Final Staff Assessment - Part 3

MORRO BAY POWER PLANT PROJECT

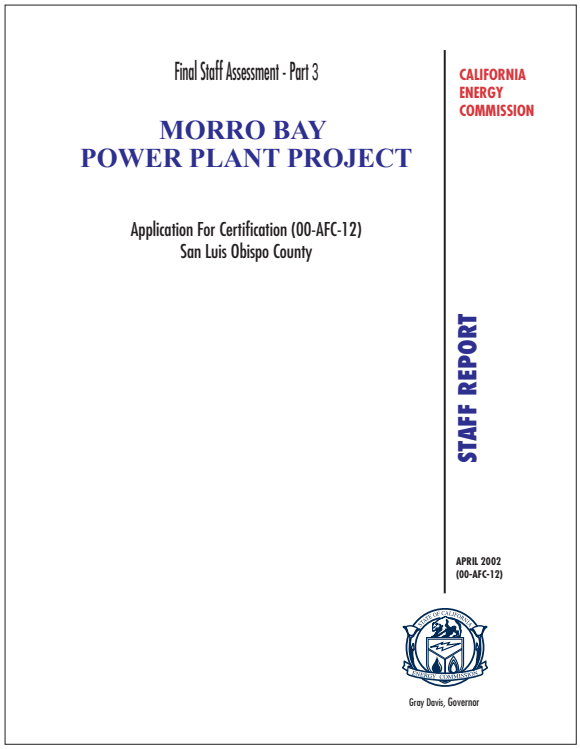
Application For Certification (00-AFC-12)
San Luis Obispo County

CALIFORNIA ENERGY COMMISSION

STAFF REPORT

APRIL 2002
(00-AFC-12)

Gray Davis, Governor



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Morro Bay Power Plant (00-AFC-12)
FINAL STAFF ASSESSMENT

EXECUTIVE SUMMARY

Marc Pryor and Kevin M. Kennedy

INTRODUCTION

This Final Staff Assessment (FSA) Part 3 contains the Energy Commission staff's analysis and recommendation on the Morro Bay Power Plant project (MBPP) in the technical areas of **Aquatic Biological Resources**, **Terrestrial Biological Resources** and **Alternatives**. Appendix A of the Aquatic Biological Resources section contains staff's Cooling Options Report that addresses dry, wet, and hybrid (wet/dry) power plant cooling options, as well as the aquatic filter barrier option.

Part 3 of the FSA is the third and last portion of the FSA. Part 1 was issued on November 15, 2001, and included the following technical areas: air quality, efficiency, facility design, geology and paleontology, hazardous materials, noise and vibration, public health, reliability, socioeconomics, traffic and transportation, transmission line safety, transmission system engineering, visual resources, waste management, worker safety and fire protection. Part II was issued on December 19, 2001. It included the cultural resources, land use, and soil and water resources technical sections. The Morro Bay Committee has taken testimony on Parts 1 and 2, and is expected take testimony on Part 3 in early June.

The MBPP and related facilities such as the electric transmission lines, natural gas line, water supply lines and wastewater lines are under the Energy Commission's jurisdiction (Pub. Resources Code §25500). When issuing a license, the Energy Commission acts as lead agency (Pub. Resource Code §25519(c)) under the California Environmental Quality Act (Pub. Resource Code §§21000 et seq.), and prepares an environmental analysis that is equivalent to the preparation of an environmental impact report (Cal. Code Regs., tit. 14 §15251(k)).

It is the responsibility of the Energy Commission staff to complete an independent assessment of the project's potential effects on the environment, the public's health and safety, and whether the project conforms with all applicable laws, ordinances, regulations and standards (LORS). The staff also recommends measures to mitigate potential significant adverse environmental effects and conditions for construction, operation and eventual closure of the project, if approved by the Energy Commission. The analyses contained in this document were prepared in accordance with Public Resources Code section 25500 et seq.; the California Code of Regulations, Title 20, section 1701 et seq. and the California Environmental Quality Act (Pub. Resources Code §21000 et seq.), and its guidelines (Cal. Code Regs., tit. 14 §15000 et seq.).

The staff is an independent party in the proceedings and the entire FSA, Parts 1 through 3, presents staff's independent analyses. It examines engineering and environmental aspects of the MBPP, based on information available at the time of document creation. The FSA contains analyses similar to those contained in Environmental Impact Reports required by the California Environmental Quality Act (CEQA). It is not a Committee document nor is the FSA a final or proposed decision on

the proposal. The FSA presents staff's conclusions and proposed conditions that apply to the design, construction, operation, and closure of the proposed facility, if certified.

PROJECT LOCATION AND DESCRIPTION

On October 23, 2000 Duke Energy Morro Bay LLC (Duke Energy or applicant) filed an Application for Certification (AFC) seeking approval from the California Energy Commission (Energy Commission) to construct and operate the proposed 1,200-megawatt (MW) Morro Bay Power Plant Project (MBPP) on the site of the existing (formerly PG&E-owned) power plant in the City of Morro Bay (County of San Luis Obispo). Off-site construction laydown and parking areas that are located several miles south of the power plant are also part of the project.

The proposed new units would replace currently operating generation units 1 to 4 with two 600 MW combined cycle units. Each new unit consists of two gas-fired turbines, two 145-foot tall stacks, and one steam turbine. The new project's four stacks will replace the existing plant's three 450-foot tall stacks. To control emissions of air pollutants, the MBPP's combined cycle units will use the best available control technology (BACT), including selective catalytic reduction (SCR) for control of nitrogen oxides (NOx) and an oxidation catalyst for control of carbon monoxide. The SCR system consists of the reduction catalyst and an aqueous ammonia injection system.

Natural gas will continue to be delivered from Pacific Gas and Electric Company's Kettleman Compressor Station through PG&E pipeline 306. The MBPP will continue to interconnect with the electrical grid at the existing PG&E switchyard located on the plant site. As proposed, the combined cycle units would use a maximum of 475 million gallons per day (gpd) of seawater for cooling and boiler makeup. MBPP's freshwater usage will be about 10,000 gpd from its onsite wells for routine operation and maintenance.

Duke Energy proposes construction of the new generating units in a single construction phase lasting 21 months. Based on construction beginning in late 2002, commercial operation would begin in late 2004. The project includes demolition of the on-site fuel oil tank farm, all existing power plant equipment (boiler–steam turbine complex), and removal of three 450 feet tall exhaust stacks. The capital cost of the MBPP is expected to be $650 million. All construction and demolition at MBPP should be complete by year 2007-08.

STAFF'S ASSESSMENT (PART 3)

The two biologic resources analyses in FSA Part 3 include discussions of the project and the existing environmental setting; the project's conformance with laws, ordinances, regulations and standards (LORS) and whether the facility can be constructed and operated safely and reliably; project specific and cumulative impacts; the environmental consequences of the project using the proposed mitigation measures; conclusions and recommendations; and proposed conditions of certification under which the project should be constructed and operated, if approved. In addition, the FSA Part 3 includes an analysis of project alternatives.

These technical areas were the subjects of workshop discussions during 2001 and 2002. Staff has received written comments from various people and agencies on these subjects, and has provided responses to public and agency comments in each section, including Appendix A of the Aquatic Biological Resources section. Comments received from other parties (i.e. intervenors and the applicant) were taken into consideration by staff but have not been specifically addressed in the response to comments portions. This is because the parties have certain rights not accorded to non-parties, such as the right to present testimony and cross examine witnesses. Staff's conclusions, recommendations and proposed conditions of certification for these topic areas reflect those workshop discussions and written comments.

Staff is not able at this time to recommend approval of the project as currently proposed due to significant impacts to aquatic biological resources resulting from the proposed continued use of once-through cooling using sea water. Use of once-through cooling would result in significant impacts to aquatic biological resources, and it also faces significant regulatory uncertainty from both federal and state law requirements regarding such impacts that is likely to delay implementation of the project. To avoid these potentially significant impacts and likely regulatory delays, staff recommends that the license require the project to use an alternative closed cooling system that avoids use of Morro Bay for cooling water. Staff has identified both dry cooling and hybrid (wet/dry) systems as a feasible alternatives to once-through cooling based on evaluation of conceptual designs not optimized for the Applicant's proposed use of duct firing. Staff believes the designs analyzed achieve the basic objective of the project and that a larger dry-cooling system optimized for duct firing will fit on the site. Staff has not evaluated the larger system to determine its feasibility and potential impacts. Based on our assessment and discussions with Central Coast Regional Water Quality Control Board (CCRWQCB) staff, we currently believe that the CCRWQCB will require dry cooling as the Best Technology Available (BTA) under the National Pollutant Discharge Elimination System (NPDES) permit. If the CCRWQCB does not require dry cooling in the NPDES permit, other mitigation measures (e.g. habitat enhancement, daily or annual water use caps) may be adequate under CEQA but have not been proposed in sufficient detail for staff to determine whether they would be sufficient.

REMAINING ISSUES

Coastal Commission's Report to the Energy Commission

The California Coastal Commission is required to report to the Energy Commission on the suitability of the proposed site and related facilities with respect to the Coastal Act and related policies, including "the degree to which the proposed site and related facilities could reasonably be modified so as to mitigate potential adverse effects" (PRC, §30413(d)(6)). The Coastal Commission plans to issue that report based on the results of the Energy Commission's analysis of the project. The Energy Commission's decision must include provisions specified by the Coastal Commission in its report unless it "… finds that the adoption of the provisions specified in the report would result in greater adverse effect on the environment or that the provisions proposed in the report would not be feasible" (PRC, §25523(b)).

Water Board's Draft NPDES Permit

Energy Commission staff continues to work cooperatively with the staff of the CCRWQCB, which is responsible for issuing the MBPP's NPDES permit. The analyses of the staffs of both agencies (and their joint Technical Working Group) has resulted in an identification of significant impacts to aquatic species as a result of the existing MBPP's once-through cooling water system that draws from Morro Bay. The CCRWQCB staff requested that the Energy Commission provide them with a site-specific CEQA analysis of cooling water and compensation options before issuing their draft NPDES permit. Part 3 of the FSA serves as that analysis, though only limited discussion of compensation options has been included because the Applicant has not provided a sufficiently detailed proposal for these options. The draft NPDES permit is will not be released until sometime after the evidentiary hearings.

Terrestrial Biological Resources

There are several components of the proposed project for which Staff is unable to draw conclusions due to a lack of data from the Applicant. These components include the determination of impacts to the federally endangered Morro shoulderband snail in the Craft temporary parking area (and pedestrian bridge) as well as the construction laydown/storage area at Camp San Luis Obispo.

In early March 2002, Morro shoulderband snails (MSS) were found at the proposed laydown areas at Camp San Luis Obispo. The MSS is a federal-listed endangered species. If use of the laydown areas are determined to cause significant impacts to the MSS, such use, absent the appropriate mitigation, would not be allowable. Currently, the applicant is conducting protocol-level surveys of these areas that must be 1) at least five in number, 2) performed at least one week apart, and 3) performed immediately after rains. Because of these protocol-level survey requirements, the data may not be available for weeks or months. Staff must receive this information before conclusions can be made on the level of impacts to this species. Although staff believes that all significant impacts can be mitigated to less than significant levels with the implementation of all proposed mitigation, it cannot at this time recommend approval of all of the project facilities due to the undetermined, potentially significant, and unmitigated adverse impacts to terrestrial biological resources.

STAFF'S RECOMMENDATION

Staff cannot recommend approval of the Morro Bay Power Plant Project until the Applicant provides a proposal for adequate mitigation for aquatic biological resource impacts under CEQA and that will demonstrate LORS compliance. Staff's analysis has shown that the entrainment impacts are significant under CEQA, and represent an adverse impact to Morro Bay under the federal Clean Water Act. Staff recommends that the mitigation be dry cooling or other alternative cooling system that would eliminate aquatic biological resource impacts. Staff has identified feasible alternative cooling options (dry cooling and hybrid cooling). While staff's analysis was based on conceptual designs that were not optimized for the use of duct firing, staff has determined that these options are available and believes they achieve the project's basic objectives. Staff has determined that the larger dry-cooling system optimized for the Applicant's proposed use of duct firing would fit on the site, but has not evaluated

such a system to determine its feasibility and impacts. Based on its assessment of the impacts and mitigation options and on discussions with CCRWQCB staff, staff also believes that dry cooling represents BTA for this project, and that it will be required by the CCRWQCB for compliance with the federal Clean Water Act. If the CCRWQCB does not require dry cooling in the NPDES permit, other mitigation measures (e.g. habitat enhancement, daily or annual water use caps) may be adequate under CEQA, but the applicant has not provided a proposed mitigation package in sufficient detail for staff and the other concerned agencies to review.

The applicant may elect to pursue a different closed cooling alternative as BTA. Whether hybrid cooling, dry cooling, some other form of closed cooling, or another mitigation option is chosen, additional analyses will be necessary to analyze impacts associated with that alternative. However, in staff's view the switch to an alternative cooling method will avoid entirely both a potentially significant environmental impact, and the regulatory uncertainty and delays that will result from the applicant's proposal to use once through cooling.

AQUATIC BIOLOGICAL RESOURCES
(MARINE AND ESTUARINE RESOURCES)

Testimony of Andrea Erichsen, Richard Anderson,
and Michael Foster, Ph.D.

INTRODUCTION

This section of the Final Staff Assessment (FSA) provides the California Energy Commission staff's analysis of potential impacts to marine and estuarine biological resources from the Morro Bay Power Plant Modernization Project (MBPP), proposed by Duke Energy North America, LLC.

Staff's assessment analyzes potential marine and estuarine biological resource impacts to state and federally listed species, fully protected species, species of special concern, Morro Bay/Estuary wetlands, and associated marine and estuarine areas of critical biological concern, including the ecosystem effects associated with this State and National Estuary. This assessment also determines the need for mitigation, the adequacy of mitigation proposed by the Applicant, specifies additional mitigation measures to reduce identified impacts to less than significant levels and determines compliance with applicable laws, ordinances, regulations, and standards. **Aquatic Biological Resources Appendix A** was prepared to complement this FSA section by providing more detailed analyses of power plant cooling alternatives as mitigation for significant impacts on aquatic biological resources.

Assessments of impacts are based upon information provided by the Applicant in the AFC (Duke 2000a; Duke 2001d; Duke 2001e; Duke 2001f; Duke 2001g; Duke 2001h), data adequacy information, 316 (a and b) study results, responses to data requests, public workshops, and through discussions with various groups and agency representatives including: U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (CDFG), National Marine Fisheries Service (NMFS), Central Coast Regional Water Quality Control Board (CCRWQCB), California Coastal Commission (CCC), and the Technical Working Group (TWG)[1].

[1] The Technical Working Group was formed by the CCRWQCB in 1998 to oversee the design, implementation, and analysis of the thermal discharge and entrainment and impingement studies. Members of the TWG included CCRWQCB staff, Energy Commission staff, the Applicant, the Applicant's consultant Tenera, and independent marine biology consultants. The independent marine biology consultants include Dr. Peter Raimondi of the University of California, Santa Cruz and Dr. Greg Cailliet of Moss Landing Marine Laboratory both of whom were hired by the CCRWQCB, and Dr. Michael Foster of the Moss Landing Marine Laboratory who was hired by the Energy Commission. Additional participants were representatives of the California Department of Fish and Game (CDFG), California Coastal Commission (CCC), and the National Marine Fisheries Service. Intervenors and other interested stakeholders were able to observe and make comments at working group meetings. Observers of the TWG included representatives from the Morro Bay National Estuary Program (MBNEP), the Coastal Alliance on Plant Expansion (CAPE), the Environmental Defense Center (EDC), the Sierra Club, and the City of Morro Bay.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

FEDERAL

- **The Endangered Species Act** of 1973 (16 USC, §1531 et seq.), and implementing regulations, (50 CFR. §17.1 et seq.), designate and provide for protection of threatened and endangered plants and animals and their critical habitat.
- **Migratory Bird Treaty Act** (16 USC §701-718) and implementing regulations (50 C.F.R.) Subchapter B (§10.1-24.12) prohibits take of migratory birds.
- **Marine Mammal Protection Act** (16 USC Chapter 31 §1361-1375) provides protection for marine mammals.
- **Clean Water Act of 1972** (33 USC §404 et seq.) requires issuance of permits to dredge or fill waterways. A Nationwide Permit 7 (NWP7) is required to construct outfall structures. Effluent discharge must be permitted by the National Pollution Discharge Elimination System Program (NPDES Section 402). Under Section 316(b) of the Clean Water Act (CWA), the Applicant is required to utilize best technology available (BTA) to minimize any adverse impacts to biological resources due to the use of a once-through cooling water system. The 316(b) study results assist in the determination of BTA for the proposed project. In addition, thermal discharge is subject to the requirements of the California Thermal Plan as an "existing" discharge. The thermal discharge studies will be used to determine if the proposed project can meet the Thermal Plan discharge requirements.
- In 1987, Section 320, was added to the Clean Water Act to establish the National Estuary Program (NEP). The goal of the NEP is to identify, restore, and protect nationally significant estuaries of the United States. Morro Bay is one of 28 designated estuaries nationwide under this program. Section 303(d) allows for the designation of impaired water bodies and results in Total Maximum Daily Load requirements for the estuary and watershed. Morro Bay has been placed on the impaired water body list due to declining quality and health of the system and is afforded extra protection due to this designation.
- **Rivers and Harbors Act** of 1899 (§10: 33 USC §401 et seq.; CFR §114-116 and 321) requires U.S. Army Corps of Engineer permitting when building in or altering of a national waterway.
- **Magnuson-Stevens Fishery Management and Conservation Act, as amended (16 U.S.C. 1801 et seq.)** The 1996 amendments to the Magnuson-Stevens Fishery Management and Conservation Act set forth a number of new mandates for the NMFS, regional fishery management councils, and other federal agencies to identify and protect important marine and anadromous fish habitat. The Councils, with assistance from the NMFS, are required to delineate "essential fish habitat" (EFH) for all managed species. The Act defines EFH as "… those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Federal agency actions which fund, permit, or carry out activities that may adversely impact EFH are required to consult with the NMFS regarding the potential effects of their actions on EFH, and respond in writing to the fishery service's recommendations. For the Pacific region, EFH has been identified for a total of 89 species covered by

three fishery management plans (FMPs) under the auspices of the Pacific Fishery Management Council.

STATE

- **California Environmental Quality Act** (CEQA), PRC §21000 et seq. Mandates protection of California's environment and natural resources to develop and maintain a high-quality environment now and in the future. Specific goals of CEQA are for California's public agencies to: 1) identify the significant environmental effects of their actions; and, either 2) avoid those significant environmental effects, where feasible; or 3) mitigate those significant environmental effects, where feasible.
- **California Endangered Species Act** of 1984 (Fish & Game Code, §2050 et seq.) protects California's endangered and threatened species. The implementing regulations, (Cal. Code Regs., tit.14, §670.5), lists animals and plants of California declared to be threatened or endangered.
- **California Coastal Act** of 1976 (PRC §30000 et seq.) requires the protection of coastal waters from adverse impacts of wastewater discharges and entrainment.
- Section 30230 of the Coastal Act states that marine resources shall be maintained, enhanced, and, where feasible, restored. Special protection shall be provided to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.
- Section 30231 of Coastal Act requires actions that minimize adverse impacts to biological productivity of coastal waters. Such actions may include: the control of run-off, minimization of discharge and entrainment, prevention of interference with surface waterflow (and streams), prevention of groundwater depletion, use of wastewater reclamation, and maintenance of natural vegetation in buffer areas that protect riparian habitats.
- Section 30240 of Coastal mandates protection of environmentally sensitive habitats from the degradation of habitat value.
- **Warren Alquist Act** Section 25527 mandates that certain areas, such as estuaries, state parks, wilderness, scenic or natural reserves, and areas for wildlife protection, are prohibited areas as sites for facilities.
- **California Porter-Cologne Water Quality Control Act 1972**; California Water Code §13000-14957; Division 7, Water Quality. The administering agency for the above authority is the Central Coast RWQCB. Section 13000 et seq. establishes the framework for regulation of activities affecting water quality in the state, as well as the state policies that shall be followed in implementing this water quality control program. Of particular interest in this case is Section 13142.5 (b), which establishes an explicit state policy that new or expanded powerplants proposing to use seawater for cooling: shall implement the best available site, design, technology, and mitigation measures feasible to minimize the intake and mortality of all forms of marine life.

- The California Thermal Plan requires that “existing” thermal discharges ensure protection of beneficial uses. The beneficial uses of concern are included in Duke Energy’s NPDES permit from the Regional Water Quality Control Board. The main beneficial use of concern is marine habitat.
- **Shellfish Protection Act** (Water Code §§14951-14958) protects commercial shellfish cultivation habitats from point and non-point source pollution.
- **Fully Protected Species** (Fish and Game Code Sections 3511, 4700, 5050, and 5515) prohibit the taking of birds, mammals, reptiles and amphibians, and fish, respectively, listed as fully protected in California.
- **State Natural Preserves** (Public Resources Code, section 5019.71), natural preserves consist of distinct non-marine areas of outstanding natural or scientific significance established within the boundaries of state park system units. The purpose of natural preserves shall be to preserve such features as rare or endangered plant and animal species and their supporting ecosystems, representative examples of plant or animal communities existing in California prior to the impact of civilization, geological features illustrative of geological processes, significant fossil occurrences or geological features of cultural or economic interest, or topographic features illustrative of representative or unique biogeographical patterns.
- **Eelgrass Habitat Protection** (30.10 of Title 14 of Cal. Code of Regulations) provides protection for eelgrass habitat.

SETTING

REGIONAL SETTING

The proposed project is located on 107 acres of an existing industrial complex in the coastal town of Morro Bay, in San Luis Obispo County, California (Duke 2000a, Section 6.6B, Figure 6.6B-1). State Highway 1, a popular tourist route, lies less than 0.25 kilometers from the eastern edge of the project site. Tourism and enjoyment of the coastal environment, wildlife, and fish, are of primary importance to the economy of the Morro Bay region.

The Morro Bay ecosystem supports one of the most important wetland systems on California’s coast (MBNEP 2000). The natural communities of Morro Bay and the associated estuary were designated as California’s first State Estuary in 1994. The following year, Congress designated Morro Bay a "National Estuary", in order to acknowledge and protect the bay’s natural diversity. Morro Bay is one of 28 estuaries in the United States to be classified as a National Estuary. Morro Rock, the base of which is adjacent to the thermal discharge from the once-through cooling process, is part of the Morro Rock Natural Preserve within Morro Bay State Park. Morro Bay is also part of the Pacific Flyway, which provides critical habitat for migrating shorebirds and waterfowl (Garret and Dun 1981; Gerdes et al. 1974; Helmers 1992; Page et al. 1999; Stenzel et al. 1994).

Morro Bay and its estuary covers approximately 2,300 acres and is sheltered from the open ocean by a sand spit and man-made breakwater. When intertidal and wetland areas are included, the acreage increases to 2,600 acres (MBNEP 2000). The bay is characterized by tidal marshes, mudflats, open water, and rocky intertidal zones, which provide highly productive, diverse, and dynamic habitats (Duke 2000, pages 6.6A-17 to 21). The ocean shore, dunes, and undeveloped upland areas, as well as wetlands in the region, support many sensitive and listed species including invertebrates, amphibians, reptiles, passerines, raptors, shore birds, waterfowl, and small to medium-sized mammals (Duke 2000a, page 6.6B-6, and pages 6.6A-51 to 65; MBNEP 2000). The estuary also provides resident and nursery habitats for a variety of fish, including steelhead trout (Duke 2000a, pages 6.6A-61 to 63; Duke 2001f). Morro Bay/Estuary supports a wide diversity of biological communities and species (MBNEP 2000). In addition to saltwater and tidal influence, Morro Bay/Estuary receives freshwater from a 48,000-acre watershed drained by Los Osos, Chorro, and Warden Creeks (MBNEP 2000).

Marine and Estuarine Biological Resources

The marine/estuarine biological resources of Morro Bay would be significantly impacted by the proposed use at MBPP of a once-through cooling system, which would require both the intake of cooling water from Morro Bay and the subsequent discharge of the warmed cooling water into Estero Bay. The use of once-through cooling also requires regular dredging in the vicinity of the intake structure which is adjacent to the navigation channel near the entrance to Morro Bay, to keep the cooling water intakes free of obstructions.

Morro Bay is a shallow, seasonally hypersaline barrier lagoon covering approximately 2,300 acres, with an average depth of 4 ft. below mean tide level. The bay was formed behind a natural sand spit, which resulted from littoral transport north from the region near Pt. Buchon. Today, the sand spit separates the bay and the delta of Chorro and Los Osos Creeks from the comparatively open waters of Estero Bay on the north side of Morro Rock. Freshwater enters the bay from seasonally flowing creeks (Chorro and Los Osos Creeks) and the entire watershed covers approximately 48,000 acres (Duke 2000a, page 6.6A-18). Morro Bay has been altered by human activities such as dredging of a navigation channel and construction along its shores (Duke 2000a, page 6.6A-18). In addition, the land that now connects Morro Rock to the mainland was constructed to close a historic natural entrance to the bay from the north.

Morro Bay/Estuary has been described as containing four distinct zones, based on their tidal influence:

- Entrance channel and upper bay.
- Central bay.
- Southernmost reaches of the bay.
- Deltas of the Chorros and Los Osos Creeks.

These areas contain distinct tidal regimes, habitats, and wildlife. The MBPP is located in the upper bay near the entrance channel where open coast, enclosed bay, and tidal lagoon influences intersect.

The diverse aquatic habitats of Morro Bay support marine and terrestrial food webs and provide critical migration, feeding, and breeding habitats for marine mammals, birds, fish, and invertebrates (MBNEP 2000). In addition to the MBPP's operational impacts, the ecological integrity of Morro Bay and its associated watershed have been strained by many significant manmade impacts including but not limited to: erosion and siltation; nonpoint source and point source pollution; dredging for channel creation and maintenance, as well as to keep the cooling intakes clear; and the introduction of exotic species (MBNEP 2000). All of these activities have affected and continue to affect the quality of the Morro Bay/Estuary.

Dominant ecological communities in Morro Bay include intertidal mud flats, eelgrass beds, and coastal salt marsh (Duke 2000a, page 6.6A-23 Figure 6.6A-6, and page 6.6A-35, Figure 6.6A-8e). The bay also contains habitats consisting of sandy subtidal, rocky intertidal (including areas created by the breakwater, wharves and pilings), and brackish marshes (MBNEP 2000). These habitats support a diversity of aquatic vegetation. In addition, the estuary accommodates a commercial shellfish lease (Gerdes et al. 1974).

There are several sensitive habitats in Morro Bay including: saltwater marsh, freshwater marsh, eelgrass beds, rocky intertidal zones, and tidal mudflats (Duke 2000a, pages 6.6A-21 to 64). Several of these habitats are considered Essential Fish Habitat (EFH) by the National Marine Fisheries Service (NMFS)(NMFS 2001a). The Essential Fish Habitat Assessment (Duke 2001f) discusses other species of concern in Morro Bay including species covered under three Fishery Management Plans (FMPs): the Pacific groundfish FMP, the coastal pelagic species FMP, and Pacific salmon FMP.

There were two special status fish species identified as inhabiting/potentially inhabiting the Morro Bay/Estuary in the AFC (Duke 2000a, page 6.6A-61-65). These species are the federally endangered tidewater goby *(Eucycloglobius newberryi)* and the steelhead trout *(Oncorhyrnchus mykiss)* (Duke 2001f*).*

The tidewater goby *(Eucycloglobius newberryi)* inhabits bays and lagoons to the north and south of Morro Bay. There is suitable habitat for the tidewater goby within Morro Bay/Estuary, and it has been detected in Morro Bay/Estuary recently. No individuals were identified during surveys for the 316(b) assessment (Duke, 2001f).

California steelhead trout *(Oncorhyrnchus mykiss)* were not detected in Morro Bay during surveys, nor were they detected as being impinged or entrained. However, this species has historically occurred in the Morro Bay ecosystem and may be present in small numbers. The NMFS and USFWS will provide their opinions on impacts to this species through the Federal Endangered Species Act Section 7 consultation and the Magnuson-Stevens Fisheries Management and Conservation Act's Essential Fish Habitat (EFH) consultation. These opinions have not yet been received by the Energy Commission. The U.S. Environmental Protection Agency (USEPA) has written a letter to the NMFS requesting concurrence with the finding that an informal consultation is satisfactory for steelhead trout since significant impacts are not expected to this species (USEPA 2001b).

The federally threatened sea otter (*Enhydra lutris*), and the state and federally endangered California brown pelican (*Pelicanus occidentalis*) are common inhabitants of Morro Bay/Estuary. These two species rely on the Morro Bay/Estuary for food that could be affected by once-through cooling. Numerous other sensitive species listed in AQUATIC BIOLOGICAL RESOURCES Table 1 also inhabit and rely periodically on the project area.

Morro Bay supports a diversity of fish, invertebrates, and many other organisms (i.e. phytoplankton, zooplankton, jellyfish, crabs, mussels, clams, worms, etc.) which form the basis of the ecosystem food web. Refer to Duke (2001 July 10, Chapter 2 pages 2-14 through 2-24) for detailed information on habitat communities and fish and invertebrate species. Larger fish, birds, and mammals (including humans) rely upon the natural diversity and productivity of Morro Bay's many habitats and microhabitats. Eighty-two percent of the fish species regularly found in the shallow eelgrass and tidal mudflats of Morro Bay in the mid-1970s were of three species: Topsmelt (*Atherinops affini*s), Shiner perch (*Cymatogaster aggregata*), and Pacific Staghorn Sculpin (*Leptocottus armatus)* (Horn 1980). Ninety-one percent of the biomass collected was represented by four species: Gray Smoothhound (*Mustelus californicu*s), Jacksmelt, Shiner Perch, and Pacific Staghorn Sculpin (Horn 1980).

Fierstine et al. (1973) provides data on fish abundance in different areas of Morro Bay from January 1968 to December 1970 (see Duke 2000a, page 6.6A-50, Table 6.6A-3 on page 6.6A-51). Samples were collected at five different stations over time. The most abundant fish near the intake of the MBPP were fish in the perch family Embiotocidae (22%), topsmelt, lingcod and anchovy. A total of 66 species were caught.

Staff agrees with the applicant that no reliable or adequate data from long-term scientific studies of fish or animal populations and community dynamics in Morro Bay are available (Duke 2000a, pages 6.6A-5 to 6, Table 6.6a-1). There are several technical reports (PG&E 1972; PG&E 1997a and 1997b; SOCAL 1973) and agency documents (CDFG monitoring); however, the temporal span of the studies ranges only from the late 1960's to the present (Duke 2000a, pages 6.6A-5 to 6 Table 6.6A-1). The CDFG provided information from 1992-1999 on subtidal channel fish and invertebrates, open water surveys for fish (1992-present), and a long-term monitoring program for Pismo clam (1945-present) (Gerdes et al. 1974). Despite these studies, the NMFS and other experts on marine biology indicate that the available information is generally inadequate to enable separation of the effects of the power plant from other factors that have altered marine communities and populations of special status species (CAPE 2001; Chesney 2001).

AQUATIC BIOLOGICAL RESOURCES Table 1
Terrestrial and Marine/Estuarine Special Status Species
Likely to Occur within One Mile of MBPP

Occurs within one mile	Scientific Name	Common Name	Legal Status Federal/State Other
Plants			
N	*Arctostaphylos morroensis*	Morro manzanita	FT
D	Calochortus clavatus var. clavatus	Club-haired mariposa lily	CNPS 4
N	Calystegia subacaulis ssp. Episcopalis	Cambria morning-glory	CSC CNPS 1B
N	*Chorizanthe breweri*	Brewer's spineflower	CNPS 1B
N	*Cirsium fontinale var. obispoense*	Chorro creek bog thistle	FE
D	Cordylanthus maritimus ssp.Maritimus	Salt marsh bird's-beak	FE /SE CNPS 1B
N	*Dithyrea maritima*	Beach spectacle-pod	FSC/ST CNPS 1B
D	Dudleya abramsii var. bettinae	San Luis Obispo serpentine dudleya	FSC CNPS 1B
D	Dudleya blochmaniae ssp. Blochmaniae	Blochman's dudleya	FSC CNPS 1B
N	*Erigeron blochmaniae*	Blochman's leafy daisy	CNPS 1B
N	*Eriodycton altissimum*	Indian knob mountainbalm	FE/SE
D	Erysimum insulare ssp. Suffrutescens	Suffrutescent wallflower	CNPS 4
N	*Layia jonesii*	Jones's layia	FSC CNPS 1B
N	*Malacothrix incana*	Dunedelion	CNPS 4
D	*Mucronea californica*	California spineflower	CNPS 4
D	*Suaeda californica*	California seablite	FE CNPS 1B
Fish			
D	*Oncorhynchus mykiss*	Central California coast steelhead trout	FT
D	*Eucyclogobius newberryi*	Tidewater goby	FE/CSC
Mollusks			
D	Helminthoglypta walkeriana	Morro shoulderband snail	FE
Insects			

D	*Icaricia icarioides moroensis*	Morro Bay blue butterfly	FSC
Herpetofauna			
N	*Taricha torosa*	California newt	CSC
D	*Anniella pulchra*	California legless lizard	FSC/CSC
D	*Clemmys marmorata pallida*	Southwestern pond turtle	FSC/CSC
D	*Rana aurora californica*	Red-legged frog	FT
N	*Scaphiopus hammondii*	Western spadefoot toad	FSC/CSC
D	*Phrynosoma coronatum*	Horned lizard	FSC/CSC
D	*Thamnophis hammondii*	Two striped garter snake	CSC
Birds			
D	*Gavia immer* (nesting)	Common loon	CSC/MNBMC
D	*Pelecanus occidentalis*	California brown pelican	FE/SE
D	*Phalacrocorax auritus* (rookery)	Double crested cormorant	CSC
D	*Ardes herodias* (rookery)	Great blue heron	CDFSC
D	*Botaurus lentiginosus*	American bittern	MNBMC
D	*Accipiter cooperi*	Cooper's hawk	CSC
D	*Accipiter striatus*	Sharp shinned hawk	CSC
D	*Circus cyaneus*	Northern harrier	CSC
D	*Elanus leucurus*	White-tailed kite	FP
D	*Aquila chrysaetos*	Golden eagle	CSC
D	*Falco peregrinus* (nesting)	Peregrine falcon	FE Delisted/SE
N	*Laterallus jamaicensis*	California black rail	FSC/ST
N	Rallus longirostris obsoletuss	California clapper rail	FE/SE
D	*Charadrius alexandrinus* (nesting)	Western snowy plover	FT/CSC
D	*Sterna antillarum*	California least tern	FE/SE
D	*Brachyramphus marmoratus*	Marbled murrelet	FT/SE
D	*Athene cunicularia*	Burrowing owl	FSC/CSC
D	*Empidonax traillii*	Willow flycatcher	SE
D	*Lanius ludovicianus*	Loggerhead shrike	FSC/CSC

D	*Riparia riparia*	Bank swallow	ST
D	*Dendroica petechia*	Yellow warbler	CSC
Mammals			
N	*Dipodomys heermanni morroensis*	Morro bay kangaroo rat	FE/SE
D	*Neotoma fuscipes (luciana)*	Monterey dusky-footed woodrat	FSC/CSC
N	*Neotoma lepida intermedia*	San Diego desert woodrat	FSC/CSC
D	*Enhydra lutris*	Southern sea otter	FT

Source: Duke (2000a) Table 6.6B-2, Duke 2001h, Attachment 27.
D = documented to occur historically within 1 mile radius of MBPP site.
N = Not documented to occur historically within 1 mile radius of MBPP site.

Status legend:
CNPS List 1B = Plants rare or endangered in California and elsewhere, CNPS List 4 = Plants of limited distribution (California Native Plant Society 1994), FE = Federally listed Endangered, FT = Federally listed Threatened, FSC = Federal species of concern, FPT = Federally Proposed (Threatened), FC = Federal Candidate, CSC = CDFG species of special concern, FP = CDFG fully protected, ST = State listed Threatened, SCE = State Candidate (Endangered) SE = State listed Endangered, MNBMC = Fish and Wildlife Service Migratory Nongame Bird of Management Concern.

Power Plant - Aquatic Impacts

Impacts on Essential Fish Habitat

The proposed project was evaluated by the applicant for its impacts to Essential Fish Habitat (Duke 2001f). As stated above, there are three Fishery Management Plans (FMPs) in the MBPP region: the Pacific groundfish FMP, the coastal pelagic species FMP, and Pacific salmon FMP. The applicant concluded that no significant impacts would result from the proposed MBPP construction and operations because these species do not generally inhabit the areas impacted by the project, and because avoidance and minimization measures will be implemented to protect water bodies and drainages (creeks) from habitat destruction, sedimentation, pollution, and erosion (Duke 2001f, page 10). The once-through cooling system was also evaluated in the EFH Assessment and the applicant concluded that salmonid, groundfish and coastal pelagic species will not be significantly adversely impacted by entrainment and impingement. The National Marine Fisheries Service (NMFS) howerver, expressed concern for entrainment and impingement losses (NMFS 2001a). Staff's independent evaluation of the impacts on aquatic biological resources is presented below.

Impacts from Once-through Cooling

Power plant once-through cooling water systems impact aquatic organisms by impingement, entrainment, and thermal discharge effects. The body of water from which the cooling water is withdrawn is called the **source water**. **Impingement** of aquatic organisms results during cooling water intake as organisms are pulled into contact with the intake screens, and are held there by the velocity of the water being

pumped through the cooling system. Unless the organisms are able to escape, they perish. **Entrainment** occurs when small aquatic organisms (fish and clam larvae, etc.) are carried through the intake screens (screen mesh size is usually 5/16 or 3/8 of an inch) and through the remainder of the cooling system. It is assumed that none of the entrained organisms survive (Duke 2001e; Duke 2001f). **Thermal discharge** is heated water from the cooling water system that is discharged into Estero Bay. This heated discharge water can cause impacts to biological resources.

Staff assessed ecological effects of entrainment and impingement on aquatic biota using data from historical studies and a recently completed 12-month study. The studies considered the effects of entraining larval fish and megalopal cancer crabs (native and European) in the cooling water system, as well as the impingement of larger fish and macroinvertebrates at the cooling water intake structure (CWIS). The thermal discharge effects were also evaluated.

The ecological impacts of impingement, entrainment, and thermal discharge are difficult to predict for this project due to the limited temporal scale of the studies and the complexity and spatial scale of this dynamic marine/estuarine ecosystem (NMFS 2001a, CAPE 2001). The Morro Bay ecosystem is impacted simultaneously by numerous man-made stressors (e.g. pesticides, nitrogen, siltation, the existing power plant)(MBNEP 2001). Acknowledging this, the staffs of the CCRWQCB and Energy Commission agreed to the following impacts assessment approach as a reasonable way to estimate impacts and to determine mitigation/compensation levels.

A main purpose of the 316(b) report is to estimate what proportion of estuarine larvae is taken by the power plant. The principle is that if the power plant takes a very small proportion of larvae then the impact is not significant, and if a large proportion is taken, the impact is significant. Proportional loss is simply the proportion of larvae taken from the Morro Bay estuary. For example, a proportional loss of 20% for a certain estuarine species means that the power plant “takes” 20% of the larvae produced in the estuary for that taxa. It is important to understand that hundreds of species are entrained, not just a few fish species, but it is impossible to identify and enumerate all these entrained species. Therefore, the study focuses on the most abundant fish taxa that can be identified and enumerated. Staff and consultants of both the Energy Commission and CCRWQCB agreed that determining proportional losses of fish larvae due to entrainment would be used as a measure of impact to the Bay/Estuary. It was also agreed, as it was for the Moss Landing Power Plant assessment, that the 316(b) study/report does not address population level impacts. No population level studies have been done in Morro Bay, and population level “impacts” are nearly impossible to detect (typically, we can only detect major events like population crashes). Population studies are long-term intensive studies that could not be undertaken in a reasonable time accommodating the permitting process. Moreover, the adult population sizes for many of the fish taxa entrained are unknown. Proportional loss is also called proportional mortality (PM). It was agreed that fish PM data would be most useful for evaluating impacts, and would be used as a proxy for all other "silent partners" --- the small, entrainable life stages of clams, worms, etc. and the phytoplankton and zooplankton of the Bay/Estuary for which entrainment impacts were not determined in the 316(b) study. The fish PMs would thus be a proxy for all planktonic organisms in the estuary that are small enough to be entrained. Even if such studies were done,

changes in populations could not be attributed to a specific cause (cause and effect). In fact, even when definite population crashes occur in conjunction with power plant operations, cause and effect is still vigorously debated. This is the case at Brayton Point Power Plant in Massachusetts, where a fishery collapse occurred following the start-up of a once-through cooling water system. The utility company and its scientists insist that the power plant is not the cause of the population crashes (but nevertheless have agreed to install a closed cooling system).

Staff evaluated the results of these studies in order to determine the scope of the project's once-through cooling impacts under both CEQA and the Clean Water Act provisions applicable to cooling water intake structures and thermal discharge. Although the significance criteria under each set of laws are different, the 316(a) and (b) study results provide the best information available for conducting both evaluations.

Clean Water Act: 316(a) and 316(b)

Staff has coordinated its evaluation of the project's compliance with The California Thermal Plan and Section 316(b) with the CCRWQCB staff because that agency implements those regulations via the NPDES permit process. The State Water Resources Control Board (SWRCB) and USEPA provide oversight for CCRWQCB's NPDES permitting process.

The MBPP Modernization Project Thermal Discharge Study for the California Thermal Plan and the Entrainment and Impingement Study for CWA section 316(b), were conducted in order to evaluate the existing condition of aquatic resources in Morro and Estero Bays and to estimate future impacts to these bays from the proposed power plant. The California Thermal Plan requires that an analysis of the thermal discharge be conducted to ensure that the NPDES permit contains limits or standards that assure protection of beneficial uses (marine habitat near the outfall). Clean Water Act section 316(b) requires that the location, design, construction, and capacity of the cooling water system reflect the use of best technology available (BTA) to minimize adverse environmental impacts due to entrainment and impingement. The 316(b) entrainment/ impingement study results assist in the determination of whether BTA will be required for the proposed project by providing information about the level of entrainment and impingement losses caused by the proposed project. If the studies indicate that the levels of water proposed to be used by the project will cause adverse impacts, BTA will be required.

As stated above, a Technical Working Group was formed by the CCRWQCB in 1998 to oversee the design, implementation, and analysis of the Thermal Discharge 316(a) and Entrainment and Impingement 316(b) studies required under the Clean Water Act permit process. Ultimately, however, the CCRWQCB will determine the appropriate limits that will be required in the NPDES permit.

All data provided in the tables and figures below reflect those conditions which the applicant predicted would occur after the MBPP is modernized. For the quantities of cooling water used, the applicant has used a maximum annual average of 427 million-gallons-per-day (mgd). This value was used by the applicant to estimate the entrainment and impingement losses identified below. As discussed in a subsequent

section, the applicant has not proposed a water limit for its NPDES permit, and staff believes that the pump capacity of 475 mgd should be used to determine impacts under CEQA. Staff stresses that the numbers used below are estimated losses that have been extrapolated for 427 mgd.

Source Water Sampling

The types of fish and invertebrate larvae in the waters of Morro Bay were measured for one year (December 1999 to December 2000) to quantify some of the natural variation in species distribution and abundance (See Duke 2001e, Table 3-1). Five stations were established to obtain representative samples of the source water (Duke 2001e, Figure 3-1). These included three stations in the bay/estuary, one at the intake (which doubled as an entrainment sampling station), and one in Estero Bay just outside the harbor entrance. These sampling stations were chosen for their accessibility and representative sampling of the source waters.

AQUATIC BIOLOGICAL RESOURCES Table 4 provides information on source water sampling results for fish larvae. At stations 1 to 4 the larvae samples represented common and abundant species such as Goby species and Sculpin. Station 5 was offshore and showed a much greater diversity of species (not a greater concentration) than the bay/estuary, many representing oceanic species. There was also seasonal and daily variation in the samples and significant differences in concentrations at different sampling stations; for example, the lowest concentration was quantified at station 5, located offshore. Morro Bay source water stations 3 and 4 consistently recorded the highest concentrations of larvae over time.

AQUATIC BIOLOGICAL RESOURCES Table 4
Relative Percentage of Fish Species Found at Five Different Source Water Sampling Locations (#1-5) at Morro Bay

Fish Species	1 Harbor Mouth	2 Intake	3 Mid Bay	4 Back Bay	5 Offshore
Unidentified Gobies	79%	75%	83%	76%	35%
Shadow Goby	5%	3%	11%	20%	1%
Northern Lampfish	-	3%	-	-	12%
Pacific Staghorn Sculpin	4%	4%	-	-	1%
Jacksmelt	1%	1%	-	-	1%
Unidentified Blennies	-	2%	-	-	1%
Northern Anchovy	-	-	-	-	9%
All other species	10%	11%	7%	4%	10%
Additional species found offshore	-	-	-	-	30%

Source: Duke 2001e

Entrainment

The primary question addressed using the 316(b) data was whether or not the proposed MBPP's entrainment would cause a significant adverse impact to the Morro Bay/Estuary ecosystem. As discussed above, fish species are used as proxies for all entrained organisms. Determining the entrainment impacts with confidence is difficult because of the lack of life history information (e.g. fecundity, mortality at different larval stages, life cycles) for most Bay/Estuarine species, including the fish species listed in AQUATIC BIOLOGICAL RESOURCES Table 4, as well as the natural variance in species population sizes and by the lack of a comprehensive, long-term monitoring program. Observed declines of fish and invertebrate populations are not typically or confidently attributable to one or two major causes. Multiple factors acting over different temporal and spatial scales are usually involved when impacts to ecological systems are detected. Nonetheless, estimating the bay/estuary ecosystem impacts of once-through cooling must also include consideration of the cumulative ecosystem impacts, which ultimately can affect long-term survival of sensitive and other species.

Entrainment levels at the existing MBPP were quantified for the 12 months ending December 2000. Weekly sampling was conducted over 24-hour periods in front of the intake structures (Duke 2001e, Station 2, Figure 3-1). The proportional entrainment estimates assume that the proposed MBPP would operate at 427 mgd (not the pump capacity of 475 mgd), about 90% capacity, and that all of the organisms entrained perish. Results revealed that the proportional entrainment losses for larvae of estuarine

fishes and megalopal cancer crabs were significant. The proportional entrainment levels for macro-invertebrates and non-estuarine fishes were lower. The greatest entrainment impacts are on the estuarine ecosystem, with lesser impacts to the offshore (oceanic) ecosystem. Staff focused on the bay/estuary and its inhabitants when analyzing the entrainment impacts.

At total of 83,600 larval fish and approximately 11,000 megalopal cancer crabs were collected over the course of the study. The most abundant fishes detected in source water sampling (approximately 81%) were gobies (shadow goby, bay goby, and unidentified goby). Gobies are distributed throughout the bay and are an important prey species for sea lions and birds (Duke 2001e, pages 3-20 to 3-25 and 3-114 to 3-115). Other species, the cabezon, Pacific herring, and white croaker are commercially important species that represent less than 1% of the entrained larvae. It is stressed that the fish larvae are proxies for all the entrained organisms from the bay/estuary ecosystem. Also, it must be understood that hundreds of species are entrained. The sampling program only collected a sub sample of all species entrained, and the actual analysis only focused on a tiny part of this sub sample (the most abundant fish and crab taxa collected). The fact that the power plant entrains hundreds of species underscores that the impact is on the ecological system, not just a single species population.

AQUATIC BIOLOGICAL RESOURCES Table 5 provides a summary of the non-estuarine fish and crab species entrained. Of the crabs, brown rock crab was the most abundant species in the source water from January through December 2000 (Duke 2000e, page 3-114). In total, there were six cancer crab species whose larvae were quantified in the entrainment study. Four of these species, the brown rock, yellow, red rock, and Dungeness, are of commercial importance.

AQUATIC BIOLOGICAL RESOURCES Table 5
Entrainment study results for Non-estuarine fish and crabs.
Proportional withdrawal ratios and equivalent adults lost

Taxa	Mean[1] Proportional Larval Loss	Equivalent[2] Adults Lost
Non-estuarine Fish		
Pacific Staghorn Sculpin	5%	N/A[3]
Northern Lampfish	2%	N/A[3]
Rockfishes	2%	26/year
White Croaker	2%	106/year
Cabezon	4%	N/A[3]
Crabs		
Brown Rock Crab	3%	5,200/year
Hairy Rock Crab	0.8%	1,300/year
Yellow Rock Crab	3%	630/year
Slender Crab	0.08%	1,200/year
Red Rock Crab	2%	42/year
Dungeness Crab	5%	54/year

[1] The average proportional loss is calculated based on mean larval duration in the water column, which is species dependent.

[2] Values presented here are the highest numbers resulting from two approaches, fecundity hindcasting and adult equivalent loss.

[3] N/A: Necessary species information not available to calculate adults lost.

AQUATIC BIOLOGICAL RESOURCES Table 6 presents entrainment results for estuarine fish. Of the fish larvae identified, blennies were entrained at high levels compared to the levels they were detected in the source water (AQUATIC BIOLOGICAL RESOURCES Table 4). The cause for this pattern is likely habitat selection by blennies; they prefer habitats among rocks and pilings such as those found in the harbor near the intake structure. Blennies were only detected in source water sampling at the intake station and at the offshore station that is not far from rocky substrate.

AQUATIC BIOLOGICAL RESOURCES Table 6
Entrainment study results for estuarine fish

Taxa	Mean[1] Proportional Larval Loss	Maximum[2] Proportional Larval Loss	Equivalent[3] Adults Lost
Gobies	11%	43%	800,000/year
Shadow Goby	1%	3%	24,000/year
Jacksmelt	22%	44%	N/A[4]
Combtooth Blennies	50%	72%	8,000/year
Pacific Herring	1%	3%	532/year
Staghorn Sculpin[5]	5% (not included in average below)	--	
Averages	**17%**	**33%**	

[1] The mean proportional loss is calculated based on the mean larval duration in the water column, which is species dependent.
[2] The maximum proportional larval loss is calculated based on a maximum larval duration in the water column, which is species dependent.
[3] Values presented here are the highest numbers resulting from two approaches, fecundity hindcasting and adult equivalent loss.
[4] N/A: Necessary species information not available to calculate adults lost.
[5] Duke Energy requested that staghorn sculpin be included in this list. The upper or maximum value has not been calculated, and the resulting averages do not include sculpin.

Table by Michael Thomas, CCRWQCB, 2001

Note that Pacific herring and jacksmelt are included in the above table as estuarine taxa because they spawn in the estuary. Proportional loss ratios for non-estuarine fish and crabs are low mainly because the source water bodies for these taxa are so large. The size of the source water body for these taxa is estimated from larval duration in the water column (# of days) and current speeds. Multiplying these values gives an estimate of how far the larvae may have traveled, which defines the source water boundaries. As determined in the Diablo Canyon Power Plant entrainment studies, the source water bodies for these taxa can be very large – up to hundreds of miles in length along the California coastline.

Initially, federally endangered tidewater goby *(Eucycloglobius newberryi)* larvae were thought to have been identified during entrainment sampling using morphometric and developmental classifications (Duke 2001e, pages 3-13; Jacobs 2001). In order to obtain more accurate identification, DNA analyses were conducted by a qualified analyst (Jacobs 2001). This work was reviewed and approved by an expert chosen by the TWG. The DNA analyses indicated that the goby larvae entrained in the cooling system were shadow goby (*Quietula y-cadua*) and arrow goby (*Clevelandia ios*), and not those of the tidewater goby (Duke 2001e, page 3-13, Appendix G). The tidewater goby was not found in entrainment samples, but it could potentially be impacted by the MBPP if the species immigrates or disperses to Morro Bay in the future.

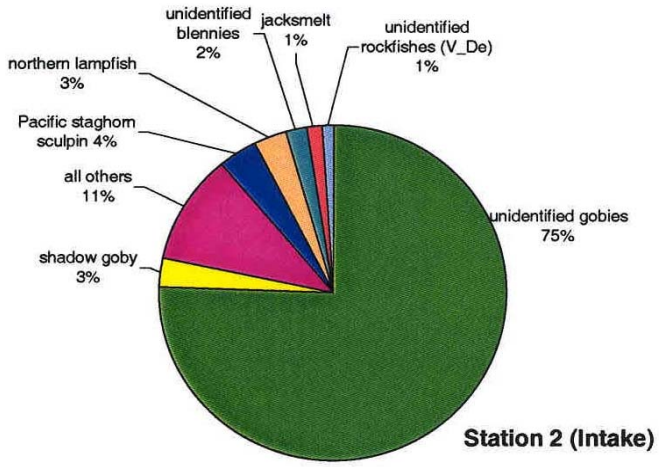
Goby larvae were entrained at high levels, 11 percent (mean proportional larval loss) and 43 percent (maximum proportional larval loss). Jacksmelt and Blennies were also entrained at high levels. Five of the six highly entrained species, gobies (including shadow goby), Pacific staghorn sculpin, combtooth blennines, and jacksmelt, depend upon shallow bay and estuary habitats.

AQUATIC BIOLOGICAL RESOURCES Table 6 includes an average range of loss for estuarine fish taxa of 17-33%. The actual loss range for individual species can be higher or lower than this range.

Clam larvae were also sampled using plankton-sampling techniques during March 2001. Clam larvae are tiny and difficult to identify. The applicant funded an experimental technique that used DNA analysis to identify the clams, although early information shows clam larvae were entrained at high levels, the final study results are not yet available (Duke 2001e, page 3-116, Appendix D). Clam species which may be impacted include the Washington Clam (*Saxidomus nuttali*), the gaper clam (*Tresus nutalli*), the Pismo clam (*Tivel stultorum*), as well as *Macoma secta* and *Mytilus galloprovincialis* (Duke 2001e, page 3-116). Because they are preyed upon by many fish, mammals (including the federally threatened southern sea otter), and birds, clams constitute an important component of the bay/estuary food web.

AQUATIC BIOLGOGICAL RESOURCES Figure 1 presents entrainment data for organisms at the intake. For example, unidentified gobies make up 75% of the fish taxa entrained, while combtooth blennies make up only 2% of the fish taxa entrained.

AQUATIC BIOLOGICAL RESOURCES Figure 1: Relative Proportions of Fish Taxa Entrained at Morro Bay Power Plant Intake Structure (Data Collected from Station Two)



There has been debate about “averaging” the proportional entrainment losses. Duke Energy states that the average proportional entrainment loss for all species is about 10%. However, the “averaging” of data across species dilutes the actual losses for some taxa. As shown in Biological Resources Table 6 above, the proportional loss range for some taxa is very high, up to 72%. Regardless of how the data are arranged or averaged, the study results show that once-through cooling causes a large proportional loss of estuarine larvae for some taxa that were identified and quantified; it is expected the same is true for other entrainable organisms. The power plant entrains hundreds of taxa, resulting in an overall loss of resources from the estuarine system. This “take” from a National Estuary that is already impaired and in ecological decline is unnecessary and avoidable.

Staff finds the applicant's proposed use of once-through cooling causes estuarine losses due to entrainment that are considered significant impacts under CEQA. Staff further finds that entrainment losses from the proposed once-through cooling system will cause adverse impacts to significant biological resources and will not comply with numerous LORS if the project is approved as proposed. See further discussion of both CEQA impacts and LORS compliance in later sections of this FSA section.

Impingement

The 12-month impingement study (completed September 8, 2000) quantified the species, abundance, and weight of organisms impinged by the existing once-through cooling system (AQUATIC BIOLOGICAL RESOURCES Table 7) (Duke 2001e, Section 4-1 for detailed methodology and Appendix H). These data are extrapolated for 427 mgd, not for the proposed permit amount of 475 mgd.

AQUATIC BIOLOGICAL RESOURCES Table 7
Relative Percentage of Fish Species Impinged at MBPP
As a Function of Abundance and Biomass

Species	Relative Impingement By Abundance (%)	Relative Impingement By Biomass (%)
Northern Anchovy	74	39
Topsmelt	6	14
Plain Midshipmen	5	13
Thornback	-	17
Speckled Sanddab	3	-
Pacific Staghorn Sculpin	2	-
Other fish species	10	9
Bat Ray	-	4
Cabezon	-	2
Pacific Sardine	-	2

Source: Duke MBPP 316(b) Resource Assessment 5/11/01

The Northern Anchovy (*Engraulis mordax*) was the most abundant species (individuals counted in each sampling period) as well as the most impinged by number (74%) and biomass (39%) (Duke 2001e, page 4-9, Table 4-2). Topsmelt (*Atherinops affinis*), plainfin midshipman (*Porichthys notatus*), speckled sandab (Citharichthyes stimaeus), California tonguefish (*Symphurus atricauda*), and Pacific staghorn sculpin (*Leptocottus armatus*), were the most commonly impinged in descending order after anchovy (in raw numbers). Together, these species account for approximately 90% of the fish impinged (Duke 2001e, page 4-12). In terms of biomass, the anchovy, topsmelt, thornback, and plainfin midshipman were the top four species. Other species such as surfperch, cabezon, pipefish, and batray were also impinged but to lesser levels. Table 4-2 in Duke's 316(b) Resource Assessment Report (2001e) provides a complete list of species impinged.

Overall, the estimated impingement, based on an annual average water use of 427 mgd, was responsible for the annual loss of an estimated 74,000 fish (2,522 pounds) and 54,979 macroinvertebrates (794.69 pounds)(Duke 2001e, Section 4-1, Tables 4-2 and 4-3). The TWG concluded that these levels were not considered biologically significant for purposes of the 316 (b) evaluation (CRWQCB 2001c), although staff believes that these levels, when considered in combination with other impacts of the project upon the marine ecosystem, contribute to the significant direct impacts of the project under CEQA. In addition, this may support a conclusion that the proposed project will interfere with the attainment of goals and policies established for estuaries in general and for Morro Bay in particular. This is discussed below in sections discussing CEQA impacts and LORS compliance.

Ecological Impacts of the Thermal Plume

The California Thermal Plan requires that “existing” thermal discharges ensure protection of beneficial uses. Thermal discharges can cause biologically important changes, including degradation of natural structure, composition, and function of near-shore, soft benthos, sandy beach, and rocky intertidal zone (including jetties) communities. The thermal plume assessment study quantified impacts to these

biological communities and attempted to extrapolate the ecological significance of the measured effects.

The existing power plant discharges cooling water to Estero Bay, just north of Morro Rock, through a surface discharge channel. The existing plant operates under NPDES permit No. CA 0003743 (March 10, 1995), which allows the plant to discharge a maximum flow of up to 668 MGD (pumping maximum)(annual average historic use ranges from 210 MGD to 567 MGD) of cooling water to Estero Bay at a temperature increase of up to 30°F above the temperature of the intake (Duke 2001d). The Applicant expects that the temperature rise for the new combined cycle units will be 20°F at maximum plant load (Duke 2000a; Duke 2001d).

Physical Characterization of the Thermal Discharge Plume

Duke Energy conducted a study to characterize the thermal discharge from the existing power plant (Duke 2001d). The final 316 (a) report describing results provides detailed methodology (Duke 2001d, Duke 2000a, Figure 6.6A-1; Appendix 6.5-1). An integral part of characterizing a thermal discharge plume is quantification of the ambient water temperature (the natural temperature range of the water in absence of the thermal discharge). Temperatures were measured at the Estero Bay buoy, approximately 2.3 km northwest of the discharge outlet; this distance was assumed to be large enough to negate effects of the plant discharge. Occasionally however, temperature increases of 1 to 2^{o}F were recorded and these were attributable to the plant (Duke 2001d). An important factor to consider when reviewing data from the 316(a) *Thermal Discharge Assessment Report* is that the plant's power production level was variable during the monitoring period, and although some information on plant power production is provided, data corresponding to the different surveys were not provided.

Summer water temperatures in Morro Bay often rise significantly above Estero Bay temperatures due to solar heating. However, intake temperatures are not significantly different from Estero Bay temperatures because the plant intake is near Morro Bay's entrance and is deep enough in the water profile to be below the warm temperature thermocline. Measurements indicate that *average* intake temperatures were up to 1.3 ^{o}F higher than Estero Bay background temperature in June (temperature differences are variable and can exceed 3 ^{o}F in the summer), with smaller rises from October to February (Duke 2001d).

Plume Configuration

The thermal surveys indicated varying thermal plume configurations during tidal cycles. As the tide rises, currents move predominantly towards the north and the plume travels in a northwesterly direction. As tide ebbs, currents move largely to the south and the plume wraps around Morro Rock. The effects of waves and wind add to these basic features. Because the predominant wave direction is from the west-northwest, a southerly along shore current develops in the near-shore zone, which frequently keeps the plume from the beach and pushes it against Morro Rock (Duke 2001d).

Thermal Plume Characteristics at Morro Rock Shoreline

Because of the discharge location and the dominant west-northwest wave direction, the thermal plume generally flows along the northern shore of Morro Rock, which contains

rocky intertidal communities. Over a length of about 500 ft from the discharge to Station 5, temperature rises often exceed 10 ^{o}F. It should be noted that the temperature sensor at Station 5 is at a fixed elevation 3 feet below Mean Lower Low Water (MLLW); therefore, this sensor may be below the plume during periods of high water. This may explain some of the periodic low temperature rises at this station and provide a misleading image of the thermal plume (Duke 2001d). The measurements indicate that the temperature rise at Station 6, on Pillar Rock, at the northwest corner of Morro Rock, exceeds 4 ^{o}F for varying fractions of the time from 6% to over 40%. The temperature sensor at this station is also located 3 ft below MLLW and, as at Station 5, may underestimate temperature rises there. The measurements further indicate that the thermal plume generates temperature rises exceeding 4 ^{o}F for lengths of up to 4,000 ft around Morro Rock, albeit for shorter periods of time. These long excursions were found to occur predominantly in the summer.

Size of 4^{o}F Temperature Rise Isotherm

Maps of the 4^{o}F temperature rise isotherms were developed for eight temperature surveys conducted between November 2000 and January 2001. Plant power production levels during these surveys varied from 63 to 85 percent of capacity. The length of the 4^{o}F temperature rise isotherms for these surveys varied from 2,000 to 5,000 feet (Duke 2001d).

Impacts to Marine Communities

In order to detect thermal discharge effects on the biotic communities in the vicinity of the MBPP discharge, several studies were conducted. The biotic communities studied were the sandy bottom benthic habitat, the beach habitat (Morro Strand State Beach) and along the rocky intertidal area of Morro Rock. The results for the Morro Rock rocky intertidal zone study show extensive changes in the biotic community within the first 600 feet of the discharge pipe. This area of the local rocky intertidal community has been modified for at least 50 years due to the thermal discharge, and with the new MBPP using the same discharge, these effects will continue. The sandy bottom benthic and beach communities were not significantly impacted by the discharge because changes to community structure and composition were not detectable.

Pismo clams were historically abundant on sandy beach bottom substrates in the vicinity of Morro Bay and were harvested by recreational fishermen (Duke 2001d). However, populations have declined on Morro Stand State Beach since the early 1970s, a decline attributed at least in part to foraging by sea otters and reduced recruitment of clam larvae to adult clams. The Pismo clam population has not since recovered from very low levels. A few juveniles were reportedly found according to the Thermal Effects Study (Duke 2001d). The Pismo clam's population decline was detected long after the plant began operation. The Thermal Effects Study did not find evidence that the temperature change significantly impacted either the water temperatures or the community structure and diversity along the sandy beach or benthic sand environments of Morro Strand State Beach. Together, this evidence does not indicate that the Pismo clam is significantly impacted by the thermal plume discharge (Duke 2001d).

Conclusions-Thermal Impacts

Thermal impacts to biological resources on Morro Rock are undesirable, and have been chronic for many decades due to the existing power plant. The rocky intertidal community growing within the influence of the thermal plume is different from what would grow and thrive there in the absence of the thermal plume.

Though not considered biologically significant to populations of specific special status species, the impacts are measurable and statistically significant to the species inhabiting Morro Rock, a rock which is part of a state nature preserve and historical cultural site. In terms of LORS, staff considers ongoing and potentially increased impacts to the Morro Rock as significant impacts due to its special status as a natural preserve. In terms of CEQA staff does not believe there will be a significant increase in effects.

Intake Maintenance

Dredging is a standard practice used to control sediment accretion that decreases the efficiency of the intake structure. The dredging process would continue periodically if once-through cooling continues to be used. There are impacts associated with dredging but staff feels they can be reduced with best management practices. Dredging will be covered in the CCRWQCB issued NPDES permit.

CEQA-Direct Impacts

As stated above, the Clean Water Act requires an evaluation of the impact of the proposed project's future water use. Under CEQA, staff typically evaluates the change to the existing environment caused by the proposed project[2]. CEQA Guidelines section 15125 state:

An EIR must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective. This environmental setting will *normally* constitute the baseline physical conditions by which a lead agency determines whether an impact is significant (Cal. Code Regs., tit. 14 § 15125(a), emphasis added).

Thus, staff's CEQA evaluation attempts to compare the biological impacts associated with the existing level of water use to the biological impacts associated with the future level of water use and to evaluate the significance of any differences between the two. For the purposes of this section of the FSA, staff was directed by the Committee to conduct one analysis using historical water use baseline of the most recent five years (8/16/01 RT, p.168, Committee Order of August 22, 2001). The Committee also acknowledged staff's right to present an analysis using an alternative baseline.

2 Although staff has decided it is appropriate to use a historical baseline in this case, staff reserves the right to argue that in different circumstances, a "zero-impact" baseline should be used.

In order to determine the historical baseline, staff obtained monthly water use data from the CCRWQCB for the period of 1987 through 2001, inclusive. The average annual water use during the most recent five years (1997-2001) was 436.6 mgd. Staff was directed to use this time period and average number by the Committee. However, staff strongly encourages the Committee to consider the implications of several alternative baselines. Specifically, the Committee should consider 10- and 15-year baselines, as well as baselines which do not include the year 2001. The CEQA Guidelines refer to "conditions as they exist at the time that the environmental analysis is commenced," which for this case was in January 2001. This language protects against any possible manipulation of the data after filing a request for a permit order to minimize or reduce the apparent impacts of the proposed project. Staff believes it is appropriate to follow that intent here. We also believe that the use of 10 or 15-year baselines present the Committee with a better understanding of the operational patterns of the existing plant.

Staff also needed to select a level of future water use with which to compare the existing (historic) level of water use. Staff has determined that the maximum permitted water use level (475 mgd) is the most appropriate for evaluating the future biological impacts of the project. This number accounts for the unpredictability in plant operation, as well as the fact that significant impacts to marine resources can occur over a relatively short period of time. According to the evidence presented at the hearings on Soil and Water Resources, the Applicant would be able to operate up to the maximum 475 mgd level for an unknown number of days, weeks, or months. In addition, another period of electrical supply shortages, such as those experienced in 2000 and early 2001, could result in all of the proposed plant's eight pumps operating for an extended period of time, corresponding to 86%-100% MBPP operating capacity. As discussed below, the unpredictable seasonal timing and duration of the maximum levels of water withdrawal can coincide with spawning events and therefore maximize impacts to bay/estuary life. Use of the 475 mgd level will also ensure that the highest level of protection for natural resources will be achieved, which staff believes is appropriate in a National and State designated Estuary.

AQUATIC BIOLOGICAL RESOURCES Table 8

MORRO BAY POWER PLANT ONCE-THROUGH-COOLING WATER USE

DERIVED FROM AVERAGE MONTHLY WATER USE DATA AS FILED WITH THE CCRWQCB FOR THE LAST 15 YEARS

	Existing	Proposed (new)
Permitted Design Flow	**707 mgd**	**475 mgd**
Historical Annual Average Flow	**210-567 mgd**	

	New PP compared to Historical[1]	
	Average Annual Historic Use	475 mgd
5 Year Average (1997-2001)	**436.6 mgd**	**+ 7.3 %**
5 Year Average (1996-2000)	**387.2 mgd**	**+ 22.7 %**
10 Year Average (1992-2001)	**379.4 mgd**	**+ 25.2 %**
10 Year Average (1991-2000)	**373.2 mgd**	**+ 27.3 %**
15 Year Average (1987-2001)	**402.4 mgd**	**+ 18.0 %**
13 Year Average (1987-2000, 14 years)	**394.2 mgd**	**+ 20.5 %**

(CRWQCB 2001d)

[1] This table compares the actual historical once-through-cooling water volumes to the design flow volume (475 MGD) of the proposed new power plant. Staff will use the 475 MGD maximum flow for impact analysis. The + indicates that the proposed new power plant with all eight pumps running will use more (+) water than the actual water volume used historically at Morro Bay Power Plant.

As can be seen from AQUATIC BIOLOGICAL RESOURCES Table 8, the range in differences between existing and future operations varies from +7.3% to +27.3%. Staff believes that the 10-year average (1991-2000) (27.3%) is the most appropriate to use because it represents recent history, while avoiding giving undue weight to the year 2000, which was, by all accounts, a very unusual year in terms of electricity generation at many older, less efficient power plants such as the existing Morro Bay power plant. Using this figure results in an incremental increase in water use of approximately 100 mgd (from 373 mgd to 475 mgd).

