CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. R5-2006-XXXX

NPDES NO. CA0083348

WASTE DISCHARGE REQUIREMENTS
FOR

UNIVERSITY OF CALIFORNIA
CENTER FOR AQUATIC BIOLOGY AND AQUACULTURE
YOLO AND SOLANO COUNTIES

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Regional Water Board) finds that:

BACKGROUND

1. The University of California (hereafter Discharger) submitted a Report of Waste Discharge, dated 30 October 2003, and applied for a permit renewal to discharge waste under the National Pollutant Discharge Elimination System (NPDES) from the Center for Aquatic Biology and Aquaculture (CABA). Additional information regarding the facility and discharge was provided on 8 October 2004, 20 October 2004, 2 February 2005, 23 June 2006 and 12 July 2006.

2. The Discharger owns and operates the CABA facility, which consists of two fish-research facilities, the Aquatic Center facility and the Putah Creek Research facility. The Aquaculture and Fisheries Program at the University of California, Davis, conducts research focused on toxicology, nutrition, stress, physiology, ecology, engineering, endocrinology, infectious diseases, and reproduction. Approximately fifteen different aquatic species may be under study at any one time at the CABA facility.

   The Aquatic Center facility is in Section 19, T8N, R2E, MDB&M and the Putah Creek Research facility is in Section 24, T8N, R1E, MDB&M as shown on Attachment A, a part of this Order. Wastewater from the Aquatic Center is circulated through a pond, Jamison Pond, prior to discharge to the South Fork of Putah Creek, a water of the United States, at latitude 38°, 31', 32" and longitude 121°, 47', 20" (Outfall 001). Wastewater from the Putah Creek Research Facility is circulated through two ponds, Beaver Pond and Curve Pond, prior to discharge to the South Fork of Putah Creek at latitude 38°, 31', 39" and longitude 121°, 48', 18" (Outfall 002).

3. Effluent from the Putah Creek Research Facility may also be diverted to a series of wetland ponds used for research studies. There is no discharge of water from these wetlands to surface waters. The wetlands are considered part of the research process, not a water of the State. The wetlands remain dry when corresponding research is not taking place. The wetlands are managed to prevent vector problems, nuisance, and toxicity to wildlife, and to minimize the occurrence of avian botulism, other infectious diseases, and bioaccumulation in the food chain.

To protect the wildlife that is attracted to the wetlands, limitations and requirements have been included in this Order for the discharge to the ponds and wetlands. The Order requires that toxic pollutants shall not be present in the water column, sediments, or biota in concentrations that produce detrimental responses in human, plant, animal, or aquatic life, and that toxic pollutants shall not bioaccumulate in concentrations that are harmful to human health or aquatic resources.

4. The source water for the CABA facilities includes dedicated groundwater wells and surface water from Lake Berryessa. The groundwater source water is high in nitrogen gas and low in dissolved oxygen. To provide quality water for their fish population, the Discharger removes the nitrogen and increases the oxygen concentration in the source water by routing it through stripping towers and pressurizing it prior to use in the various laboratories.

5. Effluent from the Aquatic Center facility may be reused to serve as irrigation water for adjacent cropland, owned by the Discharger, on an as-needed basis. This Order sets effluent limitations and monitoring and reporting requirements to support the use of effluent for irrigation purposes.

6. Effluent from an aquatic disease laboratory at the Aquatic Center is routed to an isolated evaporation/percolation pond for disposal. As required by the California Department of Fish and Game (DFG), the Discharger chlorinates the effluent for disinfection prior to discharge to the evaporation/percolation pond. This Order prohibits the discharge of wastewater from the isolated evaporation/percolation pond to surface water.

7. The Report of Waste Discharge submitted by the Discharger describes the Aquatic Center discharge (D-001) as follows:

Maximum dry weather flow to Putah Creek:	1.44	million gallons per day (mgd)
Long-term average flow to Putah Creek:	0.74	mgd
Maximum dry weather flow to evaporation pond:	0.12	mgd
Maximum dry weather flow to reuse for irrigation:	0.36	mgd
Average Effluent Temperature:		
Summer	65	ºF
Winter	63	ºF
BOD[1]	2.2	mg/l
Total Suspended Solids	5.48	mg/l
Electrical Conductivity	530	µmhos/cm

[1] 5-day, 20°C biochemical oxygen demand

8. The Report of Waste Discharge submitted by the Discharger describes the Putah Creek Research Facility discharge (D-002) as follows:

Maximum dry weather flow to Putah Creek:	1.44	mgd
Long-term average flow to Putah Creek:	0.62	mgd
Average Effluent Temperature:		
Summer	62	ºF
Winter	60	ºF
BOD[1]	1.03	mg//
Total Suspended Solids	2.50	mg//
Electrical Conductivity	450	μmhos/cm

[1] 5-day, 20°C biochemical oxygen demand

9. A cold-water concentrated aquatic animal production (CAAP) facility is defined in Title 40 of the Code of Federal Regulations (40 CFR 122.24) as a fish hatchery, fish farm, or other facility that contains, grows, or holds cold-water fish species or other cold-water aquatic animals in ponds, raceways, or other similar structures. (Other cold-water aquatic animals includes, but not limited to, the Salmonidae family of fish (e.g. trout and salmon.)) In addition, facilities defined as a CAAP must discharge at least 30 calendar days per year, produce at least 20,000 pounds harvest weight (9,090 kilograms) of aquatic animals per year, and feed at least 5,000 pounds (2,272 kilograms) of food during the calendar month of maximum feeding.

Cold-water, flow-through CAAP facilities are designed to allow the continuous flow of fresh water through tanks and raceways used to produce aquatic animals (typically cold-water fish species). Flows from CAAP facilities ultimately are discharged to waters of the United States and of the State. 40 CFR 122.24 specifies that CAAP facilities are point sources subject to the National Pollutant Discharge Elimination System (NPDES) program. The Regional Water Board is defining the CABA facility as an aquatic research facility and is not designating the facility as a cold-water, flow-through CAAP. Due to its similarity in operation and chemicals used, the Regional Board is applying 40 CFR 122.24 regulations for CAAP facilities to the applicable discharge requirements and prohibitions contained in this Order.

10. The operation of CAAP facilities may introduce a variety of pollutants into receiving waters. The United States Environmental Protection Agency (USEPA) identifies three classes of pollutants: (1) conventional pollutants (biochemical oxygen demand (BOD), total suspended solids (TSS), oil and grease (O&G), fecal coliform, and pH; (2) toxic pollutants (metals such as copper, lead, nickel, and zinc), and (3) non-conventional pollutants (ammonia nitrogen, formalin, and phosphorus). Some of the most significant pollutants discharged from the CAAP facilities are solids from uneaten feed and fish feces that settle to the bottom of the raceways. Both types of solids are primarily composed of organic matter including BOD, organic nitrogen, and organic phosphorus.

Best Management Practices are a required part of this Order. The Discharger must use Best Management Practices in conjunction with complying with effluent limitations to minimize, prevent and/or control the discharge of these pollutants.

11. Fish raised in aquaculture facilities may become vulnerable to disease and parasite infestations. Various aquaculture drugs and chemicals are used, on an as-needed basis, at the facilities to ensure the health and productivity of the confined fish population. These aquaculture drugs and chemicals are used to (1) clean raceways, (2) treat fish for parasites, fungal growths, and bacterial infections, and (3) to anesthetize fish prior to spawning or "tagging" processes.

    The CABA is an academic facility engaged in a variety of research projects. Therefore, operations at the facility have a large amount of variability in test species, habitat, exposures, and other conditions. The type of research conducted, and to be conducted, at the facilities is additionally dependent on current research needs and the Discharger's success in acquiring associated grant funding. As described in the Report of Waste Discharge and letters to the Regional Water Board dated 23 June 2006 and 12 July 2006, chemicals currently in use at the CABA facility include formalin, chlorine, sodium chloride (salt), and oxytetracycline. As a result of these operations and practices, aquacultural drugs and chemicals may be present in the effluent to waters of the United States or waters of the State. Constituents that may be present in the discharge from the CABA facilities based on existing and potential research activities include: selenium, mercury, cadmium, chromium, pyrethoids (esvenvalerate), microcystin, beta napthoflavone, estradiol, chlorpyrophos, florfenicol, chloramine T.

    Additionally, due to the Discharger's concern regarding the environmental impacts associated with the use of the Malachite-Green and Nitrofurazone, the Discharger has agreed to cease use of these aquacultural drugs at the CABA facilities. Therefore, discharge of these chemicals is also prohibited in this Order.

12. Putah Creek and the Delta, which Putah Creek ultimately flows into, are Clean Water Act (CWA) Section 303(d)-listed water bodies due to the bioaccumulative impact of methyl mercury in fish. This Order prohibits the discharge of mercury in amounts greater than the facility's existing discharge into Putah Creek.

    Monitoring conducted by the Discharger in September and November 2004 shows an methyl mercury effluent concentration of 0.032 ng/L and an average receiving water methyl mercury concentration of 0.092 ng/L. The background level of total mercury in Putah Creek, and the concentration of mercury in the facility effluent are unknown due to lack of monitoring information. This Order includes an effluent limitation for total mercury and provision requiring the Discharger to monitor and report priority pollutant concentrations, including total mercury and methyl mercury, as required by the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy or SIP). Monitoring information submitted by the Discharger will be used to establish the existing concentration of

mercury and methyl mercury in the effluent. This Order may be reopened to establish methyl mercury effluent limitations if necessary.

13. In August 2004, for facilities that produced 100,000 pounds or more of aquatic animals per year, USEPA promulgated Effluent Limitation Guidelines and New Source Performance Standards for the CAAP Point Source Category (hereafter "ELG"). The ELG regulations establish national technology-based effluent discharge requirements for flow-through/recirculating systems and net pens, based on Best Practicable Control Technology Currently Available (BPT); Best Control Technology for Conventional Pollutants (BCT); Best Available Technology Economically Achievable (BAT); and New Source Performance Standards (NSPS). For facilities that do not produce 100,000 pounds or more of aquatic animals per year, such as the CABA facilities, technology-based effluent limitations are determined on a case-by-case basis using best professional judgment (BPJ) in accordance with 40 CFR 125.3.

14. The Regional Water Board adopted a *Water Quality Control Plan*, *Fourth Edition, for the Sacramento and San Joaquin River Basins* (hereafter Basin Plan). The Basin Plan designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve water quality objectives for all waters of the Basin. These requirements implement the Basin Plan.

15. USEPA adopted the National Toxic Rule (NTR) on 22 December 1992, amended on 4 May 1995 and 9 November 1999, and the California Toxic Rule (CTR) on 18 May 2000, amended on 13 February 2001. These rules include water quality criteria for priority pollutants and are applicable to this discharge.

16. On 2 March 2000, the State Water Resources Control Board adopted the State Implementation Policy (SIP). The SIP became effective on 28 April 2000 with respect to the priority pollutant criteria promulgated for California by the USEPA through the NTR and to the priority pollutant objectives established by the Regional Water Board in the Basin Plan. The SIP became effective on 18 May 2000 with respect to the priority pollutant criteria promulgated by the USEPA through the CTR. The State Water Board adopted amendments to the SIP on 24 February 2005 that became effective on 24 February 2005.

