Prepared for

PG&E

and the
State Water Resources Control Board
Nuclear Review Committee

Independent Third-Party Interim Technical Assessment

for the

Intake Relocation for Diablo Canyon Power Plant

Prepared by

BECHTEL

Bechtel Power Corporation

Report No. 25762-000-30R-G01G-00003 Rev. 0

July 11, 2012

Independent Third-Party
Interim Technical Assessment

for the

Intake Relocation
for Diablo Canyon Power Plant

Prepared by:

Bechtel Power Corporation

Revision	Date	Affected Sections
0	July 11, 2012	Initial Issue

Contents

List of Abbreviations and Acronyms

ATC	Regional Pollution Control District Permit to Construct
BLM	Bureau of Land Management
Caltrans	California Department of Transportation
CDFG	California Department of Fish & Game
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CPUC	California Public Utility Commission
DCPP	Diablo Canyon Power Plant
EPCRA	Emergency Planning and Community Right-To-Know Act
EPRI	Electric Power Research Institute
FAA	Federal Aviation Administration
fps	foot per second
gpm	gallons per minute
GWA	Government of Western Australia
mgd	million gallons a day
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
NYSDEC	New York State Department of Environmental Conservation
OHP	Office of Historic Preservation
PG&E	Pacific Gas and Electric
PTC	Regional Control District Permit to Operate
RC	Resource Commission
RCRA	Resource Conservation Recovery Act
RWQCB	Regional Water Quality Control Board
SDRWQCB	San Diego Regional Water Quality Control Board
SPCC	Spill Prevention and Countermeasure Control Program
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Council Board
USACE	U.S. Army Corp of Engineers
USEPA	U.S. Environmental Protection Agency
USMC	U.S. Marine Corps
WDR	Waste Discharge Requirement

Independent Third-Party Interim Technical Assessment
for the Intake Relocation for
Diablo Canyon Power Plant
Report No. 25762-000-30R-G01G-00003

1. Executive Summary

This study summarizes the findings of the first phase of a detailed evaluation to assess viability of relocating the initial intake to the once-through cooling for the Diablo Canyon Power Plant (DCPP) to a suitable offshore location. This intake relocation is one of the suggested technologies in support of the Nuclear Review Committee's initiative to identify strategies to implement the California *Statewide Policy on the Use of Coast and Estuarine Waters for Power Plant Cooling*. This strategy would comply with the Section 316b, *California Once-Through-Cooling Policy*, Phase II rules

The design and use of an offshore intake fitted with a properly designed series of velocity caps and located at a suitable depth and location has been thoroughly evaluated within this report. The offshore intake technology affect impingement and entrainment reductions in four ways: (1) The velocity caps are designed to limit the inlet velocity to 0.5 feet per second (fps), (2) the radial flow field around the inlet tends to cause juvenile and adult fish to avoid the area of the inlet, (3) the low inlet velocity will tend to limit the entrainment of larvae and fish eggs, and (4) locating the velocity caps off the bottom and away from known spawning areas reduces the potential for entrainment or capture of juvenile and adult fish, larvae, and fish eggs.

The external approval and permitting assessment for the offshore intake identified a list of potentially applicable federal, state, and local permits and approvals that, not surprisingly, focused on its significant impacts to the marine environment. The efforts to conduct a successful California Environmental quality Act (CEQA) review and secure the U.S. Army Corp of Engineers (USACE) Section 404 permit, California Coastal Commission Coastal Development Permit, State Lands Commission Lease, National Pollutant Discharge Elimination System (NPDES) permit modification will represent the primary regulatory challenges.

These permits are all expected to be contentious and have lengthy processes that will be aligned with the CEQA/Environmental Impact Report review process. The primary issue of concern will be determining velocity cap construction impacts to the sensitive and productive marine habitats while offering reductions in impingement impacts that are already partially mitigated by the existing intake system.

The offshore intake technology has been reviewed against each of the Phase I criterion and the results are summarized below. The overall finding is that although it is found to be feasible, there are several significant technical and operational challenges associated with the technology. Those key challenges are the determination of their actual effectiveness in reducing fish egg and larvae entrainment, the permitting process is expected to be lengthy and the installation effort will present significant challenges that will have to be overcome.

Criterion	Status
External Approval and Permitting	No fatal flaws
Impingement/Entrainment Design	No fatal flaws but the technologies effectiveness with entrainment of fish eggs and larvae is indeterminate
Environmental Offsets	No fatal flaws.
First-of-Kind-to-Scale	No fatal flaws.

Operability of General Site Conditions	No fatal flaws.
Seismic and Tsunami Issues	No fatal flaws.
Structure and Construction	No fatal flaws.
Maintenance	No fatal flaws.
Conclusion	**Technology is a candidate for Phase 2 review.**

2. Background and Introduction

2.1 Purpose/Scope of Study

This study is performed in accordance with the requirement established by the State Water Resources Control Board (SWRCB) Pacific Gas & Electric (PG&E) to conduct a detailed evaluation to assess compliance alternatives to once-through cooling for the DCPP. This requirement is associated with the California S*tatewide Policy on the Use of Coast and Estuarine Waters for Power Plant Cooling* that established uniform, technology-based standards to implement the Clean Water Act Section 316(b), which mandates that location, design, construction, and capacity of the cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts.

This report describes the detailed evaluation of the intake relocation technology for DCPP based on the list of site-specific criteria approved by the Nuclear Review Committee. The evaluation process includes critical review of published data and literature, consultation with permitting agencies, and technical assessment supported by engineering experience and judgment. No new field data was collected as part of this effort. The results of the evaluation are used to characterize the feasibility of this technology and its possible selection as a candidate for further investigation in a follow-on phase of this study.

2.2 Regulatory History

2.2.1 Federal

The United States Environmental Protection Agency (USEPA) has proposed standards to meet its obligations under the Section 316(b) of the Clean Water Act to issue cooling water intake safeguards. Specifically, this section requires that NPDES permits for facilities with cooling water intake structures ensure that the location, design, construction, and capacity of the structures reflect the best technology available to minimize the harmful impacts on the environment. These impacts are associated with the significant withdrawal of cooling water by industrial facilities that remove or otherwise impact significant quantities of aquatic organisms present the waters of the United States. Most of the impacts are to early life stages of fish and shellfish through impingement and entrainment. Impingement occurs when fish and other aquatic life are trapped against the screens when cooling water is withdrawn resulting in injury and often death. Entrainment occurs when these organisms are drawn into the facility where they are exposed to high temperatures and pressures—again resulting in injury and death. (USEPA, 2011)

In response to a consent decree with environmental organizations, the USEPA divided the Section 316(b) rules into three phases. Most new facilities (including power plants) addressed in the Phase I rules, initially promulgated in December 2001. Existing power plants were subsequently addressed, along with other industrial facilities, in Phase II, issued in February 2004. Since then the rule has been challenged, remanded, suspended, and reproposed. The current proposed version of the rule dictates that all existing facilities that with-

draw more than 2 million gallons per day (mgd) of water from waters of the United States and use at least 25 percent of the water they withdraw exclusively for cooling purposes would be subject to:

- Upper limit on the number of fish killed because of impingement and determining the technology necessary to comply with this limit, or

- Reduce the intake velocity to 0.5 feet/second (fps) (through-screen), or lower, which would allow most fish to avoid impingement.

Large power plants (water with actual intake flow of 125 mgd or greater) would also be required to conduct studies to help their local permitting authorities (SWRCB) to determine site-specific best technology available for entrainment mortality control. Note this version abandoned the original performance standards approach that mandated the calculation of baseline against which reduction in entrainment and impingement can be measured.

The Section 316(b) Phase II final rule is expected to be issued July 27, 2012. When the final rule becomes effective, it is likely to include an implementation timeline that would drive the implementation of technologies to address impingement requirements within 8 years (2020).

2.2.2 State

The SSWRCB is responsible for ensuring compliance with the finalized Section 316(b) rules in California and it has been actively pursuing a parallel path regulatory program that is focused on the state's coastal generating stations with once-through cooling systems including DCPP. The SWRCB's use of Coast and Estuarine Waters for Plant Cooling (Once-Through Cooling) Policy became effective October 1, 2010. This policy established statewide technology-based requirements to significantly reduce the adverse impacts to aquatic life from once-through cooling. Closed-cycle wet cooling has been selected as best technology available.

Affected facilities, including DCPP, are expected to:

- Reduce intake flow to a level commensurate with that attainable with a closed-cycle wet cooling system and reduce through-screen velocity to 0.5 fps or below—Track 1, or

- Reduce impacts to aquatic life comparably by other means – Track 2

This policy is being implemented through a so-called "adaptive management strategy" that is intended to achieve compliance with the policy standards without disrupting the critical needs of the state's electrical generation and transmission system. A Nuclear Review Committee was later established to oversee the studies that will investigate the ability, alternatives, and costs for both SONGS and DCPP to meet the policy requirements. This study is a direct outgrowth of the adaptive management strategy to implement this Once-Through Cooling Policy (Bishop, 2011).

Current Cooling Water Intake System and Section 316(b) Compliance History – DCPP

DCPP operates a common cooling water intake structure to provide cooling water to the once-through cooling systems of Units 1 and 2. Each unit's water withdrawal rate is nominally 867,000 gallons per minute (gpm) or 1,248 mgd. Cooling water is withdrawn through a shoreline intake structure in a cove partially protected with man-made breakwaters. The inlet structure includes a set of inclined bar racks and traveling screens. A concrete curtain wall extends 7.75 feet below mean sea level to keep out floating debris. Incoming

cooling water for the normal circulating water system travels to one of four separate screen bays (two per unit). Each screen bay is fitted with three rotating vertical traveling screen assemblies with 3/8-inch stainless steel mesh panels. The through-screen velocity is approximately 1.95 fps. A high-pressure spray wash removes any debris or fish that have become trapped on the screen face through a grinder then into a sump that leads back to the ocean outside the intake cove. (Tetra Tech, 2009). In addition, each unit has two auxiliary saltwater trains (one duty and one standby) that perform safety-related functions and each train is served with one auxiliary saltwater pump, rated at 11,000 gpm (DCPP, 2009). The auxiliary saltwater pumps for each unit are housed in separate pump bays located near the center of the intake structure, and are serviced by a common 5-foot-wide traveling water screen.