Staff then determined whether this increase represents a significant adverse impact. Spawning and other life-cycle events, during which increased numbers of larvae and vulnerable organisms will be entrained, occur at varying times of the year, and for

durations from days to weeks at a time. As a result, significant losses can occur in a very brief period of time (days or weeks), and as the estuary's environmental condition is deteriorating as mentioned earlier, the impacts become greater over time.

Unfortunately, in order to determine whether actual impacts to biological species are higher or lower than in the past, one must ascertain the correlation between historical water use with the significant life cycle events when bay/estuarine organisms are at risk of entrainment. Although there is no data correlating historical water use with aquatic entrainment and impingement on a biologically relevant time scale, there is evidence of environmental condition decline in the estuary and this has resulted in the focus of many projects/programs to improve the estuary (such as the NEP). The Section 316(b) study does contain weekly impingement and entrainment data, but this data has never been correlated with the water used by the power plant during the period of the study. Both power plant operation and bay/estuary species life cycle events vary annually, and when considered together, they vary to an unpredictable degree. It is therefore quite probable that actual biological impacts have varied greatly from day to day, week to week, and month to month during the past years of plant operation, making it very difficult to identify a meaningful baseline with which to compare expected future impacts.

As a result of the uncertainty associated with correlating annual water use to bay/estuarine ecosystem impacts, staff determined that it would be appropriate to use a conservative approach in assessing the significance of impacts.

Specifically, staff is of the opinion that ***any*** increase in water use represents a significant impact. This conservative significance criterion is supported by the following reasons:

1. Morro Bay is a National and State Estuary. These designations require agencies to implement the utmost protection of the resource. (It should be noted that Duke Energy is proposing to build the largest newly constructed power plant in California on one of the smallest National Estuaries in the United States, using the most ecologically damaging cooling option available).

2. Morro Bay is officially listed as an impaired water body under Section 303(d) of the Clean Water Act. Moreover, the US EPA is especially concerned about entrainment impacts on impaired water bodies, as stated in the new 316(b) regulations for new facilities, and the proposed 316(b) regulations for existing facilities. It should be understood that entrainment impacts are in addition to the many other factors impacting this National and State Estuary, such as sedimentation, metals, pathogens, bacteria, agricultural runoff, urban runoff, and periodic dredging.

3. The US EPA also makes it clear in the new and proposed 316(b) regulations that estuaries are among the most sensitive water bodies, and should be protected accordingly.

4. There is general agreement among local environmental professionals that the ecological health of the Morro Bay Estuary has declined over the past several decades (Mike Multari, Director, NEP).

5. The state of California has lost over 90% of its wetlands and estuaries in the past one-hundred years. The resources of the remaining wetlands and estuaries should be protected to the highest degree possible.

6. A once-through cooling water system would continue to impact the estuary for up to fifty years.

In addition, this criterion is supported by a number of state and federal policies that stress the importance of protecting the resources in Morro Bay in particular, and in estuaries in general. For instance, in 1994, the Legislature designated Morro Bay as the first State Estuary and stated that it "recognize[d] the importance of *preserving and enhancing* Morro Bay and its watershed as one of the state's rare natural treasures." (Pub. Resources Code, § 28001, emphasis added). The need for enhanced protection of estuaries is also clearly stated in the new and proposed 316b regulations. The CCRWQCB has also officially listed Morro bay as an impaired water body, and is developing Total Maximum Daily Load requirements for the estuary and watershed.

In 1987 Congress created the National Estuary Program (NEP), funded in part by the Environmental Protection Agency (EPA). In 1995 Morro Bay was designated as one of 28 estuaries in the United States to be classified as a National Estuary. The goal of the NEP is to identify, restore, and protect nationally significant estuaries of the United States. The NEP focuses not only on improving water quality in an estuary, but also on maintaining the integrity of the whole system -- its chemical, physical, and biological properties, as well as its economic, recreational, and aesthetic values. The NEP is also designed to encourage local communities to take responsibility for managing their own estuaries. Estuaries are selected for inclusion in the NEP via nominations submitted to USEPA during designated nomination periods by the Governor(s) of the state(s) where the estuary is located.

Although USEPA administers the National Estuary Program, program decisions and activities are carried out by committees of local government officials, private citizens, and representatives from other federal agencies, academic institutions, industry, and estuary user-groups. These stakeholders work together to identify problems in the estuary, develop specific actions to address those problems, and create and implement a formal management plan to restore and protect the estuary. A Comprehensive Conservation and Management Plan (CCMP) has been prepared for Morro Bay.

Concern for estuaries is also reflected in the California Coastal Act, which states that *special protection* shall be given to areas of biological significance. (Pub. Resources Code, § 30230). The Coastal Act also states that " *the biological productivity and the quality of estuaries shall be maintained, and where feasible, restored through, among other means, minimizing adverse effects of entrainment*." (Pub. Resources Code § 30231, emphasis added).

Amongst the most significant policy applicable to this project is that established in 1993 legislation emphasizing the state's interest in protecting estuaries and other biologically sensitive areas. In Water Code § 13142.5, the Legislature stated that "*for each new or expanded coastal power plant using sea water for cooling the best available site, design, technology, and mitigation measures feasible shall be used to minimize the*

intake and mortality of all forms of marine life" This section makes a strong statement that the *best* protection of marine life that is feasible should be used to conserve and enhance all marine habitats in which once-through cooling systems are located. It also supports a conclusion that avoidance of intake and mortality is preferable to allowing the impacts to occur with the provision of in-lieu mitigation. Because this once-through cooling system is located in a sensitive estuarine environment, any increase in water use represents a significant impact under CEQA . However, even if water use did not increase, the cooling water impacts from once-through cooling **will increase over time** because the local and regional estuarine resources are in decline.

The facts in this case, in combination with the polices just discussed and with the difficulty in correlating water use to historical marine resource impacts justifies a conclusion that any increase in water use should be treated as a significant impact. Further, staff concludes that even using the same amount of water for the next fifty years will result in increased impacts over time because local and regional estuarine resources are in steady decline.Therefore, staff concludes that the project, which will cause an increase in water use of approximately 100 mgd (using a ten-year baseline of 1991-2000 and future operation of 475 mgd) or of approximately 38 mgd (using a five-year baseline of 1997-2001 and future operation of 475 mgd) will have a significant direct adverse impact on bay/estuarine resources.

CEQA - Indirect and Cumulative Ecosystem Impacts

Indirect impacts will also be caused by the MBPP's once-through cooling system. Both entrainment impacts (which constitute a direct significant impact) and impingement effects (which are not directly significant) cause indirect effects that are significant when placed in the context of their contribution to degradation of the ecosystems' structure and productivity. Staff believes that this degradation is a significant cumulative impact, and that the proposed project's indirect impacts contribute to that degradation.

One aspect of the bay/estuarine ecosystem that would likely be impacted by loss of larvae, and young and mature marine organisms, is the trophic structure of the natural communities within the ecosystem. The bay/estuary's living community has a series of attributes, such as diversity, growth form and structure, dominance, relative abundance, and trophic structure (Krebs 1994). All species inhabiting this diverse ecosystem interact with each other. The trophic structure of the Morro Bay ecosystem involves the flow of energy and materials throughout the system from the primary producers (plants) to the herbivores, to the primary, secondary, and tertiary consumers (carnivores and omnivores).

The trophic structure of a natural system is not static, but responds continuously to natural and manmade perturbations, such as the withdrawal of water for once-through cooling. Manmade perturbations and stressors may often significantly damage natural trophic structure and function. Additional impacts resulting from other forms of human encroachment and use of the region also contribute to alteration and degradation of the trophic system that supports the ecosystem. The loss of larvae, juvenile, and adult fishes, invertebrate species, and all other affected lifeforms caused by the MBPP may produce adverse impacts to Morro Bay via impacts translated up the food chain. For example, the sea otter (*Enhydra lutris*) and California brown pelican (*Pelicanus*

occidentalis) rely on the productivity of habitats and the availability of prey species within Morro Bay (Duke 2001f, page 24). Other avian and mammalian species, which feed on fish, marine invertebrates, and other organisms, may be similarly impacted. It is difficult to quantify these impacts, but the MBPP will contribute to the stressors on the bay/estuary ecosystem in ways that may not always be quickly obvious.

As proposed, the power plant's impacts would continue, in conjunction with other stressors on Morro Bay, for another 30 to 50 years. Given the fact that many LORS mandate protection and restoration of Morro Bay and its biological resources, staff believes it is appropriate to treat the indirect impacts of entrainment and impingement on the trophic structure of the estaury as potentially significant because they contribute to a cumulative biological problem by destroying many larval and small fish, invertebrates, and other organisms that are prey species for other species in Morro Bay (NMFS 2001a).

CUMULATIVE IMPACTS

As defined in CEQA section 15355, a cumulative impact is one which results from the combination of impacts associated with the proposed MBPP, in addition to those resulting from separate projects in the region; these additional projects may be underway or may be planned in the future, and they must cause similar adverse impacts. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

CUMULATIVE MARINE AND ESTUARINE IMPACTS

The MBPP is the only project resulting in entrainment and impingement in Morro Bay and thermal discharge to Estero Bay. However, as discussed above under indirect and cumulative trophic effects, these impacts kill larvae, young fish and other organisms, and breeding adults of many taxa, thus causing damage to the trophic web and decreasing ecological productivity of the bay. The MBPP and other construction projects such as urban and residential growth may cause cumulative impacts such as sedimentation of the Bay and non-point source pollution. Together (cumulatively) these are considered significant impacts. Much effort is currently being focused on mitigating and eliminating these types of impacts through programs such as the NEP.

COMPLIANCE WITH LORS

This section discusses compliance with LORS. There are many LORS that are applicable to the Marine and bay/estuary resources affected by the MBPP project. The more important ones are discussed below. To be in compliance with applicable LORS, the Applicant must comply with the following:

- A Section 7 consultation and resulting Biological Opinion from the USFWS for impacts to federally listed species;
- Consultation from the NMFS on Essential Fish Habitat;
- A Section 2081.1 Biological Opinion Consistency Determination and take permit from CDFG for impacts to special status species;

- Compliance with CWA sections 316(a) and (b), which are addressed by the CCRWQCB National Pollution Discharge Elimination System (NPDES) permit. This permit addresses BTA for the cooling water effects and thermal discharge effects due to once-through cooling;
- Consistency with the Coastal Act and related LORS as determined by the Coastal Commission in its 30413(d) report. These include maintaining, enhancing, restoring and protecting areas of biological significance, and minimizing entrainment;
- Compliance with the Porter-Cologne Act section 13142.5(b) which requires in a power plant, the best design, technology, and mitigation feasible to minimze intake mortality of all forms of marine life;
- Compliance with the Warren-Alquist Act section 25527 which says not to permit power plants in estuaries or natural reserves;
- Compliance with CWA section 320 which requires protection and improvement of National Estuaries; and
- Compliance with CWA 303(d) which requires extra protection for Morro Bay as an impaired water body.

New and Draft EPA 316(b) Regulations for Power Plants

On November 9, 2001, USEPA issued final regulations establishing nationwide standards for regulating cooling water intake systems at new facilities under Clean Water Act section 316(b)(Federal Register 2001). The regulations state "estuaries and tidal rivers have the highest potential for adverse impact [from cooling water intake structures] because they contain essential habitat and nursery areas for many species. Therefore, these areas require the most stringent minimum controls. . .", including a reduction in the intake flow to a level commensurate with that which could be attained by a closed-cycle re-circulating cooling water system. Because the modernized Morro Bay Power Plant is proposed to use the existing intake and outfall structures, these regulations do not apply to this project. Rather, they apply to *new* plants or to replacement plants with new cooling water systems or with cooling water systems that have been modified to increase their capacity. These regulations demonstrate the strong interest of the federal government in protecting and restoring estuarine environments. USEPA found the best technology available for new facilities is closed-cycle wet cooling, and established national performance standards based on closed-cycle wet cooling. They acknowledged that this might not be the best technology available at existing power plants for the purpose of a nationwide standard. Dry cooling was rejected as BTA for a nationwide standard, but USEPA acknowledged that dry cooling might be the best technology available for a specific case.

USEPA issued additional draft regulations for *existing* power plants in February 2002. These draft regulations explain that USEPA recognizes that dry cooling technology uses extremely low-level or no cooling water intake, thereby reducing impingement and entrainment of organisms to dramatically low levels. However, USEPA interprets the use of the word "minimize" in section 316(b) in a manner that allows it the discretion to consider technologies that very effectively reduce, but do not completely eliminate, impingement and entrainment and therefore meet the requirements of section 316(b). Although USEPA has rejected dry cooling technology as a national minimum

requirement (to be used in all cases), it does not intend to restrict the use of dry cooling or to dispute that dry cooling may be the appropriate cooling technology for some facilities. For example, facilities that are re-powering and replacing the entire infrastructure of the facility may find that dry cooling is an acceptable technology in some cases. A State may choose to use its own authorities to require dry cooling in areas where the State finds its fishery resources need additional protection above the levels provided by these technology-based minimum standards. These regulations are not expected to be final by the time the CCRWQCB issues its NPDES permit for the facility.

Staff finds once-through cooling to be impacting/damaging to the estuarine environment and that it is not BTA, and recommends that it's use in Morro Bay be significantly reduced or discontinued. Staff finds that BTA for the MBPP is a closed-cycle wet or dry cooling system and recommends that a closed-cycle cooling system be required for the proposed MBPP. Based on our assessment and discussions with Central Coast Regional Water Quality Control Board (CCRWQCB) staff, we currently believe that the CCRWQCB will require dry cooling as the Best Technology Available (BTA) under the National Pollutant Discharge Elimination System (NPDES) permit.

The Porter-Cologne Water Quality Control Act (Water Code section 13000 et seq.) establishes the framework for regulation of activities affecting water quality in the state, as well as the state policies that shall be followed in implementing this water quality control program. Of particular interest in this case is Section 13142.5 (b), which establishes an explicit state policy for power plants proposing to use seawater for cooling. That policy is that the best site, design, technology and mitigation measures feasible be used to minimize the intake and mortality of all forms of marine life. Staff believes that the use of one of the cooling alternatives discussed in **Appendix A** is the best way to ensure that this policy is met.

Continuing the use of once-through cooling at the proposed MBPP does not comply with the spirit nor intent of the other LORS listed above. Staff does not find that in all cases mitigation options for CEQA impacts discussed later are far-reaching enough to mitigate noncompliance with LORS. Staff recommends a closed-cycle cooling system for the proposed MBPP in order to mitigate CEQA and LORS impacts. See conclusions and recommendations later.

MITIGATION

The following sections presents the applicant's and staff's proposed mitigation respectively.

The Applicant's Proposed Mitigation for Impacts to Marine Resources

In the AFC the Applicant indicated the impacts of the cooling water system on the marine environment will be adequately reduced, compared to existing levels, and will not cause significant adverse impacts. The following are the mitigation measures proposed by the applicant in the AFC.

Staff has not received word of modified or deleted mitigation proposals.

Marine Biology Condition 1: Eight new water pumps would be installed to ensure a variable flow of cooling water.

Marine Biology Condition 2: Installation of a "demonstration aquatic filter barrier (AFB)" to be tested prior to commercial operation of the new combined cycle units. It is proposed that the demonstration AFB be permitted under the CEC process. The demonstration AFB program would be submitted six (6) months after approval for certification but would not be initiated until after "all possible appeals, petitions, and litigation relating to the Certification of the NPDES permit have been exhausted, completed, or finalized." (Duke 2001k; page 2). In the event that this condition is infeasible, the Applicant proposes to implement Marine Biology Condition #5.

Marine Biology Condition 3: As part of the demonstration program, the Applicant proposes to develop a monitoring and evaluation program for the demonstration AFB as well as the final, fully-deployed AFB. The performance evaluation proposed includes the following:

- Reduction in entrainment levels based upon reductions in actual cooling water used below intake flow capacity levels.
- Reductions in entrainment based upon the AFB's filtration performance; and
- A sliding scale incentive program wherein, money will be contributed to a Habitat Enhancement Fund if a minimal reduction (target reduction) of entrainment (a 70% reduction) is not achieved (see also Marine Biology Condition 7).

Marine Biology Condition 4: After the demonstration AFB is proven successful, the Applicant would attempt to secure all permits and approvals for the full-scale commercial implementation of the AFB. If the Applicant is unable obtain all necessary approvals and agreements of this condition, Marine Biology Condition #5 would be implemented.

Marine Biology Condition 5: If the AFB is infeasible, the Applicant would deposit $5 million into an account dedicated to a Habitat Enhancement Fund (HEF). Other indicators of infeasibility may include (but are not limited to):

- The cost of installing the AFB exceeds $7 million;
- Operational costs exceed $250,000;
- Reduction in entrainment of less than 60%; and
- Impairment of plant operation, availability, capacity, safety, or integrity.

Marine Biology Condition 6: Deployment of the full-scale AFB within one year of commercial operation of the first combined-cycle turbine. This condition depends upon successful completion of Marine Biology Conditions #2,3, and 4.

Marine Biology Condition 7: If the full-scale AFB is implemented, the HEF funding would be inversely proportional to the reduction in entrainment. If entrainment were reduced by at least 70%, no HEF funds would be provided.

***Marine Biology Condition 8*:** The Applicant proposes to provide annual funding to the Morro Bay National Estuary Program in the amount of $50,000. These monies would be dedicated to implementation of the Conservation Management Plan for Morro Bay.

The Applicant's Mitigation for Cumulative impacts

The Applicant asserts that terrestrial and marine cumulative impacts are insignificant for the proposed project. Thus, no mitigation measures have been provided.

STAFF'S PROPOSED MITIGATION FOR IMPACTS TO THE MARINE AND BAY/ESTUARY ENVIRONMENT

Staff considered a wide range of potential mitigation measures for the proposed project, including switching to alternate cooling technologies, the use of offshore cooling water intake and discharge systems, *in-situ* fish protection barriers (including the aquatic filter barrier proposed by the applicant), and *in–situ* habitat restoration and protection. These are all discussed and evaluated below. It is important to note that the effectiveness of some of these alternatives is highly dependent upon the local species and their response to the alternative designs. The various options are evaluated based on their effectiveness at reducing fatality of marine and estuarine organisms compared to present conditions. Eliminating entrainment is the primary goal, although reduction in impingement and thermal discharge effects are also desirable.

Alternative Cooling Technologies

Appendix A to this section contains a detailed review of dry cooling and hybrid cooling, which would eliminate entrainment, impingement, and thermal impacts. Because it is a key element in Applicant's proposed mitigation, staff has also considered the AFB in **Appendix A**.

Closed-cycle wet cooling water technologies use mechanical draft recirculating cooling towers with either fresh water, reclaimed water, or seawater as the cooling medium. The heat rejection mechanism in wet cooling towers is primarily the evaporation of water to the atmosphere. The application of this technology using freshwater or reclaimed water could eliminate the need for the intake and discharge structures and associated impacts. The use of freshwater cooling, other than using reclaimed water, would create additional demands on the freshwater supply and would be undesirable and infeasible in the Morro Bay region.

The closest source of wastewater is the Morro Bay-Cayucos Wastewater Treatment Plant, which is approximately 1 mile north of the project site (see **Appendix A**). This plant produces secondary treated wastewater at a capacity of 2.06 million gallons per day while the MBPP would require between 6 to 8 million gallons per day of tertiary treated wastewater for a once-through cooling system. Therefore, there is an insufficient supply of treated wastewater available to meet the full needs of the project, unless the MBPP uses a hybrid dry/wet cooling system. As discussed in **Appendix A**, staff found this option feasible.

Closed cycle dry cooling towers transfer heat convectively through heat exchangers, and are a very feasible option in Morro Bay's favorable coastal climate. Wet/dry hybrid cooling towers use combinations of the two mechanisms to reject heat to the atmosphere. Dry cooling towers use forced or induced draft fans to move ambient air through the tower. The ambient air temperature, humidity, and mass flow rate affect the heat transfer rate and, ultimately, the efficiency of the cooling tower. Morro Bay is a suitable location for dry cooling and staff found the option to be feasible (see **Appendix A** for more information). Staff used criteria provided by the applicant for its analysis, resulting in a conceptual design for a facility that could accommodate full duct firing only to 55° F. Staff has not developed a conceptual design for a facility designed to carry a larger cooling load, but noted in **Appendix A** that there is enough room for such a facility on the project site. Staff has not evaluated potential impacts associated with such a facility.

Staff has also determined that the use of **desalinized ocean water** for wet cooling towers may be feasible. The ocean water would be taken from the existing or a new intake and would significantly reduce, but not eliminate entrainment impacts.

As noted in the **Appendix A**, staff has determined that either dry cooling or hybrid cooling are feasible mitigation options that would eliminate the existing once-through cooling system and the significant associated adverse impacts of entrainment, impingement, and thermal discharge. Evaluation of the potential environmental and engineering impacts show that these options could be implemented with no unmitigable significant impacts when compared with the existing environmental setting. Another option is salt water mechanical draft cooling towers. Duke Energy may also propose other closed cooling systems or combinations of systems that would minimize entrainment and impingement.

Alternative Cooling Water Intake and Discharge Designs

This review includes a general evaluation of alternative cooling water intake technologies that could potentially mitigate impingement and to a lesser extent entrainment impacts to varied degrees

Offshore cooling water intake locations would require the construction of a large diameter pipe structure(s) extending beyond the Morro Bay Harbor. The Applicant concluded that an offshore intake appears to offer little or no potential for reducing the losses of fish and invertebrates entrained or impinged by the MBPP because of the large tidal exchange between the bay and the harbor. Staff has analyzed this option with the TWG, and concludes that changing intake locations would likely shift the impacts to a new location with different species being impacted by entrainment and impingement and add impacts from entrapment in the long pipe. An example would be San Onofre nuclear generating station, where the offshore intake caused significant biological resources losses. Staff does not find this alternative biologically to be the best option to minimize or eliminate adverse impacts to marine biota.

If the discharge point were moved farther offshore to decrease thermal impacts to Morro Rock, the new discharge pipe would become a “new” discharge under the Thermal Plan. As a new discharge, it would need to be far enough offshore to ensure that the 4-

degree F isotherm does not contact the shoreline. Such a change in the discharge location would only create new potentially significant impacts that would require costly studies and then appropriate mitigation. Mitigation for open water marine impacts is not easy to mitigate.

Behavioral Barriers

Behavioral guidance technologies are designed to produce stimuli that can potentially alter the behavior of fish and produce avoidance responses that may prevent impingement at the water intakes. These technologies include the use of strobe lights, air bubble curtains, underwater sounds, mercury lights, electric barriers, and velocity caps. Studies and tests performed by the Electric Power Research Institute and by Southern California Edison (SCE) at its San Onofre Nuclear Generating Station have reached similar conclusions that the fish behavioral barriers installed and tested were not effective. Additionally, the SCE test concluded that no currently available alternative behavioral barriers are likely to be effective or feasible in reducing fish losses (SCE 2000).

Physical Barriers

Physical barriers principally are designed to block the passage of fish from entering the intake, usually in combination with low velocity. Examples of physical barriers include traveling and stationary screens, barrier nets, and mesh barriers. These may reduce impingement but none are known to reliably reduce entrainment.

1) Traveling Screens

Traveling screens have historically been used to block the intrusion of debris and fish from entering the cooling water systems of power generating facilities. More recently designs have included various features to reduce the impingement of fish. Vertical traveling screens equipped with fish lifting buckets will be addressed under Fish Collection, Removal, and Conveyance.

Drum type and Wedge-wire screens have been tested and found to have design problems that resulted in blockages, seals, and lack of bypasses. There have also been problems with the lack of accessibility to control bio-fouling of the interior surfaces by mussels, barnacles, and other organisms. These may reduce impingement but not entrainment.

2) Barrier Nets and Meshes

Barrier nets have the ability to exclude fish from water intakes by blocking the entrance to the intake structure. The mesh size and surface area of the net must be properly sized to block the fish passage but not cause the fish to become gilled in the net. Problems with this type of technology include blockage due to debris, clogging, bio-fouling, and labor costs associated with maintenance. A new technology of this general type is the Aquatic Filter Barrier (AFB), a water permeable fabric curtain that has shown promise in some applications. However, as discussed above, its performance is too experimental and scientifically questionable at the present time to warrant use as mitigation for such serious impacts in such a significant bay/estuary.

Fish Collection, Removal, and Conveyance Systems

Fish collection technologies have been developed that either actively or passively collect fish for transport back to the source of the cooling water through a return system. These systems are designed to reduce impingement losses, and staff does not recommend them since they do not reduce entrainment.

Modified Traveling Screens

Modifications have been incorporated into traveling screens to reduce the mortality of fish and organisms. These modifications incorporate the addition of water filled buckets that collect the fish and with the aid of low-pressure washes transport them into a sluice trough. The fish are then transported back to a safe release location. This system used in conjunction with continuous rotation of the screens may be a viable alternative for fish protection. Traveling screens are currently in use at the MBPP and do not eliminate the adverse impacts. They do not reduce entrainment losses.

Fine-Mesh Screens

Fine–mesh screens with openings as small as 0.5 mm have been used in conjunction with traveling screens. The concept of using the fine mesh screens is that they will collect not only fish but also fish eggs and larvae. However, for some species impingement on the fine mesh screens can actually result in higher mortality than if the organisms were allowed to pass completely through the circulating water system. Therefore, staff cannot be conclude that the use of fine mesh screens would significantly prevent impingement of early sea life forms. In addition, staff has not found evidence that these screens would be successful mitigation for entrainment losses.

Fish Return Conveyance Systems

Fish return and conveyance systems may take the form of fish pumps or a gravity sluice system. New designs of fish pumps have demonstrated the ability to transfer fish with little or no mortality when coupled with fish bypass systems such as angled screens and louvers (EPRI 1999). These systems may reduce impingement but not entrainment, and staff does not recommend using these solely to reduce impingement.

Diversion Systems

Fish diversion systems redirect the fish away from the impingement area to a return system or safe area for return to the ambient water source. Designs of such systems include angled screens, modular inclined screens, and louvers. These may provide minor benefit only for impingement losses.

Angled Screens

Traveling screens are set at an angle to the flow of the water (about 25°) in either a “V” or slant configuration. At the apex of the angle are fish bypass slots that collect the fish that are then pumped or sluiced back to the cooling water source. These may provide minor benefit only for impingement losses.

Modular Inclined Screens

The modular inclined screen consists of an inclined screen installed after the trash racks at a shallow vertical angle of 10-20° to the flow. Fish are directed to a transport pipe for return to the seawater source. These may provide minor benefit only for impingement losses.

Louver

A louver system consists of an array of evenly spaced, vertical slats aligned across a channel at a specified angle, which leads to a bypass, through which fish escape. These would provide no value in reducing entrainment.

Results of testing of diversion systems have shown some promise. However, the results are highly dependent on swimming capabilities, behavioral tendencies, life stages, and specific site characteristics of the local species. The diversion systems discussed above may reduce impingement losses somewhat but do not minimize or eliminate the significant impacts of entrainment.

AQUATIC BIOLOGICAL RESOURCES Table 9 provides a general comparison of the benefits, applicability (to MBPP) and indicators of success for selected cooling intake fish protection technologies.

AQUATIC BIOLOGICAL RESOURCES Table 9
Comparison of Technologies Available to Eliminate or Decrease Fish Mortality

Category of Mitigation and Examples	Life Stages Protected	Applicable to MBPP?	Measure of Effectiveness
Dry Cooling Hybrid Cooling Desalinization and salt water wet cooling towers	Larvae, juveniles, and adults	Yes	No need for water Eliminates entrainment & impingement or a significant reduction in estuarine water use and associated impacts.
Diversions i.e. screens louvers	Larvae, juvenile, adults	No, impractical	Diversion efficiency
Collection Systems i.e. pumps traveling screens	Juvenile, adults	No impingement only	Reduction in immediate or latent mortality
Physical Barriers i.e. AFB, screens, porous dikes, barrier nets	Larvae, juvenile, adults	Potentially but experimental	Possible reduction in entrainment & impingement
Behavioral Barriers i.e. lights, acoustic, air bubbles, infra-sound	Juvenile, adults	No For impingement only	Reduction in Impingement

Source: EPRI 2000, modified by CEC 2002.

See **Appendix A** of this section for a detailed discussion and comparison of costs for the preferred dry or hybrid cooling alternatives and for the AFB.

Habitat Enhancement

Another option not evaluated in **Appendix A** of this section is the use of habitat enhancement to mitigate impacts from the MBPP based on a calculation of replacement acres and enhancement measures on those acres. This is called **Habitat Equivalency** and utilizes habitat enhancement methods to mitigate estuarine losses.
Although staff supported this approach in the Moss Landing case, staff believes it is less appropriate and is not our preferred approach to mitigate the marine impacts for MBPP for the following reasons:

1. It does not directly eliminate or reduce the adverse impacts caused by once-through cooling, which are causing ecological damage/losses to the ecosystem in a protected State and Nationally designated Estuary, that is in decline. Staff believes that it is preferable to avoid impacts than to attempt to mitigate them after the fact;

2. New USEPA regulations on cooling water intake, and the special status of the Morro Bay Estuary, reinforce the need to eliminate the adverse impacts of once-through cooling;

3. The acquisition of suitable habitat adjoining Morro Bay and in the supporting watershed may be challenging;

4. The restoration of in-situ (in-kind habitat) in Morro Bay may be challenging;

5. The long-term nature of the impacts associated with the Applicant's proposed once-through cooling will result in continuing and increasing (because the estuary is in decline) impacts for decades;

6. The uncertainty and difficulty of determining if mitigation is ultimately effective and complete many years after licensing; and

7. The extensive annual monitoring of the health/improved productivity of the bay/estuary that would be needed for the life of the project with the possibility of modifying/increasing the mitigation to be more effective as needed.

Although carefully designed mitigation that addresses specific management priorities would assist in enhancing and maintaining a sustaining environment for the entire Morro Bay ecosystem, and that would benefit bay/estuarine species impacted by the once-through cooling process, it is difficult to quantify the success for this type of mitigation program. This mitigation method was used for the Moss Landing Power Plant, however, the entrainment proportional losses are greater at Morro Bay. Morro Bay has been declared an impaired water body under CWA section 303(d) by the CCRWQCB, which identifies other important degradations such as sedimentation that threatens the longevity of the estuary. The CCRWQCB has the authority to address this issue and in fact is addressing the problem via its Total Maximum Daily Load requirements.

Staff received a copy of a letter from Duke Energy North America, dated April 4, 2002, addressed to Mr. Roger Briggs, Executive Officer of the CCRWQCB. This letter included an offer for establishing a habitat enhancement program fund *"at a level of at*

least $6 million" (emphasis added). Staff has not had time to consider and discuss this proposal with either the applicant, the CCRWQCB nor other agencies and stakeholders. With time for only a cursory consideration of the proposal, staff believes the proposed dollar amount to be quite low and the proposal lacks a clear nexus between impacts and specific mitigation opportunities in the Morro Bay and vicinity. Earlier reports prepared by the CCRWQCB staff identified a much higher level of compensation. In addition, CCRWQCB staff have stressed to Energy Commission staff that any habitat enhancement proposal will need to establish specific objectives that are both feasible and can be shown to directly compensate for the type of harm being caused by the project.

Other Potential Mitigation Stategies

Under CEQA, the Energy Commission can only require mitigation for changes to an identified baseline. As noted, the range of cooling water increase over historic baseline varies from approximately 38.6 mgd to 100 mgd on an annual average basis. Due to the significant resources involved, staff recommends that any increase in water use due to the project be treated as a significant adverse impact and therefore recommends that the Energy Commission prohibit any such increase. Staff recommends implementing measures that avoid the once-through cooling impacts, rather than allowing the impacts to occur and then attempting to mitigate. There are several ways to accomplish this objective:

1. The project could utilize alternative cooling methods as discussed in **Appendix A**.

2. The project could use a closed cooling system for the majority of the power demand, and a once-through system for the remaining power demand when necessary, such as for duct firing;

3. The project electrical production capacity could be reduced, which would reduce the amount of water and the number of pumps needed for cooling;

4. The project could not utilize duct firing, thereby reducing the number of pumps and the amount of water needed for cooling;

5. The project could be subject to a daily water use cap, and require strict monitoring;

6. The Energy Commission could require a numerical limit on daily and annual water use (staff recommends basing the annual limit on 1991 - 2000 historical levels), allowing the applicant to select the method of compliance;

While most of the options listed would limit the applicant's ability to generate 1,200 MW at an ambient air temperature of 85 °F, staff feels one or more of these options may provide an appropriate balance between mitigating impacts caused by the proposed facility and the applicants objective of maximizing electrical production.

Many of the CEQA mitigation measures discussed above are not far-reaching enough by themselves to assure compliance with LORS. Only a significant reduction or

avoidance of estuarine water use will accomplish that, such as in numbers 1 and 2 above.

FACILITY CLOSURE

The Applicant proposes facility closure procedures in the AFC, chapter 4-1 (Duke 2000a). The Applicant stipulates that specific procedures have been developed for the following closure categories: unexpected temporary closure, planned permanent closure, premature permanent closure, and unexpected permanent closure (see Duke 2000a, pages 4-2 to 4-5). In general the closure procedures include compliance with LORS, procedures for handling hazardous materials and preventing environmental contamination, procedures for safely shutting down the facility (emergency or planned), procedures for removing and recycling facility structures and debris without significantly impacting biological resources.

The project owner shall incorporate the procedures and mitigation measures into an **"On-site Contingency Plan"** for all categories of facility closure. This plan will clearly determine the methods and measures designed to protect the environment and public health and safety during all temporary and permanent closure scenarios (see also Condition of Certification **BIO-Terrestrial-8)**.

RESPONSES TO PUBLIC AND AGENCY COMMENTS

CALIFORNIA COASTAL COMMISSION (CCC)

CCC-1: The alternative of a pipeline that would discharge heated cooling water farther off-shore was discussed in detail by the TWG and was not deemed desirable because major adverse impacts would just be moved to an offshore location. Studies would be needed to determine impacts and resultant mitigation measures. Staff does not recommend this option.

CCC-17: The analysis of alternative cooling technologies is included in **Appendix A** to this section.

CCC-18: The CCC reiterated its position that " the provision of monetary value alone is not necessarily adequate compensation or mitigation for the loss of biological resources." Impacts must be evaluated for the life of a project. CCC requested that the following be incorporated into the conditions of certification regarding any agreed upon habitat equivalency type of mitigation:

- Specific objectives to establish a nexus and proportionality between project impacts and the proposed mitigation measure;
- Clear objectives and performance standards for mitigation;
- Key mitigation costs, such as actual land acquisition costs, reasonable restoration costs, projected and quantified administrative and overhead costs for overseeing mitigation measures;
- Enforceable implementation and completion timeframes and;

- Remedial measures or recourse to address potential shortcomings in the performance standards or overall mitigation measure.

Staff concurs with these comments. Staff is not recommending habitat equivalency as mitigation at this time. Staff agrees that the provisions listed by CCC need to be incorporated into any appropriate habitat equivalency mitigation program, and would recommend incorporating them into conditions of certification if the alternative cooling options that avoid entrainment, impingement, and thermal impacts were found to be infeasible.

CCC-19: The FSA provides analysis of using fish collection, fish removal, and fish conveyance systems or other BTA for the purpose of reducing the adverse effects caused by thermal discharge and impingement. These methods are not as preferred because of the feasibility of using dry or hybrid cooling. The fish removal systems do not mitigate for the more significant impact of entrainment nor do they eliminate entrainment, impingement, and the thermal plume. Staff agrees with these comments.

DEPARTMENT OF FISH AND GAME (CDFG)

CDFG-6: Staff revised AQUATIC BIOLOGICAL RESOURCES Table 2 according to CDFG suggestions.

CDFG-12 and 13: AQUATIC BIOLOGICAL RESOURCES Tables 5 and 6 reflect consensus of the TWG and CDFG suggestions of adding analytical models such as maximum sustainable yield (MSY) (discussed at the TWG meeting in July, 2001).

CDFG-14: Comment is acknowledged. Staff has worked consistently to obtain an adequate mitigation package from the Applicant.

CDFG-15: Staff has examined the feasibility of requiring the installation of angled traveling screens on the East Side of Embarcadero Rd. to minimize effects of impingement. This option was not deemed feasible. Although it may cause a modest reduction in impingement it will not mitigate for entrainment impacts.

CDFG-16: Staff has taken into consideration the suggestion to evaluate a) the construction of a managed marsh to cool thermal effluent before it is discharged into Estero Bay, and b) the option to divert a portion of the heated water to the sewage treatment plant's outfall.

CDFG-20: Staff believes subsequent discussions with USFWS, CDFG, and NMFS have addressed this issue.

PUBLIC COMMENTS

POST-1: Staff agrees that the Applicant should use the best available technology to prevent damage and pollution to the environment.

WHW-3: This comment discussed the need to monitor the quality of the ocean water that is returned to Estero Bay after use in once-through cooling. Staff understands the

concern and submits that the water quality is monitored and that the major impact that has been studied in the 316(a) study would be the temperature of the water.

HT-1: The comment stated “stop exterminating our estuary fish and invertebrates with sump pumps, thermal shock, and a 3/4-mile journey through the outfall. Simply return the screen wash water and critters into the bay via a water slide as described on page 42 of the PG&E study.” Staff acknowledges concern for the adverse impacts of once-through cooling and is working to eliminate the significant adverse impacts caused by its use in Morro Bay.

HT-2: The second comment was centered on the merit of using screen wash pumps continually instead of periodically to return impinged organisms back to the bay. The comment seemed to reiterate the first one. Available data do not indicate that impingement is as large part of a problem as entrainment, although staff has recommended cooling alternatives that would eliminate both impacts.

SC-2: Staff appreciates this comment on monitoring programs needed for Morro Bay should once-through cooling be permitted.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Bay/Estuary and Marine Impacts: Regarding CEQA, staff finds that the once-through cooling system to be used in the proposed MBPP will cause direct significant adverse impacts on the Morro Bay/Estuarine ecosystem. Entrainment has been identified as the most significant impact and should be reduced or avoided by using available and feasible mitigation alternatives such as closed-cycle cooling technology (see options discussed in Staff' Proposed Mitigation above and in Biological Resources Appendix A---Cooling Alternatives). Staff's CEQA analysis finds that significant impacts will result if the project as proposed is approved and operated.

Staff further finds that the MBPP as proposed will not comply with numerous federal and state LORS. Entrainment, thermal discharge, and impingement contribute to impacts on significant protected resources. When considering LORS noncompliance, it is doubtful whether some of the potential CEQA mitigation options listed in Staff's Proposed Mitigation above are far-reaching enough to accomplish a satisfactory level of reduction/avoidance of impacts. Based on its assessment of the impacts and mitigation options and on discussions with CCRWQCB staff, staff believes that dry cooling represents BTA for this project, and that it will be required by the CCRWQCB for compliance with section 316(b) of the federal Clean Water Act.

Morro Bay/Estuary is a state and federal treasure so highly valued that it was designated as both a State and National Estuary. Today, there are many efforts and funds being spent to improve the quality, and to slow and stop degradation of the bay. The MBPP has been a chronic estuarine degradation for five decades, if the use of once-through cooling as proposed were approved, this would continue. The reduction in use or avoidance of once-through cooling would provide valuable assistance to

improving the bay's ecosystem. As discussed earlier in this section of the FSA, and in **Appendix A** to this section, there are numerous cooling options and mitigation combinations that are both available and feasible that could reduce or avoid these significant impacts.

RECOMMENDATIONS

Staff recommends that the Energy Commission license the Morro Bay Power Plant Project only with mitigation that significantly reduces or avoids the proposed once-through cooling system impacts. Staff's recommendation is based on the following conclusions:

1. The entrainment impacts are found to be significant under CEQA;

2. The entrainment, impingement and thermal discharge effects are found to be impacts on significant resources under numerous LORS;

3. Alternative cooling options (dry cooling and hybrid cooling) have been analyzed (see **Appendix A**) by staff and found to be available and feasible means to avoid the significant impacts, and staff believes these feasible alternative technologies will be found to represent Best Technology Available (BTA) for this project by the CCRWQCB.

Use of once-through cooling would result in significant impacts to marine and estuarine biological resources. Staff has identified both dry cooling and hybrid (wet/dry) systems as feasible alternatives to once-through cooling, but recommends dry cooling as the preferred option.

The applicant may elect to pursue a different closed cooling alternative or other mitigation alternative. Whether hybrid cooling, dry cooling, or some other form of mitigation is chosen, additional analyses will be necessary to analyze potential impacts associated with that alternative. However, in staff's view the switch to an alternative cooling method will avoid entirely both a significant estuarine environmental impact, and the regulatory uncertainty and delays that may result from the applicant's proposal to use once-through cooling.

While it may be possible to mitigate the CEQA adverse impacts to less than significant levels through numerous non-closed cooling options, including habitat enhancement, staff believes that such mitigation would not be adequate for compliance with LORS. Section 316(b) of the federal Clean Water Act requires the use of BTA if adverse impacts to marine resources result from the project, and the California Coastal Act provides for special protection of areas of biological significance and the minimization of entrainment. Staff has determined that dry cooling and hybrid cooling are available and feasible for this project, believes they will best meet LORS, and recommends dry cooling as the preferred cooling technology.

CONDITIONS OF CERTIFICATION

There are no conditions of certification for aquatic biological resources at this time.

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APPENDIX A TO BIOLOGICAL RESOURCES
MORRO BAY POWER PLANT COOLING OPTIONS

MORRO BAY POWER PLANT COOLING OPTIONS

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MORRO BAY POWER PLANT COOLING OPTIONS REPORT

Testimony of Susan V. Lee and James Henneforth[1]

1 INTRODUCTION

PURPOSE OF REPORT

The proposed once-through power plant cooling system for the Morro Bay Power Plant (MBPP) would use large quantities of seawater. The cool seawater would be withdrawn from Morro Bay and returned at higher temperatures to Estero Bay. This analysis of cooling options at MBPP was undertaken for two reasons. First, this Final Staff Assessment (FSA) for the Morro Bay Power Plant (MBPP) Modernization Project (00-AFC-12) identifies significant impacts to aquatic biological resources that would result from the proposed use of once-through cooling, so Energy Commission staff must evaluate measures that may avoid or mitigate these significant impacts. Second, the Central Coast Regional Water Quality Control Board (CCRWQCB), as part of its cooling water intake assessment required by Section 316(b) of the federal Clean Water Act (CWA), must determine what is the Best Technology Available (BTA) for the proposed project. Options considered in this report include dry cooling, hybrid cooling, an aquatic filter barrier, and habitat enhancement. Therefore, this report will support both the Energy Commission's impact analysis under CEQA and the CCRWQCB's need to evaluate feasible cooling options.

This analysis considers the use of three technologies: a dry cooling system, a hybrid (wet/dry) cooling system, and an aquatic filter barrier (AFB) used with once-through cooling. The dry cooling system utilizes air-cooled condensers (ACCs) to cool turbine exhaust, and the hybrid system (also called a parallel condensing wet/dry system) uses water for cooling as well as ACCs. The dry and hybrid systems would avoid all impacts to aquatic species because no seawater would be used, whereas the AFB system would reduce entrainment and impingement. This analysis of dry and hybrid cooling was prepared as follows:

- A conceptual design for both hybrid and dry cooling was defined in Section 3 of the Draft Cooling Options Report (January 2002) and served as the basis of analysis for all discipline analysis. The parameters for these conceptual designs were supplied by the applicant in response to a request by staff for the criteria to use in its cooling options study (see Appendix F, Duke 2002d).

- The preliminary noise analysis found that the initial conceptual design of the hybrid and dry cooling systems would result in significant noise impacts at some sensitive receptors, so in the Noise Section of the Draft Report, two other fan configurations

[1] The authors partially relied upon other staff members for analyses of the cooling options presented in this report and are, therefore summary witnesses for those areas. The staff relied upon for these analyses will be made available to provide testimony as needed by other parties in a manner ordered by the Committee.

were developed and described. These configurations were found to reduce noise to less than significant levels.

- In this Final Cooling Options Report, the noise mitigated designs of the dry and hybrid cooling systems were further optimized. Those designs are presented in Section 3 of this report as the "Noise Mitigated Configurations" for both dry and hybrid cooling and the impacts of these designs are considered in each discipline's analysis.

The various configurations evaluated by staff are based on conceptual designs developed from design parameters supplied by the applicant in response to staff's request for criteria to use in its cooling options study (see Appendix F, Duke 2002d). These conceptual designs would limit the use of the duct firing, especially in warm weather. Larger cooling systems would be needed to optimize project output with duct firing. While staff has not developed conceptual designs optimized for duct firing, basic heat balance considerations suggest that a dry cooling system would need to be approximately 40% larger to accomodate duct firing and an ambient temperature of 64ºF. As discussed in more detail in Section 3 below, staff has determined that such a system could fit on the site, but has not conducted a detailed evaluation of the potential impacts of possible configurations at this size.

In its comments on staff's Draft Cooling Study, the Applicant argues that the ability to use duct firing to produce 1,200 MW across the ambient temperature range of 35ºF to 85ºF is a basic design criterion for the project, and that the conceptual designs considered by staff are unable to meet this criterion (Duke 2002d). These comments indicate that the Applicant's analysis shows that the proposed project, with Dry Cooling Alternative One, would generate approximately 1,200 MW at 55ºF, approximately 1,100 MW at 64ºF, and approximately 1,000 MW at 74ºF. Staff has not independently analyzed the heat balances for these conditions, but finds these results consistent with anticipated performance. The Applicant's "Updated Analysis of Alternate Cooling Systems," published concurrently with staff's Draft Cooling Options Report, states that a dry or hybrid cooling for MBPP system should be sized to allow the project to "consistently produce 1,200 MW *except at the extreme high temperature range*" (Duke 2002c UPDATED STUDY, p. 4, emphasis added). In its Report, the Applicant presented a design that it says would be able to produce 1,200 MW at an ambient temperature of 85º. That design for the air cooled condensers is approximately twice the size of the one analyzed by staff.

Staff notes that the assumptions in the Applicant's Updated Analysis Report show a duty cycle for 4,000 hours per year (hrs/yr) of duct firing, with 1,952 hrs/yr of those hours at 68ºF and the other 2,048 hrs/yr at 57ºF. In addition, assumptions used by the Applicant in its initial analysis of cooling (prepared as a part of the §316(b) process) included only 26 hrs/yr at 85ºF. Staff believes these duty cycle assumptions reasonably reflect the typical range of ambient temperatures expected at the project site. Staff disagrees with the Applicant's contention that the appropriate design criteria for the cooling system should be based on weather conditions that typically occur less than 1% of the hours in the year. Based on these considerations, staff believes that the conceptual designs it evaluated in this report meet the basic objectives of the project. As noted in the **Alternatives** section of this FSA, staff considers the basic objective of the project to be

replacement of the capacity of the existing units. As such, the options considered here provide an appropriate basis for judging the feasibility of alternative cooling systems that might be used to mitigate the significant adverse impacts to aquatic biologic resources from the proposed project and to ensure compliance with relevant laws, ordinances, regulations, and standards. If the project were to use dry or hybrid cooling, the Applicant would need to conduct more detailed engineering analysis to optimize the system.

A 100% wet cooling system is not considered because sufficient reclaimed water is not available from the Morro Bay-Cayucos Wastewater Treatment Plant, and other potential fresh water sources are also inadequate. The AFB was proposed by the Applicant as a means of reducing entrainment and impingement impacts associated with once-through cooling.

SUMMARY OF CONCLUSIONS

This report finds that both the dry cooling and hybrid cooling technologies are feasible for use at the Morro Bay Power Plant based on analysis of the conceptual designs not optimized for the Applicant's proposed use of duct firing. Results of the environmental and engineering analysis presented herein indicate that Dry Cooling Alternative One and Hybrid Cooling Alternative One (with or without implementation of a noise mitigated configuration) would result in no unmitigable significant impacts when compared with the existing environmental setting. Dry Cooling Alternative Two and Hybrid Cooling Alternative Two (with or without implementation of a noise mitigated configuration) both have the potential for impacts to cultural resources, but with existing information, staff cannot conclude whether these impacts would be mitigable to less than significant levels. The conceptual designs considered in this report are not optimized for duct firing and would limit the use of duct firing in warm weather. Staff believes that a larger system optimized for duct firing at appropriate weather conditions could be readily fit on the project site, though no detailed analysis of the potential for impacts of such a system has been conducted. The AFB, in the design presented by the Applicant, would have significant visual impacts from one key viewpoint. All cooling options have the potential to create inconsistencies with adopted land use designations.

REPORT CONTENTS

This report consists of seven sections:

1. Introduction

Section 1 describes the purpose of the report, the cooling options reviewed and other report contents, the roles of the Energy Commission and the CCRWQCB, and a brief description of the aquatic biology impacts of concern.

2. Background on Cooling Options

Section 2 provides an overview of the cooling technologies considered in this report: (dry cooling, hybrid cooling and the AFB). It describes the basic technologies and how they work, where the technologies are currently used, and the advantages and disadvantages of each.

3. Conceptual Design of Cooling Options for Morro Bay Power Plant

Section 3 presents specific designs for cooling options to replace or enhance the once-through cooling system proposed by the project. This Section presents two locations for the dry cooling system, two locations for the hybrid cooling system, and two configurations for the AFB.

4. Environmental Analysis of Cooling Options

Section 4 analyzes the environmental effects of the cooling options and the alternative locations for each of the technical issue areas that would be substantially affected (e.g., air quality, aquatic biology, visual, etc.).

5. Engineering Analysis of Cooling Options

Section 5 includes the engineering analyses for power plant reliability and efficiency, facility design, and geology and paleontology.

6. Response to Comments on the Draft Cooling Report

This section presents responses to comments made by members of the public and agencies. Responses are not presented for comments made by the Applicant or by intervenors.

7. Conclusion: Comparison of Cooling Options

Section 7 presents overall conclusions about the environmental and engineering effects of the cooling options and the AFB. This section also provides a summary table that compares the effects of the three major cooling options for each environmental and engineering issue areas.

ROLES OF THE ENERGY COMMISSION AND THE REGIONAL WATER QUALITY CONTROL BOARD

The Energy Commission is the Lead Agency for the review of the proposed MBPP Modernization Project under CEQA. This review is known as the Application for Certification (AFC) process. As part of the AFC process, the Energy Commission evaluates the potential environmental impacts of the proposed project and considers feasible mitigation for significant impacts. The Warren-Alquist Act, the Energy Commission's enabling legislation, also requires an assessment of compliance with laws, ordinances, regulations, and standards (LORS).

In addition to certification from the Energy Commission, the MBPP requires a National Pollutant Discharge Elimination System (NPDES) Permit from the CCRWQCB. The NPDES permit for the MBPP must be renewed every five years. The CCRWQCB has requested that in its AFC process for the modernized MBPP, the Energy Commission provide an independent, site-specific, CEQA analysis of the potentially feasible cooling alternatives and mitigation measures to the proposed once-through cooling system (Briggs, 2001). This information will be used by the CCRWQCB as they develop their draft NPDES Permit. As requested by the CCRWQCB, this report analyzes dry cooling and hybrid cooling options, as well as the option of using an aquatic filter barrier (AFB)

with the once-through cooling system. The CCRWQCB also requested information on habitat enhancement as another method of mitigating aquatic biological impacts.

AQUATIC BIOLOGY IMPACTS OF CONCERN

The primary operational components associated with once-through cooling that have the potential to cause significant adverse impacts to biological resources are the intake and discharge of large volumes of seawater. Once-through cooling may impact aquatic organisms by entrainment, impingement, and thermal discharge. The Technical Working Group (TWG) (described in the **Aquatic Biological Resources** section of the FSA) has carefully analyzed the 316(a) and 316(b) studies required under the Clean Water Act, and for CEQA analysis, and has determined that there will be significant impacts to the Morro Bay/Estuary ecosystem.

Impingement of aquatic organisms results during cooling water intake as organisms are pulled into contact with intake screens, and are held there by the velocity of the water being pumped through the cooling system. Unless the organisms are able to escape, they perish. **Entrainment** occurs when small aquatic organisms (fish eggs, larvae, etc.) are carried on a destructive passage through the intake screens and on through the remainder of the cooling system. It is generally assumed that a high percentage of entrained species are lost. **Thermal discharge** (i.e., release of heated water used for cooling) may also have adverse effects on aquatic species.

Entrainment may cause significant damage to the Morro Bay/Estuary ecosystem by sustaining fish larvae and egg losses and thus increase entropy (loss or waste of useful energy that would otherwise be used in ecosystem productivity) and decrease biomass in the ecosystem. Because these effects are considered significant, the FSA recommends consideration of a variety of mitigation options, including: (1) elimination of once-through cooling and use of a different cooling technology; (2) use of the AFB to reduce entrainment, plus mitigation for remaining losses; and (3) mitigation of the losses from the once-through cooling system by enhancing habitat and reducing ongoing degradation within the estuary and watershed. To varying degrees, impacts from impingement and thermal discharge would also be reduced by these mitigation options.

BACKGROUND ON COOLING OPTIONS

2.0 POWER PLANT OPERATION AND COOLING

The proposed new units at the MBPP would replace currently operating Units 1 and 2 (326 MW, 1950's technology), and Units 3 and 4 (676 MW, 1960's technology) with two state-of-the-art 600 MW natural gas-fueled combined cycle units. The proposed MBPP units will be capable of producing up to 1,200 MW when using duct firing to maximize generation output. Each new unit will consist of two gas-fired turbines and one steam turbine.

The proposed combined cycle units are expected to use a maximum of 475 million gallons per day (mgd) of seawater for once-through cooling. The cooling water intake is proposed to remain at its existing location on Morro Bay, and the heated cooling water

would continue to be discharged to Estero Bay (Pacific Ocean) through a canal outfall entering Estero Bay along the northeast side of Morro Rock.

Thermal power plants convert fuels (such as natural gas) to electrical power and waste heat. In combustion turbines, or Brayton cycles, almost all the waste heat is rejected in the exhaust gases. In steam turbines, or Rankine cycles, waste heat is rejected in the flue gases and in the condenser/cooling system. The steam turbines require cooling for efficient power generation. Operation of a cooling system for steam turbines serves three purposes: (1) condensing steam into water to allow pumping of a liquid instead of compressing a gas to raise the feedback to the boiler to high pressures; (2) recycling of the water back to the boiler to optimize water use; and (3) minimizing the steam turbine exhaust temperature to maximize the output of the steam turbine. The temperature of the heat sink and the heat transfer efficiency of the cooling system affect the overall plant performance. In the case of the MBPP, the proposed cooling medium (or heat sink) is estuarine water.

Combined cycle plants require less cooling than traditional fossil or nuclear steam power plants because only part of the electricity is generated from the steam cycle. In the case of the MBPP application, about 520 MW would be produced by the steam cycles. The combustion (gas) turbine parts of a combined cycle plant do not need water for cooling.

Historically, power plants were built along the coast to make use of seawater for power plant cooling. The relatively low capital and operating costs and the potential for high power plant operating performance resulting from the lower temperature heat sink provide generators an expectation of greater profit. For this reason, once-through cooling is still favored by many operators of coastal power plants. In once-through cooling, water is drawn from a local source (i.e., the ocean or a bay/estuary), passed through the condenser tubes, and returned to the ocean at a higher temperature. Although large volumes of water are required, once-through cooling does not consume water; rather, it uses the water briefly and returns the water at an elevated temperature. Steam is condensed in a shell-and-tube condenser.

The environmental impacts of once-through cooling include impingement and entrainment of aquatic organisms and raised temperature of the cooling water when it is returned to the receiving water (thermal discharge). Because there have long been concerns about the impacts of once-through cooling and because this cooling technology is dependent on an open water source, power plant designers have developed other cooling systems to replace once-through cooling. This section describes the three cooling technologies that can be used to replace once-through cooling: dry cooling, wet cooling, and hybrid cooling systems. For each of the cooling technologies, this section provides general background information, conceptual design information, and discusses possible environmental effects of the cooling technologies. In addition, this section describes the Aquatic Filter Barrier (AFB) that the Applicant proposes be used with once-through cooling to reduce entrainment and impingement impacts.

2.1 DRY COOLING

Description of the Process and Equipment Required

There are two types of dry cooling systems: direct dry cooling and the lesser used indirect dry cooling. In both systems, fans blow air over a radiator system to remove heat from the system via convective heat transfer (instead of once-through cooling or evaporative heat transfer). In the direct dry cooling system, also known as an air-cooled condenser (ACC), steam from the steam turbine exhausts directly to a manifold radiator system that rejects heat to the atmosphere, condensing the steam inside the radiator. This is shown in **Figure 1** (at the end of this section). Direct dry cooling is analyzed in this report.

Indirect dry cooling uses a secondary working fluid (in a closed cycle with no fluid loss) to help remove the heat from the steam. The secondary working fluid extracts heat from the surface condenser and is transported to a radiator system that is dry cooled (fans blow air through the radiator to remove heat from the working fluid). Because indirect dry cooling is not very common and does not appear to have any strategic advantages at the MBPP, it was not analyzed in this report.

Historic, Current, and Proposed Use of Dry Cooling

Dry cooling was first used in 1938 for a vacuum steam turbine installed in a power plant in Germany (Guyer, 1991). By 1971, 14 power plants worldwide had been equipped with condensers for direct dry cooling. The largest installation at that time was a roof-mounted unit for a 160 MW power plant in Utrillas, Spain. By 1991, dry cooling was being used at approximately 40 power plants worldwide with generating capacities greater than 100 MW. Since that time, use of dry cooling has also increased significantly around the world and in the United States (Guyer, 1991; EPA, 2001; Maulbetsch, 2001).

The largest dry-cooled system in the world today is the Matimba plant in South Africa, which began operating in 1991. It represented a major scale-up of dry-cooled technology, using direct dry cooling for six, 660 MW units, totaling 3,960 MW.

The Sutter Power Plant, one of the newest power plants in California (on-line in 2001) was constructed as a dry-cooled facility. This plant was constructed by Calpine Corporation and is a 540 MW, natural gas-fired, combined cycle facility. The combined cycle design consists of two combustion turbine generators (CTGs), two heat recovery steam generators (HRSGs) with duct burners, and a steam turbine generator (STG). The Sutter Power Plant uses a 100% dry cooling design that reduces groundwater use by over 95% from the original proposal of 3,000 gallons per minute (gpm) to a revised annual average of less than 140 gpm. The five percent of the water that is used represents the makeup for the steam cycle, which is not used for cooling. The dry cooled plant is a zero effluent discharge facility and does not discharge any process fluids.

The Energy Commission also permitted in 1996 a 240 MW co-generation facility with dry cooling in Crockett, which went on-line in 1995. The Crockett Co-Generation Plant uses 12 fans to cool the steam output from the 80 MW steam turbine. Energy

Commission staff visited the facility in June 2000 and found the dry cooling to be operating as expected, with no major problems. The Energy Commission also permitted in 2001 the Otay Mesa facility, a 510 MW combined-cycle facility in San Diego County, which features (insert the number of fans here). Reliant Energy has also proposed a new dry-cooled facility, the 500 MW Colusa Power Project that proposes using 40 fans. This project is currently undergoing environmental review by the Energy Commission.

Dry cooling is also becoming a common technology for power plants in Nevada. Currently, the El Dorado Energy Project is the only operational air-cooled power plant facility in the State of Nevada. This 480 MW combined cycle facility is located in Boulder City. Two other combined cycle air-cooled power plants are currently under construction in Nevada: the Duke Energy 1,200 MW Moapa Energy Facility (approximately 20 miles northeast of Las Vegas in Apex Industrial Park) and the 575 MW Big Horn Power Plant (in Primm, southwest of Las Vegas). In addition, there are four combined cycle air-cooled power plants proposed to be constructed in Nevada. These facilities include: Apex Generating Station (1,100 MW), Arrow Canyon (575 MW), and Silver Hawk (570 MW) facilities at the Apex Industrial Park, and the Copper Mountain Power Facility (600 MW) in Boulder City.

Dry cooling is also considered to be a feasible technology by the New York Department of Environmental Conservation, which has recently required dry cooling to replace once-through cooling in certain applications.

Energy Commission staff research indicates that the use of dry cooling technology is expanding rapidly, and the size of the plants using dry cooling is also increasing. It is estimated that there are over 2,500 MW of U.S. power generated using dry cooling, and approximately 15 to 20 GW worldwide.

Photos 1 and 2 (at the end of this section following the figures) show examples of dry cooling installations.

Advantages and Disadvantages of Dry Cooling

Dry cooling is the best choice of cooling technologies for a steam power plant to conserve water and minimize wastewater. However, this technology can raise environmental and economic issues, depending on the location and specific situation (these are reviewed for the MBPP site specifically in Section 4 of this report). The following is a general list of the advantages and disadvantages of dry cooling.

Advantages of Dry Cooling Systems

- Dry cooling is not water dependent so plant location is not tied to a water source. It has essentially no water intake or water discharge requirements.
- Dry cooling minimizes the use of water treatment chemicals.
- Dry cooling minimizes the generation of liquid and solid wastes.
- Dry cooling does not generate visible plumes that are commonly associated with wet cooling towers.

- Dry cooling eliminates impacts to aquatic biological resources.
- Dry cooling eliminates the need for discharge permits.
- Dry cooling eliminates the need for disturbance of wetland/aquatic substrate habitat.

Disadvantages of Dry Cooling Systems

- Dry cooling requires air-cooled condensers that could have negative visual effects.
- Compared to once-through cooling, dry cooling requires the disturbance of several acres of additional upland areas for the air-cooled condensers.
- Dry cooling can have noise impacts that are greater than once-through or wet cooling systems because of the number of fans and the considerably greater total airflow rate. New quieter fans and other mitigation measures are available to reduce these impacts.
- Using dry cooling, the power plant steam cycle efficiency and output can be slightly reduced, depending on site conditions and seasonal variations in ambient conditions. Also, extra power is needed to operate the cooling fans.
- Capital costs for building air-cooled condensers are generally higher than capital costs for once-through cooling.

2.2 WET COOLING

Description of the Process and Equipment Required

Wet cooling systems typically use about 5% of the water used by once-through cooling systems. Water is used to remove waste heat from the system through the cooling towers, and is then recirculated. In wet cooling systems, process heat is removed by evaporation each time the water is cycled through the system. **Figure 2** shows how a typical wet cooling system operates (see end of this section).

The cooling system must be replenished with "makeup water" to replace water "lost" (or consumed by) to evaporation, blowdown[2], and drift. The cooling system takes advantage of evaporation to remove heat, but cooling system water is consumed through evaporation, and evaporation increases the concentration of impurities. Blowdown volumes are dependent on the quality of the makeup water, and the system specifications regarding the impurities that are in the makeup water. Other methods of conserving water can be used, such as reverse osmosis (RO). **Photo 3** (see end of this section, following the figures) shows two mechanical draft cooling towers.

Wet cooling is not analyzed as a cooling option for the MBPP because there is not a sufficient supply of reclaimed or fresh water in the Morro Bay area.

[2] Blowdown is the bleeding off of a small percentage of the total flow, so that the new, more pure make-up water balances impurities. In this way, the water in the system stays within specifications for quality.

Current Uses of Wet Cooling

Wet cooling is one of the most common technologies in the world for the removal of waste heat, including many applications at power plants. Wet cooling towers used by U.S. industries remove heat from approximately 500 billion gallons per day (Burger, 1994).

Advantages and Disadvantages of Wet Cooling

The following is a general list of the advantages and disadvantages of wet cooling.

Advantages of Wet Cooling Systems

- Wet cooling uses only about 5% of the water required for a once-through cooling system.
- Once a wet cooling system is filled, the only water withdrawn from the environment is makeup water to replace water lost to evaporation, blowdown, and drift.
- Wet cooling removes heat by the evaporation of a small fraction of the recirculating water.
- Wet cooling can reach "wet bulb[3]" temperatures, which are generally lower than "dry bulb[4]" temperatures, thus improving cooling efficiency in comparison to dry cooling systems.
- Wet cooling can use recycled water from wastewater treatment plants, thereby avoiding the use of fresh water.

Disadvantages of Wet Cooling Systems

- Wet cooling requires a dependable source of water.
- Although more efficient than dry cooling, the power plant steam cycle efficiency and output can be slightly reduced with wet cooling systems when compared to once-through cooling systems, depending on site conditions and seasonal variations in ambient conditions.
- Wet cooling requires water treatment and monitoring to control concentrations of impurities.
- Wet cooling can produce water vapor plumes that have negative aesthetic effects.
- Capital and maintenance costs for wet cooling systems are generally higher than these costs for a once-through cooling system.

[3] Wet bulb temperature accounts for the relative humidity in the air (the largest differences between wet and dry bulb temperatures would occur in very dry conditions).

[4] Dry bulb temperature is the temperature indicated by an ordinary thermometer, that does not account for moisture in the air.

2.3 HYBRID (WET/DRY) COOLING

Description of the Process and Equipment Required

Hybrid cooling systems combine wet and dry cooling technologies. These systems reduce cooling water quantities by 95% or more from that needed for once-through cooling. The two primary hybrid systems are water conservation and plume abatement designs. These hybrid systems can vary depending upon the unique situation and objectives (Burns, 2000).

Water conservation designs reduce water usage for plant heat rejection. Water is primarily used during the hottest periods of the year to reduce the large losses in steam cycle capacity and plant efficiency that occur with all-dry systems. The hybrid water conservation systems can limit water use to only 1% to 5% of that required for all-wet systems while achieving substantial efficiency and capacity advantages during the peak load periods of hot weather. If additional water is available, it can be used to further increase plant efficiency.

Another water conservation hybrid approach is Spray-Enhanced Dry Cooling. In these systems, the exhaust steam is pre-cooled with spray before it reaches the air-cooled condenser. This system uses 25% of the water used for all-wet cooling, but reduces the capacity loss that occurs with all-dry cooling (Maulbetsch, 2001).

The most common type of hybrid system is the hybrid plume abatement system. Plume abatement towers are very similar to all-wet systems, but they also add a small amount of dry cooling to dry out the tower exhaust vapor plume during cold, high-humidity days when these plumes would be very visible. **Figure 3** (see end of this section) shows the similarities between wet towers and hybrid plume abatement towers. On an annual basis, the hybrid plume abatement towers can use from 95% to 99% of the water quantity used in conventional wet cooling system. The goal of the plume abatement towers is to achieve high plant efficiency similar to the wet towers, but with reduced plumes.

Figure 4 (see end of this section) shows a parallel condensing cooling system where the steam turbine exhaust steam is condensed simultaneously in both a standard steam surface condenser (SSC) and in an air-cooled condenser (ACC). This is a water conservation design. This configuration is used for site designs that are described in Section 3 of this appendix (see also **Plates 5 through 8**). In a parallel condensing cooling system, the amount of steam condensed in each tower depends on the overall heat rejection load, availability of makeup water and ambient conditions. During operation, the condensing pressures in both the SSC and ACC constantly equilibrate due to self-adjustment of steam flows entering each device. As ambient conditions, load conditions, and heat rejection capability of each device vary over time, the steam flow to each will automatically adjust without any active components being required on the steam side (Duke, 2001a).

Current Use of Hybrid Cooling

Plume abatement wet/dry towers have been used since the 1970s with proven reliability. The parallel condensing cooling systems (with both a wet tower and a dry

cooling tower) have been used since at least since the late 1980s. GEA Power Cooling Systems, Inc. (GEA) is one vendor that provides a parallel condensing system called the PAC Parallel Condensing System. This system combines reliable wet cooling and dry cooling tower technologies.

Advantages and Disadvantages of Hybrid Cooling

The following is a general list of the advantages and disadvantages of parallel condensing hybrid cooling.

Advantages of Parallel Condensing Hybrid Cooling Systems

- Water conservation hybrid systems use only 20% to 80% of the water consumed by wet towers, which already use only 5% of the water used by once-through systems.
- Once a parallel condensing hybrid cooling system is filled, the only water withdrawn from the environment is makeup water to replace water lost to evaporation, blowdown, and drift. Water loss is less than the water loss from all-wet cooling systems.
- Parallel condensing hybrid cooling can reach “wet bulb” temperatures in the wet portion of the system. These wet bulb temperatures are generally lower than “dry bulb” temperatures, thus improving cooling efficiency in comparison to an all-dry cooling systems.
- Because of the lowered water requirements, parallel condensing hybrid cooling systems can avoid the use of seawater when available fresh or recycled water may not be sufficient to meet the demands from an all-wet cooling system.

Disadvantages of Parallel Condensing Hybrid Cooling Systems

- Parallel condensing hybrid cooling requires a dependable source of water.
- Although more efficient than dry cooling, the parallel condensing hybrid cooling system would not be as efficient at once-through or wet cooling.
- Parallel condensing hybrid cooling systems requires water treatment and monitoring to control concentrations of impurities.
- The wet cooling side of the hybrid system can produce water vapor plumes that may have negative aesthetic effects.
- Capital and maintenance costs for parallel condensing hybrid systems are generally higher than once-through or wet systems.
- Parallel condensing hybrid cooling systems require air-cooled condensers and wet cooling towers that could have negative visual effects.
- Compared to once-through cooling, parallel condensing hybrid cooling systems require the disturbance of several acres of additional upland areas.
- Parallel condensing hybrid cooling systems can have noise impacts that are greater than once-through or wet cooling systems because of the increased number of fans and greater total airflow associated with the air cooled condensers. New quieter fans and other mitigation measures are available to reduce these impacts.

