling conditions.

The pH level of the drilling fluid is not expected to exceed 10.5 at any time. The caustic soda is generally a small part of the mixture, ranging from 200 to 2500 lbs. per well. Well drilling muds and well cuttings are typically stored in storage basins or mud pits during

drilling operations. The drilling muds may be re-used in drilling other nearby wells. Upon completion of operations, the muds and cuttings are either neutralized and made arable or transported to an approved disposal site.

When drilling activities are completed, the well must first be flowed to remove potentially damaging fluids from the formation. Well clean-out begins with flushing the well of the 300 to 500 barrels of drilling mud remaining in the well after drilling ceases. This is done with 5000 barrels or less of fresh water, or fresh water containing dissolved potassium chloride or sodium chloride. The fluid produced during this initial phase of well clean-out contains essentially no formation fluid and is disposed of at an approval disposal site.

During the second phase of well clean-out, up to 5,000 barrels of fluid are produced consisting primarily of reservoir fluid with varying amounts of formation sands, shales, clay, and some drilling mud and filtrate. This fluid is discharged into impermeable storage basins or steel tanks. The third phase of well clean-out consists of producing up to 90,000 barrels of reservoir fluid which may contain small amounts of formation sands and shale. This fluid is also discharged into impermeable storage basins or steel tanks.

The fluid produced during the second and third phase of well clean-out is disposed of by one or more of the following methods:

1. The fluid may be filtered and made suitable for subsurface injection in the manner described below. Residual solids from the filtering process would consist of formation and drilling mud solids and would be taken to an approved waste disposal facility;

2. The fluid may be concentrated by solar evaporation while contained in steel tanks and/or impermeable storage basins. The remaining residue or concentrate would be taken to an approved waste disposal facility;
3. The fluid may be transported directly to an approved waste disposal facility without further treatment or concentration.

Following clean-out operations, sustained production tests may be run on the completed well. The purpose of these tests is to evaluate reservoir performance and to recover produced fluid samples for chemical analysis. These tests would result in a volume of up to 3,000,000 barrels of reservoir fluid per well being produced. A portion of the fluid, up to 50,000 barrels, may be used to back-flush the filters. This filter backwash fluid is discharged into impermeable storage basins or steel tanks and disposed of by one or more of the methods described above. The filtered reservoir fluid is transported from the producing well through temporary pipelines and injected into wells either drilled specifically or converted for disposal purposes. All injection will take place at a depth of at least 2,500 feet and will not take place in any subsurface zone which has a total dissolved solids content of less than 10,000 mg/l, unless the quality of the injected fluid is comparable to that of the receiving water.

APPENDIX B
INDUCED SUBSIDENCE ANALYSIS

APPENDIX B

INDUCED SUBSIDENCE ANALYSIS

DWIGHT L. CAREY, D.ENV.; COURTNEY F. ISSELHARDT, M.A.;
AND CHARLES W. MORRIS, PH.D.
REPUBLIC GEOTHERMAL, INC.

The Salton Sea Anomaly Master Environmental Impact Report (MEIR) (Section 3.1.2.3 and Appendix 3.1) predicted that the maximum induced surface subsidence under worst-case conditions could range from 4.5 to 35 feet above that naturally occurring as a result of 1,400 MW of staged geothermal development during the next 30 years within the Salton Sea Anomaly. Maximum induced surface subsidence within the Niland Geothermal Energy Program (NGEP) project area under this analysis was predicted to range from 4.5 to 31 feet.

The MEIR predictions were based upon an analysis using a one-dimensional consolidation model to quantify expected reservoir compaction. Four model runs were made, each case combining an assumption regarding the quantity of fluid injected (100 percent or 80 percent of the extracted fluid) and an assumption regarding the compressibility of the reservoir rock (10^{-5} or 10^{-6} per psi). Several other assumptions critical to the modeling effort were made, among them: 1) the 4,000-foot thick geothermal reservoir lay below 2,000 feet of overburden and directly above basement; 2) the average intergranular reservoir porosity was 20 percent; 3) the reservoir had a closed boundary and received no recharge, either horizontally or vertically; 4) residual geothermal fluid was injected in blocks surrounding the production area; and 5) essentially all predicted reservoir compaction would be translated into surface subsidence. The MEIR (Section 3.1.2.3) concluded "that full field geothermal development of the Salton Sea Anomaly over the next 30 years has the potential to induce subsidence by a significant amount over the rate which is occurring naturally. Also, partial reinjection will substantially increase the risk (up to 3 times) of this accelerated rate of subsidence occurring."

A significant number of commentators to the MEIR disagreed with both the assumptions and resulting conclusions of the induced subsidence analysis presented in the MEIR (and summarized above). Comment letters contained in the "Comments and Responses" volume of the MEIR (Letter of August 24, 1981 from Olin D. Whitescarver, Union Oil Company; letter of August 25, 1981 from William C. Hass, Republic Geothermal, Inc.; letter of August 26, 1981 from J. L. Wilson, New Albion Resources Company; and letter of September 25, 1981 from Dwight L. Carey, Republic Geothermal, Inc.) pointed out that: 1) no current reservoir model has the capability to accurately predict subsidence; 2) the model's assumed rock compressibilities were one to two orders of magnitude larger than those determined from sonic log interpretations; 3) studies performed by others suggest that the surface subsidence may be only on the order of one-third of the reservoir compaction; 4) the assumption that the reservoir has closed boundaries is almost certainly erroneous, and that recharge is likely, both from below and from areas outside the anomaly; 5) much of the reservoir outside the center of the anomaly is much deeper than assumed; and 6) this deeper reservoir appears to be a low-porosity, fracture-type reservoir in a highly cemented, competent rock with essentially no intergranular porosity.

In addition, in written testimony presented to the Imperial County Board of Supervisors on May 4, 1982, M. G. Merferd, California State Oil and Gas Supervisor, summarized the California State Division of Oil and Gas's independent analysis of the potential for subsidence in the Salton Sea Anomaly and concluded that, "no detrimental subsidence can be expected as a direct result of 1,400 megawatt, full-field development in the Salton Sea Anomaly over a 30-year period."

Given the degree of disagreement over both the assumptions and conclusions of the induced subsidence analysis contained in the MEIR, it is inappropriate to simply accept without review the subsidence estimates contained in the MEIR as accurate estimates of the subsidence which could be induced by the project. Since there is general agreement

that no model exists which can accurately analyze the potential for induced subsidence from geothermal fluid withdrawal from a fracture-type reservoir such as the NGEP project production reservoir, a more qualitative approach must be used. This analysis will compare the project and reservoir characteristics assumptions used by two different organizations in modeling subsidence from geothermal operations in the Imperial Valley with the known (or inferred) characteristics of the NGEP project and reservoir. This will allow a qualitative comparison of anticipated induced subsidence from the NGEP project and the two modeled projects. This approach parallels that used by ERTEC Western, Inc. in estimating subsidence which could result from a 49 MW geothermal field and power plant located south of Brawley (Westec, 1983).

The first model selected for comparison is that presented in the MEIR (Appendix 3.1) and summarized above. The second model is one developed by Layton and Crow (1980) for a "reference" reservoir having what they believed were geohydrologic characteristics that were similar, but not identical, to existing reservoirs in the Imperial Valley.

