CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

Attachment 1 to Order No. R9-2010-0062

STAFF REPORT

Dynegy South Bay, LLC, South Bay Power Plant

Evaluation of Water Intake and Wastewater Discharge Effects on San Diego Bay and Consideration of Termination of Discharge

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1. INTRODUCTION

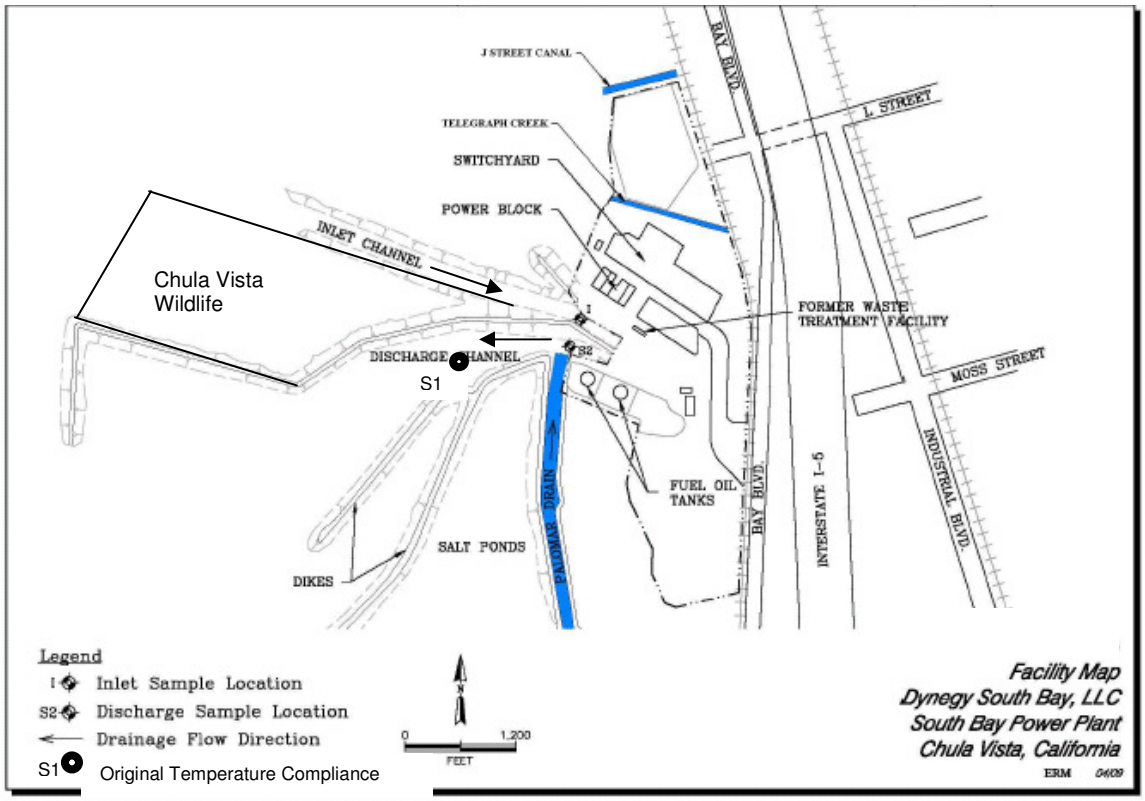
This report provides an evaluation of the California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) file records including testimony, technical evidence, and supporting documentation submitted to the San Diego Water Board relevant to determining:

1) Whether South Bay Power Plant intake and discharge operations endanger human health or the environment and can only be regulated to acceptable levels by NPDES permit modification or termination [see 40 Code of Federal Regulations, section 122.64(a)(3)]; and

2) Whether any effects identified in Item 1 above provide a sufficient basis for the Regional Water Board to require that South Bay Power Plant discharges be terminated earlier than December 31, 2010 and prior to California Independent System Operators (CAISO's) release of Units 1 and 2 from "Reliability Must Run" (RMR) status.

2. BACKGROUND

The South Bay Power Plant (SBPP) is a gas and oil fueled electrical power generating plant, operated by Dynegy South Bay, LLC (Dynegy) and located on the southeastern shore of San Diego Bay in the City of Chula Vista, approximately 16 km (10 miles) north of the U.S.-Mexican border. The plant has historically operated with four major steam cycle units with a net generating capacity of 723 megawatts electric (MWe). Each unit can generate independently or in conjunction with any other unit. Generation typically cycles on a daily basis in response to demand for electricity. The South Bay Power Plant has been operating at its current location since 1960. A facility map of SBPP is below showing the inlet channel, discharge channel, inlet sample location, discharge sample location, and original temperature compliance point.



The SBPP uses the waters of San Diego Bay for once-through cooling (OTC) of its four electric generating units. Each unit is supplied by two circulating water pumps. The quantity of water circulated through the plant is dependent upon the number of pumps in operation. When all pumps are in operation, the circulating water flow through the plant is 601 million gallons per day (mgd). The South Bay Power Plant circulates water it withdraws from San Diego Bay once through the power plant's cooling system to condense freshwater steam used in power production. After passing through the plant, the circulating water is discharged through a channel that continually mixes with San Diego Bay water.

The SBPP discharge is regulated under National Pollutant Discharge Elimination System (NPDES) Order No. R9-2004-0154 (NPDES Order R9-2004-0154), adopted by the San Diego Water Board in November 2004. The NPDES Order originally contained an expiration date of November 10, 2009. Dynegy satisfied the legal requirements for an administrative extension of its current expired NPDES Order by submitting a timely and complete application on April 10, 2009 for the reissuance of the current NPDES Order.

Dynegy updated the NPDES Permit application by letters dated October 16, 2009 and October 19, 2009 regarding the schedule for anticipated shutdown and closure of the South Bay Power Plant. Dynegy requested to continue operation of electrical generating Units 1 and 2 under the current NPDES Order R9-2004-

0154 at a reduced maximum flow-rate of 225 mgd until December 31, 2010 based on the following considerations:

- The California Independent System Operator (CAISO) has terminated the "Reliability-Must-Run" (RMR) contract for South Bay Power Plant electrical generating Units 3 and 4 such that operation of these units, and use of the associated discharge outfalls, will not be required after December 31, 2009; and

- CAISO extended the RMR contract for Units 1 and 2 for the 2010 contract year until December 31, 2010. The conditions that would allow for termination of RMR service for Units 1 and 2, including the addition of new generation and reactive power in the San Diego area, are expected to be achieved in 2010. Consequently, operation of these units, and the use of the associated discharge outfalls, at this time are not expected to be required after December 31, 2010.

Based on Dynegy's supplemental information, NPDES Order R9-2004-0154 was modified on November 9, 2009 (ratified by the San Diego Water Board on December 16, 2009) to incorporate the schedule for flow reduction to 225 mgd by December 31, 2009 and the termination of all discharges with the anticipated shutdown of Units 1 and 2 by December 31, 2010 or on the date CAISO determines that RMR services from Units 1 and 2 are no longer needed, whichever occurs first. Because the modified NPDES Order requires discharges from Units 1 and 2 to terminate no later than December 31, 2010, and an administrative extension continues only the existing permit terms and conditions, the discharge termination dates established in the modified NPDES Order cannot be administratively extended beyond December 31, 2010, even if the permit itself is administratively extended. If Dynegy proposes to discharge from Units 1 and 2 beyond December 31, 2010, a new report of waste discharge/NPDES permit application would need to be submitted to the San Diego Water Board or State Water Board, as appropriate, and a new NPDES Order will need to be adopted which protects the beneficial uses of San Diego Bay and complies with all applicable requirements. Consideration of a new permit would be subject to public participation requirements set forth in 40 Code of Federal Regulations (CFR) section 124.10 and the permitting Water Board would consider whether proposed discharges beyond December 31, 2010, endanger human health or the environment within the meaning of 40 CFR section 122.64(a)(3), serving as a basis to deny an application proposing continued discharges.