2.4 AQUATIC FILTER BARRIER

Description of the Process and Equipment Required

An Aquatic Filter Barrier (AFB) is a fine-mesh fabric with a large surface area that can be deployed in front of a water intake at a power plant. Velocities of water passing through the AFB are extremely low, thereby reducing biological losses to marine life from entrainment and impingement. A new version of the AFB technology has been developed by Gunderboom Inc.'s Marine/Aquatic Life Exclusion System (MLES). The MLES is a patented full-water-depth filter curtain consisting of treated polypropylene/ polyester fabric suspended by flotation billets on the water's surface and secured in place with anchoring systems (Gunderboom, 2001).

For the purposes of this report Energy Commission staff refers to the MLES as the Gunderboom Aquatic Filter Barrier, or generically as the AFB. Gunderboom AFB systems have withstood a diverse range of aquatic conditions, including water level fluctuations in excess of 12 feet per day, waves at least 5-6 feet, and currents of 3-4 knots (CSG, 2001). Gunderboom AFB systems consist of a custom designed curtain suspended from the water surface to the bottom, surrounding an intake so that all water going into the intake must pass through the filter material. The filter fabric is made of a strong polyethylene or polypropylene fiber and is non-woven. The fabric perforation diameter of the AFB is selected and customized to provide for exclusion of the smallest targeted planktonic organism, usually fish eggs. Larger perforation sizes allow for increased flow, reducing required fabric area and thereby, reducing the cost of the system. Therefore, perforation diameter is one of the factors considered on a case-by-case design basis (CSG, 2001). Depending on the specific design of the AFB, velocities through the AFB range from less than 0.01 feet per second (fps) to approximately 0.05 fps. This low velocity makes it possible for virtually all large organisms to swim away from the AFB during operations and theoretically, most small, motile organisms, including small fish and larvae, will also be able to swim away from the barrier fabric. Theoretically, larvae or fish eggs drawn onto the fabric would experience little pressure from the water being drawn through the fabric. To prevent overtopping, tearing, or biofouling, the Gunderboom AFB uses a computerized "air burst" system to periodically shake material by releasing air bubbles through the curtain system to dislodge sediment buildup and release any biotic materials back into the water column (CSG, 2001).

The Gunderboom AFB fits under the U.S. Environmental Protection Agency's (USEPA) definition of a "passive screen technology," in that the system is essentially a large, fine-meshed screen through which all water must pass before entering the once-through cooling intake system (CSG, 2001). Early versions of the AFB performed poorly, requiring considerable maintenance and repair (Tetra Tech, 2001).

Duke Energy has proposed the use of an AFB system for the once-through cooling system at the MBPP. This proposed system is described in Section 3 and its potential impacts are evaluated in Sections 4 and 5. Tetra Tech, Inc., at the request of the Central Coast Regional Water Quality Control Board, was asked to assess the feasibility and likely effectiveness of the AFB system proposed by Duke (Tetra Tech, 2001). The assessment found that AFB was a promising technology, however, experience in using this technology specifically to reduce impingement and entrainment at cooling water

intake structures is very limited, especially under the generally severe environmental conditions found in Morro Bay. The Tetra Tech assessment did not find that the existing performance data support a designation for the AFB as a proven Best Technology Available (BTA). Tetra Tech concluded that application of the AFB at Morro Bay would require, at minimum, a pilot test and intensive maintenance optimization during the initial years of operation.

Use of the AFB in Power Plant Cooling

Lovett Generating Station. Gunderboom AFB technology has been in place for approximately 3 years for one of the two intakes at the Lovett Station and the technology has recently been installed around the second intake. This is the only power plant where the AFB has been used at a "full-scale" level. Difficulties have occurred at that location, including tearing, overtopping, and plugging/clogging.

Bowline Generating Station. Another example of the AFB proposed for power plant use is at the Bowline Generating Station, about 30 miles north of New York City and three miles south of the Lovett facility addressed above. In August 2000, Mirant Bowline, LLC, applied to the New York Department of Environmental Conservation (NYDEC) for permission to construct and operate a 750 MW combined cycle generating facility on the Hudson River. The plant was originally proposed to use 7.5 mgd of water (to be withdrawn from a pond connected to the Hudson River) and mechanical draft (wet) cooling towers. In February 2001, Mirant revised its proposed project to incorporate a hybrid cooling system and the use of a 2-millimeter wire screen and a Gunderboom MLES to prevent intake of aquatic biota.

The NYDEC recently considered its staff's recommendation (supporting use of the AFB), the recommendation of the assigned Administrative Law Judge (recommending use of dry cooling and finding that the AFB should not be considered as Best Technology Available (BTA) due to the water requirements), positions of intervenors (also supporting dry cooling), and the position of the Mirant Bowline, LLC (supporting the AFB) (NYDEC, 2002) in its decision on the proposed project. The Decision addresses in some detail whether the AFB should be considered as "experimental" or whether it is BTA,[5] and concludes that the AFB should be implemented at Bowline and that it should be considered as BTA.

Contra Costa Power Plant. The Gunderboom AFB is also proposed for use at Mirant's existing Contra Costa Power Plant (in California), in an experiment to see if the AFB will reduce significant entrainment and impingement impacts and withstand the conditions in the interface between the San Joaquin River delta and the San Francisco Bay estuary. This installation will provide information on AFB effectiveness and durability after 5 to 10 years.

[5] The NYDEC Decision references a previous Interim Decision regarding the Athens Generating Company, L.P., in which dry cooling was determined to be BTA. In that decision, the use of hybrid cooling with AFB was rejected. However, the Athens Decision did not find that dry cooling was the only acceptable BTA, stating that the decision should be made on a case-by-case basis.

Other Power Plants. Gunderboom is currently designing aquatic filter systems for two other power generating facilities: Haverstraw, New York and Staten Island, New York. In addition to these systems, Gunderboom is currently talking to eight potential clients, including Duke Energy at Morro Bay, about installing the Gunderboom AFB systems at their power generating facilities (Dreyer, 2001).

Advantages and Disadvantages of the Aquatic Filter Barrier

The following is a general list of the advantages and disadvantages of the Gunderboom AFB.

Advantages of the Aquatic Filter Barrier

- The AFB could significantly reduce impingement and entrainment.
- The AFB would allow the continued use of once-through cooling, which allows for the highest power plant efficiencies (as compared to wet, dry, or hybrid cooling systems).

Disadvantages of the Aquatic Filter Barrier

- The AFB would exclude benthic habitat and potentially exclude shoreline habitat.
- The AFB could interfere with marine navigation, including U.S. Coast Guard search and rescue and law enforcement duties, and other water related activities.
- The permitting process for the AFB in Morro Bay, if even possible, could be time consuming and delay the construction and operation of the modernized MBPP.
- Should the AFB prove to be unsuitable and/or ineffective, either an alternative cooling system (impact avoidance) or habitat enhancement mitigation would be necessary.

PLACEHOLDER FIGURE 1

DIAGRAM OF DIRECT DRY COOLING SYSTEM

PLACEHOLDER FIGURE 2

WET COOLING SYSTEM WITH SURFACE CONDENSER AND MECHANICAL DRAFT COOLING TOWER.

PLACEHOLDER FIGURE 3

COMPARISON DRAWINGS OF A WET TOWER AND A HYBRID PLUME ABATEMENT TOWER.

PLACEHOLDER FIGURE 4

Parallel condensing cooling system, simult. SSC/ACC

COMPARISON DRAWINGS OF A WET TOWER AND A HYBRID PLUME ABATEMENT TOWER.

OR:

DUKE ENERGY MORRO BAY, LLC DRAWING SHOWING POSSIBLE LOCATION OF HYBRID COOLING SYSTEM AT MORRO BAY. THE SYSTEM WOULD HAVE 40 COOLING FANS AND 8 COOLING TOWERS.

MORRO BAY COOLING OPTIONS Photo 1
Mid-Distance View of Dry Cooling System at the Sutter Power Plant
(Shown within the box.)

MORRO BAY COOLING OPTIONS Photo 2
Close-Up View of the Dry Cooling System at the Sutter Power Project

MORRO BAY COOLING OPTIONS Photo 3
Close-Up View of Mechanical Draft Cooling Towers
(Shown within the box.)

Design of cooling options for the morro bay power plant

3.1 DESCRIPTION OF THE PROPOSED PROJECT

The Morro Bay Power Plant (MBPP) Modernization Project is proposed to be a combined cycle electric generating plant consisting of two units each comprising two General Electric Frame 7F combustion turbines (CTGs) and one steam turbine generator (STG). The combustion turbines would draw in air through a compressor section and add natural gas for combustion. The resulting hot gases would expand through a power section of the CTGs and drive electric generators. The hot exhaust gases would then pass through two heat recovery steam generators (HRSGs) to produce steam that would be directed to a single STG driving an additional electric generator. After expansion through the STGs, the now low-pressure steam must be condensed back to water to be pumped again through the HRSGs.

The Applicant has proposed to use the once-through cooling system of the existing Units 1 through 4 as a source of cooling medium for the condenser in the proposed MBPP Modernization Project. The once-through cooling system consists of drawing water from Morro Bay Harbor through a shoreline intake structure, passing it through the power plant surface condensers to cool the steam discharged by the steam turbine portions of the plant, and then discharging the heated water to Estero Bay via the existing shoreline discharge located near the northern base of Morro Rock. The eight existing cooling water pumps would be replaced with eight new pumps, and the cooling water pipes that now deliver water to the existing units would be rerouted to the new units. The timing of this work would allow the continued operation of Units 1 through 4 until the proposed units are fully operational.

Section 3.2 describes the cooling technologies studied in this report. Section 3.3 describes the design of a dry cooling ACC system, Section 3.4 describes a hybrid system, and Section 3.5 describes the AFB. Sections 4 and 5 of this report present an analysis of the environmental and engineering impacts of these cooling technologies.

3.2 COOLING OPTIONS CONSIDERED

As a result of the significant biological impacts that will occur from the use of a once-through cooling design, Energy Commission staff has reviewed several optional cooling technologies. These optional technologies would avoid entirely the use of water from Morro Bay Estuary for power plant cooling. The two types of cooling technologies considered in this report are:

1. A dry or air-cooled condenser (ACC) that transfers the heat from the steam turbine exhaust directly to the atmosphere, therefore drawing no cooling water from the Morro Bay/Estuary and discharging no heated water to Estero Bay.

2. A parallel condensing hybrid cooling tower system using treated reclaimed water that would use both dry and wet cooling tower technologies to cool the plant STG exhaust. The use of reclaimed water would eliminate the need for intake or discharge of seawater. After use, the reclaimed water would be returned to the water treatment plant.

A third cooling technology was also considered and rejected was a straight wet cooling system. Due to the limited volume of makeup water available in the Morro Bay area from the water treatment plant, and the extent of a visible vapor plume from this type of tower, this alternative was not evaluated. Ocean water for use in a wet cooling system was not pursued due to the desire to minimize impacts on marine aquatic organisms and because of concern about air emissions from cooling tower drift.

The conceptual deigns considered in this report were based on parameters supplied by the Applicant in response to a request of staff for the criteria to use in its cooling options study (see Appendix F, Duke 2002d). These conceptual designs would limit the use of the duct firing, especially in warm weather. Larger systems would be needed to optimize project output with duct firing. While staff has not developed conceptual designs specifically for duct firing, basic heat balance considerations suggest that a dry cooling

system would need to be approximately 40% larger if designed for duct firing and a 64º ambient temperature, as discussed under Heat Balance below.

The Applicant has stated in its comments on the Draft Cooling Options Report that these parameters (no duct firing, 64ºF ambient temperature) are inappropriate. The Applicant argues that the ability to use duct firing to produce 1,200 MW across the ambient temperature range of 35ºF to 85ºF is a basic design criteria for the project, and that the conceptual designs considered by staff are unable to meet these criteria (Duke 2002d). In its "The Applicant's Updated Analysis Report," published concurrently with staff's Draft Cooling Options Report, the Applicant presented a design that it says would be able to produce 1,200 MW at an ambient temperature of 85ºF. That design is approximately twice the size of the one analyzed by staff.

Staff notes that the assumptions in the Applicant's Updated Analysis Report shows a duty cycle for 4,000 hours per year (hrs/yr) of duct firing, with 1,952 hrs/yr of those hours at 68ºF and the other 2,048 hrs/yr at 57ºF. The assumptions used by the Applicant in its initial analysis of cooling (prepared as part of the §316(b) process) included only 26 hrs/yr at 85ºF. Staff believes these duty cycle assumptions reasonably reflect the typical range of ambient temperatures expected at the project site. Staff disagrees with the Applicant's contention that the appropriate design criteria for the cooling system should be based on weather conditions that typically occur less than 1% of the hours in the year when such conditions result in impacts that cannot be mitigated.

This report also analyzes the use of an aquatic filter barrier (AFB) with once-through cooling.

3.3 DRY COOLING

Design Criteria

In order to compare the performance and impacts of a dry cooling system or ACC with that of the once-through system, the operating conditions at a common design point must be established. The design and operation of an ACC are highly dependent upon the ambient conditions at a specific site. Therefore, design criteria that are based on expected site conditions have been established upon which to base the conceptual design. The parameters for these conceptual designs were supplied by the Applicant in response to a request of staff for the criteria to use in its cooling options study (see Appendix F, Duke 2002d). While these values reflect conditions on an average day, the performance of the combined cycle will be reduced when higher temperatures occur and a larger ACC than described herein would be required to fully utilize the massive duct firing proposed by the Applicant. During periods of very high ambient temperatures (which occur periodically, but seldom), operation of the steam portion of the plant could be restricted or curtailed. This design is conceptual and not optimized, and a final design and optimization for these criteria would be necessary if the dry cooling technology were to be implemented. (Further discussion on the effect of the dry cooling design identified here on plant output is found below in the section on heat balance.)

COOLING OPTIONS Table 1 below shows the criteria used for the design of the ACC.

COOLING OPTIONS Table 1
Morro Bay Power Plant Dry Cooling Tower Design Criteria

Parameter	Design Point
Site elevation	23 feet
Dry bulb temperature	64°F
Wet bulb temperature	58°F
Relative humidity	70%
Steam flowrate	1,097,000 lb/hr
Steam turbine exhaust temperature	124°F
Enthalpy[6]	1103.8 Btu/lb
Backpressure	3.87 in. Hg

Size, Configuration, and Layout

The size of the ACC is a function of the heat load from the steam turbine generator and the ambient conditions. The ACC is composed of tube bundles with fins attached to the tubes to enhance heat transfer to the air. These bundles are grouped together and mounted in an A-frame configuration on a steel support structure. These A-frame tube bundles are aligned in rows or bays. Steam is ducted directly from the steam turbine exhaust to the ACC where it enters in a parallel flow into the tubes across the top of the bays. Air is blown from below across the finned tube bundles by a series of large fans, which are located beneath the A-frame tube bundles. Each fan is considered a module. To accommodate the large mass of air required for cooling the steam, the A-frame tube bundles are elevated on top of an open structure. As the steam passes down through the tube bundles, it is condensed and drains by gravity flow into a tank from which it is pumped back to the HRSG. Since the steam is exhausted directly from the steam turbine generator after it has expanded through the turbine, it is at both a very low pressure and large volume. This condition limits the distance that the ACC can be located from the steam turbine generator, due to the drop in pressure that results during the transport of the steam; this limitation must be taken into consideration when configuring the plant layout. Two locations for the ACC are presented, Alternatives One and Two.

Staff has not developed and analyzed detailed layouts for the location of the 40% larger system that would be needed to accommodate duct firing at typical ambient temperatures. However, from the site layout, it appears that such a system would fit on the site either at the location considered for Dry Cooling Alternative Two or by splitting the ACC between the locations considered for Alternatives One and Two. Staff has not conducted a detailed evaluation of these possible configurations, but expects that any impacts would be similar in kind to those identified in Sections 4 and 5 below. Additional analysis would be needed to determine whether the larger systems resulted in greater impacts that were significant, whether additional mitigation would be needed, and whether mitigation would be able to reduce impacts to less than significant levels.

Dry Cooling Alternative One

Using the design criteria identified above, GEA (a*supplier of ACC systems) was contacted and requested to provide conceptual design information and budgetary

[6] Enthalpy is the heat content of the working fluid; it is used to determine the amount of work that can be produced in the process.

pricing for equipment that would meet the design criteria. At either location considered for the ACC, preliminary design configuration resulted in the following design parameters for each combined cycle unit.

- No. of bays 4
- No. of fans per bay 5
- No. of fan modules 20
- Fan diameter 32 feet
- Height to top of steam duct 99 feet
- Main steam duct diameter 19 feet

The results of these design parameters would require two ACCs (one for each combined cycle unit), each with a plot area of 206 feet (in length) by 165 feet (in width) by 99 feet high. Other rectangular shapes could also be used.

In Dry Cooling Alternative One, the ACCs would be located immediately south of the proposed new steam generator turbines to minimize the length of the steam pipe. This location is between the new proposed power generation units and the existing power generation units. The plot plan and elevation for this configuration are shown on **Plates 1 and 2**, respectively. Considering the current plant arrangement, this location for the ACC is both operationally feasible, and the cooling structure can physically fit into the space available. Since this location extends toward the existing power generation units, the potential exists that the ACCs would be located above the cooling water tunnels serving the existing plant. Based on Figure 2-17 of the AFC, it is believed that the tunnels may be sufficiently separated from the new units so that carefully designed ACCs could avoid the tunnels. However, if Dry Cooling Alternative One were selected and the tunnels could not be avoided, the tunnels would be need to be taken out of service during the construction of the new ACCs. This would require the early shutdown of Units 1 through 4 and the corresponding loss of electrical production, as well as the loss of revenue to the Applicant. This area was initially proposed by the Applicant to serve as the laydown and staging area for construction of the project. More recently, the Applicant has proposed off-site laydown and parking areas.

Dry Cooling Alternative Two

In Dry Cooling Alternative Two, the ACC would be located northeast of the new units, across Willow Camp Creek (shown on **Plates 3 and 4**). To minimize the length of the steam duct between the STGs and ACCs, the layout of the new units has been reconfigured with all four CTGs and HRSGs in a line with their longitudinal axes in the north-northwest direction, and the STGs both similarly aligned northeast of the CTGs and HRSGs. The ACC design parameters for Dry Cooling Alternative One would also apply to Dry Cooling Alternative Two.

Dry Cooling - Noise Mitigated Configuration

The preliminary results of the environmental analysis of both Alternatives One and Two revealed that, using the standard design described above, there is potential for noise

levels that could exceed acceptable limits. Therefore, GEA was again contacted and requested to provide a configuration that would mitigate these impacts. The revised configuration for the ACC system cooling alternative includes an increase in the number of cooling cells (thus fans), revised size and type of fans and motors using Howden SX super low noise fans, and increased overall size of the ACCs. These changes result in a reduction in the tip speed of the fan along with the blade design and motor size resulting in a significant decrease in noise generated (see environmental analysis in Section 4). The operation of the cooling system is functionally the same including the steam flow and power loss from the steam turbine. There is, however, a lower auxiliary load requirement for the new low noise case. **Plates 2A and 4A** illustrate the noise mitigated configurations for Dry Cooling Alternatives One and Two, respectively.

Staff's low noise configuration of the ACCs at the Alternative One location would be entirely within the current property lines without extending onto PG&E property. It is acknowledged that some existing buildings and facilities would need to be demolished and/or relocated. These facilities do not appear to be in locations that are critical for operations; they could readily be relocated to other areas on the property.

COOLING OPTIONS Table 2 shows a comparison of the features of the original and the revised cases.

COOLING OPTIONS Table 2
Air Cooled Condenser Comparison

	Original Configuration	Noise Mitigated Configuration
Number of bays	4	5
Fans per bay	5	5
Total fans per unit	20	25
Fan diameter	32 ft	32 ft
Area (W x L)	165 ft x 206 ft	213 ft x 200 ft
Area for two units (W x L)	330 ft x 206 ft	426 ft x 200 ft
Ht. to top of steam header	99 ft	115 ft*
Total fan shaft power	3,512 kW	1,814 kW
Motor rating	200 Hp	125 Hp
Steam flow	1,097,000 lb/hr	1,097,000 lb/hr
Inlet dry bulb temp	64°F	64°F
Noise levels @ 400 ft	63 dBA	43.5 dBA
Main steam duct diameter	19 ft.	17.5 ft

* Includes 15 ft. additional height for side by side arrangement

The noise mitigated configuration presented above is relevant to both alternative locations.

Heat Balance

The amount of power that the steam turbine can produce is directly related to its exhaust pressure. Simply stated, the higher the temperature and pressure of the steam entering the steam turbine generator, the more energy or potential for work it contains. Correspondingly, the lower the temperature and pressure of the steam exhausted into the condenser, the greater is the amount of energy extracted from the steam to produce electricity. Therefore, the colder the cooling source for the condenser, the greater the

potential output of the steam turbine generator. When using the ACC, the ambient dry bulb temperature of the atmosphere directly controls the condensing temperature. Because the ACC cannot bring the temperature of the steam to match that of the ambient dry bulb, there is always a difference between the turbine exhaust temperature and the outside temperature. This difference is called the initial temperature difference or ITD. Generally, the ITD will be on the order of 40°F to 70°F. For the ambient temperature of 64°F, the steam turbine exhaust temperature is expected to be 124.4°F, thus the ITD of 60.4°F, which is in the acceptable range.

For a STG turbine operating with an ACC at the 64°F ambient air temperature, the resulting backpressure would be 3.87 inches of mercury (in. Hg). This would compare to the backpressure, using once-through cooling, of approximately 1.4 (in. Hg). Since a colder cooling water condensing source translates to a greater output for the STG, it is estimated that using the ACC will result in a reduction of output from the STG of approximately 5 MW per unit, or 10 MW for the entire plant (less than one percent of proposed plant's nominal capacity of 1,020 MW). This degradation reflects an estimate of an average loss that is representative of an annual average site temperature. However, the losses would be greater when the temperatures at the site are greater than 64°F. Also, as the ambient dry bulb temperature increases, the output of the STG decreases due to the increased turbine backpressure. If the turbine backpressure becomes too great, operation of the steam turbine must be curtailed. It is estimated that when using a standard design steam turbine, the ambient dry bulb temperature at which this would occur is around 95°F (an infrequent occurrence in Morro Bay). If the ambient dry bulb temperature decreases, the output of the STG increases due to the decreased turbine backpressure.

This assessment represents the plant operating without the duct firing in service and is considered to be the most efficient mode of plant operation. The Applicant's comments on staff's Draft Cooling Options Report indicate that using duct firing with Dry Cooling Alternative One would generate approximately 1,200 MW at 55º, approximately 1,100 MW at 64º, and approximately 1,000 MW at 74º. Staff has not independently analyzed the heat balances for these conditions, but finds these results consistent with anticipated performance. To maximize the output available when duct firing, the plant systems would need to be optimized: this would likely include increasing the size of the dry cooling system included in the proposed project. If the massive duct firing were to be applied to the staff's ACC alternative at an ambient temperature of 64º, the additional heat from the steam turbine exhaust to the condenser would increase by about 40%. The additional heat would limit the weather conditions under which the Applicant's proposed full duct firing would be possible. Since the ACC heat removal capability is a function of surface area, it can be estimated that about 40% more area would be required to optimize for the duct-firing configuration. This would result in two additional banks of cells revising the size of the ACC from the 5x5 to a 5x7 ACC per unit.

Auxiliary Loads

Assuming the use of the low noise configuration, the ACC would require electricity to operate the 25 fans used to circulate air over the cooling tube bundles. Each fan has a diameter of 32 feet and is driven by a 125 horsepower motor. The total power required to operate the fans is 1,814 kW per unit or 3,628 kW for the entire plant. This, however, is somewhat offset by the fact that the ACC does not require cooling water pumps for

cooling water circulation. Based on the Applicant's proposed design, there would be four pumps used to provide the cooling water to each combined cycle unit, although only three of the pumps would normally be operated when the duct burners are out of service. It is estimated that these three pumps will require approximately 900 kW each (900 kW x 3 pumps = 2700 kW). Thus, based on the comparison between the once-through cooling water pumps and the ACC fans there would be a decrease in auxiliary power requirements for the ACC case of approximately 886 kW per unit (2700 kW – 1,814 kW) or about 1.77 MW for the entire plant.

Efficiency

Two factors affect plant output when using an ACC system as compared with a once-through cooling system. First, higher condenser backpressure will cause a loss of power generated by the steam turbine. Second, there is a difference in auxiliary loads to operate the fans when compared to the power required to operate the cooling water pumps. The measure of power plant efficiency is the comparison of the amount of fuel required to generate a kilowatt-hour (kWh) of electricity. For the once-through case, the plant will burn approximately 300,000 pounds per hour of natural gas per unit at the chosen design point without duct firing. The net plant heat rate would be approximately 6,900 Btu/kWh.[7]

Assuming equivalent fuel consumption for the ACC option, the heat rate of the plant would increase, reflecting a decrease in efficiency due to lower net plant output. This lower output is caused by the combination of reduced steam turbine generator output due to the higher condenser backpressure offset slightly by the decreased auxiliary loads due to the lower power requirement of the ACC fans compared to the cooling water pumps. Thus, the new plant heat rate would be approximately 6,958 Btu/kWh, or an increase of approximately 1%.

The Applicant submitted an "Updated Analysis of Alternative Cooling Systems For the Morro Bay Modernization Project" dated January 7, 2002. In Appendix M of that analysis, fuel use is compared for the once-through and air cooled cases. When considering the 68°F unfired case (unfired means that duct burners are not in use), the results presented indicate 1.5% increase in heat rate for the air cooled case relative to the once-through case. These results appear to be on the same order of magnitude as that presented by the staff in this section.

As stated above, the Central Coast Regional Water Quality Control Board hired Tetra Tech, Inc. to review the feasibility and cost estimates for specific alternatives for minimizing adverse impacts from cooling water intake at the MBPP. Tetra Tech has submitted a revised draft report dated December 31, 2001 presenting their findings. For operation at 67 percent maximum load (804 MW), Tetra Tech estimated that the energy "penalty" from dry cooling would average 1.61 percent of capacity or about 12.9 MW. These values are much lower than the Applicant's estimate of more than 100 MW lost (primarily due to no duct firing) due to dry cooling.

[7] The fuel use is measured in British thermal units or Btus; therefore, the units used to portray the efficiency (heat rate) of a power plant are Btus per kWh. This is identified as the plant heat rate.

Cost

An estimate of the capital cost for the ACC option has been developed using budget level estimates from an ACC supplier. These estimates are based on the design criteria presented in **COOLING OPTIONS Table 1** and the low noise configuration defined in **COOLING OPTIONS Table 2**. If the system were to be designed to reflect more stringent ambient conditions or with the capability to support duct firing, the costs could increase; however, such a determination would have to be made after a complete optimization of the plant performance including a cost/benefit assessment. The costs provided by the ACC supplier include: equipment engineering, materials, tube bundles, support structures, fans and accessories, motors, steam distribution headers, condensate collection tank, steam jet ejectors, and delivery to the site. Additional capital costs to complete the system include: unloading and handling of equipment and materials, erection labor and supervision, painting, engineering/design interface, steam duct supply and installation from the STGs to the ACC, and equipment to perform the erection services. The total capital cost estimate for the ACC option for both units is $61,822,000. **COOLING OPTIONS Table 3** gives a breakdown of these costs.

COOLING OPTIONS Table 3
Capital Cost Estimate: Dry Cooling Technology

Item	Cost Estimate
Suppliers equipment	$33,000,000
Owner supplied equipment & materials	2,028,000
Installation	7,692,000
Indirects, fees, & taxes	19,102,000
Total cost	$61,822,000

When compared to the cost of the proposed once-through cooling system, the ACC costs would be offset by a reduction of expenditures for the purchase and installation of new cooling water pumps, refurbishing of the traveling screens, and rerouting of the cooling water piping. Staff has estimated the costs assuming the new pumps would be installed in the same location as the existing cooling water pumps, and that the cooling water piping material would be 96 inch diameter AWWA C-300 reinforced concrete cylindrical pipe installed underground and routed as shown on AFC Figures 1-4. The estimated cost associated with the modifications to the proposed once-through cooling system is approximately $9.9 million. Therefore, the differential capital cost for the dry cooling option would be an increase of approximately $52 million. The breakdown of these costs is shown in **COOLING OPTIONS Table 4**.

COOLING OPTIONS Table 4
Capital Cost Estimate: Once-Through Cooling

Equipment	$3,300,000
Materials	1,800,000
Installation	2,400,000
Indirects and fees	2,400,000
Total cost	$9,900,000

The Applicant presented estimated costs for the ACC option in its “Evaluation of Alternate Intake Technologies – Air Cooled Condensers” dated August 9, 2001. Section 2.4 of that report states that “two direct cooled condensers for the new ACC

units including supporting systems is about $120 million more than the proposed once-through cooling water system." This value is very high in comparison to staff's estimate because the Applicant includes the estimated capital cost needed to build additional power plants to replace the amount of electrical power that the Applicant estimates would be lost due to the operation of the ACC. If these costs are removed from the Applicant's estimate, the estimate for the ACC appears to be $39 million greater than for the proposed once-through cooling design. In its January update to the analysis the Applicant revised the cost of the ACC alternative for supply and installation to $80–85 million. However, this cost includes an ACC that is sized to provide enough cooling capacity to handle the duct firing at a maximum temperature of 85°F ambient.

Tetra Tech estimated that the total cost of the ACC would be $41.4 million. The report indicated that the ACC was designed for ambient conditions of 64°F dry bulb and a thermal duty of 325 MW.

Routine operation and maintenance costs for the ACC are minimal. Since the system is completely closed, there is no chemical treatment required. There is routine maintenance required for the fans, motors, and gearboxes, and the finned tubes may need periodic cleaning and touchup. Repainting of the equipment and structure would be performed periodically. Estimates for the operation and maintenance of the ACC range from $100,000 to $300,000 per year. Operation and maintenance costs for once-through cooling would include chemicals, pump operation, screen maintenance, and periodic dredging, so costs could be comparable to those of the ACC.

3.4 HYBRID (WET/DRY) COOLING

Design Criteria

The design and operation of the hybrid cooling option are also highly dependent upon the ambient conditions at the specific site. Therefore, design criteria consistent with those established for the dry cooling option have been applied to develop a conceptual design. These criteria are not intended to form the basis of final design, but are presented for comparative analysis only. If the hybrid cooling technology were selected, further optimization for these criteria would be necessary.

Staff has not considered expanding the hybrid cooling system to optimize the system for duct firing. The designs considered here are limited by the availability of reclaimed water. While it is possible to expand only the dry cooling portion of the system or to use other water supplies, preliminary consideration of the options available suggest that an expanded dry cooling system would be a preferable means to optimize the system for duct firing.

COOLING OPTIONS Table 5 shows the criteria used per unit for the analysis of the hybrid cooling option.

COOLING OPTIONS Table 5
Hybrid Cooling Tower Design Criteria

Parameter	Design Point
Site elevation	23 feet
Dry bulb temperature	64°F
Wet bulb temperature	58°F
Relative humidity	70%
Steam flowrate	1,097,000 lb/hr
Makeup water	600 gpm
Cooling water flowrate	25,000 gpm

Using the above criteria, a single design point was selected that reflected the site conditions considered to be reasonable for purposes of this analysis. The design point used assumed the following conditions:

- Steam flow 1,097,000 pound per hour
- Steam quality 98.9%
- Cold water temperature 70°F
- Hot water temperature 90°F
- Turbine backpressure 3.87 in. Hg

Water Supply

The SWRCB Policy 75-58 favors sources of water other than fresh inland water for power plant cooling. However, staff determined that using Morro Bay/Estuary water would result in significant biological resource impacts (see **Aquatic Biological Resources** section of the FSA). Therefore, this appendix evaluates options to once-through cooling that do not use fresh water or seawater.

This analysis of a hybrid cooling option has been included to determine whether it is possible to use available water supplies other than ocean/estuarine water or freshwater. The water supply would be reclaimed wastewater from the nearby Morro Bay-Cayucos Wastewater Treatment Plant (MBCWTP). The MBCWTP is designed to treat 2.06 million gallons per day (mgd) in average dry weather, and as much as 6.60 mgd during peak wet weather flow. Currently, the MBCWTP treats wastewater to a secondary level prior to discharge to Estero Bay. Secondary effluent is not suitable for use in the cooling tower without filtration and disinfection to meet California Code Regulations Title 22 standards for turbidity and coliform content. Therefore, additional water treatment would be required before use in the cooling tower. Only a limited amount of reclaimed water is available from the MBCWTP, and the MBPP hybrid cooling system technology has been designed to maximize the use of the water reliably available from this source.

The parallel condensing wet dry hybrid cooling option would consist of both a wet cooling tower and a dry or air-cooled condenser (ACC). This concept is considered in this analysis because there is not enough reclaimed water for use in wet cooling towers only. It is designed so that exhaust coming off the steam turbine generators is split into two streams: one stream flows to a surface condenser while the other is directed to an ACC. The condensed steam produced in the surface condenser and the ACC is collected and then pumped back to the HRSGs.

As water is passed over the wet tower, some would evaporate (blowdown) and require replacement. Additionally, due to evaporation losses, the remaining water would increase in mineral content and the minerals would deposit on the tower, reducing its effectiveness. To avoid this, water would be discharged or blown down and replaced with treated reclaimed water. Also, some water would be lost as a mist that is carried up as a result of the airflow through the tower. This mist is called drift. Drift eliminators would reduce the loss to 0.0005% of the cooling water flow. The addition of treated reclaimed water would replace the losses.

The MBCWTP is located approximately 0.4 mile north of the MBPP. Use of a hybrid cooling system would require the construction of a new delivery pipeline and a return pipeline (see **Figure 5**). The return line would transport the cooling tower blowdown back to the MBCWTP for treatment. There are two potential routes for these pipelines. One route would be directly south from the plant along Embarcadero Road, and a second route would exit the MBCWTP to the east and then turn south through Lila Keiser Park and onto the MBPP site. Since the pipelines would be underground, land disturbances would be temporary during the construction period. Both routes would have to cross Morro Creek (a bored crossing to minimize disturbance to the creek is assumed).

Subject to agreement with MBCWTP, additional treatment facilities (required for treatment of secondary effluent prior to use for cooling) could be located either at the wastewater treatment plant or at the MBPP site. It is estimated that the additional water treatment facilities would require 1 to 1.5 acres of land. The additional treatment of the secondary effluent would employ physical and chemical methods to produce water suitable for use in the cooling tower. The reclaimed water pre-treatment system would use microfiltration equipment as the central technology. The microfiltration process would significantly lower the turbidity and total suspended solids (TSS) levels in the water. In a microfilter, the water is pressurized and forced through micropores removing many forms of TSS, viruses, and bacteria typically found in secondary treated effluent. In addition to solids, dissolved phosphorus is removed from the secondary effluent water in the microfiltration process. Removal of phosphates is performed as a means of limiting microbiological activity in the cooling tower makeup water. Phosphate removal is achieved by injection of alum upstream of the microfilter to precipitate aluminum phosphate solids. The microfiltration membranes then remove these solids. Sulfuric acid is also added to promote the efficiency of the precipitation process. The micro-filtration equipment is backwashed on a regular basis to clean the membranes. The backwash water would be combined with the cooling tower blowdown and returned to the MBCWTP.

Size, Configuration, and Layout

The size of the hybrid cooling system is a function of the heat load, the ambient conditions at the site, and the amount of available makeup water. Both the ACC and the wet cooling towers have been sized using site conditions that reflect normal conditions at the Morro Bay site. The ACC towers would consist of 12 fans 32 feet in diameter that would force air up through the ACC. Using these site conditions results in an ACC that is approximately 260 feet long by 87 feet wide, and approximately 30 feet high to the fan deck and 82 feet to the top of the steam header. The wet cooling towers are 84 feet

long by 42 feet wide, and approximately 57 feet high per tower. The wet cooling tower uses two 32-foot diameter fans.

Hybrid Cooling Alternatives One and Two

The most logical location for the hybrid system is to have the dry portion of the system directly south of the proposed project with the wet towers located on either side of the ACC to the east and west. This layout is Hybrid Cooling Alternative One, shown on **Plates 5 and 6**. **Plate 6A** illustrates the noise mitigated configuration at the Hybrid Cooling Alternative One site. Hybrid Cooling Alternative Two is located northeast of the new units (as with the ACC alternative), and is shown on **Plates 7 and 8**. **Plate 8A** illustrates the noise mitigated configuration at Hybrid Cooling Alternative Two.

Hybrid Cooling – Noise Mitigated Configuration

Noise impacts of the initial hybrid system defined above necessitated that the hybrid system be revised to include the super low noise Howden SX fans. Therefore, GEA was again contacted and requested to provide a configuration that would mitigate these impacts. **COOLING OPTIONS Table 6** shows the difference in the original configuration and that with the low noise design.

COOLING OPTIONS Table 6
Wet Dry Cooling Comparison (Per Unit)

	Original Configuration	Noise Mitigated Configuration
Air Cooled Condenser		
Number of bays	2	2
Fans per bay	6	6
Total fans per unit	12	12
Fan diameter	32 ft	34 ft
Area (W x L)	87 ft x 260 ft	87 ft x 265 ft
Area for two units (WxL)	174 ft x 260 ft	174 ft x 265 ft
Ht. to top of steam header	82 ft	100 ft *
Total fan shaft power	1,650 kW	1,690 kW
Motor rating	200 Hp	200 Hp
Noise levels @ 400 ft	52.1 dBA	44.4 dBA
Main steam duct diameter	13.5 ft	14 ft
Wet Tower		
Number of cells	2	2
Fan diameter	32 ft	32 ft
Area (W x L)	42 f t x 84 ft	42 ft x 84 ft
Total fan shaft power	275 kW	275 kW
Motor rating	200 Hp	200 Hp
Cooling water flow	25,544 gpm	25,544 gpm
Makeup	600 gpm	600 gpm

* Includes 15 ft additional height for side by side arrangement

Heat Balance

Although the hybrid cooling system has a wet portion included in the design that takes advantage of evaporation, the limited amount of makeup water available from MBCWTP restricts its ability to have a significant effect on the plant performance. Thus, the output

of the facility in this case would be expected to be similar to that of the dry cooling option. Therefore, the steam turbine backpressure would be expected to be 3.87 inches Hg, with the resulting difference in output being approximately 10 MW less than for the proposed MBPP without duct firing. This degradation reflects an estimate of an average loss that is conservative compared to an annual average site temperature. However, the losses would be greater when the temperatures at the site increase.

Auxiliary Loads

As with the ACC design, the hybrid cooling system also requires power to operate the 12 fans used to circulate air through the ACCs, as well as the two fans for the wet cooling towers. A 200-horsepower motor drives each fan. Together, the total power required to operate the fans is approximately 3,930 kW (3.9 MW). During periods of low ambient temperatures it may be possible to eliminate the wet cooling portion of the hybrid cooling system potentially saving an additional 550 kW in auxiliary power demand.

Both the wet cooling tower and the once-through system require circulating water pumps. The pumping loads for the once-through system are estimated to be approximately 5.4 MW while that of the hybrid system are approximately 1 MW. This results in once-through cooling auxiliary loads of approximately 5.4 MW, and hybrid auxiliary load of 3.9 MW plus 1 MW for a total of 4.9 MW. There would also be some additional power use for the pumps used to deliver the makeup wastewater and return the plant blowdown to MBCWTP. Therefore, the auxiliary power requirements for the once-through system and the hybrid system are almost equal.

Efficiency

The lower plant output when using the hybrid cooling system would result in reduced efficiency of the overall cycle when compared to the once-through design. This lower output would be caused by reduced steam turbine generator output of about 10 MW for both units (5 MW per unit) due to the higher condenser backpressures. Using this value, new plant heat rate would be approximately 6,970 Btu/kWh or an increase of approximately 1%.

In Appendix M of the "Updated Analysis of Alternative Cooling Systems For the Morro Bay Modernization Project" the Applicant presented a fuel use comparison of the once-through and hybrid cooled case. When considering the 68°F case without duct firing, the results presented indicate 1.5% increase in heat rate between the two alternatives. These results appear to be on the same order of magnitude as those presented by the staff.

Duct burning for the MBPP has been proposed by the applicant as a means to provide peaking capability for the plant beyond the normal combined cycle design that uses only the waste heat from the combustion turbines. This is common on many new power plants but is generally sized based upon the constraints of other criteria that must be evaluated including size of the property, noise, air emissions, biology, fuel use, and economics. When duct firing, the efficiency of the plant becomes worse than without the duct firing. In their January 7, 2002 updated analysis, **Appendix M Table 1**, the applicant shows a comparison of operations with and without duct firing for each of the alternative cooling systems. Using the 68°F cases the heat rate increases from 6935

Btu/kWhr to 7237 Btu/kWhr or 4.35% for the once-through case and from 7041 Btu/kWhr to 7440 Btu/kWhr or 5.67% for the ACC and hybrid cases.

Cost

The capital cost estimate for the hybrid cooling technology has been developed using budget level estimates from the equipment supplier. These estimates were based on the design criteria presented in **COOLING OPTIONS Table 5**. If the system were to be designed to reflect more or less stringent ambient conditions, the costs could increase or decrease. However, such a determination would be made on a complete optimization of the plant performance including a cost/benefit assessment. The cost of materials and services provided by the equipment supplier includes: engineering for the equipment supplied, materials, tube bundles, support structures, fans and accessories, motors, steam distribution headers, condensate collection tank, steam jet ejectors, drift eliminators, cooling tower fill materials, and delivery to the site. Additional capital costs to complete the system include: unloading and handling of equipment and materials, site work, foundations, circulating water pumps, erection labor and supervision, painting, engineering/design interface, steam duct supply and installation from the STGs to the ACC, erection equipment, and the tertiary water treatment equipment. The total capital cost estimate for the hybrid cooling options for both units is $45,520,000. **COOLING OPTIONS Table 7** gives a breakdown of these costs.

COOLING OPTIONS Table 7
Capital Cost Estimate: Hybrid Cooling Technology

Item	Cost Estimate
Suppliers equipment	$20,250,000
Tertiary water treatment plant	5,000,000
Owner supplied equipment & materials	4,168,000
Installation	3,782,000
Indirects, fees, & taxes	12,320,000
Total cost	$45,520,000

When compared to the cost of the proposed once-through cooling system, the hybrid cooling technology cost would be offset by a reduction of expenditures for upgrading the proposed once-through system, as defined in Section 3.3 above. The estimated cost associated with the modifications to the existing cooling water system is approximately $9.9 million. Therefore, the differential capital cost for the hybrid cooling technology would be an increase of approximately $35.6 million.

The Applicant estimated costs for a hybrid parallel condensing system in its 316(b) Resource Assessment. Section 6 of that report indicates that the total installed cost for hybrid parallel system would be approximately $27 million. Since no breakdown of this cost was provided, it cannot be determined why it differs from staff's estimate of $45.5 million.

In its January update to the cooling analysis, the Applicant revised the cost of the hybrid alternative for supply and installation to $81-86 million. However, this cost includes a system that is sized to provide enough cooling capacity to handle the full amount of duct firing identified for the proposed project at a maximum temperature of 85°F ambient. Additionally, the Applicant has estimated the cost to upgrade the reclaimed water

treatment plant at $15 million, which is three times more than the staff allowance for the same work.

Plume Abatement. Operation of the hybrid system allows for the flexibility to control the visible vapor plume from the cooling towers during periods of cooler weather and high humidity. This is accomplished by shutting down or reducing the flow of water to the wet cooling tower. Since the ACC performs more efficiently during these cooler periods, plant performance often is not greatly impacted. The amount of time that these conditions exist could be high in a coastal location such as Morro Bay. If such periods are excessive, it is possible that the wet cooling portion of the hybrid system could employ a plume-abated design. The additional cost to provide this modification would be considered an optimization to the design and therefore has not been addressed here.

Operation and Maintenance. Routine operation and maintenance costs for the hybrid cooling system are minimal. Since the ACC system is completely closed, there is no chemical treatment required. There is routine maintenance required for the fans, motors, and gearboxes. The finned tubes may need periodic cleaning and touchup. Repainting will be needed periodically. The wet cooling tower would require chemical treatment as well as routine maintenance of fans and pumps. Estimates for the operation and maintenance of the hybrid cooling system range from $400,000 to $500,000 per year.

3.5 AQUATIC FILTER BARRIER

The Applicant has proposed the use of the Aquatic Filter Barrier (AFB) in Morro Bay to reduce entrainment and impingement impacts of once-through cooling. **Figure 5** (see end of this section) shows the approximate location of the AFB proposed by the Applicant. Two possible cross-sections are illustrated in this figure: one is a minimal design and one includes boat mooring locations. The potential impacts of the AFB are evaluated in Sections 4 and 5 of this appendix.

In a February 15, 2002, submittal to the Energy Commission, Gunderboom, Inc., presented these additional design options for the AFB. The first option is a completely submerged AFB system located in the same place as Duke's AFB, with only marker buoys visible on the water surface. The second is a system with a boat mooring structure but located parallel to the shoreline in the vicinity of the existing MBPP intake building. The third option is a variation on Duke's mooring system, located nearer to the shoreline and likely avoiding more marine traffic. Because the Applicant has not endorsed any of these options, their potential impacts are not analyzed in this report.

One of the major constraints of the AFB at the MBPP site is the installation space in front of the project's Cooling Water Intake System (CWIS), which is an active recreation area. This is a concern identified by the Applicant, USACE, U.S. Coast Guard, and the City of Morro Bay. Tidal flows in the channel in front of the CWIS appear to provide appropriate flushing flows required to sweep particles along the surface of the AFB, but sediment may build up around the AFB, requiring frequent dredging.

Based on the size range of entrained larvae at the existing facility and required intake flows, the AFB for MBPP would require approximately 33,000 square feet of barrier. The MBPP AFB might have a length of approximately 2,000 feet assuming an average depth of 15 feet in an installation area in front of the intake (Duke, 2000a). The final design of the AFB would require information from a number of studies and field tests of the site's characteristics such as (Duke, 2000a):

- Detailed plant site mapping
- Nearshore bathymetry
- Geotech data for anchoring
- Data for currents
- Suspended solids levels
- Debris transport data
- Wind and wave data, including fetch
- Tidal current and elevation changes
- Benthic infauna, epifauna and nearshore fisheries usage of the area
- Target organisms for exclusion, life stages, location in water column, size, seasonality, and
- Permitting, navigational and local planning issues.

Cost estimates for installation of Gunderboom AFBs at power plant sites range from $4 to $6 million, which would not include the cost of multi-purpose design elements (wharves, piers, boat ramps, boardwalks, etc.) that would be unique to Morro Bay's environmental setting. Annual operation and maintenance cost at the MBPP is estimated to be around $300,000 to $500,000 and includes operation of the air burst cleaning operation, and repairing and replacement of the AFB materials over the vendor estimated 10-year life span. The actual cost would depend to a large extent on the final design of the AFB.

Permitting Requirements

The installation and use of the AFB would require the permits listed in **COOLING OPTIONS Table 8**. Staff estimates the time needed to obtain these permits at one to three years. The U.S. Army Corps of Engineers (USACE) would play a major role in permitting the AFB. At a meeting on August 29, 2001, the USACE stated that any impacts to the navigation channel might prevent them from permitting the AFB. The U.S. Coast Guard has similar concerns for channel access and speed of response to emergencies and would provide input to the USACE and the City of Morro Bay.

COOLING OPTIONS Table 8
Permits Required for Installation of Gunderboom AFB in Morro Bay

Permitting Agency	Permit Required for AFB
U.S. Army Corps of Engineers	Individual Project Permit 401 Permit: Dredging and Fill 404 Permit: Discharge Section 10 Permit: Navigable Waters Section 7 Consultation with USFWS Essential Fish Habitat Consultation with NMFS
U.S. Fish and Wildlife Service	Section 7 Consultation
National Marine Fisheries Service	1. Essential Fish Habitat Consultation for Impacts to Eelgrass 2. Possible Section 7 for Impacts to Steelhead Trout
California Coastal Commission	Determination of Consistency with Coastal Act
Regional Water Quality Control Board	401 Certification of Project Incorporate into NDPDES permit
California Department of Fish and Game	Potential permit if aquaculture leases exist
City of Morro Bay (Including the Harbor Master)	Lease required (other city permits are included in certification process through CEC)
U.S. Coast Guard	No permit; consult with U.S. Army Corps of Engineers and City Strong concern for impacts to navigation channel, human safety, and emergency response

PLATE 1 [PLACEHOLDER]

DRY COOLING ALTERNATIVE ONE, PRELIMINARY SITE PLAN

PLATE 2 [PLACEHOLDER]

DRY COOLING ALTERNATIVE ONE, ELEVATION

PLATE 2A [PLACEHOLDER]

DRY COOLING ALTERNATIVE ONE, NOISE MITIGATED CONFIGURATION

PRELIMINARY SITE PLAN

PLATE 3 [PLACEHOLDER]

DRY COOLING ALTERNATIVE TWO, PRELIMINARY SITE PLAN

PLATE 4 [PLACEHOLDER]

Dry Cooling Alternative Two, Elevation

PLATE 4A [PLACEHOLDER] — NEW FIGURE

DRY COOLING ALTERNATIVE TWO, NOISE MITIGATED CONFIGURATION

PRELIMINARY SITE PLAN

PLATE 5 [PLACEHOLDER]

HYBRID COOLING ALTERNATIVE ONE, PRELIMINARY SITE PLAN

PLATE 6 [PLACEHOLDER]

HYBRID COOLING ALTERNATIVE ONE, ELEVATION

PLATE 6A [PLACEHOLDER]

HYBRID COOLING ALTERNATIVE ONE, NOISE MITIGATED CONFIGURATION

PRELIMINARY SITE PLAN

PLATE 7 [PLACEHOLDER]

HYBRID COOLING ALTERNATIVE TWO, PRELIMINARY SITE PLAN

PLATE 8 [PLACEHOLDER]

HYBRID COOLING ALTERNATIVE TWO, ELEVATION

PLATE 8A [PLACEHOLDER] — NEW FIGURE

HYBRID COOLING ALTERNATIVE TWO, NOISE MITIGATED CONFIGURATION

PRELIMINARY SITE PLAN

PLACEHOLDER FIGURE 5

MAP OF PIPELINE ROUTES FOR RECLAIMED WATER (HYBRID COOLING)

PLACEHOLDER FIGURE 6

PROPOSED LOCATION OF GUNDERBOOM AFB...

4 ENVIRONMENTAL ANALYSIS OF COOLING OPTIONS

4.1 AIR QUALITY

Introduction

Potential air pollutant emissions and impacts from project-related air emissions are associated with both facility construction and operation. Construction emissions of concern are diesel exhaust and fugitive dust, while operational impacts include particulate matter (PM10 and PM2.5) and the combustion air pollutants. The potential air pollutant emissions include combustion by-products, fugitive dust, and cooling tower drift. This section identifies the potential air pollutant emissions and air quality impacts of using air-cooled or hybrid cooling tower systems, or adding an aquatic filter barrier (AFB) to the proposed combined cycle Morro Bay Power Plant (MBPP) in lieu of the once-through cooled configuration. These emissions and impacts are compared to each other and to the existing MBPP steam boilers, Units 1 through 4.

Air Emissions and Impacts – Existing Morro Units 1 through 4

If the existing units were not replaced with the proposed combined cycle units, the units would be subject to District Rule 429 to reduce NOx emissions during operation. Installation of the Selective Catalytic Reduction (SCR) systems necessary to comply with District Rule 429 would result in construction emissions. Alternatively, the existing units' capacity factors could be significantly reduced to comply with the rule's daily NOx emissions caps rather than the rule's concentration limits, thereby avoiding any SCR construction air emissions and reducing the other combustion air pollutant emissions from the existing units.

While the SCR construction emissions have not be modeled, it is likely that construction PM10 emissions would contribute to existing violations of the State 24-hour PM10 standard. With implementation of District construction mitigation, staff does not believe that this contribution would be significant. Operationally, District Rule 429 will reduce NOx emissions from the existing units and potentially reduce the other criteria air pollutant emissions.

Prior to December 31, 2000, Units 1 and 2 were limited to 150 parts per million (ppm) NOx, and Units 3 and 4 to 56 ppm NOx, both limits being for natural gas. Since December 31, 2000, Units 3 and 4 are limited to 10 ppm NOx for natural gas; or, all four units are limited to 3.5 tons NOx (in total) per day. The owners of Units 1 through 4 opted to meet the daily cap and have not installed the SCR emissions controls on Units 3 and 4 necessary to achieve the 10 ppm NOx limit. Currently, Units 1 and 2 can achieve about 100 ppm NOx without the use of any additional external NOx emissions controls. Units 3 and 4 were retrofit with "S" type burners, Flue Gas Re-circulation, and over-fire air and operate at about 40 to 50 ppm NOx (depending on load). Per Rule 429, by December 31, 2002, Units 1 through 4 will be limited to 2.5 tons NOx (in total) per day. If Units 1 through 4 are to remain in operation at historical capacity factors after December 31, 2002, some or all of the four units would require some type of SCR in order to meet the daily NOx cap of 2.5 tons. Alternatively, the owner could choose to curtail daily capacities of the four units to comply with the 2.5 ton/day NOx cap.

However, Staff cannot determine if the owner will choose to comply with District rule 429 beyond December 31, 2002 via unit curtailment or unit retrofit.

Air Emissions and Impacts of Dry Cooling

The magnitude of emissions from the construction of the air-cooled condenser (ACC) would be different than those from the construction of the proposed once-through cooling system. Additional sections of the project site would be disturbed for the cooling towers, and the laydown area(s) may have to be increased to store and/or prepare the air-cooled radiator components prior to installation. Grading and construction equipment would be required to prepare the site and install the ACC system. The additional soil disturbance and equipment activity would result in increased fugitive dust and vehicle exhaust emissions.

Air impact modeling for construction of the proposed project calculated project contributions to existing violations of the State 24-hour PM10 standard. The increased construction activity for a dry cooling system would increase the project's contribution to local PM10 levels relative to the proposed project, increasing the short-term and potentially unavoidable construction air impacts. With the implementation of the District and staff proposed construction mitigation, staff believes that this contribution would be less than significant.

No additional emissions would be created by the dry cooling system itself, but the operation of the system could change the impact of the PM10 and PM2.5 emissions that are created by the project. As the air is moved over the coils, PM10 and PM2.5 (dust/dirt) from the ground surface would be resuspended in the atmosphere. Since these PM emissions would not be "new" emissions, and average emission rates vary seasonally and significantly, evaluating those impacts and mitigating them, if necessary, would be difficult.

The Applicant has argued that the power plant performance penalties associated with ACCs, compared to the proposed once-through cooled project, would result in additional air pollutant emissions from additional fuel firing. The performance penalties include increased heat rates and parasitic loads. However, these potential increases in air emissions at the project are highly speculative since California has a competitive electricity market. The proposed project will operate as a merchant plant. The owner is not under contractual obligations to provide 100% of the proposed capacity in the immediate region. Furthermore, the project owner could choose to generate the "lost" capacity at another company plant, or buy capacity on the open market throughout the western system rather then generating it at the Morro Bay project.

The displaced capacity could be from an emissionless hydro or nuclear plant, from a coal plant in Wyoming, or from numerous plants throughout the western region. Therefore, the emission changes due to power plant performance degradation resulting from the dry cooling technology cannot be tied to the proposed project. Furthermore, if the Applicant opted to fire more fuel at Morro Bay to overcome reduced capacity due to ACCs, any emission increases would need to be modeled for potential impacts, and offsets would likely have to be provided for the increases. Therefore, impacts would be less than significant with the operation of a dry cooling (ACC) system.

Impacts would be the same with Dry Cooling Alternatives One and Two. Construction impacts of the noise mitigated configurations would be slightly greater than those of the original designs because the structures are larger. But impacts would remain less than significant.

Air Emissions and Impacts of Hybrid Cooling

Construction of a hybrid cooling system would likely produce both diesel and fugitive dust emissions similar to those associated with constructing the dry cooling option. There would also be additional fugitive dust and diesel exhaust impacts, compared to the proposed project or the ACC system, from constructing the pipeline used to bring cooling water to the site. Air impact modeling for construction of the proposed project calculated project contributions to existing violations to the State 24-hour PM10 standard. The increased construction activity for a hybrid cooling system would increase the project's contribution to local PM10 levels relative to the proposed project, increasing the short-term and potentially unavoidable construction air impacts. With the implementation of the District and staff proposed construction mitigation, staff does not believe that this contribution would be significant.

During operation of a hybrid cooling system, there would be PM emissions from the cooling tower drift. The amount of PM is proportional to the amount of dry to wet cooling in a hybrid or plume abatement system and the amount of drift and the total dissolved solids (TDS) in the circulating water. For the proposed hybrid cooling system with a circulating water flow rate of 25,000 gallons per minute (gpm) and a drift of 0.0006%, the gpm of drift and lbs/hr of PM10 emissions can be calculated. Assuming TDS of 3,000 ppm, the PM10 from the hybrid cooling system is estimated at 0.99 tons per year.

The annual PM10 emissions from a hybrid cooling tower will be small, but can vary with drift eliminator efficiency, make-up water TDS, allowable tower TDS, and size of the wet system. The PM10 emissions from cooling tower drift would cause less than significant impacts, as the emissions would be fully mitigated by emission reduction credits. As with the ACC system, any potential or actual power plant performance penalties compared to the proposed project will not result in air emissions that must be tied to the project. Potential air emissions increases at Morro Bay will be modeled for impacts and mitigated or offset, as appropriate. Therefore, impacts would be less than significant with the operation of a hybrid cooling system. As with the dry cooling alternatives, this conclusion applies to both locations and to the noise mitigated configurations.

Air Emissions and Impacts of the Aquatic Filter Barrier

The initial deployment of an aquatic filter barrier (AFB) would result in construction emissions different from the construction of the proposed once-through cooling system. The laydown area(s) may need to be increased to store and/or prepare the AFB components prior to installation. Construction equipment and vessels would be required to prepare the land and sea anchor sites. The additional soil disturbance and equipment activity would result in increased fugitive dust and vehicle exhaust emissions relative to the proposed project.

Staff used air impact modeling for construction of the proposed project to calculate project contributions to existing violations of the State 24-hour PM10 standard. The

increased construction activity for an AFB system would increase the project's contribution to local PM10 levels relative to the proposed project, increasing the short-term and potentially unavoidable construction air impacts. With the implementation of the District and staff proposed construction mitigation, staff does not believe that this contribution would be significant.

Depending on the aquatic species and their hatching cycles, the AFB may be deployed and/or retrieved one or more times annually. The deployment, retrieval, and any maintenance activities would result in equipment, vessel, and onshore activities, as well as increased combustion and fugitive dust emissions. Because these activities would occur annually, they would need to be permitted as part of the project and mitigated, where appropriate.

Most AFBs require air sparging[1] to minimize impingement and/or remove impinged materials. The air compressors necessary to operate the sparging system would increase the parasitic loads of the project, affecting the project heat rate and capacity. As with the dry cooling and hybrid cooling systems, any potential or actual power plant performance penalties compared to the proposed project would not result in air emissions that must be tied to the project. Potential air emissions increases at Morro Bay would be modeled for impacts and mitigated or offset, as appropriate. Therefore, there would not be any significant air emissions impacts with the operation of an AFB system at Morro Bay.

Mitigation for all Cooling Options

Construction

The implementation of the District and staff Conditions of Certification (as presented in the **Air Quality** section of the FSA) regarding construction emissions would address and mitigate to a less than significant level any potential impacts from increases in emissions from the construction of either of the cooling technologies, or the AFB.

Operation

Any potential air emissions increases at Morro Bay would be modeled for impacts and mitigated or offset, as appropriate.

Conclusion for Air Quality

Staff believes that the construction of the proposed project, the cooling technologies, or the AFB described above would increase criteria air pollutant emissions compared to the existing project. The potential emission increases could increase the short-term and unavoidable impacts due to construction. However, staff and the District have proposed Conditions of Certification that will minimize emissions, and mitigate the impacts to a less than significant level. Furthermore, if PM10 violations are measured, construction activities will be modified to reduce emissions sufficiently to ensure that standards are not violated.

[1] Air sparging uses bursts of air from below the AFB to shake off impinged materials.

Any potential or actual power plant performance penalties associated with the cooling technologies or the AFB described above, as compared to the existing or proposed project, would not result in air emissions that must be tied to the project. In addition, any air emissions increases at Morro Bay would be modeled for impacts and mitigated or offset, as appropriate. Therefore, air emission impacts would be less than significant with the operation of either of the cooling system technologies, or the AFB.

4.2 BIOLOGICAL RESOURCES

Introduction

The Applicant proposes to modernize the existing MBPP while continuing to use once-through cooling. The existing once-through cooling at the MBPP relies upon the intake of water from Morro Bay and discharge of the same water into Estero Bay. The ecological impacts of once-through cooling in Morro Bay are discussed in detail in the **Aquatic Biological Resources** section of the FSA (see also Tenera, 2001). These adverse impacts are the basis for requiring this evaluation of mitigation strategies using alternative cooling technologies.

There are three adverse biological impacts associated with once-through cooling at MBPP:

1) The entrainment of fish and invertebrate larvae,

2) The impingement of fish and invertebrates, and

3) The thermal alteration of intertidal marine communities.

Additional information on impacts may be found in the FSA section on **Aquatic Biological Resources**. This appendix evaluates the biological impacts of three cooling technologies: dry cooling, hybrid cooling, and use of the aquatic filter barrier (AFB) with once-through cooling.

Biological Impacts of Dry Cooling

Dry cooling would entirely avoid the significant adverse impacts of entrainment, impingement, and thermal discharge because it would not require the use of ocean/estuary water to cool the power plant. Avoidance of an impact is always preferable to mitigation.

The air-cooled condensers (ACCs) without noise mitigation could be placed in two alternative locations on the MBPP site (Dry Cooling Alternative Sites One or Two, as illustrated in Plates 1 and 3). In either location, the two ACCs would be 165 feet wide x 206 feet long x 99 feet high. Altogether, the ACCs would occupy an area 330 feet wide x 206 feet long x 99 feet high (a total area of approximately 1.56 acres).

Dry Cooling Alternative One, with or without noise mitigation, positions the ACCs south of the proposed location of the modernized power plant, on what is currently a paved parking lot.

Dry Cooling Alternative Two, with or without noise mitigation, positions the ACCs northeast of the proposed location of the modernized power plant, which may be re-oriented to maximize space use. This alternative places the ACCs in an area currently

used to dump seaweed captured on the once-through cooling system screens and is proposed as a 4-acre parking area during new power plant construction. This site is bordered on two sides by an Environmental Sensitive Habitat Area (ESHA) of riparian woodland.

Dry Cooling – Noise Mitigated Configuration. In order to reduce noise from the ACCs, the design has been modified for both Alternatives One and Two. The air-cooled condensers (ACCs) would be placed in the same two locations on the MBPP site (Plates 2A and 4A). In either location, the two ACCs would be 213 feet wide x 200 feet long x 115 feet high. Altogether, the ACCs would occupy an area 200 feet long x 426 wide feet x 115 feet high (a total area of approximately 2 acres).

Marine Impacts

The use of Dry Cooling Alternatives One or Two, with or without noise mitigation, would not result in any adverse impacts to the marine environment. Rather, as noted above, the use of dry cooling would entirely avoid the identified adverse impacts of entrainment, impingement, and thermal discharge.

Terrestrial Impacts

Loss of terrestrial habitat would not occur if **Dry Cooling Alternative One** were selected, with or without noise mitigation. Two ACCs would result in the permanent loss of approximately 1.6 to 2 acres of land, depending on incorporation of noise abatement. Terrestrial impacts would be minimal due to location of the facility within the existing paved, industrial area. Standard mitigation measures (i.e., biological monitoring, stormwater pollution prevention plan, buffer zones around sensitive areas) would apply to prevent adverse impacts or mitigate any impacts to less than significant levels.

Dry Cooling Alternative Two would place the ACCs in a more sensitive habitat area of the MBPP site. As with location one, the two ACCs would result in the permanent loss of approximately 2 acres of land with the incorporation of noise mitigation. The location lies within a 4-acre area that is currently being used to dump seaweed and other debris cleaned off of the once-through cooling intake structure. This general area has been proposed by the Applicant to become the “Craft” (i.e., construction workers’) temporary parking area, but it is also bordered by an ESHA containing riparian woodland and freshwater streams.

Recent developments may impact the future use of alternative location two (for both dry and hybrid designs). On March 28, 2002 the Applicant began USFWS protocol level surveys for the federally endangered Morro shoulderband snail (*Helminthoglypta walkeriana*) in the vicinity of the ESHA and the proposed “Craft” temporary parking area and temporary footbridge. These surveys are being conducted to confirm that this endangered species is <u>not</u> present in this area. Completion of the surveys may not be achieved until late 2002 or early 2003, due to the waning rainy season. The presence of Morro shoulderband snail in this area may preclude or limit use of the area. Staff will continue consulting with USFWS to ensure compliance with the Endangered Species Act and to prevent adverse impacts to this species (refer to the **Terrestrial Biological Resources** FSA for more information).

The following analysis assumes that the Morro shoulderband snail is confirmed to be absent from the area. Staff does not have survey results at this writing, and will provide an update on survey results during evidentiary hearings. There are numerous other special status species, including federal and state listed and state fully protected species and species of special concern, which nest, roost, forage, and/or migrate through the riparian habitat of Morro and Willow Camp Creeks. The ESHA is adjacent to Morro Creek, which is an evolutionary significant unit (ESU) and designated critical habitat for steelhead trout. Steelhead trout are present in Morro Creek. The creek beds themselves would not be directly disturbed but would need to be protected from all indirect impacts of pollution and degradation. Thus, endangered and threatened species, such as steelhead trout and California red-legged frog, inhabit this area and may be directly impacted if some vegetation is removed. Impacts to these and other federally listed species would be addressed in the Section 7 consultation through the USFWS. The CDFG would consult and provide take permits for state listed and protected species. Any loss of riparian habitat would require habitat mitigation, which is also required for the project at its current location.

Indirect impacts may also result from noise, lighting, and human activity that may degrade the ESHA. Direct loss of habitat as well as indirect degradation of areas of the ESHA could be mitigated with local habitat replacement and/or restoration. As discussed in the **Terrestrial Biological Resources** section of the FSA, noise and other on-site human activities would contribute cumulatively to degradation of riparian habitat quality. As a result, habitat mitigation would be required.

All of the potential adverse impacts to the ESHA and listed species would need to be evaluated fully after final designs are submitted. All potentially significant adverse impacts would be avoided and minimized with the implementation of appropriate mitigation measures (e.g., prevention of contamination and sedimentation in the streams). Staff concludes that there would be some significant terrestrial impacts from ACC Alternative Two, but that these impacts can likely be mitigated to less than significant levels.

The benefits of dry cooling to aquatic resources in Morro Bay are significant and considerable. Terrestrial biological resources impacts are not expected to be significant at location one with implementation of appropriate mitigation, similar to that defined in the Conditions of Certification for the proposed project (see the **Terrestrial Biological Resources** section of this FSA). If no Morro shoulderband snails are found in location two, biological impacts are considered mitigable to less than significant levels. If the snail is found in the area, Staff will need to consult with USFWS and evaluate the impacts and determine whether it is possible to mitigate the impacts to less than significant levels.

Biological Impacts of Hybrid Cooling

The proposed hybrid design uses recycled water for the wet component of the cooling system. As such, the need to use once-through cooling facilities would be eliminated.

Hybrid Cooling System with Noise Mitigated Configuration. In either of the two potential locations (**Plates 6A and 8A**), the hybrid cooling system with noise mitigation would have the following dimensions: the two ACCs would be 87 feet wide x 265 feet

long x 100 feet high. Altogether, the ACCs would occupy an area 174 feet wide x 265 feet long x 100 feet tall (a total area of approximately 1.06 acres).

Marine Impacts

The adverse impacts to marine biota would be entirely avoided with the use of hybrid cooling.

Terrestrial Impacts

No significant and unmitigable terrestrial impacts would result from installation of the hybrid cooling system at **Hybrid Cooling Alternative One**. This area is currently paved and used as a parking lot. In the **Terrestrial Biological Resources** section of the FSA, Staff has already proposed habitat mitigation for noise and other impacts of human activity to the ESHA. Staff has also supported the Applicant's use of a sound wall. Thus, no significant terrestrial biological impacts are expected once mitigation measures are implemented.

If **Hybrid Cooling Alternative Two** were selected, analysis and mitigation of impacts to the ESHA would be required. Impact assessment and formulation of mitigation requirements would be similar to those for **Dry Cooling Alternative Two**. Similarly, Staff awaits results of the ongoing protocol level surveys for the Morro shoulderband snail. If this endangered species is present in the area, Staff would consult with USFWS to determine an appropriate course of action for use of this location.

The following analysis assumes that the Morro shoulderband snail is confirmed to be absent from the area. In the **Terrestrial Biological Resources** section of the FSA, Staff has already proposed habitat mitigation for noise and other impacts of human activity to the ESHA. Staff has also supported the Applicant's use of a sound wall. Upon implementation of noise mitigation, the permanent loss of habitat would be 2 acres. Direct loss of habitat as well as indirect degradation of areas of the ESHA could be mitigated with local habitat replacement and/or restoration. Thus, no significant terrestrial biological impacts are expected once mitigation measures are implemented.