The Layton and Crow reference reservoir consisted of three layers, each of which was 610 m (2,000 feet) thick. The uppermost layer was a confining layer composed of impermeable shales, clays, and mudstones, except for the upper 76 m (250 feet), which was unconsolidated silts, clays, and sand. The two lower layers were geothermal reservoirs, producing from intergranular pores, that were assumed to be homogeneous, isotropic, and, for actual subsidence calculations, of infinite areal extent. Both reservoirs were also isothermal but were not hydraulically connected. Permeabilities were assumed to be 150 md in the upper layer and 50 md in the lower layer. The upper layer was assigned a compressibility of $14.5 \times 10^{-9} \text{ m}^2/\text{N}$ (1×10^{-4} per psi) and the lower layer $7.25 \times 10^{-9} \text{ m}^2/\text{N}$ (0.5×10^{-4} per psi). For calculations of pressure decline due to production the reservoirs were assumed to be hydrologically nonleaky and confined.

Pressure changes for two geothermal field development scenarios were simulated using a model of unsteady-state flow from partially penetrating wells in a nonleaky, confined aquifer to determine the influence of field development geometry. Each scenario was also tested assuming both 100 percent and 85 percent injection. Both geothermal field development scenarios modeled 20 centrally located production wells, half of which were completed in the upper layer and half in the lower layer. Both modeled geothermal fields contained twelve injection wells that were placed in groups of three at some distance from the producing wells. Fluid was injected into the upper reservoir only. The major difference between the modeled fields was the well spacing. Production wells were spaced at 9 and 13 ha/well (22 and 32 acres/well) and injection wells were placed at distances of 1,800 and 1,500 m (1.12 and 0.93 miles) from the closest production well. Total discharge for all test cases was maintained at 1,260 kg/sec (2,770 lb/sec) for 30 years. This mass was considered to provide sufficient steam to operate a 50 MW (net) power plant over its useful life, assuming fluids were at about 177°C (350°F).

The worst case simulated by this model was the densely spaced production well scenario in which 85 percent of the total production was injected back into the reservoir. Under these circumstances a maximum of 9.23 m (30.3 feet) of reservoir compaction was predicted. The least reservoir compaction, 8.27 m (27.1 feet), resulted from the wider well spacing and 100% injection. Because the researchers had no specific data upon which to estimate the amount of compaction which would reach the surface, they simply assumed subsidence-to-compaction figures of 30, 10, and 1 percent. By assuming that 30 percent of this reservoir compaction was transferred to the surface, the worst-case maximum predicted induced subsidence was reported as 2.77 m (9.1 feet) and the bowl-shaped subsidence depression covered an area of approximately 3 km^2 (1 mi^2).

Induced surface subsidence results from translation to the surface of reservoir compaction, and reservoir compaction results from reservoir pressure decline. Thus, in order to use the results of the MEIR and

Layton and Crow models to predict subsidence from the NGEP project, the models' assumptions regarding reservoir and project characteristics that result in reservoir pressure decline must first be compared with the NGEP project's reservoir and project characteristics so that the NGEP project's reservoir pressure decline can be estimated. Then similar comparisons can be made so that compaction and subsidence can be estimated.

Both the MEIR and Layton and Crow reservoir models assumed that the production reservoirs were closed to fluid flow and would receive no recharge, an assumption which both stated was conservative and would lead to a worst-case reservoir pressure decline prediction. The NGEP project reservoir is certain to receive some recharge from peripheral areas (both inside and outside the Geothermal Zone Overlay boundary), and there is a reasonable likelihood that reservoir recharge will be received from a deeper geothermal zone below the production zone. The exact amount of natural (or production induced) production reservoir recharge is impossible to predict, but is likely to be significant because of the fractured nature of the reservoir, the lack of any apparent discontinuity to the geothermal reservoir outside the project area, and the lack of any nearby geothermal production projects which could reduce the sources of the recharge. Because of this high potential for significant natural production reservoir recharge, the NGEP project will likely have significantly less reservoir pressure drop per unit of production than the other two modeled reservoirs.

The NGEP project will have a geothermal fluid production rate of approximately 136,000 pounds per hour per net megawatt. The MEIR and Layton and Crow models assumed production rates of 128,000 and 199,440 pounds per hour per net megawatt, respectively. Since a higher production rate translates directly into a higher reservoir pressure decline, the NGEP project should have less reservoir pressure decline per unit of electrical capacity than that predicted in the Layton and Crow model, and approximately the same as that predicted in the MEIR model.

Both models assumed that a percentage of the produced geothermal fluid (from 80 to 85 percent under worst-case conditions) would be injected into the production reservoir from nearby peripheral injection wells. The NGEP project would inject approximately 75 to 80 percent of the produced geothermal fluid into a zone at a depth between 5,000 and 12,000 feet from a nearby peripheral injection area. Assuming that the project proponents select the injection depth to coincide with that portion of the geothermal reservoir which will accept the injected fluids without significant pressure increases, and yet will not return the fluid to the production reservoir without time to reheat, then the NGEP project reservoir pressure decline should be similar to that of the other models.

Under the alternative injection scenario, the project would inject approximately 75 to 80 percent of the produced geothermal fluid into a reservoir which is more shallow (2,500 to 4,500 feet) and more removed (about 3.5 miles) from the production reservoir. Even in a fractured reservoir such as the NGEP project reservoir, the injected fluid would require a long time to travel the 3.5 miles to return to the production reservoir. This travel time could be significantly increased if, as is likely, imperfect vertical and/or horizontal connections exist between the shallow alternative injection reservoir and the deep production reservoir. Since a lower rate of produced fluid returned to the production reservoir translates directly into an increase in reservoir pressure decline, under this alternative the NGEP project would have significantly more production reservoir pressure decline per unit of injected fluid than that predicted in the models.

Because of the various factors discussed above, the NGEP project reservoir pressure decline, relative to that predicted in the comparison models, is difficult to predict. However, since natural recharge to the production reservoir is likely to be significant, and the rate of geo-

thermal production from, and injected fluid returned to, the production reservoir is likely to be similar to the comparison reservoirs, the NGEP project reservoir will most likely have moderately less pressure decline.

If the alternative injection plan is utilized, the production reservoir pressure decline is much more difficult to predict, since it is likely that only natural recharge will be available to balance the loss of the produced fluid from the reservoir. To facilitate the analysis, we assume that use of the alternative injection scenario will result in a production reservoir pressure decline equivalent to the worst case (100+ bars) calculated in the MEIR. At present, there is no means of realistically evaluating the production reservoir pressure decline resulting from this alternative.

It is important to note that as reservoir pressure declines, so does well productivity. Significant undesirable costs would be incurred by the project proponents if additional wells needed to be drilled to maintain adequate production rates in the face of pressure declines of the magnitude predicted by the MEIR model, Case 1 (100+ bars). It is more likely that long before that pressure drawdown is reached, other measures would be taken by the project proponents, in consultation with the California Division of Oil and Gas, such as increasing injection into the production reservoir or increasing the spacing between production wells, to stop the reservoir pressure decline.