Because of the high flow rate of the once-through cooling water system and intake velocity that exceeds 0.5 fps, the current DCPP cooling water intake structure arrangement is considered to be not effective at reducing impingement mortality and entrainment losses. Consequently, this matter has been the subject of a number of Coastal Commission Regional Water Quality Control Board initiatives that have increasingly focused attention on mitigation of impingement and entrainment impacts via application of potentially viable alternative cooling system technologies.

2.3 Screening Process (A/B Criteria)

The technology screening process for the Phase 1 portion of the evaluation will be performed by using a Criteria Set A/B approach that generates a technically comprehensive assessment while concurrently minimizing the time and effort required. The screening will be initially performed for Set A criteria. If the technology satisfies all of the Set A criteria, it will be evaluated using Set B criteria.

Set A criteria include the following items that are judged to be critical to the screening process:

- External Approval and Permitting (Nonnuclear Licensing)
- Impingement/Entrainment Design
- Offsetting Environmental Impacts

All remaining criteria are grouped into Set B criteria, which are shown below:

- First-of-a-kind to scale
- Operability general site conditions
- Seismic and tsunami issues
- Structural
- Construction
- Maintenance

During the screening process, if any criterion cannot be met, the screening process is suspended and a summary report for that technology is then prepared.

3. Technology Description

3.1 General Site and Intake Descriptions

3.1.1 Land and Sea Conditions

The terrestrial and marine environment including the physical oceanographic conditions at DCPP results in unique constraints affecting the practical selection of any cooling water intake system. DCPP is located on a coastal terrace above a rocky shoreline with bathymetry characterized by a sloping bedrock bottom with steep relief, rocky pinnacles, and prominent rocky ridges. The land side topography of the DCPP site, in general, exhibits steep topographic relief where the plant itself lies on gently sloping, narrow, coastal terrace at an elevation of 85 feet (mean sea level) above the rugged coastline, with the Irish Hills rising steeply behind the facility, to the east (Tetra Tech, 2002).

The near-shore marine environment near DCPP is naturally divided into intertidal and sub-tidal zones. The ocean water level normally varies between zero and +6 feet mean lower low water datum. Mean sea level zero is equivalent to +2.6 feet mean lower low water. Maximum tidal range is approximately 9 feet and extends from 7 feet above mean lower low water to about 2 feet below mean lower low water. The sub-tidal zone reaches a maximum depth of approximately 60 feet below mean lower low water within 100 feet of shore in some area. (DCPP, 2009)

Normal wave activity is in the 5- to 10-feet range, with storms generating waves between 20 and 30 feet. During the storm season between September 1997 and August 1998, peak swells exceeded 10 feet on 64 days. The DCPP cooling water intake is located in an area of significant production of marine algae, including surface kelp and understory algae. Kelp growth can reach 2 feet per day during the growing season between June and October. DCPP is located in a "wet marine" weather environment where ocean winds are commonly 10 to 25 miles per hour and can reach 40 to 50 miles per hour. Rainfall averages 20 inches per year; and the normal daily weather pattern is characterized by wet/foggy conditions in the morning and mild to strong winds in the afternoon. (Tetra Tech, 2002)

Daily mean seawater temperature ranges from approximately 10.5°C (50.9°F) in May to approximately 15°C (59°F) in September. The maximum seawater temperature is about 18°C (64°F) (Tetra Tech, 2002). Seawater temperature measurements at the Coastal Data Information Program (CDIP) observation buoy (Station 076 Diablo Canyon) moored at 0.2 nautical miles offshore of the plant indicate the same order of temperature range with the maximum and minimum values (based on measurements from 1996 to 2012 recorded at half-hourly interval) at 22°C (71.6°F) and 8.4°C (47.1°F).

3.1.2 Existing Shoreline Intake Description

DCPP uses a common shoreline intake structure to withdraw cooling water from the ocean to two independent once-through systems, one for each unit. The intake structure is protected by two breakwaters that extend offshore to form a semi-enclosed cove. Each unit is serviced by two, single-speed circulating water pumps. The cooling water flow rate for Unit 1 ranges from 778,000 to 854,000 gpm and, for Unit 2, from 811,000 to 895,000 gpm. The intake structure, with the inlet oriented more or less normal to the shoreline, is furnished with inclined bar racks and travelling screens for debris filtering. A concrete curtain wall extends 7.75 feet below mean sea level to keep out floating debris. Trash bars are flat bars, 3 inches by 3/8 inches on 3-3/8 inch centers, which create 3-inch openings in the racks, designed to exclude large debris. There are six travelling screens per unit, each at 10 feet (width) x 30 feet (depth), and are equipped with stainless steel 3/8-

inch mesh panel. In addition, for each unit, there are two auxiliary service water pumps housed in separate pump bays located near the center of the intake structure, and serviced by a common 5-foot-wide traveling water screen. Traveling water screens can be set to rotate at 10 or 20 fpm and can be washed manually or automatically, with high-pressure spray (Tetra Tech 2002).

An additional 9-foot-wide bar rack bay serving as a fish escape route is provided at each end of the intake structure. The partition is open between the units behind the bar racks, providing free flow of seawater and a migration route to sea for fish from one end of the structure to the other. (DCPP, 2009)

During routine operations, the traveling water screens are rotated and washed by high pressure saltwater spray for 15 minutes every 4 hours. In high-energy ocean swell events, and/or periods of increased source water debris loading conditions, the traveling screens can be placed into continuous operation at either low or high speed. The traveling screen wash system spray nozzles discharge into sluiceways located on the intake structures exterior upper deck. The sluiceways flow to a central refuse collection sump. The sump is dewatered by pumping systems capable of transferring high percentage solids laden flow. The saltwater screen wash effluent and entrained debris is pumped from the sump to a discharge outside of the power plant intake cove. Grinding and mincing equipment installed in the inlets of the refuse sump process debris captured by the traveling screens and subsequently washed off. The debris grinders reduce potential for clogging of the sump when seawater inlet flow is laden with significant quantities of ocean debris (primarily kelp and under story algae). (DCPP, 2009)

3.2 General Technology Descriptions

The relocation of intake to offshore involves enclosing the intake cove (basin), thereby preventing direct inflow to the intake basin and introducing a new tunnel underneath the breakwaters extending offshore where the velocity cap assemblies will be located. The offshore location of velocity caps will depend on bathymetry such that there is a minimum of 30 feet of water depth available during the minimum tide level condition.

The offshore tunnel/velocity caps intake system consists of the following components:

- A common drop shaft (main shaft) constructed near shore in the enclosed shoreline basin.
- An offshore rock tunnel of 30 to 32 feet diameter, connecting the main shaft to the offshore drop shafts.
- Minimum of six offshore drop shafts to install offshore velocity caps.
- Minimum of six offshore velocity caps, one for each drop shaft, to supply water to the tunnel and then to the shoreline basin.
- An enclosed shoreline basin is constructed by extending the existing inner breakwater.
- Fish collection and return system is added to each individual traveling water screen. Collected fish will be returned to the ocean via the return line from the pumphouse.

Figures IR-1 and IR-2 show the schematic arrangement for this technology. A brief description of components is as follows:

A 30- to 32-foot-diameter rock tunnel will be constructed using a tunnel boring machine to connect the main drop shaft to offshore drop shafts. The offshore tunnel length will depend on the seawater depth requirements

but the length is estimated to be approximately 1800 feet. The tunnel will be unlined. The main drop shaft will have a diameter similar to the tunnel to provide access for the tunnel boring machine. This shaft will ultimately serve as a seawater supply conduit. A construction access shaft (not shown in the figures) may be required to facilitate construction sequencing. The depth of the tunnel below seabed will be determined based on local geological conditions. Some sections of tunnel may need to be lined based on the geological conditions.

The common main shaft will be used to convey the plant cooling water, collected from offshore velocity caps, to the shoreline basin through the underground rock tunnel. The offshore drop shafts (6 shafts), which receives water from velocity caps and transfer it to the intake basin, will be constructed using a barge-based marine drilling process or installed in dry conditions inside a temporary cofferdam, as applicable. The tie-in of the drop shaft to the underground tunnel will be made after completion of the tunnel. The offshore drop shafts will have a nominal inside effective diameter of 12 feet.

The shoreline basin is constructed by extending the existing outer breakwater southward, which will close the intake cove from direct contact with the open sea environment. The only connection of this basin to the sea will be through the tunnel.

To allow the opportunity for the entrapped fish in the pumphouse to escape, a fish collection and return system is added to each traveling water screen. Existing screens will be modified to add fish buckets at the bottom of each screen panel and will include dual pressure sprays, low-pressure spray at 10 psi to get fish to the return piping and high-pressure spray to dislodge debris to the trash grinder. A fish return line will be added to return the fish to the ocean outside the western side of the cove.

3.3 Velocity Cap Details

Each velocity cap will be octagonal in shape and 48 feet across the top width. Considering the large amount of cooling water withdrawal requirements, the velocity cap horizontal openings will be sized to be large enough to maintain an inlet velocity of 0.5 fps. Large object/debris bars will be provided at the inlet to prevent the entry of this debris into the tunnel. The bars will be 150 millimeters (6 inches) apart center to center. Due to large inlet openings, the fish and floating debris such as kelp and algae, will be able to enter the velocity cap and reach the shoreline intake. The amount of such material will be substantially less than current conditions due to the system's small inlet velocity, the submerged nature of inlet, and the inlet's elevation from the sea bottom.

The placement of the offshore velocity cap assemblies will not be an obstruction to surface navigation due to their deep location. Warning buoys may be used to ensure large ship or barge to stay away from the velocity caps area.

The velocity caps will be in deeper, generally less biologically productive areas. The inlet velocity of 0.5 fps is comparable to local sea currents, which will enable even juvenile fish to swim away from these intake areas safely.