Hybrid Design and the Use of Freshwater

Both hybrid design locations would require the installation of a water pipeline that would be installed underground and run north of the MBPP site to the Morro Bay–Cayucos Wastewater Treatment Plant. The pipeline would be constructed within city streets and possibly through ESHAs, such as Morro Creek. These additional construction impacts need to be considered along with impacts of the cooling structures themselves.

Based upon the current biological analysis of the MBPP site, it is expected that any potential impacts could be mitigated to less than significant levels. The installation of the water pipeline will require a CDFG streambed alteration agreement and a Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (USACE No The biological resources benefits of implementing a hybrid cooling system are significant. The hybrid cooling system would eliminate marine impacts and would not create any significant or unmitigable terrestrial impacts. The use of reclaimed freshwater is encouraged for water conservation reasons and would not create significant biological impacts.

Biological Impacts of the Aquatic Filter Barrier

The Applicant has proposed two AFB designs: one with a single set of pilings, and a second with pilings on either side of the submerged AFB that could also be used as a boat dock (see **Figure 5** in Section 3 of this appendix). Both of the Applicant's proposed designs are similar in shape and size.

Marine Impacts

The AFB would enclose a portion of the water column from the floor of the Bay to the surface. This would result in a direct loss of aquatic habitat, some of which may be sensitive habitat. The AFB would potentially eliminate eelgrass and other important fish habitat in Morro Bay. The loss of this habitat would need to be mitigated within Morro Bay.

The indirect impacts of the AFB on biological resources may be significant. The design incorporating the boat dock would result in indirect impacts such as increased water pollution, habitat disturbance, and general increases in human activity in the area around the AFB, which as proposed is close to or within essential fish habitat. The marine biological impacts of the AFB would need to be studied thoroughly and mitigated as necessary in consultation with NMFS and USFWS (as well as USACE and other permitting agencies).

Unforeseen impacts may result if the AFB fails due to technical reasons, weather, or other damage (e.g., from boat traffic). The impacts may be unintentional entrainment and impingement, or damage to habitats in the bay (e.g., if the AFB were carried away in a storm). The development of a comprehensive AFB mitigation, implementation, monitoring, and maintenance plan would be required and the administration of this plan would have to be adaptively managed due to the experimental nature of the technology in the coastal marine environment. Experimental actions such as the AFB in a state and federal estuary are considered to be exceptionally risky, and receiving the necessary approval from the multiple federal and state agencies may not be feasible (see **COOLING OPTIONS Table 8**). Impacts resulting from the installation of the AFB would be significant but could be mitigated to less than significant. The mitigation would be difficult because it would involve replacing estuarine habitat, but possible. Whether the AFB significantly reduces entrainment is uncertain.

Terrestrial Impacts

Neither of the proposed AFB designs will result in significant direct or indirect terrestrial impacts.

Effectiveness of the AFB in Reducing Biological Impacts

The U.S. Environmental Protection Agency considers the AFB to be a promising passive screen technology for minimizing impingement and entrainment. However, there are few published, peer-reviewed studies or rigorously tested scientific data to support its effectiveness and durability, particularly in a coastal marine environment (Riverkeeper, Inc., 2001; Huddleston, 2001). While Staff has data showing both the benefits and problems with this technology, there is also significant disagreement

among scientists about the AFB and its implementation as the BTA for mitigating biological resources impacts.

Effectiveness of the AFB in Decreasing Entrainment

Scientific studies of the biological effectiveness of the AFB in reducing larval entrainment have been attempted since 1994 (Huddleston, 2001; LMS, 2000). The main test site, where the bulk of AFB information was generated, is the Lovett Generating Station on the Hudson River, NY. In 1994, the first AFB was installed there to prevent entrainment and impingement of anadromous fish that spawn in the Hudson River. Several studies were conducted testing the amount of reduction in entrainment and impingement with the AFB, as well as any mortality to larvae through impingement on the AFB screen (LMS, 2001;Radle, 2001). Larger organisms were able to swim against the intake velocity easily, and small organisms and larvae were reportedly able to swim away or were freed by the AFB's air burst system, which is designed to remove sediment and other debris from the AFB (LMS, 2001). Thus, there are data in support of the conclusion that the AFB is effective at decreasing entrainment while not causing impingement of larvae on the structure.

There have also been several studies quantifying the reduction (efficacy) of the AFB in decreasing entrainment of fish larvae. Most data Staff has received was collected at the Lovett Station on the Hudson River (LMS, 1999 LMS, 2001). Reduction in entrainment may be between 70-90%. However, the reported efficacy rates of the AFB in reducing entrainment have been debated because problems have been documented with its performance and maintenance (Bell, 2001; Duke, 2001c; Henderson, 2001; Huddleston, 2001; Gunderboom, 2002; Radle, 2001). Duke 2001c proposed a target 70% reduction in entrainment and their implementation of the AFB was contingent on installing a test AFB with a proven performance level above 60% (Duke 2001c, page 4). Duke's proposal, presumably developed in concert with an AFB design company, contains multiple stages of testing and determining the feasibility of continuing with the AFB, including costs, permits, and performance (see Duke, 2001c, Figures 1 and 2). This may be a prudent tactic, however, it underscores the concern that AFB deployment is to experimental for this specific location, considering the significance of the adverse biological impacts that it would be preventing.

On a more basic level, some studies of AFB efficacy have presented contrasting results on larval survival and mortality of the control group, which cannot be explained (Radle, 2001, p.9). Generally, when the control group of an experiment fails unexpectedly, the results for the entire experiment should be considered invalid. Some of the studies may therefore invalid. In addition, the conditions of the studies were not matched to the natural environment (larvae were not fed), and lacked appropriate control groups, adequate sample sizes, and replication of the experiment. There are also many questions about the length of time that it takes larvae to die, if impinged on the AFB. There is little evidence that the larvae are impinged, but the data are not conclusive (Radle, 2001, p.8). Staff considers these shortcomings of all studies regarding AFB effectiveness.

AFB Maintenance, Performance, and Longevity

The maintenance, performance, and longevity of an AFB system depends on the size, location, and capacity of the AFB, as well as advances in technology (Gunderboom 2002). Huddleston chronicles the many issues with AFB installation, operation, and maintenance, which Duke 2001c acknowledges in their proposal (see Marine Conditions #2 and #5). Some of the specific problems encountered with the AFB between 1994 and 1997 included: strap failure, anchoring failure, tearing of the AFB screen, over-topping of the AFB due to sediment accretion, deterioration of the AFB due to flexing under tidal action, development of small holes in the AFB caused by chafing of air hoses, valves, and support lines, and extensive algal growth (after development of the air-burst system) (Bell, 2001; Henderson, 2001; Huddleston, 2001). Dr Huddleston, a fisheries and wetlands ecologist, has testified for Riverkeeper, Inc. that the AFB is *not* yet a proven technology and cannot be relied upon as a component of BTA to mitigate for adverse impacts of entrainment. In contrast, Gunderboom, Inc reports that AFB at Lovett (NY) initially experienced several major types of problems with the AFB, but that many of the problems were resolved over time, through trial and error (Gunderboom 2002). These problems of performance, reliability, and durability are valid and practical concerns when considering approval of an AFB in a coastal environment.

The air-burst system used to clean the AFB of debris has also been evaluated with contrasting results, and several experts, including Bell (2001, p.3) and Henderson (2001, p.4), testified that the air-burst system inadequately controlled biotic growth and sediment accumulation. For example, Dr. Henderson's testimony states, "After 29 days, the fabric exposed to moving water and air-burst cleaning was found to have an even greater reduction in flow than the corresponding static test panels" (Henderson, 2001, p.4). In some instances, the flow was stopped altogether. Henderson (2001, p.5) concludes that "…the permeability after 29 days exposure was greatly reduced under all conditions and was reduced by greater than 96% in the case of the panels that were subjected to air-burst cleaning." Gunderboom, Inc. recently submitted information indicating that the performance of the airburst system is improved and no longer experiences such performance problems (Gunderboom, Inc. 2002).

Morro Bay: Site-Specific Considerations for AFB Feasibility

The above performance and maintenance questions are of concern for a coastal location like Morro Bay, and the AFB could be determined to be infeasible due the above issues. Staff would require additional data indicating that these problems could be avoided and rectified quickly if they did occur. As Duke (2001c) indicates in their own proposal, the installation cost of the AFB should be "no more than $7million including the cost of the demonstration unit" and that ongoing operational costs should be less than $250,00. Staff does not have adequate data to evaluate whether or not this is proposal has a reasonable chance at meeting these criteria for cost and performance (>60% decrease in entrainment with a target of 70%) feasibility.

Morro Bay is a high energy, coastal, tidal environment surrounded by kelp and eelgrass habitats, as well as a boat marina. Indeed, biofouling may cause failure of the entire system. Often, tears and other structural damage cannot be repaired without removing the AFB from the water, and depending on the time of year, removal may be impractical (Henderson, 2001). While repairs are being made, the MBPP's intake would again be

entraining and impinging biota, or the power plant would be required to shut down until repair is completed.

As described in Section 3.5, on March 19, 2002, the State of New York accepted an AFB (manufactured by Gunderboom, Inc.) as best technology available (BTA) for the Mirant Bowline, LLC's Bowline Power Plant (NYDEC, 2002). The Bowline Decision discusses many of the valid scientific concerns and limitations of data obtained from AFB studies. However, the Gunderboom proposed to operate at the Bowline Power Plant facility would be deployed in an inland river 30 miles north of New York city. This location (and that of the Lovett Generating Station) is in contrast to the proposed MBPP, which is located near the narrow mouth a coastal Bay and estuary. According to the Bowline Decision (pages 3-4): the approved Gunderboom would be used at a 750 MW combined cycle facility that "…allows a low intake velocity and limits intake capacity to the proposed maximum of 7.5 mgd." This volume of water use is significantly lower than the 475 mgd permit level in the Regional Water Quality Control Board's Pollution Discharge and Elimination System permit for the MBPP.

In Morro Bay, the natural environment is more dynamic than the Hudson River in terms of the tides, currents, storm events, salt water, and potential debris (including nearby private and commercial boats). Successful use of the AFB has been achieved in waves up to five feet; however, the likelihood of the AFB surviving recurring storm and high tide events over the course of 20 years is lower. Thus, in a coastal environment like Morro Bay, this technology would likely require a high level of maintenance. If the AFB were destroyed in a storm, a backup mitigation plan would need to be implemented in a timely fashion. Testing and monitoring would also require multiple years to complete. Thus, the AFB is not proven to be effective and would require extensive and intensive monitoring of its effectiveness and durability (Henderson, 2001; Huddleston, 2001; Algert, 2001).

The City of Morro Bay has expressed concern regarding the AFB's impacts to safe boat traffic, public access to the beach in the area, biofouling, maintenance, and visual impacts (Algert, 2001). Contrary to the recent assertion that permitting the AFB would be relatively easy to complete (Gunderboom, Inc. 2002), Staff has already receive agency feedback during an interagency meeting held in August 2001. This meeting was held specifically to discuss the permit requirements for an AFB in Morro Bay. Refer to **COOLING OPTIONS Table 8** which lists the permits discussed at that meeting.

Staff acknowledges the recent efforts made by Gunderboom, Inc. to design additional AFB concepts for the Applicant that would better fit in Morro Bay's small area (Gunderboom, Inc. 2002). However, Staff does not have any evidence from Gunderboom, Inc., that the U.S. Coast Guard, the Harbor Master, the City of Morro Bay, or the U.S. Army Corps of Engineers would approve the new designs or that the new designs would negate the significant concerns of the key permitting agencies.

Staff has not received supporting quantitative or descriptive information from Gunderboom, Inc. regarding the actual and specific operation of its AFB designs in coastal marine environments, for example AFBs are reportedly installed in coastal areas of Alaska. While Staff supports the continued development and refinement of AFB technology where site conditions render it feasible, Staff does not possess sufficient

evidence that an AFB would provide successful mitigation for aquatic impacts to the specific site in Morro Bay. Based on available information, Staff has determined that the use of an AFB in Morro Bay would be "experimental" mitigation. Duke 2001c proposes a multi-staged approach to evaluating the AFB's feasibility and this further supports Staffs conclusion that the AFB may not be feasible for the Morro Bay Power Plant in Morro Bay.

In conclusion, while the AFB is a promising technology that may be applicable BTA for some locations, the adverse impacts to Morro Bay are too significant to support the implementation of this experimental technology. Staff does not have adequate supportive, scientific, and quantitative information needed to overcome several areas of uncertainty (including financial concerns). Thus, at this time, Staff does not consider the AFB to constitute a feasible option for mitigation of biological aquatic impacts to Morro Bay, a federal and state designated estuary.

Conclusion for Biological Resources

Dry and hybrid cooling technologies have similar benefits to aquatic biological resources and similar impacts to terrestrial resources. Hybrid cooling will result in additional temporary, yet mitigable, impacts due to the construction of the water pipeline. The use of noise mitigation for either of the cooling alternatives would lessen the biological impacts, while habitat losses for both cooling systems with noise mitigation would increase slightly (0.4 acres for dry cooling to 0.02 acres for hybrid cooling). The adverse impacts of using dry or hybrid cooling at location One, within the industrial footprint, would be less than significant and/or mitigable to less than significant levels. The potential impacts of using location Two, near the ESHA may be significant pending ongoing protocol level surveys for the Morro shoulderband snail. However, if the snail is confirmed to be absent from the area, impacts of the proposed dry and hybrid designs at this location would be mitigable to less than significant levels.

Due to a lack of convincing scientific and practical data, Staff does not consider the AFB to be a currently feasible technology for mitigating significant adverse marine impacts. Losses of sensitive estuarine habitats within the AFB would need to be mitigated. There would be no terrestrial impacts associated with the AFB. Lastly, AFB permitting is estimated to take one to three years. While the AFB may potentially reduce impacts from entrainment and impingement, its use is considered experimental and there are no guarantees that any benefits will result or that they will be permanent. Therefore, dry cooling and hybrid cooling Alternative One and then Alternative Two are preferred over once-through cooling, either as proposed or with the addition of the AFB.

4.3 CULTURAL RESOURCES

Introduction

Cultural resources include archaeological resources or resources within the built environment 45 years or older and areas of cultural importance to a community within American society. The Morro Bay area is particularly sensitive for archaeological resources, and there are three recorded significant sites, eligible for the California Register of Historic Resources (CRHR), within the boundaries of the existing plant. The more ground disturbance caused by this project, the more potential there is for discovering archaeolog-

ical resources. Mitigation to reduce adverse impacts below a level of significance is available, but this can potentially result in expensive time-consuming data recovery.

Two of the three archaeological sites within the project area have been registered with the Native American Heritage Commission (NAHC) as Salinan sacred sites. In addition to these sites, Morro Rock has been identified by both the Salinan and Chumash Native American groups as a sacred site and is an historical resource eligible for inclusion in the CRHR. In addition, a concerned Native American has raised questions regarding potential noise impacts to Native American religious experience at Morro Rock. The sacred sites within the project area have not been evaluated for their value as traditional cultural resources in accordance with the CRHR criteria.

Information provided in Sections 2 and 3 of this appendix describing dry cooling and hybrid cooling technologies indicates that either of these options would result in additional ground disturbance and potentially more impacts to cultural resources than the once-through cooling that is currently proposed. Location Two for either the ACC alternative or the hybrid cooling alternative would impact an existing archaeological site. Noise levels at Morro Rock would be substantially reduced from existing levels for either dry cooling or hybrid cooling, assuming the noise mitigated configurations were implemented.

To determine whether the AFB would impact cultural resources, additional information is necessary because surveys have not been conducted for the affected offshore areas. If additional sites were encountered either before or during construction, mitigation measures would need to be implemented.

Cultural Resources Impacts of Dry Cooling

The ground disturbance necessary for the supports for the ACC units will be 1.6 acres for Dry Cooling Alternative One, and 1.8 acres for Dry Cooling Alternative Two. The noise mitigated configuration at either location would cover nearly 2 acres. There are several archaeological sites very near the proposed project, and three sites within the boundaries of the existing plant. It is possible that once the structures and asphalt of portions of the existing plant are removed, additional cultural resources will be discovered. If Dry Cooling Alternative One is selected and archaeological sites are discovered under the existing plant, data recovery would be necessary and may be the only feasible option. This should reduce any impacts to a level that is less than significant.

The proposed site plan for Dry Cooling Alternative Two would locate the ACCs northeast of the proposed project. This would impact an archaeological site that is also a registered Native American sacred site. Use of this location would cause a significant adverse impact to a significant and perhaps extensive archaeological site. Testing and data recovery would be required to mitigate the impact to less than significant levels. Analysis and curation of collected artifacts would be necessary. Some archaeological reports indicate the possibility of deeply buried sub-surface components in this area. Data recovery would be sufficient to mitigate archaeological values of the site; however, the Native American Heritage Commission (NAHC) considers the only acceptable mitigation for a sacred site to be avoidance. If the sacred site were determined eligible to the CRHR based on traditional cultural values, the project impact would be significant

and unmitigable. If it were not, staff would consider the project's impact on the traditional cultural values to be less than significant.

Dry or hybrid cooling would require an additional laydown area. Cultural resource assessments would need to be completed for the new laydown and parking areas, and, if resources were discovered, mitigation would need to be devised. Mitigation could potentially include testing, data recovery, analysis, and curation.

The FSA cultural resources section addresses the concern of noise because a member of the Native American community raised the question of noise from the plant interfering with the quality of religious experience on Morro Rock. Since Morro Rock has been identified as a sacred site by both Salinan and Chumash Native American groups, it is necessary to consider potential impacts to this sacred site. In the FSA, staff found that the proposed plant, using once-through cooling, would be quieter than the existing plant. In the AFC (pp. 6.12-57), the Applicant indicates that the proposed plant will have noise levels that are approximately 18 dBA lower than the existing plant. According to the Noise analysis in this appendix, use of dry cooling in the noise mitigated configuration would substantially decrease the ambient noise levels. Therefore, with noise mitigation measures, there would not be a significant impact to Native American religious experience at Morro Rock.

Cultural Resources Impacts of Hybrid Cooling

In addition to increased ground disturbance caused by the cooling apparatus, hybrid cooling would require construction of a water pipeline from the treatment plant to the MBPP. Since the entire Morro Bay area is sensitive for cultural resources, the potential for impacts to archaeological resources increases with this option. Although the pipeline would be installed in a city street and these areas are already disturbed, the infrastructure in many cities was built before environmental laws were in place. As a result, when there is additional ground disturbance, archaeological deposits may be discovered.

Hybrid Cooling Alternative One would locate the air-cooled condensers (ACCs) and cooling towers to the south of the proposed plant. This location (where there is currently a parking lot) has the potential to impact undiscovered archaeological resources. Use of this location would cause additional ground disturbance and might impact undiscovered archaeological resources that would need to be mitigated. It is likely that the necessary mitigation would involve testing, evaluation, data recovery, analysis, and curation of collected artifacts.

Hybrid Cooling Alternative Two would locate the ACCs and cooling towers to the northeast of the proposed project. As described for Dry Cooling Alternative Two, use of this location would cause a significant adverse impact to a significant archaeological site. Data recovery in the area of the identified site that would be impacted by the condensers would be required to mitigate the significant impact. Analysis and curation of collected artifacts would occur. This is an important and perhaps extensive archaeological site. Some archaeological reports indicate the possibility of deeply buried sub-surface components in this area. There is a potential for mitigation for impacts to this site to be very time-consuming and expensive. This archaeological site is also registered with the NAHC as a Native American sacred site. Unlike the

archaeological site, the sacred site has not been evaluated in accordance with CRHR criteria for its value as a traditional cultural resource. According to the NAHC, the only acceptable mitigation for a sacred site is avoidance. If the sacred site were determined eligible to the CRHR based on traditional cultural values, the project impact would be significant and unmitigable. If it were not, staff would consider the project's impact on the traditional cultural values to be less than significant.

ACCs would also be a part of hybrid cooling, and similar to dry cooling with the noise mitigated configuration, the ambient noise level at Morro Rock would be substantially lower than the current ambient noise levels. Therefore, there would not be a significant noise impact to Native American religious experience at Morro Rock.

Cultural Resources Impacts of Aquatic Filter Barrier

If the AFB were used, the harbor would need to be investigated for its prior uses and associated cultural resources. If pilings or anchors were placed in the harbor floor, geotechnical work would need to be completed to ensure cultural resources are not impacted. If additional land elements (wharves, piers, boat ramps, boardwalks, etc.) are added, areas not previously surveyed for cultural resources may need to be surveyed to determine the location of archaeological sites. If archaeological sites were discovered, it would be necessary to evaluate them and determine mitigation if they are to be impacted by the AFB. The harbor has been dredged several times in recent history, making it unlikely that artifacts close to the surface still remain.

Conclusion for Cultural Resources

From a cultural resources stand point, once-through cooling as originally proposed by the Applicant would have the least impacts. Of the cooling options considered in this report, once-through cooling with the AFB is the option with the least impacts. Dry Cooling Alternative One has the potential to impact undiscovered resources, but it is expected that these impacts could be successfully mitigated to less than significant levels. As identified in the **Noise** section of this appendix, mitigation measures for noise impacts appear to be effective for both dry cooling options and will not result in a significant impact at Morro Rock.

The hybrid cooling alternatives would also have the most potential to disturb previously undiscovered resources due to the required construction of a water pipeline. Implementation of Dry Cooling Alternative Two and Hybrid Cooling Alternative Two would require mitigation for impacts to a significant archaeological resource. They would also cause a significant unmitigable impact to a Native American sacred site, if the sacred site were determined eligible to the CRHR based on traditional cultural values. If it were not, staff would consider the project's impact on the traditional cultural values to be less than significant. Noise levels for hybrid cooling would be slightly lower than dry cooling and both would be quieter than currently ambient conditions. Therefore, there would be no significant impact at this location.

Hybrid Cooling Alternative Two would cause the most impacts to both previously identified and potential resources. Significant impacts similar to those of Dry Cooling Alternative Two and Hybrid Cooling Alternative Two have the potential to occur with the currently proposed cooling method, however avoidance appears feasible as a mitigation measure. However, should the sacred site be deemed eligible to the CRHR based on

traditional cultural values, avoidance may not be feasible for construction of the larger structures associated with alternative cooling systems.

4.4 HAZARDOUS MATERIALS MANAGEMENT, WORKER SAFETY, AND FIRE PROTECTION

Introduction

As possible alternatives to the once-through cooling system proposed for the Morro Bay Power Plant (MBPP), the potential impacts of dry and hybrid cooling technologies are evaluated herein for hazardous materials management, worker safety, and fire protection. There would be no difference in impact in these disciplines among the dry or hybrid cooling alternative locations, or if the noise mitigated configuration were constructed. Therefore, these alternatives are not addressed separately in this analysis.

Hazardous Materials Impacts of Dry Cooling

Dry cooling would not use the large volumes of water used in once-through cooling systems, reducing the volume of chemicals (e.g., sodium hypochlorite) needed to control algae growth within the system (particularly in the condenser tubes). Thus, hazardous materials usage would decrease. However, the larger volume of piping (including seals, flanges, and valves) could result in oxygen entry into the system and therefore would require an increase use in oxygen scavengers to prevent corrosion and scaling. The MBPP project is proposing to use aqueous hydrazine, an acutely toxic hazardous material, as an oxygen scavenger. Staff has recommended the use of a non-toxic alternative, carbohydrazide. If the Applicant were to select this chemical, or if the Energy Commission requires its use, the overall use of hazardous materials with dry cooling would be the same or less than as with both the current and proposed once-through cooling.

Hazardous Materials Impacts of Hybrid Cooling

Both hybrid cooling alternatives would use larger volumes of water than the dry cooling options, but less than once-through cooling. Therefore, the amount of hazardous materials and the risk of accidental release for hybrid cooling would be somewhat less than with once-through or dry cooling.

Hazardous Materials Impacts of the Aquatic Filter Barrier

Construction and placement of an AFB with once-through cooling would not be expected to create any risk of exposure to hazardous materials even if fabrication were conducted on-site.

Worker Safety and Fire Protection

The risk to workers and the impacts on fire protection would not change significantly with any of the cooling technologies. This is mostly due to the generic nature of worker and fire protection required at a power plant licensed by the Energy Commission.

Conclusion for Hazardous Materials Management, Worker Safety, and Fire Protection

Staff does not consider the impacts from the cooling technologies discussed to be significantly different, since rather minor differences in hazardous materials use would

exist with any of the options. Because both the Applicant and staff have proposed mitigation measures or Conditions of Certification in the FSA and such conditions would be applied to any cooling option, the overall risk due to hazardous materials is approximately the same for all proposed cooling methods technologies, and is less than significant. Staff concludes that the impacts to workers and fire protection are also similar with all cooling options.

4.5 LAND USE

Introduction

The evaluation of cooling technologies for the MBPP for the land use technical area is primarily focused on two issues: (1) consistency with applicable land use plans, ordinances, and policies; and, (2) compatibility with existing and planned land uses.

Laws, Ordinances, Regulations, and Standards

The Federal Rivers and Harbor Act and Clean Water Act require regulatory review and approval of any action that proposes to locate a structure, or excavate or discharge dredged or filled material into "Waters of the United States." Under these Acts, the quality of Waters of the United States must be protected from significant degradation and protected from unreasonable alteration or obstruction.

The Gunderboom Aquatic Filter Barrier (AFB) would be located within the harbor, which is considered a navigable water of the United States. The primary jurisdictional authority over navigable waters of the United States is the U.S. Army Corps of Engineers (USACE). Under its jurisdictional authority, the AFB would require a Section 401 Permit (dredging or fill), as well as a Section 10 Permit (navigation). The principal criterion used for approving these permits is the probable impacts of a proposed action in light of its intended use. Benefits and detriments are balanced by considering effects on such issues as conservation, economics, navigation, water quality, and the needs and welfare of the public. In processing the above-referenced permits, the USACE would coordinate with the U.S. Environmental Protection Agency, the Regional Water Quality Control Board, National Marine Fisheries Service, California Coastal Commission, and U.S. Coast Guard.

Applicable State laws, ordinances, regulations, and standards (LORS) for implementation of either a dry cooling or hybrid cooling engineering system, as well as the AFB, would include the California Coastal Act of 1976 (Public Resources Code § 30000 et seq.), the Warren-Alquist Act (Public Resources Code § 25500 et seq.), the Subdivision Map Act (Public Resources Code § 66410 – 66499.58), and State Tide and Submerged Land Leasing (Public Resources Code § 6701 – 6706). Please refer to the Land Use section of the FSA for summaries of these laws, ordinances, regulations, and standards.

Applicable local laws, ordinances, regulations, and standards for implementation of either a dry cooling or hybrid cooling engineering system, as well as the AFB, would include the City of Morro Bay General Plan, City of Morro Bay Coastal Land Use Plan (MBLCP), City of Morro Bay Zoning Ordinance, City of Morro Bay Waterfront Master Plan, and City of Morro Bay Flood Damage Prevention Ordinance (No. 477). Although

it is not currently a legally binding agreement, the City and Duke Energy Draft Agreement to Lease and Agreement Regarding Power Plant Modernization (Draft Agreement to Lease) would also be affected by implementation of either an alternative cooling system or placement and use of the AFB. Please refer to the Land Use section of this FSA for summaries of these laws, ordinances, regulations, and standards.

Land Use Impacts of Dry Cooling

In regard to land use, the impacts of both dry cooling alternatives in comparison to the existing facility would primarily include: (1) increased noise; (2) increased acreage; (3) facility size and bulk; and, (4) abandonment and demolition of the existing seawater intake structure and outfall area. While the noise mitigated configuration would cover about 25% more area (whether at the Alternative One or Alternative Two location), the land use impacts of the noise mitigated configuration would be the same as those explained below.

Dry Cooling Alternative One

Under Dry Cooling Alternative One, the array of air-cooled condensers (ACCs) would be placed on the southeast portion of the 14-acre footprint of the proposed facility (project site). The increased acreage needed for Dry Cooling Alternative One could be accommodated within the existing MBPP property boundaries, and would not encroach into the site's Environmentally Sensitive Habitat Area (ESHA).

Dry Cooling Alternative One introduces a new structure (the ACCs), which would have visual effects on surrounding land uses, particularly from views south of the site where the existing plant is currently less visible. However, visual impacts are mitigable to less than significant levels. Please refer to the Visual Resources section of this appendix for information regarding potential impacts and mitigation.

Noise from the ACCs would create long-term impacts to surrounding land uses that would be greater than the existing facility, but the noise impacts are mitigable to a less than significant level with implementation of the noise mitigated configuration described in Section 3. Please refer to the Noise section in this appendix for detail regarding these impacts.

From the land use perspective, Dry Cooling Alternative One may not be consistent with the MBPP property's existing land use designations and zoning (see discussion on consistency below).

Abandonment and demolition of the seawater intake structure and outfall area may create beneficial impacts to surrounding land uses if these project features were restored and/or re-developed in a manner that is compatible with existing and planned development, as well as with the City's Coastal Land Use Plan and adopted portions of its Waterfront Master Plan.

Dry Cooling Alternative Two

Under Dry Cooling Alternative Two, the array of ACCs would be placed along the north side of the project site. This location also introduces a new main part of the facility as a result of the installation of the array of ACCs. In this case, the ACCs would be set back

further within the property in comparison to the configuration of Dry Cooling Alternative One. The area required for installation of this alternative could be accommodated within the site's existing property boundaries.

Dry Cooling Alternative Two would create visual impacts due to the bulk of the facility associated with the array of ACCs. However, this bulk would be set back further within the property in comparison to the configuration of Dry Cooling Alternative One, and visual impacts are considered to be mitigable to less than significant levels. Please refer to the Visual Resources section of this appendix for potential impacts and mitigation.

Under Dry Cooling Alternative Two as originally designed, the operation of the array of ACCs would exceed the noise standards of the Morro Bay Noise Element at certain sensitive receptors and therefore requires mitigation to achieve compliance with LORS. The long-term increase in noise would result in significant adverse impacts to surrounding land uses that would require additional mitigation (use of low or super low noise fans). This design mitigation is feasible and would reduce noise impacts to less than significant levels. Please refer to the Noise section in this appendix for detail regarding noise impacts and mitigation.

The array of ACCs at this location would also be located closer to the ESHA designated land use area, and may potentially impact it. The noise levels associated with the ACCs may affect biological resources; refer to the Terrestrial Biological Resources section of this appendix for further discussion. The City has several objectives, policies, and programs in its General Plan and Coastal Land Use Plan, as well as development standards in its zoning ordinance that address ESHAs. If construction and operation of Dry Cooling Alternative Two were conducted in a manner that fully adheres to these objectives, policies, programs and zoning ordinances, no significant adverse impacts to land use would occur.

From the land use perspective, Dry Cooling Alternative Two may not be consistent with the MBPP property's existing land use designations and zoning (see discussion on consistency below).

As with Dry Cooling Alternative One, abandonment and demolition of the seawater intake structure and outfall area may create beneficial impacts to surrounding land uses if these project features were restored and/or re-developed in a manner that is compatible with existing and planned development, as well as with the City's Coastal Land Use Plan and adopted portions of its Waterfront Master Plan.

Land Use Impacts of Hybrid Cooling

The physical impacts of the two hybrid cooling alternatives would be essentially the same as those described above for the dry cooling alternatives. They include: (1) noise; (2) increased acreage; (3) facility bulk and visual impact; and, (4) abandonment and demolition of the existing seawater intake structure and outfall area.

The hybrid cooling alternatives would require similar amounts of acreage to accommodate the ACCs and the wet cooling towers. This acreage is available within

the boundaries of the existing site. In Hybrid Cooling Alternative One, the array of cooling equipment would be placed on the southeast portion of the project site, similar to Dry Cooling Alternative One. The acreage for the hybrid cooling system is available within the boundaries of the existing property.

The configuration for Hybrid Cooling Alternative Two would be located immediately adjacent to an ESHA designated land use area, similar to Dry Cooling Alternative Two. Please refer to the Terrestrial Biological Resources section of this appendix for additional information regarding potential impacts and mitigation for this area.

Visual impacts on surrounding land uses for both hybrid cooling alternatives are considered to be greater than for the dry cooling alternatives due to frequent presence of a vapor plume if plume abatement is not implemented; however, plume abatement is considered to be feasible mitigation. Please refer to the Visual Resources section of this appendix for discussion of impacts and mitigation.

Noise impacts to surrounding land uses and sensitive receptors are determined to be potentially significant but feasible mitigation (in the form of the noise mitigated configuration) is available for both Hybrid Cooling Alternative One and Alternative Two. Please refer to the Noise section of this appendix for additional information regarding impacts and mitigation.

Under Hybrid Cooling Alternative Two, the cooling system would be located closer to the ESHA designated land use area. The noise levels associated with the hybrid cooling system may potentially affect biological resources. Refer to the Terrestrial Biological Resources section of this appendix for further discussion.

The hybrid cooling alternatives additionally include construction of a pipeline for cooling water that would connect the facility to the Morro Bay-Cayucos Wastewater Treatment Plant. This pipeline would be constructed within city streets and a portion of the site's ESHA. Construction of the pipeline would increase public and surrounding land use nuisances. However, due to the temporary nature of construction, these impacts are not considered to generate a significant affect to land use. Also, if appropriately designed and mitigated, construction and operation of the pipeline should not significantly affect the site's ESHA. Please refer to the Terrestrial Biological Resources section of this appendix for additional information regarding the ESHA.

From the land use perspective, the Hybrid Cooling Alternatives may not be consistent with the MBPP property's existing land use designations and zoning; see discussion in the following section.

Impacts associated with abandonment, demolition, and ultimately, re-development or restoration of the seawater intake structure and outfall area would be the same as for the dry cooling alternatives, and may result in beneficial impacts.

Consistency with Plans, Ordinances, and Policies

The key land use issue for the alternative cooling options is whether the project would be consistent with the Coastal Development Industrial designation of the City's Local Coastal Plan if the project were modified to not use seawater for power plant cooling.

For projects that fall under the Energy Commission's jurisdiction, the Coastal Act requires the Coastal Commission to provide to the Energy Commission a written report on the suitability of the project. That report must consider "… the conformance of the proposed site and related facilities with certified local coastal programs" (CCA § 30413(d)(5)). As noted in the Land Use section, the Coastal Commission has stated that they will be submitting their consistency/suitability report on the project after the public release of the Final Staff Assessment. Energy Commission staff are working with the Coastal Commission to ensure that the report will include consideration of whether cooling alternatives that will not use seawater would be consistent with the Coastal Act, the MBLCP, and related laws and regulations. Staff has attempted to review the proposed cooling alternatives for the project using applicable policies of the Coastal Act absent the Coastal Commission's report.

The term Coastal Development Industrial appears only in the legend of the City's Land Use Map, and is not defined in the General Plan, Coastal Land Use Plan, or Zoning Ordinance. For the purposes of its land use planning documents, counsel for the City has determined that Coastal-Dependent Industrial and Coastal Development Industrial are synonymous (Sheppard et al., 2001). The City's Coastal Land Use Plan defines the land use of the property as "Coastal-Dependent Industrial." Chapter II, page 23 of the City's Coastal Land Use Plan defines this term as:

"Coastal-Dependent Industrial Land Use: This land use specifically relates to those industrial land uses which are given priority by the Coastal Act of 1976 for location adjacent to the coastline. Examples of uses in this designation are thermal power plants, seawater intake structures, discharge structures, tanker support facilities, and other similar uses which must be located on or adjacent to the sea in order to function. The Morro Bay wastewater treatment facilities are protected in their present location since an important operational element, the outfall line, is coastal-dependent."

The City's Coastal-Dependent Industrial definition from the MBLCP limits land uses under the Coastal-Dependent Industrial designation to those industrial land uses which are given priority by the Coastal Act.

The definition of Coastal Dependent use in California Coastal Act section 30101 suggests that the project without the use of seawater would not be a coastal dependent use. Coastal Act section 30101 defines a "Coastal-dependent development or use …" as "… any development or use which requires a site on, or adjacent to, the sea to be able to function at all." It should be noted that the proposed project using a closed-cooling alternative system would still be coastal dependent to the extent that it relies on seawater to meet it cooling needs.

The California Coastal Act includes several provisions that relate to coastal dependent development and particularly to the location or expansion of power plants in the coastal zone. CCA § 30260 encourages the expansion and reasonable long-term growth of coastal dependent industry at existing sites. Section 30260 states the following:

"Coastal-dependent industrial facilities shall be encouraged to locate or expand within existing sites and shall be permitted reasonable long-term growth where consistent with this division. However, where new or expanded coastal-dependent industrial facilities

cannot feasibly be accommodated consistent with other policies of this division, they may nonetheless be permitted in accordance with this Section and Sections 30261 and 30262 if (1) alternative locations are infeasible or more environmentally damaging; (2) to do otherwise would adversely affect the public welfare; and (3) adverse environmental effects are mitigated to the maximum extent feasible." (CCA § 30261 pertains to oil tanker facilities; use and design and CCA § 30262 pertains to oil and gas development).

As is discussed in the main body of this section of the FSA, the significant use of seawater may result in adverse impacts and may, for that reason, be inconsistent with the Coastal Act's requirements for the protection of coastal resources. The alternative cooling systems being considered in this Appendix were evaluated as possible mitigation for those adverse impacts to coastal resources. CCA § 30260 gives priority to expansion of existing coastal dependent industries. A reasonable reading of the Coastal Act and the MBLCP that harmonizes these different sections suggests that the requirement for coastal-dependent industry should not prevent mitigation of adverse impacts from an expansion of an existing coastal-dependent power plant.

Staff recognizes that the Coastal Commission has the responsibility for interpreting these provisions in its report to the Energy Commission under CCA § 30413(d). If the Coastal Commission determines that the project using an alternative cooling system in place of seawater cooling is not coastal-dependent industry, use of dry-cooling or hybrid-cooling would be inconsistent with the site's land use designation under the MBLCP. This inconsistency would be a significant land use effect unless the City amended its General Plan, Coastal Land Use Plan, and Zoning Ordinance.

The Energy Commission's decision must include provisions specified by the Coastal Commission in its report unless it "… finds that the adoption of the provisions specified in the report would result in greater adverse effect on the environment or that the provisions proposed in the report would not be feasible" (Warren-Alquist Act, Section 25523(b)).

If the existing once-through cooling were replaced by a closed cooling system (e.g., dry-cooling) the existing Outfall Agreement between the City and the Applicant would not be necessary. As a result, Public Resources Code § 6701 – 6706 (State Tide and Submerged Lands Leasing) would no longer apply to the project.

Abandonment and redevelopment of the facility's existing seawater intake structure would be subject to consistency with the California Coastal Act (the intake structure is outside of the City's local coastal plan boundary) and the design and architectural standards of the adopted Chapter 5 of the City's Waterfront Master Plan. Should the project be modified to use an alternative closed-cooling system, Energy Commission staff expect that the Coastal Commission would report on these aspects of the modified project under CCA § 30413(d). Abandonment of the outfall area would also require consistency with applicable regulations of the Federal Harbors and Rivers Act and Clean Water Act. However, no inconsistencies with these regulations are anticipated. Other applicable laws, ordinances, regulations and standards associated with the dry- and hybrid- cooling alternatives would be essentially the same as for the proposed project (see the Land Use section of the FSA). Implementation of the applicable

Conditions of Certification found in the Land Use section of the FSA would ensure consistency with these requirements.

The additional cooling towers necessary for the closed-cooling system alternatives would lengthen project construction, as well as increase the nuisances and inconveniences associated with them (i.e., new pipeline construction, etc.). However, given the breadth of the project's overall construction schedule (23 months), the additional construction time needed for the towers is not considered to raise new issues not already evaluated in the FSA.

Land Use Impacts of the Aquatic Filter Barrier

Construction and operation of the Aquatic Filter Barrier (AFB) would affect recreational activities within and adjacent to Morro Bay Harbor. Recreational boating, fishing, diving, and related activities within the AFB area would be restricted on a long-term basis, and could result in significant impacts. Additionally, offshore access to the far north end of the main channel of the harbor and its shoreline would be limited, which may conflict with the California Coastal Commission's interpretation of the Coastal Act's requirements for public coastal access. This hindrance to access may result in significant impacts requiring mitigation, such as the identification and dedication of additional public easements for coastal access. Staff cannot conclude whether or not such mitigation would reduce potential land use impacts to a less than significant level without more detailed design plans.

Construction and operation of the AFB would also have a direct impact on routine harbor activities and boat/vessel movement, as well as with such activities as the periodic dredging of the harbor by the USACE, and some types of maritime emergency response activities conducted by the U.S. Coast Guard. These impacts could be significant if not appropriately factored into the AFB's design. In addition, it has been noted by the U.S. Coast Guard that construction and maintenance of the AFB may result in accidental spills of hazardous materials such as oil or hydraulics fluids, and that contingency plans must be in place to respond to such potential incidents (U.S. Coast Guard, 2001). Development and appropriate implementation, as necessary, of an Emergency Response Plan and/or Hazardous Materials Spill Contingency Plan may resolve this issue.

While construction of either one or two sets of pilings may have a significant visual impact on surrounding land uses (as described in the Visual Resources section of this appendix), the design standards and aesthetic goals and objectives of the City's Coastal Land Use Plan and adopted portions of the Waterfront Master Plan may still be able to be met, avoiding land use policy conflicts impacts. If the pilings were designed such to allow vessels to dock, a beneficial impact could occur. Public use of the pilings would be contingent upon either: (1) the Applicant's willingness to allow public use; or, (2) requiring public use as a condition of certification. Either voluntary or conditioned public use of the pilings would require consideration of property damage and liability, as well as public safety. Consequently, although staff does not anticipate a conflict with local land use and coastal policy if such design criteria can be met, a significant, physical impact to land use recreation, harbor operation and coastal access would still be anticipated to occur.

In addition, it is noted that the AFB would require a lease agreement with the City under the City's authority to permit uses within State tide and submerged lands.

Conclusion for Land Use

The proposed closed-cooling system alternatives may affect whether the project is consistent with the City's Coastal Dependent Industrial designation of the project site. Energy Commission staff believe that adoption of a closed-cooling system alternative as mitigation for adverse impacts to coastal resources should not prevent approval of an otherwise allowable expansion of an existing coastal-dependent power plant. The Coastal Commission will have the responsibility for interpreting relevant provisions of the Coastal Act and the MBLCP in its report to the Energy Commission under section 30413(d) of the Coastal Act. If the Coastal Commission determines that the project using an alternative closed-cooling system in place of seawater cooling is not coastal-dependent industry, use of dry-cooling or hybrid-cooling would be inconsistent with the site's land use designation under the MBLCP.

The Energy Commission's decision must include provisions specified by the Coastal Commission in its report unless it "… finds that the adoption of the provisions specified in the report would result in greater adverse effect on the environment or that the provisions proposed in the report would not be feasible" (Warren-Alquist Act, Section 25523(b)).

Implementation of the AFB may affect harbor activities. These impacts include physical limitations on water-related recreational activities, limitations on the harbor's routine working operations, potential conflicts/limitations on the harbor's special operations (e.g., emergency Coast Guard response and dredging). Staff cannot conclude whether these impacts may be significant after mitigation without the submittal(s) and review(s) of more detailed design, construction and operational plans.

4.6 NOISE

Introduction

The use of either dry or hybrid cooling systems would introduce additional noise sources to the overall plant design, consisting of fans, motors, gearboxes, and, in the hybrid system, cascading water. The most significant noise sources are the fans, which are located relatively high on the system structures. The wet cooling tower fans (part of the hybrid cooling system) may be placed lower than the dry cooling system fans. Motors and gearboxes are typically located near ground level, and may be shielded by other components of the system. The sides of the wet cooling tower structure may significantly shield noise from cascading water.

The array of structures for both types of systems may provide shielding of some units for receptors, depending on the receptor position. That is, one of the cooling towers or radiator units may block line of sight to some or all of the others, which would reduce the noise received from the shielded units. For receptors parallel to the array, each unit would contribute noise to the total noise exposure, with little or no shielding.

Any type of combined cycle power plant will introduce the possibility of high start-up noise levels due to the need to bypass HRSG-produced high-pressure steam to the condenser until it is of adequate quantity and quality to send to the steam turbine. For dry cooling systems, the high-pressure start-up steam would be ducted into the manifolds leading to the air-cooled condensers. Silencers or other acoustical treatment may be required in the steam lines to ensure that noise due to the steam bypass during start-up does not exceed acceptable levels.

The noise analysis of the dry and hybrid cooling systems was prepared as follows:

- A conceptual design for both hybrid and dry cooling was defined in Section 3 of the Draft Cooling Options Report (January 2002). That design is presented in the Noise section as the "Base Case" (or Option 1).
- The preliminary noise analysis found that the "Base Case" would result in significant noise impacts at some sensitive receptors, so two other fan configurations were developed and are described in the Draft Report (Options 2 and 3). These configurations were found to reduce noise to less than significant levels, but were not evaluated in other technical areas in the Draft Report.
- In this Final Cooling Options Report, the noise mitigated designs of the dry and hybrid cooling systems were further optimized. Those designs, presented in Section 3 as the "Noise Mitigated Configuration," are also analyzed in this section and in the other technical areas in the remainder of Sections 4 and 5.

Noise level data used for this analysis were obtained from GEA Power Cooling Systems, Inc. (GEA), a supplier of cooling equipment for power plants and similar industrial installations. The actual noise emissions of a given cooling system installation may vary from these values, depending upon final system configuration, but the values presented here are expected to be reasonably representative of typical installations.

Noise Impacts of Dry Cooling

Dry Cooling Alternative One

In Dry Cooling Alternative One the array of air-cooled condensers would be placed on the southeast portion of the project site, immediately south of the proposed location of the combined cycle units. Forty fan units are proposed as Option 1 (the "base case" in this analysis). Two noise-reducing options were provided by GEA, which are identified as Options 2 and 3 below. The reference noise levels and operational assumptions are presented in **COOLING OPTIONS Table 9**.

COOLING OPTIONS Table 9
Cooling Fan Installation Operational Assumptions
Dry Cooling Alternatives

Option	No. of Fans	Motor Ratings	Sound Level, dBA at 400 feet	Layout	Relative Cost
1 (Base Case)	20X2	200 HP	66	165'x206'X2	--
2	25X2	150 HP	60	192'x192'X2	+10%
3	30X2	100 HP	52	224'x188'X2	+30%

Given the assumptions listed above, the noise levels due to the fan installations at the nearest receptors were predicted based upon hemispherical spreading. The predicted noise levels at the nearest affected receptors are given in **COOLING OPTIONS Table 10.**

COOLING OPTIONS Table 10
Predicted Cooling Fan Noise Levels
Dry Cooling Alternative One

Receptor	Distance, feet	Sound Level, dBA			
		Option 1 (Base Case)	Option 2	Option 3	Ambient
Residences to southeast	1,800	56	47	39	43
Morro Rock	3,000	48	42	34	48

The predicted values indicate that, in the base case (Option 1), the fan noise levels would exceed the noise standards of the Morro Bay Noise Element at the nearest residences. The fan noise levels at the nearest residences would also exceed the 5 dBA L_{90} increase that staff uses as a threshold for determining whether additional analysis is required to assess whether project noise results in a significant noise impact. At Morro Rock, the predicted fan noise levels in Option 1 would be equal to the ambient noise level, which would result in a cumulative noise level 3 dBA higher than the ambient noise level. This would not be considered a significant increase in noise levels, though the fans would constitute a new and noticeable noise source.

In order to reduce noise to acceptable levels, a new noise mitigated configuration was developed and is analyzed below. Although Options 2 and 3 provided some reductions in noise levels, staff determined that they required design refinements. Therefore, as defined in Section 3 of this report, a final noise mitigated configuration was developed; this configuration is considered below.

Dry Cooling Alternative One – Noise Mitigated Configuration

In this configuration, the array of air-cooled condensers would be placed immediately south of the proposed location of the combined cycle units.

The reference noise levels and operational assumptions for the noise mitigated dry cooling system alternative are presented in **COOLING OPTIONS Table 11**.

COOLING OPTIONS Table 11
Cooling Fan Installation Operational Assumptions
Noise Mitigated Dry Cooling Alternative

System	No. of Fans	Motor Ratings	Sound Level, dBA at 400 feet	Fan Diameter
Dry cooling (ACC)	25 X 2	125 HP	43.5	32 feet

Given the assumptions listed above, the noise levels due to the fan installations were predicted at the nearest five receptors described in the AFC and the FSA. The calculations accounted for hemispherical spreading, shielding by the combined cycle units and the proposed noise barrier as appropriate, and for ambient and predicted project operational noise levels.

The predicted noise levels at the nearest affected receptors are given in **COOLING OPTIONS Table 12**.

COOLING OPTIONS Table 12
Predicted Cooling Fan Noise Levels
Dry Cooling Alternative One – Noise Mitigated Configuration

Condition	Sound Levels at Receivers, dBA				
	R1 (Scott Avenue)	R4 (Radcliff & Berwick)	R5 (RV Park)	R10 (Embarcadero)	R11 (Coleman Park)
Cooling sources[a]	30	26	24	37	37
Ambient	41	42	40	63	54
Proposed project	41	37	43	44	46
Project cumulative[b]	44	43	45	44[d]	46[d]
Cooling cumulative[c]	44	43	45	45[d]	47[d]
LORS standard	45	45	45	--	--
Change from proposed project	0	0	0	+1	+1
Change from current ambient conditions	+3	+1	+5	-18	-8

[a]Noise level from cooling equipment.
[b]Proposed project noise plus ambient noise level.
[c]Proposed project noise plus ambient noise plus cooling system noise
[d]Assumes ambient noise level without existing power plant.

The predicted values indicate that, in Alternative One - Noise Mitigated Configuration, the cumulative noise levels would not exceed the noise standards of the Morro Bay Noise Element at the nearest residences, nor would the changes in cumulative noise levels at the nearest residences exceed the 5 dBA L_{90} increase that staff uses as a threshold for determining whether additional analysis is required to assess whether project noise results in a significant noise impact. Therefore, there would be no significant increase in noise levels.

Dry Cooling Alternative Two

In Dry Cooling Alternative Two, the array of air-cooled condensers would be placed on the north side of the project site. As in Dry Cooling Alternative One, 40 fan units are

proposed. Noise levels assumed for this alternative are the same as given by **COOLING OPTIONS Table 9**.

Given the assumptions listed above, the noise levels due to the fan installations at the nearest receptors were predicted, based upon hemispherical spreading. The predicted noise levels at the nearest affected receptors are given by **COOLING OPTIONS Table 13**.

COOLING OPTIONS Table 13
Predicted Cooling Fan Noise Levels
Dry Cooling Alternative Two

Receptor	Distance, feet	Sound Level, dBA			
		Option 1 (Base Case)	Option 2	Option 3	Ambient
Residences to southeast	2,100	52	46	38	43
Baseball fields	200	72	66	58	45
High school	800	60	54	46	45
Houses east of Highway 1	800	60	54	46	43
Morro Rock	3,300	48	42	34	48

The predicted values indicate that, in the base case (Option 1), the fan noise levels would exceed the noise standards of the Morro Bay Noise Element at the nearest residences. The fan noise levels at the nearest residences would also exceed the 5 dBA L_{90} increase that staff uses as a threshold for determining whether additional analysis is required to assess whether project noise results in a significant noise impact.

At the baseball fields, the predicted fan noise levels in Option 1 would exceed the noise standards of the Morro Bay Noise Element. At the high school, the predicted fan noise levels in Option 1 would be generally consistent with the Morro Bay Noise Element, assuming that the noise levels inside the classrooms would be no more than 45 dBA during school hours. In both of these cases, the fan noise levels would exceed the 5 dBA L_{90} increase that staff uses as a threshold for determining whether additional analysis is required to assess whether project noise results in a significant noise impact.

At Morro Rock, the predicted fan noise levels in Option 1 would be equal to the ambient noise level, which would result in a cumulative noise level 3 dBA higher than the ambient noise level. This would not be considered a significant increase in noise levels, though the fans would constitute a new and noticeable noise source. In order to ensure compliance with LORS and to optimize design criteria, a noise mitigated configuration was developed. Analysis of that configuration follows.

Dry Cooling Alternative Two – Noise Mitigated Configuration

In this design, the array of air-cooled condensers would be placed immediately northeast of the combined cycle units. The reference noise levels and operational assumptions for all of the fan cooling system alternatives were presented in **COOLING OPTIONS Table 11**.

Given the assumptions listed above, the noise levels due to the fan installations at the nearest receptors were predicted at the nearest six receptors described in the AFC and the PSA, and at the adjacent ball field area. The calculations accounted for hemispherical spreading, shielding by the combined cycle units and the proposed noise barrier as appropriate, and for ambient and predicted project operational noise levels. The predicted noise levels at the nearest affected receptors are given in **COOLING OPTIONS Table 14**.

COOLING OPTIONS Table 14
Predicted Cooling Fan Noise Levels
Dry Cooling Alternative Two – Noise Mitigated Configuration

	Sound Levels at Receivers, dBA						
Condition	**R1 (Scott Avenue)**	**R4 (Radcliff & Berwick)**	**R5 (RV Park)**	**R10 (Embarcadero)**	**R11 (Coleman Park)**	**Ball Field**	**R2 (High School)**
Cooling sources[a]	28	29	34	20	20	46	37
Ambient	41	42	40	63	54	42	42
Proposed project	41	37	43	44	46	40	36
Project cumulative[b]	44	43	45	44[d]	46[d]	44	43
Cooling cumulative[c]	44	43	45	44[d]	46[d]	48	44
LORS standard	45	45	45	--	--	60[e]	60[e]
Change from proposed project	0	0	0	0	0	+4	+1
Change from current: ambient conditions	+3	+1	+5	-19	-8	+6	+2

[a]Noise level from cooling equipment.
[b]Proposed project noise plus ambient noise level.
[c]Proposed project noise plus ambient noise plus cooling system noise.
[d]Assumes ambient noise level without existing power plant.
[e]Threshold of speech interference.

The predicted cumulative fan noise levels would not cause a significant noise LORS impact at the ball fields or the high school, as the resulting outdoor noise levels would be below the threshold of speech interference. Although the change in noise levels at the ball fields would exceed the 5 dBA threshold for potential noise impacts, the resulting noise level would have no adverse effects, and would be insignificant.

The predicted values indicate that, in Alternative Two - Noise Mitigated Configuration, the cumulative noise levels would not exceed the noise standards of the Morro Bay Noise Element at the nearest residences, nor would the changes in cumulative noise levels at the nearest residences exceed the 5 dBA L_{90} increase that staff uses as a threshold for determining whether additional analysis is required to assess whether

project noise results in a significant noise impact. Therefore, there would be no significant increase in noise levels.

Conclusion for Dry Cooling

The predicted noise levels associated with both noise mitigated dry cooling alternatives are less than significant in terms of both LORS compliance and the threshold that staff uses to determine whether additional assessment of changes in ambient noise levels is required.

Noise Impacts of Hybrid Cooling

Hybrid Cooling Alternative One

In Hybrid Cooling Alternative One, the array of cooling equipment for the hybrid cooling system would also be placed on the southeast portion of the project site. Twenty-four (24) fan units are proposed, along with four (4) wet cooling towers in the "Base Case". Staff developed working assumptions for this alternative using the data provided by GEA, adjusting for the use of 24 fans. Similarly, staff estimated the effects of noise-reducing options to be the same as expected for the dry cooling alternatives. The reference noise levels and operational assumptions are presented in **COOLING OPTIONS Table 14**.

COOLING OPTIONS Table 14
Cooling Fan Installation Operational Assumptions
Hybrid Cooling System

Option	No. of Fans	Motor Ratings	Sound Level, dBA at 400 feet	Layout	Relative Cost
1 (Base Case)	24	200 HP	64	N/A	--
2	30	150 HP	58	N/A	+10%
3	36	100 HP	50	N/A	+30%

Given the assumptions listed above, the noise levels due to the fan installations at the nearest receptors were predicted, based upon hemispherical spreading. The predicted noise levels at the nearest affected receptors are given by **COOLING OPTIONS Table 15**.

COOLING OPTIONS Table 15
Predicted Cooling Fan Noise Levels
Hybrid Cooling Alternative One

Receptor	Distance, feet	Sound Level, dBA			
		Option 1 (Base Case)	Option 2	Option 3	Ambient
Residences to southeast	1,700	54	45	37	43
Morro Rock	3,000	46	40	32	48

The predicted values indicate that, in the base case (Option 1), the fan noise levels would exceed the noise standards of the Morro Bay Noise Element at the nearest

residences. The fan noise levels at the nearest residences would also exceed the 5 dBA L_{90} increase that staff uses as a threshold for determining whether additional analysis is required to assess whether project noise results in a significant noise impact. At Morro Rock, the predicted fan noise levels in Option 1 would be lower than the ambient noise level, and would result in a cumulative noise level 2 dBA higher than the ambient noise level. This would not be considered a significant increase in noise levels, though the fans would constitute a new and noticeable noise source.

Because noise mitigation would be required for compliance for LORS and CEQA, and because Options 2 and 3 above required design modifications, a fourth design was developed. This noise mitigated configuration is analyzed below.

Hybrid Cooling Alternative One – Noise Mitigated Configuration

Given the assumptions listed above, the noise levels due to the cooling equipment at the nearest receptors were predicted at the nearest five receptors described in the AFC and the FSA. The calculations accounted for hemispherical spreading from three sets of fans, for shielding by the combined cycle units and the proposed noise barrier as appropriate, and for ambient and predicted project operational noise levels. The system configuration is described by **COOLING OPTIONS Table 16**. The predicted noise levels at the nearest affected receptors are given in **COOLING OPTIONS Table 17**.

COOLING OPTIONS Table 16
Cooling Fan Installation Operational Assumptions
Noise Mitigated Hybrid Cooling Alternative

System	No. of Fans	Motor Ratings	Sound Level, dBA at 400 feet	Fan Diameter
Hybrid cooling (ACC only)	12 X 2	200 HP	44.4	34 feet
Hybrid cooling (wet towers only)	2 X 2	200 HP	44.4*	32 feet
*Worst-case assumption based on motor rating				

COOLING OPTIONS Table 17
Predicted Cooling Fan Noise Levels
Hybrid Cooling Alternative One – Noise Mitigated Configuration

Condition	Sound Levels at Receivers, dBA				
	R1 (Scott Avenue)	**R4 (Radcliff & Berwick)**	**R5 (RV Park)**	**R10 (Embarcadero)**	**R11 (Coleman Park)**
Cooling source[a]	34	31	30	41	42
Ambient	41	42	40	63	54
Proposed project	41	37	43	44	46
Project cumulative[b]	44	43	45	44[d]	46[d]
Cooling cumulative[c]	45	43	45	46[d]	48[d]
LORS standard	45	45	45	--	--
Change re: project	0	0	0	+2	+2
Change re: ambient	+4	+1	+5	-17	-6

[a]Noise level from cooling equipment.
[b]Proposed project noise plus ambient noise level.
[c]Proposed project noise plus ambient noise plus cooling system noise
[d]Assumes ambient noise level without existing power plant.

The predicted values indicate that the cumulative noise levels would not exceed the noise standards of the Morro Bay Noise Element at the nearest residences, and that the changes in cumulative noise levels at the nearest residences would not exceed the 5 dBA L_{90} increase that staff uses as a threshold for determining whether additional analysis is required to assess whether project noise results in a significant noise impact.

The above values do not account for noise produced by cooling water pumps, which the Applicant reports to be substantial. Based upon the Applicant's data, the noise levels due to the pumps could increase the noise levels at Receptors 1, 4, 5, 10 and 11 above by 4 to 8 dBA, depending upon the relative locations of the pumps and the receptors. The resulting noise levels could be significant at Receptors 1, 4 and 5.

After accounting for unmitigated cooling water pump noise, noise levels due to the cooling system would probably exceed LORS at the nearest residences. Noise mitigation for pumps is feasible, and would be required for the pumps to achieve compliance with the LORS, and to ensure that no substantial increase in ambient noise levels would occur. Pump noise can be reduced by using pump enclosures or lagging.[2]

[2] "Lagging" means wrapping the noise source with a layer of thin metal over a layer of fiberglass insulation, or applying a layer of damping material, such as lead or loaded vinyl, which reduces the vibration emanating from the equipment housing. Lagging significantly reduces the noise emissions through the equipment casing or housing, and may be used in place of an enclosure for small pieces of equipment. Because effective lagging may interfere within access for maintenance, enclosures are sometimes preferred.

Hybrid Cooling Alternative Two

In Hybrid Cooling Alternative Two, as originally conceived, the array of air-cooled condensers and cooling towers would be placed on the north side of the project site. As in Hybrid Cooling Alternative One, twenty-four fan units are proposed, along with four (4) wet cooling towers. The noise levels assumed for this alternative are the same as given by **COOLING OPTIONS Table 14**.

Given the assumptions listed above, the noise levels due to the fan installations at the nearest receptors were predicted, based upon hemispherical spreading. The predicted noise levels at the nearest affected receptors are given by **COOLING OPTIONS Table 18**.

COOLING OPTIONS Table 18
Predicted Cooling Fan Noise Levels
Hybrid Cooling Alternative Two

Receptor	Distance, feet	Sound Level, dBA			
		Option 1	Option 2	Option 3	Ambient
Residences to southeast	2,000	50	44	36	43
Baseball Fields	200	70	64	56	45
High School	800	58	52	44	45
Houses east of Highway 1	800	58	52	44	43
Morro Rock	3,300	46	40	32	48

The predicted values indicate that, in the base case (Option 1), the fan noise levels would exceed the noise standards of the Morro Bay Noise Element at the nearest residences. The fan noise levels at the nearest residences would also exceed the 5 dBA L_{90} increase that staff uses as a threshold for determining whether additional analysis is required to assess whether project noise results in a significant noise impact.

At the baseball fields, the predicted fan noise levels in Option 1 would interfere with normal speech communication, which would adversely affect the users of the ball fields. At the high school, the predicted fan noise levels in Option 1 would be generally consistent with the Morro Bay Noise Element, assuming that the noise levels inside the classrooms would be no more than 45 dBA during school hours. In both of these cases, the fan noise levels (using conventional fans) would exceed the 5 dBA L_{90} increase that staff uses as a threshold for determining whether additional analysis is required to assess whether project noise results in a significant noise impact.

At Morro Rock, the predicted fan noise levels in Option 1 would be below the ambient noise level, which would result in a cumulative noise level 2 dBA higher than the ambient noise level. This would not be considered a significant increase in noise levels, though the fans would constitute a new and noticeable noise source.

Because noise mitigation would be required for compliance for LORS and CEQA, a noise mitigated configuration was developed and is analyzed below.

Hybrid Cooling Alternative Two – Noise Mitigated Configuration

Given the assumptions listed above, the noise levels due to the cooling equipment at the nearest receptors were predicted at the nearest six receptors described in the AFC and the FSA, and at the adjacent ball field area. The calculations accounted for hemispherical spreading from three sets of fans, for shielding by the combined cycle units and the proposed noise barrier as appropriate, and for ambient and predicted project operational noise levels. The predicted noise levels at the nearest affected receptors are given in **COOLING OPTIONS Table 19**.

COOLING OPTIONS Table 19
Predicted Cooling Fan Noise Levels
Hybrid Cooling Alternative Two

Condition	Sound Levels at Receivers, dBA						
	R1 (Scott Avenue)	**R4 (Radcliff & Berwick)**	**R5 (RV Park)**	**R10 (Embarcadero)**	**R11 (Coleman Park)**	**Ball Field**	**R2 (High School)**
Cooling sources[a]	34	35	37	34	29	49	40
Ambient	41	42	40	63	54	42	42
Project	41	37	43	44	46	40	36
Project cumulative[b]	44	43	45	44[d]	46[d]	44	43
Cooling cumulative[c]	44	44	45	44[d]	46[d]	50	45
LORS standard	45	45	45	--	--	60[e]	60[e]
Change re: Project	0	+1	+1	0	0	+6	+2
Change re: Ambient	+3	+2	+5	-19	-8	+8	+3

[a]Noise level from cooling equipment.
[b]Proposed project noise plus ambient noise level.
[c]Proposed project noise plus ambient noise plus cooling system noise
[d]Assumes ambient noise level without existing power plant.
[e]Threshold of speech interference.

The predicted values indicate that, in the noise mitigated configuration of Alternative Two, the cumulative noise levels would not exceed the noise standards of the Morro Bay Noise Element at the nearest residences, nor would the changes in cumulative noise levels at the nearest residences exceed the 5 dBA L_{90} increase that staff uses as a threshold for determining whether additional analysis is required to assess whether project noise results in a significant noise impact. Therefore, there would be no significant increase in noise levels.

The predicted cumulative fan noise levels would not cause a significant noise LORS impact at the ball fields or the high school, as the resulting outdoor noise levels would be below the threshold of speech interference. Although the change in noise levels at the ball fields would exceed the 5 dBA threshold for potential noise impacts, the resulting noise level would have no adverse effects, and would be insignificant.

The above values do not account for noise produced by cooling water pumps, which the Applicant reports to be substantial. Based upon the Applicant's data, the noise levels due to the pumps could increase the noise levels at Receptors 1, 4, 10 and 11 above by 4 to 8 dBA, depending upon the relative locations of the pumps and the receptors. The resulting noise levels could be significant at Receptors 1 and 4.

After accounting for unmitigated cooling water pump noise, noise levels due to the cooling system would probably exceed LORS at the nearest residences. As discussed in Hybrid Cooling Alternative One, feasible mitigation for pump noise is available, and would be required for the pumps to achieve compliance with the LORS, and to ensure that no substantial increase in ambient noise levels would occur.

Conclusion for Hybrid Cooling

The predicted noise levels associated with both hybrid cooling alternatives are potentially significant in terms of LORS compliance and the threshold that staff uses to determine whether additional assessment of changes in ambient noise levels is required. For both alternatives, use of the noise mitigated configuration and other feasible mitigation measures (enclosing or lagging the cooling water pumps) are expected to reduce the identified noise impacts to a level that is insignificant.

Noise Impacts of the AFB

It appears that the AFB would involve no significant noise sources that were not addressed in the AFC. That is, any pumps and construction measures required for its operation would probably be the same as, or similar to, those required at the power plant site for once-through cooling. These noise sources were included in the AFC noise level predictions, and any necessary mitigation measures were addressed by the original acoustical design of the project.

Construction Noise

Of the three cooling options, the AFB would have the fewest potential construction noise impacts, as the construction would occur farther away from the most sensitive receptors. The most significant variable introduced by installation of fans and/or cooling towers would be the potential increase in the amount of time required for construction, or potential changes in the hours during which construction would occur. The allowable noise levels for construction activities would not be different for any of the alternatives.

Conclusion for Noise

Of the three cooling options, the AFB would have the fewest potential noise impacts, as the only significant noise sources would be pumps and motors, which are relatively quiet as compared to the remainder of the equipment comprising the power plant. The noise impacts of the AFB are expected to be the same as for once-through cooling.

The dry cooling option would produce the lowest unmitigated noise levels. No mitigation measures beyond the noise mitigated configuration would be required for the dry cooling option.

The hybrid cooling option would also require the noise mitigated configuration, and would produce higher noise levels than the dry cooling system, due to the use of cooling water pumps. The noise produced by the pumps could exceed the LORS and the noise

increase threshold at the nearest residences. Noise mitigation for the pumps appears to be feasible.

4.7 PUBLIC HEALTH

Introduction

This section evaluates the health risks from operating the proposed project using three different cooling technologies: dry cooling, hybrid cooling, and once-through cooling with an aquatic filter barrier (AFB). It then compares such risks with the baseline risk from the existing Units 1 through 4 currently operated using once-through cooling. The potential impacts that are addressed in this section are the cancer and non-cancer impacts from exposure to the project's non-criteria, pollutants (or air toxics) for which there are no specific air quality standards. Such pollutants may originate from a project's combustion turbines, cooling structures, or equipment to be used for construction. The methods for assessing the cancer and non-cancer health impacts of such pollutants are presented in the **Public Health** section of this FSA. Since staff considers the risk of cancer as the most sensitive measure of the potential for health hazards from specific sources of environmental pollutants, the relative impacts of these cooling technologies are assessed in terms of their respective cancer risk levels. The potential impacts of the companion criteria pollutants (for which there are specific air quality standards) are addressed in the **Air Quality** section in terms of compliance with the applicable standards.

The toxic pollutants of concern in this analysis would result from both construction and operation. Construction emissions include diesel exhaust and dust-related PM10 on which there are adsorbed air toxics. Pollutants from operations include combustion by-products and air toxics from cooling tower drift.

Since the present once-through cooling system is operated as a closed system, it does not allow for human exposure to the potentially toxic additives usually added to the cooling water to prevent biofouling and system corrosion. Therefore, the once-through cooling technology does not significantly contribute to the risk from present facility operations. The risk is related instead to emissions from the existing boilers, the diesel fire pump engines, and diesel emergency generator that will continue to be used for the proposed project. The existing project risk estimate is 1.4 in a million as noted on page 6.2-68 of the AFC. Staff does not consider this risk level as suggesting a significant cancer risk.

Public Health Impacts of Dry Cooling

As noted in the **Air Quality** section, the additional construction activities from erecting a dry cooling structure would increase the dust-related PM10 emissions. PM10 impacts are of concern in this public health analysis because health effects can result from the interaction of the toxic pollutants that might be adsorbed to the PM10. Such adsorption would be associated with specific soil contamination that must be remediated before beginning construction.