To translate reservoir pressure decline into reservoir compaction, both models were required to assume a value for formation compressibility. Layton and Crow assumed a rock compressibility of 10^{-4} per psi, while the MEIR model used a worst-case rock compressibility of 10^{-5} per psi. These assumed rock compressibilities lead to maximum reservoir compaction estimates of 30 and 35 feet, respectively, after 30 years at 85 or 80 percent injection. The MEIR model also analyzed a

second case, changing the formation compressibility to 10^{-6} per psi. This case resulted in substantially less reservoir compaction, only 6.2 feet.

The NGEP project reservoir, being significantly deeper than either of the modeled reservoirs, is more compacted and lithified than the modeled reservoirs prior to production, and thus should have a lower production formation compressibility. The evidence from rock chips that there is essentially no intergranular porosity of the Niland reservoir rock supports this assumption.

For the NGEP project reservoir, a worst-case estimate of rock compressibility of 10^{-6} per psi is very reasonable, although a lower figure is not unexpected. Since a lower rock compressibility translates directly into less compaction per unit of pressure decline, the NGEP project reservoir should have less compaction per unit of pressure decline than the worst-case model estimates. Combining this with the previous estimate that the NGEP project reservoir should have moderately less pressure decline, a worst-case estimate of the NGEP project reservoir compaction would be moderately less than the 4.5 feet predicted by the MEIR low compressibility, high injection rate case (Case 3). We have assumed a worst-case value of 3 feet of reservoir compaction. For the alternative injection case, worst-case reservoir pressure declines have been assumed equivalent to the MEIR Case 1. This leads to the expectation of an equivalent amount of reservoir compaction, or about 6.2 feet.

Finally, reservoir compaction must be translated into surface subsidence through the reservoir overburden. Both models assumed that the overburden consisted of relatively thin (2,000-foot thick), relatively poorly compacted and lithified, relatively impermeable sediments. The NGEP project reservoir overburden is much thicker (7,500 feet), more compacted and lithified (especially the deeper rocks), and apparently just as impermeable. Since thicker, more lithified overburden is less

likely to translate reservoir compaction into surface subsidence, the NGEP project area should have less surface subsidence per unit of reservoir compaction than that produced by the models. However, since the compaction-subsidence translation values assumed by the modelers varied significantly (from 1 percent to 100 percent), a reasonable factor must simply be selected. For this analysis, a worst-case value of 50 percent has been assumed. This is significantly above the maximum percentage assumed by Layton and Crow and significantly below that assume in the MEIR.

As a result of the above qualitative analysis comparing the assumptions contained in the two models and the known or assumed information regarding the NGEP project, an order-of-magnitude estimate for induced subsidence resulting from the NGEP can be made. Since the NGEP project reservoir pressure decline and formation compressibility, under worst-case conditions, were estimated to be somewhat less than the values estimated in the MEIR model Case 3, it is not unreasonable to expect that under worst-case conditions the project area may experience as much as 3 feet of reservoir compaction after 30 years. If the alternative injection plan were used, estimates are even more speculative, but compaction comparable to the MEIR Case 1 are likely.

However, because of the much greater thickness and strength of the NGEP project reservoir overburden, significantly less of the reservoir compaction (on the order of 50 percent) would reach the surface than the MEIR estimated. Therefore, maximum anticipated induced surface subsidence resulting from the NGEP project after 30 years under worst-case conditions is on the order of 1.5 feet for the primary injection plan, and 3 feet for the alternative injection plan. Although this is less than that predicted by the MEIR, it is greater than the ERTEC Western, Inc. estimate for a similar reservoir located south of Brawley (Westec, 1983). However, it cannot be overemphasized that this is an estimate of the maximum anticipated induced surface subsidence under worst-case conditions, and that for the reasons given above (including the project

proponents' economic incentives not to tolerate the reservoir pressure declines necessary to produce this subsidence), it is very likely that there will be no actual discernable surface subsidence.

APPENDIX C

VOLUME ESTIMATES OF WORST CASE
PRODUCTION AND INJECTION FLUID SPILLS

APPENDIX C

VOLUME ESTIMATES OF WORST CASE PRODUCTION AND INJECTION FLUID SPILLS

TERRY R. THOMAS, D.ENV.
REPUBLIC GEOTHERMAL, INC.

Geothermal Production Fluid Spill

The largest volume of geothermal production fluid which could be released to the environment would occur in the event of a rupture of the collector production pipe near the power plant. At this point in the system, the entire high-pressure brine flow is collected immediately upstream of the high-pressure flash vessel. According to the project applicant, as a result of system design precautions, the largest volume of brine which could be released before the geothermal wells could be shut-in (i.e. complete cessation of production flow) would be equivalent to about 30 seconds of fluid production. This is attributed to in-line flow pressure sensors which would instantaneously detect a sudden pressure drop in the system from a pipe rupture and immediately activate high/low pressure emergency shut-off valves. These valves would automatically shut-in the production wells within approximately 30 seconds.

To further provide a conservative estimate of the worst-case spill, it is assumed that concurrent with the pipe rupture the automatic shut-in system also fails. The chances of these events occurring simultaneously are extremely remote; however, a backup system would still be immediately available to the power plant operator. An independent pressure drop signal would be apparent in the power plant control room. Operators would be alerted as to the likelihood of a pipe rupture and the failure of the low pressure switches to activate the emergency shut-off valves. The operators could then activate an independent switch signaling the shut-off valves to close. A conservative estimate of the time required for the operator to recognize the problem and complete the contingency response is an additional 30 seconds. As such,

the worst-case spill is estimated to be the entire high-pressure brine flow to the high-pressure flash vessel for a 60 second period. The volumes for the Phase I and Phase II facilities are calculated as follows:

High-Pressure Brine Temperature	-	375°F
High-Pressure Brine Specific Gravity	-	1.06
High-Pressure Brine Volume (Phase I)	-	2,950,000 lb/hr
High-Pressure Brine Volume (Phase II)	-	5,900,000 lb/hr
Brine Density	-	8.328 lb/gal

$$= \text{Maximum Phase I Production Spill } \frac{(2,950,000 \text{ lb/hr}) (1 \text{ min})}{(8.328 \text{ lb/gal}) (1.06) (60 \text{ min/hr})}$$

$$= 5,600 \text{ gallons}$$

$$= \text{Maximum Phase II Production Spill } \frac{(5,900,000 \text{ lb/hr}) (1 \text{ min})}{(8.328 \text{ lb/gal}) (1.06) (60 \text{ min/hr})}$$

$$= 11,100 \text{ gallons}$$

Geothermal Injection Fluid Spill

A similar approach was taken to estimate the maximum spill from a rupture of the main alternative injection well field pipeline at a point near the power plant. (These are the longest pipelines and, thus, the worst case to evaluate. Spills from the peripheral injection site would be lower in magnitude.) A single 16-inch diameter injection line is assumed for the Phase I facility, and a similar sized injection line is proposed to run parallel to the first for the expanded Phase II facility. It is assumed that a 30 second response time is needed by the operator to recognize a catastrophic problem, shut down the injection pumps, and temporarily direct the production flow to the overflow brine storage pond until the production wells can be shut-in. Thus, the volume of injection fluid potentially lost is 30 seconds of injection flow.