By letter dated January 11, 2010, Dynegy reported that Units 3 and 4 were permanently shut down as of December 31, 2009, resulting in the reduction of maximum flow rate from 601 mgd to 225 mgd (63 percent reduction). Unit 3 last operated on December 10, 2009 and Unit 4 last operated on November 3, 2009.

The San Diego Water Board's Public Hearing Notice dated January 22, 2010 established the procedures for conducting the hearing on this matter including identifying Dynegy and No More South Bay Power Plant Coalition as designated parties and documenting the procedure for requesting status as a designated party. The San Diego Water Board received requests for designated party status from City of Chula Vista and the California Independent System Operator Corporation. By Notification dated February 9, 2010 the San Diego Water Board granted both requests.

In accordance with the deadlines established in the January 22, 2010 hearing notice, the San Diego Water Board received written evidence, including rebuttal evidence, from the designated parties. The San Diego Water Board has also received timely submittals from interested persons including, the City of Coronado, and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service. Information contained in these submittals was reviewed and considered by the San Diego Water Board in the preparation of this Staff Report.

3. EFFECTS OF INTAKE AND DISCHARGE

Many studies have been performed on the discharges from the South Bay Power Plant since 1960 when the discharge began. For this report, staff reviewed the most recent reports, the findings and fact sheet information contained in the current NPDES Order, as well as submittals from Dynegy, the No More Power Plant Coalition, CAISO, and the City of Chula Vista pursuant to the Notice of Public Hearing dated January 22, 2010. The main information relied upon for this staff report is contained in:

- NPDES Order No. R9-2004-0154 and Fact Sheet,
- *"SBPP Cooling Water System Effects on San Diego Bay, Volume* 1: *Compliance with Section 316(a) of the Clean Water Act for the South Bay Power Plant, August 12, 2004"* (316(a) Report),
- "*SBPP Cooling water Study Effects on San Diego Bay, Volume II: Compliance with Section 316(b) of the Clean Water Act for the South Bay Power Plant, August 12, 2004*" (316(b) Report)

Arguments have been made by the No More Power Plant Coalition that the past reports, including the 316(a) Report and 316(b) Report, are not valid because they are not based on "true" background water quality conditions established before the discharge began. There are two reasons for not using background water quality in these reports. Unfortunately, sewage was being discharged into the bay until 1963 so the water quality in the bay was not representative of water quality unaffected by discharges in 1960 when the SBPP discharge began. In

addition, there is limited actual data on water quality at that time. Instead of using a background before the discharge began, the reports use an accepted method of identifying reference stations for comparison with discharge stations.

All of the past studies on the SBPP evaluate effects using a part of San Diego Bay as the discharge channel. The compliance point for the permit was in the middle of a southeast portion of San Diego Bay. The previous NPDES Orders identified this compliance point as the location where the discharge channel ends and San Diego Bay water begins. In the current NPDES Order No. R9-2004-0154, the compliance point has been moved to the property line of the SBPP. The use of the original compliance point in past studies does not invalidate the studies, but it did result in effects not being fully characterized in the portion of San Diego Bay between the property line and the old compliance point in the middle of the southeast portion of San Diego Bay.

Order No. R9-2004-0154 contains a finding that pursuant to the *State Implementation Policy* (SIP) and the provisions of the *California Toxics Rule* (CTR), the SBPP discharge does not have the reasonable potential to cause or contribute to an excursion above the applicable priority pollutant criterion or objective for any of the 126 priority pollutants listed in the CTR, except copper. Therefore, priority pollutants except copper are do not have the reasonable potential to impact water quality in San Diego Bay.

Below is a discussion of the impacts of each constituent of concern relevant to the SBPP including copper, chlorine, temperature, dissolved oxygen, and sediment as well as a discussion of the impacts to eel grass, benthic communities, turtles, entrainment, and impingement.

a. Copper

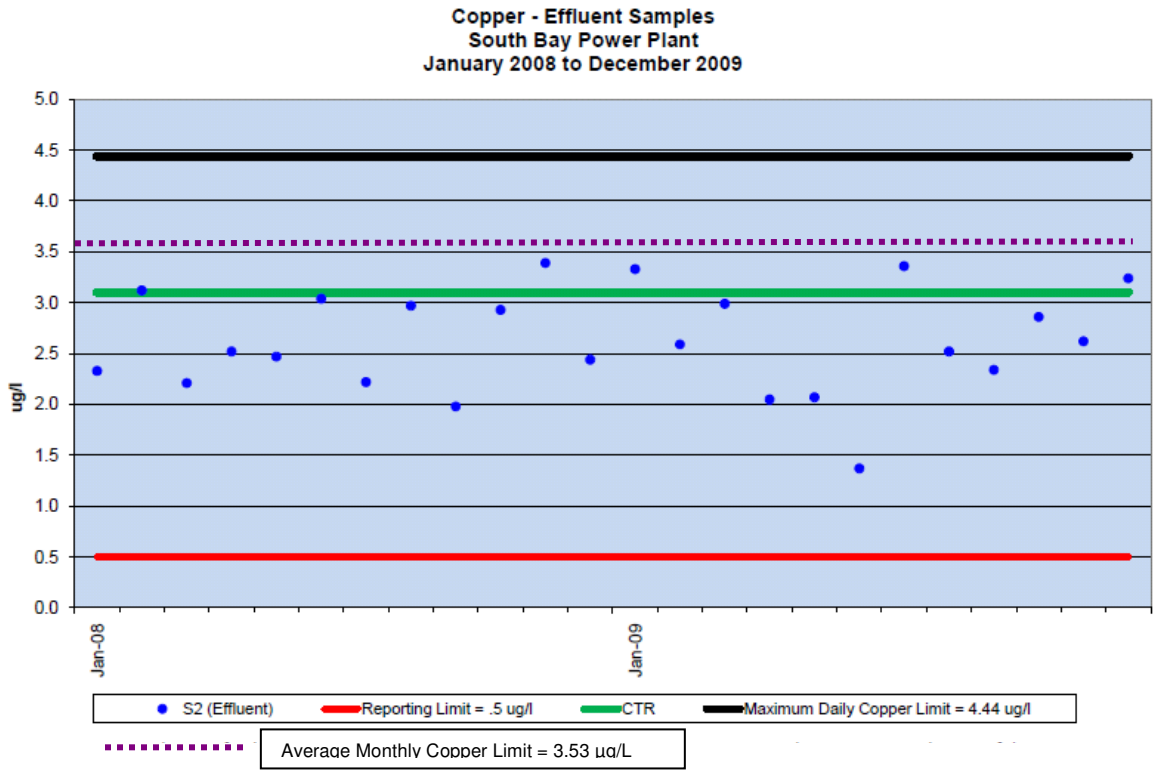
Prior to 2010, there were four generating units in operation at SBPP that used once-through cooling water. Each of the four units had a single condenser that is a shell-and-tube arrangement in which heat is transferred from the turbine exhaust steam to the cooling water. The tubing material used in the Unit 1 condenser is AL6X, a high performance stainless steel containing alloying elements of chromium, molybdenum and nickel. The condensers of Units 2, 3, and 4 use copper-nickel tubing. Currently, only Unit 1 and 2 are permitted to discharge. Because Unit 1 has stainless steel tubing, it does not contribute copper to the discharge. Since Units 3 and 4 were shut down at the end of 2009 and Unit 1 has stainless steel tubing, all copper currently discharged from the SBPP is from Unit 2, the only remaining Unit that has copper-based tubing.

A special copper study was conducted at the SBPP in 1999 to estimate the overall annual loading of copper from the SBPP discharge to south San Diego Bay. The study estimated that the average copper concentration difference

between the cooling water intake and discharge was found to be 0.39 ± 0.17 µg/L. This confirmed that the power plant does add an incremental load of copper to south San Diego Bay. The study estimated that the plant at maximum cooling water flow added approximately 710 ± 310 pounds of copper annually to south San Diego Bay. Based on calculations using maximum flow rates from the four units, the amount of copper discharged to San Diego Bay has been reduced by approximately 77% because of the termination of discharge from Units 3 and 4.