4. Criterion Evaluation

4.1 External Approval and Permitting

4.1.1 General Discussion

The external approval and permitting assessment focused on identifying the applicable (required) permits and approvals for construction and operation of an offshore modular water offshore intake system.

The initial assessment effort focused on developing a comprehensive list of potentially applicable permits and approvals at the federal, California, county, and municipal level (as applicable). This applicability of each permit/approval to the proposed offshore intake option was evaluated. Those permits and approvals that were deemed applicable were subsequently scrutinized to characterize the expected duration and complexity of the regulatory review process. Special attention was directed to identifying environmental impact issues or criteria that would preclude the applicable permit or approval from ever being issued or granted. That is, the focus was to screen each applicable permit or approval for fatal flaws in the associated regulatory review process that would preclude the offshore intake system from further consideration.

The assessment also focused on identifying the critical path (longest duration) initial preconstruction permitting processes, that is, those that support site mobilization, physical site access, initial earthwork/foundations for each cooling system technology option. The duration of the permitting and the approval process, while not a definitive fatal flaw, could later serve as a screening tool if combined with specific schedule limitations.

Permits and approvals that support later stages of construction and operation that are not critical path to the commencement of construction were also included in the assessment since these items could pose significant operational constraints to future DCPP operations.

4.1.2 Detailed evaluation

This summary list of permits provided the basis for subsequent discussions with key relevant regulatory authorities regarding the applicable permit application needs and the permit review time frames. These discussions were also critical for the identification of potential regulatory or permit-related barriers to implementation—fatal flaws.

The following regulatory authorities were contacted:

- U.S. Army Corps of Engineers (USACOE)
- California Public Utility Commission (CPUC)
- California Coastal Commission
- California State Lands Commission
- State Water Resources Control Board (SWRCB)
- Central Coast Regional Water Quality Control Board (CCRWQCB)
- San Luis Obispo Air Pollution Control District
- San Luis Obispo County

The following sections describe the relevant key permitting/approval processes for each closed cooling technology. The findings are summarized in Table IR-1. This table lists the applicable permits and approvals, determines the critical path review processes, and most importantly, highlights those processes that may be fatally flawed.

4.1.2.1 Offshore Intake System

The relocated offshore intake system refers to abandonment of the existing shoreline intake system and the addition of a new offshore velocity cap intake system similar to the current system at SONGS. The velocity cap system will be located offshore in deeper, less biologically rich water, though not as distant and deep as the deepwater option.

US Army Corps of Engineers

The USACE is the lead agency for Clean Water Act Section 404 and Section 10 permitting processes, which are focused primarily on impacts to waters of the United States and waterborne navigation. The offshore intake system will involve offshore tunneling (tunnel boring machine) processes, with some cut and fill near the velocity cap installations, which will pose significant construction impacts to USACE jurisdictional waters.

For minor impacts, the USACE has established a general permit program (nationwide permit) for a host of less significant work processes involving waters of the United States. The significant marine work associated with this cooling system option precludes any nationwide permit permitting process for cut/fill and tunneling construction options. DCPP, therefore, would then be faced with securing the more complex individual Section 404/10 permit.

While individual Section 404 permit review periods can often be lengthy, the USACE representative for the DCPP area explained that all USACE facilities have goals to issue an individual Section 404 permit within 120 days of deeming the associated application complete (Lambert, 2012). This period is a goal, not a statutory commitment. Consequently, in many cases, this goal is not realized. These delays are often associated with the mandated consulting processes that need to be pursued with the State Historic Preservation Office, U.S. Fish and Wildlife Service, or National Marine Fisheries Service. In other cases, there are extensions of public notice periods or scheduling complications for the public hearing. The applicant for the Section 404/10 permit has to directly pursue consultations with the California Coastal Commission and SWRCB. Receipt of an individual Section 404 permit is contingent on previous receipt of permits from the California Coastal Commission and SWRCB.

This difficult situation with the permitting process is impeded further by the understaffed local USACE office (two to three permit writers), so permit review durations have been getting longer. For the more complex and contentious situations, the permitting process can extend to 1 to 2 years. Hence, the USACE permits are often characterized as the critical path permitting process. Given the significant new marine work associated with this cooling technology option, it is likely that the Section 404 will represent a critical path item to the completion of permitting.

Despite the potential for review periods longer than the 120-day target, the USACE did not see any specific barriers or fatal flaws regarding the Section 404 permitting process for the offshore intake system.

California Public Utility Commission

PG&E's DCPP is regulated by the CPUC, which is charged with overseeing investor-owned public utilities. San Luis Obispo County may share the role of lead agency for the CEQA review process with the CPUC. CEQA is regulatory statute, which requires state or local regulatory agencies to identify, assess, avoid, or otherwise mitigate the significant environmental impacts from the proposed action—the addition of new cooling system technology.

The proposed new offshore system will certainly trigger preparation of Environmental Impact Report. The Environmental Impact Report is a detailed report that identifies the potentially significant environmental effects the project is likely to have. The report identifies feasible alternatives to the proposed project and indicates the ways in which significant effects on the environment can be mitigated or avoided. This Environmental Impact Report will also be used by other state agencies to support their respective review and approval processes.

Following finalization of the Environmental Impact Report, the CPUC will evaluate whether to certify CEQA compliance. This certification then supports their subsequent decision regarding whether the costs associated with the new cooling system can be reclaimed via a consumer rate base adjustment.

While the CPUC-sponsored review process and decision regarding cost recovery will likely be a lengthy, complex, and contentious process, there are no definitive environmental barriers that preclude successfully completing the CEQA review and a positive record of decision.

California Coastal Commission

The California Coastal Commission has a broad mandate to protect the coast resources of California, which includes the entire DCPP facility. Consequently, the Commission's environmental concerns address a broad range of subject matter include visual resources, land and marine-based biological resources, land use and socioeconomic concerns (for example, recreational use/access). Despite this comprehensive focus, the Commission has little in the way of specific, objective criteria that could be used to effectively screen any of the cooling technology options from further consideration.

The California Coastal Commission representatives (Detmer & Luster 2012) indicated that the Commission recognized that there were no great options to the existing once-through cooling system at DCPP. Indeed, the Commission believes that almost all of the cooling system technology replacement options present some sort of negative impacts. Given that basis, the Commission may consider options that may present additional onshore or different offshore impacts to help mitigate the offshore environmental consequences of the existing once-through cooling. The Commission mandate to protect the coastal resources offers this agency some latitude to balance one set of impacts versus another. This evaluation process is on a case-by-case basis, which can be translated into the conclusion that there are few triggers that would automatically preclude any cooling system options from consideration, including the offshore intake system.

Despite the lack of obvious fatal flaws, the offshore intake system will certainly include significant offshore construction efforts, so the California Coastal Commission will be focused on the deleterious construction impacts on marine resources (for example, local fish, shellfish, vegetation, hard marine substrate, commercial fishing) and the potentially offsetting positive benefits associated with reducing operational entrainment impacts. These impacts will be reduced simply because there is less likely to be a less rich biological environment and so less entrainment losses despite the largely unchanged water withdrawal rate. Visual impacts in the coastal zone, a typical key Commission subject area, will obviously not be an important factor for this largely submerged system. Thermal discharge impact matters will also be sideline issues, since they remain largely unchanged with this cooling system.

The California Coastal Commission consideration of these issues and their follow-on approval process is mostly aligned with the CEQA process. That is, any application for a Coastal Development Permit will depend on information generated by the associated Environmental Impact Report development process. Consequently, the Commission permit review process will also be aligned with CEQA and consequently its dura-

tion will mirror the CEQA timeline (approximately 1 year). That period offers evidence that the Coastal Development Permit could be a critical path permitting process.

California State Lands Commission

Construction efforts in subaqueous lands associated with any cooling system modifications will be evaluated/approved by the California State Lands Commission. This review and associated lease approval process can follow three different tracks, as shown below:

- **Categorical Exemption** — applicable to those situations where there are no significant environmental impacts and there are no substantive changes in the existing land use. It is unlikely that this option would apply to any of the potential cooling system options that require marine work.

- **Mitigated Negative Declaration** — applicable for work that poses minor environmental impacts, during noncritical seasons, for limited periods of time.

- **Environmental Impact Report/CEQA Process** — applicable for work that could potentially generate significant environmental impacts, uses heavy construction equipment, and/or will continue over a significant time period (months). This review process is not fast-track and could extend for a year.

The California Coastal Commission evaluates each project individually and determines the appropriate review/approval path. As the offshore intake technology will obviously result in a significant addition of cooling system infrastructure to subaqueous lands, DCPP will not be able to pursue the largely administrative Categorical Exemption path or the streamlined *Mitigated Negative Declaration* process. This option will invoke the longer, more complex Environmental Impact Report /CEQA review process.

Commission representatives (DeLeon & Oggins, 2012) explained the current process for nonnuclear coastal power plant lease holders to develop and implement their "implementation plan" to meet California's Once-Through-Cooling Policy performance goals has been very slow. Most of these facilities have requested extensions to continue to evaluate the potentially available mitigation strategies. This experience offers evidence that the associated CEQA review will not be an expeditious process. A review period of at least a year is a distinct possibility.

Despite this expected lengthy review process, the related marine work in subaqueous lands does not appear to offer any specific impacts or regulatory considerations that represent fatal flaws.

State Water Resources Control Board – Central Coast Regional Water Quality Control Board

While the SWRCB has overall permit authority for California's two active nuclear power stations, the CCRWQCB has the follow-on inspection and enforcement role for the issue permits. For DCPP, the SWRCB expects to modify the existing NPDES permit in support of the proposed offshore intake system. The lack of significant disruption to local land surfaces is expected to negate any need for new waste discharge requirements permit for construction impacts to jurisdictional streambed areas and possibly avoid the need to seek coverage under the general storm water permit for construction activity.

Inshore intake system construction activities will potentially generate significant, temporary water quality and marine habitat (intertidal and subtidal) impacts. Installation of the system using the tunnel boring machine will limit the marine habitat losses and water quality impacts to localized areas near the new velocity cap.