BENEFICIAL USES OF THE RECEIVING STREAM

17. Table II-1 of the Basin Plan identifies the beneficial uses of Putah Creek downstream of the CABA facility discharges as:

- Municipal and domestic supply,
- Agricultural irrigation,
- Agricultural stock watering,
- Water contact recreation,
- Canoeing and rafting,

- Non-contact water recreation,
- Warm freshwater aquatic habitat,
- Potential cold freshwater aquatic habitat,
- Warm spawning habitat, and
- Wildlife habitat.

18. From 1995 through 1998, students of the University of California, Davis, under the direction of Dr. Peter Moyle, observed juvenile and adult salmon in the South Fork of Putah Creek. Salmon were observed spawning in December 1997 and January 1998. Since that time, the University has continued its research and the beneficial use of cold-water aquatic habitat has been site-specifically confirmed to exist in Putah Creek.

EFFLUENT LIMITATIONS AND REASONABLE POTENTIAL

19. Effluent limitations and toxic and pretreatment effluent standards established pursuant to Sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 304 (Information and Guidelines), and 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act (CWA) and amendments thereto are applicable to the discharge.

20. The federal Clean Water Act (CWA) mandates the implementation of effluent limitations that meet water quality standards established pursuant to state or federal law. This requirement applies to narrative criteria and criteria that specify maximum amounts of specific pollutants. Pursuant to Federal Regulations, 40 CFR Section 122.44(d)(1)(i), NPDES permits must contain limits that control all pollutants that "*are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality*." 40 CFR Section 122.44(d)(1)(vi), further states "[W]*here a state has not established a water quality criterion for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or contributes to an excursion above a narrative criterion within an applicable State water quality standard, the permitting authority must establish effluent limits*."

21. On page IV – 17.00 of the Basin Plan, the implementation policy, "Policy for Application of Water Quality Objectives" specifies that the Regional Water Board "*will, on a case-by-case basis, adopt numerical limitations in orders which will implement the narrative objectives*." This Policy complies with 40 CFR 122.44(d)(1). With respect to narrative objectives, the Regional Water Board must establish effluent limitations using one or more of three specified sources, including EPA's published water quality criteria, a proposed state criterion (*i.e.*, water quality objective), or an explicit state policy interpreting its narrative water quality criteria (*i.e.*, the Regional Water Board's "Policy for Application of Water Quality Objectives")(40 C.F.R. 122.44(d)(1) (vi) (A), (B) or (C)).

22. The Basin Plan contains a narrative objective requiring that: "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental*

physiological responses in human, plant, animal, or aquatic life". The Basin Plan requires the application of the most stringent objective necessary to ensure that surface and ground waters do not contain chemical constituents, toxic substances, radionuclide, or taste and odor producing substances that adversely affect beneficial uses. The Basin Plan states that material and relevant information, including numeric criteria, and recommendations from other agencies and scientific literature will be used in evaluating compliance with the narrative toxicity objective. For waters designated as municipal, the Basin Plan specifies that, at a minimum, waters shall not contain concentrations of constituents that exceed Maximum Contaminant Levels (MCL) of CCR Title 22. The Basin Plan further states that, to protect all beneficial uses, the Regional Water Board may apply limitations more stringent than MCLs. When a reasonable potential exists for exceeding a narrative objective, Federal Regulations mandate numerical effluent limitations and the Basin Plan narrative criteria clearly establish a procedure for translating the narrative objectives into numerical effluent limitations.

23. Federal Regulations require effluent limitations for all pollutants that are or may be discharged at a level that will cause or have the reasonable potential to cause, or contribute to an in-stream excursion above a narrative or numerical water quality standard. Previous Order 99-017 required the Discharger to conduct a study of USEPA priority pollutants and/or National Toxic Rule (NTR) constituents that could potentially affect the receiving waters. This study was not completed and submitted to the Regional Water Board by the due date of 1 September 2002. The Discharger was also required, by a California Water Code (CWC) Section 13267 Order, issued by the Executive Officer on 10 May 2002, to fully characterize the wastewater discharge for conformance with the California Toxic Rule (CTR), NTR and Basin Plan water quality standards and objectives and to the report this information to the Regional Water Board. On May 7, 2003, the Discharger submitted a partial set of monitoring data, but failed to submit all the data required by previous R5-Order 99-017 and the CWC Section 13267 Order. The Discharger did not comply with requirements contained in Order No. 99-017 or the CWC Section 13267 Order. This Order contains provisions that:

    a. Require the Discharger to conduct and submit the results of a constituent study to provide information as to whether the levels of CTR / NTR constituents (and all other constituents specially listed in the Attachment I of the CWC Section 13267 letter and Attachment B of this Order) in the discharge cause, have the reasonable potential to cause or contribute to an in-stream excursion above a water quality standard, including Basin Plan numeric and narrative objectives and water quality standards;

    b. If the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a water quality standard, require the Discharger to submit sufficient information to calculate effluent limitations for those constituents; and

    c. Allow the Regional Water Board to reopen this Order and include effluent limitations for those constituents.

24. After review of Discharger information submitted in the permit application, in corresponding studies, and in monitoring reports, the Regional Water Board finds that the discharge from the CABA facility does have a reasonable potential to cause or contribute to an in-stream excursion above a water quality standard for chlorine, formalin (formaldehyde), selenium, mercury, cadmium, chromium, and electrical conductivity. Effluent limitations for these parameters are included in this Order, and other constituents that the CABA facility may potentially be using in the future.

25. **Chlorine**: Chlorine and chlorine-containing solutions are occasionally used by the Discharger to clean and sanitize tanks and other components of the facility. Chlorine can cause toxicity to aquatic organisms when discharged to surface waters. The use of chlorine as a disinfectant presents a reasonable potential of a discharge in toxic concentrations.

    The previous Order contained a daily maximum limitation for residual chlorine of 0.02 mg/l. USEPA recommends, in their Ambient Water Quality Criteria for the protection of fresh water aquatic life, a maximum 1-hour average and a 4-day average chlorine concentrations of 0.019 mg/*l* and 0.011 mg/*l*, respectively. To be protective of aquatic habitat, a maximum daily effluent limitation based on a maximum 1-hour average of 0.019 mg/L, and a 4-day average effluent limitations of 0.011 mg/L of chlorine, based on the Basin Plan narrative toxicity objective and Ambient Water Quality Criteria, have been included in this Order. The Discharger is expected to be able to comply with the new limitations upon adoption of this Order.

26. **Formalin**: In information provided by Discharger on 8 October 2004, 20 October 2004, and 23 June 2006, formalin is administered in fish tanks by dissolving the mixture at an application rate of 150 ppm (or 150 mg/L). For each treatment, the application is once per day for five consecutive days. There are approximately 15 treatments per year.

    Formalin is approved through the US Food and Drug Administration's New Animal Drug Application (NADA) program for use in controlling external protozoa and monogenetic trematodes on fish, and for controlling fungi of the family *Saprolegniacae* in food-producing aquatic species (including trout and salmon). For control of other fungi, formalin may be used under an Investigational New Animal Drug (INAD) exemption. Information submitted with the Report of Waste Discharge indicates a typical usage rate and a historical minimum flow of 300 gallons per minute. Therefore, the estimated maximum calculated concentration of formalin in the discharge from Outfall 001, assuming no removal of formaldehyde, would be 90 µg/L formalin (33.4 µg/L as formaldehyde).

    As a Discharger at other fishery locations, the California Department of Fish and Game (DFG) Pesticide Unit conducted biotoxicity studies to determine the aquatic toxicity of formalin using *Pimephales promelas* and *Ceriodaphnia dubia* in accordance with the analytical methods specified in EPA600/4-91-002, *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*. These "short-term chronic tests" measure effects such as reduced growth of the

organism, reduced reproduction rates, and lethality. Results were reported as a No Observed Effect Concentration (NOEC) and a Lowest Observed Effect Concentration (LOEC).

The DFG Pesticide Unit also conducted acute toxicity tests using *Ceriodaphnia dubia* in accordance with methods specified in EPA600/4-90/027, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms.* Acute toxicity test results typically are reported as the No Observed Adverse Effect Level (NOAEL), Lowest Observed Adverse Effect Level (LOAEL), and Lethal Concentration to fifty percent of the population (LC_{50}). Results of the DFG acute and chronic aquatic life toxicity testings and the Basin Plan narrative toxicity objective were considered in determining if water quality-based effluent limitations for formalin as formaldehyde are necessary.

Results of 7-day chronic toxicity tests indicated *Ceriodaphnia dubia* was the most sensitive species, with a 7-day NOEC value of 1.3 mg/l formaldehyde for survival and <1.3 mg/L for reproduction (the Regional Water Board used a NOEC of 1.3 mg/L). Acute toxicity tests conducted using *Ceriodaphnia dubia* showed a 96-hour NOAEL of 1.3 mg/l formaldehyde. Additional acute toxicity tests with *Ceriodaphnia dubia* were conducted using only an 8-hour exposure, resulting in a 96-hour NOAEL concentration of 6.7 mg/L formaldehyde. The USEPA Integrated Risk Information System (IRIS) reference dose, as a drinking water level, is 1.4 mg/L and the USEPA Drinking Water Health Advisory level is 1.0 mg/L. The taste and odor threshold for formaldehyde is 0.6 mg/l.

Based on the results of the toxicity tests and estimates of potential discharges of formaldehyde from the facility, formaldehyde may be discharged at levels that cause, or have the reasonable potential to cause, or contribute to an excursion of the narrative water quality objective for toxicity in the Basin Plan. Accordingly, this Order includes water quality-based effluent limitations for formaldehyde based on Basin Plan narrative toxicity objectives. The taste and odor threshold for formaldehyde has been established as a 30-day average effluent limitation based on the Basin Plan's chemical constituents objective.

27. **Oxytetracycline***:* The discharge of uneaten fish food contains some of the most significant pollutants discharged from aquaculture facilities. In a letter dated 23 June 2006, the Discharger states that the antibiotic oxytetracycline is administered in feed formulations and dissolved in tanks to control acute disease outbreaks. However, the Regional Water Board has determined that oxytetracycline can be safely discharged when used in feed formulations. Oxytetracycline, used as a food additive in a manner consistent with associated BMPs, is released in minimal amounts in the facility effluent. Therefore, oxytetracycline, when used in feed formulations, is not likely to be discharged from the CABA facility at levels that would cause, have the reasonable potential to cause, or contribute to an excursion of Basin Plan narrative water quality objectives for toxicity. Effluent limitations for total suspended solids contained in this Order limit the amount of uneated food to be released in the facility effluent.

Oxytetracycline is dissolved in tanks at an application rate of 20 mg/L. The typical usage rate and a historical minimum flow of 300 gallons per minute provides an estimated maximum calculated concentration of oxytetracycline in the discharge from Outfall 001 of 0.20 mg/L. The Regional Water Board considered the results of acute and chronic aquatic life toxicity testing conducted by the DFG Pesticide Unit for oxytetracycline used in an immersion bath treatment. Results of acute toxicity tests using *C. dubia* showed a 96-hour NOAEL of 40.4 mg/L. Results of chronic toxicity tests using *C. dubia* showed a 7-day NOEC for reproduction of 48 mg/L. The estimated maximum discharge concentration of 0.2 mg/L of oxytetracycline from the immersion treatments and the estimated maximum discharge concentration of 2.0 mg/L from the food treatment are both less than the lowest NOEC and NOAEL.