Final effluent limitations for total recoverable copper (4.44 µg/L – maximum daily and 3.53 µg/L - average monthly) were incorporated into Order No. R9-2004-0154. These limitations were calculated based on the SIP and the CTR. Order No. R9-2004-0154 also contains interim effluent limitations for total recoverable copper (< 2.5 µg/L copper over the intake water - maximum daily) which was applicable for the first 36 months of Order No. R9-2004-0154.

The SBPP is in compliance with Order No. R9-2004-0154 effluent limitations for copper as shown in the graph below modified from the Dynegy submittal dated February 22, 2010. There were no violations of the interim limit in effect from November 10, 2004 for the first 36 months. Since November 20, 2007, when the final effluent limitations became effective, there have been no violations of the final limit based on the CTR.



The copper effluent limitations appear higher than the CTR criterion (3.1 µg/L) because CTR criterion is only the dissolved fraction of copper and the effluent limitations are determined using conversion procedures contained in the SIP to the total amount of recoverable copper. The CTR criterion expressed as total recoverable concentration is 3.73 µg/L (not shown on the above figure). In addition, the effluent limitations were derived from the CTR criteria using a statistical method pursuant to procedures in the SIP designed to ensure that the criteria are achieved in the receiving water at the required frequency and duration. The effluent copper concentration is lower than the total recoverable CTR copper criterion of 3.73 µg/L and achieves full compliance with the effluent limitations in Order No. R9-2004-0154.

Because the discharge of copper to San Diego Bay has been reduced by 77% since adoption of Order R9-2004-0154 and the discharge is in compliance with effluent limitations based on the CTR, the continued discharge of copper from SBPP for the remainder of the permit term is not expected to adversely affect beneficial uses and does not support the conclusion that the permitted activity poses an unacceptable risk to human health or the environment in the short term. Any proposed discharge beyond 2010 must be evaluated to determine whether it poses and unacceptable risk of endangering human health or the environment in the longer term.

Copper discharged from SBPP over the 50 year lifetime of the power plant may have accumulated in the sediment. Sediment sampling would need to be performed to determine the extent of any copper accumulation in the sediment. Other sources of copper in south San Diego Bay such as the 24th Street Marine Terminal, past industrial discharges, past sewage discharges, and boats with copper-based paint would need to be considered as well. Continued discharge from the SBPP for the remainder of the permit term is not expected to significantly affect any historic copper accumulation in the sediment.

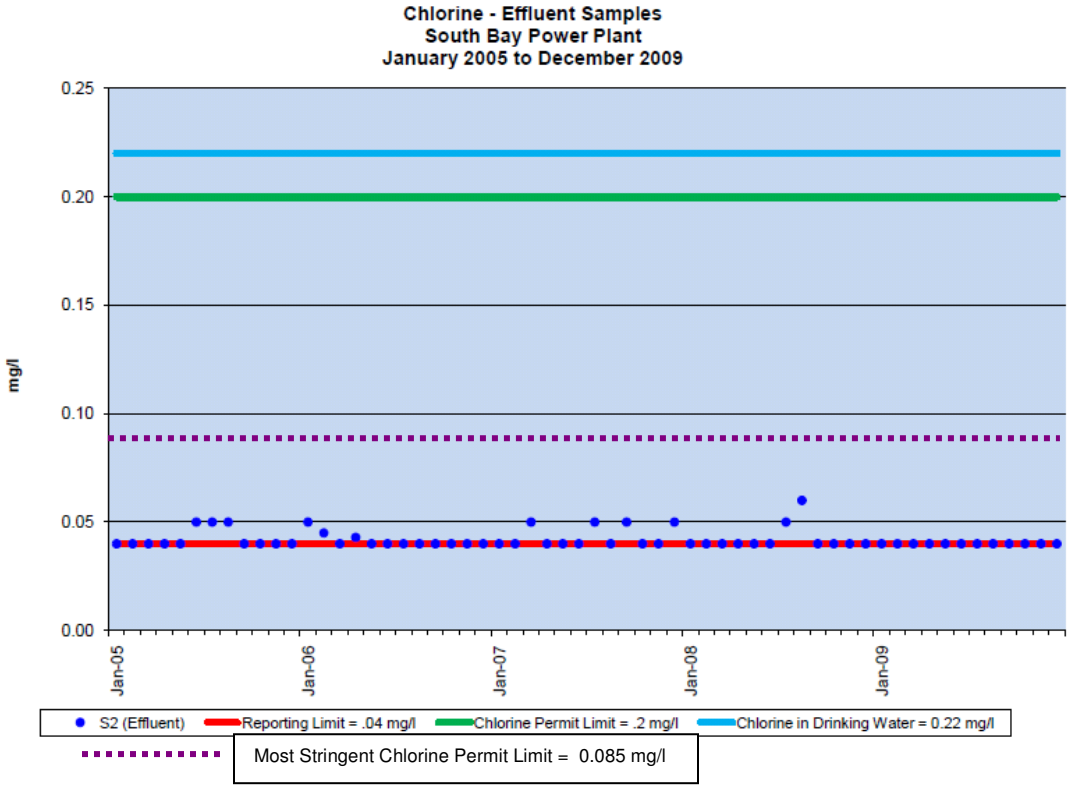
b. Chlorine

Chlorine is an effective biocide used to minimize the growth of algae and slime within the condenser tubes to maintain heat transfer efficiency. The SBPP operates the chlorination system intermittently to reduce the impact on the receiving water. Sodium hypochlorite is used in 20 minute cycles every 4 hours, staggered in each Unit so only one is chlorinated at a time. Since SBPP is now operating only two of the previous four units, the amounts of chlorine discharged is expected to be approximately half of what it was when Order No. R9-2004-0154 was adopted. The total residual chlorine is present intermittently in the effluent in concentrations ranging from 0.040 to 0.070 mg/L.

Order No. R9-2004-0154 has effluent limitations for chlorine based on the lower of 1) the USEPA BAT limit of 0.20 mg/l and 2) an equation based on a toxicity

evaluation specific to the SBPP which is a function of the duration of uninterrupted chlorine discharge in minutes. A longer discharge time would render a lower (i.e. more stringent) effluent limitation for total residual chlorine. The maximum duration of uninterrupted chlorine discharge at the SBPP is 80 minutes (i.e. 20 minutes per Unit per cycle). Based on the equation, the total chlorine residual effluent limitation associated with the maximum chlorine discharge time (based on an 80 minute combined cycle time, when all four Units are operating) is 0.085 mg/l. When only one Unit is operating, the effluent limitation is less stringent at 0.144 mg/l (20 minute cycle time). There are currently only two units in operation so the most stringent chlorine effluent limitation would be 0.111 mg/l when two Units are operating (40 minutes combined cycle time).

From January 2005 though December 2009, the SBPP has been in compliance with the most stringent variable effluent limitation of 0.085 mg/L for chlorine as shown in the figure below.



Order No. R9-2004-0154 requires samples be collected when concentrations are anticipated to be at or near their highest and daily logs of the chlorination process and sampling times.

Chlorine may have sublethal effects on aquatic life such as benthic organisms that are discussed in other sections of this report.

The chlorine effluent limitation, based on water quality objectives, is protective of beneficial use designations established in the Basin Plan. SBPP is in compliance with the chlorine effluent limitations which are protecting beneficial uses. Allowing the discharge to continue for the short term remaining before the permit expires does not pose an unacceptable risk to human health or the environment. Any proposed discharge beyond 2010, however, must be evaluated to determine whether it poses an unacceptable risk to human health or the environment in the longer term.

c. Temperature

Until 2010, the SBPP utilized four Units of closed cycle steam turbines to generate electricity. After December 31, 2009, only two units are permitted for discharge. The elevated-temperature water used to condense the steam is discharged back to the San Diego Bay. The naturally low-mixing, shallow water at the SBPP intake can be as high as 85 F (30 C). The effluent temperature may be as much as 23 to 25 F higher than the intake water when the plant is operating at peak load. This can result in discharge temperatures as high as 100 degrees F (38 C) for several hours of the day and occasionally briefly higher.