Operationally, the relocated offshore intake system may reduce the impingement impacts relative to the existing inshore system, but this reduction is tempered by the fact that the existing inshore system has proven to already mitigate these impacts. The offshore deeper less biologically productive location will serve to mitigate some of the entrainment impacts This system will not, by itself, reduce the overall water withdrawal or discharge rates. Consequently, the thermal discharge impacts to aquatic life will remain largely unchanged.

Given that the cooling water withdrawal and discharge rates will remain essentially unchanged, any revisions to the current DCPP NPDES permit will be limited to compliance provisions of Section 316b, *California Once-Through Cooling Policy*, Phase II requirements. There will ostensibly be no changes to the current water treatment system, as this option is still a once-through system that now includes a more effective biological screening system.

Both the SWRCB and CCRWQCB representatives (Jauregui, 2012 and Morris, 2012) explained that there are no obvious regulatory barriers regarding issuance of this revised NPDES permit for any of the cooling system options currently under consideration, including the offshore intake system. The CCRWQCB and SWRCB will not necessarily preclude cooling system options from consideration, even if these options fall short of full compliance with the performance criteria tied to Section 316b, *California Once-Through Cooling Policy*, Phase II rules (that is, through-screen velocity less than 0.5 fps and entrainment/impingement levels equivalent that associated with a closed-cooling cycle system). The offshore intake system entrainment reduction performance will fall well short of closed-cycle cooling attributes.

The State Water Resources Control Board is ultimately a political body (9 members), interested in reviewing as much information/evidence from the applicant and from their own technical staff regarding the feasibility and impacts of various cooling system alternatives. Consequently, none of the SWRCB permits represent a fatal flaw or critical path permitting process to the offshore intake system.

San Luis Obispo Air Pollution Control District

DCPP is located within the San Luis Obispo Air Pollution Control District, a state-designated, non-attainment area for PM-10 and PM-2.5, that is, the District has failed to achieve compliance with the state ambient air quality standards for these pollutants (Annicchiarico, 2012). In addition to this air quality compliance issue, there are also local concerns regarding visibility impacts on the nearest visibility sensitive areas, so-called Class I areas that are comprised of national parks (over 6000 acres), wilderness areas (over 5000 acres), national memorial parks (over 5000 acres), and international parks that were in existence as of August 1977. While these situations may have ramifications for those cooling system options that generate significant particulate emissions (closed cooling cycle systems), air quality permits/approvals are not expected to play an appreciable role for the offshore intake system—a system that is not expected to generate any additional operational air emissions.

San Luis Obispo County

While many of potential cooling systems options for DCPP will likely trigger the need for the San Luis Obispo County Planning and Building Department to initiate a Conditional Use Permit process, which in turn will be wholly dependent on a CEQA review process, there is some question as to whether the relocated offshore intake system will represent a sufficient trigger for the Condition Use Permitting or CEQA process

The county recently completed a CEQA/Conditional Use Permit review process for the DCPP steam generator replacement project (Hostetter, 2012). The county, along with the Nuclear Regulatory Commission, were designated the “lead agencies” for the CEQA review. The CEQA/Conditional Use Permit process for the

steam generator replacement project, which involved significant rounds of negotiations, was characterized as complex and lengthy (years long).

As the county (Hostetter, 2012) predicted that any cooling system option with significant potential for environmental impacts would likely trigger a similar complex and lengthy CEQA/Conditional Use Permit review, the offshore intake system significant marine impacts will be subject to this rigorous process. The county can be expected to aggressively pursue the evaluation of alternative cooling system options in addition to reviewing the offshore intake system.

The county also explained (Hostetter, 2012) that is unlikely that they will identify any environmental impact criteria from the CEQA review process that would immediately preclude any of the cooling system alternatives under consideration, including the offshore intake system. The county views the CEQA review process as the mechanism that will ultimately identify the best solution for DCPP—all solutions will be considered.

Other Regulatory Agencies

In addition to the key regulatory agencies discussed above, there are a number of regulatory agencies that could potentially play a role in the permitting of the various cooling system technology options. The U.S. Fish and Wildlife Service, California Department of Fish & Game (CDFG), and California Office of Historic Preservation, for example, often play significant regulatory roles in power plant upgrade projects. Construction and operation of the offshore intake system is likely to temporarily and permanently disturbance sensitive marine habitat and also reduce impingement impacts to local fish and shellfish. These attributes will make the U.S. Fish and Wildlife Service and CDFG service key parties to CEQA review process, but they are not expected to trigger the need to secure a 2081 Incidental Take Permit because of the lack of marine-based endangered species. Since this option primarily involves offshore work and underwater facilities, it is unlikely the cultural or historic resources (land-based) will be impacted.

Installation of this largely submerged system will not alter the overall profile of the DCPP facility and certainly not require significantly tall or large construction equipment. These considerations will preclude significant interactions with the California Department of Transportation (Caltrans) (roadway crossings, encroachments, oversized vehicles) and the Federal Aviation Administration (FAA), whose focus would be limited to aviation obstruction impacts posed by tall new permanent or temporary features (less than 200 feet above ground level).

Finally, the California Energy Commission will be largely excluded from the permitting processes primarily because offshore intake systems will not boost currently power levels of the DCPP facility, let alone reach the 50 MW threshold, which would mandate CEC review.

4.1.2.2 Summary

The external approval and permitting assessment for the offshore intake system identified a list of potentially applicable federal, state, and local permits and approvals that, not surprisingly, focused on its significant impacts to the marine environment. The efforts to conduct a successful CEQA review and secure the requisite USCOE Section 404 permit, California Coastal Commission Coastal Development Permit, State Lands Commission Lease, NPDES permit modification will represent the primary regulatory challenges.

These permits are all expected to be contentious and have lengthy review processes that are aligned with the CEQA/Environmental Impact Report review process. The primary difficulty appears to be that the offshore intake system poses significant construction impacts to the sensitive and productive marine habitats, while

offering only some reductions in impingement impacts that are already partially mitigated by the existing intake system. Despite this incremental improvement regarding impingement-related losses, the consistent message from all of the interested regulatory agencies was that there were no environmental impact issues or regulatory criteria that would preclude this technology option from securing the necessary construction and operating permits and approvals. That is, there were no fatal flaws in the associated regulatory review process, that would preclude the relocated offshore intake system from further consideration.

The assessment also indicated that the Section 404 permit and the CPUC-sponsored CEQA review process will likely represent the critical path review and approval processes (approximately 12 month) for the offshore modular offshore intake system. This critical path process does not represent barrier to development of this cooling technology system.

4.2 Impingement/Entrainment Design

4.2.1 General Discussion

The current DCPP shoreline intake system allows fish to enter the onshore pump intake structure directly. There are six traveling water screens per unit with a flow through velocity of 1.95 fps. Fish egg, larvae, and fish drawn into the intake would either pass through the screen mesh or impinged on screen panels. In lieu of the current open channel system using offshore velocity cap intakes in deeper, less biologically productive water, combined with low inlet velocity of 0.5 fps, serves to encourage less adult/juvenile fish to enter the intake system. For fish that do enter through the offshore intake system, the proposed fish collection and return system, equipped with each screen, would be able to return them back to the source water via the return piping.

4.2.2 Detailed Evaluation

The offshore velocity cap intake technology positions the velocity cap intakes in deeper, less biologically productive water, a significant distance from the existing shoreline intake system. Fish in the immediate area of the velocity cap will be able to sense the relatively gentle influent velocity (no more than 0.5 fps) and escape the area. As a result of using multiple velocity caps, the fish entrainment into the offshore intake system will be minimized, which subsequently will reduce the number of fish potentially getting impinged on the screens. In addition, all existing traveling water screens will be modified to add on the fish collection and return system to permit the return of impinged fish to the ocean via the return line. This arrangement satisfies the intent of the proposed Phase II rule, section 122.21(r)(6) for impingement mortality reduction plan for the power plants using offshore velocity cap intakes (USEPA, 2011).

Finally, the deeper intake location and low inlet velocity results in a lower populations of fish eggs and larvae and reduced entrainment losses even though the water withdrawal rate remains unchanged.

In summary, use of new offshore intake location, velocity cap intakes with low velocity, and the fish collection and return system with all traveling screens will result in significant improvement in both impingement mortality and entrainment losses.

4.3 Environmental Offsets

4.3.1 General discussion

The environmental offsets are an environmental management tool that has been characterized as the "last line of defense" after attempts to mitigate the environmental impacts of an activity are considered and exhausted (GWA, 2006). In some cases, significant unavoidable adverse environmental impacts may be able to be counterbalanced by some associated positive environmental gains. Environmental offsets, however, are not a project negotiation tool, that is, they do not preclude the need to meet all applicable statutory requirements and they cannot make otherwise "unacceptable" adverse environmental impacts acceptable within the applicable regulatory agency.

In some cases, regulatory agencies may be so constrained by their regulatory foundation that offset opportunities are limited or unavailable. The San Luis Obispo Air Pollution Control District, for example, has the regulatory authority to offset new air emissions in their district from previously banked emission reductions as long as the new emission sources meet appropriate stringent emission performance criteria. The Air Pollution Control District cannot offset new air emissions with reductions in the impingement and entrainment impacts to aquatic life or reductions in land disturbance. In other cases, the regulatory agencies, such as the California Coastal and State Lands Commissions, have a more broadly-based, multidisciplinary review process that supports a more flexible approach to using environmental offsets to generate the maximum net environmental benefit.

With these considerations in mind, the following assessment of offsetting environmental impacts focuses on identifying both positive and negative construction and operational environmental impacts associated with the construction and operation of the offshore intake system from a broad range of environmental evaluation criteria.

4.3.2 Detailed Discussion

The following sections evaluate the air, water, waste, noise, marine and terrestrial ecological resources, land use, cultural and paleontological resources, visual resources, transportation, and socioeconomic issues associated with construction and operation of the offshore intake system. Given the wide range of environmental impact subject areas under consideration, the systematic approach used in the Diablo Canyon License Renewable Application process was used (PG&E, 2009). Consequently, following discussion of the individual environmental subject areas, the related consequences are categorized as having either positive or negative small, moderate, or large impact significance. The specific criteria for this categorization are shown below

- **Small:** Environmental effects from not detectable or minor such they will not noticeably alter any important attribute of the resource

- **Moderate:** Environmental effects are sufficient to noticeably alter, but not significantly change, the attributes of the resource.