In addition, the proposed alternative injection well field pipeline system slopes up toward the alternative injection wells. As such, gravity drainage of the entire fluid contents of the pipeline(s) could also conceivably be lost through the rupture. The volume estimates for the worst-case injection fluid spill are calculated as follows:

Injection Fluid Temperature	-	231°F
Injection Fluid Specific Gravity	-	1.18
Injection Fluid Volume (Phase I)	-	2,661,000 lb/hr
Injection Fluid Volume (Phase II)	-	5,322,000 lb/hr
Brine Density	-	8.328 lb/gal
Nominal Injection Pipe Diameter	-	16-inch I.D.
Longest Proposed Injection Route	-	23,120 ft.
Conversion Units	-	0.1337 cubic ft./gal

$$\text{Phase I Injection Pipeline Volume} = \frac{(3.1416)(0.6667 \text{ ft.})^2(23,120 \text{ ft.})}{(0.1337 \text{ ft.}^3/\text{gal})}$$

$$= 241,000 \text{ gallons}$$

$$\text{Phase II Injection Pipeline Volume*} = 2 (241,450 \text{ gal})$$

$$= 483,000 \text{ gallons}$$

$$\text{Maximum Phase I Injection Fluid Spill} = \frac{(2,661,000 \text{ lb/hr})(0.5 \text{ min})}{(8.328 \text{ lb/gal})(1.18)(60 \text{ min/hr})} + 241,450 \text{ gal}$$

$$= 2,300 \text{ gal} + 241,000 \text{ gal}$$

$$= 244,000 \text{ gallons}$$

$$\text{Maximum Phase II Injection Fluid Spill} = \frac{(5,322,000 \text{ lb/hr})(0.5 \text{ min})}{(8.328 \text{ lb/gal})(1.18)(60 \text{ min/hr})} + 482,900 \text{ gal}$$

$$= 4,500 \text{ gal} + 483,000 \text{ gal}$$

$$= 488,000 \text{ gallons}$$

*It is assumed that both 16-inch I.D. remote injection pipelines suffer a simultaneous catastrophic rupture near the power plant.

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APPENDIX D
SAMPLE DRIFT EMISSIONS CALCULATIONS

APPENDIX D

SAMPLE DRIFT EMISSIONS CALCULATIONS

REPUBLIC GEOTHERMAL, INC.

Circulation Flow = 38.5×10^6 lb/hr

Drift Rate = 0.01% of Circulation Flow

$$= (.0001) (38.5 \times 10^6 \text{ lb/hr}) = 3,850 \text{ lb/hr}$$

Cooling Tower Makeup Water = 1,300,000 lbs/hr

TDS of Makeup Water (Steam Condensate) = 10 ppm

Salt added to Circulation Flow

$$= (10 \text{ ppm}) (1,300,000 \text{ lbs/hr}) = 13 \text{ lbs/hr}$$

Blowdown Rate = 64,000 lbs/hr

Drift Salt Content

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APPENDIX E

ARCHAEOLOGICAL REPORT

ARCHAEOLOGICAL EXAMINATIONS OF THE REPUBLIC
GEOTHERMAL, INC., 49 MW PLANT SITE NEAR THE
SALTON SEA

Prepared by
Jay von Werlhof,
Imperial Valley College Barker Museum
442 Main Street
El Centro, California 92243

March 1983

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I. INTRODUCTION

Republic Geothermal, Inc., requested Imperial Valley College Foundation to undertake cultural field studies of a portion of the extensive geothermal field near Salton Sea in Imperial County (letter, 11 March 1983). Sherilee von Werlhof, IVC Foundation Environmental Studies Coordinator, delegated Jay von Werlhof, IVC Barker Museum Senior Archaeologist, to perform the research and field work. Since the project area includes private land owners as well as State and Federal interests, several laws and guidelines shaped the scope of the investigation. The pertinent ones are: PL 94-579; PL 59-209 and supplements in PL 96-95; PL 89-665; 36 CFR 8921; 36 CFR 800; 40 CFR 1500; and CEQA, 1970 et seq.

Republic Geothermal, Inc., has been an historic explorer and developer of geothermal energy in California. Since 1975, the company has directed careful and detailed studies of geothermal potentials in Imperial County. These studies concentrated on the East Mesa in the south central sector of the county, and more recently along the east side of the Salton Sea at the county central point. The latter sector has been the target of an intensive study the County of Imperial initiated as the Salton Sea Geothermal Anomaly. The resultant product was a detailed report WESTEC Services, Inc., prepared in January, 1981, entitled the Salton Sea Geothermal Anomaly Master Environmental Impact Report (WESTEC Services, Inc., MEIR, 1981).

That same year, WESTEC also prepared an environmental impact report for a Magma 49 MW geothermal plant site within the anomaly, and appended to it an overview of southern California prehistory (WESTEC

Appendix 8.2, Magma EIR, 1981). While most of the discussion is a synthesis of researches conducted over a sixty year period, WESTEC field personnel included some first-hand field observations from surveys the project generated. Since the cultural background material is well known and already of record pertinent to the Salton Sea anomaly, the IVC report for Republic will reference the subject as discussed in the WESTEC Appendix.

This current report, in sum, is a negative declaration.

II. REPUBLIC FIELD AREA

Moving from exploratory to tactical developments, Republic is completing plans for its 49 MW geothermal power plant and ancillary features. Covering parts of six Sections, the facility will include three integrated systems: 1) an Injection area; 2) Injection pipeline routes; and 3) a Production area. All of it is contained within the Imperial County Salton Sea Geothermal Anomaly, and specifically in its east central sector.

This sector can best be shown on portions of the Wister and the Niland U.S.G.S. quadrangle maps (Plats 4 and 5). The sector contains approximately 2,500 acres.

On a broad view, the sector is in the Colorado Desert of southeastern California, three miles east of the Salton Sea. The unincorporated sunbelt town of Niland (1247 pop.) adjoins the sector on its east border.

The highest elevation is at the northeast corner of the sector, at 48' below sea level. From here, the sector slopes along a northeast to southwest gradient, dropping to a minus 202' at the southwest corner.

Before intensive agriculture leveled the Republic subject property, natural drainways cut the lakebed sediments on closely spaced and parallel channels, from northeast to southwest. Irrigation and drain ditches now subdivide the entire sector on at least one-half mile intervals, and along cardinal directions. The entire sector has been deep plowed, graded, tiled, and under intensive agriculture.

Nowhere within the sector does a native biome exist. Even at the intersection of Alcott Road and English Road, on the southeast corner (T11S, R14E, NW 1/4, SW 1/4, Section 8), which has been fallow the past few years, the vegetation is not representative of the Creosote Scrub Bush Desert Community to which the area had belonged in prehistoric times. Years of grading and deep plowing finally removed the last germinating vestiges of indigenous growth.

III. RESEARCH

Jay von Werlhof examined the official I.V.C. Barker Museum mapbook and site records of historic and prehistoric archaeological sites known to the subject area. No sites of record exist within the Republic developmental parcel.