Order No. R9-2004-0154 contains effluent limitations for temperature in the form of incremental degrees above the temperature of the intake water or delta T: the instantaneous maximum delta T shall not be more than 25 F (13.9 C) and the daily average shall not be more than 15 F (8.3 C). These temperature limits were carried forward from the previous NPDES Order.

The State Water Quality Control Plan for Control of Temperature in Coastal and Interstate Waters and Enclosed Bays and Estuaries of California *(Thermal Plan)* requires that elevated temperature waste discharges from existing discharges comply with limitations necessary to assure protection of beneficial uses. The SBPP is an existing discharger and is required to comply with limitations which assure protection of beneficial uses.

Order No. R9-2004-0154 required a change in compliance point for the temperature effluent limitations. This change in compliance point was necessary in order for Duke Energy (the former SBPP operator and permit holder) to fully comply with federal NPDES regulations (40 CFR 122.45 and CFR 122.41(j)(1) that require effluent limitations to be enforced a location that is close to or at the point of discharge and representative of the discharge. The new temperature compliance point is at the west end of the discharge channel at station S2. The previous temperature compliance point was located approximately 1000 feet downstream of station S2, inside the receiving waters of south San Diego Bay.

Order No. R9-2004-0154 states that, pursuant to Clean Water Act Section 316(a), the temperature discharge limitations are not more stringent then necessary for protection and propagation of a "balanced indigenous community" within the discharge channel but, these thermal limitations do not fully ensure protection of water quality needed for attainment of the beneficial uses of south San Diego Bay as required by the *Basin Plan* and *State Thermal Plan*.

The SBPP discharge channel exhibits a lower overall diversity of benthic invertebrates, the absence of certain indigenous invertebrate species (polychaete worms and amphipods) and the presence of tolerant invasive species. Furthermore, up to 104 acres of eelgrass habitat (critical to the protection and propagation of indigenous communities) have been precluded from the discharge channel and other areas of south San Diego Bay due to the elevated temperatures and redistribution of turbidity in the Bay from the SBPP discharge. These impacts are discussed in more detail below.

Historic temperatures up to 95 or 96 degrees F (35 C) have been measured at the eastern end of the SBPP discharge channel during summer months. Under extreme conditions of elevated temperature and lowered DO, fish and other mobile organisms could lose the ability to find cooler waters and could become trapped in the cooling water discharge channel. Fish surveys conducted prior to adoption of Order No. R9-2004-0154 indicate a diverse community of certain species of fish resides in the cooling water channel during winter months; however, the effects of additional discharges of heat on south Bay's beneficial uses are unknown.

The San Diego Water Board recognizes that the requirement to relocate the discharge temperature compliance point from Station S 1 to the SBPP property line at Station S2 in order to comply with NPDES regulations (40 CFR 122.45 and CFR 122.41(j)(1)), may have provided for important side benefits. In particular, this relocation may have helped in abating some of the detrimental thermal impacts to the discharge channel. This change in compliance location will eliminate any potential mixing or dilution zones for temperature and ensure that less heat is dispensed to the discharge channel. Since there is a direct correlation between DO levels in the discharge channel and temperature, less heat dispensed to the discharge channel may also provide for higher DO levels. Higher DO levels and lower temperature regimes may positively impact the health and survivability of fish, benthic invertebrates, and eelgrass in the discharge channel. Additional studies have not been performed to evaluate the effects of the change in the temperature compliance point.

Although, the thermal discharge is causing impacts to the beneficial uses, these impacts have been on-going for 50 years. There has now been a 63% decrease in the flowrate from the SBPP which will reduce impacts by an unquantified amount. According to the "Assessment of the 2009 Flow Reduction of South Bay Power Plant Intake and Discharge Effects, February 20, 2010, prepared for Dynegy South Bay LLC,"(2010 Assessment) the current SBPP thermal plume

that extends beyond the Plant's point of discharge at the property line is 63 percent smaller, and several degrees cooler and thinner, as a result of the shutdown of Units 3 and 4. The volume of the present thermal plume is 63 percent smaller, and the temperature is 4 to 5 degrees F cooler at the point of discharge. The 2010 Assessment states that this lower temperature is not only significant in minimizing the potential for effects on receiving water biota but, in combination with the loss of the plume's flow and momentum, creates a thinner plume that is less likely to contact receiving water shoreline and bottom habitats. The lower temperature and smaller volume of the discharge plume from Units 1 and 2 provide increased assurance that existing discharge temperature limits are fully protective of the balanced, indigenous community (BIC) of fish, shellfish and other wildlife in the receiving waters pursuant to Clean Water Act Section 316(a). The effects of the smaller volume and lower temperature have not been fully evaluated, but will reduce impact to beneficial uses by an unquantified amount.

Allowing the permitted activity to continue for the remainder of the permit term does not pose an unacceptable risk to human health or the environment in the short term. Any proposed discharge beyond 2010, however, must be evaluated to determine whether it endangers human health or the environment in the long term.

d. Dissolved Oxygen

Higher water temperatures reduce the amount of oxygen in the water, and at the same time increase the metabolic rates of animals, which in turn increases their oxygen demand. Metabolic rate has been shown to double every 10 degrees C (18 degrees F).

The Basin Plan specifies the following water quality objective for dissolved oxygen (DO) in inland surface waters:

> *DO levels shall not be less than 5.0 mg/l in inland surface waters with designated MARINE or WARM beneficial uses. The annual mean DO concentration shall not be less than 7 mg/l more than 10% of the time.*

It is not clear if enclosed bays such as San Diego Bay should appropriately be classified as *"Inland surface waters with designated MARINE beneficial uses"* as implied in the Basin Plan. Inland surface waters are generally fresh water and do not have the beneficial use designation of MARINE. San Diego Bay is considered an enclosed bay with the designated MARINE beneficial use, not an inland surface water. The Basin Plan does not explicitly designate a DO objective for enclosed bays like San Diego Bay.

A review of DO sampling data for the year 2001, compiled by the San Diego Unified Port District *(Port of San Diego, Bay-Wide Water Quality Monitoring Program, 2001)*(2001 Port Program), for five stations dispersed around San Diego Bay is discussed in Order No. R9-2004-0154. The 2001 Port Program shows that the ambient DO levels in San Diego Bay do not meet the above objective. The annual mean DO at only one station exceeded 7.0 mg/l (i.e. 7.02 mg/l at Station 1, Shelter Island), a station that was close to the open ocean waters and the mouth of north San Diego Bay. The annual mean DO values at the other four stations, in the inner Bay, were in the 5.57-6.32 mg/l range.

An analysis of the 2001 weekly mean DO sampling data, obtained from the 2001 Port Program, for the station located in south San Diego Bay (i.e. Station 5, at the mouth of Chula Vista Marina; to the north of the SBPP intake channel) showed that 20.5 percent of ambient DO values were less than 5.0 mg/l and 94.8 percent of ambient DO values were less than 7.0 mg/l. An analysis of DO sampling data taken at half hour intervals during the summer of 2001 (May through October) at Station 5, showed that 28.5 percent of ambient DO values were less than 5.0 mg/l and 98.2 percent of ambient DO values were less than 7.0 mg/l.

The 316(a) Report submitted by Duke Energy in August 2004 evaluated whether the SBPP causes a decrease in the concentration of DO in south San Diego Bay to levels below naturally occurring conditions and evaluated if any observed declines in DO result in altering biological communities from what might be expected as a balanced indigenous community under natural environmental conditions.