The DFG toxicity testing was based on immersion that introduces the antibiotic directly into the water column. The maximum concentration of oxytetracycline estimated in the Discharger's effluent from food formulation treatments is based on the conservative assumption that all of the Oxytetracycline would be discharged to the receiving waters. Accordingly, this Order does not include water quality-based effluent limitations for this substance; however, it does require reporting of its use as specified in the attached Monitoring and Reporting Program. When additional information becomes available regarding the use or toxicity of any of these substances, the Regional Water Board will re-evaluate whether their corresponding discharge may cause, have the reasonable potential to cause, or contribute to an excursion of Basin Plan objectives for toxicity. If necessary, this Order will be re-opened to include numeric effluent limitations.

28. **Salinity (Sodium Chloride)*:*** The Discharger reports that sodium chloride (salt) is used at the CABA facility at a rate of up to 35,000 mg/L. Sodium chloride is used as a stress reducer, an osmo-regulatory enhancer, and as a treatment for fish lice. The FDA considers sodium chloride an unapproved new animal drug of low regulatory priority (LRP drug) for use in aquaculture. Consequently, the FDA is unlikely to take regulatory action if an appropriate grade is used, good management practices are followed, and local environmental requirements are met. The Discharger reports that the treatment level for fish lice is 3.5% (30,000mg/L) in a static bath. A maximum estimated effluent concentration of sodium chloride is estimated to be approximately 30 mg/L sodium chloride following treatment.

Salinity (Electrical Conductivity): In water, sodium chloride dissociates into sodium and chloride ions that contribute to total dissolved solids (TDS) concentrations. TDS are solids that can be dissolved in water. These solids may include carbonate, bicarbonate, chloride, sulfate, phosphate, nitrate, calcium magnesium, sodium, organic ions, and other ions. The salinity of wastewater is determined by measuring electrical conductivity (EC) to measure the ability of a water molecule to carry an electrical current, a property that is proportional to the concentration of ions in solution. When salts dissolve in water, ions are formed and the solution will conduct electricity. EC increases with salinity because of the increasing presence of ions (usually sodium and chloride ions).

There are no numeric water quality objectives for EC, TDS, or chloride in the NTR, CTR, or Basin Plan for Putah Creek. Domestic and municipal water supply and agricultural irrigation are beneficial uses of the receiving water. *Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1* (R.S. Ayers and D.W. Westcot, Rome, 1985), recommends that the EC level in waters used for agricultural irrigation not exceed 700 μmhos/cm (Agricultural Water Quality Goal) because it will reduce crop yield for sensitive plants. The Agricultural Water Quality Goal for TDS is 450 mg/L and the Secondary MCL for EC is 900 μmhos/cm. USEPA's recommended ambient water quality criteria for chloride for the protection of freshwater aquatic life, are 860 mg/l as a one-hour average and 230 mg/l as a four-day average. The Agricultural Water Quality Goal for chloride is 106 mg/L.

Because dissolved ions in water increase EC, the measures of TDS, chloride ions, and EC are related. Therefore, effectively controlling the level of EC in an effluent will also result in the presence of less TDS and chloride in the effluent.

Information submitted by the Discharger indicates that water for the CABA facility is supplied by pumped groundwater and Lake Berryessa surface water. Groundwater EC levels range from 620 umhos/cm to 873 umhos/cm. Lake Berryessa supply water EC levels range from 240 umhos/cm to 475 umhos/cm. Receiving water monitoring information submitted by the Discharger indicates that the EC level in Putah Creek upstream and downstream of the two discharge locations range from 238 umhos/cm to 569 umhos/cm.

The Discharger's effluent EC data for September 2003 through July 2006 indicates that the EC in the two discharges range from 542 umhos/cm to 795 umhos/cm for the Aquatic Center and from 450 umhos/cm to 800 umhos/cm for the Putah Creek Research Facility. Therefore, EC effluent limitations have been included in this Order to protect the beneficial uses of the receiving water. To be consistent with the Regional Water Board's current strategy of not allowing an increase of salinity discharges into surface waters that drain into the Delta, an average monthly effluent limitation (AMEL) of 800 μmhos/cm for the Aquatic Center and the Putah Creek Research Center have been established. These EC effluent limitations: (1) allow the Discharger to continue discharging their current amount of salinity until results of the Salinity Minimization Study, as required in this Order, are implemented, and (2) prevent the Discharger from increasing its current salinity loading to the receiving water. Data submitted by the Discharger demonstrates that the Discharger shall be able to comply with the EC limitations and consideration of a compliance schedule for EC is not necessary.

The Regional Water Board may reopen this Order to revise the EC effluent limitation if further information becomes available that concludes the monthly average EC limitation should be less than 800 umhos/cm to protect the beneficial uses of the receiving waters.

Additionally, due to the direct relationship between EC, TDS, and chloride, this Order does not include effluent limitations for TDS or chloride. However, to establish the specific relationship between EC and chloride in the effluent, EC and chloride monitoring are required when salt is being applied at the facility. Because the Discharger has control over the use of salt, and the current discharge has a salinity concentration that meets the 800 μmhos/cm proposed limitation, the Discharger is expected to be able to comply with final limitations for EC upon adoption of this Order.

29. **Cadmium:** In a 12 July 2006 letter to the Regional Water Board, the Discharger states that cadmium may potentially be used in future research activities. The CTR criterion for cadmium for aquatic life, after adjusted for hardness, is 2.65 μg/L, and the California primary MCL for cadmium is 5 μg/L. Effluent limitations have been established for cadmium based on the CTR criterion. Because the Discharger has control over the use of cadmium the Discharger is expected to be able to comply with final limitations upon adoption of this Order.

30. **Chromium:** In a 12 July 2006 letter to the Regional Water Board, the Discharger states that chromium may potentially be used in future research activities. The California primary MCL for total chromium is 50 μg/L. Effluent Limitations have been established for total chromium based on the California primary MCL criteria for human health. Because the Discharger has control over the use of chromium the Discharger is expected to be able to comply with final limitations upon adoption of this Order.

31. **Mercury:** In a 12 July 2006 letter to the Regional Water Board, the Discharger states that mercury compounds may potentially be used in research activities. The CTR human health criterion for total mercury is 0.05 μg/L. Effluent Limitations have been established for total mercury based on the CTR criterion. Because the Discharger has control over the use of mercury, and mercury compounds, the Discharger is expected to be able to comply with final limitations upon adoption of this Order.

32. **Selenium:** In a 12 July 2006 letter to the Regional Water Board, the Discharger states that selenium may potentially be used in research activities. The CTR aquatic life criterion for selenium is 5 μg/L. Effluent Limitations have been established for selenium based on the CTR criterion. Because the Discharger has control over the use of selenium the Discharger is expected to be able to comply with final limitations upon adoption of this Order.

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

33. **Biochemical Oxygen Demand (5-day):** Biochemical oxygen demand (BOD) is a measure of the amount of oxygen used in the biochemical oxidation of organic matter. Organic matter is discharged from aquaculture facilities primarily from feces and uneaten feed. Elevated levels of organic compounds contribute to eutrophication and oxygen depletion. Limitations for BOD (5-day) found in the previous Order are

technically feasible and indicative of performance for fishery facilities similar to the CABA facility. The USEPA has collected data from aquaculture facilities throughout the nation in support of the Effluent Limitation Guidelines and New Source Performance Standards for the Concentrated Aquatic Animal Production Point Source Category, 40 CFR Part 451. Though not directly applicable to the Discharger, data contained in the Technical Development Document (EPA-821-R-04-012) demonstrate that the limitations for BOD (5-day) in the previous Order are protective of water quality and shall be carried over for this permit.

34. **Total Suspended Solids:** Solids are the largest pollutant loadings from aquaculture facilities. Proper management of flow through systems captures most of the generated solids. As stated in the Technical Development Document (EPA-821-R-04-012), "Suspended solids can degrade aquatic ecosystems by increasing turbidity and reducing the depth to which sunlight can penetrate, which decreases photosynthetic activity and oxygen production by plants and phytoplankton. Increased suspended solids can also increase the temperature of surface water since the particles absorb heat from the sunlight. Higher temperatures can result in lower DO levels and impact aquatic habitat.

Suspended solids can abrade and damage fish gills, increasing the risk of infection and disease. They can also cause a shift toward more sediment-tolerant species, reduce filtering efficiency for zooplankton in lakes and estuaries, carry nutrients and metals, adversely affect aquatic insects that are at the base of the food chain (Schueler and Holland, 2000), and may harm fish development (Colt and Tomasso, 2001)."

Limitations for total suspended solids (TSS) found in the previous Order are technically feasible and indicative of performance for fishery facilities similar to the CABA facility. The USEPA has collected data from aquaculture facilities throughout the nation in support of the Effluent Limitation Guidelines and New Source Performance Standards for the Concentrated Aquatic Animal Production Point Source Category, 40 CFR Part 451. Though not directly applicable to the Discharger, data contained in the Technical Development Document (EPA-821-R-04-012) demonstrate that the limitations for TSS in the previous Order are protective of water quality and shall be carried over for this permit.

35. **Settleable Solids:** *S*ettleable solids are part of the solids pollutant loadings from aquaculture facilities. Proper management of flow through systems captures most of the generated solids. As stated in the Technical Development Document (EPA-821-R-04-012), "As sediment settles, it can smother fish eggs and bottom-dwelling organisms, interrupt the reproduction of aquatic species, destroy habitat for benthic organisms (USEPA, 2000) and fish spawning areas. Deposited sediments also increase the sediment oxygen demand, which can deplete DO in lakes or streams (Schueler and Holland, 2000). The previous Order contained a daily maximum limitation for settleable solids of 0.1 ml/l. In order to ensure the Discharger maintains proper management of the facility and protects the receiving water, this limitation is being carried over to this permit.

36. **pH:** The Basin Plan includes numeric water quality objectives that the pH "…*not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses*." The Receiving Water is designated as having both COLD and WARM beneficial uses. Effluent Limitations for pH are included in this Order and are based on the Basin Plan objectives for pH.

37. The provisions and requirements in this Order are consistent with the antidegradation provisions of 40 CFR 131.12 and State Water Resources Control Board Resolution No. 68-16. This Order maintains the effluent limitations in the previous Order No. R5-99-017 and sets additional water quality based effluent limitations and requires the continued implementation of Best Management Practice. Compliance with these requirements will result in the use of best practicable treatment or control of the discharge.

38. The Clean Water Act, Section 303(a-c), requires States to adopt numeric criteria where they are necessary to protect designated uses. The Regional Water Board adopted numeric criteria in the Basin Plan. The Basin Plan is a regulatory reference for meeting the state and federal requirements for water quality control (40 CFR 131.20). State Board Resolution No. 68-16, the Antidegradation Policy, does not allow changes in water quality less than that prescribed in Water Quality Control Plans (Basin Plans). The Basin Plan states that; "The numerical and narrative water quality objectives define the least stringent standards that the Regional Board will apply to regional waters in order to protect the beneficial uses." This Order contains Receiving Water Limitations based on the Basin Plan numerical and narrative water quality objectives for Biostimulatory Substances, Chemical Constituents, Color, Dissolved Oxygen, Floating Material, Oil and Grease, pH, Pesticides, Radioactivity, Salinity, Sediment, Settleable Material, Suspended Material, Tastes and Odors, Temperature, Toxicity and Turbidity.