IV. FIELD METHOD

While von Werlhof at first thought that the sector would contain undisturbed parcels and would require a crew of two to survey the area, such was not the case. A preliminary field check on 28 March 1983 proved that no portion remained undeveloped. Therefore, on 29 and 30 March von Werlhof examined the Republic geothermal area alone. He drove to the northeast corner of the Injection field, at the intersection of Wilkens

Road and the East Highline Canal. As experienced throughout the Republic sector, no portion lay outside the intensive impact zone of Twentieth Century agricultural developments. Most fields are in cultivation and under irrigation at the present time. While as a matter of policy Imperial Valley College Foundation personnel do not trespass fields of growing crops, borders are examined. The procedure is to park at a field corner and to walk perimeters, looking for any evidence of the prehistoric past and anything of historic significance (bottles, cans, trash, etc., of the recent past are not considered "significant"). None was observed in this northerly parcel, the Injection zone (see Plat 5).

The portion of the project area planned for Injection pipes is along existing ditch banks. Since all of these are cultural topographic features that historic agriculturalists constructed, none of them was walked. All of them are high and level berms of soil either excavated from ditches and drains, or trucked in.

The Production parcel was examined in the method described for the Injection parcel. As with that, no prehistoric resources or significant historic resources were noted.

V. CONCLUSION

The subject area is in the bed of Lake Cahuilla (200 B.C. - 1500 A.D.), a prehistoric body of water that filled the Imperial and Coachella valleys. The evaporation rate in the desert of Imperial County averages 5' per year (Imperial Irrigation District records). At elevations of minus 48' to 200', the approximate age for the oldest prehistoric surface material within the Republic geothermal field would be from

1500 A.D. It is probable that Native encampments existed in this area prior to historic intensive farming. On the west side of Imperial Valley is a heavy concentration of occupational sites between minus elevations of 50' to 150'. This relatively undisturbed area supported a large population of seasonal gatherers who followed the shoreline as it receded into the Salton Sink. Unfortunately, the east side of the valley suffered widespread disturbance before any attempts were made to record sites within the former lakebed, representing the Yuman III cultural period, 1500 A.D. - 1900 A.D.

On archaeological grounds, there is no reason to delay or to deny the applications for which Republic Geothermal, Inc., has filed. Should any unusual objects of stone, bone, shell, or ceramic materials be uncovered during the construction phase of the Republic Geothermal project all work should cease until a qualified archaeologist could examine the finds.

VI. REFERENCES

Imperial Irrigation District Records. I.I.D. Headquarters, Imperial, California.

WESTEC Services, Inc.

1981 Archaeological Survey of a Proposed 49 MW Plant Site and Geothermal Wells Locations in Imperial County, California. Unpublished Report, San Diego, California. Appendix 8.2.

WESTEC Services, Inc.

1981 Cultural Resource Overview to the Salton Sea Anomaly Area, Imperial County, California. Unpublished Report, San Diego, California. Appendix to MEIR.

[illegible]

The Indians of California

NILAND 1.2 MI.
BRAWLEY (U.S. 98) 20 MI.

R14E

ROAD CLASSIFICATION

Medium-duty ——— Light-duty ———
Unimproved dirt
○ State Route

QUADRANGLE LOCATION

WISTER, CALIF.
SE/4 FRINK 15' QUADRANGLE
N 3315—W 11530/7.5

1956

AMS 2850 I SE-SERIES V895

PLAT 5

APPENDIX F
INITIAL STUDY

INITIAL STUDY

FOR

(Environmental Review of Proposed Project)

Date of Application July 30, 1982 I.S.N. 1376-82

Project Type: Geothermal Production CUP

Project Name: Niland Development Project

Republic Plant #3

Address of Project Site: Hazard Road, 1 mile east of English Road, 2 1/2 miles southwest of Niland

Project Sponsor: Republic Geothermal Inc.

Address: 11823 E. Slauson Avenue, Suite One

Santa Fe Springs, California

Telephone Number: (213) 945-3661

Current Property Owner of Record: See Attachment 1 of Application

Address: _____

Telephone Number: _____

Initial Study Prepared By:

Name: Phil Shafer

Signature: *Phil Shafer*

Name: _____

Signature: _____

Name: _____

Signature: _____

Findings
By
E.E.C.

✓ EIR

____ Negative Declaration

Richard D. Mitchell
RICHARD D. MITCHELL
Planning Director
E.E.C. Chairman

1.0 Introduction

- 1.1 Technical Discussion of Proposed Project (See Attachment if necessary)
A geothermal, electric, 49 megawatt (net), field development (1840 ac.)
and brine processing/generating facility (12 ac.). See project description
attached.

- 1.2 Project Location: Southeast 1/4 of the northwest 1/4 of Section 17, Township
11 South, Range 14 East, S.B.B.&M north side Hazard Road, 1 mile east of Englis-
Road (plant); Sections 8, 16, 17, 20 and 21, Township 11 South, Range 14 East,
and Section 33, Township 10 South, Range 14 East, southwest, and north of
Niland (field).

- 2.0 Probable Impact of Proposed Project on Environment (all "Yes" and "Maybe"
Answers will be discussed in Environmental Impact Report).

	Yes	Maybe	No
--	-----	-------	----

- 2.1 Geology, will the proposal result in:

2.1.1 Landform and topography

- a. Change in topography or
ground surface relief features?

_____	_____	<u>X</u>
-------	-------	----------

2.1.2 Structural Geology

- a. Unstable earth conditions
or in changes in geologic
substructures?

_____	<u>X</u>	_____
-------	----------	-------

- b. The destruction, covering
or modification of any unique
geologic or physical features?

_____	_____	<u>X</u>
-------	-------	----------

2.1.3 Geologic Hazards

- a. Exposure of people or property
to geologic hazards such as earth-
quakes, landslides, mudslides,
ground failure, or similar hazards?

_____	<u>X</u>	_____
-------	----------	-------

2.1.4 Soils

a. Disruptions, displacements
compaction overcrowding of soil?	<u>X</u>	—	—
b. Any increase in wind or water
erosion of soils either on or off
the site?	—	—	<u>X</u>
c. Changes in deposition or
erosion of beach sands, or changes in
siltation, desposition or erosion
which may modify the channel of a
river or stream or the bed of the
ocean or any bay, inlet, or lake?	—	—	<u>X</u>

2.2 Hydrology. Will the proposal result in:

2.2.1 Groundwater

a. Alteration of the direction or
rate of flow of ground waters?	—	<u>X</u>	—
b. Change in the quantity of
ground waters, either through direct
additions or withdrawals, or through
interception of an aquifer by cuts
or excavations?	<u>X</u>	—	—

2.2.2 Surface water

a. Change in currents, or the
course or direction of water
movements, in either marine or
fresh waters?	—	—	<u>X</u>
b. Changes in absorption rates,
drainage patterns, or the rate and
amount of surface water runoff?	<u>X</u>	—	—
c. Alterations to the course or
flow of flood waters?	—	<u>X</u>	—
d. Change in the amount of surface
water in any water body?	—	—	<u>X</u>
e. Discharge into surface waters,
or in any alteration of surface
water quality, including but not
limited to temperature, dissolved
oxygen or turbidity?	—	—	<u>X</u>
f. Substantial reduction in the
amount of water otherwise available
for public water supplies?	—	—	<u>X</u>
g. Exposure of people or property
to water related hazards such as
flooding or tidal waves?	—	—	<u>X</u>

2.3 Climatology. Will the proposal result in:

a. Alteration of air movement, moisture or temperature, or any change in climate, either locally or regionally?