- **Large:** Environmental effects are clearly noticeable and are sufficient to change the attributes of the resource.

The results of these evaluations and impact categorization are subsequently summarized in the Table IR-2.

Air

The air quality impacts associated with installing the offshore intake system are small given that the primarily marine-based nature of the associated construction activities. There will be little or no opportunity to generate fugitive dust from land disturbance activities, as the primary activity will involve offshore marine work. Some additional vehicle-related air emissions can be expected from the small number of outage workforce personal vehicles and over-the-road project construction vehicles. Self-propelled earthmoving equipment will be unnecessary, but there may be some emission sources on temporary offshore platforms or barges. Construction supplies and piping-related equipment deliveries may be significant in the early phases of construction.

The offshore system may result in a minor decrease in DCPP overall plant efficiency, due to increased pumping power demands associated an offshore submerged velocity cap intake. The resulting power reduction is not expected to produce any tangible increase in greenhouse gas or other pollutant emissions from replacement fossil power sources.

Surface Water

Offshore intake system construction activities are primarily marine-based and they have the potential to generate significant water quality impacts. Placement of the velocity cap over the downshaft to the underground tunnel will result in some localized turbidity impacts from disruption of the local seabed. Since the connecting piping systems to the velocity cap are installed via a tunneling (tunnel boring machine), this impact could be a moderate negative level. These construction efforts are not expected to result in any land-based disturbance or storm water -related impacts.

The offshore intake system will not change the overall cooling water withdrawal or discharge rates.

Groundwater

Given the primarily offshore construction environment associated with the installation of the offshore intake system, no significant additional groundwater resources will be needed.

The offshore intake system is not expected to require any additional groundwater resources.

Waste

Constructions-related waste, including marine bed sediment, tunnel spoils, and recyclable metals associated with surplus piping and cap materials, will be generated during the outage. Tunneling wastes are expected to be considerable. The final disposition of these materials has not been determined. Most of the velocity cap wastes are expected to have salvage value and, therefore, will not represent a burden to offsite disposal facilities. Disposal of the marine sediment, whether directed to an onsite or offsite disposal area, will represent a moderate construction negative impact.

While operation of the velocity cap system may include self-cleaning capability, physical inspection and cleaning of the individual modular screens have the potential to generate additional biological wastes (vegetative debris). Collection and disposal of these marine wastes represent a small operational negative impact.

Noise

The county of San Luis Obispo County General Plan and Local Coastal Plan limit noise levels to 70 dBA at the property line of the affected (public area [Tetra Tech, 2008]). Noise impacts from construction activities for the offshore intake system are not expected to be significant for land-based locations, since the primary work areas will be well offshore. Buffer areas around offshore construction zones will likely be established for safety reasons, which will also serve to reduce noise impacts to offshore noise receptors (watercraft) and shoreline areas that have public access. Given that PG&E owns all coastal properties north of Diablo Creek to the southern boundary of Montana de Oro State Park and all coastal properties south of Diablo Creek for approximately 8 miles, the potential for construction-related noise impacts to the public along shoreline areas is unlikely. Consequently, the construction activities are expected to pose little or no additional noise impact.

Operational noise levels are expected to be largely unchanged following installation of the new intake system.

Land Use

Construction activities associated with offshore intake system are primarily offshore and these activities will likely temporarily preclude normal recreational activities in waters in the immediate construction areas. As mentioned above, buffer zones will be created and maintained during the course of construction for the safety of the workforce and public. The potential temporary restriction of normal public access in these marine areas represents a small negative impact for this cooling technology option.

The velocity cap will obviously represent a change in land use in those previously natural subaqueous areas. The offshore velocity cap will be located in relatively deep waters and therefore should not represent an impediment to surface navigation. However, the module locations may be marked with surface buoys to preclude deep water activities. Given these impacts, operation of this underwater system is expected to offer a small-term negative impact.

Marine Ecological Resources

Offshore intake system construction activities will potentially generate significant, temporary water quality and marine habitat impacts. Installation of the velocity cap intake using the tunnel boring machine will reduce marine habitat losses and water quality impacts to localized areas around the velocity caps— a moderate negative impact.

While the offshore intake system may reduce the impingement and entrainment impacts associated with the DCPP once-through systems, this once-through system boasts the lowest impingement biomass rate (weight/gallons of water withdrawn) of all coastal power plants (Tenera, 2011). This is due primarily to its relatively confined engineering cove and exposed rocky coast that create a localized environment where the local fish and shellfish population adapted to strong coastal currents and variable ocean surges making them somewhat resistant to the flow dynamics of cooling water intake systems. This offshore intake system will not, by itself, reduce the overall water withdrawal or discharge rates. The thermal discharge impacts to aquatic life will remain largely unchanged. Consequently, this system will, operationally, offer a moderate positive impact relative to the current condition.

Terrestrial Ecological Resources

Construction activities associated with the offshore intake system are primarily marine-based and consequently present little or no impact to land areas. Thus, there will be no construction impacts to terrestrial natural habitat areas or areas with significant ecological value or sensitivity. Operation of the offshore intake system will similarly present no new threat to these resource areas.

Cultural and Paleontological Resources

Since installation of the velocity cap and associated piping will be confined to subaqueous lands, there is little or no potential to discover new cultural or paleontological resources in these developed areas. Operation of this system will similarly pose no new threat to cultural or paleontological resources.

Visual Resources

All construction equipment will be low profile, that is, the construction support features and equipment will not extend above the height of local facility structures.

The offshore intake system will be submerged and will present no permanent change in external profile of the facility.

Transportation

Increased commuting traffic from the construction workforces and construction deliveries could worsen the existing level of service on local roads during the plant outage. While the associated construction period means that related traffic impacts will not be transitory, the necessary workforce is not expected to be large. Consequently, the transportation-related construction impacts should be considered a small negative impact.

Operationally, the offshore intake system may increase maintenance and service requirements for the offshore velocity cap, but any related maintenance staff increases are expected to be minimal. Therefore, there are limited or no operational transportation impacts for this system.

Socioeconomic Issues

While there will be some additional construction-related employment opportunities, these opportunities are not expected to significantly strain local community resources (for example, housing, school, fire/police services, water/sewer).

Operational maintenance staff levels may increase slightly, but will not result in any related community service or resource concerns.

4.3.3 Summary

Table IR-2 summarizes the air, water, waste, noise, marine and terrestrial ecological resources, land use, cultural and paleontological resources, visual resources, transportation, and socioeconomic environmental offsets for the offshore intake system. The construction impacts could be characterized as having moderate negative impact significance based on the nature of the installation method, mostly tunneling with local areas cut-and-fill. Both construction practices will involve significant marine-based work that will generate increased turbidity during construction in the seawater near construction areas, produce a sizeable marine

spoils waste, and result in permanent and temporary losses of marine habitat. Theses impacts are not offset by the limited employment opportunities that may be gained during this same period.

Operationally, there is a moderate positive impact significance related to the offshore intake systems reduction of the already partially mitigated impingement impacts and its reduction of previously unconstrained entrainment impacts. There is no coincident reduction of cooling water withdrawals, so no change in thermal discharge impacts. Overall, the moderate benefits associated with reductions of impingement impacts appear to be outweighed by the significant (large) impacts associated with the disruption of the marine habitats and associated water quality degradation when the cut-and-fill construction practices are employed. The balance of positive and negative environmental offsets is more even when considering the less disruptive tunneling installation process.

4.4 First-of-a-Kind in Scale

4.4.1 General Discussion

The velocity cap intake technology is a proven and feasible concept that is commercially available and one that can support the significant water withdrawal rates associated with once-through cooling system operation. The velocity cap concept is being successfully operated at SONGS.

4.4.2 Detailed Evaluation

- The offshore velocity cap technology is widely used for intakes requiring large water withdrawal. The largest once-through cooling intake with comparable water usage is SONGS, which also withdraws water from a similar Pacific Ocean environment.

- The enhancement relative to the current SONGS design is the installation of multiple velocity caps to reduce the inlet flow velocity to 0.5 fps providing enhanced protection for aquatic life. In addition, fish collection and return system will be added to all traveling water screens to further reduce the impingement mortality, with collected fish return back to the ocean via the return line.

4.5 Operability General Site Conditions

4.5.1 General Discussion

The velocity cap technology can be integrated into the existing open channel system with the addition of modifications mainly at offshore location, as shown on Figures IR-1 and IR-2. While there are no changes to the onshore pump intake structure, there will be additional head loss in the intake system. These potential impacts are evaluated in the following section.

4.5.2 Detailed Evaluation

This technology ahs been reviewed from an operation point of view an the findings are presented below:

- The offshore velocity cap/intake tunnel design will be sized to ensure a low pressure drop across the system. To minimize the added offshore component head loss as compared to the existing shoreline intake system, the focus of the design is to lower the pressure drop by employing multiple velocity caps and large diameter tunnel.

- The added head loss could adversely affect the operation of the existing circulating water pumps due to reduced submergence and net positive suction head available but our review of the pump characteristics has demonstrated that the pumps should be able to function acceptably to supply the cooling requirements of the plants.

- The total head loss increase is not expected to be more than 4 to 5 feet over the existing shoreline intake. A physical pump intake model testing will be necessary to evaluate the effect of 4 to 5 feet lower submergence on the vortex formation and to find solutions to eliminate undesirable vortices if necessary.

- The lower water level will also result in reduced net positive suction head available to the pumps, which may limit the allowable pump operation. It may become necessary to throttle the circulating water pump discharge valve, or add a new throttling valve to limit the pump flow to the desired levels during single pump operation.

- Due to the reduction in pump head caused by additional pressure drop, the circulating water pumps will deliver slightly less flow (current pump rated head is 96.5 feet). This flow reduction may result in a slight load reduction.