Dry Cooling Alternative One would be located just south of the existing tank farm. Therefore, pre-construction soil sampling surveys should be conducted at this location, as well as the areas beneath the structures to be demolished as part of the proposed project. The Conditions of Certification in the **Waste Management** section of the FSA

for the proposed construction activities would be adequate to ensure the appropriate pre-construction mitigation. These conditions specifically require preparation and implementation of a site mitigation plan that would ensure removal of all soil contaminants before starting construction. These same conditions would also be applied to the noise mitigated configuration to ensure that impacts would be less than significant.

The toxic health risks from diesel equipment emissions would be minimized through implementation of the Conditions of Certification in the **Air Quality** section, which would also apply to construction of any cooling structures that might be used for the project.

The last dry cooling-related toxic impacts of potential significance would be the emission increases from increased generation that might be considered necessary to counteract the loss in generation efficiency. Since such loss can easily be replaced at other generating facilities (as noted in the **Air Quality** section), staff does not consider the potential loss in efficiency as a significant factor in the assessment of dry cooling-related health risks. Therefore, dry cooling with any of the design options addressed in this report would be incapable of meaningfully increasing the 1.5 in a million cancer risk specified in the FSA for the proposed project. Staff regards the suggested cancer risk as less than significant.

Public Health Impacts of Hybrid Cooling

Construction of a hybrid cooling system would generate similar diesel and dust emissions associated with construction of a dry cooling system. As with dry cooling, implementation of staff-proposed mitigation requirements would be adequate to reduce the cancer and non-cancer risks of concern. The Conditions of Certification are specified in the **Air Quality** and **Waste Management** sections of the FSA.

The other hybrid cooling-related impacts of potential concern would result from exposure to any toxic water constituents that would be emitted in the wet cooling phase. Such constituent emissions do not occur with once-through cooling. Health impacts from such emissions would mainly depend on the quality of the utilized water. For any such application, using water that has been purified to ensure that its toxic constituents remain below applicable drinking water standards would prevent the health impacts of concern. Staff typically finds the risk from conventional cooling towers to be at less than significant levels. If reclaimed water from MBCWTP were to be utilized for this project, as is recommended, tertiary treatment would be required to maintain these pollutants at the desired levels. Using an effective drift eliminating system would minimize the potentially impacted area. An efficiency of 0.0005% is presently achievable for such systems. Staff considers such hybrid cooling-related water use in any of the design options addressed in this report as incapable of adding significantly to the 1.5 in a million cancer risk calculated for the project as currently proposed with once-through cooling. It would similarly be incapable of significantly increasing the 1.4 in a million associated with existing operations.

Public Health Impacts of the Aquatic Filter Barrier

Any use of an aquatic filter barrier (AFB) at the proposed facility would only affect the aquatic species in the water to be used and would not generate any emissions of health significance. Therefore, such use would not increase the 1.5 in a million cancer risk from the project as proposed. Any air toxics emissions from deployment, retrieval, or

maintenance activities would be minimized through compliance with the staff proposed mitigation measures specified with respect to dust generation and diesel exhaust involved.

Conclusions for Public Health

Since the proposed once-through cooling system is a closed system that does not expose plant workers or area residents to any constituents of the utilized seawater, its continued use in the proposed modernization project would not introduce any cooling-related health risk to the project area. The use of dry cooling would also prevent exposure to these water constituents, thereby avoiding a potentially significant health risk from facility cooling. The use of hybrid cooling could theoretically introduce a cooling-related risk to the area. However, the requirement for water purification would be adequate to reduce any such health risks to less than significant levels. Compliance with mitigation measures mandated by the Air District and included in the Conditions of Certification proposed in this FSA would be adequate to reduce all construction-related air toxics emissions to less than significant levels. Staff concludes that the air-cooled and hybrid cooling alternatives could each be erected and operated in ways that would pose a less than significant public health risk.

4.8 SOCIOECONOMIC RESOURCES

Introduction

The modernization of a power plant could have socioeconomic impacts due to modifications in the plant's need for water, land, or public services, and revenues to public agencies, could have either adverse or beneficial socioeconomic impacts. Dry or hybrid cooling technologies, by virtue of their potential impacts on noise and visual conditions, could have impacts on public finance or surrounding neighborhoods and businesses that are different from once-through cooling.

Socioeconomic Impacts of Dry Cooling

Neither of the dry cooling alternatives nor the noise mitigated configurations would have significant impacts on employment, housing demand, or demand for schools in Morro Bay. As with other plant designs, direct fiscal impacts on the community would be positive because new plants generate more tax revenue. Dry cooling would not require a new outfall agreement, and thus would generate $250,000 less revenue to the City annually than anticipated from the outfall lease required for once-through cooling. As described in the Visual Resources section of this appendix, visual impacts of the dry cooling structures are potentially significant, but can be mitigated to less than significant levels, so there would be no adverse neighborhood consequences compared to once-through cooling. Increased noise levels would result if the dry cooling system was installed without mitigation, but feasible mitigation is available for both sites.

Socioeconomic Impacts of Hybrid Cooling

The hybrid cooling alternatives would not have significant impacts on employment, housing demand, or demand for schools in Morro Bay. As with other plant designs, direct fiscal impacts on the community would be positive because new plants generate more tax revenue. Elimination of the outfall would reduce City revenues compared to once-through cooling, as described above. If potential noise impacts and visual impacts (hybrid cooling without plume abatement) are not mitigated, hybrid cooling would have

adverse neighborhood consequences compared to once-through cooling. However, noise and visual mitigation is available and feasible (see discussion in the Noise and Visual sections of this appendix.

Socioeconomic Impacts of the Aquatic Filter Barrier

Use of the AFB with once-through cooling would not have significant impacts on employment or housing demand in Morro Bay, and thus not on schools either. As with other plant designs, fiscal impacts on the community would be positive because of higher power plant property values than for the existing plant. The Visual Resources section identifies a significant visual impact for the AFB; this could have adverse secondary socioeconomic impacts on the community, potentially affecting tourism. The AFB cooling technology would not have differential socioeconomic impacts than the once-through cooling option (see Socioeconomics section of this FSA).

Conclusion for Socioeconomics

Any of the cooling options would have positive short-term employment impacts, and would likely generate positive fiscal benefits to the City. Because of the elimination of the outfall and associated municipal revenue, the fiscal benefits of dry cooling and hybrid cooling would be somewhat less than those associated with once-through cooling or the use of the AFB.

4.9 TRAFFIC AND TRANSPORTATION

Introduction

The implementation of cooling options for the Morro Bay Power Plant (MBPP) would result in some traffic impacts not associated with either the existing environment or with the Applicant's original proposal. A dry cooling system for the MBPP would result in increased truck traffic for the delivery of structural steel and other materials and supplies. The hybrid cooling system that is considered could result in an increase in truck traffic and would also require the construction of a water pipeline to the Morro Bay–Cayucos Wastewater Treatment Plant located north of the MBPP site. The AFB would increase truck traffic to the Morro Bay harbor, as equipment and supplies would need to be transferred to barges for the construction and installation of the AFB. The construction activity in the bay along with the placement of the AFB could impact marine traffic.

Traffic and Transportation Impacts of Dry Cooling

The construction of a dry cooling system at either of the two possible sites, with or without the noise mitigated configuration, would result in additional truck traffic for the delivery of material, equipment, and supplies. This would be expected to occur over a relatively short period of time and construction schedules could be planned such that peak truck traffic would not increase during construction. Impacts would be less than significant.

Traffic and Transportation Impacts of Hybrid Cooling

The construction of a hybrid cooling system at either of the two possible sites, with or without the noise mitigated configuration, could result in additional truck traffic for the delivery of material, equipment, and supplies. This cooling option also requires the construction of a water pipeline to be placed in city streets. This would require the

development of a traffic control plan for the construction activity that would take place in city streets. If proper construction and safety procedures are followed for working in city streets, it should be possible to carry out this construction activity with minimum impact on the community, and impacts would be less than significant.

Traffic and Transportation Impacts of the Aquatic Filter Barrier

Morro Bay is approximately four miles long and 1.75 miles wide at its maximum width. Portions of the bay are not suitable for the passage of commercial vessels because of sand spit and seaweed beds, resulting in restriction of marine traffic to a fairly narrow portion of the bay.

The main channel of the bay must be dredged every few years in order to maintain its depth for safe passage by marine traffic. Morro Bay area marine traffic consists of commercial fishing vessels (up to 300 vessels during certain fishing seasons), tour boats, and recreational boats. Harbor Department and U.S. Coast Guard vessels are also stationed at the harbor.

The main channel for the bay is along the north shoreline where the filter is to be located. This could be a problem as boats enter and exit the harbor. After entering the bay, this channel runs parallel to the north shoreline and then makes a fairly sharp turn to the south in the vicinity of the existing water intake structure for the power plant.

The proposed AFB has the potential to create the following problems for marine traffic:

- The north shoreline has an access area for recreational boaters. Access to the bay could be somewhat restricted by the location of the filter. The filter would also reduce access to the north shoreline for the tour boats operating in the bay.
- The filter location appears to be very close to the main channel for boats entering and leaving the bay. Marine traffic leaving the bay travel along the shoreline, then in the vicinity of the power plant intake, these boats make a left turn to exit the bay. Traffic coming into the bay travels through a fairly narrow entrance channel of approximately 50 feet in width. It then travels along the north shoreline approximately 250 to 300 feet offshore and make a fairly sharp right turn in the vicinity of the power plant intake to get to a dock and mooring location.
- The location of the filter is also of some concern for the vessels of both the City of Morro Bay Harbor Department and the U.S. Coast Guard. When they are called out for a rescue mission, their vessels would be traveling at high speeds. The placement of the filter near the main shipping channel could create a hazard.
- If barges and vessels used for the construction of the circulating cooling water supply system must anchor or moor in a manner other than to an existing approved dock or pier, they could create a safety hazard to shipping traffic.
- Construction of the filter would require that the City of Morro Bay Harbor Department and the U.S. Coast Guard be involved in the development of a marine traffic plan for both the construction and operation of the AFB. They would also need to be consulted on determining the location of the AFB in the bay to minimize marine traffic problems.

During construction of the AFB, truck trips to and from Morro Bay harbor would be required. This would be for the delivery of materials, equipment, and supplies to be transferred to barges for the construction of the offshore structure to support the AFB. This impact could be handled with the development of a traffic control plan as noted in the **Traffic and Transportation** section of the FSA. This plan would include, but not be limited to, identifying truck routes, scheduling deliveries during off peak traffic hours, use of signing, lighting and other traffic control devices to ensure public safety. These control measures would be needed to minimize overall traffic congestion impacts on harbor operations, tourism, and other commercial activities.

Conclusion for Traffic and Transportation

The truck traffic associated with the construction activities for the dry cooling alternatives would not result in a significant impact on traffic assuming the Applicant follows the mitigation measures and Conditions of Certification set forth in the **Traffic and Transportation** section of the FSA.

For the hybrid cooling alternatives, the impact on traffic should not be significant assuming the Applicant follows normal safety and construction procedures for working in city streets.

The placement of the AFB in Morro Bay would increase truck traffic to the harbor and create some marine traffic concerns during its construction and operation. These concerns would need to be mitigated. Staff believes that the concerns associated with the construction and operation of the AFB can be mitigated to less than significant levels with the development of a marine traffic control plan. This plan would need to be developed in consultation with the City of Morro Bay and the U.S. Coast Guard.

The increase in harbor truck traffic would be mitigated through delivery schedules arranged to avoid the peak traffic periods for the community. Similarly, peak traffic periods at the harbor, such as during the tourist season, would be avoided through off-peak time delivery schedules.

4.10 VISUAL RESOURCES

Introduction

This section presents a visual analysis of the various cooling options compared to a baseline established by the existing Morro Bay Power Plant. Implementation of any of the cooling alternatives would also include the visual benefit of removal of the existing power plant and its regionally prominent stacks.

The primary issue of concern with respect to visual resources is the introduction of additional visible structures and plumes into the power plant and harbor landscape. Specifically, with the dry cooling option, the two air-cooled condensers (ACCs) would be visible as a single, large, elevated, geometric structure that could appear quite massive from foreground viewing distances depending on viewing location (for the remainder of this analysis the two side-by-side ACC structures will be referred to as a single ACC structure since its appearance would be that of a single geometric box structure). The hybrid cooling alternatives would have a smaller (paired) ACC structure than for the dry cooling option, but would include two additional cooling towers with the potential to

generate visually dominant plumes. In either case, the cooling structures would exhibit an industrial visual character similar to that of other existing and proposed structures at the site.

The Gunderboom Aquatic Filter Barrier (AFB) system would be installed in Morro Bay north of the T-Pier and would extend up to 2,000 feet toward the mouth of the harbor. The AFB would have the appearance of a narrow floating dock, anchored to mooring piles. The AFB could have two possible configurations. The occurrence of significant visual impacts would depend primarily on the extent to which the new structures introduce additional visual contrast, dominate views, or cause additional view blockage of higher quality landscape features such as Morro Bay waters, the sand spit or ocean, the hills to the east of the site, or sky.

The following assessment of visual impacts is based on an analysis conducted from six representative key observation points (KOPs). The reader is referred to Figure 7 (see end of this sub-section) for the location of the KOPs. Figure 8 presents a photograph of the existing conditions as viewed from KOP 8 at Morro Rock. Figure 9 presents a visual simulation of the proposed project as viewed from KOP 8.

Visual Impacts of Dry Cooling

Dry Cooling Alternative One

Under Dry Cooling Alternative One, the ACC would be located immediately south of the proposed power plant. The ACC would appear as a large elevated box-like structure (330 feet long x 206 feet wide x 99 feet high). Figure 10 (see end of this sub-section) presents a visual simulation of Dry Cooling Alternative One. The simulation represents the view from KOP 8 (Morro Rock). The ACC is prominently visible adjacent to the proposed power plant. Also, the simulation illustrates the removal of the water intake structure, which would occur under the dry cooling alternatives.

COOLING OPTIONS Table 13 summarizes Dry Cooling Alternative One's visual impacts by KOP. As shown in the table, compared to existing views, an increase in visual contrast, project dominance, and view blockage caused by project structures, would be experienced at three of the six representative viewing areas (KOP 5 - Morro Strand State Beach, KOP 6 - Morro Dunes Trailer Park and Resort Campground, and KOP 7 - Morro Creek at Embarcadero Road). The resulting visual impact on these three viewing locations would be adverse and significant.

COOLING OPTIONS Table 13
Dry Cooling Alternative One: Summary of Visual Impacts

KOP	Location	Description of Impact Before Mitigation
KOP 5	Morro Strand State Beach	**Adverse and Significant**. The new power plant and dry cooling structures would be located closer to KOP 5 than the existing power plant that is being replaced. As a result, the apparent scale of the new facilities would be similar to that of the existing plant. However, the new facilities would have a much stronger industrial character due to greater structural complexity and highly metallic coloration and texture. There would also be a noticeable increase in visible light at night due to the closer proximity of the facilities to KOP 5. The air-cooled condenser (ACC) would be partially screened by the proposed Heat Recovery Steam Generator (HRSG) structures, Gas Turbine Generator (GTG) air inlets and enclosures, and Steam Turbine Generator (STG) structures. The portion of the ACC that would be visible would appear similar in character to the other power plant structures.
KOP 6	Morro Dunes Trailer Park and Resort Campground	**Adverse and Significant**. The new power plant and dry cooling structures would be located closer to KOP 6 than the existing power plant that is being replaced. As a result, the apparent scale of the new facilities would be similar to that of the existing plant. However, the new facilities would have a much stronger industrial character due to greater structural complexity and highly metallic coloration and texture. There would also be a noticeable increase in visible light at night due to the closer proximity of the facilities to the trailer park. The ACC would be minimally visible from KOP 6 due to the screening provided by the proposed project structures.
KOP 7	Morro Creek at Embarcadero Road	**Adverse and Significant**. The new power plant and dry cooling structures would be located closer to KOP 7 than the existing power plant that is being replaced. As a result, the apparent scale of the new facilities would be similar to that of the existing plant. However, the new facilities would have a much stronger industrial character due to greater structural complexity and highly metallic coloration and texture. There would also be a noticeable increase in visible light at night due to the closer proximity of the facilities to the KOP 7. The ACC would be partially screened by, and appear similar in character to, other proposed structures.
KOP 8	Morro Rock	**Beneficial**. Compared to the existing power plant, the proposed facilities would be smaller in scale though more industrial in appearance due to metallic surface color and texture and complexity of form. Overall visual contrast, structural dominance, and view blockage would all be reduced by replacing the existing power plant with Dry Cooling Alternative One.
KOP 14	Sunset Plateau	**Beneficial**. The proposed facilities would be smaller in scale though more industrial in appearance due to metallic surface color and texture and complexity of form. The structure locations would encroach on sightlines to Morro Rock, the harbor, sand spit, and ocean. However, overall visual contrast, structural dominance, and view blockage would all be reduced by replacing the existing power plant with Dry Cooling Alternative One.
KOP 15	Harbor Front Tract	**Beneficial**. The proposed facilities would be smaller in scale though more industrial in appearance. View blockage of Morro Rock by structures would be eliminated though the location of the new HRSGs in relation to Morro Rock could result in occasional view blockage of Morro Rock by HRSG plume drift. Visual contrast, structural dominance, and view blockage would all be reduced by replacing the existing power plant with Dry Cooling Alternative One.

From KOP 8 (Morro Rock), KOP 14 (Sunset Plateau), and KOP 15 (Harbor Front Tract), the resulting visual impact would be beneficial because of the reduction in visual contrast, structural dominance, and view blockage that would be experienced by replacing the existing power plant with Dry Cooling Alternative One.

With full and effective implementation of staff-proposed Visual Resources Mitigation Measures 1, 2, and 3 (through Conditions of Certification VIS-1 through VIS-3, respectively), the significant visual impacts that would occur at KOPs 5, 6, and 7 would

be reduced to levels that would be less than significant. However, these less than significant impacts would be greater than the impacts created by the proposed project.

Dry Cooling Alternative Two

Under Dry Cooling Alternative Two, the proposed power plant facilities (HRSGs, GTGs, and STGs) would be re-oriented in an east-west configuration on the site. The ACC would be located immediately to the northeast of the power generation facilities. The ACC would have the same dimensions as for Dry Cooling Alternative One. Figure 11 presents a visual simulation of Dry Cooling Alternative Two as viewed from KOP 8 (Morro Rock). The ACC would be substantially screened from view by the proposed power plant. However, the in-line power plant configuration would make the HRSGs more visible. Also, the simulation illustrates the removal of the water intake structure, which would occur under the dry cooling alternatives.

COOLING OPTIONS Table 14 summarizes Dry Cooling Alternative Two's visual impacts by KOP. As shown in the table, compared to the existing views, the resulting visual impacts from Dry Cooling Alternative Two would be similar to Dry Cooling Alternative One. An increase in visual contrast, project dominance, and view blockage caused by the project structures would be experienced at three of the six representative viewing areas (KOPs 5, 6, and 7). The resulting visual impact on these three viewing locations would be adverse and significant. Also, under this alternative, the ACC would be prominently visible from Lila Kaiser Park (located just north of Morro Creek), resulting in an adverse and significant visual impact.

COOLING OPTIONS Table 14
Dry Cooling Alternative Two: Summary of Visual Impacts

KOP	Location	Description of Impact Before Mitigation
KOP 5	Morro Strand State Beach	**Adverse and Significant**. The new power plant and dry cooling structures would be located closer to KOP 5 than the existing power plant that is being replaced. As a result, the apparent scale of the new facilities would be similar to that of the existing plant. However, the new facilities would have a much stronger industrial character due to greater structural complexity and highly metallic coloration and texture. There would also be a noticeable increase in visible light at night due to the closer proximity of the facilities to KOP 5. Also, with this alternative, the HRSGs, GTGs, and STGs would be re-orientated on the site in a linear east-to-west configuration with the ACC situated to the northeast of the power generation facilities. This configuration would result in greater visibility of the power plant structures to Morro Strand State Beach since there would be less opportunity to screen facilities with other facilities.
KOP 6	Morro Dunes Trailer Park and Resort Campground	**Adverse and Significant**. The new power plant and dry cooling structures would be located closer to KOP 6 than the existing power plant that is being replaced. As a result, the apparent scale of the new facilities would be similar to that of the existing plant. However, the new facilities would have a much stronger industrial character due to greater structural complexity and highly metallic coloration and texture. There would also be a noticeable increase in visible light at night due to the closer proximity of the facilities to the trailer park. With the re-configuration of the power plant facilities and addition of the ACC on the northeast side of the site, the project would be substantially more visible from the trailer park and structural visual contrast would be increased. The project would dominate views to the south and would cause a significant increase in the blockage of sky.
KOP 7	Morro Creek at Embarcadero Road	**Adverse and Significant**. The new power plant and dry cooling structures would be located closer to KOP 7 than the existing power plant that is being replaced. As a result, the apparent scale of the new facilities would be similar to that of the existing plant. However, the new facilities would have a much stronger industrial character due to greater structural complexity and highly metallic coloration and texture. There would also be a noticeable increase in visible light at night due to the closer proximity of the facilities to the KOP 7. With the re-configuration of the power generation facilities and addition of the ACC on the northeast side of the site, the ACC and eastern-most structures would be partially screened by other project structures. However, with re-configuration of the proposed project structures, additional sight lines to the PG&E switchyard would be opened up, increasing visual exposure to this complex industrial facility.
KOP 8	Morro Rock	**Beneficial**. Compared to the existing power plant, the proposed facilities would be smaller in scale though more industrial in appearance due to metallic surface color and texture and complexity of form. Overall visual contrast, structural dominance, and view blockage would all be reduced by replacing the existing power plant with Dry Cooling Alternative Two. Also, The ACC (located to the northeast of the HRSG facilities) would be substantially screened from view by other structures.
KOP 14	Sunset Plateau	**Beneficial**. The proposed facilities would be smaller in scale though more industrial in appearance. The structure locations would encroach on sightlines to Morro Rock, the harbor, sand spit, and ocean. However, overall visual contrast, structural dominance, and view blockage would all be reduced by replacing the existing power plant with Dry Cooling Alternative Two.
KOP 15	Harbor Front Tract	**Beneficial**. The proposed facilities would be smaller in scale though more industrial in appearance due to metallic surface color and texture and complexity of form. View blockage of Morro Rock by structures would be eliminated though the location of the new HRSGs in relation to Morro Rock could result in the occasional blockage of views of Morro Rock by HRSG plume drift. Overall visual contrast, structural dominance, and view blockage would all be reduced by replacing the existing power plant with Dry Cooling Alternative Two.

From KOPs 8, 14, and 15, the resulting visual impact would be beneficial because of the reduction in visual contrast, structural dominance, and view blockage that would be experienced by replacing the existing power plant with Dry Cooling Alternative Two.

With full and effective implementation of staff-proposed Visual Resources Mitigation Measures 1, 2, and 3 (through Conditions of Certification VIS-1 through VIS-3, respectively), the significant visual impacts that would occur at KOPs 5, 6, and 7 would be reduced to levels that would be less than significant. Also, it would be recommended that additional trees be planted along the southern perimeter of Lila Kaiser Park in order to screen views of the ACC from the park and reduce the associated visual impact to a level that is not significant. However, these less than significant visual impacts would be greater than the impacts created by the proposed project, which would avoid the additional project visibility, structural contrast, and view blockage of higher quality landscape features (coastal hills, harbor, sand spit, dunes, ocean, and sky) that would be caused by the east-west orientation of project facilities and the addition of the ACC under Dry Cooling Alternative Two.

Specifically, the in-line configuration of project facilities and addition of the ACC under Dry Cooling Alternative Two would result in an increase in project visibility (and visual contrast and view blockage) from KOPs 5, 6, 8, 14, and 15 because the “in-line” orientation of the structures would result in less screening of proposed structures by other proposed structures. A decrease in visibility would be experienced from KOP 7 because the in-line orientation would result in slightly more screening of project structures by other project structures. However, in this case additional sight lines to the PG&E switchyard would be opened up, increasing the visual exposure to this complex, industrial facility.

Visual Impacts of Hybrid Cooling

Hybrid Cooling Alternative One

Under Hybrid Cooling Alternative One, an ACC (combined unit) and two conventional cooling towers would be located immediately south of the proposed power plant. The ACC would appear as a relatively large, elevated box-like structure (260 feet long x 174 feet wide x 82 feet high). Each cooling tower would appear rectilinear in shape and would be 84 feet long x 42 feet wide x 57 feet high. Figure 12 presents a visual simulation of Hybrid Cooling Alternative One as viewed from KOP 8 (Morro Rock). The ACC and west cooling tower would be prominently visible adjacent to the proposed power plant. The east cooling tower would be screened from view by the ACC. Also, the simulation illustrates the removal of the water intake structure, which would occur under the hybrid cooling alternatives. **COOLING OPTIONS Table 15** summarizes the visual impacts of the power plant facilities by KOP.

COOLING OPTIONS Table 15
Hybrid Cooling Alternative One: Summary of Visual Impacts
(Not Including Vapor Plume Analysis)

KOP	Location	Description of Impact Before Mitigation
KOP 5	Morro Strand State Beach	**Adverse and Significant**. The new power plant and dry cooling structures would be located closer to KOP 5 than the existing power plant that is being replaced. As a result, the apparent scale of the new facilities would be similar to that of the existing plant. However, the new facilities would have a much stronger industrial character due to greater structural complexity and highly metallic coloration and texture. There would also be a noticeable increase in visible light at night due to the closer proximity of the facilities to KOP 5. The air-cooled condenser (ACC) and eastern-most cooling tower would be almost completely screened by the proposed Heat Recovery Steam Generator (HRSG) structures, Gas Turbine Generator (GTG) air inlets and enclosures, and Steam Turbine Generator (STG) structures. The western-most cooling tower would be partially visible above the sound wall. The visible portions of the ACC and cooling towers would appear similar in character to the other power plant structures.
KOP 6	Morro Dunes Trailer Park and Resort Campground	**Adverse and Significant**. The new power plant and dry cooling structures would be located closer to KOP 6 than the existing power plant that is being replaced. As a result, the apparent scale of the new facilities would be similar to that of the existing plant. However, the new facilities would have a much stronger industrial character due to greater structural complexity and highly metallic coloration and texture. There would also be a noticeable increase in visible light at night due to the closer proximity of the facilities to the trailer park. The ACC and cooling towers would not be visible from the trailer park due to screening provided by other project structures and existing vegetation.
KOP 7	Morro Creek at Embarcadero Road	**Adverse and Significant**. The new power plant and dry cooling structures would be located closer to KOP 7 than the existing power plant that is being replaced. As a result, the apparent scale of the new facilities would be similar to that of the existing plant. However, the new facilities would have a much stronger industrial character due to greater structural complexity and highly metallic coloration and texture. There would also be a noticeable increase in visible light at night due to the closer proximity of the facilities to the KOP 7. The eastern-most cooling tower and a portion of the ACC would be partially screened by other proposed structures.
KOP 8	Morro Rock	**Beneficial**. Compared to the existing power plant, the proposed facilities would be smaller in scale though more industrial in appearance due to metallic surface color and texture and complexity of form. Overall visual contrast, structural dominance, and view blockage would all be reduced by replacing the existing power plant with Hybrid Cooling Alternative One. The eastern-most cooling tower would be screened from view.
KOP 14	Sunset Plateau	**Beneficial**. The proposed facilities would be smaller in scale though more industrial in appearance. The structure locations would encroach on sightlines to Morro Rock, the harbor, sand spit, and ocean. However, overall visual contrast, structural dominance, and view blockage would all be reduced by replacing the existing power plant with Hybrid Cooling Alternative One.
KOP 15	Harbor Front Tract	**Beneficial**. The proposed facilities would be smaller in scale though more industrial in appearance. View blockage of Morro Rock by structures would be eliminated though the location of the new HRSGs in relation to Morro Rock could result in occasional view blockage of Morro Rock by HRSG plume drift. Visual contrast, structural dominance, and view blockage would all be reduced by replacing the existing power plant with Hybrid Cooling Alternative One.

As shown in the table, compared to existing views, the resulting visual impacts from Hybrid Cooling Alternative One structures would be similar to Dry Cooling Alternative One. An increase in visual contrast, project dominance, and view blockage caused by the project structures would be experienced at three of the six representative viewing areas (KOP 5 - Morro Strand State Beach, KOP 6 - Morro Dunes Trailer Park and

Resort Campground, and KOP 7 - Morro Creek at Embarcadero Road). The resulting visual impact on these three viewing locations would be adverse and significant.

From KOP 8 (Morro Rock), KOP 14 (Sunset Plateau), and KOP 15 (Harbor Front Tract), the resulting visual impact would be beneficial because of the reduction in visual contrast, structural dominance, and view blockage that would be experienced by replacing the existing power plant with Hybrid Cooling Alternative One (assuming plume abated wet cooling towers).

This alternative would also require the construction of a new pipeline within city streets to bring cooling water to the site from the Morro Bay-Cayucos Wastewater Treatment Plant, just north of the power plant site. Although additional visual impacts would result from construction of the pipeline, these impacts would be temporary and minimally visible to the public, and there would be no lasting visual evidence of the pipeline's presence. Therefore, the visual impacts associated with pipeline construction would not be significant.

Based on a plume modeling analysis conducted by staff, the use of conventional cooling towers at this location would result in the formation of substantial steam plumes approximately 92% of daylight hours. The 10% frequency plume during daylight hours would be approximately 718 feet long x 645 feet high x 126 feet wide. These plumes would be visually dominant and would cause significant view blockage. The resulting visual impact would be adverse and significant.

With full and effective implementation of staff-proposed Visual Resources Mitigation Measures 1, 2, and 3 (through Conditions of Certification VIS-1 through VIS-3), the significant visual impacts (from structure visibility) that would occur at KOPs 5, 6, and 7 would be reduced to levels that would be less than significant. In order to mitigate the significant visual impact that would result from plume formation, it is recommended that only plume abated wet cooling towers be considered. Based on the available meteorological data, a design point of 38^{o}F and 80% relative humidity should reduce the daytime plume frequency during hours with high visibility to zero. However, additional plume analysis should be performed when and if a plume abated cooling tower is proposed for this project site.

Although Hybrid Cooling Alternative One, properly mitigated, would not create any significant adverse impacts, it would have greater impacts than the proposed project because the proposed project would result in less structural contrast and view blockage of higher quality landscape features (coastal hills, harbor, sand spit, dunes, ocean, and sky) when viewed from the surrounding areas.

Hybrid Cooling Alternative Two

Under Hybrid Cooling Alternative Two, the power plant facilities would be re-oriented in an east-west configuration on the site and the ACC and cooling towers would be located immediately to the northeast of the HRSGs. The ACC and cooling towers would have the same dimensions as for Hybrid Cooling Alternative One. Figure 13 presents a visual simulation of Hybrid Cooling Alternative Two as viewed from KOP 8 (Morro Rock). The ACC is barely visible above the STG enclosures. The cooling towers would be screened

from view. However, the in-line power plant configuration would make the HRSGs more visible. Also, the simulation illustrates the removal of the water intake structure, which would occur under the hybrid cooling alternatives. **COOLING OPTIONS Table 16** (below) summarizes Hybrid Cooling Alternative Two's visual impacts by KOP.

COOLING OPTIONS Table 16
Hybrid Cooling Alternative Two: Summary of Visual Impacts
(Not Including Vapor Plume Analysis)

KOP	Location	Description of Impact Before Mitigation
KOP 5	Morro Strand State Beach	**Adverse and Significant**. The new power plant and hybrid cooling structures would be located closer to KOP 5 than the existing power plant that is being replaced. As a result, the apparent scale of the new facilities would be similar to that of the existing plant. However, the new facilities would have a much stronger industrial character due to greater structural complexity and highly metallic coloration and texture. There would also be a noticeable increase in visible light at night due to the closer proximity of the facilities to KOP 5. Also, with this alternative, the HRSGs, GTGs, and STGs would be re-orientated on the site in a linear east-to-west configuration with the ACC and cooling towers situated to the northeast of the power generation facilities. This configuration would result in greater visibility of the power plant structures to Morro Strand State Beach since there would be less opportunity to screen facilities with other facilities.
KOP 6	Morro Dunes Trailer Park and Resort Campground	**Adverse and Significant**. The new power plant and hybrid cooling structures would be located closer to KOP 6 than the existing power plant that is being replaced. As a result, the apparent scale of the new facilities would be similar to that of the existing plant. However, the new facilities would have a much stronger industrial character due to greater structural complexity and highly metallic coloration and texture. There would also be a noticeable increase in visible light at night due to the closer proximity of the facilities to the trailer park. With the re-configuration of the power plant facilities and addition of the ACC and cooling towers on the northeast side of the site, the project would be substantially more visible from the trailer park and structural visual contrast would be increased. The project would dominate views to the south and would cause a significant increase in the blockage of sky.
KOP 7	Morro Creek at Embarcadero Road	**Adverse and Significant**. The new power plant and hybrid cooling structures would be located closer to KOP 7 than the existing power plant that is being replaced. As a result, the apparent scale of the new facilities would be similar to that of the existing plant. However, the new facilities would have a much stronger industrial character due to greater structural complexity and highly metallic coloration and texture. There would also be a noticeable increase in visible light at night due to the closer proximity of the facilities to the KOP 7. With the re-configuration of the power generation facilities and addition of the ACC and cooling towers on the northeast side of the site, the ACC and eastern-most structures would be partially screened by other project structures. However, with re-configuration of the proposed project structures, additional sight lines to the PG&E switchyard would be opened up, increasing visual exposure to this complex industrial facility.
KOP 8	Morro Rock	**Beneficial**. Compared to the existing power plant, the proposed facilities would be smaller in scale though more industrial in appearance due to metallic surface color and texture and complexity of form. Overall visual contrast, structural dominance, and view blockage would all be reduced by replacing the existing power plant with Hybrid Cooling Alternative Two. Also, the ACC and cooling towers (located to the northeast of the HRSG facilities) would be partially screened and fully screened from view (respectively) by other structures.
KOP 14	Sunset Plateau	**Beneficial**. The proposed facilities would be smaller in scale though more industrial in appearance. The structure locations would encroach on sightlines to Morro Rock, the harbor, sand spit, and ocean. However, overall visual contrast, structural dominance, and view blockage would all be reduced by replacing the existing power plant with Hybrid Cooling Alternative Two.
KOP 15	Harbor Front Tract	**Beneficial**. The proposed facilities would be smaller in scale though more industrial in appearance. View blockage of Morro Rock by structures would be eliminated though

KOP	Location	Description of Impact Before Mitigation
		the location of the new HRSGs in relation to Morro Rock could result in occasional blockage of views of Morro Rock by HRSG plume drift. Overall visual contrast, structural dominance, and view blockage would all be reduced by replacing the existing power plant with Hybrid Cooling Alternative Two.

As shown in the table, compared to existing views, the resulting visual impacts from the Hybrid Cooling Alternative Two structures would be similar to Dry Cooling Alternative Two. An increase in visual contrast, project dominance, and view blockage caused by the project structures would be experienced at three of the six representative viewing areas (KOPs 5, 6, and KOP 7). The resulting visual impact on these three viewing locations would be adverse and significant. Also, under this alternative, the ACC would be visible from Lila Kaiser Park (located just north of Morro Creek), resulting in an adverse and significant visual impact.

From KOPs 8, 14, and 15, the resulting visual impact would be beneficial because of the reduction in visual contrast, structural dominance, and view blockage that would be achieved by replacing the existing power plant with Hybrid Cooling Alternative Two (assuming plume abated wet cooling towers).

This alternative would also require the construction of a new pipeline within city streets to bring cooling water to the site from the Morro Bay-Cayucos Wastewater Treatment Plant, just north of the power plant site. Although additional visual impacts would result from construction of the pipeline, these impacts would be temporary, minimally visible to the public, and there would be no lasting visual evidence of the pipeline's presence. Therefore, the visual impacts associated with pipeline construction would not be significant.

As discussed above for Hybrid Cooling Alternative One, the plume modeling analysis conducted by staff determined that vapor plumes from the conventional cooling towers would form approximately 92% of daylight hours. The 10% frequency plume during those daylight hours would be approximately 718 feet long x 645 feet high x 126 feet wide. These plumes would be visually dominant and would cause significant view blockage. The resulting visual impact would be adverse and significant.

With full and effective implementation of staff-proposed Visual Resources Mitigation Measures 1, 2, and 3 (through Conditions of Certification VIS-1 through VIS-3, respectively), the significant visual impacts (from structure visibility) that would occur at KOPs 5, 6, and 7 would be reduced to levels that would be less than significant. Also, it is recommended that additional trees be planted along the southern perimeter of Lila Kaiser Park in order to screen views of the ACC from the park and reduce the associated visual impact to a level that is not significant. In order to mitigate the significant visual impact that would result from plume formation, it is recommended that only plume abated wet cooling towers be considered. Based on the available meteorological data, a design point of 38^{o}F and 80% relative humidity should reduce the daytime plume frequency during hours with high visibility to zero. However, additional plume analysis should be performed when and if a plume abated cooling tower is proposed for this project site.

Although Hybrid Cooling Alternative Two, properly mitigated, would not create any significant adverse impacts, it would have greater impacts than the proposed project

because the proposed project would result in less structural contrast and view blockage of higher quality landscape features (coastal hills, harbor, sand spit, dunes, ocean, and sky) when viewed from the surrounding areas.

Visual Impacts of the Aquatic Filter Barrier

The AFB system would be installed in Morro Bay north of the T-Pier and would extend up to 2,000 feet toward the mouth of the harbor (see Figure 9, end of this sub-section). The AFB would have the appearance of a narrow floating dock, anchored to mooring piles and could have two possible configurations – one with one set of mooring piles and a second option with two sets of pilings that would allow for boat mooring.

In either case, from most viewpoints the AFB would not appear out of character in the harbor environment. From the north T-Pier, the commercial waterfront area, and boats in the harbor, the AFB, if visible, would appear consistent with other harbor features including moorings, boats, docks, and piles. From these locations, the resulting visual impact would not be significant. However, from the northern portion of The Embarcadero and Coleman Drive, the Gunderboom mooring piles would partially obscure open views across the harbor waters to the rolling form of the sand spit. The resulting visual contrast and view blockage would cause an adverse and significant visual impact. Therefore, it is recommended that the mooring piles be kept to a minimum height. The residual visual impact of the AFB, though reduced with shorter piles, would still be significant.

Conclusion for Visual Resources

Staff concludes that from most viewing areas of the existing power plant and proposed project site, the proposed project and dry cooling alternatives would result in an overall long-term improvement in visual quality through the removal of the existing power plant and its regionally dominant stacks. However, the Hybrid Cooling Alternatives have the potential to cause significant visual impacts (due to view blockage and degradation of visual quality) associated with the formation of prominent and persistent plumes from the wet cooling towers. Figure 14 presents a visual simulation of Hybrid Cooling Alternative One with cooling tower steam plumes present. Therefore, staff is recommending that only plume abated wet cooling towers be considered under the Hybrid Cooling Alternatives.

The cooling alternatives have the potential to cause long-term significant adverse visual impacts to Morro Strand State Beach and the Morro Dunes Trailer Park and Resort Campground. These long-term operational impacts would result from the project's contrasting appearance and foreground visibility. However, with proper implementation of the Applicant's proposed mitigation measures as augmented by staff's proposed mitigation measures and Conditions of Certification, and the use of plume abated wet cooling towers under the hybrid cooling options, the impacts of the cooling alternatives would be reduced to levels that would not be significant.

The cooling alternatives also have the potential to cause nighttime lighting impacts when viewed from the elevated perspectives of the Sunset Plateau and Harbor Front Tract residential areas. The significance of the potential lighting impacts cannot be determined at this time because the project is lacking a detailed lighting plan. However, effective implementation of staff's proposed mitigation measures and Conditions of

Certification would reduce the long-term significant adverse visual impacts and any potential nighttime lighting impacts to levels that are not significant.

The proposed project is preferred over Dry Cooling Alternatives One and Two because the ACC and/or re-configured power generation facilities would result in greater visual contrast and view blockage, and in some cases greater project dominance. Even with effective mitigation of the significant visual impacts associated with the dry cooling alternatives, the residual impacts (impacts remaining following mitigation), though not significant, would still be greater than the residual impacts of the proposed project.

The proposed project is also preferred over the hybrid cooling alternatives because the ACC and cooling tower structures would result in greater visual contrast and view blockage. Also, the vapor plumes associated with the hybrid cooling alternatives would cause adverse and significant visual impacts (due to view blockage and degradation of visual quality) if not abated. Even with effective mitigation of the significant visual impacts associated with the hybrid cooling alternatives, the residual impacts, though not significant, would still be greater than the residual impacts of the proposed project.

It should also be noted that the elimination of the water intake building under the various cooling options would not fully compensate for the visual impact of the ACC and cooling towers. The ACC would appear larger and more industrial than the intake building and the ACC and cooling towers would introduce more visual contrast and view blockage compared to the intake building. The greater visual contrast and view blockage associated with the ACC and cooling towers would be particularly noticeable from Morro Rock, Coleman Drive, and the harbor. Also, from most of the KOPs evaluated (5, 6, 7, 14, and 15), the intake building would either be less visible than the ACC or not visible at all.

With respect to site configuration, Dry Cooling and Hybrid Cooling Alternatives One are preferred over Dry Cooling and Hybrid Cooling Alternatives Two because the in-line configuration of facilities and increased structural visibility, visual contrast, and view blockage associated with the Alternative Two site configuration would result in greater residual visual impacts compared to the Alternative One site configuration. This conclusion assumes the implementation of plume abated cooling towers for the Hybrid Cooling Alternatives. Therefore, the ranking of the proposed project and alternatives from most preferred to least preferred is as follows:

- Proposed Project
- Dry Cooling Alternative One
- Hybrid Cooling Alternative One (assuming plume abated cooling towers)
- Dry Cooling Alternative Two
- Hybrid Cooling Alternative Two (assuming plume abated cooling towers)
- Existing Morro Bay Power Plant

If plume abated cooling towers are not proposed, then the hybrid cooling alternatives become least preferred overall because of the significant visual impacts associated with

conventional cooling tower vapor plume formation. Furthermore, if plume abated cooling towers are not proposed under the hybrid cooling alternatives, the existing Morro Bay Power Plant would be preferred over the hybrid cooling alternatives.

The AFB alternative is not preferred because of the residual degradation of visual quality that would be experienced from a portion of The Embarcadero and Coleman Drive even with a reduction in pile heights.

PLACEHOLDER FIGURE 7

MORRO BAY POWER PROJECT – KOP LOCATIONS

PLACEHOLDER FIGURE 8

KOP 8 – MORRO ROCK – EXISTING CONDITIONS

PLACEHOLDER FIGURE 9

KOP 8 – MORRO ROCK – PROPOSED PROJECT

PLACEHOLDER FIGURE 10

KOP 8 – MORRO ROCK – DRY COOLING ALTERNATIVE ONE

PLACEHOLDER FIGURE 11

KOP 8 – MORRO ROCK – DRY COOLING ALTERNATIVE TWO

PLACEHOLDER FIGURE 12

KOP 8 – MORRO ROCK – HYBRID COOLING ALTERNATIVE ONE

PLACEHOLDER FIGURE 13

KOP 8 – MORRO ROCK – HYBRID COOLING ALTERNATIVE TWO

PLACEHOLDER FIGURE 14

KOP 8 – MORRO ROCK – HYBRID COOLING ALTERNATIVE ONE WITH COOLING TOWER PLUME

4.11 WASTE MANAGEMENT

Introduction

This section evaluates the waste management impacts of dry cooling and hybrid cooling technologies for the MBPP project. The noise mitigated configurations would have impacts similar to those originally designed (see Section 3 for details). The technical area of waste management encompasses both hazardous and non-hazardous wastes that are generated during facility construction and operation. Construction wastes include those associated with site preparation, such as contaminated soil from excavating activities, in addition to those generated during actual facility construction. Once-through cooling does not generate any wastes during operation.

Waste Management Impacts of Dry Cooling

Wastes generated during construction of the air-cooled condenser (ACC) would consist of relatively minor amounts of hazardous and non-hazardous wastes such as excess paint, packing materials, concrete, lumber, spent solvent, and clean-up materials. The amount of soil that would need to be excavated would depend on the final design chosen, but may not be significant if the ACC were built on pilings. Classification of the excavated material would take place after it is stockpiled. It would then be sampled and analyzed to determine on-site reuse or off-site disposal options in accordance with the final Site Mitigation and Implementation Plan. Dry cooling would not generate any wastes during operation.

Waste Management Impacts of Hybrid Cooling

Construction of either of the hybrid cooling alternatives would generate types of wastes similar to those from the other cooling technologies. The amount of soil from excavation activities could be larger, since pilings would not likely be used for the wet cooling towers. Instead, a basin would be constructed that would be placed on the ground, with some excavation required. There could be minor amounts of additional waste generated from construction of a pipeline used to bring cooling water to the MBPP site from the Morro Bay–Cayucos Water Treatment Plant, located about one mile to the north.

During operation of a wet cooling tower, relatively minor amounts of sludge collects in the basin of the cooling tower and would require removal every few years. The sludge would require testing to determine its classification as hazardous or non-hazardous.

Waste Management Impacts of the Aquatic Filter Barrier

Construction and placement of the aquatic filter barrier (AFB) would not be expected to generate any wastes unless fabrication was conducted on-site, in which case, only minor non-hazardous wastes consisting mostly of debris would be generated. No soil excavation activities would be expected.

Conclusion for Waste Management

Staff does not consider the waste management impacts from the cooling technologies to be significantly different, since rather minor amounts of wastes would be generated from any of the technologies. All impacts are less than significant. Although once-through and dry cooling do not generate any operational wastes, the hybrid cooling option also does not generate any significant amounts from operation. The types of

construction wastes generated would be similar for the dry cooling and hybrid cooling technologies. Minimal to no waste would be generated during construction of the AFB.

4.12 SOIL AND WATER RESOURCES

Introduction

This section analyzes potential impacts on soil and water resources from the construction and operation of two cooling systems that could be used in place of once-through cooling: (1) dry cooling, and (2) hybrid cooling. The analysis focuses on the potential for induced erosion and sedimentation and adverse impacts to water quality and supply resulting from the construction of these alternative cooling technologies. This section also analyzes potential impacts on soil and water resources resulting from the installation and maintenance of the Aquatic Filter Barrier (AFB).

Soil and Water Impacts of Dry Cooling

Dry Cooling Alternative One

The air-cooled condensers (ACCs) used for Dry Cooling Alternative One would encompass approximately 2 acres in the noise mitigated configuration. The ACCs would be located between the proposed power block and the existing Peregrine Building.

Earthmoving activities for either configuration would primarily be limited to the construction of the ACCs. Accelerated wind- and water-induced erosion could result from such earthmoving activities, which in turn could ultimately result in increased sediment loads within nearby receiving waters. However, impacts related to erosion and sedimentation would be less than significant due to compliance with requirements of the Clean Water Act. The earthmoving required for Dry Cooling Alternative One would be included as part of the overall National Pollutant Discharge Elimination System (NPDES) permit for stormwater discharge from construction activities. As required within the permit, the Applicant would be required to develop a Stormwater Pollution Prevention Plan (SWPPP) that identifies Best Management Practices (BMPs) used to properly manage the quantity and quality of stormwater with regard to erosion and sedimentation. Examples of BMPs are: the use of sediment barriers, limiting the amount of exposed area, conveyance channels, sediment traps, and stormwater control devices.

Project excavation could disturb potentially contaminated soils and/or groundwater. Refer to the **Soil and Water** and **Waste Management** sections of the FSA for discussions on contaminated soils and groundwater that specify appropriate mitigation measures and Conditions of Certification to ensure impacts are less than significant.

Dry Cooling Alternative Two

The ACCs used for Dry Cooling Alternative Two would encompass approximately 2 acres with the noise mitigated configuration. The ACCs would be located north of the proposed MBPP, abutting the northern bank of Willow Camp Creek.

The ACC location may potentially lie within a floodplain and would need to be elevated and/or bermed for flood protection and/or prevention purposes. Earthmoving activities for this alternative would be greater than Dry Cooling Alternative One in order to construct

a berm for the ACCs. However, impacts related to flooding would be less than significant because the Applicant would need to comply with Federal Emergency Management Agency and the City of Morro Bay's flood permits. Erosion and sediment impacts would be comparable to Dry Cooling Alternative One; however, more stringent BMPs would be required due to the ACCs' proximity to Morro Creek and Willow Camp Creek. Earthen berms constructed to direct sediment-laden runoff to a sediment trap, coupled with limiting exposed areas and upstream runoff, are examples of highly effective erosion and sediment control BMPs. Examples of stormwater BMPs include water quality devices such as oil skimmers and extensive water quality monitoring to ensure that potential water-borne pollutants are contained on-site.

Excavation activities may encounter potentially contaminated soils and/or groundwater; therefore, proper handling and disposal procedures may be required. Refer to the **Soil and Water** and **Waste Management** sections of the FSA for discussions on contaminated soils and groundwater and appropriate mitigation measures and Conditions of Certification to ensure that impacts are less than significant.

Soil and Water Impacts of Hybrid Cooling

Hybrid Cooling Alternative One

The hybrid cooling option would entail two 2-celled cooling towers, air-cooled condensers (ACCs), and water supply and discharge pipelines. Total ground disturbance for this hybrid cooling option would be about 1.06 acres with the noise mitigated configuration.

In order to provide cooling water for the MBPP project from the Morro Bay–Cayucos Wastewater Treatment Plant (MBCWTP), water pipelines and an additional wastewater treatment facility would be required. Approximately 1.5 acres of land would be disturbed to accommodate the additional treatment facility. The pipelines, which would extend approximately 0.4 miles from the MBPP to the MBCWTP, would be installed underground along two potential routes. Whichever route is chosen, the pipelines would have to cross Morro Creek.

Because a SWPPP would be required, impacts related to erosion and sediment control and stormwater runoff would be less than significant. Refer to the previous impact analyses for a more detailed discussion and for examples of BMPs. Boring under Morro Creek could cause a "frac-out"[3] and potentially release suspended contaminated sediments into the channel. However, impacts would be less than significant with the implementation of a suitable Frac-Out Contingency Plan. If trenching across the Creek were selected, appropriate BMPs (through coordination with the U.S. Army Corps of Engineers) would ensure that impacts related to erosion and sedimentation would be less than significant.

Excavation activities may disturb potentially contaminated soils and/or groundwater; therefore, proper handling and disposal procedures may be necessary. Refer to the **Soil and Water** and **Waste Management** sections of the FSA for discussions on

[3] A "frac-out" can occur during boring (horizontal drilling) below a creek or river when drilling fluids under pressure find their way into subsurface fractures, potentially resulting in contamination of the surface water.

contaminated soils and groundwater, and appropriate mitigation measures and Conditions of Certification to ensure less than significant impacts.

Hybrid Cooling Alternative Two

The ACCs and cooling towers used for Hybrid Cooling Alternative Two would disturb a total of about 1.06 acres of on-site land, with the noise mitigated configuration.

The ACC and cooling towers may potentially lie within a floodplain and would need to be elevated and/or bermed for flood protection and/or prevention purposes. Therefore, earthmoving activities for this alternative would be greater than Hybrid Cooling Alternative One due to the need to construct a berm for the cooling structures. However, impacts related to flooding would be less than significant because the Applicant would be required to comply with the Federal Emergency Management Agency and the City of Morro Bay's flood permits. In addition, water supply/wastewater discharge pipelines would have to cross Willow Camp Creek and Morro Creek. Erosion and sediment impacts would be comparable to Hybrid Cooling Alternative One; however, more stringent BMPs would be required due to the proximity of the hybrid cooling structures to Morro Creek and Willow Camp Creek. Refer to the discussion of Dry Cooling Alternative Two for examples of BMPs.

Excavation activities could encounter potentially contaminated soils and/or groundwater; therefore, proper handling and disposal procedures would be necessary. Refer to the **Soil and Water** and **Waste Management** sections of the FSA for discussions on contaminated soils and groundwater and appropriate mitigation measures and Conditions of Certification to ensure impacts are less than significant.

Soil and Water Impacts of the Aquatic Filter Barrier

The Aquatic Filter Barrier (AFB) would require the installation of single pilings or a pair of pilings to keep the filter barrier in place. During construction of the AFB, there would be a potential for bay sediment to become suspended. Also, during maintenance activities a burst of air would be directed into the mesh barrier to clear it of debris. This activity would also cause sediment and other particles to become suspended. The sedimentation impact would be short-lived and with proper BMPs would be considered a less than significant impact. Cofferdams and aquatic silt curtains would be examples of BMPs to be used during construction.

Conclusion for Soil and Water Resources

The once-through cooling process would require minor earth disturbance activities that would occur as a result of the tie-in pipelines for the proposed MBPP to the existing lines. Erosion and sedimentation impacts would be less than significant because there is feasible mitigation that would be included as part of the NPDES permit requirements for stormwater discharge from construction activities.

Dry Cooling Alternative One would be limited to on-site earthmoving activities and the ACCs would encompass approximately 2 acres. Dry Cooling Alternative Two would require additional earthmoving if the existing location is determined to be likely to encounter flooding. Hybrid Cooling Alternative One would require both on-site and off-site earthmoving activities as well as boring under, or trenching through, Morro

Creek. Hybrid Cooling Alternative Two would require additional earthmoving to create a berm in order to prevent potential flooding. Hybrid Cooling Alternative Two would also require both on-site and off-site earthmoving activities as well as boring under, and trenching through, Morro Creek and Willow Camp Creek. Because earthmoving activities related to Dry Cooling Alternative One would be limited to the MBPP site, this option would have fewer impacts than Dry Cooling Alternative Two and both Hybrid Cooling Alternatives One and Two. The impacts of the noise mitigated configurations would be similar to those described for the original configurations.

THE AFB WOULD ONLY BE USED WITH ONCE-THROUGH COOLING. NO LAND-BASED EROSION AND SEDIMENTATION WOULD OCCUR AS A RESULT OF THE AFB INSTALLATION AND OPERATION, SINCE THE AFB WOULD BE INSTALLED WITHIN THE BAY. SEDIMENTATION COULD OCCUR DURING THE CONSTRUCTION AND MAINTENANCE OF THE AFB, BUT APPROPRIATE BMPS WOULD MAKE IMPACTS ASSOCIATED WITH THIS ACTIVITY LESS THAN SIGNIFICANT. DRY COOLING ALTERNATIVE ONE WOULD CREATE THE FEWEST EROSION AND SEDIMENTATION IMPACTS, ALTHOUGH ALL OF THE ALTERNATIVES WOULD HAVE IMPACTS THAT, WITH MITIGATION, ARE LESS THAN SIGNIFICANT FOR SOIL AND WATER RESOURCES.

5 ENGINEERING ANALYSIS OF COOLING OPTIONS

5.1 FACILITY DESIGN

Facility Design encompasses the civil, structural, mechanical, and electrical engineering design of the project. The purpose of the Facility Design analysis is to, among other things, provide reasonable assurance that the project can be designed and constructed in accordance with all applicable LORS and in a manner that assures public health and safety. Conditions of Certification have been established that will ensure that the proposed power plant is designed and constructed in compliance with applicable LORS.

Introduction

Three cooling options are evaluated for the MBPP: a dry cooling system, a hybrid cooling system, and use of the Aquatic Filter Barrier (AFB). Each of the cooling system alternatives would require the construction of some fixed facilities (e.g., foundations, structures, mechanical systems, electrical systems, control systems, etc.). The Conditions of Certification for the proposed project (as defined in the **Facility Design** section of this FSA) cover the design and construction of these types of fixed facilities. The structural and mechanical aspects of a Gunderboom AFB would also be covered by the proposed Conditions of Certification.

Facility Design Impacts of Dry Cooling

The dry cooling system, in any of the configurations described in this appendix, would require the construction of some fixed facilities (e.g., foundations, structures, mechanical systems, electrical systems, control systems, etc.). The proposed Conditions of Certification cover the design and construction of these types of fixed facilities. If the dry cooling system is selected, **FACILITY DESIGN Table 1** in the **Facility Design** section of this FSA will need to be revised accordingly.

Facility Design Impacts of Hybrid Cooling

The hybrid cooling system options, in any configuration defined herein, would also require the construction of some fixed facilities (e.g., foundations, structures, mechanical systems, electrical systems, control systems, etc.). The Conditions of Certification for the proposed project cover the design and construction of these types of fixed facilities. If the hybrid cooling system is selected, **FACILITY DESIGN Table 1** in the **Facility Design** section of this FSA will need to be revised accordingly.

Facility Design Impacts of the Aquatic Filter Barrier

The aquatic filter barrier (AFB) would require the construction of some mechanical and structural components. The Conditions of Certification for the proposed project cover the design and construction of these types of fixed facilities. If an AFB is selected, **FACILITY DESIGN Table 1** in the **Facility Design** section of this FSA will need to be revised accordingly.

Conclusion for Facility Design

The proposed Conditions of Certification adequately address the engineering concerns associated with all three cooling system options. If an alternative cooling system is selected, **FACILITY DESIGN Table 1** in the **Facility Design** FSA section will need to

be revised. This table lists the major structures and equipment associated with the facility. The proposed Conditions of Certification require the Applicant to submit pertinent design documents for these major structures and equipment to the Chief Building Official (CBO). The CBO would then verify that the designs and construction are in accordance with applicable LORS.

5.2 GEOLOGY AND PALEONTOLOGY

Introduction

The structures for Dry Cooling Alternative One, Dry Cooling Alternative One with the noise mitigated configuration, Hybrid Cooling Alternative One and Hybrid Cooling Alternative One with the noise mitigated configuration would be located to the south of the existing tank farm, between the proposed combined cycle combustion turbine facility and the existing power plant. The structures for Dry Cooling Alternative Two, Hybrid Cooling Alternative Two, and the noise mitigated configurations at this location would be located northeast of the existing tank farm on the opposite side of Willow Camp Creek. The Gunderboom AFB is a passive screen technology that would be located in front of the cooling water intake system in Morro Bay Harbor, immediately west of the Power Plant.

Geology and Paleontology Impacts of Dry Cooling

The Morro Bay Power Plant facility is located on a low-lying coastal terrace at the northern end of Morro Bay. The terrace is underlain by bedrock of the Franciscan Formation at elevations of -50 to -80 feet (mean sea level datum) beneath the proposed project site. Morro Rock is located approximately 2,000 feet west of the site. The structures for all four dry cooling alternatives would overlie dune sand, estuarine deposits, and hydraulic fill, which blanket the coastal terrace. Borings completed by Hushmand Associates (2000a) in the immediate vicinity of Dry Cooling Alternative One and the noise mitigated configuration indicate that the structures for these alternatives would be underlain by loose-to-medium dense silty sand with local estuarine deposits. Site-specific geotechnical data for location of Dry Cooling Alternative Two and the noise mitigated configuration is not available, but sub-surface conditions are expected to be similar to conditions encountered near the location of Dry Cooling Alternative One.

Faulting and Seismicity

No active or potentially active faults are known to cross the power plant footprint or the harbor area and no indications of surface faulting were observed at the power plant site during the site visit. Therefore, the potential of surface rupture on a fault beneath the proposed footprints of the dry cooling alternatives is considered to be very low.

The ground shaking impacts of the dry cooling alternatives are also identical. The Applicant calculated a peak ground acceleration at the Morro Bay Power Plant site of 0.33g associated with a magnitude 6.8 earthquake on the Los Osos fault (Duke, 2000a), located 8 kilometers south of the plant site. The Applicant's geotechnical consultant, Hushmand Associates (2000a), also performed the probabilistic analysis, using the Abrahamson-Silva (1997), Campbell (1997), and Sadigh (1997) attenuation relationships to calculate peak ground accelerations at the Morro Bay Power Plant site of 0.30g for the Design Basis Earthquake and 0.39g for the Upper Bound Earthquake. These events are defined by the 1997 UBC as having probabilities of exceedance of 10% in

50 years (for the Design Basis Earthquake) and 10% in 100 years (for the Upper Bound Earthquake). These values are consistent with the California Division of Mines and Geology (CDMG) Map Sheet 48, which predicts a peak ground acceleration with a 10% chance of exceedance in 50 years of between 0.3g and 0.4g for the project area.

Liquefaction and Expansive Soils

During the preliminary geotechnical investigation for the proposed MBPP Modernization Project the depth to groundwater beneath the site generally varied from approximately four feet below existing grade to 14 feet below existing grade (Hushmand Associates, 2000a). The combination of saturated sand and silty sand of varying density beneath the locations for the dry cooling structures and the potential for a moderately high peak ground accelerations at the site points to a potential for liquefaction. Hushmand Associates (2000a) concluded that localized liquefaction in unconsolidated sand layers could result in several inches of settlement. As a result, their report recommends the use of pile foundations for "relatively heavy structures" (Hushmand Associates, 2000a).

The potential for liquefaction induced lateral spreading within the soils beneath most of the proposed dry cooling structure locations is considered low because of the low surface gradients at the project site and the heterogeneous nature of the liquefiable soils.

Potentially expansive clays occur at depths of 15 to 70 feet beneath the site (Hushmand, 2000a) and may also occur in Morro Bay Harbor. However, at these depths, the estuarine deposits do not undergo the changes in moisture content required to produce expansion. As a result, the potential for damage to the project facilities from expansive soils is expected to be low.

Tsunami

Tsunamis occurred in the Morro Bay area in 1878, 1946, 1953, 1960, and 1964, resulting in localized damage to piers, wharves, and buoys in Morro Bay Harbor (Duke, 2000a). The ground surface elevation at the proposed dry cooling alternative sites is above the maximum run up attributed to these historic tsunamis. Therefore, the potential for damage to the dry cooling structures from a tsunami is expected to be low.

Slope Failures

Since the dry cooling alternatives are located on a coastal terrace that has a slope of between 1% and 2%, the potential for slope failures is considered to be low.

Geological and Paleontological Resources

No significant sand and gravel resources of the quality required to produce Portland cement concrete have been identified in the project area (Duke, 2001b) and no other significant mineralogical resources are known to exist in the project area. The paleontological assessment included both an archival record search from the University of California, Berkeley, Museum of Paleontology and a field survey of the project site on February 1, 1999 (Govean, 1999). The paleontological assessment concluded that the sediments beneath the power plant site are geologically very young and the proposed project site footprint was highly disturbed during the construction of the original MBPP.

Therefore, both the proposed project and the proposed dry cooling alternatives are believed to have a low paleontologic sensitivity.

Geology and Paleontology Impacts of Hybrid Cooling

The hybrid cooling alternatives are generally located within the same footprints as the dry cooling alternatives. Therefore, the geologic and paleontologic impacts of the hybrid cooling alternatives are essentially identical to the geologic and paleontologic impacts of the dry cooling alternatives, described above. The noise mitigated configurations would also have impacts similar to those described for dry cooling.

Geology and Paleontology Impacts of Aquatic Filter Barrier

The AFB would likely be supported by piles driven into the estuarine deposits in Morro Bay Harbor.

Faulting and Seismicity

No active or potentially active faults are known to cross the harbor area. Therefore, the potential of surface rupture on a fault beneath the AFB is considered to be very low. The ground shaking impacts of the cooling alternatives and the AFB system are also identical. In addition, liquefiable soils are also likely to be present in Morro Bay Harbor where the AFB would be located.

The only seismic hazard that is significantly greater for the AFB than for the existing plant or the proposed project and the dry and hybrid cooling alternatives is the threat of a tsunami. A tsunami would potentially damage the AFB in the harbor.

Geological and Paleontological Resources

The sediments in the harbor are also very young and would only be disturbed by pile driving activities. As a result the AFB is also expect to have a low paleontologic sensitivity.

Conclusion for Geology and Paleontology

The Applicant will likely be able to comply with applicable LORS for any of the cooling options. No significant geologic or paleontologic resources have been identified in the project area. The significant geologic hazards associated with the proposed cooling alternatives are strong ground shaking and liquefaction potential. The potential impacts of these seismic hazards on the cooling alternatives are expected to be nearly identical to their potential impacts on both the existing power plant and the proposed project. The AFB would also be at risk from a tsunami. The LORS require preparation of an Engineering Geology Report that addresses these issues and provides design recommendations to mitigate any potential impacts associated with liquefaction and strong ground shaking.

The cooling alternatives should have no adverse impact with respect to geologic hazards or geological and paleontological resources if project construction complies with the LORS outlined in the Conditions of Certification of the Geology and Paleontology FSA.

5.3 POWER PLANT RELIABILITY AND EFFICIENCY

Introduction

If the cooling system of a combined cycle power plant such as Morro Bay fails to operate, or operates at a level of effectiveness lower than intended, the plant's power output may be curtailed (reduced), or the plant may be forced to shut down entirely. Additionally, the plant's fuel efficiency would be adversely impacted by any degradation of cooling system effectiveness.

Reliability Impacts of Dry Cooling

Once-through ocean water cooling provides a reliable source of nearly constant temperature cooling water that ensures optimum power plant operation year-round. While severe storms could cause the system to become clogged with sand or marine life such as kelp, degrading cooling system performance, this would be a very rare occurrence.

Dry cooling relies on the dry bulb temperature of the ambient air to provide the needed cooling effect. In hot climates, extremely hot days may degrade cooling system performance, causing partial curtailment of power output or, in the worst case, total shutdown of the power plant. In the marine climate of Morro Bay, however, it is highly unlikely that such extremely hot days will occur. Significant adverse impacts on plant reliability from use of dry cooling are therefore unlikely.

Dry Cooling Alternatives One and Two would produce identical effects from a reliability standpoint.

Efficiency Impacts of Dry Cooling

Once-through ocean water cooling maximizes power plant fuel efficiency by providing a continuous source of effective cooling for the plant's steam condensers.
Dry cooling will typically provide less effective cooling of the condensers, reducing the efficiency of the steam cycle portion of the power plant, and thus the overall fuel efficiency of the facility. Since only about one-third of the power from a combined cycle power plant is produced by the steam cycle, however, this negative impact on fuel efficiency is diluted. An analysis of the Sutter Power Project (97-AFC-2) showed that annual average fuel efficiency would be reduced 1.5% compared to a wet cooling system. A similar reduction in efficiency could be expected for the MBPP. Energy Commission staff concluded that the reduction in water consumption and wastewater production justified the use of dry cooling at Sutter. The benefits under consideration for the MBPP Project include elimination of entrainment, impingement, and thermal effects.

Dry Cooling Alternatives One and Two would produce identical effects from an efficiency standpoint.

Reliability Impacts of Hybrid Cooling

A hybrid cooling system can be expected to yield reliability at least as great as a dry cooling system, and probably greater, due to the inherent redundancy of the combination of dry and wet systems. Significant adverse impacts on plant reliability from use of hybrid cooling are therefore unlikely.

Hybrid Cooling Alternatives One and Two would produce identical effects from a reliability standpoint.

Efficiency Impacts of Hybrid Cooling

A hybrid cooling system can be expected to provide cooling more effectively than a dry cooling system, especially on the very hot days when dry cooling system performance would show the most degradation. While less effective on an annual average basis than once-through ocean water cooling, a a hybrid system would reduce the loss of power plant fuel efficiency to less than the 1.5% reduction that might be expected with a dry cooling system. Incorporation of a hybrid cooling system would thus present less of an adverse impact on fuel consumption than dry cooling, but would still likely be less efficient than once-through cooling.

Hybrid Cooling Alternatives One and Two would produce identical effects from an efficiency standpoint.

Reliability and Efficiency Impacts of the Aquatic Filter Barrier

Neither reliability nor efficiency of the power plant should be significantly affected by incorporation of the AFB.

Conclusion for Reliability

Once-through ocean water cooling is the most reliable method for cooling the MBPP Project. Dry cooling, hybrid cooling, and the AFB may exhibit slight adverse impacts on plant reliability, but it is not expected that these impacts would be significant.

Conclusion for Efficiency

ONCE-THROUGH OCEAN WATER COOLING SHOULD YIELD MAXIMUM FUEL EFFICIENCY. DRY COOLING WILL LIKELY PROVIDE A REDUCTION OF FUEL EFFICIENCY UP TO 1.5%; A HYBRID COOLING SYSTEM WOULD LIKEWISE REDUCE FUEL EFFICIENCY, BUT TO A LESSER DEGREE. THE NOISE MITIGATED CONFIGURATIONS FOR DRY AND HYBRID COOLING WOULD CAUSE SIMILAR EFFICIENCY IMPACTS. THE AFB SHOULD HAVE NO SIGNIFICANT IMPACT ON FUEL EFFICIENCY.

6 RESPONSES TO COMMENTS

The following written comments provided by members of the public, two legislators, the San Luis Obispo County Chumash Council, the County Office of Education, and the Sierra Club were received by Energy Commission staff on or before March 25, 2002. Staff provides responses to each comment. Copies of the written comments are provided in as Attachment 1.

JOHN BARTA, RESIDENT (JB)

JB-1: "Now, at nearly the eleventh hour, it seems that a portion of the CEC staff has twisted the process in a direction where there is a possibility that we might create something that can only be described as a "new elephant in our front yard". Only this one will be much louder than the existing elephant in our front yard. It would also violate numerous local ordinances, regulations, and standards while being inconsistent with our general plan.