The mean hourly DO concentration for both the San Diego Bay open water stations and the SBPP discharge channel fell within ±1 standard deviation of the mean hourly DO concentration of reference stations. In comparison to the mean condition of the combined reference stations, all south San Diego Bay stations had greater levels of DO in the morning and lower levels of DO in the afternoon where the reference stations had greater levels of DO in the afternoon and lower levels in the morning. The mean daily DO concentrations of 5.38 ± 1.01 mg/l (reference sites), 5.52 ± 0.35 mg/l (open San Diego Bay), and 4.99 ± 0.32 mg/l (SBPP discharge channel) do not substantially differ. The SBPP discharge channel had a daily DO regime that exhibited lower productivity and lower DO consumption than reference stations analyzed in the 316(a) report.

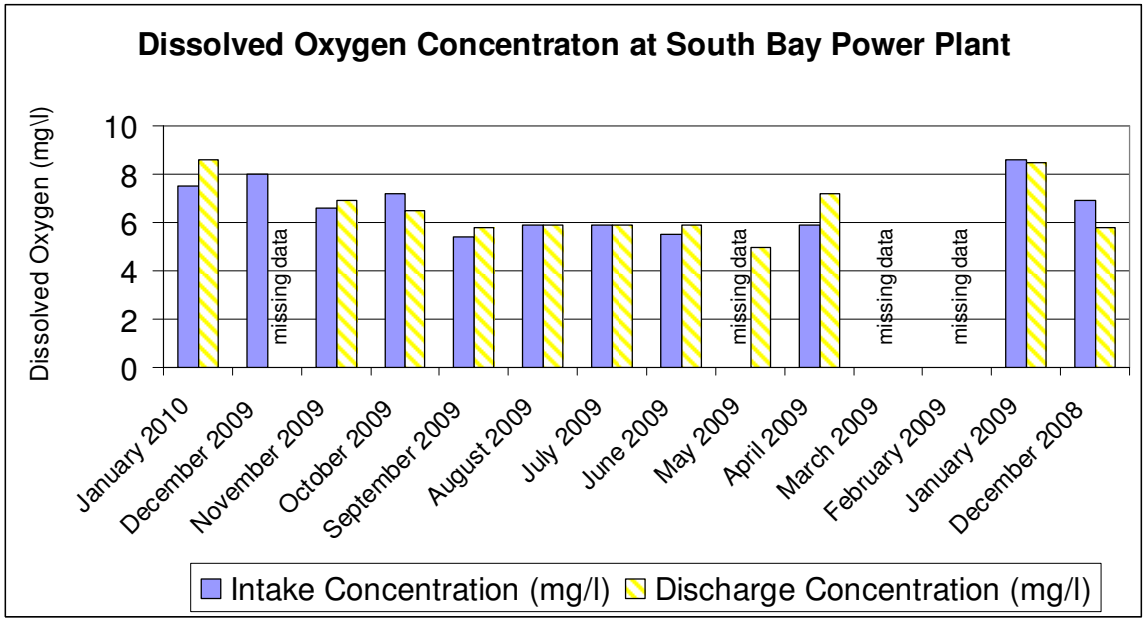
Duke Energy's 316(a) Report states that these ambient DO levels appear to support fish populations in the SBPP discharge channel and do not appear to limit their distribution or species composition.

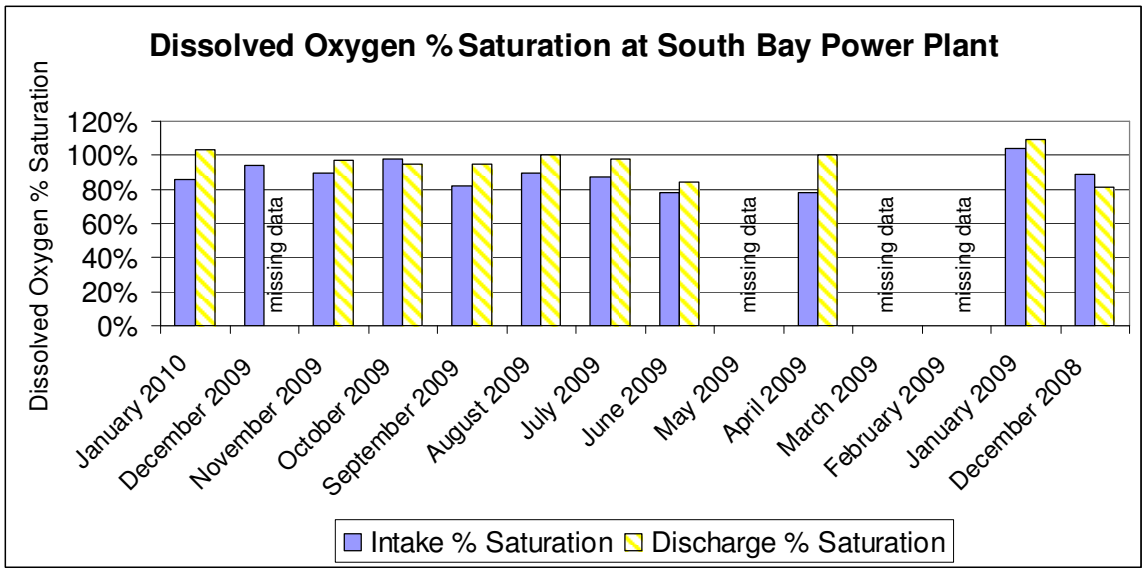
Order No. R9-2004-0154 requires Duke Energy to conduct monthly monitoring for DO in the effluent and for 12 receiving water stations throughout San Diego Bay. The DO data from the effluent was to be compared to DO levels in the

receiving water stations to determine the extent of impact of the thermal effluent from SBPP to DO levels in south San Diego Bay. A DO discharge limitation was planned to be considered after adequate data has been collected. This monthly DO data has not been fully evaluated. However, an abbreviated evaluation is discussed below.

Available monthly monitoring data for intake and discharge DO from December 2008 through January 2010 are shown in the following charts. Intake DO concentrations ranged from 5.4 mg/l in September 2009 to 8.6 mg/l in January 2009. Intake DO percent saturation ranged from 78% in April 2009 to 104% in January 2009. Discharge DO concentrations ranged from 5.0 mg/l in May 2009 to 8.6 mg/l in January 2010. Discharge DO percent saturation ranged from 81% in December 2008 to 109% in January 2009.

Based on the monthly monitoring data, DO concentrations are generally lower in the hotter summer months as would be expected. Discharge DO concentrations and percent saturation are often higher than intake concentrations and percent saturations. All the intake and discharge concentrations are greater than the 5 mg/l value from the DO objective for inland surface waters. On the other hand, most of the intake and discharge concentrations were below the 7 mg/l DO objective (64% and 73% respectively). For comparison, the Port of San Diego data from 2001 for a station north of the intake channel showed 95% of the samples below 7 mg/l.