GROUNDWATER

39. The Basin Plan designates the beneficial uses of groundwater in the discharge area as municipal and domestic supply, agricultural supply, industrial service supply, and industrial process supply.

40. The Discharger discharges wastes to land. This Order prohibits the discharge from causing the underlying groundwater to be degraded.

41. Groundwater monitoring must be conducted to determine if discharges to ponds have caused increases in wastewater constituent concentrations in groundwater to be degraded or exceed WQO(s) or otherwise not comply with Regional Water Board plans and policies, including State Water Resources Control Board Resolution No. 68-16. This Order requires the Discharger to develop a Groundwater Monitoring Well Installation Plan and begin groundwater monitoring to determine compliance with the Groundwater Limitations. The Groundwater Monitoring Well Installation Plan must

propose to assess the potential impact effluent constituents have on the surrounding groundwater body. Specifically, the Plan must include assessment of the impact the chlorinated Aquatic Center Disease Lab effluent discharged to the isolated evaporation/percolation may have to the chloride concentration in the groundwater. A regular schedule of required groundwater monitoring is included in the MRP. The Regional Water Board may reopen this Order to include additional groundwater limitations if data indicates that the discharge to ponds degrade, or have the potential to degrade groundwater or caused groundwater constituents to exceed water quality objectives.

BEST MANAGEMENT PRACTICES

42. In the 1990 Pollution Prevention Act (PPA) the United States Congress declared a "national policy of the United States that pollution should be prevented or reduced at the source whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner." 40 CFR Section 122.44(k)(4) states that BMPs are authorized when "The practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA." The 1990 PPA policy and 40 CFR Section 122.44(k) form the basis for the requirement that the Discharger develop and implement a best management practices (BMP) operating plan to control, reduce and prevent the discharge of pollutants from its operations and activities to Putah Creek. The BMPs required in this Order work in conjunction with the effluent limitations to reduce the quantity of pollutants discharged to the receiving water.

43. BMPs are practices designed to minimize the amount of pollutants that must be treated or disposed of. The most important and cost-effective method of controlling the pollutants generated and discharged by an aquaculture facility is the efficient operation of the facility (Phillips et al. 1993, Kendra 1991, Stechey and Trudell 1990, Wester 1989). In developing its BMP operating plan, the Discharger will analyze all processes and activities at the facility to determine the potential for a release of pollutants due to that activity and ways to minimize that potential.

44. For the aquaculture industry, typical BMPs include the use of demand feeders, the use of floating feed, and the use of re-aeration water falls when possible. The Order requires that a Discharger develop a plan and implement BMPs **within 120 days after the effective date of this Order**. EPA has developed a general handbook to assist aquaculture facilities in identifying and utilizing BMPs and in developing and implementing materials accounting and BMP Plans (EPA 1993). The BMP operating plan must be reviewed and amended, as necessary, whenever there is a change in the facility or a change in the operation of the facility that materially increases the potential for an increased discharge of pollutants, in response to instances of non-compliance with this Order or when directed by the Regional Board.

GENERAL

45. Monitoring and reporting is required by this Order for the purposes of assessing compliance with permit limitations and water quality objectives and gathering information to evaluate the need for additional limitations.

46. California Water Code (CWC) Section 13267 states, in part, "*(a) A regional board, in establishing…waste discharge requirements… may investigate the quality of any waters of the state within its region"* and *"(b) (1) In conducting an investigation…, the regional board may require that any person who… discharges… waste…that could affect the quality of waters within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports.*" The attached Monitoring and Reporting Program is issued pursuant to CWC Section 13267 and is necessary to assure compliance with these waste discharge requirements. The Discharger is responsible for the discharges of waste at the facility subject to this Order.

47. The discharge is currently regulated by Waste Discharge Requirements Order No. R5-99-017, adopted by the Regional Water Board on 30 April 1999.

48. The action to adopt an NPDES permit is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000, et seq.), requiring preparation of an environmental impact report or negative declaration in accordance with Section 13389 of the California Water Code.

49. USEPA and the Regional Water Board have classified this discharge as a minor discharge.

50. The Regional Water Board has considered the information in the attached Fact Sheet in developing the Findings of this Order. The Fact Sheet, Monitoring and Reporting Program No. R5-2006-XXXX, Attachment A, and the Standard Provisions and Reporting Requirements for Waste Discharge Requirements (NPDES) are a part of this Order.

51. The Regional Water Board has notified the Discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for this discharge and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.

52. The Regional Water Board, in a public meeting, heard and considered all comments pertaining to the discharge.

53. This Order shall serve as an NPDES permit pursuant to Section 402 of the CWA, and amendments thereto, and shall take effect upon the date of hearing, provided USEPA has no objections.

IT IS HEREBY ORDERED that Order No. R5-99-017 is rescinded and the University of California, its agents, successors and assigns, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, and the provisions of the Clean Water Act and regulations and guidelines adopted thereunder, shall comply with the following:

A. Discharge Prohibitions:

1. The discharge of wastewater at a location or in a manner different from that described in the Findings is prohibited.

2. The discharge of wastewater from the wetland and ecosystem ponds to surface waters is prohibited.

3. The discharge of mercury in an amount greater than the existing discharge is prohibited.

4. The discharge of Malachite-Green and Nitrofurazone is prohibited.

5. The discharge of aquacultural drugs and/or chemicals, other than Malachite-Green and Nitrofurazon, in which the Regional Water Board has not authorized its use and determined whether waste discharge requirements are required, is prohibited.

6. The by-pass or overflow of wastes to surface waters is prohibited, except as allowed by Standard Provision A.13. [See attached “Standard Provisions and Reporting Requirements for Waste Discharge Requirements (NPDES)”].

7. Neither the discharge nor its treatment shall create a nuisance as defined in Section 13050 of the California Water Code.

8. The discharge of any wastewater or any alcohol, formaldehyde, phenolic resin, or melamine resin storage tank spill catchment basin water or residue to any ground surface, surfaces waters, or surface water drainage courses is prohibited.

9. The discharge of any wastes to the ground surface, surface waters or surface water drainage courses is prohibited except as specified in this Order.

10. The discharge of waste classified as “hazardous” as defined in Sections 2521(a) and 2522(a) of 23 CCR Division 3, Chapter 15 is prohibited.

11. The discharge of wastewater from the Aquatic Center evaporation and percolation pond to surface waters is prohibited.

B. Effluent Limitations:

1. Effluent discharged from the Aquatic Center facility to the South Fork of Putah Creek (D-001) and to adjacent agricultural land (D-001A) shall not exceed the following limits:

Constituents	Units	Monthly Average	Weekly Average	Daily Maximum	Instantaneous Maximum	Four-Day Average	One-Hour Average
Biochemical Oxygen Demand (BOD)[1]	mg/L	10	15	25	--	--	--
	lbs/day[2]	62	93	154	--	--	--
Total Suspended Solids (TSS)	mg/L	25	40	65	--	--	--
	lbs/day[2]	154	247	401	--	--	--
Formaldehyde	mg/L	0.6	--	--	1.3	--	--
	lbs/day[2]	3.7	--	--	8.0	--	--
Electrical Conductivity @ 25° C	µmhos/cm	800	--	--	--	--	--
Cadmium, Total	µg/L	2.2	--	4.3	--	--	--
	lbs/day[2]	0.01	--	0.03	--	--	--
Chromium, Total	µg/L	50	--	100.5	--	--	--
	lbs/day[2]	0.3	--	0.6	--	--	--
Mercury, Total	µg/L	0.05	--	0.10	--	--	--
	lbs/day[2]	0.00030	--	0.00060	--	--	--
Selenium	µg/L	4.1	--	8.2	--	--	--
	lbs/day[2]	0.03	--	0.05	--	--	--
Settleable Solids	ml/L	--	--	0.1	--	--	--
Total Residual Chlorine	ug/L		--	18.04	--	11	
	lbs/day[2]	--	--	0.11	--	0.066	

[1] 5-day, 20° C biochemical oxygen demand (BOD)
[2] Based upon a long-term average discharge of 0.73 million gallons per day (mgd).

a. The discharge shall not have a pH less than 6.5 nor greater than 8.5.
b. The average dry weather discharge flow shall not exceed 1.44 mgd from the hatchery.
c. Survival of aquatic organism in 96-hour bioassays of undiluted waste shall be no less than:

Minimum for any one bioassay - 70%
Median for any three or more consecutive bioassays - - - - 90%

2. Effluent discharged from the Putah Creek Research Facility to the South Fork of Putah Creek (D-002) shall not exceed the following limits:

Constituents	Units	Monthly Average	Weekly Average	Daily Maximum	Instantaneous Maximum	Four-Day Average	One-Hour Average
Biochemical Oxygen Demand (BOD)[1]	mg/L	10	15	25	--	--	--
	lbs/day[2]	52	78	129	--	--	--
Total Suspended Solids (TSS)	mg/L	25	40	65	--	--	--
	lbs/day[2]	129	207	336	--	--	--
Formaldehyde	mg/L	0.6	--	--	1.3	--	--
	lbs/day[2]	3.1	--	--	6.7	--	--
Electrical Conductivity @ 25° C	µmhos/cm	800	--	--	--	--	--
Cadmium, Total	µg/L	2.2	--	4.3	--	--	--
	lbs/day[2]	0.01	--	0.02	--	--	--
Chromium, Total	µg/L	50	--	100.5	--	--	--
	lbs/day[2]	0.26	--	0.52	--	--	--
Selenium	µg/L	4.1	--	8.2	--	--	--
	lbs/day[2]	0.02	--	0.04	--	--	--
Settleable Solids	ml/L	--	--	0.1	--	--	--
Total Residual Chlorine	ug/L		--	18.04	--	11	
	lbs/day[2]	--	--	0.093	--	0.056	

[1] 5-day, 20° C biochemical oxygen demand (BOD)
[2] Based upon a long-term average discharge of 0.62 mgd.

a. The discharge shall not have a pH less than 6.5 nor greater than 8.5.

b. The average dry weather discharge flow shall not exceed 1.44 mgd from the hatchery.

c. Survival of aquatic organism in 96-hour bioassays of undiluted waste shall be no less than:

Minimum for any one bioassay - 70%
Median for any three or more consecutive bioassays - - - - 90%

C. Discharge Specifications / Pond Disposal Limitations

1. Aquatic Center facility pond (Jamison Pond) and Putah Creek Research Facility ponds and wetlands:

   a. No waste constituent shall be released or discharged, or placed where it will be released or discharged, in a concentration or in a mass that causes violation of groundwater limitations.

   b. Objectionable odors originating at this facility shall not be perceivable beyond the limits of the disposal areas or property owned by the Discharger.

   c. The dissolved oxygen concentration, in the upper one-foot of the pond water, shall not be below 1.0 mg/l.

   d. The ponds shall not have a pH less than 6.5 or greater than 9.0.

   e. Ponds shall be managed to prevent breeding of mosquitoes. In particular,

      i. An erosion control program should assure that small coves and irregularities are not created around the perimeter of the water surface;

      ii. Weeds shall be minimized; and

      iii. Dead algae, vegetation, and debris shall not accumulate on the water surface.

   f. Ponds shall have sufficient capacity to accommodate allowable flow and design seasonal precipitation.

   g. Freeboard shall always be greater than one foot (measured vertically to the lowest point of overflow) to prevent overflows.