"I urge you to not support any of the air cooling plans. Dry or hybrid air cooling would produce a facility that is big, ugly, and WAY too noisy. It would violate local ordinances, regulations, and standards. And most importantly, despite the impression you may have been given by a tiny, dedicated local group, it would be completely unacceptable to the community."

Response: *The noise analysis presented in Section 4.6 of this report concludes that the noise impacts of both dry cooling alternatives would be less than significant and would comply with City requirements. The visual impacts of the dry cooling structures are analyzed in Section 4.10. This analysis concludes that while the visual impacts of the ACCs would be greater than those of the proposed project, they would still be less than significant when compared to the baseline (the views of the existing power plant).*

BARBARA PLAYAN, RESIDENT OF MORRO BAY (BP)

BP-1: "I have lived in Morro Bay since 1980 + sold real estate full time here since then.

"Having many friends + acquaintances here, I haven't talked to one person who doesn't realize we need a new power plant. The sooner the better!

"Talked to a mobile park owner on Beach St + he was tired of washing the rust off the mobile homes every day from the plant.

"We voted for the new plant + we expected it to be built!

"These opponents are pseudo-intelle[c]tuals who would oppose anything if it would get them into the spotlight."

Response: *Comment noted.*

KENNETH R. VESTERFELT, CITIZEN OF MORRO BAY (KRV)

KRV-1: "I wish to address the feasibility of installing a dry/cooling system for the proposed new energy plant. Given the sensitivity of our environment, I assume that includes our landscape. The vision of structures that would be 10 stories high and the size of a football field translates into landscape pollution.

"If I were to make such a decision it would take a tremendous explanation that incorporated:

- short and long term financial feasibility
- rationale that supported the above noted landscape pollution
- proven scientific evidence whose impact made the former two considerations insignificant[.]"

Response: *The estimated cost of a dry cooling system is presented in Section 3 of this report. This report presents a detailed analysis of the dry cooling structures (Section 4); conclusions are summarized in the response to JB-1 (above).*

BETTY WINHOLTZ (BW)

BW-1: "I hope the CEC Staff and Committee is allowed to take a holistic view of this project in spite of the pi[e]cemeal hearings. For example, the violation of the noise ordinance by eight tenths of a dB to have alternative cooling is a small sacrifice for saving life in the bay/estuary.

"This does not mean I'm anxious to allow the power plant to continue to violate our nighttime noise limit. If there are ways to get them to stay under it, like limiting nighttime load, whether or not alternative cooling is use, would be wonderful."

Response: *The analysis presented in Section 4.6 of this report concludes that noise impacts of the dry cooling equipment would be less than significant.*

STATE SENATOR JACK O'CONNELL

O'CONNELL-1: "… I believe the CEC's proposed cooling alternatives are not feasible and are incompatible with the unique community of Morro Bay. The proposed alternative cooling options would be directly inconsistent with the City's General Plan and would violate numerous ordinances and regulations, including land use designations and zoning ordinances, while at the same time adversely impacting visual, noise, air quality, socioeconomic, and other local natural resources issues."

Response: *Section 3 of this report finds several cooling options to be feasible. Impacts of each cooling option are analyzed in this report in each of the disciplines listed in the comment. It should be noted that all impacts are compared to the existing baseline, as required by CEQA, so the existing power plant serves as the point of comparison for impact significance. The potential violations of ordinances and regulations referenced by the commenter represent issues that would also apply, in most cases, equally to the proposed project with once-through cooling.*

ASSEMBLYMEMBER ABEL MALDONADO

MALDONADO-1: "I too oppose the use of dry cooling for the Morro Bay Power Plant and alternative cooling methods that would cause or exacerbate adverse effects on visual, noise, air quality, socio-economics, and other local resources compared to the proposed project. I understand that the proposed alternative cooling options may be in direct violation of the City's Municipal Code, General Plan, the Coastal Land Use Plan and the Coastal Act."

Response: *See response to O'Connell-1 above.*

SAN LUIS OBISPO COUNTY CHUMASH COUNCIL (SLOCCC)

SLOCCC-1: "The proposal by CEC Staff regarding dry cooling and hybrid cooling raises the most serious concerns for the SLOCCC because their Native American Sacred sites and cultural resources would be greatly disturbed by the proposed structures."

Response: *The cultural resources analysis in this report (Section 4.3) finds that Dry Cooling and Hybrid Cooling Alternatives One would be unlikely to impact cultural resources. The report acknowledges that the Alternative Two sites do have the potential to disturb a Native American sacred site.*

SLOCCC-2: "We also have concerns about the noise level of the dry cooling currently being proposed — from what we understand this will be very much louder than water-cooling. We are concerned about the effects of this huge increase in noise on the wildlife near the plant."

Response: *As detailed in the noise analysis in this report (Section 4.6), the dry cooling alternatives would likely be slightly louder than the existing plant at some locations, but significantly quieter than the existing plant at other locations. In all cases, the noise impact of the dry cooling facilities is determined to be less than significant.*

SLOCCC-3: "We also have questions as to the use of chemicals for dry cooling. What are the chemicals involved in this procedure, how hazardous is their use, transportation and storage on site, and how is it being proposed that these chemicals be dealt with?"

Response: *Section 4.4 of this report determines that the overall use of hazardous materials in a dry cooled system would be less than that of both the currently and the proposed power plant. No hazardous chemicals are expected to be used with the ACCs.*

SAN LUIS OBISPO COUNTY OFFICE OF EDUCATION (EDUC)

EDUC-1: "We are strongly opposed to the alternative dry cooling options presented to the CEC. These massive towers would negatively impact the visual view in Morro Bay; they would violate the noise ordinance in the city; they would negatively impact the archaeological and cultural resources of the site; and infringe upon environmentally sensitive habitat. Overall, we have determined that the dry cooling alternative has no place in this project or in this community."

Response: *See previous responses regarding the potential noise and visual impacts of dry cooling. Potential impacts of Dry Cooling Alternative Two on the ESHA are evaluated in the Biological Resources Section (4.2) and are found to be mitigable to less than significant levels.*

SIERRA CLUB SANTA LUCIA CHAPTER (SC)

SC-1: Dry cooling or an equivalent non-extractive technology should be required in order to stop the enormous mortality inflicted by both the existing and the proposed plants in light of the demonstrated feasibility of alternatives to once-through cooling.

Response: *Comment noted.*

COLLEEN RAY (CR)

CR-1: "…[t]he alternatives for dry or hybrid cooling systems currently under consideration will significantly increase noise and violate City standards. Furthermore, the addition of huge cooling structures 10 stories high would defeat the goal of minimizing the plant's visual impacts to scenic coastal lands and potentially disturb sacred Native American sites."

Response: *Please see previous responses.*

DAVID NELSON (DN)

DN-1: Morro Bay Power Plant must not be permitted to continue to use once-through cooling. Dry cooling works.

Response: *Comment noted.*

ROSEMARY BOWKER (RB)

RB-1: "I am strongly in favor of the use of once-through seawater for cooling and very much opposed to the use of air cooling for the following reasons: (a) less efficient generation; (b) use of seawater in the future will decline from past use; (c) visual and noise impacts; (d) it would not work well on the foggy coast; (e) impacts to the Bay are not well-defined but could be mitigated with habitat enhancement.

Response: *The efficiency, visual, and noise impacts of several dry cooling scenarios are addressed in this report. Regarding the claim that dry cooling would not work well on the coast, the Morro Bay coastal environment is ideal for dry cooling due to its consistent and relatively low temperatures throughout the year.*

7 CONCLUSION: COMPARISON OF COOLING OPTIONS

This report finds that both the dry cooling and hybrid cooling technologies are feasible for use at the Morro Bay Power Plant based on analysis of conceptual designs not optimized or the Applicant's proposed use of duct firing. Sections 4 and 5 of this appendix describe the potential impacts of dry cooling and hybrid cooling facilities (each in two possible locations), and the Aquatic Filter Barrier (AFB) to serve the Morro Bay Modernization Project. These cooling facilities would replace (or modify, in the case of

the AFB) the proposed use of once-through cooling. This study was undertaken because of potential significant impacts of once-through cooling to aquatic biological resources, and to satisfy the request of the CCRWQCB for site-specific CEQA analysis of impacts of proposed cooling alternatives.

Because potentially significant noise impacts were identified after initial analysis of the dry and hybrid cooling alternatives, a noise mitigated configuration was developed for each location and cooling type. These configurations are analyzed in this appendix in each discipline and are found to have no substantial difference in the level of impact from the original configurations. Impacts are summarized below.

The environmental and engineering disciplines can be divided into two groups: those with the potential for significant impacts that would be difficult to mitigate, and those with little to no potential for significant impacts (either because impacts are negligible, or because impacts that are identified can be reduced to an insignificant level through application of readily available mitigation measures). Technical areas in which impacts would be less than significant for all three types of cooling (some with implementation of mitigation or conditions of certification) are the following:

Air quality
Hazardous materials
Worker safety and fire protection
Noise
Public health
Traffic and transportation
Soil and water resources
Geology and paleontology
Biological resources (terrestrial)
Power plant reliability and efficiency
Waste management

Staff notes that the Applicant has indicated that it would disagree with both the nature of staff's analysis and our conclusions for air quality, noise, and power plant efficiency. Staff's analysis is based on conceptual designs for the alternative cooling systems that are not optimized for duct firing, and that would limit the use of duct firing in warm weather. The parameters for these conceptual designs were supplied by the applicant in response to a request from staff for the criteria to use in its cooling options study (see Appendix F, Duke 2002d). Staff believes that a larger system optimized for duct firing at appropriate weather conditions could be readily fit on the project site, though no detailed analysis of the potential for impacts of such a system has been conducted. Staff's conclusions for air quality, noise, and power plant efficiency are summarized below:

- **Air Quality:** Construction emissions for dry and hybrid cooling would be greater than those for once-through cooling, but impacts are found to be less than significant because mitigation will be required. Operational particulate emissions would be slightly greater with both dry and hybrid cooling because in dry cooling, fans would re-suspend particulate matter in the area, and hybrid cooling creates minor particulate emissions associated with cooling tower drift. Staff does not consider these impacts to be significant. This conclusion in air quality leads to a similar conclusion in the public health analysis that impacts of dry and hybrid cooling would also be less than significant.
- **Noise:** Noise from dry and hybrid cooling would create significant impacts if the proposed designs (as initially defined in Section 3) were used. However, for both Dry Cooling and Hybrid Cooling Alternatives One and Two, noise mitigated

configurations are presented in which fan configuration or type is modified and noise levels are reduced to less than significant levels. Mitigation requirements would be less extensive for the hybrid cooling alternatives than the dry cooling alternatives, because these systems include fewer fans. The AFB would not create significant noise impacts.

- **Power Plant Efficiency:** As described in Sections 2 and 3, power plants cooled by dry and hybrid cooling technologies are less efficient than those using once-through cooling, so power generation is slightly reduced using these technologies. Also, additional electricity is required to operate the cooling fans, so net power generation is reduced for that reason as well. The reductions in efficiency are found to be small (1.5% or less for both dry and hybrid cooling), and they are determined not to cause significant adverse impacts on the availability of fuel or to cause wasteful or inefficient energy consumption.

Staff identified three technical areas where potential impacts from dry and hybrid cooling technologies or the AFB could be significant: cultural resources, visual resources, and land use. The conclusions of these analyses are described below.

- **Cultural Resources:** Implementation of Dry Cooling Alternative Two and Hybrid Cooling Alternative Two would affect a site that is both an archaeological resource and a registered Native American sacred site. Staff believes that it is feasible to mitigate the impact to archaeological resources, but does not know whether it would be possible to mitigate the potential impacts to traditional cultural values. To make this determination, staff would need to ascertain whether the site is also eligible for the California Register of Historic Resources based on its traditional cultural values. If the site were determined to be eligible based on its traditional cultural values, the project impact would be significant and unmitigable. If the site were not determined eligible, staff would consider the project's impact on the traditional cultural values represented by the site to be less than significant and the only mitigation required would be that for the archaeological resources associated with the site.
- **Visual Resources:** The visual impacts of each cooling option are evaluated from key viewpoints surrounding the Morro Bay site. Visual impacts of both the dry cooling and the hybrid cooling alternatives are found to be significant when viewed from several viewpoints, but impacts are mitigable. The impacts of the vapor plume from the hybrid cooling towers would be significant if plume abatement systems were not implemented, but plume abatement is considered to be feasible. The AFB alternative in the design options presented by the Applicant would cause significant adverse impacts because of the degradation of visual quality that would be experienced from a portion of The Embarcadero and Coleman Drive. These impacts are not mitigable.
- Land Use**:** The project site is designated Coastal Dependent Industrial under the MBLCP. The Coastal Commission will make a determination of the consistency of the dry- and hybrid-cooling alternatives with this designation in its report to the Energy Commission. Energy Commission staff believe that provisions of the Coastal Act giving priority to expansion of coastal dependent industry (such as the existing plant) at existing sites provide a basis for consistency and therefore, no impact would occur. If the Coastal Commission determines that the project using an alternative cooling system in place of sea-water cooling is not a coastal-dependent

industry, use of dry-cooling or hybrid-cooling would be inconsistent with the site's land use designation under the MBLCP, and a significant land use impact would occur if the City did not amend its adopted land use plans and ordinances.

The AFB requires the construction of pilings that may have a significant visual affect on surrounding land uses. The design standards, aesthetic goals and objectives of the California Coastal Act, the City's Coastal Land Use Plan and adopted portions of the Waterfront Master Plan may allow the AFB to avoid land use policy conflicts. Staff cannot make this determination without more detailed design, construction and operation plans of the AFB.

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TERRESTRIAL BIOLOGICAL RESOURCES

Testimony of Andrea Erichsen and Richard Anderson

INTRODUCTION

This section of the Final Staff Assessment (FSA) provides the California Energy Commission staff's analysis of potential impacts to terrestrial biological resources from the Morro Bay Power Plant Modernization Project (MBPP), proposed by Duke Energy North America, LLC.

This document provides staff's assessment of terrestrial biological resources impacts to state-listed and federally listed species, fully protected species, species of special concern, wetlands, and other areas of critical biological concern. It also describes the terrestrial biological resources of the project site and ancillary facilities, identifies impacts, determines the need for mitigation, determines the adequacy of mitigation proposed by the Applicant, specifies additional staff proposed mitigation measures to reduce identified impacts to less than significant levels, determines compliance with applicable laws, ordinances, regulations, and standards, and recommends Conditions of Certification.

Analysis of impacts is based upon information provided by: the Applicant in the AFC (Duke 2000a; Duke 2001d; Duke 2001e; Duke 2001f; Duke 2001g; Duke 2001h); data adequacy information; responses to data requests; public workshops; and through discussions with various agency representatives including: the U.S. Fish and Wildlife Service (USFWS), the California Department of Fish and Game (CDFG), the National Marine Fisheries Service (NMFS), the California Coastal Commission (CCC), and the Morro Bay National Estuary Program (MBNEP).

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

FEDERAL

- The Endangered Species Act of 1973 (16 USC, §1531 et seq.), and implementing regulations, (50 CFR. §17.1 et seq.), designate and provide for protection of threatened and endangered plants and animals and their critical habitat.
- Migratory Bird Treaty Act (16 USC §701-718) and implementing regulations (50 C.F.R.) Subchapter B (§10.1-24.12) prohibits "take" of migratory birds.
- Rivers and Harbors Act of 1899 (§10: 33 USC §401 et seq.; CFR §114-116 and 321) requires U.S. Army Corps of Engineer permit to build in or alter national waterways such as harbors.

STATE

- California Environmental Quality Act (CEQA), PRC §21000 et seq. mandates protection of California's environment and natural resources to develop and maintain a high-quality environment now and in the future. Specific goals of CEQA are for

California's public agencies to:1) identify the significant environmental effects of their actions; and, either 2) avoid those significant environmental effects, where feasible; or 3) mitigate those significant environmental effects, where feasible.

- California Endangered Species Act of 1984 (Fish & Game Code, §2050 et seq.) protects California's endangered and threatened species. The implementing regulations, (Cal. Code Regs., tit.14, §670.5), lists animals of California declared to be threatened or endangered.
- Warren-Alquist Act Section 25527 mandates that certain areas, such as estuaries, state parks, and wilderness and scenic or natural reserves, areas for wildlife protection, are prohibited for installation of industrial facilities.
- California Coastal Act of 1976, sets state policies for the conservation and development of California's 1,100 mile coastline, particularly issues such as public access, coastal recreation, the marine environment, coastal land resources, and coastal development.
- Section 30240.states that (a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas. (b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.
- California Native Species Conservation and Enhancement Act (Fish & Game Code, §1750 et seq.) mandates as state policy, maintenance of sufficient populations of all species of wildlife and native plants and the habitat necessary to ensure their continued existence at optimum levels.
- Native Plant Protection Act (Fish & Game Code, §1900 et seq.) establishes criteria for determining if a species, subspecies, or variety of native plant is endangered or rare and regulates the taking, possession, propagation, transportation, exportation, importation, or sale of endangered or rare native plants.
- Fish and Game Code, §1600 et seq. requires that any person planning to substantially divert or obstruct the natural flow, or substantially change the bed, channel or bank of any river, stream or lake designated by the department, or planning to use any material from the streambeds, must notify the Department prior to such activity. Under this code, the Department provides a Streambed Alteration Agreement designed to protect fish and wildlife from impacts of the proposed action(s).
- Fish and Game Code, Sections 3511, 4700, 5050, and 5515, prohibit the taking of birds, mammals, reptiles and amphibians, and fish, respectively, listed as fully protected in California.
- Native Plant Protection Act of 1977 (Fish and Game Code, Section 1900 et seq.) gives CDFG authority to designate state endangered and rare plants and provides specific protection measures for identified populations.

LOCAL

- City of Morro Bay General Plan. Requires protection of environmentally sensitive habitats. Restricts permitted uses and specifies requirements for buffers zones, and conservation easements. Please refer to the Land Use section of the FSA for additional details on local policies.
- Program LU-22-4 states that no development or use or clearing of natural vegetative land shall occur in the City areas without review and approval of the City.
- Program LU-55 mandates that all Environmentally Sensitive Habitat Areas shall be protected against adverse impacts to the maximum extent possible.
- City of Morro Bay Coastal Land Use Plan. Requires protection of environmentally sensitive habitats along coastline and restricts permitted uses.
- City of Morro Bay Zoning Ordinance (Municipal Code Section 17). Requires protection of Environmentally Sensitive Habitats (ESH). Restricts permitted uses and specifies requirements for buffers zones, and conservation easements. Biological surveys (BS) are required for all proposed development that is or may be located within 100 feet of an ESH.

SETTING

REGIONAL SETTING

The proposed project is located on 107 acres of an existing industrial complex in the coastal town of Morro Bay, in San Luis Obispo County, California (Duke 2000a, Section 6.6B, Figure 6.6B-1). State Highway 1, a popular tourist route, lies less than 0.25 km from the eastern edge of the project site. Tourism and enjoyment of the coastal environment, wildlife, and fish, are of primary importance to the economy of Morro Bay.

The Morro Bay/Estuary ecosystem supports one of the most important wetland systems on California's coast (MBNEP 2000). The natural communities of Morro Bay and the associated estuary were designated California's first State Estuary in 1994. In 1987, Congress created the National Estuary Program and Morro Bay was one of 28 estuaries in the United States to be classified as a National Estuary, in order to acknowledge and protect the bay's natural diversity. Morro Rock is part of the Morro Rock Natural Preserve within Morro Bay State Park. Morro Bay/Estuary is also part of the Pacific Flyway, which provides critical habitat for migrating shorebirds and waterfowl (Garret and Dun 1981, Gerdes et al. 1974, Helmers 1992, Page et al. 1999, Stenzel et al. 1994). The regional terrestrial communities include beaches, coastal active dunes and fore-dunes, coastal dune, and coastal valley scrub. In upland areas, there are also significant areas of coastal valley grasslands and riparian woodland (Duke Energy 2000, Section 6.6A).

The Morro Bay/Estuary itself covers 2,300 acres and is sheltered from the open ocean by a sand spit. When including intertidal and wetland areas, the acreage increases to 2,600 acres (MBNEP 2000). The bay is characterized by tidal marshes, mudflats, open water, and rocky intertidal zones, which provide highly productive, diverse, and dynamic

habitats (Duke 2000, pages 6.6A-17 to 21). The ocean shore, dunes, and undeveloped upland areas, as well as wetlands in the region, support many sensitive and listed species including invertebrates, amphibians, reptiles, passerines, raptors, shore birds, waterfowl, and small to medium-sized mammals (Duke 2000a, page 6.6B-6, and pages 6.6A-51 to 65; MBNEP 2000). The estuary also provides resident and nursery habitats for a variety of fish, including steelhead trout (Duke 2000a, pages 6.6A-61 to 63; Duke 2001f). Thus, Morro Bay/Estuary supports a wide diversity of biological communities and species (MBNEP 2000). In addition to saltwater and tidal influence, Morro Bay/Estuary receives freshwater from a 48,000-acre watershed drained by three creeks, Los Osos, Chorro, and Warden creeks (MBNEP 2000).

There are seven sensitive ecological communities listed by the California Natural Diversity Data Base (CNDDB) for the Morro Bay region including: central coast dune scrub, central maritime chaparral, valley needlegrass grassland, northern coastal salt marsh, coastal brackish marsh, coastal and valley freshwater marsh, and riparian woodlands (Duke 2000a, pages 6.6B-46 to 47).

LOCAL SETTING

The project site is a 107-acre parcel that is bordered to the north, east and southeast by a mosaic of the land uses including: light industrial, marine-related commercial and recreational, and residential (including ball park to the north of the MBPP and within the property boundary) (Duke 2000a, Section 6.6B, Figure 6.6B-1 and Figure 6.6B-2). The existing power plant lies less than 500 meters (0.3 miles) east of the Pacific Ocean, less than 250 meters (0.15 miles) north/northeast of Morro Bay and is bordered on the west, north and northeast by coastal beaches, dunes, dune scrub, wetlands, and riparian woodlands (Duke 2000a, page 6.6B-4, Figure 6.6b-2a). Within 1.6 km (one mile) of the MBPP, there are the following community types: urban, planted forest, coastal valley grassland, riparian woodland, coastal scrub, coastal dune slack, and coastal active dunes and foredunes (Duke 2000a, page 6.6B-7). The dunes and associated slack and scrub communities occur adjacent to the west border of the MBPP site, and extend north and south along the coast.

In addition to the project site in Morro Bay, there are two off-site locations that will be used for project activities: the proposed construction storage and laydown area (39.2 acres) at Camp San Luis Obispo, located 12.87 km (8 miles) south of Morro Bay; and the proposed satellite parking area in the City of Morro Bay. These three sites are described in detail below.

Power Plant Site in the City of Morro Bay

The proposed project will directly affect approximately 57 acres within the 107-acre parcel in the City of Morro Bay (Duke 2000a, page 6.6B-7). The 57 acres where the new power plant facilities will be built have been modified over the last five decades to various degrees. Some areas are dominated by exotic and ruderal plants, such as ice plant, and some areas are completely paved. Some of the 57-acre MBPP site, where the demolition, construction, and operation will occur, may support sensitive species that could be significantly disturbed.

The areas surrounding the 57-acres within the 107-acre MBPP site consist of several sensitive and valuable habitats including:

- Riparian woodland (Morro and Willow Camp creeks);
- Southern valley grasslands;
- Coastal dune scrub;
- Planted trees and shrubs; and
- Ice plant (exotic) (used by Morro Shoulderband Snail).

Riparian woodland, containing Morro Creek and Willow Camp Creek, occurs north and east of the power plant site (Duke 2000a, pages 6.6B-32-33). The riparian area is dominated by tall trees such as cottonwood, oak, and sycamore, but also contains a sometimes dense understory of plants such as willow and elderberry. This habitat type contains high biological diversity, and Morro Creeks provides critical habitat for steelhead trout (Duke 2000a, page 6.6B-38). Scattered arroyo willow also may be found in wet depressions, seeps, and near Tank 5, Spill Basin 3, and the blowdown tank.

The valley grasslands occur in small patches on south-facing hillsides in the southern area of the property, and are adjacent to coastal scrub and tree plantings (along Highway 1) (Duke 2000a, page 6.6B-24). This area potentially provides habitat for many special status species known to inhabit the region although no special status plants or animals were detected during surveys in these small patches of valley grassland.

Intermixed with the grasslands, especially on the western border, is coastal dune scrub. Most of this vegetative community is in a disturbed or degraded state, yet it remains a sensitive and important type of wildlife habitat. There is a larger adjacent complex of coastal scrub extending from the project's western border to the west and northwest along the dunes and beaches of Estero Bay. A one-acre patch of disturbed dune scrub is located near Tanks 3 and 4 (Duke 2000a, page 6.6B-18). This area was documented to contain burrowing owl in 1999, and may provide suitable habitat for the Morro shoulderband snail (MSS) and California legless lizard.

Planted wind-rows and forest patches of eucalyptus, pines, and other non-native trees and shrubs are located in the southeastern area of the MBPP property. This area is not developed and has been designated as an Environmental Sensitive Habitat Area (ESHA) by the City of Morro Bay. The Eucalyptus trees are important because they provide roosting habitat for Monarch Butterflies (*Danaus plexippus*). This ESHA, although not directly impacted by the proposed project, should also receive protection from indirect impacts.

Ice plant (*Carpobrotus* or *Mesembryanthemum* sp.) is an exotic invasive succulent from the southern hemisphere. There are numerous ice plant species, which have been introduced in California. In the vicinity area around the proposed project, it grows in diverse locations including sandy soils including dune habitats (Duke 200a, page 6.6B-10, 6.6B-15-16) As discussed in the following section, the federally endangered Morro shoulderband snail has recently been found in ice plant vegetation near the proposed project (Roth 2001a; Walgren 2001b). Ice plant occurs on-site as well. While ice plant is

generally undesirable compared to native species, it is a sensitive habitat in this case and should be protected when it is potentially inhabited by an endangered species.

The proposed project is required to comply with Section 7 of the federal Endangered Species Act. Accordingly, the U.S. Environmental Protection Agency (USEPA) has requested a formal Section 7 consultation with the USFWS to address all terrestrial impacts to federally listed species (USFWS 2002a; USEPA 2001a; USEPA 2002). On November 27, 2001, the USEPA sent a letter to USFWS requesting informal consultation determination (Duke 2001m; Attachment One, page 2, USEPA 2001a). The USFWS responded on January 18, 2002, stating that several major concerns required attention from the Applicant in order for the USFWS to concur with USEPA (USFWS 2002a). The USFWS subsequently decided to proceed with a formal consultation regarding the following species: the endangered Morro shoulderband snail, the threatened California red-legged frog, the endangered tidewater goby, the threatened southern sea otter, and the endangered least Bell's vireo (USFWS 2002a). Impacts to the brown pelican may also be addressed.

TERRESTRIAL BIOLOGICAL RESOURCES Table 1 lists plant and animal species recognized as being of special concern or protected under state and federal laws. The species in the table have been documented to occur (indicated with a "D" listed in the first column) or are likely to occur within a one-mile radius of the MBPP. Thus, they may occasionally occur on-site and rely upon habitats within or adjacent to the MBPP site, including the marine environment.

TERRESTRIAL BIOLOGICAL RESOURCES Table 1
Terrestrial and Marine/Estuarine Special Status Species
Likely to Occur within One Mile of MBPP

Occurs within one mile	Scientific Name	Common Name	Legal Status Federal/State Other
Plants			
N	*Arctostaphylos morroensis*	Morro manzanita	FT
D	Calochortus clavatus var. clavatus	Club-haired mariposa lily	CNPS 4
N	Calystegia subacaulis ssp. Episcopalis	Cambria morning-glory	CSC CNPS 1B
N	*Chorizanthe breweri*	Brewer's spineflower	CNPS 1B
N	*Cirsium fontinale var. obispoense*	Chorro creek bog thistle	FE
D	Cordylanthus maritimus ssp.Maritimus	Salt marsh bird's-beak	FE /SE CNPS 1B
N	*Dithyrea maritima*	Beach spectacle-pod	FSC/ST CNPS 1B

D	Dudleya abramsii var. bettinae	San Luis Obispo serpentine dudleya	FSC CNPS 1B
D	Dudleya blochmaniae ssp. Blochmaniae	Blochman's dudleya	FSC CNPS 1B
N	*Erigeron blochmaniae*	Blochman's leafy daisy	CNPS 1B
N	*Eriodycton altissimum*	Indian knob mountainbalm	FE/SE
D	Erysimum insulare ssp. Suffrutescens	Suffrutescent wallflower	CNPS 4
N	*Layia jonesii*	Jones's layia	FSC CNPS 1B
N	*Malacothrix incana*	Dunedelion	CNPS 4
D	*Mucronea californica*	California spineflower	CNPS 4
D	*Suaeda californica*	California seablite	FE CNPS 1B
Fish			
D	*Oncorhynchus mykiss*	Central California coast steelhead trout	FT
D	*Eucyclogobius newberryi*	Tidewater goby	FE/CSC
Mollusks			
D	Helminthoglypta walkeriana	Morro shoulderband snail	FE
Insects			
D	*Icaricia icarioides moroensis*	Morro Bay blue butterfly	FSC
Herpetofauna			
N	*Taricha torosa*	California newt	CSC
D	*Anniella pulchra*	California legless lizard	FSC/CSC
D	*Clemmys marmorata pallida*	Southwestern pond turtle	FSC/CSC
D	*Rana aurora californica*	Red-legged frog	FT
N	*Scaphiopus hammondi*i	Western spadefoot toad	FSC/CSC
D	*Phrynosoma coronatum*	Horned lizard	FSC/CSC
D	*Thamnophis hammondii*	Two striped garter snake	CSC
Birds			
D	*Gavia immer* (nesting)	Common loon	CSC/MNBMC
D	*Pelecanus occidentalis*	California brown pelican	FE/SE
D	*Phalacrocorax auritus* (rookery)	Double crested cormorant	CSC
D	*Ardes herodias* (rookery)	Great blue heron	CDFSC

D	*Botaurus lentiginosus*	American bittern	MNBMC
D	*Accipiter cooperi*	Cooper's hawk	CSC
D	*Accipiter striatus*	Sharp shinned hawk	CSC
D	*Circus cyaneus*	Northern harrier	CSC
D	*Elanus leucurus*	White-tailed kite	FP
D	*Aquila chrysaetos*	Golden eagle	CSC
D	*Falco peregrinus* (nesting)	Peregrine falcon	FE Delisted/SE
N	*Laterallus jamaicensis*	California black rail	FSC/ST
N	Rallus longirostris obsoletuss	California clapper rail	FE/SE
D	*Charadrius alexandrinus* (nesting)	Western snowy plover	FT/CSC
D	*Sterna antillarum*	California least tern	FE/SE
D	*Brachyramphus marmoratus*	Marbled murrelet	FT/SE
D	*Athene cunicularia*	Burrowing owl	FSC/CSC
D	*Empidonax traillii*	Willow flycatcher	SE
D	*Lanius ludovicianus*	Loggerhead shrike	FSC/CSC
D	*Riparia riparia*	Bank swallow	ST
D	*Dendroica petechia*	Yellow warbler	CSC
Mammals			
N	*Dipodomys heermanni morroensis*	Morro bay kangaroo rat	FE/SE
D	*Neotoma fuscipes (luciana)*	Monterey dusky-footed woodrat	FSC/CSC
N	*Neotoma lepida intermedia*	San Diego desert woodrat	FSC/CSC
D	*Enhydra lutris*	Southern sea otter	FT

Source: Duke (2000a) Table 6.6B-2, Duke 2001h, Attachment 27.

D = the species has been documented to occur historically within 1 mile radius of MBPP site.
N = there is no available historical record of the species' occurrence within 1 mile radius of MBPP site. However, this lack of data does not completely preclude the possibility that the species may occur in suitable habitat(s).

Status legend: CNPS List 1B = Plants rare or endangered in California and elsewhere, CNPS4=Plants of limited distribution (California Native Plant Society 1994), FE = Federally listed Endangered, FT = Federally listed Threatened, FSC = Federal species of concern, FPT = Federally Proposed (Threatened),

FC = Federal Candidate, CSC = CDFG species of special concern, CDFG-sensitive = Species that warrant special protection during timber operations, FP = CDFG fully protected, ST = State listed Threatened, SC = State Candidate (Endangered) SE = State listed Endangered, MNBMC = Fish and Wildlife Service Migratory Nongame Bird of Management Concern.

Terrestrial surveys were conducted to search for the special status plant and wildlife species listed in TERRESTRIAL BIOLOGICAL RESOURCES Table 1. For a complete list of species observed, refer to Duke (2000a) Appendix 2. The surveys did not detect living terrestrial threatened or endangered plant and wildlife species inhabiting the larger 107-acre project site, but the federally endangered steelhead trout (*Onchorhynchus mykiss irideus*) was observed in Morro Creek (Duke 2000a, page 6.6B-63). The federally endangered Morro shoulderband snail (*Helminthoglypta walkerina*) shells were found on the 107-acre site, although none were alive nor near the proposed new power plant site.

Special Status Mollusk: The Morro shoulderband snail *(Helminthoglypta walkeriana*) is a federally endangered species that inhabits the vicinity of the MBPP (Duke 2000a, pages 6.6B-67 to 69; Duke 2001h, pages 34-37; Walgren 2001b). As such, all adverse impacts to this species must be avoided, minimized, and mitigated as necessary.

Protocol-level surveys were conducted in January, February, and April of 2001. The surveys detected six empty shells of the Morro shoulderband snail on the MBPP property (Duke 2000a, page 6.6B-69; Duke 2001h, page 35, Appendix 22, Figure 4; USEPA 2001a). These shells were found in the southeastern area of the site an area that is heavily disturbed. No live or dead snails were detected in the dune strand and dune scrub habitats along the western edge of the site.

The California Department of Parks and Recreation (DPR) has provided additional new survey data from December 2, 2001-March 2002 indicating that Morro shoulderband snails are reproducing and persisting in both the project vicinity, as well as inland in San Luis Obispo (see Impacts section for more details)(Huffman-Broadway 2002c). Protocol-level surveys were also initiated on March 28, 2002 for the Craft temporary parking area and the ESHA near the site of the proposed temporary footbridge (Terry Huffman, update on March 28, 2002 at CEC workshop on terrestrial biology). Survey results for Camp San Luis Obispo and the Craft temporary parking area are expected in late May 2002 or thereafter. Impacts, use, and mitigation for impacts to these areas will be discussed and determined after the data have been collected, in consultation with the USFWS and CDFG.

Special status birds: There are numerous special status birds which may fly over, forage nearby, or nest and roost in vegetation within or near the MBPP site (Duke 2000a, pages 6.6B-76 to 83). See TERRESTRIAL BIOLOGICAL RESOURCES Table 1. Morro Bay is part of the avian migratory route known as the Pacific Flyway. During migration and winter (June-March), over 25,000 birds may be counted in one day, and as many as 89 bird species have been documented in the area (Gerdes et al. 1974). The most abundant species are shorebirds and wading birds, commonly observed feeding in mudflats, along beaches, and other estuarine habitats (Gerdes et al. 1974). All direct and indirect impacts to special status bird species and their habitats must be avoided and mitigated as necessary.

The snowy plover (*Charadrius alexandrinus*) is a shorebird that is federally threatened and is a California Species of Special Concern. Critical habitat has been designated for this shorebird on the beach and dunes west of the project site (Duke 2001h, pages 38-41 and Attachment 23; USFWS 2001a). This species has nested in this area near Morro Rock as recently as 1997. The major causes of decline for this species include habitat destruction and habitat and nest disturbance due to human activities. This species is highly endangered by disturbances from human recreational activities (CCC 2001a; USFWS 2001a). DPR conducts an ongoing program in the area to protect this species from human encroachment.

The peregrine falcon (*Falco peregrinus*) nests on Morro Rock west of the proposed project. This falcon is a federally de-listed endangered species, but is listed as state endangered. In 2001 two nesting pairs were confirmed for the first time on the rock (Walton 2001; Walton 2001a). Since 1970, there has been a nesting pair breeding on the rock (Walton 2001; Walton 2001a). This falcon species inhabits Morro Bay year-round and forages for avian prey in the general vicinity of the project area.

A burrowing owl (*Athene cunicularia*) inhabited the northwestern corner of the MBPP site in 1999. This species is a California Species of Special Concern and a Federal Species of Concern. Additionally, within and adjacent to the riparian habitats, that exist along the northern and eastern border around the power plant area, there may be warblers, woodpeckers, flycatchers, swallows, red-shouldered and red-tailed hawks, accipiters, and black-crowned night heron rookeries (staff site visit June 20, 2001; Zeiner et al. 1990).

Special status reptiles and amphibians: There were seven special status species identified as being historically present in the area, including the federally threatened California red-legged frog (*Rana aurora californa*). Species-specific surveys conducted in the summer of 2000 did not find individuals, egg masses, or populations of this species on-site in potentially suitable habitat (Duke 2000a, pages 6.6B-71 to 72; USFWS 1998). The California legless lizard (*Anniella pulchra),* a federal and state species of special concern*,* may occur in the dune strand on and adjacent to the site, although it was not detected during surveys conducted by the Applicant's consultant in January, February, and April of 2001 (Duke 2001h, page35; Zeiner et al.1988). All adverse impacts to these species and their habitats must be avoided and/or mitigated as necessary.

Special status mammals: No special status mammals were detected on site. The Morro Bay Kangaroo Rat (*Dipodomys heermanni morroensis*) is a federal and state endangered species whose range is restricted to coastal scrub and chaparral habitats in Los Osos, which is at the southern end of Morro Bay (Zeiner et al. 1990a). This species is nocturnal and defends small (30-120m^2) home ranges (Zeiner et al. 1990a). The Applicant did not survey for this kangaroo rat species due to a lack of appropriate habitat at the project site (Duke 2000a, page 6.6B-83). Neither the nocturnal Monterey dusky-footed woodrat (*Neotoma fuscipes luciana*), nor the San Diego desert woodrat (*Neotoma lepida intermedia*), both state and federal Species of Special Concern, were detected on site (Duke 2000a, pages 6.6B-48 to 84; Zeiner et al. 1990a). Habitats for these species include succulents and scrub habitats (Zeiner et al. 1990a). Because

these habitats exist near the power plant, there may be impacts to the woodrat species from the demolition, construction, operation, and maintenance of the MBPP.

Special Status Insects: The Morro blue butterfly (*Icaricia icarioides moroensis*) is a federal species of special concern. This species prefers habitats near the proposed MBPP that contain its preferred host plant, the silver beach lupine (*Lupinus chamissonis*) (Duke 2000a, page 6.6B-69). A population of monarch butterflies (*Danaus plexippus*) inhabits and over-winters within the eucalyptus and pine trees on the south side of the MBPP property (Duke 2000a, page 6.6B-70). The California Natural Diversity Database (NDDB) lists concern for monarch butterfly wintering sites but the species is not state or federally listed, nor is it a federal or state species of concern.

Special Status Plants: There are 16 special status plant species known to inhabit the region, however, none of the species listed in TERRESTRIAL BIOLOGICAL RESOURCES Table 1**,** including 4 federally listed species, were detected on-site (see also Duke 2001h, pages 29-34).

Special Status Fish: The California steelhead trout *(Oncorhyrnchus mykiss)* is a federally threatened and state endangered species that inhabits Morro Creek within the MBPP project site. (Duke 2000a, page 6.6B-66; Moyle et al. 1995). The population of Morro Creek is considered an evolutionarily significant unit (Duke 2000a, page 6.6B-66). Morro Creek currently supports steelhead trout populations of varied age classes (Duke 2001h, pages 47-48). Thus, impacts to Morro Creek should be avoided during MBPP construction, operation, maintenance, and closure. Willow Camp Creek flows into Morro Creek from the south/southeast and is a smaller, channelized, and intermittent creek, which no longer provides suitable steelhead habitat (Moyle et al. 1995).

Off-Site Satellite Parking Area

The off-site satellite parking area is proposed for a 10-acre parcel of land on the south side of Highway 1 in an unincorporated portion of San Luis Obispo County east and south of the MBPP (TRC 2001c, Figures 1 and 2; Duke 2001h Attachment 10). Quintana Road borders the southern side of the property. The site is flat and most of the 10 acres have historically been cultivated for hay crops (TRC 2001c, page 1). A veterinary clinic is located in the western part of the property, and the entire property is enclosed by a barbed-wire fence. According to the TRC report (TRC is a consulting firm working for the Applicant), the parking area will be restricted to 5 acres (Duke 2001h, page 21 reports impacts to 3 acres). The temporary parking area will be created by removing the existing vegetation, depositing geotextile material to prevent erosion, and finally, depositing a 4-inch thick layer of crushed rock (TRC 2001c, page 1). The site will be restored to agricultural use through removal of the crushed rock and geotextile material once Duke's use of the site is finished (TRC 2001c, page 2).

Special status species were not observed on-site during biological surveys conducted on behalf of the Applicant (TRC 2001c, pages 9-11). However, the CNDDB contains observations of the following special status species within a 2 mile radius: Blochman's dudleya (*Dudleya blochamaniae*), San Luis Obispo serpentine dudleya (*Dudleya abramsii*), Cambria morning glory (*Claystegia subacaulis*), Jones' layia (*Layia jonesii*), Chorro Creek bog thistle (*Cirsium fontinale*), steelhead trout, and the California red-

legged frog (TRC 2001c, page 10). On-site habitat conditions no longer support the above plant species, and the creek does not contain steelhead anymore. This area was not surveyed for California red-legged frog. But, they are considered present unless additional surveys show otherwise.

A portion of the site lies within the coastal zone, and is subject to California Coastal Commission (CCC) jurisdiction (TRC 2001, page 10). The site is adjacent to riparian and native scrub such as coyote bush (*Baccharus pilularis*), forb species such as poppies (*Eschscholzia californica*), and grassland habitats to the west. These habitat patches are presently degraded, disconnected, and unlikely habitats for the red-legged frog although use of this area will include protective measures to avoid impacts to the ephemeral drainage on-site (Duke 2001h, pages 54-62). Other special status species, especially passerines, diurnal raptors, and owls may use this site for foraging and possibly nesting (TRC 2001c, page 10).

Off-Site Construction Staging Areas at Camp San Luis Obispo

On June 20, 2001, Duke submitted information regarding the proposed construction equipment storage areas. The Applicant proposes to use three areas at Camp San Luis Obispo (8 miles southeast of Morro Bay) for storing large equipment related to construction of the MBPP. A total of 39.2 acres will be used for this purpose. The three areas are: Area A/B (entirely paved 4.8 acres), area C/D (12.4 acres of which approximately 50% is paved) and area E (fallow grasses and forbs, 22 acres). Camp San Luis Obispo is owned and operated by the State of California and has served multiple purposes ranging from military training to agriculture, mining, and residential activities.

Area A/B is adjacent to riparian and upland communities that provide quality habitat for many sensitive species including the California red-legged frog (*Rana auroroa draytonii*) and Morro shoulderband snail. Surveys for this frog species detected the species in many locations. It occurs in many local drainages and there are recent historical records of its occurrence in the CNDDB (Duke 2001h, page 58). This site is not critical habitat for this frog species because of its designation as a military training site. However, open vegetation in Area A/B provides dispersal habitat between riparian habitats.

On March 14, 2002 several Morro shoulderband snails were found at one of the construction laydown areas at Camp San Luis Obispo. On March 23, 29, and April 5, 2002, surveys detected numerous individuals of this endangered snail within specific laydown areas C/D and E, as well as within the habitats surrounding the proposed areas of use (Huffman-Broadway 2002c). Protocol level and non-protocol level surveys have been underway since late March. The protocol level surveys may not be complete until next fall and winter. Upon completion of the surveys, the potential for and extent of use of these laydown areas (A/B, C/D, and E) will be determined, as will mitigation requirements. Consultation with the USFWS, CDFG and other appropriate agencies is ongoing.

Other federally listed species which may occur in the area include: steelhead trout, Least Bell's vireo (*Vireo bellii pusillus*), California condor (*Gymnogyps californianus*), the state threatened Swainson's Hawk (*Buteo swainsoni*), as well as the special status species listed in Attachment 2 (Duke 2001j). None of the aforementioned species were

reportedly observed at the site. There are also several bat species, which inhabit buildings within the staging areas. The grass fields and fallow areas and ditches in Area E may provide habitat for burrowing owl. There are potentially 17 sensitive plant species in the region, but none have been detected within the areas impacted by the proposed laydown area due to the disturbed habitat conditions. One species, the federally endangered Chorro Creek bog thistle (*Cirsium fontinale var. obispoense*), was specifically reviewed and was not detected on site.

PROJECT SPECIFIC IMPACTS

FACILITY DEMOLITION AND CONSTRUCTION

The construction of the proposed MBPP, if approved, will proceed in three major phases:

- Removal of the on-site tank farm;
- Construction of the new power plant in the former location of the tank farm; and
- Demolition of the existing 1,002 MW power plant in the southern portion of the site.
- Demolition of the tank farm will impact 19 acres of natural ground, gravel surface, earthen berms, asphalt paving, and equipment foundations in the north portion of the site. Tank farm demolition and soil remediation is predicted to require 3 months of activity within the existing industrial area. Demolition should not directly impact designated critical habitats or known habitats of special status species. To ensure this, pre-demolition surveys and avoidance and minimization measures will be required. However, increased levels of noise, lighting, dust, traffic, and human activity may cause indirect impacts. Overall, the biological impacts due to the removal of the tank farm will be insignificant upon implementation of all required mitigation measures. (Please see the Hazardous Waste, Soil and Water, Traffic and Transportation, and Air Quality sections of the FSA for additional analyses of the demolition of the tank farm).

Construction of the new power plant will require approximately 21 months of construction activity, as well as the establishment of numerous on-site and off-site temporary facilities. The construction access road will disturb sensitive dune scrub habitat and construction traffic may pose significant hazards to wildlife unless mitigated (Duke 2001m; pages 12-16). Installation of a permanent bridge spanning Morro Creek, as part of the construction access road, is also proposed. There will be other potentially significant, yet mitigable, impacts from noise and pollution (please see the Air Quality, and Soil and Water sections of this FSA). Impacts to biota are potentially significant during construction, due to the requirement for temporary parking and storage areas, the use of heavy equipment, and the installation of bridges and roads. The specific impacts, caused by specific MBPP project components, are detailed individually below.

Demolition of the existing power plant, including the exhaust stacks for Units 1 to 4, will take place on industrial asphalt surfaces. This demolition is planned to occur after construction of the new power plant. Noise, air pollution and traffic are among the greatest threats to terrestrial biological resources during this phase. This process will

require at least 36 months of activity on site. All mitigation measures to avoid and minimize impacts to biota will need to be implemented to ensure less than significant impacts.

Demolition and construction activities will also result in indirect adverse impacts to terrestrial biological resources, such as those resulting from noise, air pollution, lighting, human activity, and traffic. These indirect impacts would be significant without adequate avoidance and minimization measures, including those proposed by the Applicant (Please see the Noise, Air Quality, Soils and Water, and Traffic and Transportation sections of the FSA for additional information on mitigation measures).

Power Plant - Terrestrial Impacts

The existing power plant and associated buildings and parking areas occupy approximately 14 acres, all of which is presently paved and lies adjacent to the existing 24-acre Pacific Gas and Electric Morro Bay Switchyard (Duke 2001b part II, page 1). Outside this industrial area, direct impacts will result due to the permanent and temporary disturbance of habitats from the on-site and off-site facilities for the proposed MBPP. The project's permanent and temporary impacts to wildlife habitats, such as dune scrub, riparian, and grassland are summarized in TERRESTRIAL BIOLOGICAL RESOURCES Table 2 (Duke 2001l pages 9-11).

TERRESTRIAL BIOLOGICAL RESOURCES Table 2
Direct Impacts of the MBPP
Permanent and Temporary Habitat Impacts
Does not include Industrial Land Uses on the MBPP Site

Location	*Permanent Impacts (Acres)*	*Temporary Impacts (Acres)*
Gas Pipeline and Temporary Footbridge (Willow Camp Creek)	0	0.4
Access Road (disturbed dune scrub and grassland)	0.33	0
Embarcadero Extension (including roadway, bikeway and pedestrian path)(disturbed dune scrub and grassland)	0.77	0
New Front Access Gate (grassland)	0.3	0
Bike and Pedestrian paths (around south border and Embarcadero) (disturbed grassland)	0.84	0
Permanent Bridge (Morro Creek)	0	0.1
Soil Remediation West Tank Farm (dune scrub)	0	0.1
Craft Parking Lot (riparian-disturbed)	0	4.0
Access to Craft Parking area	0.5	0
Camp San Luis – 3 Staging Areas (grassland in areas C/D and E)	0	39.2*
Camp San Luis Obispo (road improvements)	0.03	0
Satellite parking site (agricultural crop)	0	5.0**
Total dune scrub	1.1	0.1
Total upland including grassland/riparian	1.67	48.7

Source: Duke 2001g, page 8; Duke 2001l, pages 9-11.
* At the March 21, 2002 workshop, the Applicant stated that impacts were temporary.
**Duke 2001g, lists 5 acres, however, Duke 2001l lists 3 acres.

The following sections discuss specific impacts of the main MBPP project site and vicinity on terrestrial biological resources.

On-site Impacts to Habitats and Special Status Species

The sensitive habitats surrounding the proposed power plant, including riparian and dune scrub habitats, will be physically disturbed during both construction and operation of the proposed project. The impacts will be both direct and indirect in nature. Direct impacts will result from the creation of the construction access road, which will transect sensitive habitats. Significant indirect impacts to wildlife will result from the road and traffic, as vehicles, cyclists, pedestrians use the road and bike path, especially after the MBPP construction is finished (see section below on road and bike path).

Impacts to Coastal Dune Scrub Habitat

The permanent loss of approximately one acre of dune scrub on the west side of the site may result in direct habitat loss as well as in barriers to the migration and dispersal of special status species. Special status species that may be directly impacted on-site and within the project vicinity include: Morro shoulderband snail, steelhead trout, California red-legged frog, California legless lizard, Morro blue butterfly, and other special status plants listed in TERRESTRIAL BIOLOGICAL RESOURCES Table 1 (see Duke 2001h, pages 29-34). All of these species have the potential to exist in the MBPP project area. Therefore, they may be significantly impacted without appropriate mitigation, including habitat mitigation and avoidance and minimization measures. The Applicant's terrestrial surveys did not detect living individuals of these species either on-site or on the adjacent coastal dune scrub property. Yet, the DPR has recently found live Morro shoulderband snails in the vicinity of the MBPP site (Duke 2000a, pages 6.6B-63 to 71; Duke 200h, Attachments 26 and 28; Walgren 2001b).

Impacts to Morro Shoulderband Snail

Impacts to Morro shoulderband snail have been a focal concern for this project. This species inhabits coastal dune scrub habitats such as those surrounding the proposed MBPP. In June 2001, a special meeting was held to discuss results of a second survey for the Morro shoulderband snail. The survey found the empty shells of this species on site after the filing of the AFC (Duke 2001h; pages 35-36).

In November, staff received information from DPR in Morro Bay regarding the documentation of Morro shoulderband snails north of Morro Creek along Highway 41(Roth 2001a; Walgren 2001a). The snail shells found belonged to juvenile snails found near the road under iceplant.

There is evidence that populations of Morro shoulderband snail are present within the vicinity of the areas designated for the proposed power plant. DPR provided information related to their ongoing comprehensive surveys designed to document Morro shoulderband snail occurrence in Morro Strand State Beach (Walgren 2001b; DPR 2001a). The first survey was conducted on December 2, 2001 during the rainy season in what were previously thought to be unsuitable habitats characterized by non-native European beachgrass (*Ammophila arenaria*) and iceplant (*Mesembryanthemum sp*.). The location of the survey was approximately 1,500m (0.9 miles) north of the MBPP site, and within (39meters (100 feet) of Hwy 41, a road proposed as the construction access road for the MBPP. The initial survey found the following:

1) 1 live Morro shoulderband snail under a medium-sized *A. arenaria*;
2) 15 fresh Morro shoulderband snail shells, ranging from small-large;
3) 3 unidentified egg masses, similar to snail eggs; and
4) 2 faded old Morro shoulderband snail shells.

Seven of the fresh shells were within 2.1 meters (7 feet) of each other near egg masses and under a native forb, buckwheat (*Erigeron sp*.). Staff has subsequently received three additional updates from DPR regarding their ongoing surveys. All of the surveys reported detection of additional living Morro shoulderband snails as well as young and fresh shells. The results of these ongoing and recent surveys, conducted by an independent agency permitted to study this species, confirms the presence of living and reproducing individuals near the proposed MBPP site, in habitat that occurs on the proposed MBPP site (ice plant). Together, the results indicate that the project area, while low in snail densities, potentially provides habitat for a persisting Morro shoulderband snail population (Roth 2001a; DPR 2001a; Walgren 2001a; Walgren 2001b). Thus, any adverse impact to snail habitat is significant. Furthermore, the potential for incidental take of this species due to project-related activities is significant, particularly along the construction access road to the north of the proposed MBPP site.

On March 21, 2002, staff held a public workshop, which was attended by representatives of the CDFG, USFWS, CCC, DPR, CAPE, the Applicant, the City of Morro Bay, and members of the public. During this workshop participants discussed, in detail, the significance of habitat impacts and potential mitigation measures for impacts to the Morro shoulderband snail. As discussed below in the **Mitigation** section, impacts to Morro shoulderband snail are not fully determined for proposed project activities at Camp San Luis Obispo, and the on-site Craft Parking Area because biological surveys in these areas are continuing. Protocol level Surveys for Morro shoulderband snail may need to be continued next fall and winter (rainy season). Mitigation will need to be finalized after the critical information becomes available.

Impacts to Snowy Plover

Morro Strand State Beach has been designated as critical nesting habitat for the snowy plover (*Charadrius alexandrinus*) (Duke 2001h, page 39; USFWS 2001). The MBPP will not directly impact the nesting habitat for this species. However, construction of a permanent bridge across Morro Creek, along with the associated installation of a permanent paved road, will enable more humans and animals to access the area. The bridge will be within 400 meters (0.25 miles) of the designated critical nesting and winter foraging habitats of the plover.

The following quote is from the USFWS biological opinion for the U.S. Air Force's 2001 interim beach management plan at Vandenberg Air Force Base. It is included to illustrate the significant adverse impacts from public recreational use of the snowy plover beach habitat like those found in Morro Bay. (Italics indicate the quotation.)

- Human activities such as walking, jogging, unleashed pets, horseback riding, and off-road vehicles can destroy the western snowy plover's cryptic nests and chicks.

- Indirect impacts from these activities include disturbance of western snowy plover adults to the extent that they abandon nests or interference with incubation to the point that eggs become buried by sand or fail to hatch because of exposure to cold or heat (Warriner et al. 1986). Western snowy plovers do not usually abandon their nests because of wind without another compounding factor such as human disturbance (Page, pers. comm.).
- Human activities can also interfere with foraging activities by disrupting the ability of adults and chicks to get to the wet beach to feed and return to the dunes or their nest (Burger 1993).
- Chicks can also become separated from their parents as a result of human disturbance of broods. Such disturbance could cause or contribute to chick mortality by interfering with essential chick-rearing behaviors or by causing intolerable stresses directly to the chicks (Cairns and McLaren 1980). For example, separation of chicks and their parent can lead to lethal exposure to wind and cold temperatures or disturbance that interferes with foraging could result in the starvation of western snowy plover chicks. (end of USFWS quote)

The Draft Recovery Plan lists Atascadero Beach (Figure L-104) in Morro Bay, as a critical nesting area and lists management actions needed to achieve target recovery goals for this species. Table B-1 of the Plan (page B-15) lists a goal of 40 breeding pairs for Atascadero Beach as well as a winter population goal of 67-153 plovers. Specific types of management measures are recommended in Table C-1 of the Plan (page C-18). These include: restrictions on access by humans, pets, horses, vehicles, prohibition of flying kites during breeding, monitoring of the plover population, distribution of educational materials to the public, enforcement of protective measures, and restoration of habitat (USFWS 2001a). The proposed road, pedestrian and bicycle paths, and permanent bridge over Morro Creek will contribute significantly to the existing degradation of nesting and wintering habitats, to depredation of nests, to decreased nest success, and to decreased plover survival in this area. Mitigation measures, including those listed in the Draft Recovery Plan, are recommended to lessen adverse impacts to less than significant levels.

Impacts to the California Red-legged Frog

The California red-legged frog inhabits riparian habitats and breeds in deep standing pools and streams (Duke 2001h; Zeiner et al. 1988). Although this species was not detected during on-site surveys (although there was an unconfirmed report of one frog vocalization), the removal and degradation of potential habitat within the ESHA along Morro and Willow Camp Creeks would constitute significant impacts, and must be avoided. Construction-related activities, parking, traffic, and the installation of the temporary footbridge, and permanent gas supply pipeline will also result in significant adverse impacts to this species absent implementation of mitigation measures.

Impacts to the Steelhead Trout

Morro Creek is critical habitat for Steelhead trout (Oncorhyrnchus mykiss) (Duke 2001h, page 47). Steelhead of several age classes were detected during surveys of Morro Creek in June 2001 (Duke 2001h, pages 47-48). No habitat for this species will be lost or significantly altered. However, there is a potential for significant adverse impacts

during construction, demolition, operation, maintenance, and closure of the MBPP. Such impacts include pollution and habitat degradation. The Applicant must avoid impacts to Morro Creek in order to prevent the occurrence of significant adverse impacts. The following discussion regarding proposed bridges provides additional information relevant to this species.

Impacts of Bridge Crossings

A permanent clear-span bridge is proposed to enable construction equipment access across Morro Creek (Duke 2001h, page 13). The Applicant will dedicate the bridge to the City of Morro Bay after construction. The bridge will then be available for use by pedestrians, bicyclists, and emergency and maintenance vehicles. Thus, the bridge will create a continuous road system for Embarcadero Road to the north side of Morro Creek (Duke 2000a, page 6.6B-101). The bridge will be approximately 24 ft. wide and 150 ft. long and will be supported by two concrete footings set 10-15 ft. back from the top of the stream banks (Duke 2001h, pages 13-14).

The Applicant plans to avoid any disturbance of Morro Creek and associated riparian habitat by completely spanning this sensitive area, thereby avoiding direct and indirect impacts to these areas and the steelhead in the creek. No riparian vegetation will be removed during installation and all parts of the bridge will remain outside the stream channel and banks.

The bridge construction phases will use best management practices to avoid impacts to Morro Creek (Stream Protection Plan Duke 2001j). Consultation with the USFWS, U.S. Coast Guard (USCG), and U.S. Army Corps of Engineers (USACE), were required. The UCACE and USCG have issued letters summarizing their review and indicating approval of the bridge (USCG 2001; USACE 2001). The USFWS consultation is underway and protection for this species will be included in the Biological Opinion. Thus, no significant impacts are expected from the construction of the bridge on steelhead trout and Morro Creek in general.

The CDFG has expressed concerns with the bridge and the associated road, which connects the bridge to the power plant. If the road is improved, widened and connected to the north side of Morro Creek, there would be increased vehicular, bike, and pedestrian traffic through an area of dune scrub habitat. This will likely exacerbate and accelerate the degradation of snowy plover habitats as a result of increased traffic flow, increased non-point source pollution from vehicular traffic, and by increased access to the sensitive beach areas west of the proposed project (as discussed above).

A second full-span temporary footpath bridge has been proposed across Willow Camp Creek in order to connect the main plant site with the temporary Craft parking area (Duke 2001g). The bridge will be installed directly above the work area created during installation of the gas pipeline (discussed in the following section). The bridge will be removed once construction is completed and the channel of the creek will not be impacted by equipment during construction and use of the bridge. Detailed installation methods for the bridge are provided in Duke (2001g) and the Applicant plans to mitigate for impacts to the creek and comply with the CDFG Streambed Alteration Agreement, thus minimizing impacts to less than significant levels (Duke 2001j).

Impacts of Roads

An access road will be constructed on the western side of the MBPP facility. A new 100-foot long road will connect the power plant site to an existing dirt road on the west side of the MBPP site. The road will continue north and pass through moderate to degraded dune scrub habitat from the Embarcadero to Morro Strand State Beach. The road will permanently impact 0.77 acres of this habitat. The access road will traverse Morro Creek after installation of a permanent bridge, and will continue north along an existing paved road, that bends east and connects with Highway 1.

Construction equipment is proposed to enter and exit along these access roads for many months (approximately 5 years). The existing dirt road may be widened in some places for use by trucks during construction activities. In addition, the City of Morro Bay is in favor of expanding and improving this road, and constructing the bridge, bike and pedestrian paths. Besides providing bike and pedestrian access, the City wants to use the road and bridge as improved access for emergency response vehicles. The road and trail construction will also result in a uniform road with a consistent width of 36 feet. At present, the width of the sand road is variable and uncontrolled.

As discussed above, staff is concerned that the proposed roads, bridges, and pathways will cause significantly more traffic to pass through the sensitive dune habitats. This may result in more individuals of sensitive species being killed, and may contribute to the continued degradation of the area's habitat. Coastal dune habitat, which is present on both sides of this road, will be permanently removed. Construction traffic may result in incidental take of listed species, such as the Morro shoulderband snail. General public use of the road will also increase, and installation of a paved road along may interfere with natural dune sand movement. Together, these multiple impacts will contribute cumulatively to exacerbate the degradation of this environmentally sensitive area.

Impacts of Bike and Pedestrian Pathways

The Applicant proposes to construct two new bike/pedestrian paths both on-site and along the western border of the proposed MBPP. A Class I path will be constructed along the south side of the MBPP (on-site) to provide access from Main Street to Embarcadero (Duke 200h, Attachment 12). This area has some large Eucalyptus trees and an understory of nonnative grasses. A Class II path will be constructed to link to an existing Class I path along Embarcadero Road. The existing Class I path along Embarcadero Road will transition into a Class II path as it crosses over the proposed Morro Creek bridge and continues northward towards Highway 1. Together the proposed bike and pedestrian paths will create a loop around the MBPP (Duke 200h, Attachment 12). The bike path will directly disturb and encroach upon the edges of sensitive natural communities, potentially causing habitat degradation, habitat fragmentation. It may also result in indirect impacts such as increased noise, lights, access by domestic and feral animals, and barriers to wildlife dispersal (as discussed above). Mitigation for habitat loss (along the dune scrub habitat) and general avoidance of impacts to pathways of special status species will be required to ensure that impacts will be less than significant

Impacts of the Craft Parking Area

The Craft parking lot will be installed upon a 5-acre area that is currently being used to dump seaweed and debris collected from the cooling water intake structure (Duke 2001. The increased traffic and human activity created during use of this area for parking may significantly impact the ESHA and special status species breeding, roosting, or foraging in the ESHA.

Due to recent local findings of living Morro shoulderband snail (DPR 2001a), it was determined that the ESHA and general area containing the Craft parking area and the proposed temporary bridge should be surveyed for this species. Consequently, protocol level surveys were initiated on March 28, 2002 to determine the absence or presence of Morro shoulderband snail. Because the survey protocol requires that five weeks of surveys be conducted during the rainy season (which is ending), the surveys may not be completed this spring. The protocol level surveys for this species will be continued as needed during the next rainy season in consultation with the USFWS.

Impacts of Proposed Landscape Screening

The Applicant proposes to mitigate for visual impacts with several areas of landscape plantings (Duke 2000a, Figure 6.13; Duke 200h, Attachment 12; Duke 2001 Attachment 18). Duke (2001h) Attachment 18 contains the plant species list for landscaping. This list is comprised of many native, locally abundant, and non-invasive plant species. The landscaping plants will not adversely impact special status species and will provide cover and habitat for wildlife. Staff also recommends that existing ESHAs and natural or native communities, including the exotic eucalyptus trees relied upon by the monarch butterflies, not be removed during installation of new landscaping. The Applicant's use of adaptive management for landscaping will assist in minimizing adverse impacts and maximizing the longevity and success of this aspect of the project. The adaptive management plan will need to be reviewed and approved by staff in consultation with USFWS and CDFG.

The Eucalyptus trees in the ESHA along the southern edge of the MBPP will not be directly impacted by MBPP facilities, however the habitat must be protected because it provides critical roosting habitat for Monarch Butterflies (*Danaus plexippus*). Any pruning, thinning, removal, or disturbance of the trees in the southern area must be surveyed carefully by a qualified biologist beforehand so that adverse impacts to the butterfly and other wildlife using the area are avoided. Specific details for how this area will be "adaptively" managed will be determined in consultation with the USFWS and CDFG.

Linear Facilities

Impacts of Stormwater and Natural Gas Pipelines

New stormwater pipelines and natural gas pipelines will be placed underground on the existing MBPP site. Pipeline construction for stormwater runoff and intake, and natural gas will be limited to on-site tie-ins. The stormwater pipelines would tie-in on-site to the existing pipeline that leads to the outfall located approximately 300 feet south of the MBPP site (refer to **Soil and Water Resources** section of the FSA). No significant biological impacts are expected.

Two natural gas pipelines will extend from the northeastern portion of the site and connect to the existing PG&E regulator station. The pipelines will be 40 ft. long and be installed under a small ephemeral stream named Willow Camp Creek. This creek drains into Morro Creek, which is critical habitat for steelhead trout (Duke 2001I; page 47). Installation of the pipelines will require a CDFG Streambed Alteration Agreement (Duke 2001g; Duke 2001h, page 16-19). The pipelines will be installed using Horizontal Directional Drilling (HDD). This method was chosen during continued consultation with CDFG, USFWS, NMFS, and CCC (Duke 2001g, pages 1-3, Huffman-Broadway 2002a, pages 2-3). Staff expects impacts from installation and operation of the gas line to be insignificant with the use of avoidance and minimization measures as proposed by the Applicant and staff, and through the CDFG Streambed Alteration Agreement process.

Impacts of Transmission Facilities

The project does not require additional transmission line construction, except for installation of short generation ties from the proposed MBPP to the existing PG&E switchyard that is located on the proposed MBPP site (Duke 2000a, page 6.18-2). No data exists that indicates a problem with avian electrocution at the current MBPP and the risk is not expected to increase. Thus, transmission facilities are not expected to cause significant impacts.

Indirect Impacts

Potential causes of indirect impacts include air pollution, noise, lighting, traffic, erosion, and collisions of birds with facility structures. Indirect impacts from noise or air pollution may also impact Morro Rock. Indirect impacts result from construction and demolition activities, as well as maintenance and operation of the facility. Indirect adverse impacts may reduce the effective size of remaining habitats by decreasing the quality, connectivity, and safety of habitats for wildlife (i.e. resting, nesting, foraging, roosting) on-site and on adjacent lands. For example, a burrowing owl was seen using a burrow in the northwest corner of the MBPP site in 1999. This area will not be physically disturbed; however, temporarily increased noise and human activities (i.e. construction, traffic) may adversely affect the owl's use of the area. Once construction is finished, the higher level of human activity due to the construction road, and the pedestrian and bike lanes, may be too high for the owls to tolerate. The disturbance and probable displacement of the burrowing owl is potentially significant, and will need to be mitigated. The Applicant has proposed to mitigate for impacts to this species and with CEC, USFWS, and CDFG-approved mitigation measures, impacts are expected to be insignificant.

Impacts of Air Emissions During Plant Operation

Heat Recovery Steam Generator (HRSG) Emissions: Air emissions from the HRSG stacks will contain air pollutants such as nitrogen oxide gases (NOx), sulfur oxides (SOx), and PM10 (refer to Air Quality Section of this Staff Assessment). Nitrogen oxide gases may be converted to nitrate particulates which, when deposited on the ground, could adversely affect vegetation communities adapted to low nutrients (Weiss 1999). Serpentine soils and their associated plant and insect communities are particularly sensitive to additional inputs of nitrogen because these communities are adapted to low nitrogen levels (Weiss 1999). Additional nitrogen levels from manmade sources such as air pollution may provide invasive species with an advantage and cause the eventual

degradation and extinction of serpentine plant-insect populations (Weiss 1999). Some species, such as the checkerspot butterfly (*Occidayas editha spp. bayensis*) and its primary larval host plant, dwarf plantain (*Plantago erecta*), are threatened due to habitat alteration and degradation via nitrogen "pollution" from urbanized areas (Weiss 1999). Although there are no serpentine soil communities on the MBPP project site, these soils within 2 to 6 km of the proposed MBPP. Some of these areas are associated with the California State Park system (Duke 2001h, page 6, Attachment 9).

The Applicant proposes to use the Best Available Control Technology (BACT) in order to decrease emission levels from those currently being produced by the power plant (see Air Quality Section of this Staff Assessment). The BACT measures include use of selective catalytic reduction for NOx as well as an oxidation catalyst to control carbon monoxide and volatile organic compound (an ozone precursor) emissions (Duke 2000a pages 6.2-74 to 6.2-77; Duke 2001h, page 4). Overall, NOx will be decreased, and volatile organic carbon (VOC) emissions will also be reduced (Duke 2000a, page 6.2-5). SOx and PM10 emissions will increase, however, the resultant ambient concentrations will be below federal and state limits (Duke 2000a, page 6.2-18 to 6.2-22). Based upon the emission levels and proposed mitigation (see Air Quality section of the FSA) no significant impacts are expected to local serpentine soil-plant communities.