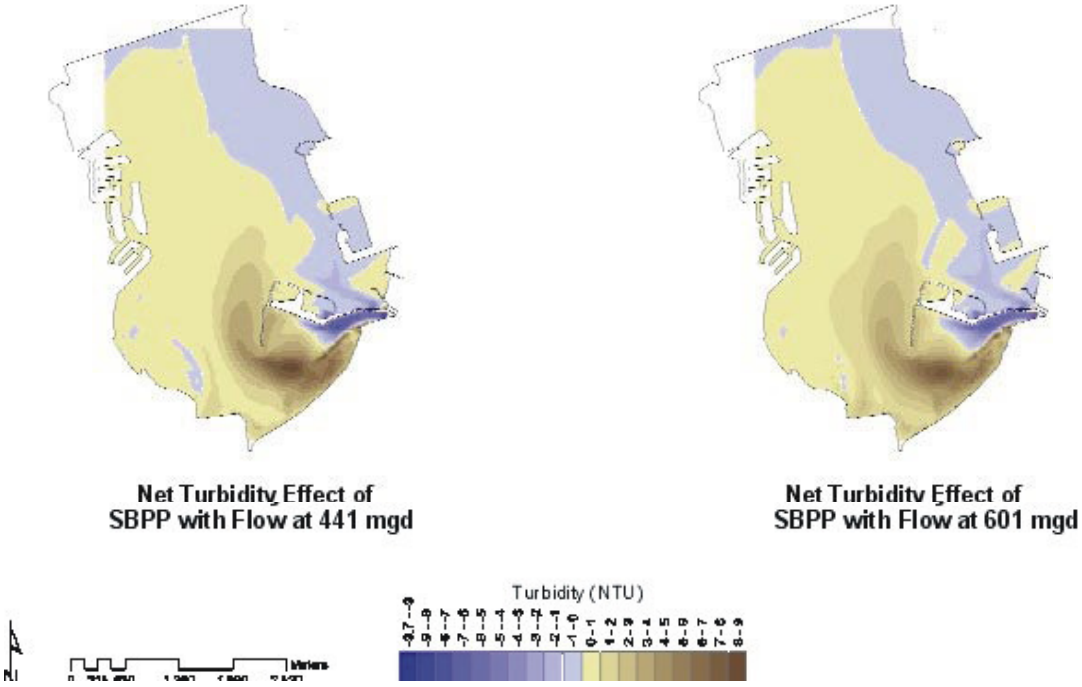


Because there is not an appropriate water quality objective for DO in San Diego Bay and the data has not been fully evaluated, it can not be determined at this time whether the SBPP is adversely affecting the DO concentration or percent saturation in San Diego Bay. Based upon this information and in light of the 63% reduction in flow as of the end of 2009, it does not appear that allowing the discharge to continue for the remainder of the permit term poses an unacceptable risk to human health or the environment over the short term. Any proposed discharge beyond 2010 must be evaluated to determine whether it endangers human health or the environment in the longer term.

e. Sediment Load

The distribution of particle sizes within soft sediment marine environments is a significant factor affecting the composition of infaunal assemblages, and the suspension of fine sediments by currents can increase turbidity thus decreasing light penetration through the water column and affect the growth of bottom vegetation. Although the SBPP discharge is not likely to cause increases in the amount of suspended material in the South Bay, it can influence the distribution of turbid water within the South Bay. The power plant cooling water flows contribute to South Bay turbidity distribution by drawing clearer waters southward along the deeper navigational channels on the eastern portion of the bay and expanding natural turbidity plumes along the western portion of the South Bay. Current and turbidity modeling support the idea that discharged cooling water from the SBPP plays a role in the export of naturally-generated turbidity from the discharge channel and the immediate vicinity of the Chula Vista Wildlife Island.

The figure below from the 316(a) report shows projected turbidity at the previous maximum flowrate of 601 mgd and at the mean summer 2003 flowrate of 441 mgd. The current maximum permitted flowrate is 225 mgd or roughly half of the mean summer 2003 flowrate of 441 mgd. Due to the reduced flowrate, turbidity effects are expected to be less than shown by the figure with flow at 441 mgd. The 316(a) Report identified impacts from the turbidity redistribution to eelgrass which are discussed in the next section of this report.



f. Eelgrass (Zostera marina)

Eelgrass beds are considered a critical component of the San Diego Bay food web. Much of the eelgrass primary productivity enters the food web as detritus, and eelgrass beds actively uptake nutrients, produce oxygen, stabilize sediments and slow current velocities. Fish and invertebrates use eelgrass beds as a refuge from predators, as a food source, and as nursery habitat. Eelgrass provides surfaces for egg attachment and sheltered locations for juveniles to hide and feed. Fish and invertebrates produced from these beds are ecologically, commercially, and recreationally important species, both as permanent bay residents and as oceanic species. Waterfowl, especially surf scoter, scaup, and brant are present in high numbers in late fall and winter. Black brant, in particular, rely heavily on eelgrass of central and south Bay as they are one of the few birds that consume it directly.

The predicted turbidity and thermal effects of the SBPP cooling water flows estimate that the SBPP, operating at maximum cooling water circulation rates (i.e. 601.13 MGD) would preclude eelgrass from approximately 104 acres of south San Diego Bay. Excluding areas dredged for power plant operation, the 316(a) Report estimated that 104 acres of south San Diego Bay would lose eelgrass due to the power plant discharge including the entire discharge channel and areas of South Bay immediately west and north of the Chula Vista Wildlife Island. The preclusion of 104 acres (42 hectares) represents roughly 7-8 percent of the estimated eelgrass bed coverage in San Diego Bay (500-700 hectares) and 13-20 percent of estimated bed coverage in the South Bay (200-300+ hectares).

The 316(a) Report indicated that while natural turbidity plays a primary role in dictating the distribution of eelgrass in south San Diego Bay, the high flow rate of the SBPP discharge plays a direct role in distributing naturally generated turbidity to the discharge channel and influencing the distribution of eelgrass. The 316(a) Report also suggests that there are aggregate effects of turbidity and temperature within near-field portions of the thermal plume of the SBPP. These effects may result in either an absence of eelgrass, or seasonal die-off of eelgrass.

In the area of the discharge channel nearest the SBPP, summer season discharge temperatures alone may limit the occurrence of eelgrass, and thus turbidity may not be a significant factor in structuring eelgrass habitat within these areas. Published scientific literature[1] has shown that eelgrass suffers reduced growth at temperatures above 25-30 degrees C (86 F) and temperatures of 35 degrees C (95 F) or higher would contribute to direct mortality. Below are figures depicting the temperature ranges from stations near the SBPP. Stations on the left side of the figures are nearest the SBPP discharge beginning in the discharge channel and moving out into the bay. Some stations on the right side of the figures are near the intake channel and farther out in San Diego Bay.