2. All tail waters from the Putah Creek Research Facility wetlands shall be returned to the Putah Creek Research Facility for treatment and discharge.

3. Aquatic Center Evaporation/Percolation Pond:

   a. No waste constituent shall be released or discharged, or placed where it will be released or discharged, in a concentration or in a mass that causes violation of groundwater limitations.

   b. There shall be no discharge of wastewater to surface water from this pond.

c. Objectionable odors originating at this facility shall not be perceivable beyond the limits of the disposal areas or property owned by the Discharger.

d. The dissolved oxygen concentration, in the upper one-foot of the pond water, shall not be below 1.0 mg/l, as a means of discerning compliance with Pond Disposal Limitation No. 1.

e. The ponds shall not have a pH less than 6.5 or greater than 9.0.

f. Ponds shall be managed to prevent breeding of mosquitoes. In particular,

i. An erosion control program should assure that small coves and irregularities are not created around the perimeter of the water surface;

ii. Weeds shall be minimized; and

iii. Dead algae, vegetation, and debris shall not accumulate on the water surface.

g. Ponds shall have sufficient capacity to accommodate allowable flow and design seasonal precipitation.

h. Freeboard shall always be greater than one foot (measured vertically to the lowest point of overflow) to prevent overflows.

D. Solids Disposal:

1. Collected residue or other solids removed from liquid wastes or containment areas shall be disposed of in a manner approved by the Executive Officer, and consistent with *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste,* as set forth in Title 27, CCR, Division 2, Subdivision 1, Section 20005, et seq.

2. Any proposed change in disposal practices from a previously approved practice shall be reported to the Executive Officer and USEPA Regional Administrator at least **90 days** in advance of the change.

E. Best Management Practices (BMP) Plan

1. Within **120 days after adoption of this Order**, the Discharger shall develop and implement a Best Management Practices Plan to prevent or minimize the generation and discharge of wastes and pollutants to the waters of the United States and waters of the State. The Discharger shall develop and implement a BMP plan consistent with the following objectives:

   a. Solids Management

      i. Conduct fish feeding in a manner that minimizes the discharge of unconsumed food to surface waters.

      ii. Clean tanks at frequencies that minimize the disturbance and subsequent discharge of accumulated solids during routine activities.

      iii. Report the final disposition of all other solids and liquids, including aquaculture drugs and chemicals, not discharged to surface waters in the effluent.

   b. Operations and Maintenance

      i. Maintain in-system technologies to prevent the overflow of any floating matter or bypassing treatment technologies.

      ii. Ensure storage and containment of drugs, chemicals, fuel, waste oil, or other materials to prevent spillage or release into the aquatic animal production facility, waters of the United States, or waters of the State.

      iii. Collect, store, and dispose of fish mortalities and other solids in an environmentally safe manner and in manner so as to minimize discharge to waters of the United States or waters of the State.

      iv. Prevent fish from being released within the FDA-required withdrawal time of any drug or chemical with which they have been treated.

   c. Salinity Minimization Study

      i. Identify and evaluate feasibility of existing and potential water supply alternatives.

      ii. Evaluate salinity concentrations of feasible water supply sources.

      iii. Identify potential reduction of salinity in discharge associated with use of identified water supply alternatives.

iv. Implement use of feasible water supply(ies) and implement best management practices that feasibly minimize salinity in discharge to receiving water.

2. The Discharger shall ensure that its operations staff implement the BMP Plan and are trained in the specific procedures it requires.

3. The Discharger shall review the BMP operating plan for adequacy if effluent violations or noncompliance occurs and revise as necessary.

4. The Discharger shall review and amend, as necessary, the BMP Plan whenever there is a change in the facility or a change in the operation of the facility that materially increases the potential for an increased discharge of pollutants, in response to instances of non-compliance with this Order or when directed by the Regional Board.

F. Receiving Water Limitations:

Receiving Water Limitations are based upon water quality objectives contained in the Basin Plan. As such, they are a required part of this permit. The discharge shall not cause the following in the receiving water:

1. *Bacteria:* The fecal coliform concentration shall not exceed a geometric mean of 200/100ml based on a minimum of not less than five samples for any 30-day period. More than ten percent of the total number of samples taken during any 30-day period shall not exceed 400/100 ml.

2. *Dissolved Oxygen:* Concentrations of dissolved oxygen to fall below 7.0 mg/L. The monthly median of the mean daily dissolved oxygen concentration shall not fall below 85 percent of saturation in the main water mass, and the 95th percentile concentration shall not fall below 75 percent of saturation.

3. *Oil and Grease:* Oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the water surface or on objects in the water, or otherwise adversely affect beneficial uses.

4. *Color:* Discoloration that causes nuisance or adversely affects beneficial uses.

5. *pH:* The ambient pH to be depressed below 6.5, nor raised above 8.5, nor changes in normal ambient pH levels to be exceeded by more than 0.5 units.

6. *Temperature:* The natural receiving water temperature to increase more than 5°F.

7. *Settleable Matter:* Substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.

8. *Radioactivity:* Radionuclides to be present in concentrations that are harmful to human, plant, animal or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal or aquatic life.

   Concentrations of radionuclides in excess of the maximum contaminant levels (MCLs) specified in Table 4 (MCL Radioactivity) of Section 64443 of Title 22 of the California Code of Regulations.

9. *Toxicity:* Toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. This applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances.

10. *Biostimulatory Substances:* Biostimulatory substances that promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses.

11. *Floating Material:* Floating material in amounts that cause nuisance or adversely affect beneficial uses.

12. *Sediment*: Suspended sediment load and suspended sediment discharge rate alterations to cause nuisance or adversely affect beneficial uses.

13. *Suspended Sediment*: Suspended sediment concentrations that cause nuisance or adversely affect beneficial uses.

14. *Taste and Order:* Taste or odor-producing substances to impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin or to cause nuisance or adversely affect beneficial uses.

15. *Chemical constituents*: Concentrations of chemical constituents in excess of the Maximum Contaminant Levels set forth in California Code of Regulations, Title 22:

16. *Turbidity:* Changes in turbidity that cause nuisance or adversely affect beneficial uses. Turbidity attributable to controllable water quality factors to exceed the following:

    - More than 1 Nephelometric Turbidity Units (NTUs) where natural turbidity is between 0 and 5 NTUs.
    - More than 20 percent where natural turbidity is between 5 and 50 NTUs.
    - More than 10 NTUs where natural turbidity is between 50 and 100 NTUs.
    - More than 10 percent where natural turbidity is greater than 100 NTUs.

17. *Pesticides*[1]*:*

- Pesticides in individual or combined concentrations that adversely affect beneficial uses.

- Pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial uses.

- Total identifiable persistent chlorinated hydrocarbon pesticides in concentrations detectable within the accuracy of analytical methods approved by the Environmental Protection Agency or the Executive Officer.

- Concentrations exceeding those allowable by applicable antidegradation policies (see State Water Resources Control Board Resolution No. 68-16 and 40 CFR Section 131.12.)

- Concentrations exceeding the lowest levels technically and economically achievable.

- Concentrations exceeding the Maximum Contaminant Levels set forth in California Code of Regulations, Title 22, Division 4, Chapter 15.

18. Aquatic communities and populations, including vertebrate, invertebrate, and plant species, to be degraded.

G. Groundwater Limitations:

The discharge shall not cause the underlying groundwater to be degraded.

H. Wetland Limitations:

1. Toxic pollutants shall not be present in the water column, sediments, or biota in concentrations that produce detrimental response in human, plant, animal or aquatic life; or that bioaccumulate in concentration that are harmful to human health or aquatic resources. The discharge into the wetlands shall not cause aquatic communities and populations, including vertebrate, invertebrate and plant species, to be degraded as determined by acute or chronic toxicity analysis, wetlands monitoring or technical reports required by the Executive Officer.

2. The wetlands must be managed so as not to create vector problems and to minimize the occurrence of avian botulism and other infectious diseases. The

[1] The term pesticide shall include: (1) any substance, or mixture of substances which is intended to be used for defoliating plants, regulating plant growth, or for preventing, destroying, repelling, or mitigating any pest, which may infest or be detrimental to vegetation, man, animals, or households, or be present in any agricultural or nonagricultural environment whatsoever, or (2) any spray adjuvant, or (3) any breakdown products of these materials that threaten beneficial uses. Note that discharges of "inert" ingredients included in pesticide formulations must comply with all applicable water quality objectives.

local mosquito abatement district or Yolo and Solano County Environmental Health Departments shall be consulted annually to determine if changes need to be made in procedures in managing the wetlands for vector control.

I. Provisions:

1. The research facilities shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.

2. The Discharger shall not allow pollutant-free wastewater to be discharged, into the collection, treatment, and disposal system, in amounts that significantly diminish the facility's capability to comply with this Order. Pollutant-free wastewater means rainfall, groundwater, cooling waters, and condensates that are essentially free of pollutants.

3. The discharge may contain constituents that have a reasonable potential to cause or contribute to an exceedance of water quality objectives: CTR, NTR constituents (priority pollutants), and additional constituents that are specifically listed in a Clean Water Code Section 13267 letter issued by the Executive Officer on 10 May 2002, and Attachment B of this Order. The Discharger shall comply with the following time schedule in conducting a study of these constituents potential effect in surface waters:

Task	Compliance Date
Submit Workplan and Time Schedule	**3 months** after effective date of this Order
Begin Study	**6 months** after effective date of this Order
Complete Study	**18 months** after effective date of this Order
Submit Study Report	**21 months** after effective date of this Order

The Discharger shall submit to the Regional Water Board, on or before each compliance due date, the specified document or a written report detailing compliance or noncompliance with the specific date and task. If noncompliance is reported, the Discharger shall (1) state the reasons for noncompliance and (2) include proposed actions and an estimated time schedule for compliance. The Discharger shall provide a follow-up notification to the Regional Water Board, by letter, when compliance is re-established.

The Discharger must utilize USEPA standard test methods and detection limits to achieve detection levels below applicable water quality criteria. At a minimum the Discharger shall comply with the Monitoring Requirements for these

constituents as outlined in Section 2.3 and 2.4 of the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California*, adopted 2 March 2000 by the State Water Resources Control Board. Report all peaks identified by the USEPA standard test methods.

If, after review of the study results, it is determined that the discharge has reasonable potential to cause or contribute to an exceedance of a water quality objective, this Order will be reopened and effluent limitations will be added for the subject constituents.

4. The Discharger shall conduct the acute and chronic toxicity testing specified in the Monitoring and Reporting Program. If the testing indicates that the discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above the water quality objective for toxicity, the Discharger initiate a Toxicity Identification Evaluation (TIE) to identify the causes of toxicity. Upon completion of the TIE, the Discharger shall submit a workplan to conduct a Toxicity Reduction Evaluation (TRE) and, after Regional Board evaluation, conduct the TRE. This Order will be reopened and a chronic toxicity limitation included and/or a limitation for the specific toxicant identified in the TRE included. Additionally, if a chronic toxicity water quality objective is adopted by the State Water Resources Control Board, this Order may be reopened and a limitation based on that objective included.