Impacts from Noise associated with Plant Construction and Operation

Noise will result from the demolition, construction, and operation of the MBPP (Duke 2001a, Section 6.12). For a detailed analysis of noise impacts and related mitigation measures, refer to the Noise Section of the Final Staff Assessment.

Construction activities will temporarily increase noise levels and frighten wildlife away, disrupt their nesting, roosting, or foraging activities, or prevent them from using the habitats available around the MBPP. Construction equipment, such as concrete mixers, backhoes, jackhammers, trucks, and drills can produce high and startling (yet temporary) noise levels that may range from 75 to 90 dBA. The Applicant states (page 6.6B-100) that the noise contributed by the construction of the MBPP will cause increase of up to 5.5 dB above ambient noise levels. The greatest noise impacts will result from demolition of the tank farm and existing power plant stacks, impacts predicted to continue for approximately 32 months. The noise from these demolition and construction activities is potentially significant, yet temporary. Construction will be restricted to the existing plant site and during specific times of the day (7a.m. to 7p.m. weekdays and 9a.m. to 7 p.m. weekends)(MBPP 2000a, Section 6.12). The impacts of construction noise to biological resources, though potentially significant, can be mitigated to less than significant levels, provided that noise minimization and mitigation measures, including staff's proposed mitigation, are implemented.

Operational noise levels will be higher adjacent to the northern and northeastern border of the MBPP along the ESHA because the new facility will be located in the area of the tank farm. The construction and operation noises generated by the proposed MBPP will significantly impact approximately 2.71 acres of adjacent riparian habitat, which provides habitat for songbirds, and amphibians (Huffman-Broadway 2002b). Species such as reptiles, amphibians and songbirds have been studied to a limited degree in the literature because they are particularly sensitive to noises which may interfere with their

mating songs and calls and other communications (Fletcher and Busnel 1978). The AFC addresses the potential for noise levels to interfere with the male song effectiveness and amphibian vocalization, and the Applicant proposes installation of a sound wall to lessen the adverse impacts (Duke 2000a, page 6.6B-103; Bowles 1995). With appropriate mitigation to reduce noise levels, habitat compensation for impacts to on-site riparian habitat, and prevention of impacts to other local sensitive areas such as Morro Rock, adverse impacts from operational noise will be less than significant.

Impacts of Lighting

Lighting will also be required on-site. Bright night lighting will disturb wildlife activities such as foraging, and navigation during flight (birds, bats, and insects). Lights may also make roosting or nesting birds more visible to predators or in general disturb these activities. Night lighting is also suspected to attract migratory birds to areas, and if the lights are on tall buildings or HRSG stacks, collisions could occur (Duke 2000a, page 6.6B-102). To reduce the likelihood of such impacts, lighting should be shielded and pointed downward. These features will minimize potential adverse impacts and avoid increased light pollution in natural areas such as wetlands, dunes, and riparian habitat (Duke 2000a, page 6.6B-102).

Impacts of Traffic

During demolition and construction the presence and activity of large trucks and varied types of machinery pose threats to wildlife (refer to previous discussion in the section addressing the impacts of the roads, bridges, and human access). Vehicles may crush wildlife and plants and may produce dust, noise, and air pollution within the vicinity of use. These impacts are significant because traffic will continue to enter the site for at least five years and may result in mortality to special status species. Risk of injury is high along the northern end of the construction access road (Hwy 41) because a population of the federally endangered Morro shoulderband snail inhabits the area. Traffic impacts may also be significant in the ESHAs and the off-site parking and staging areas, without approved mitigation. Mitigation measures will be required to avoid and minimize adverse impacts of traffic to biological resources. Mitigation measures related to traffic are recommended to avoid impacts to Morro shoulderband snail, snowy plover, red-legged frog, dune scrub habitat, and ESHAs.

Impacts of Erosion

Soil erosion has been identified as a major cause of environmental degradation of Morro Bay (MBNEP 2000). Without adequate prevention and control of erosion, the MBPP may contribute to cumulative adverse impacts of erosion on the Morro Bay ecosystem. Soil erosion related to terrestrial construction activities can impact aquatic biological resources if allowed to enter Morro Bay. However, the use of appropriate site-specific measures can mitigate potential erosion impacts (Duke 2000a, page 6.6-99). Impacts of construction within and along the sensitive habitats of Morro Creek and Willow Camp Creek must also be avoided or minimized to avoid impacts to sensitive species, particularly steelhead trout and California red-legged frog. A draft erosion control plan shall be submitted to the Energy Commission for review and approval (see Soils and Water Resources section of the FSA). Through implementation of an approved erosion control plan, it is anticipated that aquatic biological resources will not be significantly impacted by erosion impacts from the power plant site.

Impacts of Avian Collision with Stacks

Avian collisions with Heat Recovery Steam Generator (HRSG) stacks occur when the birds are unable to see the stacks during fog and rain events or during migration when birds frequently fly at night (CEC 1995; Kerlinger 2000). Critical factors, which increase the risk of collision include: stack location, size, and visibility, weather conditions (fog, rain), and species-specific flocking and flight behaviors. Nocturnal migrants typically fly 2,000 feet or more above the ground, but may fly lower during inclement weather or due to the physiography of a region (i.e. mountain ridges, or large water bodies).

The site-specific placement of the towers as well as local seasonal bird occurrence and behaviors also contribute to risk factors for avian collision and mortality with stack structures and wires (CEC 1995; Kerlinger 2000; Manville 1999). Specifically, the MBPP is surrounded by beaches, estuaries, and the ocean, which provide attractive foraging habitat for birds such as gulls, pelicans, egrets, herons, ducks and geese, and shorebirds (i.e. curlews and yellowlegs). Raptor species may also be at risk, including peregrine falcon.

Studies of bird collision fatalities also indicate that avian mortalities are significantly associated with structures over 1,000 feet tall. Low numbers of collisions have been reported with structures in the 400-650 foot range (Goodwin 1975; Maehr et al. 1983; Weir 1974; Zimmerman 1975). Because the proposed stacks will only be 145 feet tall, they should pose very small risk of injury to birds. Thus, although an occasional collision can be expected, the proposed stacks are not expected to cause significant numbers of bird collision fatalities.

Impacts to Morro Rock

Morro Rock is part of the DPR system and is a perennial breeding site for cormorants, gulls, peregrine falcons, barn owls, and other special status bird species. Special status plants may also grow there. Consequently, adverse impacts to Morro Rock must be avoided and mitigated to less than significant levels. The potential adverse impacts of noise pollution and air emissions on Morro Rock have been evaluated and have been determined to be insignificant if mitigation measures established in the **Air Quality** and **Noise** sections of the FSA are implemented. Many of the bird species nesting on Morro Rock nest at high elevations that are high enough to protect them from mammalian predators. Also, nests on Morro Rock are reasonably far away from the cars and people that continually mill about the base of the rock. If the birds have been able to adapt to the presence of humans and their associated noise, they are unlikely to be significantly impacted by the more distant construction noises at the MBPP.

Protection of the Peregrine falcons and their nests on Morro Rock from human disturbance as well as any impacts from the proposed project is a high priority. The Applicant has consulted with Dr. Brian Walton, a falcon expert, who specifically evaluated the risk of significant disturbances due to the proposed project's construction and operation noise, air pollution and risk of collision and electrocution (Walton 2001; Walton 2001a). In addition, the Electric Power Research Institute (EPRI) recently reported that the reproductive success and health of Peregrine falcons nesting on power plant stacks in Wisconsin were not adversely impacted by exposure to emissions from the burning of fossil fuels (EPRI 2002a).

In 2001, there were two nesting pairs on Morro Rock, and one nest fledged 3 young in June 2001, while the second pair was re-nesting at that time (site visit July 2001). The Peregrine falcons nesting and inhabiting the project area are subject to scientific study (banding, productivity monitoring) and frequent observation by the public. Dr. Walton concluded that the risk of adverse impacts to the peregrine falcon, as a result of the proposed MBPP, was less than significant. Staff acknowledges Dr. Walton's expertise regarding peregrine falcon ecology and does not anticipate any direct or indirect adverse impacts to peregrine falcons and other birds on Morro Rock from construction, demolition, noise, air pollution, and general plant operation.

Maintenance Impacts

Maintenance activities on the project site include keeping vegetation cleared away from the fence line for fire control. The cutting or pruning of trees in the ESHAs may result in adverse impacts to sensitive species, such as the monarch butterfly. The extensive and inappropriate use of herbicides, rodenticides, and insecticides could potentially cause environmental problems, including mortality of non-target species, and environmental contamination. Use of these products should be kept to a minimum. With the implementation of approved mitigation measures, adverse impacts due to maintenance activities will be insignificant.

Impacts to Habitats and Special Status Species at the Off-Site Construction, Laydown, and Satellite Parking Area

Off-Site Construction Staging Areas at Camp San Luis Obispo

The Applicant proposes to use three areas at Camp San Luis Obispo for the storage of equipment related to construction of the MBPP (Duke 2001h, Attachment 3, Figure 3, Attachment 5). In total, the three areas are approximately 39.2 acres in size. Roughly 30 acres in parcels C/D and E represent grassland vegetation. The southwestern border of Parcel E is contiguous with riparian habitat that supports special status species such as the Morro shoulderband snail, California red-legged frog, and least Bell's vireo (Duke 2001h, Attachment 5). The temporary removal of approximately 30 acres of grassland vegetation (approximately 60% of 12.4 acres within Area C/D, and 22 acres within Area E) may adversely impact foraging, nesting, and dispersal habitats for special status species such as the least Bell's vireo, songbirds, raptors, Morro shoulderband snail, and the California red-legged frog.

During use of the Camp San Luis Obispo site, there will be an average 10 to 20 vehicle trips per 24-hour period. Such activity will result in noise and air pollution produced by the traffic and could potentially cause direct (mortality) or indirect (disruption of behaviors, degradation of habitat quality) harm to sensitive species in the area. The resulting impacts may be significant due to the temporary loss of upland-grassland habitats used by many special status species and indirect disturbance of noise, erosion, and air and noise pollution to riparian habitats. Habitat mitigation and avoidance and minimization measure will be required to ensure less than significant impacts to the California red-legged frog, Morro shouderband snail, and least Bell's vireo.

On March 14, 2002 several live Morro shoulderband snails were found in Area E. After staff's Public Workshop on March 21, 2002, protocol level surveys were conducted at

the proposed laydown areas at Camp San Luis Obispo. These surveys were conducted to determine the abundance and distribution of the snail at Camp San Luis Obispo. Non-protocol level surveys were conducted within surrounding habitats and nearby habitats (Huffman-Broadway 2002c, pages 2-3). In total 39 snails were found within the Staging areas E and C/D (Huffman-Broadway 2002c, Table 1). Staff is awaiting the results of the further surveys so that final impacts analyses and mitigation requirements can be determined in consultation with USFWS and CDFG.

Off-Site Satellite Parking Area

An off-site satellite parking area is proposed for an unincorporated portion of San Luis Obispo County east and south of the MBPP (TRC 2001, Figures 1 and 2; Duke 2001h, Attachment 3, Figures 1 and 2). This parking area is designed to accommodate a maximum of 200 workers (TRC 2001, page 1). The impacts of project-related activity to this area will be temporary in nature because the areas will revert to agricultural production after the Applicant is finished using the area. However, there is a potential for significant adverse impacts to the designated critical habitat of the California red-legged frog (Duke 2001h, page 54; Huffman-Broadway, pages 4-5). In addition, there will be a temporary disturbance of approximately 5 acres of agricultural foraging and nesting habitat for special status species (as noted above in Biological Resources 2). Staff has concluded that biological impacts from the satellite parking area will be insignificant provided appropriate mitigation measures are implemented.

Summary of Terrestrial Impacts

Impacts of the project to terrestrial biological resources are significant because there are endangered species as well as ESHAs in the three areas impacted by the MBPP. The direct impacts of permanent and temporary habitat loss will require habitat compensation and mitigation in order to bring impacts to insignificant levels. Indirect impacts of construction, operation and maintenance to special status species can be mitigated to insignificant levels.

CUMULATIVE IMPACTS

As defined in CEQA Guidelines Section 15355, a cumulative impact is one which results from the combination of impacts associated with the proposed MBPP, in addition to those resulting from separate projects in the region; these additional projects may be underway or may be planned in the future and must cause similar adverse impacts. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Several proposed projects need to be evaluated (Duke 2000a, pages 6.6B-109-110-111, Table 6.1-1, Figure 6.1-2). One particular project in Morro Bay called The Cloisters is a residential housing tract. Like the MBPP, the Cloisters will adversely impact coastal dune scrub habitat, needed by the Morro shoulderband snail, and silver beach lupine. The Cloisters development has been required to provide habitat mitigation. Staff will also require the MBPP to provide local habitat mitigation for project impacts to avoid significant cumulative impacts.

Additional projects in the Morro Bay area that may cause terrestrial impacts include:

- The Morro Bay Airport expansion which would impact small areas of willow scrub, freshwater marsh, and other "waters of the United States". These habitats are not impacted by the MBPP.
- The Woodlands Development, a residential/resort/golf course development proposed to impact 9 acres of central coast scrub.
- The Cypress Ridge Residential Development project on Nipomo Mesa will create 384 residences and impact riparian and coastal dune scrub habitats. Impacts will be mitigated.
- The Guadalupe Oil Field Cleanup will result in unavoidable and significant impacts to riparian and dune scrub habitats.
- The MCI Worldcom project will produce an impact to a small area of coastal dune scrub.
- The Southern California Water Company Water Well project in Los Osos has already resulted in the take of Morro shoulderband snails.

With Staff's approved compensation/mitigation and input from other agencies, the Applicant will be able to fully mitigate terrestrial impacts and the proposed MBPP will not contribute significantly to cumulative terrestrial impacts.

MITIGATION

APPLICANT'S PROPOSED MITIGATION

Demolition and Construction

The Applicant proposed mitigation measures to be implemented at all project locations (see Duke 200a, page 6.6B-2; Duke 2001f; Duke 200h). The following mitigation measures were proposed to avoid adverse impacts to terrestrial biological resources:

- Appoint qualified biological monitors during certain construction activities;
- Implementation of a Coastal Dune Scrub Restoration Plan (Duke 2001i);
- Implementation of a Stream Protection Plan (Duke 2001j);
- Implement an Erosion Control Plan;
- Installation of exclusionary fences and zones of protection around sensitive habitats;
- Preparation of a Worker Environmental Awareness Program (WEAP) discussing protection for all special status species and habitats; and
- Preparation of a Biological Resources Mitigation, Implementation, and Monitoring Program (BRMIMP)(Duke 2001n);

Plant Operation, Noise, and Lighting

The Applicant has proposed the following mitigation for noise and lighting impacts during operation:

- Construction of a 20-ft. tall sound wall along the northern berms of the tank farm with absorptive characteristics on the side facing the plant; and
- Installation of downward-directed and shielded lighting;

Habitat Mitigation

On-site Conservation Easements

The Applicant has proposed to set aside 27.1 acres of wetland, riparian, and dune scrub on the proposed MBPP site into permanent conservation easements through an approved natural resources management organization (Duke 2001l, page 12). During the Public Workshop on March 21, 2002, the Applicant stated that the details regarding these easements were forthcoming. At this time, staff has not received the information.

Purchase of Den Dulk Property

The Applicant purchased the 8-acre Den Dulk property, which lies on the western border of the MBPP and contains disturbed coastal dune scrub, which is intersected by a sandy well-traveled road leading to the beach. Less than 4 acres of this property would be restored through the Coastal Dune Scrub Restoration Plan.

Coastal Dune Scrub Restoration Plan

The Applicant purchased the 8-acre Den Dulk property, which lies on the western border of the MBPP and contains disturbed coastal dune scrub, which is intersected by a sandy well-traveled road leading to the beach. Less than 4-acres of this property would be restored through the Coastal Dune Scrub Restoration Plan, which is proposed as mitigation for the Morro shoulderband snail, legless lizard, and other sensitive dune scrub species, such as horned lizard. Under the plan, the Applicant would mitigate for unavoidable project-related impacts to coastal dune scrub by restoring a one acre portion of the Den Dulk property (Duke 2001l; Attachment 1, Figures 3 and 5). The Applicant asserts that the one acre of restored coastal dune scrub will adequately mitigate for habitat losses to disturbed coastal scrub (0.33 acres) using a 3:1 ratio (Duke 2001l; page 1). Another 2.57 acres would be managed to remove non-native plants and grasses. Thus, the total restoration/enhancement area is 3.57 acres (Duke 2001l; pages 1 and 2; Attachment 1, Figure 1). The proposed restoration plan includes the following goals:

1. Restoration of dune topography (1.0 acre site) to resemble adjacent dune habitat;
2. Removal of non-native dune vegetation from dune scrub areas immediately adjacent to the restoration area (2.57 acres);
3. Establishment of native dune vegetation (Duke 2001l, pages 11-12);
4. Implementation of a 3 year adaptive maintenance and monitoring plan; and
5. Long-term protection of one acre of the site and surrounding area by incorporating it into a conservation easement.

Species-Specific Mitigation

In order to avoid and minimize impacts to special status species to less than significant levels, the Applicant has proposed to address impacts to the following species:

Morro Shoulderb and Snail

Pre-construction surveys will be performed prior to demolition and ground disturbance regarding installation of the bike and pedestrian paths (Duke 2001g, page 37). Construction fencing will be erected around the toe of the coastal dune scrub restoration/enhancement area. Huffman-Broadway (2002a, (pages 15-19) recently submitted a revise Biological Assessment which discusses mitigation measures. These include a proposal to install permanent protective fencing and to provide information on habitat sensitivity along the construction access road (Huffman-Broadway 2002a, pages 18-19, Attachments 6 and 12).

Steelhead Trout

Protective measures for ESHAs, and specific installation and restoration procedures are proposed for the gas pipeline, bridges, Craft parking lot, tank farm demolition, and power block construction (Duke 2001g, pages 49-51). See also the Soil and Water Resources section of the FSA for information on soil erosion and pollution prevention.

California Red-Legged Frog

Pre-construction surveys will be conducted and protective fencing will be installed at all project locations (Duke 2001g, pages 61-62 and Attachment 19). Impacts to Morro Creek and riparian area at Camp San Luis Obispo and the satellite parking area will be avoided. Protective measures for ESHAs, and specific installation and restoration procedures are to be provided for the gas pipeline, bridges, parking lot (Craft and off-site), tank farm demolition, power block construction, and construction at Camp San Luis Obispo. Huffman-Broadway (2002a) pages 19-22 details recently revised mitigation measures. Daily monitoring will be conducted during installation of protective fencing and earthmoving activities near sensitive habitats. Weekly monitoring will be ongoing in sensitive habitats where this species may occur (Huffman-Broadway 2002a, page 22).

Snowy Plover

The Applicant initially stated that the project would not impact “essential habitat components of designated critical habitat” for the snowy plover(Duke 2001g, page 40). The Applicant proposed that implementation of habitat compensation for impacts to coastal dune scrub habitat would mitigate for impacts associated with the installation of the road, permanent bridge, and bike and pedestrian trails (Duke 200h, page 40). In March 2002, the Applicant altered its determination of impacts to this species and initiated discussion and negotiation regarding mitigation for the snowy plover. Mitigation includes installation of permanent protective fencing as well as seasonal fencing (Huffman-Broadway 2002a, pages 22-24, Attachments 6, 11, and 12).

Least Bell’s Vireo

Mitigation measures for this species by the applicant include the avoidance of impacts to riparian habitats and protective measures during site use at Camp San Luis Obispo (Duke 2001g, page 42).

California Legless Lizards

Pre-construction surveys would be performed prior to demolition and ground disturbance regarding installation of the bike and pedestrian paths (Duke 2000a, pages

6.6B-93 to 94). Construction fencing will be erected around the toe of the coastal dune scrub restoration/enhancement area. During grading, excavation, and off-loading in coastal dune scrub, a qualified biological monitor will be on site in order to detect any legless lizards that are unearthed. Any individual snails or legless lizards that are discovered would be translocated to suitable habitat.

Burrowing Owl

The Applicant proposes to implement pre-construction surveys, burrow enhancement, and passive relocation (Duke 2000a, pages 6.6B-95 to 96). Any mitigation actions would be taken prior to the nesting season (action from September 1 to January 31). Measures to mitigate potential impacts to the burrowing owl would follow the CDFG recommendations and published burrowing owl mitigation guidelines (CBOC 1993). Pre-construction surveys of the project site and the 150-meter buffer zone will be conducted 30 days prior to construction to ensure that no additional burrowing owls have occupied the site since the previous survey. If ground disturbance activity is delayed for more than 30 days following a pre-construction survey, then the site and the buffer zone will be re-surveyed. If burrows are found, but will not be impacted, they will be fenced prior to construction to ensure construction vehicles do not impact burrow sites. If owls are found on the project site in areas proposed for construction, they cannot be translocated during the breeding season (February 1 – August 31) unless a qualified biologist (approved by the CDFG) verifies non-invasively that either: the owls have not begun egg-laying and incubating; or the juveniles have fledged, are foraging independently, and are capable of independent survival.

Morro Bay Blue Butterfly

The Applicant proposes to avoid roosting and breeding habitats where feasible and to plant its preferred host plant -- Blue Lupine -- in restoration areas (Duke 2000a, page 6.6B-96).

Mitigation for Impact to the Satellite Parking Area

The Applicant proposes installation of protective fencing around the parking area and driveway to minimize adverse impacts to the California red-legged frog (Duke 2001h, Attachment 3). The drainage along the western edge of the site is within the jurisdiction of CDFG, ACOE, and the RWQCB. The Applicant states that permits from these agencies will not be required as long as the drainage is avoided and a 300 ft. buffer is implemented. A Stormwater Pollution Prevention Plan for this site will be required to prevent erosion, dust, and other environmental impacts (see Soil and Water Resources Section of this Staff Assessment).

Mitigation for Impact to the Construction Staging Areas at Camp San Luis Obispo

A total of 39.2 acres of upland vegetation will be temporarily impacted by use of this area (Duke 2001l, pages 10-11). The Applicant originally stated that impacts would be permanent, but on March 21, 2002, they stated that the impacts would be temporary. The Applicant's proposed mitigation measures specifically include:

- Pre-construction surveys for sensitive species including:
- Morro shoulderband snail;

- California red-legged frog;
- Burrowing owl and avoidance, relocation and habitat mitigation if needed; and
- Bat species in any buildings to be demolished;
- Compliance with USFWS Biological Opinion regarding impacts to Morro shoulderband snail;
- Compliance with USFWS Biological Opinion regarding impacts to California red-legged frog;
- Installation of exclusionary fencing between riparian areas and roadways and staging areas;
- Implementation of a Stormwater Pollution Prevention Plan; and
- Implementation of an Erosion/Sediment Control Plan.

The Applicant has not proposed habitat mitigation for impacts to Morro shoulderband snail or California red-legged frog. However, they have discussed mitigation options with staff, USFWS, CDFG, and other agencies and parties at staff's March 21, 2002 Public Workshop.

CUMULATIVE IMPACTS

The Applicant asserts that terrestrial cumulative impacts are insignificant for the proposed project. Thus, no mitigation measures have been proposed.

STAFF'S RECOMMENDED MITIGATION

In general, staff supports the Applicant's proposed mitigation measures, which are aimed at preventing significant impacts from construction, operation, maintenance, and closure of the power plant. Some of the newly proposed measures in Huffman-Broadway (2002a) are still under negotiation with staff, USFWS and other agencies. Staff recommends implementation of the following standard conditions, which were similarly proposed by the Applicant:

1. Hiring of a designated biologist (see **Conditions of Certification BIO-T-1, BIO-T-2 and BIO-T-3**);
2. Implementation of Worker Environmental Awareness Program (WEAP) (see **Condition of Certification BIO-T-4**);
3. Preparation of a BRMIMP (see **Condition of Certification BIO-T-5**);
4. Preparation of facility closure plans (for emergency and permanent closures) (see **Condition of Certification BIO-T-6**).
5. Compliance with USFWS, CDFG, RWQCB and ACOE permit requirements (see **Conditions of Certification BIO-T-7, BIO-T-8, BIO-T-9, BIO-T-10 and BIO-T-11**); and
6. Implementation of construction and operation mitigation measures (see **Conditions of Certification BIO-T-12 and BIO-T-13**);

Staff supports the establishment of 27.1 acres of conservation easements on the MBPP site (Duke 2001l; page 12) (see **Condition of Certification BIO-T-16**)

Staff also recommends habitat mitigation/compensation for significant habitat losses, and prefers participation in local conservation programs approved by natural resource management and protection agencies. Staff recommends that project compensation funds, provided by the Applicant, contribute to such programs as discussed later in this section (see **Conditions of Certification BIO-T-14 and BIO-T-15**).

The following discussion highlights specific mitigation issues of concern to staff and recommends additional mitigation for significant adverse impacts.

Staff's Proposed Mitigation for Impacts to Dune Scrub Habitat

The Applicant's proposed habitat mitigation, a Coastal Dune Scrub Restoration Plan, was submitted to fulfill mitigation requirements for disturbance to coastal dune scrub habitat (Duke 2001i). This plan's proposed mitigation area in an insular, 1-acre patch of land, surrounded by roads and the power plant. The surrounding 2.57- acre weed removal area does little to add to the quality, size, or connectivity of this small area. The coastal dune scrub vegetative community is a valuable and rare habitat that meets foraging, nesting, and dispersal needs of many wildlife species. If a proposed mitigation designed to replace this specific habitat cannot function as habitat, then that mitigation is unacceptable. Such is the case with the Applicant's proposal. The proposed mitigation area is more likely to function as a garden or visual display than a functioning and viable habitat, able to support wildlife species over long periods of time.

Meanwhile, the Applicant and City of Morro Bay propose to build a permanent road, bike and pedestrian path, and bridge that will be adjacent to the mitigation area and will enable more traffic to pass through on a paved surface. As a direct result there will be more traffic, more habitat degradation, and more habitat fragmentation. The proposed "adaptive management" and monitoring of the mitigation parcel does not extend long enough (only 3 yrs.) to monitor and manage problems likely to result due to its proximity to such disturbances. Because the size and location of the mitigation falls short of the intent of the mitigation, and will not be monitored and maintained for an effective amount of time, the value of the "created" habitat is practically and scientifically questionable. Consequently, staff does not support the Applicant's proposed Coastal Dune Scrub Restoration Plan as a satisfactory, beneficial, and viable habitat mitigation plan for reducing impacts to dune scrub habitats to less than significant levels.

Instead, staff supports the partial or complete fulfillment of mitigation through an ongoing, regional habitat restoration/conservation program. To this end, DPR is undergoing intensive restoration efforts on 26 acres of dune scrub north of the project facility, a parcel that was very recently found to support living and reproducing Morro shoulderband snails. The proposal includes removal on invasive exotic European beach grass, maintenance of the restored dune scrub area, and continued surveys for the Morro shoulderband snail in the area. The estimated cost for the entire project is $167,226 (DPR 2001b). The lands would continue to be owned and managed by DPR and administrative overhead costs would be added to the cost of the project. Funding amounts will be based upon final compensation levels, and will be disbursed through the Morro Bay National Estuary Program. Additional funds may be directed to other approved projects or programs

In proposed Condition of Certification **BIO-T-15**, staff recommends that the Applicant provide the following, similar to that proposed Huffman-Broadway (2002a) Attachments 11 and 12. Additional mitigation measures are also likely to be required as a result of the Section 7 consultation with USFWS, as recommended in Condition of Certification **BIO-T-10**.

1. Installation and maintenance of protective fencing during construction on both sides of the road south of Morro Creek;

2. Installation and maintenance of protective fencing along the west side of the road north of Morro Creek as well as provision of educational materials (discussed in more detail in the following section);

3. Installation and maintenance of protective fencing by the Applicant of seasonal fencing to protect the nesting habitat of the snowy plover, at a cost not to exceed $10,000/yr adjusted for inflation. The location of the fencing will be established in consultation with USFWS and CDFG and other agencies, as is discussed in more detail in the following section;

4. Monitoring of snail and Western snowy plover populations protected by the fencing;

5. Monitoring for road mortality of wildlife during construction. All procedures for monitoring shall be approved by the Energy Commission in consultation with CDFG and USFWS and included in the BRMIMP;

6. Continued maintenance of the fences, bridge, and road during the life of the project. The maintenance and management plan will adaptive and will be developed in consultation with the USFWS, CDFG, the City of Morro Bay, the Coastal Commission, and DPR; and

7. Establishment of a habitat compensation fund through the MBNEP for protection and purchase and restoration of dune scrub habitat, riparian, and upland habitats as approved by USFWS, CDFG, CCC, DPR, and other appropriate agencies.

Staff's Proposed Mitigation for Impacts to the Federally Endangered Morro Shoulderband Snail

The Applicant has not formally proposed adequate mitigation for habitat impacts to the Morro shoulderband snail, although recent discussions at the March 21, 2002 workshop, produced some agreement that additional mitigation was necessary considering the significance of recent survey findings.

Scientific data documenting living, young, and possibly reproducing Morro shoulderband snails approximately 1,500 m north of the project property constitutes new and convincing evidence that North Morro Bay supports an isolated, and potentially viable Morro shoulderband snail population (DPR 2001a). This population persists close to the MBPP site, and lies directly along the project's construction access road (DPR 2001a; Walgren 2001a). This snail species is vulnerable to vehicle, bike, and foot traffic. Little data exist on dispersal and the ability of the snails to colonize new areas. The MBPP will be impacting degraded dune scrub habitat as well as iceplant, both of which are

presently important for the survival of this species. Thus, any adverse impacts to the snail and these habitats are considered significant. Staff recommends compensation/mitigation for these impacts below.

Because the proposed construction access road (extension of highway 41) is precisely adjacent to the sites where live and young snails were recently found, staff recommends that the Applicant installs protective railings/or fences along the road and develops avoidance and minimization measures specifically for that stretch of road (refer also to the recent proposal in Huffman-Broadway 2002a). Please refer to **Condition of Certification BIO-T-17**.

Staff agrees that mitigation measures identified by the Applicant (Huffman-Broadway 2002a), should be implemented, including production of educational sign/materials and kiosk(s) designed to inform the public about the sensitive biological resources in the area and the importance of not driving upon, degrading, or trampling the dune scrub habitat. The location and content of these mitigation measures will be developed and approved in consultation with USFWS, CDFG, the City of Morro Bay, and DPR.

As of this writing, the USFWS requires the resolution of several issues. These issues include agreement with the City of Morro Bay regarding the installation of a permanent fence along Highway 41 / Atascadero Rd / Embarcadero Road, and the need for survey results for Camp San Luis Obispo construction laydown areas and the on-site Craft temporary parking area.

Because the snail inhabits areas in close proximity to the MBPP site, an appropriate habitat mitigation strategy would mitigate for impacts to the Morro shoulderband snail close to the proposed project site as written in **Condition of Certification BIO-T-14** as discussed in the previous section regarding dune scrub habitat.

Staff's Proposed Mitigation for Impacts to the Western Snow Plover:

Based upon analysis of the proximity of the plover's nesting and foraging habitats to the proposed bridge, road, and bike and pedestrian pathway, Staff finds the Applicants original conclusion of "no effect" to be incorrect. The Applicant has recently submitted a modified "effects determination" for this species, though formal mitigation has not been proposed (Huffman-Broadway 2002a, page 1). The Applicant's proposal to restore the Den Dulk property is insufficient mitigation for impacts to coastal dune scrub habitat (Duke 200h, page 40).

Staff supports the creation of a temporary bridge across Morro Creek instead of the proposed permanent bridge because a temporary bridge would result in fewer biological impacts. However, should the permanent bridge be installed, staff recommends that adequate mitigation be developed. The Applicant should be required to mitigate for both the loss of dune scrub habitat along the road and for indirect and cumulative impacts to the dune scrub habitat of the wildlife inhabiting it, especially the snowy plover.

To mitigate for adverse impacts to snowy plover and its habitat, staff recommends that the Applicant provides annual funding not to exceed $10,000/yr. for the installation and maintenance of protective fencing of nesting areas (see **Conditions of Certification**

BIO-T-15 and BIO-T-17). The funds will also be used to implement a monitoring program for snowy plover nests and protection afforded by the fence. Funds will be provided annually to a qualified land management organization (such as MBNEP) for them to disburse to a qualified agency (such as DPR) or approved consultant, to carry out the work. Details of the fencing and monitoring plan will be determined in consultation with the USFWS, CDFG, the City of Morro Bay, DPR, and other relevant agencies.

Staff's Proposed Mitigation for Noise, Lighting, and Construction-related Impacts

The Applicant proposes several technological noise mitigation measures (see Noise section of the FSA) including building a 20-ft. tall sound wall to assist in protecting riparian habitats from noise levels (Duke 2000a, page 6.6B-103). Staff finds that these measures will assist in decreasing impacts. Construction activities, such as the installation of bridges or parking areas, should be conducted with an appropriate buffer area (i.e. a 100 ft. buffer) between work areas and the ESHAs. These activities should also be conducted outside the sensitive courtship and breeding season of songbirds, amphibians, and other sensitive wildlife. The proposed mitigation for impacts due to lighting will also be helpful. However, noise and lighting will still result in potentially significant impacts to adjacent riparian habitat. These impacts can be mitigated to less than significant levels through Staff's proposed habitat compensation. See TERRESTRIAL BIOLOGICAL RESOURCES Tables 3 and 4 and **Conditions of Certification BIO-T 5, BIO-T-12, and BIO-T-13**.

- The proposed mitigation measures for adverse impacts to any burrowing owls observed hunting and nesting are adequate and must be detailed in the BRMIMP. There have been no owls detected on-site since 1999 thereby excluding the need for direct habitat mitigation. All mitigation will be approved in consultation with CDFG (See **Conditions of Certification BIO-T-5 and BIO-T-13**).
- Staff supports the protection (also applies to plant operation and maintenance) of all ESHAs including the Eucalyptus grove used by roosting Monarch butterflies, the riparian areas along Morro and Willow Camp Creeks, and the black-crowned night heron rookeries. Protective measures should be detailed in an adaptive management plan, that will be approved by the Energy Commission in consultation with the USFWS ,CDFG, and CCC and will be included in the BRMIMP (See **Conditions of Certification BIO-T-5 and BIO-T-13**).
- The proposed avoidance and minimization measures related to potential impacts to the Morro blue butterfly during construction are satisfactory. The protection and restoration of Silver Beach Lupine (*Lupinus chamissonis*) will be combined with exclusionary fencing, avoidance during construction, and dust control measures.

Staff's Proposed Mitigation for Impacts at the Satellite Parking Area

Mitigation measures proposed by the Applicant, including pre-construction surveys, use of a 300 ft. buffer to protect the ephemeral creek, installation of exclusionary fencing, and the implementation of a Stormwater Pollution Prevention Plan are acceptable for the reduction of impacts due to temporary disturbance of 5-acres of agricultural land (see **Conditions of Certifications BIO-T-5, BIO-T-7, BIO-T-10, BIO-T-12, and BIO-T-13**).

Staff's Proposed Mitigation for Impacts at the Construction Staging Areas at Camp San Luis Obispo

The MBPP will temporarily impact approximately 32 acres at Camp San Luis Obispo for 2-3 years (Duke 2001l, Table on pages 10-11). The recent discovery of the federally endangered Morro shoulderband snail at this site results in the need to mitigate for habitat loss as well as a need to implement avoidance and minimization measures. Staff recommends that the Applicant participate in conservation and restoration projects through the Morro Bay National Estuary Program. The Applicant shall provide funds to acquire and restore upland grassland habitats, with specific details of the mitigation program to be determined in consultation with USFWS, CDFG and other appropriate agencies. The habitat mitigation will be designed to protect existing, local Morro shoulderband snail and red-legged frog populations. The total mitigation acreage will be based upon a formula for temporary impacts to Morro shoulderband snail habitat and California red-legged frog (See Biological Resources Tables 3 and 4). For example, using a 2:1 mitigation ratio, 25 acres of impact would require 50 acres of habitat compensation. The final number of acres cannot be determined at this time, due to incomplete Morro shoulderband snail survey data from the Applicant. However, impacts and acreages will be determined once surveys are completed and the significance of impacts to the snail, in particular, is assessed in consultation with USFWS and CDFG.

- In order to avoid adverse impacts to natural communities, the Applicant will survey for sensitive species, avoid riparian habitats, and provide a biologist, worker environmental awareness training, and environmental monitors at the site to ensure that sensitive species are not adversely impacted.

All mitigation for Camp San Luis Obispo will be detailed thoroughly in the BRMIMP and approved in consultation with USFWS and CDFG**.**

Compensation Values for Impacts to Sensitive Habitats and Special Status Species

In summary, staff recommends that the Applicant provide habitat compensation and/or restoration funds for direct loss of sensitive habitats, for loss of habitats that are potentially home to sensitive species, and for indirect or cumulative impacts that reduce habitat value for sensitive species or sensitive habitats. In general, when impacts such as losses of sensitive habitat occur, staff prefers to mitigate by having similar high quality habitat protected at some appropriate ratio within the context of an applicable approved regional plan/program. Restoration or enhancement of the property may also be desirable. This normally includes requiring the Applicant to provide funds for specific defined objectives in a specific manner.

In some past projects, the Energy Commission has required applicants to implement specific mitigation projects that have not been successful. These unsuccessful programs have resulted in undesirable delays, islands of protected areas that do not fit into a regional plan, and in one case, a bankruptcy which caused years of delays. Staff now believes that the greatest benefit and potential for successful mitigation results from requiring the Applicant to provide funding for mitigation soon after power plant certification and before site mobilization and the start of construction. For this approach to work, staff must provide specific directions for use of the funds that will result in a nexus between the impacts and the mitigation. For example, if grassland habitat is

impacted and compensation funds are provided to compensate for the loss, the funds would be used to the greatest benefit possible. This could be that the funds contribute to the purchase of a parcel that includes riparian and grassland and is a piece of a regional plan/program. A nonprofit organization such as the MBNEP may be able to use those funds to obtain matching grant funds or some other way of leveraging the funds, thereby providing increasing benefit over what the applicant could accomplish.

Staff proposes this type of compensation for significant project impacts. The ultimate use of these funds can be determined by a technical advisory committee, comprised of agency representatives and other stakeholders, with final approval by the Energy Commission.

TERRESTRIAL BIOLOGICAL RESOURCES Tables 3 and 4 summarize the compensation ratios and costs for each category of staff's recommended terrestrial mitigation for adverse impacts of the proposed project. The compensation ratios for replacement and restoration costs per acre have not yet all been agreed upon amongst the Applicant and other agencies. In addition, not all of the acreage and cost amounts are final because some of the impacts, such as those at Camp San Luis Obispo and in the Craft temporary parking area, are still being assessed. In deriving acreage amounts, mitigation ratios, costs, used in TERRESTRIAL BIOLOGICAL RESOURCES Table 3, staff has considered input from the Applicant, agencies, intervenors. TERRESTRIAL BIOLOGICAL RESOURCES Table 4 estimates total mitigation costs. Staff believes that the values in TERRESTRIAL BIOLOGICAL RESOURCES Tables 3 and 4 will enable mitigation of significant terrestrial impacts to insignificant and acceptable levels.

TERRESTRIAL BIOLOGICAL RESOURCES Table 3. Compensation Calculations

Resource Impact	Acres	Comp. Ratio	Comp. acres	M&M Endowment	Cost per acre	Total
MSS Iceplant **D**	3.0	0.5	1.5	1.5= $1500.	$60,000.	$91,500
Dune/fencing **D**	0.28	3.0	0.84	0.84= $840.	$60,000.	$51,240
Fencing Restoration acre **D**	0.28	1.0	0.28	0.28= $280.	$30,000	$8,680
Dune/Road **D**	0.77	0.5	0.385	0.385=$385.	$60,000	$23,485
Road widening **D**	0.33	3.0	0.99	0.99= $990.	$60,000	$60,390
Restoration acre **D***	0.33	1.0	0.33	0.33= $330.	$30,000	$10,230
New Access Road **D**	0.3	0.5	0.15	0.15= $150.	$60,000	$9,150
Riparian/indirect **R**	2.71	0.5	1.35	1.35= $1350	$10,000	$14,850
Snowy Plover **D**	Nesting areas					Not to exceed $10,000/year**
CSLO MSS **U**	25	1.5	37.5	37.5= $37,500	$5,000	$225,000
CSLO CRLF **U**	25	0.25	6.25	6.25= $6,250	$5,000	$37,500 (if triggered)

Legend:
Comp.= Compensation. The "Compensation Ratio" is the number of acres to be mitigated for each acre of impact.

M&M = Management and Maintenance ($1,000/yr)
D = dune scrub habitat
R = riparian habitat
U= upland grassland
*Restoration acre determined according to CDFG mitigation guidelines of 3:1 for habitat acquisition and 1:1 for restoration for a combined 4:1 ratio.
**snowy plover protection and monitoring funds will be required annually for the life of the project.

TERRESTRIAL BIOLOGICAL RESOURCES Table 4. Compensation Summary

Habitat	Compensation Amount
Dune	$254,675
Upland	$225,000
Riparian	$14,850
Snowy Plover	Not to exceed $10,000 per year (adjusted for inflation)
Total (some changes may be made in values based on results of MSS surveys)	**$494,525** (not including the Snowy Plover costs)

$494,525 shall be provided to the MBNEP to be used as directed by a technical /advisory committee to mitigate to the greatest benefit, for all types of biological resources impacted by the proposed project. Additional mitigation may be required, depending on the results of additional snail surveys and final evaluations by CDFG and USF&WS.

CUMULATIVE IMPACTS

Staff has determined that terrestrial cumulative impacts are mitigable to insignificant levels with the incorporation of Staff's and the Applicant's proposed mitigation, including Staff's proposed habitat compensation.

COMPLIANCE WITH LORS

To be in compliance with applicable laws, ordinances, regulations and standards, the Applicant must receive and comply with the following:

- A Section 7 Biological Opinion from the USFWS for impacts to federally listed species;
- A Section 2081.1 Biological Opinion Consistency Determination and take permit from CDFG for impacts special status species;
- CDFG Streambed Alteration Agreement(s) as required for installation of bridges, culverts, and pipelines;
- A U.S. Coast Guard Authorization under 33CFR for installation of the bridge over Morro Creek; and
- A U. S. Army Corps of Engineers Section 404 permit for culvert construction at Camp San Luis Obispo.

The project must also comply with the City of Morro Bay's General Plan regarding the protection of environmentally sensitive habitat areas (ESHA's) via the creation of the Applicant's proposed conservation easements. (Please refer to the **Land Use** section

of the FSA). These documents will identify mitigation measures required by each regulatory agency.

To help the project owner comply with laws, ordinances, regulations, and standards, and the biological resource mitigation measures associated with this project, the Applicant must designate a biological resource specialist (the Designated Biologist). The Designated Biologist must become familiar with the biological resource issues of the project area prior to the beginning of any project-related site mobilization. The Designated Biologist will help the Project Owner make certain that all mitigation measures are complied with during project construction and operation.

FACILITY CLOSURE

The Applicant proposed facility closure procedures in the AFC, chapter 4-1 (Duke 2000a). The Applicant stipulates that specific procedures have been developed for the following closure categories: unexpected temporary closure, planned permanent closure, premature permanent closure, and unexpected permanent closure (see Duke 2000a, pages 4-2 to 4-5). In general, the closure procedures include compliance with LORS, procedures for handling hazardous materials and preventing environmental contamination, procedures for safely shutting down the facility (emergency or planned), procedures for the removal and recycling of facility structures and debris, without significantly impacting biological resources.

The Project Owner shall incorporate the procedures and mitigation measures into an "On-site Contingency Plan" for all categories of facility closure. This plan will clearly determine the methods and measures designed to protect the environment and public health and safety during all temporary and permanent closure scenarios (see also Condition of Certification **BIO-T-8**).

RESPONSE TO AGENCY AND PUBLIC COMMENTS

CALIFORNIA COASTAL COMMISSION (CCC)

CCC-3: Staff has identified and analyzed any impacts of the MBPP (noise, air pollution) to biological resources living on Morro Rock in the FSA.

CCC-15: CCC asserts that PSA was premature in any statement that the proposed road would not disturb natural or sensitive communities. Staff agrees with CCC's comment.

CCC-16: CCC requested that the Energy Commission consider CCCs policies in evaluating the MBPP and it's agreement with the City on the Embarcadero. The specific policies include: Coast Act Section 30212(a). The CCC provided this quote from that section: "Public access from the nearest public roadway to the shoreline and along the coast shall be provided in new development projects except where: it is inconsistent with public safety…or the protection of fragile coastal resources." CCC staff emphasized that they consider the dune strand area west of the MBPP, which would be affected by the access road, to be a fragile coastal resource and a sensitive habitat

pursuant to Section 30240 which states “environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas.” In addition, Section 30240 states that “development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas.” These regulations provide important rules, which will enable the Energy Commission to assist in determining proper decisions on the issue at hand as well as in determining appropriate mitigation.

CCC-18: The CCC reiterated its position that “ the provision of monetary value alone is not necessarily adequate compensation or mitigation for the loss of biological resources.” Impacts must be evaluated for the life of a project. CCC requested that the following be incorporated into the conditions of certification regarding any agreed upon habitat equivalency type of mitigation:

- Specific objectives to establish a nexus and proportionality between project impacts and the proposed mitigation measure;
- Clear objectives and performance standards for mitigation;
- Key mitigation costs, such as actual land acquisition costs, reasonable restoration costs, projected and quantified administrative and overhead costs for overseeing mitigation measures;
- Enforceable implementation and completion timeframes; and
- Remedial measures or recourse to address potential shortcomings in the performance standards or overall mitigation measure.

Staff concurs with these comments and has incorporated them into conditions of certification.

CCC-20: CCC requested that Energy Commission include in the conditions of certification a requirement for a Horizontal Directional Drilling (HDD) Fluid Monitoring Plan for construction work on the storm water and natural gas pipelines. Staff acknowledges this comment and has been working with CCC, CDFG, USFWS, and NMFS to evaluate the use of HDD installation of the pipelines.

CCC-21: CCC requested that Energy Commission include in the conditions of certification a requirement for a geotechnical report for the HDD activities occurring under Morro Creek. Refer to Water and Soil Resource Conditions of Certification.

CCC-22: CCC requested that BIO-3 include a provision that the designated biologist be empowered to stop construction activities that, in the opinion of the monitor, have the potential to impact biological resources that were not previously anticipated or mitigated. Staff concurs and has incorporated this request in the Conditions of Certification.

CCC-23: CCC requested changes to BIO-T-5 including such that the BRMIMP include a means through which impacts to terrestrial biological resource may be quantified and documented. Staff supports this and needs to confer on a means to achieve this goal.

CCC-24: CCC requested acknowledges this comment regarding BIO-T-5 so that the BRMIMP receive review and approval in consultation with the Coastal Commission. Staff concurs and has incorporated this request into BIO-5.

CCC-25: CCC requested that the Dune Restoration and Enhancement Plan receive review and approval in consultation with the Executive Director of the Coastal Commission.

DEPARTMENT OF FISH AND GAME (CDFG)

CDFG-3: Suggested Fish and Game Codes were considered for addition to the FSA. Staff added them as applicable.

CDFG-4: Staff acknowledges this comment regarding the biological resources within a 1- mile radius of the MBPP.

CDFG-5: Staff acknowledges this comment regarding the biological resources impacted at the proposed project site and has continued to work with CDFG to determine impacts and mitigation.

CDFG-6: Regarding Biological Resources Table 1. Staff revised the table according to CDFG suggestions.

CDFG-7: Staff has met with CDFG personnel to address these important issues regarding the road, bike path, and bridge.

CDFG-8: Staff has addressed impacts to steelhead and riparian habitats from the project's proposed roads, bridge, and construction in consultation with CDFG, NMFW, and USFWS.

CDFG-8: Staff has considered impacts to cormorants, which nest on Morro Rock.

CDFG-9: This comment is taken into consideration and has been discussed further with CDFG.

CDFG-10: The impacts to Morro shoulderband snail have been discussed further with USFWS and CDFG.

CDFG-11: Impacts to Morro Rock and peregrine falcons have been addressed further in the FSA.

CDFG-17: Staff agrees with CDFG but made the conclusion based on an understanding that according to the available data, all agency concerns could definitely be resolved through avoidance, design, prevention, and mitigation.

CDFG-20: Staff believes that subsequent discussions with USFWS, CDFG, and NMFS have addressed this issue.

CDFG-21,22, 23, and 24: The avoidance of dunes is not applicable for a road that is already in existence and used frequently. Staff has been prepared to incorporate mitigation recommended by CDFG and USFWS to protect the dunes and avoid them if feasible. Alternative routes for the road were not deemed feasible because the road to be used during construction is already in existence. Any serious conflicts with CDFG policies or city or county policies should have been discussed and resolved a long time ago.

CDFG-25: Staff has addressed impacts of noise to nesting birds on Morro Rock. The USFWS Biological Opinion will address all impacts to the California red-legged frog and conclusions and conditions from the Biological Opinion must be fully complied with according to Biological Condition of Certification BIO-10.

CDFG-28: Comment is on potential impacts of lights and traffic to roosting birds is acknowledged and is always of concern. However, many of the species roosting on the MBPP site presently do so with significant levels of light, traffic, and noise. Certainly, avoidance measures to detect and mitigate for additional disturbances will be required. Staff is eager to receive input from CDFG and USFWS on how to monitor for and mitigate for these potential impacts if they do occur.

CDFG-29: Additional impacts of nitrogen from vehicles are address in the Air Quality Section, and based on that analysis, biology staff concludes that no impacts will affect the riparian habitats adjacent to the MBPP.

CITY OF MORRO BAY (CMB)

CMB-86: Staff revised the FSA based on the suggestions and criticisms concerning impacts to California legless lizard and the Morro shoulderband snail and the eucalyptus grove where the monarch butterflies roost.

CMB-87: Staff revised the FSA based on the suggestions and criticisms concerning impacts to peregrine falcons and monarch butterflies.

CMB-88: Staff has addressed impacts to Morro Rock.

CMB-89: The Applicant is not expected to need to disturb the monarch butterfly habitat and will be expected to avoid trimming and removal of eucalyptus trees. Any such activities will require consultation with CDFG and/or USFWS so that any needed mitigation can be determined.

CMB-90: Staff concurs with this comment and confirms that these details are always provided in the Conditions of Certification. Any protocol-level surveys for listed species will be determined in USFWS and CDFG permits and those permits must be followed completely according to Biological Conditions of Certification.

CMB-91: Exclusionary fencing is definitely an indispensable component of preparation for construction activities, and employee training, and is also a mitigation measure to permanently protect sensitive areas during plant operation. Pre-construction surveys enable the Biologist to determine the extent of the fencing.

CMB-92: Staff agrees with the suggestions concerning the environmental awareness training program. The designated biologist does develop and administer the training. It is standard to include all employees, especially construction employees, in the training. These suggestions are included in the Biological Conditions of Certification BIO-T-1 and BIO-T-4).

CMB-93: Staff has been in consultation with the USFWS and CDFG to ensure that the Applicant provides satisfactory data and mitigation for the Morro shoulderband snail and California legless lizard. The strongest level of protection and mitigation is being pursued by staff in consultation with the USFWS and CDFG and all conditions set forth by these agencies have been recommended as part of the Biological Conditions of Certification.

CMB-94: Staff acknowledges the comment and emphasizes that CDFG protocols for relocating the owls will be required. Staff is also requiring habitat mitigation for the small habitat losses and indirect impacts of noise and traffic because they are likely to scare the owls away. However, burrowing owls have not been documented nesting on-site since 1999.

CMB-95: Comment supporting use of silver dune lupine is acknowledged and has been incorporated into habitat mitigation/restoration management measures.

CMB-96: Employee Environmental Awareness Training is a standard CEC requirement for Biology and is approved by staff in consultation with USFWS and CDFG. The program would be very well defined and monitored by the Energy Commission for compliance monthly.

CMB-97: Yes, noise-reducing technology is available, and is required to eliminate or minimize significant adverse impacts biological resources.

PUBLIC COMMENTS

POST-1: Staff agrees that the Applicant should use the best available technology to prevent damage and pollution to the environment.

BW-2: Staff appreciates the information regarding the status of the permanent bridge within the City's General Plan and the potential for the bridge to become designated temporary. Staff also appreciates the author's opinions on the usefulness of the bridge.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Terrestrial Biological Resources Impacts: There are several federal and state listed species and sensitive habitats impacted by the Applicant's 107-acre project site, the 39.2-acre construction storage site at Camp San Luis Obispo, and the 10-acre satellite parking site (Duke 2000a, Section 6.6B; Duke 2001c; Duke 2001f; Duke 2001g; Duke 2001h). Staff recommends that all significant permanent and temporary adverse impacts to special status species and their habitats be mitigated to less than significant

levels. Staff has provided general mitigation requirements in the Conditions of Certification. The Applicant shall comply fully with all USFWS and CDFG biological permit conditions, other agency permit conditions listed above, and mitigation requirements.

There are several components of the proposed project for which Staff is unable to draw conclusions due to a lack of data from the Applicant. These components include the determination of impacts to the federally endangered Morro shoulderband snail in the Craft temporary parking area (and pedestrian bridge) as well as the construction laydown/storage area at Camp San Luis Obispo. The data may not be available for weeks to months (for the protocol level surveys). Staff must receive this information before conclusions can be made on the level of impacts to this species. Thus, the level of mitigation for the impacts will be developed pending the needed survey information. Ultimately, Staff believes that all significant impacts can be mitigated to less than significant levels with the implementation of all proposed mitigation.

RECOMMENDATIONS

Staff recommends that the main facility site (excluding the Craft temporary parking area) and satellite parking area of the Morro Bay Power Plant Modernization Project be approved for certification pending acceptance and implementation of Staff's recommended mitigation along with the Applicant's stipulated mitigation. However, Staff has several major areas of concern that are unresolved at this time.

- First, staff does not recommend the approval of use of the Craft temporary parking area (and pedestrian footbridge) until protocol level surveys are complete and the surveys confirm the absence of the federally endangered Morro shoulderband snail. The protocol level surveys may not be completed until next winter because the surveys must be conducted during the rainy season. If the snail is present in the area, staff will evaluate the impacts and determine a course of action in consultation with the USFWS, CDFG, and other relevant agencies. Mitigation may range from complete avoidance of use in the area, to partial use with approved to protective measures along with habitat mitigation/compensation. Habitat mitigation/compensation has been discussed at the public workshop on March 21, 2001 and all parties acknowledged that this aspect of the project would remain incomplete until further information is collected and analyzed.
- Second, staff cannot approve use of the construction laydown/storage area at Camp San Luis Obispo because recent data indicate that Morro shoulderband snails exists on the site. Staff will continue consulting with the USFWS and CDFG to determine the significance of impacts and mitigation. Similarly, mitigation may range from complete avoidance of the area, to partial use with approved protective measures along with habitat mitigation. Habitat mitigation has been discussed at the Public workshop on March 21, 2001 and all parties acknowledged that this aspect of the project would remain incomplete until further information is collected and analyzed.

At this time, Staff cannot recommend approval of all of the project facilities due to yet undetermined, potentially significant, and unmitigated adverse impacts to biological resources.

TERRESTRIAL BIOLOGY CONDITIONS OF CERTIFICATION (BIO-T)

Designated Biologist Selection

BIO-T-1 The project owner shall submit the resume, including contact information, of the proposed Designated Biologist to the CPM for approval. The Designated Biologist must meet the following minimum qualifications:

1. Bachelor's Degree in biological sciences, zoology, botany, ecology, or a closely related field;
2. Three years of experience in field biology or current certification of a nationally recognized biological society, such as The Ecological Society of America or The Wildlife Society;
3. At least one year of field experience with biological resources found in or near the project area; and
4. An ability to demonstrate to the satisfaction of the CPM the appropriate education and experience for the biological resources tasks that must be addressed during project construction and operation.

Verification: The project owner shall submit the specified information at least 60 days prior to the start of any site (or related facilities) mobilization. Site and related facility activities shall not commence until an approved Designated Biologist is available to be on site.

If a Designated Biologist needs to be replaced, then the specified information of the proposed replacement must be submitted to the CPM at least ten working days prior to the termination or release of the preceding Designated Biologist.

Designated Biologist Duties

BIO-T-2 The Designated Biologist shall perform the following during any site (or related facilities) mobilization, ground disturbance, grading, construction, operation, and closure activities:

1. Advise the project owner's Construction/Operation Manager, supervising construction and operations engineer on the implementation of the biological resources Conditions of Certification;
2. Be available to supervise or conduct mitigation, monitoring, and other biological resources compliance efforts, particularly in areas requiring avoidance or containing sensitive biological resources, such as wetlands and special status species or their habitat;
3. Clearly mark sensitive biological resource areas and inspect these areas at appropriate intervals for compliance with regulatory terms and conditions;

4. Inspect active construction areas where animals may have become trapped prior to construction commencing each day. At the end of the day, inspect for the installation of structures that prevent entrapment or allow escape during periods of construction inactivity. Periodically inspect areas with high vehicle activity (parking lots) for animals in harms way;
5. Notify the project owner and the CPM of any non-compliance with any biological resources Condition of Certification; and
6. Respond directly to inquiries of the CPM regarding biological resource issues.

Verification: The Designated Biologist shall maintain written records of the tasks described above, and summaries of these records shall be submitted in the Monthly Compliance Reports.

During project operation, the Designated Biologist shall submit record summaries in the Annual Compliance Report.

Designated Biologist Authority

BIO-T-3 The project owner's Construction/Operation Manager shall act on the advice of the Designated Biologist to ensure conformance with the biological resources Conditions of Certification. If required by the Designated Biologist, the project owner's Construction/Operation Manager shall halt all site mobilization, ground disturbance, grading, construction, and operation activities in areas specified by the Designated Biologist.

The Designated Biologist shall:

1. Require a halt to all activities in any area when determined that there would be adverse impact to biological resources if the activities continued;
2. Inform the project owner and the Construction/Operation Manager when to resume activities; and
3. Notify the CPM if there is a halt of any activities, and advise the CPM of any corrective actions that have been taken, or will be instituted, as a result of the halt.

Verification: The Designated Biologist must notify the CPM immediately (and no later than the following morning of the incident, or Monday morning in the case of a weekend) of any non-compliance or a halt of any site mobilization, ground disturbance, grading, construction, and operation activities. The project owner shall notify the CPM of the circumstances and actions being taken to resolve the problem.

Whenever corrective action is taken by the project owner, a determination of success or failure will be made by the CPM within five working days after receipt of notice that corrective action is completed, or the project owner will be notified by the CPM that coordination with other agencies will require additional time before a determination can be made.

Worker Environmental Awareness Program

BIO-T-4 The project owner shall develop and implement a CPM approved Worker Environmental Awareness Program (WEAP) in which each of its employees, as well as employees of contractors and subcontractors who work on the project site or any related facilities during site mobilization, ground disturbance, grading, construction, operation and closure are informed about sensitive biological resources associated with the project.

The WEAP must:

1. Be developed by or in consultation with the Designated Biologist and consist of an on-site or training center presentation in which supporting written material is made available to all participants;
2. Discuss the locations and types of sensitive biological resources on the project site and adjacent areas;
3. Present the reasons for protecting these resources;
4. Present the meaning of various temporary and permanent habitat protection measures;
5. Identify whom to contact if there are further comments and questions about the material discussed in the program; and
6. Include a training acknowledgment form to be signed by each worker indicating that they received training and shall abide by the guidelines.

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

Verification: At least 60 days prior to the start of any site (or related facilities) mobilization, the project owner shall provide to the CPM two (2) copies of the WEAP and all supporting written materials prepared or reviewed by the Designated Biologist and a resume of the person(s) administering the program.

The project owner shall provide in the Monthly Compliance Report the number of persons who have completed the training in the prior month and a running total of all persons who have completed the training to date.

The signed training acknowledgement forms shall be kept on file by the project owner for a period of at least six months after the start of commercial operation.

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

Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP)

BIO-T-5 The project owner shall submit two copies of the proposed BRMIMP to the CPM (for review and approval) and to CDFG and USFWS (for review and comment) and shall implement the measures identified in the approved BRMIMP.

The final BRMIMP shall identify; (typical measures are)

1. All biological resources mitigation, monitoring, and compliance measures proposed and agreed to by the project owner;
2. All biological resources Conditions of Certification identified in the Commission's Final Decision;
3. All biological resource mitigation, monitoring and compliance measures required in federal agency terms and conditions, such as those provided in the USFWS Biological Opinion;
4. All biological resources mitigation, monitoring and compliance measures required in other state agency terms and conditions, such as those provided in the CDFG Incidental Take Permit and Streambed Alteration Agreement and Regional Water Quality Control Board permits;
5. All biological resources mitigation, monitoring and compliance measures required in local agency permits, such as site grading and landscaping requirements;
6. All sensitive biological resources to be impacted, avoided, or mitigated by project construction, operation and closure;
7. All required mitigation measures for each sensitive biological resource;
8. Required habitat compensation strategy, including provisions for acquisition, enhancement, and management for any temporary and permanent loss of sensitive biological resources;
9. A detailed description of measures that will be taken to avoid or mitigate temporary disturbances from construction activities;
10. All locations on a map, at an approved scale, of sensitive biological resource areas subject to disturbance and areas requiring temporary protection and avoidance during construction;
11. Aerial photographs, at an approved scale, of all areas to be disturbed during project construction activities - one set prior to any site or related facilities mobilization disturbance and one set subsequent to completion of project construction. Include planned timing of aerial photography and a description of why times were chosen;
12. Duration for each type of monitoring and a description of monitoring methodologies and frequency;
13. Performance standards to be used to help decide if/when proposed mitigation is or is not successful;
14. All performance standards and remedial measures to be implemented if performance standards are not met;
15. A discussion of biological resources related facility closure measures;
16. A process for proposing plan modifications to the CPM and appropriate agencies for review and approval; and
17. A copy of all biological resources permits obtained.

Verification: The project owner shall provide the specified document at least 60 days prior to start of any site (or related facilities) mobilization.

1. The CPM, in consultation with the CDFG, the USFWS and any other appropriate agencies, will determine the BRMIMP's acceptability within 45 days of receipt.

2. The project owner shall notify the CPM no less than five working days before implementing any modifications to the approved BRMIMP to obtain CPM approval.

3. Any changes to the approved BRMIMP must also be approved by the CPM in consultation with CDFG, the USFWS and appropriate agencies to ensure no conflicts exist.

Within thirty (30) days after completion of project construction, the project owner shall provide to the CPM, for review and approval, a written report identifying which items of the BRMIMP have been completed, a summary of all modifications to mitigation measures made during the project's site mobilization, ground disturbance, grading, and construction phases, and which mitigation and monitoring items are still outstanding.

Closure Plan Measures

BIO-T-6 The project owner will incorporate into the permanent or unexpected permanent closure plan, and the BRMIMP, measures that address the local biological resources.

Protocol: The planned permanent or unexpected permanent closure plan will address the following biological resources related mitigation measures:

1. Removal of transmission conductors when they are no longer used and useful;
2. Removal of all power plant site facilities and related facilities;
3. Measures to restore wildlife habitat to promote the re-establishment of native plant and wildlife species; and
4. Revegetation of the plant site and other disturbed areas utilizing appropriate seed mixture.

Verification: At least twelve months prior to commencement of closure activities, the project owner shall address all biological resources related issues associated with facility closure, which is incorporated into the BRMIMP, in a Biological Resources Element. The Biological Resources Element will be incorporated into the Facility Closure Plan and include a complete discussion of the local biological resources and proposed facility closure mitigation measures.

Incidental Take Permit

BIO-T-7 The project owner shall acquire an Incidental Take Permit from the California Department of Fish and Game (CDFG) (per Section 2081(b) of the Fish and Game Code; California Endangered Species Act) and incorporate the terms and conditions into the project's BRMIMP.

Verification: At least 30 days prior to the start of any site or related facilities mobilization activities, the project owner shall submit to the CPM a copy of the final CDFG Incidental Take Permit.

Streambed Alteration Agreement

BIO-T-8 The project owner shall acquire a Streambed Alteration Agreement from the CDFG (per Section 1600 of the Fish and Game Code), and incorporate the biological resource related terms and conditions into the project's BRMIMP.

Verification: At least 30 days prior to the start of any site or related facilities mobilization activities, the project owner shall submit to the CPM a copy of the final CDFG Streambed Alteration Agreement.

Regional Water Quality Control Board Certification

BIO-T-9 The project owner will acquire the Regional Water Quality Control Board Section 401 state Clean Water Act certification, and incorporate the biological resource related terms and conditions into the project's BRMIMP.

Verification: At least 30 days prior to the start of any site or related facilities mobilization activities, the project owner will provide the CPM with a copy of the final Regional Water Quality Control Board's certification.

Federal Biological Opinion

BIO-T-10 The project owner shall provide final copies of the Biological Opinion per Section 7 of the federal Endangered Species Act obtained from the U. S. Fish and Wildlife Service. The terms and conditions contained in the Biological Opinion shall be incorporated into the project's BRMIMP.

Verification: At least 30 days prior to the start of any site or related facilities mobilization activities, the project owner shall submit to the CPM a copy of the U. S. Fish and Wildlife Service's Biological Opinion.

U. S. Army Corps of Engineers Section 404 Permit

BIO-T-11 The project owner shall provide a final copy of the U.S. Army Corps of Engineers Section 404 of the federal Clean Water Act permit. The biological resources related terms and conditions contained in the permit shall be incorporated into the project's BRMIMP.

Verification: At least 30 days prior to the start of any site or related facilities mobilization activities, the project owner shall submit to the CPM a copy of the U.S. Army Corps of Engineers permit.

Preventative Design Mitigation Features

BIO-T-12 The project owner shall modify the project design to incorporate all feasible measures that avoid or minimize impacts to the local biological resources.

Protocol: The Project Owner shall ensure that:

1. transmission line poles, access roads, pulling sites, and storage and parking areas are designed to avoid identified sensitive resources;
2. the water intake pipes that use natural waterways are screened in a manner to avoid entrainment;
3. wetland loss is avoided; and
4. transmission lines and all electrical components are designed and constructed to reduce the likelihood of electrocutions of large birds.

Verification: All mitigation measures and their implementation methods will be included in the BRMIMP.

Construction Mitigation Management to Avoid Harassment or Harm

BIO-T-13 The Project Owner shall manage their construction site, and related facilities, in a manner to avoid or minimizes impacts to the local biological resources.

Protocol: The Project owner shall ensure that:

1. All avoidance and minimization measures will be in place before site mobilization;

2. Pre-construction surveys for project facilities (the main site, satellite parking, and construction staging areas) will be clearly defined and agreed upon in advance with input from USFWS and CDFG. All surveys will be conducted prior to any site mobilization;

3. Pre-construction surveys for the endangered Morro shoulderband snail in compliance with all measures established in the USFWS Biological Opinion will be completed prior to any site mobilization;

4. Pre-construction surveys for California red-legged frog on the MBPP Site, at Camp San Luis Obispo, and at the Satellite Parking area (as required by the USFWS) will be completed prior to any site mobilization;

5. Pre-construction surveys for burrowing owl on the project site and at off-site storage and parking areas will be completed prior to any site mobilization, followed by avoidance or passive relocation, if owls are observed;

6. Pre-construction surveys for raptor nests and all sensitive and special status species of animals and plants on the project site and at off-site storage and parking areas will be completed prior to any site mobilization;

7. Excavation and ground disturbing activities will avoid activity within a reasonable distance established by CDFG or USFWS, during hibernation, breeding or rest periods for burrowing animals such as burrowing owl;

8. A sound wall is constructed that is adequate to reduce noise impacts to riparian areas and other ESHAs during construction and operation of the MBPP;

9. Pruning, tree removal, or ground disturbance in ESHAs is prohibited without biological surveys and consent of the Designated Biologist in consultation with the USFWS and CDFG as needed;

10. Construction area boundaries are clearly marked with stakes, flagging, silt fencing, and/or rope or cord to minimize inadvertent degradation or loss of adjacent habitat during facility construction/modernization;

11. All equipment storage will be restricted to designated construction zones or areas that are currently not habitat for special status species;

12. A speed limit of 20 miles/hour at all project locations including the construction access road will be enforced;

13. Wildlife-safe rodenticides and high specificity herbicides will be used on-site and along linears as feasible. Use all pesticides in accordance with USDA label requirements;

14. Dust control measures will be implemented during construction and operation;

15. Shielded, down-facing lighting will be implemented;

16. All food-related trash will be disposed of in closed containers and removed at least once a week, and that feeding of wildlife shall be prohibited;

17. Hazardous debris and waste will be cleaned up on-site and along linears;

18. An erosion prevention and control plan (see Soil and Water Resources Section) will be implemented on-site and along linears.