4.6 Seismic and Tsunami Issues

4.6.1 General Discussion

The design criteria will be similar to the existing structures and it can properly be designed against design seismic requirements and design wave forces.

4.6.2 Detailed Evaluation

The detailed evaluation leads to the following:

- The structural design will use the same seismic category as the existing category that was employed for the current shoreline intake. The tunnel will be constructed in a rocky substrata containing minimal fractures.

- This technology assumes a submerged installation and with a location offshore. It will be designed to withstand design wave forces.

4.7 Structural

4.7.1 General Discussion

The offshore velocity cap system can be designed properly against all design loadings expected to be encountered in the open sea environment.

4.7.2 Detailed Evaluation

With proper engineering design method and identification of all critical loadings, it is not expected that the structural considerations of the offshore velocity cap intake system will be a limiting factor in its selection.

4.8 Construction

4.8.1 General Discussion

The major construction activities for using this technology include:

- A near-shore main vertical shaft
- A second offshore access shaft, if required for tunnel work sequencing
- An underground tunnel below sea bottom
- An offshore vertical shafts without connection to the tunnel
- Construct precast velocity cap components onshore
- Install and connect precast velocity caps to vertical shafts and placement of backfill material and seabed riprap and armor protection
- Connect offshore vertical shafts to underground tunnel
- Add fish collection and return features to all traveling water screens
- Install fish return piping from the pumphouse to the ocean away from the intake cove
- Construct and complete breakwater enclosure

4.8.2 Detailed Evaluation

The velocity cap precast components will be built onshore, launched from the surface of a barge, and dropped to their design location. Upon completion of the velocity cap installation, the seabed will be leveled with graded crushed stone and protected with riprap and armor stone on the top layer for stability and scour protection purposes.

4.9 Maintenance

4.9.1 General Discussion

There are minimal operation and maintenance efforts associated with use of offshore velocity cap intakes.

4.9.2 Detailed Evaluation

The velocity caps, vertical shafts, tunnel, and main shaft are subject to biofouling due to not being able to use an offshore chlorination system, which impacts the effectiveness of the intake tunnel conveyance. The bio-fouling growth thickness, however, reaches to an equilibrium depending on the type and velocity of the flow in the conduit and the conduit will be sized to account for the fouling.

Also, the design will consider standard methods used by the industry to support ways to remove seashells and other biofouling that will collect at the bottom of the main shaft.

5. Conclusion

Modifying the existing shoreline intake system by enclosing the existing inner breakwater, constructing an offshore tunnel and associated shafts, attaching a set of velocity caps to the tunnel, and adding fish collection and return features to traveling water screens is technically feasible. This change will likely be viewed as complying with the Section 316b, *California Once-Through Cooling Policy*, Phase II rules regarding the re-

duction of impingement impacts, since the velocity caps inlet velocity will be less than 0.5 fps and a fish collection and return system added to the traveling water screens.

Additionally, the use of velocity cap intake will significantly reduce the entry of juvenile and adult fish due to their ability of sensing the horizontal flow field and escaping potential entry, particularly with the very low inlet velocity of 0.5 fps. However, the system cannot ensure significant reduction in entrainment of fish egg and larvae compared to the existing open shoreline intake due to (1) large inlet openings, and (2) no reduction in volumetric flow rate. Given the uncertainty regarding the entrainment mitigation ability of this system, it may be necessary for DCPP to conduct further studies and marine monitoring to assess their compliance with California Once-Through Cooling Policy expectations.

A complete evaluation of the offshore technology for the DCPP based on the Section 4 criteria has concluded that this technology should be a candidate for further consideration in the subsequent Phase 2 stage of this assessment.

6. Appendices

None.

6.1 Input Data

The input data as cited in this section are from the references listed in Section 6.2.

6.2 References

Bishop, J., *Policy on Use of Coastal and Estuarine Waters for Power Plant Cooling – CalEPA*, SWRCB, 2011___

California's Coast Power Plants: Alternative Cooling System Analysis, Section C. Diablo Canyon Power Plant, Tetra Tech, ___

Comments – Proposed EPA 316(b) BTA Impingement Standard - Open Coastal Power Plants Using Once-Through Cooling (PG&E Diablo Canyon Power Plant), Tenera Environmental, July 2011.

DCPP, 2009. *Auxiliary Salt Water System*, System Training Guide E-5, May 2009

DCPP, 2010. *Circulating Water System*, System Training Guide E-4, May 2010.

DeLeon, J., California State Lands Commission (personal communications, April 16, 2012)

Detmer, A., California Coastal Commission (personnel communications, April 17, 2012)

Environmental Offsets Position No. 9, Government of Western Australia (GWA), January 2006

Hostetter, R., San Luis Obispo County Planning and Building Department, April 17, 2012)

Jauregui, R., State Water Resources Board (personnel communications, May 2, 2012)

Lambert, J., U.S. Army Corps of Engineers (personal communication, April 11, 2012)

Luster, T., California Coastal Commission (personal communication, April 17, 2012)

National Pollution Discharge Elimination System-Cooling Water Intake Structures at Existing Facilities and Phase I facilities, Proposed Rule, 40 CFR Parts 122 and 125, April 20, 2011.

Oggins, C., California State Lands Commission (personal communications, April 16, 2012)

PG&E, November 2009. *License Renewal Application Diablo Canyon Power Plant Unit 1 and 2 - Appendix E Applicants Environmental Report – Operating Renewal Stage (Chapter 4)*

Tetra Tech Inc., *Evaluation of Cooling System Alternatives*, DCPP, November. 2002.

Tetra Tech, March 2009. Diablo Canyon Power Plant Cooling Tower Feasibility

USEPA, Proposed Regulations to Establish Requirements for Existing Cooling Water Intake Structures at Existing Facilities, EPA – 820-F-11-002, USEPA, March 2011.

Von Langen, P., Central Coast Regional Water Quality Control Board (personal communication April 16, 2012)

Willey, G., San Luis Obispo Air Pollution Control District (personal communication, April 19, 2012)

Table IR-1.
Environmental Permit/Approval Assessment for Modular Wedge Wire Screen System
Diablo Canyon Power Plant

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path (Yes/No/NA)	Fatal Flaw (Yes/No/NA)
Permit/Approval	Assessment	Permit Review Period (preconstruction)	Critical Path	Fatal Flaw
National Environmental Policy Act – Bureau of Land Management (BLM) or Other Responsible Lead Federal Agency (Record of Decision, Right-of-Way)	Not applicable — the addition of the offshore intake system does not constitute major federal action (federal land, funding).	Not applicable	NA	NA
Section 404/10 Permit – U.S. Army Corps of Engineers (USACE)	Installation of the offshore intake system, either via cut-and-fill processes or tunneling, will generate significant impacts to waters of the United States and will involve work in navigable waters. Individual form of permit will be required.	120 days from complete application (goal) ~12 months (expected)	Potential	NA
Section 401 Water Quality Certificate – U.S. Army Corp of Engineers (USACOE) & Regional Quality Control Board (RWQCB)	Section 401 permit process will parallel Section 404 permit process.	~12 months (expected)	Potential	NA
Nationwide Permit – U.S. Army Corps of Engineers	Not applicable — the installation of the offshore intake system will generate significant impacts to waters of the United States that cannot be addressed by the nationwide permitting process.	Not applicable	NA	NA
Section 7 Consultation with U.S. Fish and Wildlife Service (Endangered Species Act of 1973)	Installation of the relocated offshore intake system poses significant impacts marine habitat and aquatic life and also serve to somewhat reduce operational impingement losses.	Connected to CEQA process	No	No
Notice of Proposed Construction or Alteration – Federal Aviation Administration (FAA)	Not applicable — the addition of the addition of the offshore intake system will not result in any exterior changes to existing structures.	Not applicable	NA	NA
Notice of Proposed Construction or Alteration – FAA	Not applicable — the addition of the offshore intake system will not demand the services of a crane or other construction equipment in excess of 200 feet above ground level.	Not applicable	NA	NA

Table IR-1.
Environmental Permit/Approval Assessment for Modular Wedge Wire Screen System
Diablo Canyon Power Plant *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path (Yes/No/NA)	Fatal Flaw (Yes/No/NA)
Multiple-Use Class L Limited Land Use Designated Utility Corridor – Bureau of Land Management (BLM) or Other Responsible Federal Agency	Not applicable — the addition of the offshore intake system will not require any additional land, nor involve any exterior changes to existing structures	Not applicable	NA	NA
California Public Utility Commission (CPUC) Approval	CPUC will likely be the lead agency for the California Environmental Policy Act (CEQA) review process regarding the proposed offshore intake system. The CEQA review process trigger development of a comprehensive Environmental Impact Report.	~12 months	Potential	No
California Energy Commission (CEC) – Final Decision	Not applicable — the addition of the offshore intake system will not result in a net power capacity (increase) >50 MW, the threshold for CEC.	Not applicable	NA	NA
Coastal Development Permit – California Coastal Commission/Local Coastal Programs	Applicable because of the considerable offshore and near-shore development within the coastal zone While there are no specific fatal flaws with the offshore intake system, the significant construction-related marine habitat impacts and associated limited reduction in operational impingement losses are likely to make for a contentious approval process.	Connected to CEQA (~12 months)	Potential	NA
Coastal Development Lease – California State Lands Commission	Applicable because of the considerable offshore development on subaqueous lands. While there are no specific fatal flaws with the offshore intake system, the significant construction-related marine habitat impacts and associated limited reduction in operational impingement losses are likely to make for a contentious approval process.	Connected to CEQA (~12 months)	Potential	NA
Regional Pollution Control District Permit to Construct (ATC) – San Luis Obispo Regional Air Pollution Control District	Not applicable — the offshore intake system will not generate any additional operational air emissions.	Not applicable	NA	NA
Regional Control District Permit to Operate (PTO) – San Luis Obispo Air Pollution Control District	Not applicable — the offshore intake system will not generate any additional operational air emissions.	Not applicable	NA	NA