_____ X _____

2.4 Air Quality. Will the proposal result in:

a. Substantial air emissions or deterioration of ambient air quality?

_____ X _____

b. The creation of objectionable odors?

_____ X _____

2.5 Noise. Will the proposal result in:

a. Increases in existing noise levels?

X _____ _____

b. Exposure of people to severe noise levels?

_____ _____ X

2.6 Biology. Will the proposal result in:

2.6.1 Vegetation (Flora)

a. Change in the diversity of species or number of any species of plants, (including trees, shrubs, grass, crops, microflora and aquatic plants)?

_____ _____ X

b. Reduction of the numbers of any unique, rare, or endangered species of plants?

_____ _____ X

c. Introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species?

_____ _____ X

d. Reduction in acreage of any agricultural crop?

X _____ _____

2.6.2 Wildlife (Fauna)

a. Change in the diversity of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms, insects or microfauna)?

_____ _____ X

b. Reduction of the numbers of any unique, rare or endangered species of animals?

_____ _____ X

c. Have an effect upon, or a need for new or altered governmental services in any of the following areas?

1. Fire protection?	_____	<u>X</u>	_____
2. Police protection	_____	<u>X</u>	_____
3. Schools?	_____	<u>X</u>	_____
4. Parks or other recreational facilities?	_____	<u>X</u>	_____
5. Maintenance of public facilities, including roads?	_____	<u>X</u>	_____
6. Other governmental services?	_____	<u>X</u>	_____

d. An effect upon or a need for new public health services resulting in:

1. Creation of any health hazard or potential health hazard (excluding mental health)?	_____	<u>X</u>	_____
2. Exposure of people to potential health hazards?	_____	<u>X</u>	_____
3. A risk of an explosion or the release of hazardous substances (including, but not limited to oil, pesticides, chemicals or radiation) in the event of an accident or upset conditions?	<u>X</u>	_____	_____

e. A need for new systems or substantial alterations to the following utilities?

1. Power or natural gas?	_____	_____	<u>X</u>
2. Communications systems?	_____	_____	<u>X</u>
3. Water?	_____	_____	<u>X</u>
4. Sewer or septic tanks?	_____	_____	<u>X</u>
5. Storm water drainage?	_____	_____	<u>X</u>
6. Solid waste and disposal?	_____	_____	<u>X</u>

c. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals?

_____ X

d. Deterioration to existing fish or wildlife habitat?

_____ X

2.7 Archaeology and Paleontology: Will the proposal result in:

a. Alteration of a significant archaeological or historical site, structure, object or building?

_____ X

b. An alteration or destruction of a significant paleontological site?

_____ X

2.8 Land Use: Will the proposal result in?

a. A substantial alteration of present or planned land use of the area?

_____ X

b. A substantial alteration of the present zoning of the area?

_____ X

c. Generation of substantial additional vehicular movement?

_____ X

d. Effects on existing parking facilities, or demand for new parking?

_____ X

e. Substantial impact upon existing transportation systems?

_____ X

f. Alterations to present patterns of circulation or movement of people and/or goods?

_____ X

g. Alterations to waterborne, rail or air traffic?

_____ X

h. An impact upon the quality or quantity of existing recreational opportunities?

_____ X

2.9 Socioeconomics: Will the proposal result in?

a. Altering the location, distribution, density or growth rate of the human population of the area?

_____ X

b. Effecting existing housing or create a demand for additional housing?

_____ X

2.10 Visual Resources: Will the proposal result in?

a. The obstruction of any scenic vista or view open to the public or will the proposal result in the creation of an aesthetically offensive site open to public view?

_____ X _____

b. Production of new light or glare?

X _____ _____

3.0 Special Conditions and Stipulations:

Mandatory Findings of Significance

a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

_____ _____ X

b. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief, definitive period of time while long-term impacts will endure well into the future)

_____ _____ X

c. Does the project have impacts which are individually limited, but cumulatively considerable? (A project may impact two or more separate resources where the impact of each resource is relatively small, but where the effect of the total of those impacts on the environment is significant.)

_____ X _____

d. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

_____ _____ X

4.0 Unavoidable Impacts of Proposed Project:
Will the proposed project result in:

4.1 Resource Base

a. Use of substantial amounts of fuel or energy?

_____ X

b. Substantial increase in demand upon existing sources of energy, or require the development of new sources of energy?

_____ X

c. Increase in the rate of use of any natural resources?

X _____

d. Substantial depletion of any nonrenewable resource?

_____ X _____

4.2 Growth inducement

a. A substantial growth of population?

_____ X _____

b. A substantial growth of economic base?

_____ X _____

c. A substantial change in social needs?

_____ X

E.E.C. DETERMINATION

(To be completed by the Environmental Evaluation Committee on the basis of the results found in the Initial Study)

Through Review of the Initial Study, the Environmental Evaluation Committee has:

_____ Found the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION WILL BE PREPARED.

_____ Found that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because the mitigation measures described on an attached sheet have been added to the project. A NEGATIVE DECLARATION WILL BE PREPARED.

✓
_____ Found the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

Date: 5/17

RICHARD D. MITCHELL
Planning Director
EEC Chairperson

For: _____

k1

NOTES

- 2.1.2.a Possible compaction of reservoir structure.
- 2.1.3.a Possible induced seismicity and surface subsidence.
- 2.1.4.a Surface soil disturbance for plant site, drill pads, and sumps.
- 2.2.1.a and b Geothermal reservoir fluids will be withdrawn and reinjected.
- 2.2.2.a Paving and structures at plant site may alter absorption and runoff rates.
 - c The plant site is within an area where desert flash floods have been observed to flow.
- 2.3.a Cooling tower emissions might locally raise humidity.
- 2.4.a There will be substantial quantities of moisture and possibility of some non-condensable gases.
 - b Some H₂S and other gases could be released.
- 2.5.a Drilling and some plant operations will create higher noise levels.
- 2.6.1.d About 30 acres of agricultural land will be converted, the remaining 1810 acres should be unaffected.
- 2.8.c The extent to which the permanent plant staff and construction worker generated traffic is substantial is arguable.
- 2.9.a,b, and c The construction workers and permanent staff will generate both temporary and permanent incremental changes in population and need for housing and all other services.
- 2.9.d.1 and 2 See 2.4, 2.5, and 2.9.d.3 below.
 - 3 In addition to the normal risks associated with an industrial plant, the rupture of lines or vessels could release brines and fumes with hazardous concentrations of constituents and high temperature fluids.
- 2.10.a The plant will be a visible intrusion on the flat landscape.
 - b The plant will be night lighted and an incremental addition to the "urban look and feel" of the Valley at night.

3.0.c Indeterminate without further study, but probable.

4.1.c and
d

The geothermal resource will be depleted. It is arguably renewable in the short term by reinjection, and absolutely renewable, at a rate much lower than the extraction rate, in the long term.

4.2.a and

b

The question is whether the incremental growth induced is "substantial".