19. Traffic access will be restricted to existing roads, designated access roads, construction storage and staging areas, and parking areas;

20. Construction activities which create high noise levels (i.e. >70 dbA) will be restricted to 7a.m. to 7p.m. on weekdays, and 9a.m. to 5p.m. on weekends, to minimize impacts to wildlife;

21. Construction will be limited to daytime at all drainages and drains to avoid impacts to special status reptiles, amphibians, and mammals;

22. Construction activities near ESHAs will be conducted with an appropriate buffer area and/or outside the sensitive courtship and breeding season of songbirds, amphibians, and other sensitive wildlife;

23. Temporary fencing and wildlife escape ramps will be provided for construction areas that contain steep walled holes or trenches if outside of an approved, permanent exclusionary fence. If a temporary fence is used, it will be hardware cloth or similar materials that are approved by USFWS and CDFG;

24. Open trenches will be inspected for wildlife each morning prior to start of daily construction activities. Any wildlife observed will be allowed to escape on its own if possible prior to commencement of construction. Otherwise, the Designated Biologist will contact the appropriate agency for assistance;

25. All construction pipes, culverts, or similar structures will be inspected prior to pipe burial. Pipes to be left in trenches overnight will be capped;

26. Non-security related firearms or weapons will be prohibited from the site;

27. Prohibit pets from being brought to the site;

28. Report all inadvertent deaths of sensitive species to the appropriate project representative. Injured animals will be reported to CDFG, and the Project Owner will follow instructions that are provided by CDFG;

29. Revegetate and maintain all linears, construction, staging, temporary parking, and equipment storage areas with appropriate native plant species; and

30. Provide a post-construction compliance report, within forty-five (45) calendar days of completion of the project, to the Energy Commission CPM.

Verification: All mitigation measures and their implementation methods will be included in the BRMIMP.

Habitat Compensation

BIO-T-14 To compensate for impacts to sensitive habitats that lie west and northwest of the project site, and for impacts to riparian habitats in the ESHA on the north and northeast side of the project site, and for impacts to upland habitats at Camp San Luis Obispo, the Project Owner will implement the following terrestrial compensation:

1. All Compensation Funds (Funds) shall be provided to the Morro Bay National Estuary Program to be used or directed in a “Morro Bay Power Plant Mitigation and Conservation Plan” (MBMCP). The MBMCP will be created under the auspices of the Energy Commission to guide the spending of the compensation funds so that the greatest benefit to wildlife results while maintaining a nexus between impacts and mitigation. The intent of the MBMCP is to implement an aggressive conservation program that includes acquiring fee interests, conservation easements, or management agreements on lands.

2. The MBMCP will be implemented by the MBNEP with oversight from the Energy Commission.

3. The Plan shall be approved by Energy Commission in consultation with an Advisory Committee with participation from USFWS, CDFG, CCC, MBNEP, City of Morro Bay, the Project Owner, and other stakeholders as appropriate. The Advisory Committee shall not exceed 12 representatives so that progress is not impeded.

4. The MBNEP is authorized to spend 10% of the Funds for management and administrative costs incurred by the MBNEP while administering the MBMCP.

5. The MBNEP may use Funds for approved projects in cooperation and coordination with other conservation organizations and may use the Funds to secure matching grants for the benefit of the Morro Bay watershed. This objective is included to clarify that the leveraging of Funds is permitted to obtain additional benefits for the Morro Bay watershed.

6. The Energy Commission and MBNEP shall enter into a Memorandum of Understanding (MOU) as to the authority to spend the Compensation Funds. No Funds will be spend prior to completion of the MOU, unless an exceptional opportunity has arisen, in which case, the Energy Commission CPM may authorize expenditure of Funds.

7. $1,000 has been required for each Compensation Acre for use in a long-term management and maintenance endowment. The total for this endowment is $43,325. The MBNEP shall maintain this $43,325 endowment for the Compensation Acres. The principle will remain invested in a CPM and MBNEP approved investment in perpetuity.

8. The Conservation Funds shall be spent on projects focused on the following habitats and species and for the amounts indicated below.

    a. The amount of $254,675 is required to compensate for loss of approximately 4.5 acres of dune habitat. These Funds will be used to acquire and/or restore coastal dune scrub habitats with Morro shoulderband snail present, or a strong potential to be present.

    b. The amount of $14,850 will be applied to compensate for the loss of approximately 1.35 acres of riparian habitat. Riparian habitats supporting California red-legged frog should be acquired and/or restored.

    c. The amount of $225,000 is required to compensate for the temporary loss of approximately 37.5 acres of upland habitat. Upland habitats supporting (or demonstrating the potential to

support) Morro shoulderband snails and California red-legged frog should be acquired and/or restored.

d. The total amount of the Funds will total $494,525.

Some funding or acreage levels may change pending receipt of needed information and completion of environmental analysis.

Verification: Not less than 15 days after project certification the Project Owner will provide to the CPM, a copy of the check and verification that the check was provided to the MBNEP in the amount of $494,525 payable to the MBNEP. The Advisory Committee must complete a MBMCP and have it approved by the CPM within one year of certification of the proposed project.

Mitigation for Impacts to Snowy Plover

BIO-T-15 The Project Owner will contribute funds of no more than $10,000/yr (adjusted for annual inflation rates) for annual installation of protective fencing for nesting snowy plover and monitoring of plover populations, for the life of the project. The placement and timing of the fencing shall be determined in consultation with the USFWS and DPR. During pre-construction and construction of the project, the project owner or his authorized agent shall submit to the CPM a monthly status report of all fencing and monitoring activities. Upon commencement of commercial operation (and throughout the life of the project), the project owner or his authorized agent shall submit to the CPM in the Annual Compliance Report all fencing and monitoring activities.

Verification: Not less than 15 days prior to the start of any site mobilization activities the Project Owner will provide a copy of the checks to the CPM. The Project Owner will also provide a letter from the land management organizations and agencies involved stating the amount of funds received.

On-site Conservation Easements

BIO-T-16 The Project Owner will establish on-site 27.1 acres of wetland, riparian, and dune scrub into permanent conservation easements through a pre-approved natural resource management organization, in consultation with USFWS and CDFG. A Management Plan for the Conservation Easement will be developed in consultation with USFWS and CDFG.

Verification: Not less than 15 days prior to the start of any site mobilization activities the Project Owner will provide a copy of the easement contracts and management plan to the CPM for approval.

Mitigation for Impacts to Morro shoulderband Snail and Snowy Plover Along the Construction Access Road

BIO-T-17 The Project Owner shall provide protective measures to mitigate for potential impacts to the Morro shoulderband snail, snowy plover, as well as dune scrub habitats, along the construction access road. All of the measures and plans shall be developed in consultation with the USFWS, CDFG and DPR.

1. Prior to any site mobilization in preparation for installation of the permanent bridge over Morro Creek, the Project Owner shall install pre-approved protective and permanent fencing/railing, an informational kiosk, and educational signs (materials) along Hwy 41 north of Morro Creek;

2. A detailed Management Plan shall be required for the roadway, north and south of the bridge as well as management of the fencing, kiosk(s), and educational displays;

3. The road management plan will be developed, approved, and implemented to protect natural resources along the road for the life of the project; and

4. Only emergency vehicles will be authorized to use the bridge crossing Morro Creek during the life of the project.

Verification: Not less than 90 days prior to the start of site mobilization for installation of the Morro Creek bridge, the Project Owner shall provide to the CPM an agency approved design for installation of the fence, the kiosk, and all signs and educational materials. The Management Plan shall also be due at that time. All designs and plans must be approved by the CPM in consultation with the USFWS and CDFG prior to installation of any structures.

Not less than 30 days prior to the start of site mobilization for installation of the Morro Creek bridge, the Project Owner shall provide to the CPM photographic evidence that the fencing has been successfully installed, and that the kiosk(s) and educational materials are available.

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ALTERNATIVES

Testimony of Susan V. Lee

INTRODUCTION

The purpose of staff's alternatives analysis is to consider whether there are alternatives that could feasibly attain most of the basic objectives of the project and avoid or substantially lessen one or more of the significant effects of the project. If the Energy Commission determines that the proposed project will result in significant adverse impacts and identifies an alternative that meets these criteria, it cannot license the project unless it finds that the benefits of the project outweigh the impacts and that the alternative is infeasible. However, the Energy Commission does not have the authority to approve alternative configurations, require alternative technology designs, or to require the Applicant to move the proposed project to another location without first conducting a more in-depth review of the environmental consequences of the alternative. If the Applicant changes the location to one of the alternative sites, it must file a new Application for Certification (AFC) for that site and a new review process would ensue.

Energy Commission staff is required by the Energy Commission's siting regulations to examine the "feasibility of available site and facility alternatives to the Applicant's proposal which substantially lessen the significant adverse impacts of the proposal on the environment" (Cal. Code Regs., tit. 20, §1765). The "Guidelines" for implementation of the California Environmental Quality Act (CEQA) provide further direction by requiring an evaluation of the comparative merits of "a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the project objectives" (Cal. Code Regs., tit. 14 §15126.6). The analysis should identify and compare the impacts of the various alternatives, but in less detail than the analysis of the proposed project.

Duke's AFC (MBPP AFC 5-1 to 5-2) stated that "modification of an existing facility is exempt from … the requirement to consider offsite alternatives." Staff notes that Duke's proposed project requires demolition of the existing tank farm, construction of an entirely new generating facility, and the demolition of the existing power plant. It is unclear whether demolition of the tank farm and existing plant would occur if the proposed project were denied and one of the project alternatives were constructed at a different site[1]. In order to provide a comprehensive evaluation, staff's analysis considers a full range of alternatives.

METHODOLOGY

To prepare this alternatives analysis, staff used the methodology summarized below:

- Identified the basic objectives of the project;

[1] It is noted, however, that Duke has stated that "… if the proposed power project is not sited at the existing Morro Bay Power Plant, operations at the current plant will continue in operation with at least units 3 and 4 as they might be modified with retrofit installation SCR emission control systems" (Duke, 2001b).

- Provided an overview of the project and its potentially significant adverse impacts;
- Evaluated the No Project alternative;
- Identified and evaluated feasible alternative electricity generation technologies;
- Considered other alternatives (smaller plant; different configurations)
- Identified screening criteria for alternative sites;
- Conducted a screening analysis to assess the feasibility of alternative sites;
- Determined whether the alternative technologies and sites reduced or avoided any significant impacts of the proposed project; and
- Determined whether the alternative technologies and sites would cause one or more impacts that could be significant.

BASIC PROJECT OBJECTIVES

After reviewing the Morro Bay Power Project (MBPP) AFC, staff identified the following project objectives:

- The construction and operation of a highly efficient merchant power plant in the San Luis Obispo County region that supplies economic, reliable and environmentally sound electrical energy and capacity;
- Replacement of capacity of the existing facility. The existing facility has a capacity of approximately 1,000 megawatts (MW) as does the proposed facility without duct firing);[2]
- The location of the site near key infrastructure, such as transmission line interconnections (230 kV or greater), and supplies of process water and natural gas; and
- Maintenance of local electric reliability while reducing electric system losses.
  The Applicant's objectives also include use of the existing site, because it believes that use of that site for a new plant (and the subsequent demolition of the existing plant) would improve the environment in the Morro Bay, reduce overall impacts, and allow development of a facility that could operate at maximum efficiency. However, while there clearly are advantages to using the existing infrastructure, there are also potential environmental impacts of continued operation at the existing site, as documented in this Final Staff Assessment (Parts 1 through 3 inclusive). Therefore, staff did not include the Applicant's objective of use of the existing site in this analysis.

[2] Duke commented on the PSA that the Energy Commission's consideration of alternatives is limited to those that can produce 1,200 MW. Staff does not agree, but staff did look for alternative sites that could support a power plant with that approximate capacity. In the Cooling Options Report (**Appendix A** to the **Aquatic Biological Resources** section of the FSA), staff also evaluated project configurations using dry cooling and hybrid cooling that would limit duct firing in certain circumstances and so would not produce 1,200 MW at those times.

The Applicant suggested in its comments on staff's Preliminary Staff Assessment (PSA) of May 2001, that "it is the Applicant's prerogative and responsibility to identify the basic project objectives." The Applicant then listed 13 objectives (which were not previously defined in the AFC), 8 of which would require the plant to be located at the proposed location. Staff does not accept these objectives; this analysis is based on the objectives defined above.

SUMMARY OF PROPOSED PROJECT

On October 23, 2000 Duke Energy Morro Bay LLC filed an Application for Certification (AFC) seeking approval from the California Energy Commission (Energy Commission) to construct and operate the proposed Morro Bay Power Plant Project that would generate up to 1,200-megawatt (MW) of power (with duct firing). The "modernization" Project is proposed to be located at the existing 1,002 MW Morro Bay Power Plant site that is owned and operated by Duke Energy. This site is located within the City of Morro Bay, San Luis Obispo County, near Morro Bay Harbor, bordered on the west by Embarcadero Road and on the east by Highway 1.

Duke proposes two new 600 MW combined cycle, electric generation units to replace the currently operating generation Units 1 and 2 (326 MW, 1950's technology) and Units 3 and 4 (676 MW, 1960's technology) The new plant would be capable of producing a total of 1,200 MW. Each of the two new units would consist of two gas-fired, combustion turbine generators (CTG), each with a Heat Recovery Steam Generator (HRSG),and one steam turbine generator (STG) that will be driven by steam generated in the respective HRSGs.(Steam will be generated in the HRSGs by using waste heat produced by the CTGs.) Each of the four CTG/HRSG "trains" will feature145-foot tall stacks, for a total of four new stacks. This compares with the existing plant's three 450 foot tall stacks.

The AFC states that the combined cycle units would use a maximum of 165,000 gallons per minute (gpm) each (464,000 gpm when both are operating) of seawater for cooling and boiler makeup. MBPP's freshwater usage would be about 10,000 gallons per day (gpd) from its onsite wells for routine operation.

Natural gas to fuel the new facility will be delivered from PG&E's Kettleman Compressor Station through PG&E pipeline 306. Natural gas originates from the south with El Paso Natural Gas in Arizona and from the north with PG&E/Northwest in Oregon. The MBPP will continue to interconnect with the electrical grid at the existing Pacific Gas & Electric (PG&E) switchyard located on the plant site.

To control emissions of air pollutants, the MBPP's combined cycle units will use best available control technology (BACT) including selective catalytic reduction (SCR) for control of nitrogen oxides and an oxidation catalyst for control of carbon monoxide. The SCR system consists of the reduction catalyst and an aqueous ammonia injection system.

Duke Energy proposes construction of the two new generating units in a single construction phase lasting 21 months, with initial start-up to follow one month later.

Based on construction beginning in late 2002, and Duke's proposed construction schedule, initial start-up would occur in the fall of 2003 and full-scale commercial operation would begin in fall 2004.

The Project also includes demolition of the onsite fuel oil tank farm, the existing power plant, and the three 450 feet tall exhaust stacks. Demolition would be completed in three stages:

- Stage One: Demolition of the tank farm would begin immediately after certification of the Project and is expected to take three months. (The site of the existing tank farm is the location of the proposed new power plant.)
- Stage Two: Demolition of the three 450 foot stacks will begin after commercial operation of the new units.
- Stage Three: The existing generating units are expected to be dismantled in approximately 2007 - 2008.

A series of traffic, landscaping and aesthetic features are also proposed as part of the Project, including bike paths, installation of a bridge across Morro Creek, landscaping, and refurbishment of the sea water intake structure.

The Applicant chose the proposed site for this project for following reasons:

- Infrastructure for the power plant is already in place;
- The site is adjacent to the PG&E Morro Bay Switchyard where the Applicant will connect to the transmission system;
- The site contains existing once-through seawater cooling water intake and discharge structures; and
- The Applicant believes that use of existing infrastructure at the site would result in a lower level of environmental impacts when compared to other site possibilities that are not currently developed.

POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS

Staff's assessment of environmental impacts is presented in detail in the individual sections of the FSA. The issues of most concern identified in those sections are the following:

- Aquatic Biological Resources: Potentially significant estuarine biological resource impacts from entrainment have been identified in the Clean Water Act section 316(b) biological resource studies. Due to these estuarine impacts, an analysis of other cooling technologies (dry cooling, hybrid cooling) is presented as an appendix to the Aquatic Biological Resources section. No mitigation has been proposed by the Applicant that would reduce these impacts to less than significant levels.
- Terrestrial Biological Resources: Potentially significant impacts have been identified to terrestrial species including the Morro shoulderband snail and the California red-legged frog at several sites including the project site, access road, and the Camp

San Luis Obispo laydown area. These impacts are likely to be mitigable to less than significant levels with recommended mitigation to compensate for lost habitat.

- Soil and Water Resources: While there are concerns due to potential impacts resulting from MBPP's pumping of groundwater on City wells and the possible effect on the contamination plume, these impacts are believed to be mitigable to less than significant levels.

The following sections first present alternatives that were eliminated from detailed consideration, and explain why these alternatives are not analyzed. Subsequent sections present alternatives analyzed in detail, including the No Project Alternative and site alternatives (involving construction of a 1,000 MW power plant in a different location).

ALTERNATIVES OUTSIDE THE SCOPE OF DETAILED CONSIDERATION

Public Resources Code Section 25305(c) states that conservation, load management, or other demand reducing measures reasonably expected to occur shall be explicitly examined in the Energy Commission's energy forecasts and shall not be considered as alternatives to a proposed facility during the siting process. The forecast that will address this issue is the Energy Commission's California Energy Outlook. Thus, such alternatives are not included in this analysis.

GENERATION TECHNOLOGY ALTERNATIVES

Staff compared various alternative technologies with the proposed project. We examined the principal electricity generation technologies that do not burn fossil fuels such as natural gas. These are geothermal, solar, hydroelectricity, wind, biomass, and waste-to-energy. Staff also considered coal and nuclear power generation to provide a thorough analysis of alternative generation technologies.

Geothermal, Solar Power, Wind, Hydroelectric Power

Solar, wind and hydroelectricity resources would require large land areas in order to generate 1,000 megawatts of electricity. Each of these technologies is described briefly below.

Geothermal Resources. Geothermal technologies use steam or high-temperature water (HTW) obtained from naturally occurring geothermal reservoirs to drive steam turbine/generators. There are vapor dominated resources (dry, super-heated steam) and liquid-dominated resources where various techniques are utilized to extract energy from the HTW. Geothermal is a commercially available technology, but it is limited to areas geologic conditions resulting in high subsurface temperatures. Even in areas where such conditions are present, there have been issues with the reliability of the steam supply and the corrosiveness of the supply. There are no viable geothermal resources in the San Luis Obispo County region.

Solar. Solar radiation (sunlight) can be collected to generate electricity via solar thermal and solar photovoltaic technologies. These technologies are largely infeasible for the Morro Bay area due to their large land requirements and the lack of consistent

sunshine. For example, centralized solar projects using the parabolic trough technology require at least approximately 5 acres per MW; consequently 1,000 MW would require at least 5,000 acres, more than 500 times the amount of space used by the proposed combined-cycle facility.

Wind. Wind generation, while it does not require use of fossil fuels, also has environmental effects. Wind farms large enough to produce significant quantities of electricity require use of large amounts of land, can have significant visual impacts, and in some areas, have resulted in a large number of raptor deaths. The noise generated by the wind turbines can also be of concern.

Generation from wind is not always available because, even in prime locations, the wind does not blow continuously. In California, the average wind generation capacity factor has been 25 to 30 percent. Although the cost of wind-generated energy, with the inclusion of federal production tax credits, is somewhat competitive, such low production cost is highly dependent on a very high quality wind resource. Such a resource does not exist within over 100 miles of Morro Bay. Because centralized wind generation areas generally require 40 to 50 acres per MW, generation of 1,000 MW would require 40,000 to 50,000 acres.

Hydroelectric Power. Hydroelectric facilities do exist in San Luis Obispo County (e.g., Lopez Lake, Lake Nacimiento, Whale Rock Reservoir and Santa Margarita Lake) (MBPP AFC 5-43). However, new large hydroelectric facilities capable of generating 1,000 megawatts would require inundation of more than 60,000 acres with water, resulting in extensive biological and environmental impacts.

Biomass

Major biomass fuels include forestry and mill wastes, agricultural field crop and food processing wastes, and construction and urban wood wastes. Several techniques are used to convert these fuels to electricity, including direct combustion, gasification, and anaerobic fermentation. Biomass facilities do not require the extensive amount of land as the other renewable energy sources discussed above. However, most biomass facilities produce only small amounts of electricity (in the range of 5-25 MW), and so could not meet project objectives. Biomass facilities also generate significant air emissions and require numerous truck deliveries to supply the plant with the waste. Also, in waste-to-energy facilities there is some concern regarding the emission of toxic chemicals, such as dioxin, and the disposal of the resultant toxic ash.

Conclusions Regarding Non-Fossil Fuel Energy Sources

The renewable energy technologies discussed above have the potential for significant land use, biological, air quality, noise, and visual impacts. In addition, the generation of 1,000 MW of electricity from these sources would require major commitments of land or other resources. Consequently, staff does not believe that these technologies present feasible alternatives to the proposed project.

Coal

Staff also considered the option of building a coal-fired power plant. Conventional boiler steam turbine technology using coal as a fuel would be feasible for commercial scale generation. However, coal would have to be imported from outside California, resulting

in increased truck and/or train traffic, and coal storage issues. Furthermore, coal combustion results in a higher level of emissions than that for natural gas burning facilities. The Energy Element of the San Luis Obispo County General Plan would allow use of coal only if other cleaner fuels became unavailable. For these reasons staff concluded that this alternative technology option is not feasible.

Nuclear Power

Staff did not consider a nuclear power plant alternative. The Diablo Canyon nuclear facility, owned and operated by PG&E, is already operating in San Luis Obispo County. California law prohibits new nuclear plants until the scientific and engineering feasibility of disposal of high-level radioactive waste has been demonstrated. Consequently, staff concluded that nuclear power is not a feasible alternative.

Demand Side Management

One alternative to a power generation project could be programs to reduce energy consumption. The Warren-Alquist Act specifically prohibits the Energy Commission from considering conservation programs as alternatives to a proposed generation project (Pub. Resources Code, Section 25305(c)). This is because the approximate effect of such programs has already been accounted for in the agency's "integrated assessment of need," and the programs would not in themselves be sufficient to substitute for the additional generation calculated to be needed.

The Warren-Alquist Act was amended in 1999 to delete the necessity of an Energy Commission finding of "need" in power plant licensing cases. In spite of the state's success in reducing demand in 2001, California continues to grow and overall demand is increasing. The 2002-2012 Electricity Outlook Report (CEC, 2002c) concludes that, despite exceptional conservation efforts in 2001, voluntary demand reduction will likely decrease over time.

While conservation and demand reduction programs are not considered as alternatives to a proposed project, the Energy Commission is responsible for several such programs, the most notable of which are energy efficiency standards for new buildings and for major appliances. These programs are typically called "energy efficiency," "conservation," or "demand side management" programs. One goal of these programs is to reduce overall electricity use; some programs also attempt to shift such energy use to off-peak periods.

The Energy Commission's Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24, Part 6) were established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. The Energy Commission adopted new standards in 2001, as mandated by Assembly Bill 970 to reduce California's electricity demand. The new standards went into effect on June 1, 2001. Since 1975, the displaced peak demand from these conservation efforts has been roughly the equivalent of eighteen 500 MW power plants. The annual impact of building and appliance standards has increased steadily, from 600 MW in 1980 to 5,400 MW in 2000, as more buildings and homes are built under increasingly efficient standards (CEC, 2002c).

After the California Independent System Operator (Cal-ISO) ordered rolling blackouts in January 2001 as a result of statewide electricity shortages, conservation efforts initially resulted in dramatic reductions in electricity use. Electricity use for each month in 2001 ranged from 5% to 12% less than it was in 2000. However, in 2002 demand has been increasing as the memories of rolling blackouts fade.

The California Public Utilities Commission supervises various demand side management programs administered by the regulated utilities, and many municipal electric utilities have their own demand side management programs. The combination of these programs constitutes the most ambitious overall approach to reducing electricity demand administered by any state in the nation.

The Energy Commission is also responsible for determining what the state's energy needs are in the future, using 5 and 12 year forecasts of both energy supply and demand. The Energy Commission calculates the energy use reduction measures discussed above into these forecasts when determining what future electricity needs are, and how much additional generation will be necessary to satisfy the state's needs.

Having considered all of the demand side management that is "reasonably expected to occur" in its forecasts, the Energy Commission then determines how much electricity is needed. The most recent estimation of electricity needs is found in the 2002-2002 Electricity Outlook Report (available on the Energy Commission's website).

SMALL POWER PLANTS

Staff also considered the possibility of a smaller sized alternative, such as a 240 MW gas fired combined cycle project located at the MBPP site. This generation capacity is only about 20% of the capacity the Applicant proposes to construct, but is considered here as an alternative in order to facilitate a thorough analysis of project options. This smaller project capacity would significantly reduce the amount of cooling water required for the project thereby reducing the quantity of biota impinged or entrained and reducing the size of the thermal plume. This alternative would reduce the impacts associated with construction of the large new facility (traffic, noise, and dust), but it would not eliminate potentially significant impacts on biological and water resources because the same cooling sources and discharges would be used. This alternative would also not fully meet the project objectives, which require development of a large power plant. Therefore, the development of a smaller facility was eliminated from consideration.

PARTIAL UPGRADE ALTERNATIVE

The AFC (MBPP AFC 5-7) presents an alternative based on the scenario in Duke's August 1999 AFC, in which:

- Units 3 and 4 (the newer, 1960's technology units with 676 MW capacity) would continue to operate indefinitely; and
- Units 1 and 2 (the older and smaller, 326 MW units) would be replaced by a new 500 megawatt (MW) combined-cycle facility.

According to Duke, this proposal was made because existing Units 3 and 4 at MBPP are competitive in the California energy market. However, in response to the 1999

AFC, the City of Morro Bay sought the complete and early demolition of the existing units as a condition of its support for the modernization Project. As a result, Duke agreed to withdraw the AFC in October 1999.

Following withdrawal of the 1999 AFC, Duke, the City of Morro Bay, and residents participated in discussions of how the use of the site could be improved. As a result of those discussions, the proposed modernization project was developed and the current AFC was prepared and submitted.

The Partial Upgrade Alternative is therefore eliminated because it would have substantially greater visual impacts than the proposed project, and would not eliminate the biological impacts associated with once-through cooling.

OTHER ALTERNATIVES CONSIDERED IN THE AFC

The AFC (MBPP AFC 5-17 to 5-38) considers several other alternatives: (1) different structure alternatives for enclosing the new units, (2) alternative cooling technologies, (3) changes to the cooling water discharge location or the water intake system, and (4) alternative configurations of the new units within the existing MBPP site. Alternative cooling technologies are described and evaluated in detail in an Appendix to the **Aquatic Biological Resources** section of this FSA. Structure alternatives mitigate visual impacts are considered in the **Visual Resources** section of the FSA, which includes a condition of certification requiring that the Applicant submit a partial shielding design when the plant design is finalized.

The AFC presented four configurations within the onsite tank farm area as alternatives to the configuration proposed for the project (MBPP AFC 5-15 to 5-16 and AFC Figure 5-2):

- The new units perpendicular to each other (the configuration selected as the Project as defined by this AFC);
- Stacks back to back, plant configuration perpendicular to the coast (shift to northern most section of the tank farm);
- Stacks in a row, perpendicular to the coast; and
- Stacks back to back, plant configuration perpendicular and parallel to the coast to form two sides and the corner of a square.

These configurations were the subject of detailed discussions between Duke, the City of Morro Bay, and residents. The result of these discussions was the development of the proposed project's configuration, which was determined to be preferred over the alternative configurations. Staff considers that the four configurations are therefore essentially design options that lead to the development of the proposed project. As a result, the alternative configurations described in the AFC are not evaluated as project alternatives.

ALTERNATIVES ANALYZED

The following sections evaluate several alternatives in comparison to the proposed MBPP project: the No Project Alternative, and six alternative power plants sites.

THE NO PROJECT ALTERNATIVE

The CEQA Guidelines state, "The purpose of describing and analyzing a No Project Alternative is to allow decision makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project" (Cal. Code Regs., tit. 14, §15126.6(i)). Toward that end, the No Project analysis considers "existing conditions" and "what would be reasonably expected to occur in the foreseeable future if the project were not approved…" (§15126.6(e)(2)). Defining the conditions that would occur in the foreseeable future if the proposed project is not approved is not straightforward. It requires some speculation about the future use of the existing power plant, given that the plant is relatively old and the generating units are aging, and in need of increasingly frequent maintenance. The following paragraphs describe the process used to define a reasonable No Project operating scenario.

In its PSA comments, Duke states that the No Project Alternative could result in (1) increased reliance on older less efficient power plants, or (2) another site, possibly a greenfield site, would have to be developed (Duke Energy, 2001c). Staff does not believe that a decision not to proceed with Morro Bay modernization would necessarily result in either of these events occurring. As of April 2002, there were nearly 12,000 MW of new generating facilities being evaluated in the Energy Commission's siting process, including a 600 MW facility proposed by Duke. An additional over 12,000 MW of power generating facilities have been approved, including about 10,000 MW under construction throughout the state (CEC, 2002c). These projects are being built in response to statewide demand for market power, and staff does not believe that the Commission's action on the Morro Bay project would directly affect the number or location of pending or future applications. Staff agrees that the No Project Alternative would result in continuation of both less efficient power generation at the Morro Bay site and in greater impacts in some environmental issue areas, but for some period of time that is shorter than the anticipated life of the new project.

Duke's response to Data Request Letter 23 (Duke, 2000a) describes several No Project operational scenarios based on the potential for the existing plant to run at 30, 39, and 59 percent of capacity. Which of these scenarios would actually occur in the absence of the new project and over what period of time would depend primarily on statewide factors such as:

- Levels of economic growth;
- Natural gas prices (higher gas prices could lead to greater electricity consumption, as well as higher electricity prices);
- Conservation policies and their effectiveness;
- Weather (hotter or cooler than normal summers, high or low hydroelectric production as a result of varying levels of winter precipitation);
- Imports of electricity;

- Wholesale power policies and prices;
- Whether or not new power plants are constructed or planned re-power of existing plants occurs; and
- Transmission system congestion or improvements.

Defining the No Project Scenario

After consideration of information presented by Duke, the No Project Alternative has been defined as follows. The No Project Alternative assumes that the proposed project is not constructed. The existing plant would be left "as is". Initially, Units 1-4 would remain in operation, and the three existing 450-foot tall stacks would remain in place. No new combined-cycle units would be added. Due to the age of Units 1 and 2, it is assumed that these units would remain in service for about five years, and that Units 3 and 4 only would continue to operate, but a lower levels, subsequent to that. Based on this speculative timeframe, in combination with Duke's three scenarios (59, 39, and 30 percent of capacity described above), the No Project Alternative is assumed to be as follows:

- 2002 to 2006: Units 1 through 4 operational (total capacity averaging 59% of current, or producing about 590 MW, which was the output of the existing plant in the year 2000);
- 2006 to 2010: Units 3 and 4 only, operating at 39% of current, or about 390 MW; and
- After 2010: Units 3 and 4 only, operating at 30% of current capacity, or about 300 MW)

Environmental Impacts of the No Project Scenario

The MBPP AFC (pages 5-8 to 5-9) states that the No Project Alternative would result in greater environmental effects than the proposed project. However, when Duke provided details on the specific environmental effects of the No Project Alternative (estimated for three operational scenarios in Duke's Data Response, Duke, 2001a), it became clear that some effects would be greater under the proposed project than in the No Project scenario. The No Project scenario effects detailed by Duke include:

- Greater environmental impacts in terms of operational noise and use of greater amounts of cooling water per MW-hour of energy produced[3].
- Greater emissions of NOx, CO, VOC (although SOx, CO2, and PM10 emissions would be less). Specific changes in air emissions were estimated by Duke as follows:

NOx emissions could be 17% lower than those of the new project at the 30% capacity level, but up to 62% greater than the new project at 59% capacity.
SOx emissions would be between 35 and 65% of those of the proposed project.
CO emissions would be between 29 and 250% greater than those of the new project.
CO2 emissions would be 42% (at low capacity) to 82% (at higher capacity) of new project emissions.

[3] Whether or not the total cooling water use or biological impacts associated with cooling water use would be greater under the No Project Alternative than for the proposed project depends on the selection of an appropriate baseline time period for comparison with the future.

VOC emissions could range from 90% to 174% of new project emissions.
PM10 emission would be less in all No Project scenarios, ranging from 48 to 93% of new project emissions.

- Lower efficiency in power generation, resulting in higher energy production costs.
- Potential lower reliability during periods of high electricity demand.
- Existing Units 1 through 4 at MBPP would be required to meet stringent new air emission levels restriction by adding selective catalytic reduction (SCR)[4], which would also be used by the proposed project to control emissions. With the added SCR, the existing units would require larger onsite storage quantities of ammonia and increased transport and storage of hazardous materials at the existing site.
- The capacity of the existing facility is 198 MW less than the proposed project at 1200 MW. However, Duke's No Project scenarios present further reduced capacity estimates of future operational levels, depending on supply and demand conditions defined above, ranging from 30 to 59% of existing plant capacity.

The changes in air emissions estimated above by Duke show that in some scenarios the existing plant would be expected to have higher emission than the proposed facility. However, as illustrated in Air Quality FSA Table 7-B, the actual air quality impacts of the new facility (impacts are the estimated concentrations on the ground, where they would affect people) are expected to be greater than the existing facility in nearly all cases. This is primarily due to the much greater stack height of the existing plant. In addition, the Air District in its regulation of the existing plant has effectively reduced emissions from the existing plant, especially with its Rule 429 that governs the emissions from the four boilers. Overall, staff concludes that differences in air quality emissions or impacts should not be major factors in comparing the proposed plant with the No Project scenario.

With respect to local, state, and regional transmission and distribution of electricity, the current system transmits power generated by the existing power plant (a) to local demand (30% to 40% of power generated; Duke, 2001), and (b) into the regional transmission system at PG&E's Gates Substation (near Coalinga in the Central Valley) from the MBPP switchyard. The No Project Alternative would maintain this current system. The proposed project would result in the increased power generated by the MBPP to serve both local and regional demand, thereby improving the State's overall electrical reliability.

As for the visual impacts, under the No Project alternative the three 450-foot exhaust stacks, the fuel storage tanks, and the existing generating building would not be removed, thereby maintaining the visual impact that exists today. Duke proposes to remove the large exhaust stacks and replace them with four 145-foot exhaust stacks, thus slightly reducing the visual impact of the power plant. Duke also proposes to remove the large fuel storage tanks and the main generating structure on the property, thus further reducing the visual impact of the power plant.

[4] In order to meet emission limits that become effective on January 1, 2003, Duke would have to either curtail generation or install SCR; either action could reduce emissions to required levels.

Water quality and biological resources impacts of the No Project Alternative would be less than those of the proposed project because the plant capacity would be significantly less. Water intake and discharge would be reduced, thus reducing impacts to the marine environment.

The No Project Alternative would have substantially less of an impact on traffic than would the proposed project. Since there would be no construction, there would be no construction-related traffic along Highway 1, Highway 41, and other areas adjacent to the existing plant site in the center of the City of Morro Bay.

In summary, the No Project scenario would avoid both the demolition- and construction-related impacts of the proposed project because no demolition and new construction would occur. Under the No Project scenario, existing operational impacts would continue to occur, but at diminishing levels due to the expected reduction in operational levels of the plant over time. These operational impacts include the continued visual impacts of the facility itself, noise impacts, and the marine biological and water quality effects of the existing plant.

SITE ALTERNATIVES

Determining the Geographic Area for Site Alternatives

In considering site alternatives, staff had to determine a reasonable geographical area within which a plant could be located and still meet project objectives. Because alternatives must consider the underlying objectives of the proposed project as listed above, staff confined the geographic area of site alternatives to (a) the San Luis Obispo County region, and (b) sites that have existing transmission capacity to the Morro Bay area.

The AFC (MBPP AFC 5-5) argues that the power plant is a “coastal dependent” facility because it relies on seawater for cooling. This does not require that alternative sites also be located on the coast. Current technologies allow use of relatively small amounts of reclaimed water or potable water for cooling, and either dry or hybrid cooling towers can be used in areas where adequate supplies of water are not available. Therefore, this analysis of alternative sites is not restricted to coastal locations.

The AFC presents several key criteria required for reasonable selection of an offsite alternative, as shown in **ALTERNATIVES Table 1**.

ALTERNATIVES Table 1
Criteria for Offsite Alternatives

AFC Criteria for Offsite Alternatives *	Staff Response
For a coastal location, a potential alternative site would have to be among those areas i dentified by the CCC in 1978 as a location that is not inappropriate for a power plant pursuant to Section 30416(b) of the CCA.	A new coastal site would be difficult to permit given current regulations and land uses. Therefore, only non-coastal alternative sites are considered herein.
The potential alternative site would also have to be among those areas identified in 1978 by the Commission as suitable for a power plant.	Staff is not bound to consider only sites identified in 1978.
The potential alternative site would have to be zoned or be capable of being rezoned "Heavy Industrial" or "Coastal Dependent Industrial."	Agreed.
The site would have to be large enough to support construction of a 1,200 MW generating facility.	Agreed.
The site would need to have sufficient existing infrastructure, or access thereto within a reasonable distance, to support a 1,200 MW generating facility, including • Natural gas pipelines (20-inch or larger). • Major roads to support deliveries and operations. • Water for utilities and cooling (e.g., ground water, wastewater treatment facility effluent). • Reasonable proximity to an existing transmission line system to facilitate connecting transmission lines and switching facilities (230-kV or higher and with the capacity for the new plant).	Agreed.

* MPPP AFC 5-6

None of the alternative sites discussed below has been subjected to an in-depth analysis similar to that conducted for the MBPP site. However, the analysis of each alternative site provides adequate information for the decision-makers consistent with CEQA and Energy Commission regulations.

Alternative Site Screening Analysis

Alternative sites were identified through a review of the Applicant's AFC, consideration of public comment, and an analysis of site availability within and around San Luis Obispo County. The AFC did not present any alternative sites. The public has suggested consideration of Duke's tank farm in the hills, northeast of the existing plant. Based on that input and staff's consideration of sites meeting screening criteria, staff selected six alternative sites that satisfied the preliminary site requirements within San Luis Obispo County or on/near existing transmission paths.

Staff found no alternative coastal site that could support a facility of this size and also reduce impacts of the proposed facility. This is due to the lack of "Heavy Industry" zoning (which would be required for construction of a power plant) in coastal areas. Staff was therefore required to search for inland site alternatives for this project. The use of an inland site would require a change in the cooling system from the proposed once-through ocean water cooling to an air-cooled condenser or to cooling tower technologies. This would entail a significant change in facility design, but is contemplated here in order to conduct a thorough analysis of site alternatives. In addition, the Appendix to the **Aquatic Biological Resources** section of this FSA

incorporates an analysis of dry cooling and hybrid (wet/dry) cooling technologies for the proposed MBPP site. Both dry cooling and hybrid cooling are found to be feasible at the MBPP site, and the impacts of these options are described in that testimony. The conclusions of this analysis and the impacts described in this study are also relevant to the use of these cooing technologies at alternative sites.

Water Availability. The main constraint to power plant siting for alternatives to the MBPP is availability of cooling water. As described below, several alternative sites located in the Central Valley are evaluated; these sites have good access to transmission and have been identified as potential power plant sites in the Energy Commission's ongoing effort to identify sites that could be used to add generation capacity for the State. A variety of potential sources of cooling water for power generation are available; however, the State Water Resources Control Board Policy 75-98 has established the following priority system for use of water for power plant cooling:

- Wastewater being discharged to the ocean;
- Ocean water;
- Brackish water from natural sources or irrigation return flow;
- Inland waste waters of low total dissolved solids; and
- Other inland waters.

The first source (wastewater discharge to ocean) is not available in the project area or in the area of the alternative sites in sufficient quantities. The second source, ocean water, is infeasible for all alternative sites, given their distance from the ocean. Both the City of Morro Bay and the Central Valley in general are in very constrained water supply situations. For the City of Morro Bay alternative sites, for which a small amount of treated wastewater would be available, hybrid cooling and dry cooling are considered to be feasible. The remaining sites identified below have very limited access to groundwater. Irrigation return flow is not available, according to water district staff, and there are no significant quantities of available wastewater (i.e., reclaimed water) near these sites. Therefore, two options are available for water supply for the alternative sites: (1) use of potable water from public providers (e.g., the State Water Project via the California Aqueduct), or (2) use of dry cooling or hybrid cooling technologies that minimize water use.

Water supplies in the Central Valley are extremely limited, so additional withdrawal of large quantities of groundwater is not an option. The major source of water in the Valley is the California Aqueduct, but the Aqueduct carries water to various entities (including San Luis Obispo County/Morro Bay) under contract. Therefore, in order to use water from the Aqueduct, two conditions must be met: (1) the user must contract for (purchase) water from sources with an excess of water, and (2) adequate capacity must be available in the Aqueduct to transport the water. The user must pay the transport costs (pumping) for water shipped via the Aqueduct. Water purchased to be shipped via the Aqueduct must be of drinking water quality.

The California Department of Water Resources and the U.S. Bureau of Reclamation (USBOR) control the Aqueduct. The area around the alternatives sites considered

below is in USBOR jurisdiction (USBOR, 2001). Aqueduct water is committed to certain contractors, who may have excess water available to sell to a power plant developer. Water rights would have to be researched to guarantee that adequate water supplies could be developed for wet cooling needs. As an example, the Hanford Energy Project (a 99 MW power plant requiring about 750,000 gallons per day) was recently approved by the Energy Commission. In order to meet these water needs (which are significantly smaller than those that would be required for a 1200 MW plant), the Hanford Applicant entered into water contracts with six separate water agencies/jurisdictions.

As a result of the questionable sources of water available in the Central Valley, this analysis assumes that dry cooling or hybrid (wet/dry) cooling may be required for these sites. As stated above, the Appendix to the **Aquatic Biological Resources** section of this FSA includes a detailed description of cooling technologies and their potential impacts at the proposed project site.

Alternative Sites

The six alternative sites are considered herein are listed below, and their locations are illustrated on ALTERNATIVES Figure 1 through 3:

- Tank Farm Alternative (San Luis Obispo County, three miles northeast of Morro Bay);
- Morro Creek Alternative (San Luis Obispo County, one mile northeast of the existing plant);
- Gates Substation Alternative (Fresno County, 13 miles east of Coalinga);
- Lemoore Naval Air Station (Kings and Fresno Counties);
- Pleasant Valley State Prison (Coalinga, Fresno County); and
- Avenal State Prison (Avenal, Fresno County)

Feasibility of Alternative Sites

Duke's comments on the PSA state that none of the alternatives sites identified herein are feasible as defined by CEQA. Staff disagrees with this comment. Duke defines feasibility so narrowly that only its proposed project would meet feasibility criteria. In addition, Duke attempts to eliminate certain sites based on certain potential environmental impacts rather than allowing those impacts to become factors in the comparison of sites. Because CEQA requires consideration of a "reasonable range of alternatives," and because neither Duke nor any other party has suggested other sites, only these six sites are considered in this FSA. Each of these sites meets the project objectives defined above.

ALTERNATIVES Figure 1
Morro Creek and Tank Farm Alternative Sites

ALTERNATIVES Figure 2
Gates Substation and Lemoore AFB Alternative Sites

ALTERNATIVES Figure 3
Avenal and Pleasant Valley Alternative Sites

Duke also argues that the existing MBPP would continue to operate if one of these alternative sites were selected. This cannot be known for certain at this time. If Duke decided to construct and operate a new plant at another site rather than modernizing the existing facility, market conditions may result in the older MBPP not being competitive due to its older equipment and reduced efficiency. The Energy Commission cannot require the Applicant or any other entity to construct at an alternative site; therefore, the analysis of alternatives focuses on the impacts of use of the alternative site, and does not assume that the impacts at both the existing project and project alternatives would occur.

The following sections describe each alternative site, and the environmental advantages and disadvantages of each.

Impacts Common to All Alternatives

The site alternatives described below have the following impacts in common:

- **Water Supply**: None of the alternative sites addressed below would have access to seawater for cooling, so there would be no impacts to aquatic biological resources. These sites have no direct access to water supplies for cooling. Water contracts may be available; however, feasible cooling options also include hybrid or dry cooling technologies.
- **Air Quality**: Emissions would be similar for all alternatives; however, all alternative sites are more isolated from sensitive receptors than the proposed project so potential health risks of air emissions would be less. The availability of Emission Reduction Credits would be a concern; availability of credits in the appropriate air district would need to be verified. More offsets may be required for San Joaquin Valley sites due to the distance of the sites to the offset locations.
- **Transmission**: For the four San Joaquin Valley sites, transmission line losses would result from transmission of required local power back to the MBPP Substation (for service to the City of Morro Bay and surrounding areas). However, these losses would be less than those of the proposed project in which the bulk of MBPP power would be transmitted from MBPP to the Gates Substation.

Tank Farm Alternative

Project and Site Description

The Applicant owns an existing tank farm approximately 3 miles northeast of downtown Morro Bay, which occupies a portion of the 62 acres owned by Duke. The tank farm has historically been used for storage of water for fire fighting and fuel oil, which was originally pumped to this location from offshore tankers via a pipeline to Estero Bay. There are two existing 500,000-barrel fuel oil tanks. The site is within the jurisdiction of San Luis Obispo County. The site is at an elevation of approximately 660 feet, and is accessible by a paved access road from Highway 41. The elevation rise along the 1.2-mile access road is from about 200 feet (at Highway 41) to about 660 feet at the tank farm site.

The surrounding land uses are agricultural and industrial (the existing tank farm is surrounded by avocado orchards). The natural gas supply pipeline line is immediately adjacent to the tank farm site so only an interconnection system would be required. The transmission system interconnection line would be approximately 3 miles long (to the MBPP Switchyard). The route is assumed to follow the existing natural gas pipeline that runs between the tank farm and the existing MBPP site.

Water for cooling at the Tank Farm site would have to be provided either by the City of Morro Bay or from the ocean. With the 660-foot elevation difference between the tank farm and the ocean, pumping of seawater to the site is not considered feasible. The City of Morro Bay receives most of its water from the State Water Project pipeline. The City also has wells (on property leased from Duke) that provided city water prior to the completion of the SWP. These wells are currently in jeopardy of contamination from a subsurface plume from a gas station underground tank leak. The City's desalination plant has a capacity of 576,000 gpd (potentially expandable to 1,200,000 gpd), but it is not currently operational and its reliability is questionable (Duke, 2000a). As addressed in the Cooling Options report (Appendix to the **Aquatic Biological Resources** section in this FSA), there is some treated water from the Morro Bay water treatment facility that could be used to allow for use of parallel condensing hybrid cooling towers. Cooling at the Tank Farm site could be accomplished with either dry cooling or hybrid cooling towers.

Advantages

- **Noise**: This location is isolated and has many fewer noise receptors than the proposed plant.
- **Biological Resources**: The site is currently disturbed in some areas by grading and paving so there would be minimal new disturbance to biological resources.
- **Access During Operation**: The site is located only one mile off of Highway 41. The turnoff to the tank farm is 2.1 miles east of Highway 1 and about 13.5 miles west of Highway 101. The proximity to these highways would facilitate material transport for deliveries and operations.
- **Natural Gas**: Natural gas pipelines are located immediately adjacent to the site.
- **Site Control**: The Applicant has site control.

Disadvantages

- **Access for Construction**: Access to the site is via a single lane paved roadway (1.2 miles northwest of Highway 41) designed for light traffic and not heavy construction vehicle traffic. The road would require significant improvement, affecting adjacent avocado orchards.
- **Current Land Use and Zoning**: While the site is currently used for industrial purposes, it is zoned for agriculture. The site would require a rezoning decision by the County of San Luis Obispo.
- **Biological Resources**: There are wetlands areas within the tank farm property (resulting from the creation of a bermed area intended to protect downslope areas

from a tank rupture or leak) that would be disturbed or eliminated by construction of a new plant at this site.

- **Transmission:** A 3-mile transmission line would have to be built to connect with the MBPP Switchyard. This line would be highly visible as it followed the existing gas pipeline along the ridgelines toward the west and south.
- **Water Quality and Erosion**: Construction in this hilltop location would require implementation of comprehensive measures to prevent erosion and sedimentation into Morro Creek, which runs parallel to Highway 41.
- **Visual Resources:** Impacts of this site on the ridge above the City of Morro Bay would likely be significant. Visual screening would be difficult in this location due to the hilltop setting, especially with use of dry cooling technology.

Morro Creek Site

Members of the public stated that the Applicant could achieve project objectives with an electric generation facility located just east of but physically adjacent to the City of Morro Bay near existing transmission lines but further from the coast. One such potential site is located along the north side of Little Morro Creek Road approximately one mile east of the existing plant. This area is within unincorporated San Luis Obispo County in an area that is currently agricultural with low-density residential usage.
The existing natural gas pipeline to the MBPP passes immediately west of this site, and the 230 kV transmission line to the Gates Substation is within a few hundred feet to the south. As for the Tank Farm site (above), water supply would be limited. At a distance of over one mile from the ocean, once-through cooling is not considered to be feasible because it would be infeasible to move the volume of water required in both intake and discharge systems across that distance. However, either dry cooling or hybrid cooling technologies could be used at this site.

Advantages

- **Transmission and Natural Gas:** The site can easily be connected to the PG&E substation and is adjacent to the existing gas line.
- **Access:** The site has an accessible road system, though access roads would need to be evaluated for their ability to support construction traffic.
- **Visual Resources**: The site would be substantially less visible from central Morro Bay and from offshore (due to its location north and east of a ridge with over 200 feet of elevation). While visual impacts may still occur due to the site's visibility from Highway 41, views of the site from the coast and from central Morro Bay would be limited.
- **Noise and Air Quality**: Operational impacts of the proposed MBPP at its current site would be reduced or eliminated (noise and air quality impacts would be shifted one mile to the east, where there are fewer people nearby).

Disadvantages

- **Current Land Use and Zoning**: Land is not zoned heavy industrial but rather agriculture and vineyard, and the land is currently used for agriculture. This site would require a rezoning decision by the County of San Luis Obispo.
- **Hazards:** There is the potential for flooding and liquefiable soils due to the site's location within the floodplain of Morro Creek.
- **Site Control**: Owner does not have site control

Gates Substation Alternative

Project and Site Description

The PG&E-owned Gates Substation is a major transmission substation providing 500/230/70 kV service on the backbone of the 500 kV system. The site is located in Fresno County, about 65 miles northeast of the existing MBPP, at 18336 West Jayne Avenue, 1.7 miles east of Interstate 5, 5 miles southwest of the community of Huron and 13 miles east of Coalinga. The substation was constructed in the early 1970's.

Staff considered a location adjacent to PG&E's Gates Substation as an alternative power plant site for Morro Bay site because it is this substation that receives the bulk of the power generated by the MBPP and transmits it to the regional transmission system. The site could be located in two areas adjacent to the substation (impacts of both would be the same due to their existing agricultural land use): immediately northeast (to the east of the 500 kV switchyard) or southwest (south of the 500 kV switchyard) from the portions of the Gates Substation used by PG&E. The existing Gates Substation owned by PG&E incorporates adequate land that could be available for power plant development, but even if PG&E had other plans for this land, adjacent land is agricultural and so could be converted to use for a power plant.

According to a Site Evaluation completed for the Energy Commission's Peaking Plant Project (CEC, 2001a), a power plant in this location would be served by the northwest/southeast trending PG&E main gas pipelines, 300A and 300B which cross the property approximately 3,600 and 1,100 feet south and west of the substation, respectively. The transmission system interconnection line would be available immediately adjacent to the power plant at the Gates Substation.

It should be noted that the Gates Substation is the southern end of the 90-mile segment of Path 15 (between Los Banos and Gates) where there is an existing transmission constriction, especially with respect to power flowing from south to north. However, because MBPP power would feed to the Gates Substation in all circumstances considered in this analysis, the transmission constriction would be the same in all alternatives. Also, the California Public Utilities Commission (CPUC) is currently reviewing a PG&E application to construct a new 500 kV transmission line between the Gates and Los Banos Substations. A Final Supplemental Environmental Impact Report (EIR) was issued by the CPUC in February 2002 to consider the environmental impacts of this transmission project.

Required infrastructure for this site would be provided as follows:

- Substation water is supplied from an onsite well that is sufficient only for current station domestic uses. Groundwater is located at a depth of about 200 feet, and adjacent land uses are primarily irrigated farmland. As discussed above, groundwater sources have not been identified in quantities needed for once-through cooling, but the site could support a dry cooling plant. The California Aqueduct is located 4 miles east of the substation site.
- Major transmission lines (230 kV and 500 kV) are located adjacent to the site.
- Natural gas pipelines are available within one mile of the substation.
  The Gates Substation is surrounded by agricultural land uses with annual crops, orchards, and vineyards. No residences or other buildings are visible from the substation. No wetlands or vernal pools were observed in the vicinity of the substation. This area is potential habitat for kit fox, kangaroo rat, and horned toads (species of concern in the area).

Advantages

- **Current Land Use and Zoning:** The surrounding area is primarily agricultural so there are few sensitive receptors for air quality, noise, and visual impacts. Operational impacts of the proposed MBPP would be moved away from population centers like Morro Bay.
- **Visual Resources**: A power plant at this location would be consistent with existing industrial land uses (major substation and numerous transmission lines).
- **Access:** The site is located on a major roadway with an off-ramp from Interstate 5, thus facilitating material transport for deliveries and operations.
- **Transmission:** No new transmission lines would be required (only connection of the new power plant to the existing substation).

Disadvantages

- **Land Use**: Existing farmland would be lost. However, much of this farmland is within PG&E's property and is leased for farming until PG&E decides to use its property for substation expansion or other electrical support purposes.
- **Site Control.** The site is not within the Applicant's control.

Lemoore Naval Air Station

The Lemoore Naval Air Station began operation in 1961 and is located about 95 miles north-northeast of Morro Bay. It includes about 18,000 acres, 4,000 of which are utilized for base operations (CEC, 2001b). The base is approximately 10 miles by 5 miles (east-west). The remaining base acreage is leased for agriculture. PG&E's 230 kV Henrietta Substation is located about 1 mile south of the base and is connected with the Gates Substation (which is approximately 15 miles to the southwest) by existing 230 kV transmission lines. The base is primarily within Kings County, with a portion in Fresno County.

Base personnel identified two potential sites on the base, including a 20-acre site northwest of the main gate that has been reserved for potential future development of a golf course, and a former landfill that has been fully restored and covered and is being monitored for methane gas production. Because of the noise caused by naval flight training (40-50 take-offs and landings per day), use of base land has been restricted and a large agricultural area has been retained to prevent residential encroachment to the airfields. Non-military land uses within the Base are open fields and agricultural areas (cotton fields and pistachio groves).

A housing development within the base is located one mile east of the main gate. State Highway 198 passes across the southern boundary of the base and leads to Highway 99 (about 30 miles to the east) and Interstate 5 (about 15 miles to the west).

Security at all military bases is now much stricter than it was at the time of PSA preparation, and it may be that current security policies would preclude development of a power plant on the base.

Required infrastructure for this site is as follows:

- Water service to the base is from the Westlands Water District (through the nearby California Aqueduct), which primarily serves agricultural users and is in short supply. The Base's existing supply of drinking and irrigation water is extremely limited. Water disposal is currently through an on-site treatment plant and evaporator ponds. Treated water from the evaporator ponds could be available for power plant cooling, but volume would be insufficient for anything but hybrid or dry cooling. The City of Lemoore has no fresh water available, and all current supplies of recycled wastewater are under contract for agricultural use (City of Lemoore, 2001).
- Transmission lines of 230 kV are located 0.5 miles south of the identified sites.
- Natural gas is supplied to the base via a 6-inch high-pressure gas line, which is stepped down for distribution within the base. However, a 1,000 MW power plant would require a larger gas pipeline (approximately 20 inches in diameter), so a new connection to the major PG&E gas lines near the I-5 (approximately 15 miles west of this site would be required.

Advantages

- **Aquatic Biology:** Use of this site would eliminate potentially significant impacts to the marine environment.
- **Land Use and Zoning**: Land is disturbed and not in agricultural production. The nearest residences would be over one mile away. Operational impacts of the proposed MBPP would be reduced or eliminated as the site is removed from population centers.
- **Transmission:** The area has access to transmission grid within 0.5 miles; transmission lines exist to serve local power demand in Morro Bay area (via Henrietta and Gates Substations, both of which have 230 kV circuits)
- **Noise**: Noise in the area is dominated by flight operations, and there are no sensitive land uses near the identified sites.

- **Access:** There is excellent access along Highway 198 from east or west; low traffic volumes.

Disadvantages

- **Water Supply:** Adequate water supply may be difficult to obtain, although dry or hybrid cooling is feasible.
- **Biological Resources**: Fresno Kangaroo rat (a State and Federal endangered species) may be present in the area.
- **Plant Design**: Facility height may be restricted by naval flight requirements, but the location northwest of the main gate is not considered to be likely to be affected by these restrictions.
- **Site Control**: The site is not within the Applicant's control, and security concerns may preclude power plant development.

Pleasant Valley State Prison

Project and Site Description

The Pleasant Valley State Prison is located east of the City of Coalinga on Jayne Avenue (in Fresno County), about 60 miles north-northeast of Morro Bay. The prison site is 640 acres in total. It opened in 1994 and houses about 5,000 prisoners. Prior to its use as a prison, the site was in agricultural use (CEC, 2000c).

There are no nearby residences (aside from the prison inmates), and agricultural land uses surround the site. Jayne Avenue has access to Interstate 5, approximately 7 miles to the east. State Highways 33 and 198 also pass through Coalinga, giving it good transportation access. Oil fields surround the town and oil infrastructure (pipelines, wells, tanks) is visible. The 500/230 kV Gates Substation is located 10 miles east of this site, and a new transmission line would be required to connect to the substation.

After the PSA was issued, the land adjacent to the prison was developed for use as a mental health facility. While the prison itself would not be considered a sensitive receptor, hospital inmates would be considered sensitive. Due to ongoing construction at the site, it is not clear whether adequate land will remain for a power plant.

Required infrastructure for this site is as follows:

- Natural gas is available off Line #105 from 4th Street, where additional gas pressure could be provided. Quantity of gas available is uncertain.
- Transmission access is about 10 miles to the east at the Gates Substation, so a 10-mile 230 kV transmission line would need to be constructed.
- Adequate water for once-through cooling may not be available (see discussion above), but dry cooling could be implemented. The City of Coalinga obtains drinking water from the California Aqueduct under contract with the USBOR. Additional water supplies are dependent on weather and availability; long-term contracts may not be available.

Advantages

- **Zoning and Land Use**: Land is currently zoned as PF (Public Facility; Coalinga, 2002; Fresno, 2002). Operational impacts of the proposed MBPP would be reduced or eliminated and moved further from population centers.

Disadvantages

- **Visual Resources**: The site is within a few miles of the City of Coalinga and along the main access highway to the city, so it would be highly visible to a large number of viewers. However, the area is not as scenic as the Morro Bay setting.
- **Noise** from plant construction and operation may disturb prison occupants and hospital patients (in the new facility).
- **Gas Supply:** While there is a gas pipeline in Coalinga, the adequacy of the natural gas supply has not been confirmed.
- **Site Control:** The site is not within the Applicant's control.

Avenal State Prison

Sites within the vicinity of the City of Avenal were considered as alternatives to the proposed project, because the city is near the transmission interconnection point where the MBPP power feeds into the State's 500 kV system at the Gates Substation.

On October 9, 2001, Duke filed an AFC for a 600 MW combined cycle power plant to be located east of central Avenal area in an industrially zoned area east of the I-5 (Duke, 2001e). Duke's application to construct the Avenal plant demonstrates the availability of water, transmission, and gas in the Avenal area. This analysis considers a different site, located about three miles south of central Avenal along Highway 33. While supplies of surface water in the area may not be sufficient to support two large power plants, dry or hybrid cooling could be used to reduce water demand.

The Avenal State Prison is located in Kings County on a 640 acres parcel on Highway 33. The prison was opened in 1987 after being solicited by the local community. It is surrounded by gentle rolling hills and is at about 750 feet of elevation. Agricultural land uses surround the site. The site is located about 10 miles south of the Gates Substation and 60 miles northeast of Morro Bay. There are no nearby residences (aside from prison occupants). There is a 66 kV substation, shooting range, and sewer treatment plant nearby.

Two possible sites are considered: one near the natural gas connection north of the prison site (further from the highway but also further away from transmission), and one near the substation (but further from the natural gas line).

Required infrastructure for this site is as follows:

- The existing 230 kV transmission line between Morro Bay and the Gates Substation is less than 5 miles to the northwest of this site, so an interconnection would be required. A 66 kV substation is located across the street from the prison; 66 kV lines

from this substation go to north to the Kettleman Hills Substation and then to the Gates Substation, so a parallel route for a new 230 kV line could be constructed adjacent to existing lines. The Gates Substation is less than 10 miles to the north.

- Potable water is available from the City of Avenal (via City of Coalinga which provides water to Avenal), but adequate supplies for once-through cooling are unlikely.
- There is an 18-inch natural gas pipeline (from Line 105) at the site.

Advantages

- **Access:** The site has easy access from Highway 33 for construction and maintenance.
- **Land Use and Zoning**: Land is currently agricultural and zoned AG-40 (agricultural, but permitted uses include public utility and public service structures; CDC, 2002). Adjacent to another major industrial facility (State Prison) so some benefits of co-location of industrial land uses and their associated impacts would result. Co-location would also reduce the visual impact of the power plant along Highway 33.
- **Noise and Air Quality**: Operational impacts of the proposed MBPP would be reduced or eliminated, and the site would be removed from a population center (though near the prison).

Disadvantages

- **Transmission Access:** Transmission access at a distance (5 miles away) so a new 230 kV transmission line would need to be constructed.
- **Visual Resources**: A power plant in this location would be highly visible from Highway 33, despite the adjacent prison. The valley is scenic, with a mountain range to the west and hills to the east that separate it from the San Joaquin Valley. A power plant may create a significant visual impact
- **Site Control**: The site is not within the Applicant's control.

ALTERNATIVE SITES ELIMINATED

CEQA requires identification of alternatives that were considered in the alternatives screening process, but that were rejected as infeasible. The following sections describe those alternatives.

Sites to the North

Intervenors suggested consideration of alternative sites to the north (e.g., expansion of Duke's Moss Landing plant) because these sites would not require use of the constricted portion of the transmission segment known as "Path 15." These northern sites are not considered herein because:

- There is a current application before the California Public Utilities Commission and action with the Western Area Power Administration for expansion of the portion of Path 15 between PG&E's Gates and Los Banos Substations. This proposal calls for construction of a 90-mile 500 kV transmission line by mid-2004. Given that the on-

line date for the MBPP modernization (or for any other new plant that would be approved in 2002) would likely be 2004, this transmission constriction is not expected to be relevant.

- The MBPP currently provides 30 to 40 percent of its power to the coastal San Luis Obispo County area (including the City of Morro Bay). Therefore, site alternatives were limited to areas near the existing 230 kV transmission lines into the Morro Bay Substation because the Moss Landing site could not provide this local power.

California Men's Colony

This prison facility opened in 1954 and is located along Highway 1 just west of San Luis Obispo. There is a 115 kV substation on the prison grounds. The plant is immediately east of and adjacent to Chorro Creek, which has a high level of biological sensitivity (CEC, 2001d). There are residences in close proximity to the prison facility and substation site, so noise and visibility would be significant concerns. The site is constrained with hills around it, and would be highly visible from Highway 1, a scenic highway, and about 3 miles northwest of the City of San Luis Obispo. The site was eliminated from further consideration because it offers no significant advantages over the proposed site.

Diablo Canyon Alternative

The Diablo Canyon Nuclear Plant is located about 10 miles south of the City of Morro Bay and about 7 miles west of Highway 101. There are 750 acres within the Plant property, including a large amount of coastline. This large amount of land was set aside to protect the plant from adjacent development, unauthorized intrusion, and to mitigate environmental impacts by creating an undeveloped buffer around the Plant.

The nearest natural gas supply interconnection line is approximately 6 miles east of the plant, so a new gas line would need to be installed over that distance. The transmission system interconnection currently exists, since Diablo Canyon generates power that supplies the whole State of California. There are 5 existing transmission circuits at the plant site: three 500 kV lines (one to Gates Substation and two to Midway Substation near Buttonwillow) and two 230 kV lines that both connect to the Morro Bay switchyard. The lines originate at a switchyard located adjacent to the nuclear facility. Water at this site could be provided by seawater, if an adequate coastal site could be identified.

While this site offers the potential to remove the existing MBPP from the center of the City of Morro Bay, its use would result in the relocation of marine biological impacts and visual impacts to another scenic area of the coast. In addition, the availability of this land for use as a thermal power plant is questionable since the nuclear power plant requires a high level of security and isolation.

CONCLUSIONS REGARDING ALTERNATIVE SITES

This screening level analysis has not resulted in the identification of "fatal flaws" for any of the six alternative sites. However, more detailed analysis of conditions and resources at each site might result in identification of potential impacts in addition to those listed above. To summarize staff's comparison of the important issues and potential significant impacts of the proposed project:

- Each of the six alternative sites has the potential to eliminate impacts to the marine environment (though it is noted that use of dry or hybrid cooling at the proposed project site would also reduce or eliminate most impacts to the marine environment, even if Units 3 and 4 were to remain operational).
- Four of the six alternative sites would have less visual impact than the proposed project. The visual impacts of the Tank Farm alternative site could be significant, similar to the impacts of the proposed project, and the Avenal State Prison site is located also a scenic area.
- Noise from plant operation and construction would affect fewer receptors at all six alternative sites because none are located in the center of a community.
- All six sites are in agricultural production or otherwise disturbed so impacts on biological resources are not expected to be significant.

Alternatives Table 3 summarizes the major issues and concerns regarding the six alternative sites. Where infrastructure connections (e.g., new gas pipelines or transmission lines) are required to be constructed, the impacts associated with their construction are also considered.

ALTERNATIVES Table 3
Comparison of Alternative Sites

Alternative Site	Major Issues, Concerns, or Benefits	Potentially Significant Impacts of Proposed Project				Preliminary Comparison to Proposed MBPP
		Biological Resources	Air Quality	Visual Resources	Soil / Water	
Tank Farm Alternative	• Plant and transmission lines would be highly visible from City of Morro Bay • Greater construction impacts for plant, transmission line, and water supply	Disturbed site; no marine impacts. Better than proposed.	Similar to proposed though receptors are further away	Ridgetop location above Morro Bay; similar to proposed.	Water supply concern; greater construction impacts.	Potentially Worse
Morro Creek Alternative	• Operational impacts would be relocated only one mile from existing site • Site is less visible from central Morro Bay	Agricultural site; no marine impacts. Better than proposed.	Similar to proposed though receptors are further away	Less visible than proposed site, but still potentially significant	Water supply concern; dry or hybrid cooling feasible.	Potentially Better
Gates Substation Alternative	• Gas, transmission, and land is available • Minimal visual impacts (isolated location)	Agricultural site adjacent to substation. Better than proposed.	Better than proposed; no nearby receptors. Offsets may be more difficult to obtain.	No sensitive viewers; better than proposed.	Water supply concern; dry or hybrid cooling feasible.	Potentially Better
Lemoore Naval Air Station	• Gas, transmission, and land is available • Security concerns may preclude development	Unknown, but as existing military base, likely better than proposed.	Better than proposed; no nearby receptors. Offsets may be more difficult to obtain.	No sensitive viewers; better than proposed	Water supply concern; dry or hybrid cooling feasible.	Uncertain
Pleasant Valley State Prison	• 10-mile transmission connection required • Visual impacts from City of Coalinga • Adjacent hospital under construction	Potential biological impacts along transmission line; likely better than proposed	Better than proposed; no nearby receptors. Offsets may be more difficult to obtain.	Potential sensitive views; still better than proposed	Water supply concern; dry or hybrid cooling feasible.	Uncertain
Avenal State Prison	• 5 to 10 mile transmission connection required • Visual impacts from Highway 33 and throughout valley	Potential biological impacts along transmission line; likely better than proposed	Better than proposed; no nearby receptors. Offsets may be more difficult to obtain.	Potential sensitive views; still better than proposed	Water supply concern; dry or hybrid cooling feasible.	Uncertain

CONCLUSION

Staff does not believe that energy efficiency measures and alternative technologies (geothermal, solar, wind, and hydroelectric) present feasible alternatives to the proposed project.

The No Project Alternative, while it would result in the reduction of construction impacts and some air pollutants, would also not allow the proposed modernization to occur. Modernization would reduce visual and noise impacts of the existing plant by removal of the existing stacks and generation building, and would also contribute to meeting the State's need for electrical power. While the existing operational impacts such as air emissions and water quality effects would continue, these effects would be reduced due to the reduced capacity of the plant over time.

The option of constructing a smaller project, such as a 240 MW combined cycle unit would create traffic, biological resources, visual, and water resource impacts but at lower levels than the proposed project. A smaller MBPP project would also make use of many existing infrastructure systems: water intake and discharge, transmission interconnection, natural gas supplies, and other existing mechanical systems. However, it would not meet project objectives requiring development of a large power plant and therefore it was eliminated from detailed consideration.

This section also presented an analysis of six alternative sites. CEQA requires that an alternatives analysis focus on elimination of the project's potential significant impacts to less than significant levels. The FSA identifies potentially significant adverse impacts to aquatic biological resources as a result of the high volume of seawater used for cooling. All six alternative sites are removed from the coast so they would not use seawater for cooling. In addition, hybrid or dry cooling technologies are believed to be feasible at the alternative sites, as well as being feasible at the proposed project site as mitigation for the aquatic biological resource impacts as discussed in the Appendix to the **Aquatic Biological Resources** section of the FSA. Two alternative sites, Morro Creek and Gates, appear to have the potential to best eliminate the proposed project's impacts without creating greater impacts at their locations.

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