[1] See Evans et al. 1986; Zimmerman et al., 1989; Bintz et al., 2003

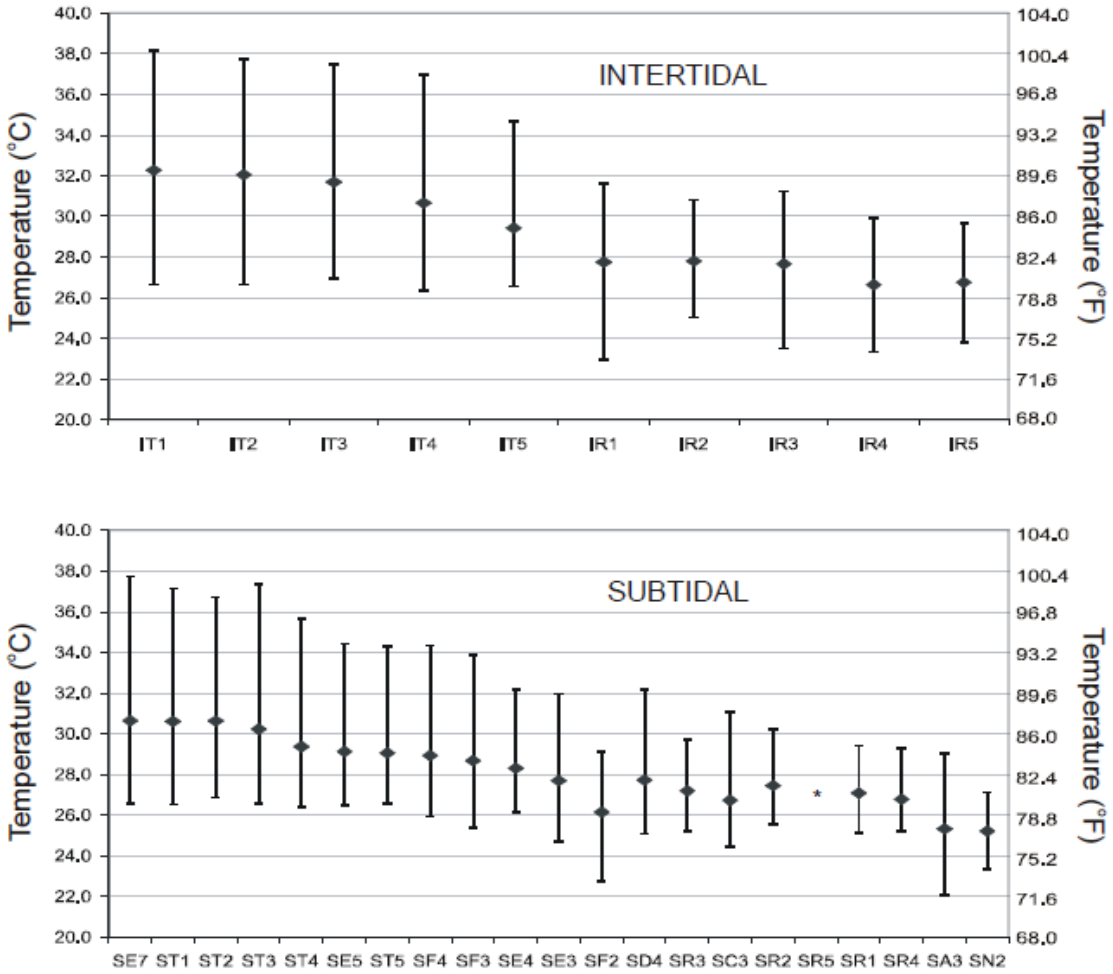


Figure ES-3. Mean, maximum, and minimum water temperatures during August 2003 at intertidal and subtidal stations in SBPP discharge channel and South Bay. Intertidal elevations were +0.3 m (+1.0 ft) above Mean Lower Low Water; subtidal bottom depths ranged from -0.4 m (-1.4 ft) to -4.2 (-13.8 ft) below MLLW. (*) Station SR5 not included due to incomplete data.

These impacts to eel grass were identified and acknowledged in NPDES Order R9-2004-0154 in Finding 14 and 19. Finding 19 of NPDES Order R9-2004-0154 also says “Measures to mitigate the detrimental impacts of the SBPP discharge to the discharge channel are needed. Measures to restore the beneficial uses of south San Diego Bay and to rehabilitate the damage caused to the biological resources of the Bay are also necessary.”

The flow at the SBPP has been reduced by 60% which will reduce the impacts, although by an unknown amount. The 316(a) Report also provided an estimation that 71 acres of eelgrass would be precluded by the discharge during mean operating flows of 441 MGD during 2003. The preclusion of eelgrass from the discharge under current maximum discharge conditions of 225 MGD is unknown, but is expected to be less than the amount caused by flows of 601 MGD or 441

MGD. Based upon available information, allowing the discharge to continue for the remainder of the permit term does not pose an unacceptable risk to human health or the environment. Any proposed discharge beyond 2010, however, must be evaluated to determine whether it endangers human health or the environment in the longer term.

g. Benthic Organisms

As found in Order No. R9-2004-0154, the biotic communities in the immediate vicinity of the discharge point and in the discharge channel have been degraded by exposure to the once-through-cooling water discharge from the SBPP. The degradation to the biotic communities is due to several factors, including elevated temperature, flow volume, and flow velocity. The degradation to biotic communities includes a lower diversity of benthic invertebrates residing in the near field stations of the discharge channel compared to those in reference stations outside the discharge channel. Furthermore, certain invertebrate species (including polychaete worms and amphipods) are largely absent in near field stations of the discharge channel. These species were found in abundant quantities in reference stations outside the discharge channel. Additionally, certain invasive species were found in high numbers at field stations at the discharge location. The absence of polychaete worms and amphipods from the discharge channel and dominance of tolerant invasive species demonstrates that the thermal regimes of the discharge channel are adversely impacting native indigenous populations. Furthermore, it is important to note that the Benthic Response Index (BRI) was specifically developed for unvegetated subtidal habitat that is not subject to thermal impacts. Thus, the calculation and comparison of BRI scores between sites that are unvegatated and subject to thermal impacts to those that are not may not be accurate for the observational detection of any discharge impacts.

These impacts were identified and acknowledged in NPDES Order R9-2004-0154 in Finding 14 and 19. Finding 19 of NPDES Order R9-2004-0154 also says “Measures to mitigate the detrimental impacts of the SBPP discharge to the discharge channel are needed. Measures to restore the Beneficial Uses of south San Diego Bay and to rehabilitate the damage caused to the biological resources of the Bay are also necessary.” These impacts were identified in NPDES Order R9-2004-0154 and the flow at the SBPP has been reduced by 60% which will reduce the impacts, although by an unknown amount. Based upon this information, allowing the discharge to continue for the remainder of the permit term does not pose an unacceptable risk to human health or the environment. Any proposed discharge beyond 2010, however, must be evaluated to determine whether it endangers human health or the environment in the longer term.

h. Turtles

At the San Diego Water Board's December 16, 2009 meeting to ratify the permit modification, Dr. Jeffrey Seminoff, Director for the Marine Turtles Research Program for U.S. National Marine Fishery Service, testified that SBPP has not had any ill effect on the Eastern Pacific Green Sea Turtles which reside in the Bay, and that expedited closure of the plant will not benefit the turtles. He also testified that the turtles will remain in San Diego Bay, with or without the warm water associated with the power plant discharge. Dr. Seminoff has been studying the green turtles for almost 20 years and is a nationally recognized expert on sea turtles. Mr. Seminoff has noted that the discharge channel is a key resting site for green turtles, and that conditions in the channel are very favorable for the turtles. The warm water increases growth rates of the turtles, helping the population to recover more quickly from former exploitation (unrelated to the SBPP). The aggregation of green turtles in and around the plant illustrates that this is a good quality, inviting habitat for this endangered species. Because green turtles do not depend on eelgrass in the bay, the health of the eelgrass systems does not affect the turtles.

Dr. Seminoff's testimony is supporting documentation that the water quality for the turtles is adequately protected by NPDES Order No. R9-2004-0154 for SBPP. Based upon this information, allowing the discharge to continue for the remainder of the permit term does not pose an unacceptable risk to human health or the environment in the short term. Any proposed discharge beyond 2010 will be evaluated to determine whether it endangers human health or the environment in the longer term.

i. Entrainment and Impingement of Marine Organisms

Duke Energy submitted a report titled "SBPP Cooling water Study Effects on San Diego Bay, Volume II: Compliance with Section 316(b) of the Clean Water Act for the South Bay Power Plant, August 12, 2004" (316(b) Report) as part of their NPDES Permit application. This report discusses the effects of entrainment and Impingement.

<u>Entrainment</u>

The 316(b) Report indicates that larval forms of five taxa make up 99 percent of the entrainment impacts. These include a CIQ goby complex (complex made up shadow, arrow and cheekspot gobies), anchovies, silversides, blennies and longjawed mudsuckers. The 316(b) Report indicates that a number of models (fecundity hindcasting [FR], adult equivalent loss [AEL] and empirical transport model [ETM]) were used to determine adult losses as it corresponds to larval entrainment losses. The report identifies that 13 percent of the anchovies adult

population and 15.1 percent of the silverside adult population in the source water would be lost annually due to larval entrainment losses. The report indicates that in 2003 approximately 27 percent of the goby complex larval from the source water population was lost and 50 percent of the longjawed mudsucker larval population was lost due to entrainment.

According to the Fact Sheet (page 32) to Order No. R9-2004-0154, the San Diego Water Board considers these larval and equivalent adult fish losses to be significant. The Department of Fish Game and the National Marine Fisheries Service have both indicated that these larval and equivalent adult fish losses are significant and would have an adverse impact on source water populations in south San Diego Bay.

Impingement

Based upon the collection of 50,970 fishes with a total weight of 74 kg over 52 weeks of actual operating flow rates, the annual impingement of fish under full operating flow rates was estimated by the 316(b) Report to be 385,588 individuals weighing 556 kg.