APPENDIX B

DOE CORRESPONDENCE WITH FEDERAL, STATE, AND LOCAL AGENCIES

United States
Department of
Agriculture

Soil
Conservation
Service

1523 East Valley Parkway, Suite 213
Escondido, California 92027
Phone: (619) 489-1959

April 17, 1984

Mr. Jerald S. Scheinberg
Project Manager
U.S. Department of Energy
1333 Broadway
Oakland, California 94612

Dear Mr. Scheinberg:

Your March 28 letter to Mr. Andreuccetti has been forwarded to me for the Soil Conservation Service's reply. In that letter, you asked about prime or unique farmlands near Niland, California.

Attached are copies of the appropriate portions of the soils maps. There is one prime farmland soil within the project area that could be impacted by wells or plant construction. The soils within the site are classified as follows:

<u>Map Symbol</u>	<u>Soil Name</u>	<u>Farmland Class</u>
114	Imperial silty clay, wet	Statewide importance
115	Imperial-Glenbar silty clay loams, wet	Statewide importance
122	Meloland very fine sandy loam, wet	Prime
125	Niland gravelly sand, wet	Statewide importance
128	Niland-Imperial complex, wet	Statewide importance

I am also attaching the description of Important Farmlands categories as applied to California. Should you have questions concerning any of the information that we have provided, please contact Mr. David Estrada, Area Soil Scientist, at (619) 489-1959.

Sincerely,

Timothy W. Patton

forWARD S. DAVID
Area Conservationist

attach

jc

RECEIVED
19

The Soil Conservation Service
is an agency of the
Department of Agriculture

SCS-AS-1
10-79

CALIFORNIA NO. 1

SHEET NO. 1 OF 33

IMPORTANT FARMLANDS INVENTORY AS APPLIED TO THE STATE OF CALIFORNIA

PRIME FARMLANDS

Prime Farmland is land best suited for producing food, feed, forage, fiber and oilseed crops and also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land but not urban buildup land or water). It has the soil quality, growing season and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods.

Prime Farmland meet all the following criteria:*

1. The soils have:
 - A. Aquic, udic, ustic or xeric moisture regimes and an available water capacity of at least 4 inches (10 cm) per 40 to 60 inches (1 to 1.52 meters) of soil to produce the commonly grown cultivated crops (cultivated crops include, but are not limited to, grain, forage, fiber, oilseed, sugarbeets, vegetables, orchard, vineyard, and bush fruit crops) adapted to the region in 7 or more years out of 10; or
 - B. Xeric, ustic, aridic or torric moisture regimes in which the available water capacity is at least 4 inches (10 cm) per 40 to 60 inches (1 to 1.52 meters) of soil and the area has a developed irrigation water supply that is dependable (a dependable water supply is one in which enough water is available for irrigation in 8 out of 10 years for the crops commonly grown) and of adequate quality; and,
2. The soils have a temperature regime that is frigid, mesic, thermic or hyperthermic (pergelic and cryic regimes are excluded). These are soils that, at a depth of 20 inches (50 cm), have a mean annual temperature higher than 32° F (0° C). In addition, the mean summer temperature at this depth in soils with an O horizon is higher than 47° F (8° C); in soils that have no O horizon, the mean summer temperature is higher than 59° F (15° C); and,
3. The soils have a pH between 4.5 and 8.4 in all horizons within a depth of 40 inches (1 meter); and,

*The national LIM definitions have been slightly modified for California standards: criterion 10 is a California definition, not a national one. Part 1A which reads "AWC of at least 4 inches (10 cm), per 40 to 60 inches (1 to 1.52 meters) of soil" is a California definition.

4. The soils either have no water table or have a water table that is maintained at a sufficient depth during the cropping season to allow cultivated crops common to the area to be grown; and,
5. The soils can be managed so that, in all horizons within a depth of 40 inches (1 meter), during part of each year the conductivity of the saturation extract is less than 4 mmhos/cm and the exchangeable sodium percentage (ESP) is less than 15; and,
6. The soils are not flooded frequently during the growing season (less often than once in 2 years); and,
7. The product of K (erodibility factor) x percent slope is less than 2.0; and,
8. The soils have a permeability rate of at least 0.06 inch (0.15 cm) per hour in the upper 20 inches (50 cm) and the mean annual soil temperature at a depth of 20 inches (50 cm) is less than 59° F (15° C); the permeability rate is not a limiting factor if the mean annual soil temperature is 59° F (15° C) or higher; and,
9. Less than 10 percent of the surface layer (upper 6 inches (15 cm)) in these soils consists of rock fragments coarser than 3 inches (7.6 cm); and,
10. The soils have a minimum rooting depth of 40 inches (1 meter).

ADDITIONAL FARMLAND OF STATEWIDE IMPORTANCE

Farmland of Statewide Importance is land other than Prime Farmland that has a good combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops and is available for these uses (the land could be cropland, pastureland, rangeland, forest land or other land, but not urban builtup land or water).

Farmland of Statewide Importance meets all the following criteria:

1. The soils have:
 - A. Aquic, udic, ustic or xeric moisture regimes and an average available water capacity of at least 3.5 inches (8.8 cm) within a depth of 60 inches (1.52 meters), or in the root zone (root zone is the part of the soil that is penetrated by plant roots) if the root zone is less than 60 inches deep to produce the commonly grown cultivated crops (cultivated crops include, but are not limited to, grain, forage, fiber, oilseed, sugarbeets, vegetables, orchard, vineyard and bush fruit crops) adapted to the region in 7 or more years out of 10; or
 - B. Xeric, ustic, aridic or torric moisture regimes in which the available water capacity is at least 3.5 inches (8.8 cm) within a depth of 60 inches (1.52 meters) deep and the area has developed irrigation water supply that is dependable (a dependable water supply is one in which enough water is available for irrigation in 8 out of 10 years for the crops commonly grown) and of adequate quality; and,

2. The soils have a soil temperature regime that is frigid, mesic, thermic or hyperthermic (pergelic and cryic regimes are excluded). These are soils that at a depth of 20 inches (50 cm) have a mean annual temperature higher than 32° F (0° C). In addition, the mean summer temperature at this depth in soils with an O horizon is higher than 47° F (8° C); in soils that have no O horizon the mean summer temperature is higher than 59° F (15° C); and,
3. The soils have a pH between 4.5 and 9.0 in all horizons within a depth of 40 inches (1 meter) or in the root zone if the root zone is less than 40 inches deep; and,
4. The soils either have no water table or have a water table that is maintained at a sufficient depth during the cropping season to allow cultivated crops common to the area to be grown; and,
5. The soils can be managed so that, in all horizons within a depth of 40 inches (1 meter), or in the root zone if the root zone is less than 40 inches deep, during part of each year the conductivity of the saturation extract is less than 16 mmhos/cm and the exchangeable sodium percentage (ESP) is less than 25; and,
6. The soils are not flooded frequently during the growing season (less often than once in 2 years); and,
7. The product of K (erodibility factor) x percent slopes is less than 3.0; and,
8. Less than 10 percent of the surface layer (upper 6 inches (15 cm)) in these soils consists of rock fragments coarser than 3 inches (7.6 cm).

UNIQUE FARMLAND

Unique Farmland is land other than Prime and Additional Farmland of Statewide Importance, that is currently used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season and moisture supply needed to produce sustained high quality and/or high yields of a specific crop when treated and managed according to modern farming methods. Examples of such crops are citrus, olives, avocados, fruit and vegetables.