5. This permit authorizes the discharge of sodium chloride, oxytetracycline, and formalin in accordance with the effluent limitations, BMP plan requirements, Monitoring and Reporting requirements and other conditions of this permit. This permit authorizes the discharge of cadmium, chromium, mercury, and selenium in accordance with the effluent limitations, BMP plan requirements, Monitoring and Reporting requirements and conditions set forth below. The Discharger shall submit the following prior to the use of pyrethroids, microcystin, beta napthoflavone, estradiol, chlorpyrophos, florfenicol, chloramine T, or any other chemical or antibiotic that may enter the wastewater discharge:

   a. The common name(s) and active ingredient(s) of the drug or chemical proposed for use and discharge.

   b. The purpose for the proposed use of the drug or chemical (i.e. list the specific disease for treatment and specific species for treatment).

   c. The amount proposed for use and the resulting calculated concentration in the discharge.

   d. The duration and frequency of the proposed use.

   e. Material Safety Data Sheets and available toxicity information.

f. Any related Investigational New Animal Drug (INAD), New Animal Drug Application (NADA) information, extra-label use requirements and/or veterinarian prescriptions.

The Discharger also shall also submit acute toxicity test information on any new chemical or drug in accordance with methods specified in EPA600/4-90/027, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, using *Ceriodaphnia dubia,* to determine the NOAEL, and LOAEL.

If the toxicity testing, or above listed information submitted to the Regional Board indicates that the drug or chemical is, or may be discharged at a level that will cause, have the reasonable potential to cause, or contribute to an in-stream excursion above any chemical-specific water quality criteria, or Basin Plan objective, this Permit may be reopened to established effluent limitations. In this instance, the drug or chemical shall not be discharged until the permit is modified accordingly.

6. The Discharger shall comply with all the items of the "Standard Provisions and Reporting Requirements for Waste Discharge Requirements (NPDES)", dated February 2004, which are part of this Order. This attachment and its individual paragraphs are referred to as "Standard Provisions."

7. The Discharger shall comply with Monitoring and Reporting Program No. R5-2006-XXXX, which is part of this Order, and any revisions thereto as ordered by the Executive Officer.

When requested by USEPA, the Discharger shall complete and submit Discharge Monitoring Reports. The submittal date shall be no later than the submittal date specified in the Monitoring and Reporting Program for Discharger Self Monitoring Reports.

8. This Order expires on XX December 2011 and the Discharger must file a Report of Waste Discharge in accordance with Title 23, CCR, not later than **180 days** prior to the expiration date, in application for renewal of waste discharge requirements if it wishes to continue the discharge.

9. This Order may be reopened for revision of the effluent limitations, prohibitions, or monitoring and reporting requirement if information becomes available that indicates such revisions are necessary to assure water quality criteria/objectives are met and the beneficial uses of the receiving waters are protected.

J. Groundwater Provisions:

1. **Groundwater Monitoring Tasks.** Within **120 days after adoption of this Order**, the Discharger shall submit a Groundwater *Monitoring Well Installation Work Plan.* The work plan shall describe a proposed groundwater monitoring well network containing one or more background monitoring wells and sufficient number of designated monitoring wells to evaluate performance and compliance with this Order's groundwater limitations. These include monitoring wells immediately down gradient of the Aquatic Center ponds (aquatic disease wet lab evaporation/percolation pond and Jamison pond), the Putah Creek Research Facility sedimentation pond, and the wetlands area.

   The Groundwater *Monitoring Well Installation Work Plan* must evaluate the hydrogeology of the groundwater aquifer between the Aquatic Center effluent pond and Putah Creek and address the potential hydraulic flow between the groundwater and the surface water. The plan must include supporting information that addressed if data from a groundwater monitoring well between the Aquatic Center pond and Putah Creek will provide water quality information that differs from receiving water quality data. The Discharger is permitted to use existing groundwater monitoring wells 4A, 3A, and 14A, as shown in Attachment A, for monitoring of groundwater from the Putah Creek Research Facility.

   The network's monitoring wells shall be constructed to yield representative samples from the first saturated zone, and deeper zones as necessary, to evaluate the discharge's impact on groundwater. All wells shall comply with appropriate standards as described in *California Well Standards Bulletin 74-90* (June 1991) and *Water Well Standards: State of California Bulletin 94-81* (December 1981), and any more stringent standards adopted by the Discharger or county pursuant to CWC Section 13801. The proposed network should include existing monitoring wells where they will serve to measure compliance or provide other relevant information (e.g., depth to groundwater).

   The Discharger shall install approved monitoring wells, properly destroy ineffective wells (as necessary), and monitor groundwater in accord with this Order's MRP. Following well installation, the Discharger shall submit a *Monitoring Well Installation Report.*

   The Discharger shall continue to monitor groundwater in existing monitoring wells in accordance with the MRP unless and until individual existing wells are removed from the approved network. After the first sampling event, the Discharger shall report on its sampling protocol as specified in this Order's MRP. After one year of monitoring, the Discharger shall characterize natural background quality of monitored constituents in a technical report. The report shall present a summary of monitoring data and determine natural background quality for each parameter/constituent identified in the MRP based on data from at least eight consecutive groundwater monitoring events using the methods described in Title 27, Section 20415(e)(10). For each parameter/constituent, the

report shall compare measured concentrations in wells used to monitor impacts from the discharge against the calculated natural background concentration, as well as the interim numeric groundwater limitations.

The Discharger shall comply with the following compliance schedule in implementing the work required by this Provision:

Task	Compliance Date
A. Submit Groundwater Monitoring Well Installation Work Plan (See Attachment C)	**Within 120 days** after the effective date of this Order
B. Implement monitoring well installation work plan	**30 days** following completion of task A
C. Complete monitoring well installation and well destruction and commence groundwater monitoring from newly installed wells	**60 days** following completion of task B
D. Submit Monitoring Well Installation Report	**30 days** following completion of task C
E. Submit technical report on sampling procedures and proposed Data Analysis Methods as described in the MRP	**1st day of the second month** following the first sampling event
F. Submit technical report: natural background quality	**365/730 days** following completion of task E

2. All technical reports required herein that involve planning, investigation, evaluation, or design, or other work requiring interpretation and proper application of engineering or geologic sciences, shall be prepared by or under the direction of persons registered to practice in California pursuant to California Business and Professions Code, Sections 6735, 7835, and 7835.1. To demonstrate compliance with Title 16, CCR, Sections 415 and 3065, all technical reports must contain a statement of the qualifications of the responsible registered professional(s). As required by these laws, completed technical reports must bear the signature(s) and seal(s) of the registered professional(s) in a manner such that all work can be clearly attributed to the professional responsible for the work.

K. General Provisions:

1. Prior to making any change in the discharge point, place of use, or purpose of use of the wastewater, the Discharger shall obtain approval of, or clearance from the State Water Resources Control Board (Division of Water Rights).

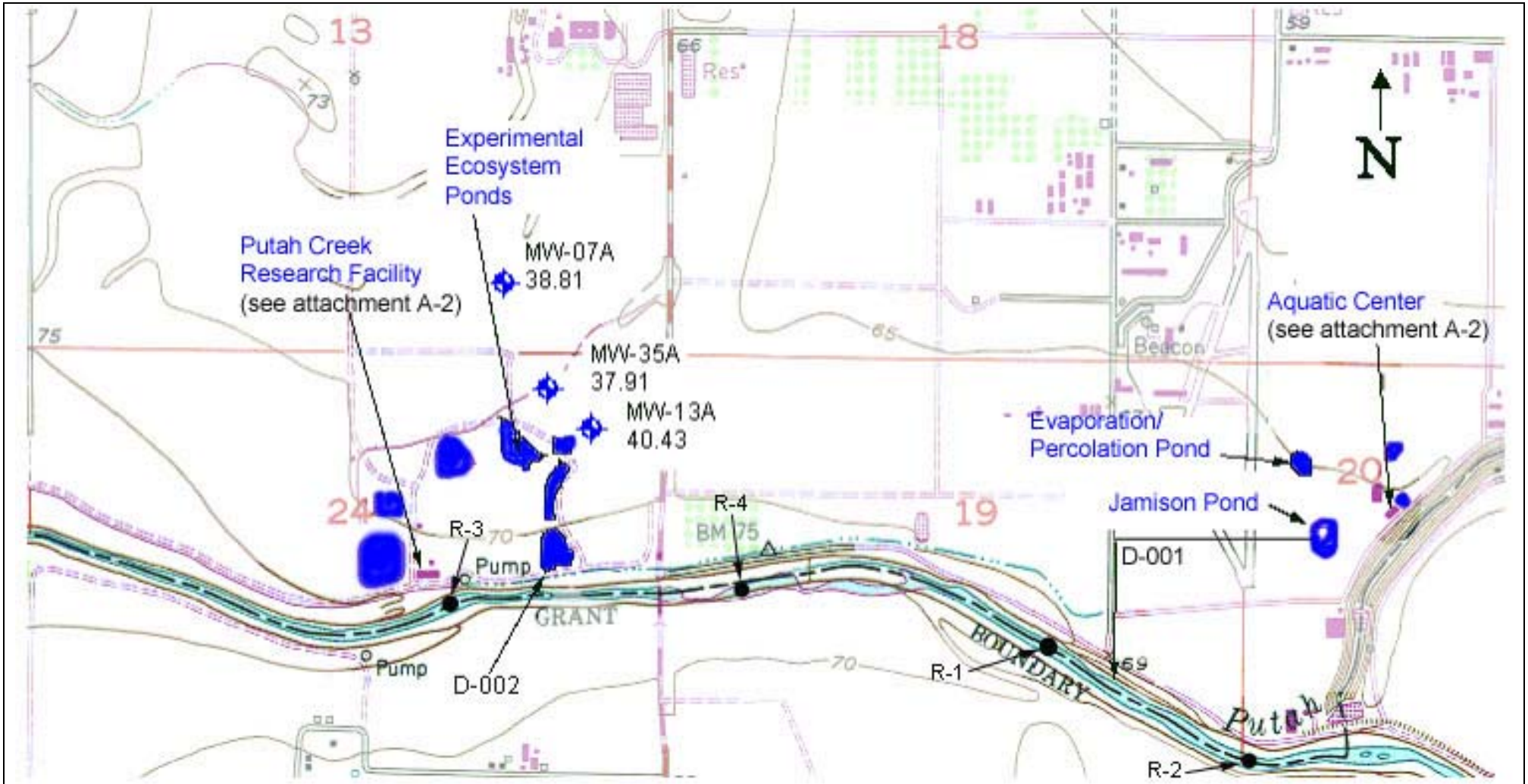
2. In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the Discharger, the Discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be immediately forwarded to this office.

   To assume operation under this Order, the succeeding owner or operator must apply in writing to the Executive Officer requesting transfer of the Order. The request must contain the requesting entity's full legal name, the State of incorporation if a corporation, address and telephone number of the persons responsible for contact with the Regional Water Board and a statement. The statement shall comply with the signatory paragraph of Standard Provision D.6 and state that the new owner or operator assumes full responsibility for compliance with this Order. Failure to submit the request shall be considered a discharge without requirements, a violation of the California Water Code. Transfer shall be approved or disapproved in writing by the Executive Officer.

I, PAMELA C. CREEDON, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on XX December 2006.