Table IR-1.
Environmental Permit/Approval Assessment for Modular Wedge Wire Screen System
Diablo Canyon Power Plant *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path (Yes/No/NA)	Fatal Flaw (Yes/No/NA)
Title V Federal Operating Permit – San Luis Obispo Air Pollution Control District and USEPA	Not applicable — the offshore intake system will not generate any operational additional air emissions.	Not applicable	NA	NA
Title IV Acid Rain Permit – USEPA	Not applicable — the offshore intake system will not generate any additional operational air emissions.	Not applicable	NA	NA
Dust Control Plan – San Luis Obispo Air Pollution Control District	Not applicable — construction of the offshore intake system expected to disturb little ground surfaces and so there is little potential to generate significant dust emissions. The offshore intake system itself will not generate any additional air emissions.	Not applicable	NA	NA
NPDES Industrial Discharge Permit – Central Coast Regional Water Quality Control Board (CCRWQCB) and State Water Resources Board	The offshore intake system will not change the cooling water withdrawal or blowdown rates. This system is not expected to demand any changes in the water treatment system. Any subsequent required alteration of the current NPDES permit will be minor.	~6 months	No	No
Notice of Intent (NOI) – National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction Activity, Central Coast Regional Water Quality Control Board (CCRWQCB)	Not applicable — construction of the offshore intake system is not expected to disturb ground surfaces or alter storm water management features onsite.	Not applicable	NA	NA
Storm Water Pollution Prevention Plan (SWPPP) – National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction Activity – Central Coast Regional Quality Control Board (CCRWQCB)	Not applicable — construction of the offshore intake system is not expected to disturb ground surfaces or alter storm water management features onsite.	Not applicable	NA	NA
Notice of Intent (NOI) – National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Industrial Activity, Central Coast Regional Water Quality Control Board (CCRWQCB)	Not applicable — DCPP NPDES permit addresses operational storm water. No changes to existing stormwater management system are expected from addition of the offshore intake system.	Not applicable	NA	NA

Table IR-1.
Environmental Permit/Approval Assessment for Modular Wedge Wire Screen System
Diablo Canyon Power Plant *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path (Yes/No/NA)	Fatal Flaw (Yes/No/NA)
Storm Water Pollution Prevention Plan (SWPPP) – National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Industrial Activity, Central Coast Regional Quality Control Board (CCRWQCB)	Not applicable — DCPP NPDES permit addresses operational storm water. There is no separate operational phase SWPPP.	Not applicable	NA	NA
2081 Permit for California Endangered Species Act of 1984 (Fish and Game Code, §2050 through 2098) – California Fish and Game Department (CFGD)	The installation of the offshore intake system is expected to impact marine habitat areas, but there are no threatened or endangered species in the immediate marine area.	Not applicable	NA	NA
Lake and Streambed Alteration Agreement - California Department of Fish & Game (CDFG)	Not applicable — the addition of the relocated offshore intake system will not results in impacts to jurisdictional streambed areas (waters of the state).	Not applicable	NA	NA
Waste Discharge Requirements (WDR) – Central Coast Regional Water Quality Control Board	Not applicable — the addition of the relocated offshore intake system will not results in impacts to jurisdictional streambed areas (waters of the state).	Not applicable	NA	NA
Section 106 Review – Office of Historic Preservation (OHP)	Not applicable — the relocated offshore intake system will not demand any additional land nor generate any new surface disturbances.	Not applicable	NA	NA
Notification of Waste Activity – RCRA Hazardous Waste Identification Number (Small Quantity Generator) – Construction Phase - Department of Toxic Substance Control, USEPA, San Luis Obispo County Environment Health Services – California Unified Program Agency	Installation of the offshore intake system could potentially require an identification number to support management or construction wastes, unless current DCPP identification will be used.	1-2 weeks	No	No

Table IR-1.
Environmental Permit/Approval Assessment for Modular Wedge Wire Screen System
Diablo Canyon Power Plant *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path (Yes/No/NA)	Fatal Flaw (Yes/No/NA)
Notification of Waste Activity - RCRA Hazardous Waste Identification Number (Small Quantity Generator) – Operation - Department of Toxic Substance Control, USEPA, San Luis Obispo County Environmental Health Services - California Unified Program Agency	Not applicable – the addition of the offshore intake system will allow for the continuing use of the existing hazardous waste ID number. There will be not impacts to the onsite hazardous treatment facility (oil separation unit).	Not applicable	NA	NA
SPCC Plan - 40 CFR 112 and Aboveground Petroleum Storage Act – San Luis Obispo Environmental Health Services- California Unified Program Agency and USEPA	Not applicable – the addition of the offshore intake system is not expected to require additional water treatment chemicals.	Not applicable	NA	NA
Underground Storage Tank Permit - San Luis Obispo County Environmental Health - California Unified Program Agency and State Water Resources Board	Not applicable - the addition of the offshore intake system is not expected to require force the relocation of underground tanks.	Not applicable	NA	NA
Risk Management Plan (Clean Air Act 112r) – San Luis Obispo County Environmental Health Services - California Unified Program Agency and USEPA	Not applicable – the addition of the offshore intake system will not require the addition of any new volatile chemicals.	Not applicable	NA	NA
Emergency Planning and Community Right-to-Know Act (EPCRA) – 40 CFR 311 & 312 - San Luis Obispo County Environmental Health Services - California Unified Program Agency and USEPA	Not applicable – the addition of the offshore intake system is not expected to require any new chemicals are stored in quantities that exceed applicable thresholds (e.g., 10,000 lbs for hazardous chemicals, 500 lbs for extremely hazardous chemicals).	Not applicable	NA	NA
Land Use Zones/Districts Approval – San Luis Obispo County Department of Planning and Building	Not applicable – the addition of the offshore intake system will be an internal improvement conducted wholly within existing structures.	Not applicable	NA	NA

Table IR-1.
Environmental Permit/Approval Assessment for Modular Wedge Wire Screen System
Diablo Canyon Power Plant *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path (Yes/No/NA)	Fatal Flaw (Yes/No/NA)
Condition Use Plan Amendment – San Luis Obispo County Department of Planning and Building	While the scope of work associated with installation of largely offshore submerged facility may pose some jurisdictional issues, the offshore intake system will likely be addressed by an amendment to the existing Conditional Use Permit.	Not applicable	NA	NA
Grading Plan Approval or Permit – San Luis Obispo County Department of Public Works & Planning and Building	Not applicable — there will be no onsite grading during the installation of the offshore intake system.	Not applicable	NA	NA
Erosion and Sediment Control Plan (Rain Event Action Plan) – San Luis Obispo County Department of Public Works	Not applicable — similar to the construction-phase SWPPP. No separate submittal is expected to be directed to the county.	Not applicable	NA	NA
Building Permit (including plumbing and electrical) – San Obispo County Building Division	Not applicable — the addition of the offshore intake system may demand an individual or set of county building permits.	Not applicable	NA	NA
Domestic Water Supply Permit (public potable water) –San Obispo County Department of Environmental Health	Not applicable — no new potable water systems are planned.	Not applicable	NA	NA
San Luis Obispo County Well Water Permit – San Luis Obispo County Environmental Health Services	Not applicable — no new wells to be developed.	Not applicable	NA	NA
California Department of Transportation (Caltrans) – Oversize/Overweight Vehicles	Not applicable — the offshore intake elements and associated piping are expected to be oversized.	Not applicable	NA	NA
Caltrans Heavy Haul Report (transport and delivery of heavy and oversized loads)	Not applicable — the offshore intake features and associated piping are expected to be oversized.	Not applicable	NA	NA
Resource Conservation (RC) Land Use Management Approval	Not applicable — while local municipality rules may supersede this regional land use/watershed protection-related project approval process, this is not the case for DCPP.	Not applicable	NA	NA
Temporary Power Pole – Local municipality or San Luis Obispo County Public Works Department	Not applicable — the installation of the offshore intake system is not expected to require local power poles.	Not applicable	NA	NA

Table IR-1.
Environmental Permit/Approval Assessment for Modular Wedge Wire Screen System
Diablo Canyon Power Plant *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path (Yes/No/NA)	Fatal Flaw (Yes/No/NA)
Fire Safety Plan Approval, Certificate of Occupancy, Flammable Storage – San Luis Obispo County Fire Department	The addition of the offshore intake system may require minor revisions to the existing Fire Safety Plan.	1 month for approval of Fire Safety Plan.	No	No
Sewer and Sewer Connections – San Luis Obispo County Environmental Health Services	Not applicable — No new sanitary connections are envisioned.	Not applicable	NA	NA
Road Crossing or Encroachment Permit (Caltrans)	Not applicable — the addition of the offshore intake system will not pose any road crossing or encroachment issues.	Not applicable	NA	NA

Notes: Levels of Impact of Significance

Small: Environmental effects from not detectable or minor such they will not noticeably alter any important attribute of the resource
Moderate: Environmental effects are sufficient to noticeably alter, but not significantly change, the attributes of the resource.
Large: Environmental effects are clearly noticeable and are sufficient to change the attributes of the resource.