The most abundant taxon both numerically and by weight impinged was anchovies, comprising 93 percent by number and 40 percent by weight of all fishes impinged. Most of the fish impinged (over 96 percent of the total abundance and 87 percent of the total biomass) were not commercially or recreationally fished species. The 316(b) Report claims that estimated impingement effects, under peak operation conditions, are minimal and indicates that SBPP operation represents a low potential risk to taxa populations.

The alternate technologies, designs, and operational and maintenance features evaluated in the 2003 316(b) Report are closed-cycle cooling water systems, behavioral barriers, and physical barriers. Wet/dry hybrid cooling towers using untreated wastewater or desalinated water was the only viable closed-cycle cooling system evaluated for use at the SBPP.

The 316(b) Report evaluated these options and eliminated them because of the short-term nature of Duke Energy's SBPP lease with the Port of San Diego, which expired in 2009. There would not be enough time to design, permit, and construct the closed-cycle cooling water systems, behavioral barriers, or physical barriers. The 316(b) Report also conducted a cost\benefit analysis for these options which indicated that the costs (amortized over the 5-year, expected, remaining life of the plant) were wholly disproportionate to the environmental benefits gained based on the entrainment/impingement data collected in 2003.

The 316(b) Report concluded that these technologies traded decreases in impingement of larger organisms for increased environmental impacts on other

life stages, sizes, or types of organisms and therefore do not represent Best Technology Available (BTA) for the SBPP intake.

The 316(b) Report recommended that the existing fish return system be upgraded to reduce bird predation and that the trough be extended so that it returns impinged organisms into deeper water. The 316(b) Report concluded that the existing shoreline vertical traveling screen represents the BTA. This conclusion is based on the relative insignificant entrainment and impingement effects (including no population-level effects) and consideration of various alternative technologies, including potential for further reducing entrainment and impingement losses, engineering feasibility, and cost-effectiveness, as outlined in the guidance manual (USEPA 1977).

The USEPA indicated that the 5-year plant life amortization schedule utilized by Duke Energy to conduct a BTA cost analysis is not justified because the SBPP is likely to continue operation after Duke Energy's SBPP lease with the Port of San Diego expires in 2009. The USEPA recommended that a standard long-term operating (20 years) schedule be used in the BTA analysis. A long-term amortization schedule may render alternate screens and fish return technologies cost effective in reducing entrainment and impingement losses. NPDES Order No. R9-2004-0154 required a comprehensive demonstration study on intake structures to address USEPA's concerns and to re-evaluate compliance with Clean Water Act Section 316(b).

Clean Water Act Section 316(b)

Section 316(b) of the Clean Water Act requires that the location, design, construction and capacity of cooling water intake structures reflect the Best Technology Available (BTA) for minimizing adverse environmental impacts including entrainment and impingement.

On February 16, 2004, the USEPA published a final rule to implement Section 316(b) of the Clean Water Act. This rule (40 CFR 125, Subpart J, *Requirements Applicable to Cooling Water Intake Structures for "Phase II Existing Facilities" Under Section 316(b) of the Act)* established location, design, construction and capacity standards, for cooling water intake structures at existing power plants that use the largest amounts of cooling water (i.e. greater than 50 MGD). The new rule went into effect on September 7, 2004.

As a result, NPDES Order No. R9-2004-0154 required Duke Energy to conduct a comprehensive demonstration study on intake structures to address the provisions of the new Clean Water Act Section 316(b) rule.

Litigation following the 2004 316(b) rule's adoption led USEPA to suspend Phase II in 2007. The Second Circuit Court decision (known as the Riverkeeper II decision) remanded several significant provisions of USEPA's proposed Phase II

regulations establishing uniform performance standards for large existing power plants. This suspension remains in effect until such time that further direction is provided by either USEPA or the State Water Resources Control Board. USEPA directed NPDES permitting authorities to implement Section 316(b)'s requirements for existing facilities using best professional judgment (BPJ), the same guidance that has been in place since 1977. When USEPA suspended this 316(b) rule, the San Diego Water Board suspended the requirements to conduct the comprehensive demonstration study on intake structures to comply with Section 316(b) by letter dated June 1, 2007. To date, the San Diego Water Board has not renewed the permit nor undertaken a new best technology available analysis. Such an analysis would be required if Dynegy submits an application to discharge from the SBPP beyond 2010.

The State Water Resources Control Board (State Water Board) is considering a Draft "Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling" (OTC Policy). The proposed OTC Policy will establish technology-based standards to implement federal Clean Water Act section 316(b) and reduce the harmful effects associated with cooling water intake structures on marine and estuarine life including impingement and entrainment. The proposed OTC Policy would apply to the 19 existing power plants (including South Bay Power Plant) that currently have the ability to withdraw over 15 billion gallons per day from the State's coastal and estuarine waters using a single-pass system, also known as once-through cooling. Under the current proposed OTC Policy, SBPP would be required to achieve significant reductions in entrainment and impingement through a compliance schedule by December 31, 2012. The State Water Board is expected to consider the proposed OTC Policy in spring 2010.

Evaluation

NPDES Order R9-2004-0154 terminates the discharge from SBPP on December 31, 2010 or the date CAISO determines that RMR services from Units 1 and 2 are no longer needed, whichever occurs first, absent further action by the San Diego Water Board. Because of this termination clause in NPDES Order R9-2004-0154, discharges from Units 1 and 2 cannot continue beyond December 31, 2010 even if that Order is administratively extended. Instead, if Dynegy proposes to discharge beyond 2010, a new application will need to be submitted which demonstrates compliance with Clean Water Act Section 316(b), likely through the State Board's Policy. In the absence of an effective OTC Policy, CWA section 316(b) would require the San Diego Water Board to use its best professional judgment to determine what constitutes best technology available to minimize adverse environmental impacts associated with the once through cooling intake structures if it were to consider issuing a new NPDES order for SBPP. The San Diego Water Board would also consider whether proposed discharge beyond 2010 endangers human health or the environment within the

meaning of 40 CFR section 122.64(a)(3) which can serve as a basis for denying a permit application.

There are clear impacts due to entrainment and impingement identified in NPDES Order R9-2004-0154, but these impacts have been ongoing since 1960 when the SBPP first began discharging. In January 2010, SBPP began discharging 60% less cooling water than has been discharged in the past. According to Dynegy's 2010 Assessment, as of January 1, 2010, the entrainment intake effects have been reduced by at least 63 percent and impingement effects have been reduced by 86 percent of the levels previously calculated based on assumed Plant operations at maximum generating capacity and cooling water flow rates.

In light of the substantially reduced flow, it is reasonable to assume there are substantial corresponding reductions in the effects of impingement and entrainment. Under these circumstances, for the short term, allowing the discharge (and corresponding intake) to continue for the remainder of the permit term does not pose an unacceptable risk to human health or the environment. As indicated above, any proposed discharge beyond 2010 will be evaluated to determine whether it endangers human health or the environment in the longer term as well as for compliance with the best technology available requirements of CWA section 316(b).

4. CONCLUSION

Title 40 Code of Federal Regulations, section 122.64(a)(3) provides the following cause for terminating a permit during its term, or for denying a permit renewal application: "A determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination."

As discussed above, the SBPP has operated for approximately 50 years. Beginning in 2010, the maximum permitted flow has been reduced by 63 percent. The current permit by its own terms requires discharges to terminate at the end of 2010 or earlier if the CAISO determines that Units 1 and 2 are no longer needed for power reliability needs and expires on December 31, 2010. Allowing the discharge (and intake) at SBPP to continue until the permit expires at the end of 2010 does not pose an unacceptable risk to human health or the environment over the short term remaining in the life of the permit. Any proposed discharge beyond 2010 will need to be evaluated to determine whether it endangers human health or the environment in the longer term as well as for compliance with the best technology available requirements of CWA section 316(b) and other applicable legal requirements.