_____

PAMELA C. CREEDON, Executive Officer



Drawing Reference:

U.S.G.S TOPOGRAPHIC MAPS
7.5 MINUTE QUADRANGLE

Attachment A-1

SITE LOCATION MAP
University of California, Davis
Aquatic Center: Section 19, T8N, R2E, MDB&M
Putah Creek Research Facility: Section 24, R1E, MDB&M
Yolo and Solano Counties

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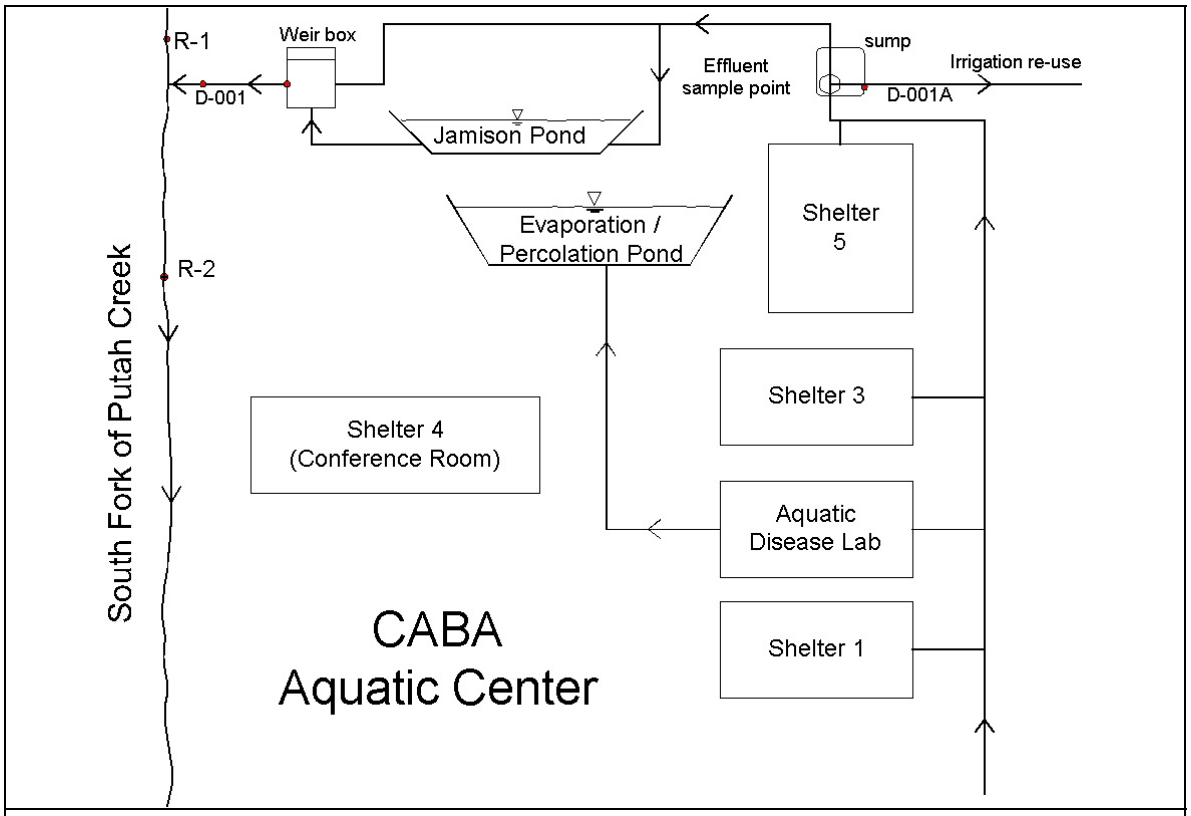

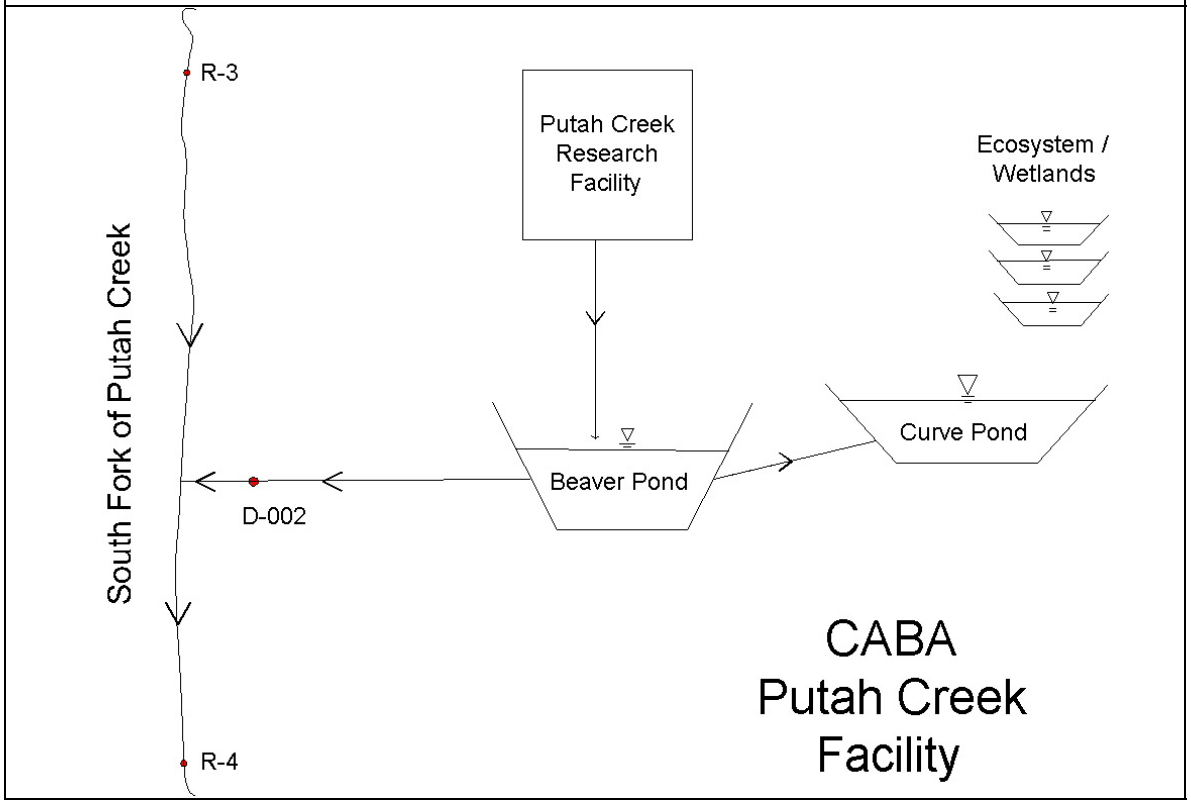

PROCESS SCHEMATICS **ATTACHMENT A-2**

University of California, Davis
Center For Aquatic Biology and Aquaculture (CABA)

I. SAMPLING FREQUENCY AND NUMBER OF SAMPLES

Samples shall be collected from the effluent and upstream receiving water and analyzed for the constituents listed in Attachment B, section IV, to provide the indicated number of valid sample results by the submittal due date. Sampling frequency shall be adjusted so that the appropriate number of samples is collected by the due date and so that the sampling is representative of the wastewater discharge.

Constituent/Sample Type [1]	Frequency	Timeframe (Years)	Total Number of Samples
Volatile Organics/grab	Quarterly	1	4
Semi-Volatile Organics/grab or composite	Quarterly	1	4
Inorganics/grab or composite	Quarterly	1	4
Pesticides & PCBs/grab or composite	Quarterly	1	4
Other Constituents[2]/grab or composite	Quarterly	1	4
Discharge Flow[3]	Monthly	1	12
Dioxins/grab or composite	Semi-annual	1	2

1 The effluent sampling station and the upstream receiving water station specified in the NPDES Permit Monitoring and Reporting Program should be used.

2 See list in Attachment B, section II.

3 Discharge Flow. Discharge flow should be recorded and reported for each day of sample collection.

II. DIOXIN AND FURAN SAMPLING

Section 3 of the SIP requires that each NPDES discharger conduct sampling and analysis of dioxin and dibenzofuran congeners.

A. The required number and frequency of sampling are once during dry weather and once during wet weather for one year, for a total of two samples.

B. Each sample shall be analyzed for the seventeen congeners listed in the table below. High Resolution GCMS Method 8290, or another method capable of individually quantifying the congeners to an equivalent detection level, shall be used for the analyses.

C. Sampling shall start during winter months and all analyses shall be completed and submitted in accordance with the compliance dates specified in this Order. Sample results shall be submitted along with routine monitoring reports as soon as the laboratory results are available.

D. For each sample the discharger shall report:

1. The measured or estimated concentration of each of the seventeen congeners

2. The quantifiable limit of the test (as determined by procedures in Section 2.4.3, No. 5 of the SIP)

3. The Method Detection Level (MDL) for the test

4. The TCDD equivalent concentration for each analysis calculated by multiplying the concentration of each congener by the Toxicity Equivalency Factor (TEF) in the following table, and summing the resultant products to determine the equivalent toxicity of the sample expressed as 2,3,7,8-TCDD.

Congener	**TEF**	**Congener**	**TEF**
2,3,7,8TetraCDD	1	2,3,4,7,8-PentaCDF	0.5
1,2,3,7,8-PentaCDD	1.0	1,2,3,4,7,8-HexaCDF	0.1
1,2,3,4,7,8-HexaCDD	0.1	1,2,3,6,7,8-HexaCDF	0.1
1,2,3,6,7,8-HexaCDD	0.1	1,2,3,7,8,9-HexaCDF	0.1
1,2,3,7,8,9-HexaCDD	0.1	2,3,4,6,7,8-HexaCDF	0.1
1,2,3,4,6,7,8-HeptaCDD	0.01	1,2,3,4,6,7,8-HeptaCDF	0.01
OctaCDD	0.0001	1,2,3,4,7,8,9-HeptaCDF	0.01
2,3,7,8-TetraCDF	0.1	OctaCDF	0.0001
1,2,3,7,8-PentaCDF	0.05		

III. REPORTING REQUIREMENTS

A. **Laboratory Requirements**. The laboratory analyzing the monitoring samples shall be certified by the Department of Health Services in accordance with the provisions of Water Code Section 13176 and must include quality assurance/quality control data with their reports.

B. **Criterion Quantitation Limit (CQL)**. The criterion quantitation limits will be equal to or lower than the minimum levels (MLs) in Appendix 4 of the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (Copies of the SIP may be obtained from the State Water Resources Control Board, or downloaded from http://www.waterboards.ca.gov/iswp/index.html) or the detection limits for purposes of reporting (DLRs) published by the Department of Health Services (http://www.dhs.ca.gov/ps/ddwem/chemicals/DLR/dlrindex.htm) which is below the controlling water quality criterion concentrations summarized in Attachment B, section II of this Order.

C. **Method Detection Limit (MDL)**. The method detection limit for the laboratory shall be determined by the procedure found in 40 Code of Federal Regulations (CFR) Part 136, Appendix B (revised as of 14 May 1999).

D. **Reporting Limit (RL).** The reporting limit for the laboratory. This is the lowest quantifiable concentration that the laboratory can determine. Ideally, the RL should be equal to or lower than the CQL to meet the purposes of this monitoring.