Table IR-2.
Offsetting Impacts for the Initial Intake Relocation
Diablo Canyon Power Plant

Category	Impacts – Construction	Impacts – Operations	Magnitude	Construction Impact Significance	Operation Impact Significance
Air	Minor increase in greenhouse gases, NOx, volatile organic compound, CO, and particulate matter from construction equipment, material deliveries, commuting workforce. Increased greenhouse gas emissions from replacement fossil-fuel generation to offset the short-term loss of SONGS generation during the plant outage to install wedge system.	While the wedge wire system could result in some reduction of plant efficiency, there should be no significant changes in overall air quality impacts or greenhouse gas emissions during operation.	Insignificant temporary increase in CO_2 greenhouse gas emissions from temporary increase in commuting traffic during associated plant outage.	Small Negative	None
Surface Water	Construction activities are primarily marine-based and they have the potential to generate significant water quality impacts from disruption of the intertidal and sub-tidal lands. Cut-and-fill installation practices will be more disruptive than the tunneling option.	Operational cooling water withdrawal and discharge rates will be remain largely unchanged.	Not applicable	Large Negative- cut and fill Moderate Negative - tunneling	None
Groundwater	No additional groundwater resources will be needed to support construction.	No additional groundwater resources will be needed to support operations.	Not applicable	None	None
Waste	A significant marine sediment wastes will be generated to facilitate installation of the offshore piping system.	Minor increase in waste generation from maintenance activities on the submerged modular screen systems.	Marine Spoil Wastes	Moderate Negative	None
Noise	Buffer areas around offshore construction zones will serve to reduce noise impacts to offshore noise receptors (watercraft) and distant shoreline areas that have public access.	Operational noise levels are expected to be largely unchanged as a result of the wedge wire system.	Noise impacts above the 70 dBA threshold value in areas with public access are not expected to occur during construction or operation.	None	None

Table IR-2.
Offsetting Impacts for the Initial Intake Relocation
Diablo Canyon Power Plant *(cont.)*

Category	Impacts – Construction	Impacts – Operations	Magnitude	Construction Impact Significance	Operation Impact Significance
Land Use	Construction activities are primarily offshore and they may temporarily preclude normal recreational activities in nearby waters.	The wedge wire screen modules and associated piping represent a change in land use of the marine bed and could preclude some waterborne activities.	Need duration of work schedule	Small negative	Small negative
Marine Ecological Resources	Construction will potentially generate significant, temporary water quality and marine habitat impacts (localized turbidity impacts and loss of marine habitat). These impacts will be more significant for the cut-and-fill installation option then the tunneling option.	Further reduces impingement impacts that are already mitigated by engineered cove and local fish populations resistant to heavy currents and ocean surges. Overall water withdrawal or discharge rates are unchanged. Entrainment and thermal discharge impacts to aquatic life will remain largely unchanged	Marine bed area disturbed tunneling and cut and fill?	Large Negative – cut and fill Moderate Negative - tunneling	Moderate Positive
Terrestrial Ecological Resources	Since construction will be confined to previously disturbed land, there is no potential to disturb natural habitats or other areas with significant ecological value or sensitivity.	No permanent loss of natural habitat areas or other areas with significant ecological value or sensitivity.	Not applicable	None	None
Cultural & Paleontological Resources	Since construction will be confined to previously disturbed land, there is little or no potential to discover new cultural or paleontological resources in these developed areas.	No permanent loss of cultural or paleontological resources.	Not applicable	None	None
Visual Resources	All construction equipment will be low profile, i.e., not extend above the height of local facility structures.	The wedge wire intake system will be submerged and present no permanent change in external profile of the facility.	Not applicable	None	None
Transportation	Increased traffic from the construction workforce and construction deliveries could temporarily worsen the existing level of service on local roads during the plant outage.	The wedge wire screen system will not significantly alter the current number of plant deliveries or operating personnel.	Workforce numbers - Level of service impacts?	Small Negative	None

Table IR-2.
Offsetting Impacts for the Initial Intake Relocation
Diablo Canyon Power Plant *(cont.)*

Category	Impacts – Construction	Impacts – Operations	Magnitude	Construction Impact Significance	Operation Impact Significance
Socioeconomic Issues	While there will be some additional construction-related employment opportunities, these opportunities are not expected to significantly strain local community resources (e.g., housing, school, fire/police services, water/sewer).	Maintenance staff levels are expected to be largely unchanged in response to the wedge wire system.	Increase in construction employment?	Small Positive	None

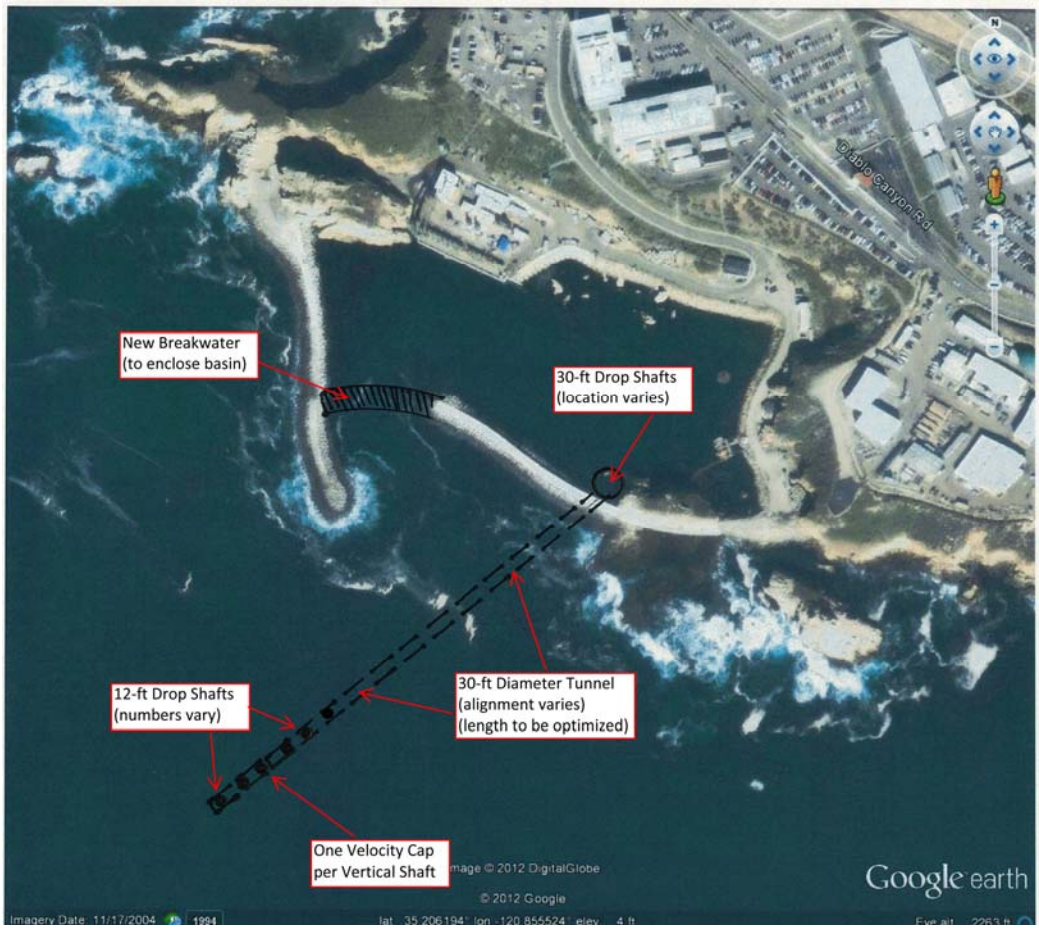
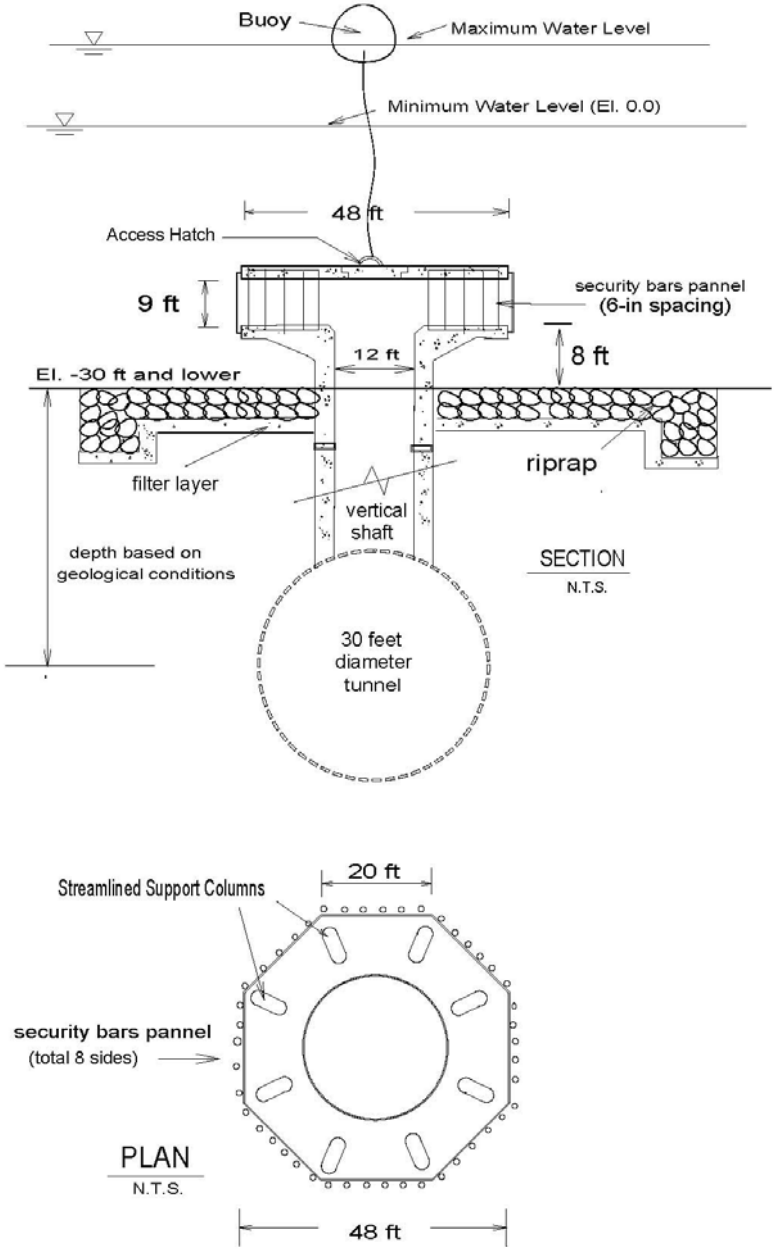


Figure IR-1. Offshore Tunnel with Velocity Cap Layout



NOTES:

1. Design flow per each velocity cap is 300,000 gpm.
2. Total number of velocity caps is six (6) for two units.
3. Design Inlet Velocity is 0.5 ft per second.

Figure IR-2. Offshore Velocity Cap Intake Concept