Characteristics of unique farmland:

- (a) It is used for a specific high value food or fiber crop;
- (b) It has a moisture supply that is adequate for the specific crop; the supply is from stored moisture, precipitation, or a developed irrigation system;
- (c) Combines favorable factors of soil quality, growing season, temperature, humidity, air drainage, elevation, aspect, or other conditions, such as nearness to market, that favor the growth of a specific food or fiber crop.

.. These lands are currently producing the following crops of high economic importance to California as identified in the annual report of the Department of Food and Agriculture:

Fruit Orchard Crops

Apples	Olives
Apricots	Peaches
Avocados	Pears
Cherries	Persimmons
Citrus	Plums
Dates	Pomegranates
Figs	Prunes
Nectarines	

Vegetable Crops

Artichokes	Cucumber
Asparagus	Garlic
Beans	Lettuce
(Dry & Snap)	Melons
Broccoli	Onions ..
Brussels	Peas
Sprouts	Peppers
Cabbage	Potatoes
Carrots	Spinach
Cauliflower	Sweet Potatoes
Celery	Tomatoes

Tree Nuts

Almonds
Walnuts
Pistachio

Irrigated Field Crops

Alfalfa	Rice
Barley	Safflower
Corn	Sorghum
Cotton	Sugarbeets
Oats	Wheat

Vineyard and Caneberries

Bushberries
Grapes
Kiwi Fruit

Specialties (not elsewhere classified)

Cut Flowers	Nursery Products
Hops	Strawberries
Ladino Clover	
Seed	

ADDITIONAL FARMLAND OF LOCAL IMPORTANCE

In some local areas there is concern for certain Additional Farmlands for the production of food, feed, fiber, forage and oilseed crops, even though these lands are not identified as having national or statewide importance. These lands are to be identified by a local committee made up of concerned agencies, and called together by the SCS District Conservationist designated as county representative. The local committee will review the lands under this category on at least a five-year basis.

Mr. Jerald S. Scheinberg
Department of Energy
San Francisco Operations Office
1333 Broadway
Oakland, CA 94612

State of California - The Resources Agency
OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
P. O. Box 2390
Sacramento, CA 95811
(916) 445-8006

April 13, 1984
Reply to: DOE840330A

RE: Geothermal Power Plant and Well Field-Niland, California

The item cited above was received in this office on March 30, 1984.

Thank you for consulting us pursuant to 36 CFR 800.

We concur in your determination that this undertaking:

- ☒ does not involve National Register and/or eligible properties.
☐ will not affect National Register and/or eligible properties.

An official National Register eligibility determination (36 CFR 63) is unnecessary in cases of no effect. However, the provisions of 36 CFR 800.7 apply if previously unidentified National Register or eligible resources are discovered during construction.

Contact Dwight A. Dutschke of our staff if you have any questions.

Dr. Knox Mellon
State Historic Preservation Officer

United States Department of the Interior

FISH AND WILDLIFE SERVICE
SACRAMENTO ENDANGERED SPECIES OFFICE
1230 "N" Street, 14th Floor
Sacramento, California

RECEIVED
JUN 4 1984
L&G Division

In reply refer to: SESO

JUN 1 1984

#1-1-84-SP-319

Jerald S. Scheinberg
Department of Energy
San Francisco Operations Office
1333 Broadway
Oakland, California 94612

Subject: Niland, California in Imperial County.

Dear Mr. Scheinberg:

This responds to the letter from your agency dated March 28, 1984, requesting a list of endangered and threatened species and those proposed for listing that may be present within the subject project area. This fulfills the requirement of the Fish and Wildlife Service to provide information on listed species pursuant to Section 7(c) of the Endangered Species Act of 1973, as amended.

To the best of our knowledge, there are no listed or proposed threatened or endangered species within the project area. However, we are attaching a list of candidates which might, within the foreseeable future, be proposed and then undergo a final rulemaking. We urge that you consider informal consultation to avoid any conflicts at a later date should the species become listed and be present within the area of the proposal. Informal consultation should be requested of our office at the letterhead address.

Should you have additional questions regarding this list or your responsibilities under the Act, please contact Mr. Ralph Swanson at (FTS) 448-2791 or (916) 440-2791. Thank you for your interest in endangered species.

Sincerely yours,

Gail C. Kobetich
Project Leader

Attachments

ATTACHMENT B

FEDERAL ACTION AGENCY REQUIREMENTS UNDER SECTION 7(c)

Biological Assessments

This process is initiated by a Federal agency in requesting a list of proposed and listed endangered and threatened species that may be within the area of a construction project. The purpose of the assessment is to identify any proposed and/or listed species which are/is likely to be affected by a construction project. The assessment should be completed within 180 days after initiation of the assessment (or within such a time period as is mutually agreed to by our two agencies). If the Biological Assessment is not initiated within 90 days of receipt of the species list, your agency should informally verify the accuracy of the list with our Service. No irreversible commitment of resources is to be made during the Biological Assessment process which would result in violation of your requirements under section 7(a) of the Act. Planning, design, and administrative actions may be taken by your agency; however, no construction may begin.

Your agency should: conduct an on-site inspection of the area to be affected by the proposal which may include a detailed survey of the area to determine if the species is present and whether suitable habitat exists for either expanding the existing population or for potential reintroduction of the species; review literature and scientific data to determine species distribution, habitat needs, and other biological requirements; interview experts including those within Fish and Wildlife Service, National Marine Fisheries Service, State conservation departments, universities and others who may have data not yet published in scientific literature; review and analyze the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; analyze alternative actions that may provide conservation measures. At the conclusion of the assessment as described above, the Federal agency shall prepare a report documenting the results. The report shall also include a discussion of study methods used, any problems encountered, and other relevant information. Upon completion, the report should be forwarded to our office (1230 "N" Street, 14th Floor, Sacramento, CA 95814).

1/ "Construction Project" means any major Federal action which significantly affects the quality of the human environment designed primarily to result in the building or erection of man-made structures such as dams, buildings, roads, pipelines, channels, and the like. This includes Federal actions such as permits, grants, licenses, or other forms of Federal authorization or approval which may result in construction.

LISTED AND PROPOSED ENDANGERED AND THREATENED
SPECIES, AND CANDIDATE SPECIES THAT MAY OCCUR
IN THE AREA OF THE PROPOSED
PROJECT NAME

IMPERIAL COUNTY, CALIFORNIA
1-1-84-SP-319

LISTED SPECIES

NONE

PROPOSED SPECIES

NONE

CANDIDATE SPECIES

Plant

Orocoxia sage

(2) Salvia greatae

Fish

Desert pupfish

(1) Cyprinodon macularius

- (1) Category 1
- (2) Category 2

APPENDIX C

DEFINITION OF SIGNIFICANT IMPACTS

**COUNCIL ON ENVIRONMENTAL QUALITY
(43 FR 230, NOVEMBER 1978)**

Sect. 1508.27 Significantly.

"Significantly" as used in NEPA requires considerations of both context and intensity:

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

(b) Intensity. This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity.

(1) Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

(2) The degree to which the proposed action affects public health or safety.

(3) Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

(4) The degree to which the effects on the quality of the human environment are likely to be highly controversial.

(5) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

(6) The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

(7) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

(8) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

(9) The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

(10) Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.