E. **Reporting Protocols**. The results of analytical determinations for the presence of chemical constituents in a sample shall use the following reporting protocols:

1. Sample results greater than or equal to the reported RL shall be reported as measured by the laboratory (*i.e.*, the measured chemical concentration in the sample).

2. Sample results less than the report RL, but greater than or equal to the laboratory's MDL, shall be reported as "Detected, but Not Quantified," or DNQ. The estimated chemical concentration of the sample shall also be reported.

3. For the purposes of data collection, the laboratory shall write the estimated chemical concentration next to DNQ as well as the words "Estimated Concentration" (may be shortened to "Est. Conc."). The laboratory, if such information is available, may include numerical estimates of the data quantity for the reported result. Numerical

estimates of data quality may be percent accuracy (± a percentage of the reported value), numerical ranges (low to high), or any other means considered appropriate by the laboratory.

4. Sample results that are less than the laboratory's MDL shall be reported as "Not Detected" or ND.

F. **Data Format**. The monitoring report shall contain the following information for each pollutant:

1. The name of the constituent.

2. Sampling location.

3. The date the sample was collected.

4. The time the sample was collected.

5. The date the sample was analyzed. For organic analyses, the extraction date will also be indicated to assure that hold times are not exceeded for prepared samples.

6. The analytical method utilized.

7. The measured or estimated concentration.

8. The required Criterion Quantitation Limit (CQL).

9. The laboratory's current Method Detection Limit (MDL), as determined by the procedure found in 40 CFR Part 136, Appendix B (revised as of 14 May 1999).

10. The laboratory's lowest reporting limit (RL).

11. Any additional comments.

IV. CALIFORNIA TOXIC RULE CONSTITUENTS TO BE MONITORED

The Discharger is required to monitoring for the constituents that are listed in the following table in accordance with requirements set forth in this Order.

Attachment II - Constituents to be monitored

			Controlling Water Quality Criterion for Surface Waters			
CTR #	Constituent	CAS Number	Basis	Criterion Concentration (ug/L or noted) (1)	Criterion Quantitation Limit (ug/L or noted)	Suggested Test Methods
VOLATILE ORGANICS						
28	1,1-Dichloroethane	75343	Primary MCL	5	0.5	EPA 8260B
30	1,1-Dichloroethene	75354	National Toxics Rule	0.057	0.5	EPA 8260B
41	1,1,1-Trichloroethane	71556	Primary MCL	200	0.5	EPA 8260B
42	1,1,2-Trichloroethane	79005	National Toxics Rule	0.6	0.5	EPA 8260B
37	1,1,2,2-Tetrachloroethane	79345	National Toxics Rule	0.17	0.5	EPA 8260B
75	1,2-Dichlorobenzene	95501	Taste & Odor	10	0.5	EPA 8260B
29	1,2-Dichloroethane	107062	National Toxics Rule	0.38	0.5	EPA 8260B
	cis-1,2-Dichloroethene	156592	Primary MCL	6	0.5	EPA 8260B
31	1,2-Dichloropropane	78875	Calif. Toxics Rule	0.52	0.5	EPA 8260B
101	1,2,4-Trichlorobenzene	120821	Public Health Goal	5	0.5	EPA 8260B
76	1,3-Dichlorobenzene	541731	Taste & Odor	10	0.5	EPA 8260B
32	1,3-Dichloropropene	542756	Primary MCL	0.5	0.5	EPA 8260B
77	1,4-Dichlorobenzene	106467	Primary MCL	5	0.5	EPA 8260B
17	Acrolein	107028	Aquatic Toxicity	21	2	EPA 8260B
18	Acrylonitrile	107131	National Toxics Rule	0.059	2	EPA 8260B
19	Benzene	71432	Primary MCL	1	0.5	EPA 8260B
20	Bromoform	75252	Calif. Toxics Rule	4.3	0.5	EPA 8260B
34	Bromomethane	74839	Calif. Toxics Rule	48	1	EPA 8260B
21	Carbon tetrachloride	56235	National Toxics Rule	0.25	0.5	EPA 8260B
22	Chlorobenzene (mono chlorobenzene)	108907	Taste & Odor	50	0.5	EPA 8260B
24	Chloroethane	75003	Taste & Odor	16	0.5	EPA 8260B
25	2- Chloroethyl vinyl ether	110758	Aquatic Toxicity	122 (3)	1	EPA 8260B
26	Chloroform	67663	OEHHA Cancer Risk	1.1	0.5	EPA 8260B
35	Chloromethane	74873	USEPA Health Advisory	3	0.5	EPA 8260B
23	Dibromochloromethane	124481	Calif. Toxics Rule	0.41	0.5	EPA 8260B
27	Dichlorobromomethane	75274	Calif. Toxics Rule	0.56	0.5	EPA 8260B
36	Dichloromethane	75092	Calif. Toxics Rule	4.7	0.5	EPA 8260B
33	Ethylbenzene	100414	Taste & Odor	29	0.5	EPA 8260B
88	Hexachlorobenzene	118741	Calif. Toxics Rule	0.00075	1	EPA 8260B
89	Hexachlorobutadiene	87683	National Toxics Rule	0.44	1	EPA 8260B
91	Hexachloroethane	67721	National Toxics Rule	1.9	1	EPA 8260B
94	Naphthalene	91203	USEPA IRIS	14	10	EPA 8260B
38	Tetrachloroethene	127184	National Toxics Rule	0.8	0.5	EPA 8260B
39	Toluene	108883	Taste & Odor	42	0.5	EPA 8260B
40	trans-1,2-Dichloroethylene	156605	Primary MCL	10	0.5	EPA 8260B
43	Trichloroethene	79016	National Toxics Rule	2.7	0.5	EPA 8260B
44	Vinyl chloride	75014	Primary MCL	0.5	0.5	EPA 8260B
	Methyl-tert-butyl ether (MTBE)	1634044	Secondary MCL	5	0.5	EPA 8260B
	Trichlorofluoromethane	75694	Primary MCL	150	5	EPA 8260B
	1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	Primary MCL	1200	10	EPA 8260B
	Styrene	100425	Taste & Odor	11	0.5	EPA 8260B
	Xylenes	1330207	Taste & Odor	17	0.5	EPA 8260B

SEMI-VOLATILE ORGANICS						
60	1,2-Benzanthracene	56553	Calif. Toxics Rule	0.0044	5	EPA 8270C
85	1,2-Diphenylhydrazine	122667	National Toxics Rule	0.04	1	EPA 8270C
45	2-Chlorophenol	95578	Taste and Odor	0.1	2	EPA 8270C
46	2,4-Dichlorophenol	120832	Taste and Odor	0.3	1	EPA 8270C
47	2,4-Dimethylphenol	105679	Calif. Toxics Rule	540	2	EPA 8270C
49	2,4-Dinitrophenol	51285	National Toxics Rule	70	5	EPA 8270C
82	2,4-Dinitrotoluene	121142	National Toxics Rule	0.11	5	EPA 8270C
55	2,4,6-Trichlorophenol	88062	Taste and Odor	2	10	EPA 8270C
83	2,6-Dinitrotoluene	606202	USEPA IRIS	0.05	5	EPA 8270C
50	2-Nitrophenol	25154557	Aquatic Toxicity	150 (5)	10	EPA 8270C
71	2-Chloronaphthalene	91587	Aquatic Toxicity	1600 (6)	10	EPA 8270C
78	3,3'-Dichlorobenzidine	91941	National Toxics Rule	0.04	5	EPA 8270C
62	3,4-Benzofluoranthene	205992	Calif. Toxics Rule	0.0044	10	EPA 8270C
52	4-Chloro-3-methylphenol	59507	Aquatic Toxicity	30	5	EPA 8270C
48	4,6-Dinitro-2-methylphenol	534521	National Toxics Rule	13.4	10	EPA 8270C
51	4-Nitrophenol	100027	USEPA Health Advisory	60	5	EPA 8270C
69	4-Bromophenyl phenyl ether	101553	Aquatic Toxicity	122	10	EPA 8270C
72	4-Chlorophenyl phenyl ether	7005723	Aquatic Toxicity	122 (3)	5	EPA 8270C
56	Acenaphthene	83329	Taste and Odor	20	1	EPA 8270C
57	Acenaphthylene	208968	No Criteria Available		10	EPA 8270C
58	Anthracene	120127	Calif. Toxics Rule	9,600	10	EPA 8270C
59	Benzidine	92875	National Toxics Rule	0.00012	5	EPA 8270C
61	Benzo(a)pyrene (3,4-Benzopyrene)	50328	Calif. Toxics Rule	0.0044	0.1	EPA 8270C
63	Benzo(g,h,i)perylene	191242	No Criteria Available		5	EPA 8270C
64	Benzo(k)fluoranthene	207089	Calif. Toxics Rule	0.0044	2	EPA 8270C
65	Bis(2-chloroethoxy) methane	111911	No Criteria Available		5	EPA 8270C
66	Bis(2-chloroethyl) ether	111444	National Toxics Rule	0.031	1	EPA 8270C
67	Bis(2-chloroisopropyl) ether	39638329	Aquatic Toxicity	122 (3)	10	EPA 8270C
68	Bis(2-ethylhexyl) phthalate	117817	National Toxics Rule	1.8	3	EPA 8270C
70	Butyl benzyl phthalate	85687	Aquatic Toxicity	3 (7)	10	EPA 8270C
73	Chrysene	218019	Calif. Toxics Rule	0.0044	5	EPA 8270C
81	Di-n-butylphthalate	84742	Aquatic Toxicity	3 (7)	10	EPA 8270C
84	Di-n-octylphthalate	117840	Aquatic Toxicity	3 (7)	10	EPA 8270C
74	Dibenzo(a,h)-anthracene	53703	Calif. Toxics Rule	0.0044	0.1	EPA 8270C
79	Diethyl phthalate	84662	Aquatic Toxicity	3 (7)	2	EPA 8270C
80	Dimethyl phthalate	131113	Aquatic Toxicity	3 (7)	2	EPA 8270C
86	Fluoranthene	206440	Calif. Toxics Rule	300	10	EPA 8270C
87	Fluorene	86737	Calif. Toxics Rule	1300	10	EPA 8270C
90	Hexachlorocyclopentadiene	77474	Taste and Odor	1	1	EPA 8270C
92	Indeno(1,2,3-c,d)pyrene	193395	Calif. Toxics Rule	0.0044	0.05	EPA 8270C
93	Isophorone	78591	National Toxics Rule	8.4	1	EPA 8270C
98	N-Nitrosodiphenylamine	86306	National Toxics Rule	5	1	EPA 8270C
96	N-Nitrosodimethylamine	62759	National Toxics Rule	0.00069	5	EPA 8270C
97	N-Nitrosodi-n-propylamine	621647	Calif. Toxics Rule	0.005	5	EPA 8270C
95	Nitrobenzene	98953	National Toxics Rule	17	10	EPA 8270C
53	Pentachlorophenol	87865	Calif. Toxics Rule	0.28	0.2	EPA 8270C
99	Phenanthrene	85018	No Criteria Available		5	EPA 8270C
54	Phenol	108952	Taste and Odor	5	1	EPA 8270C
100	Pyrene	129000	Calif. Toxics Rule	960	10	EPA 8270C

INORGANICS						
	Aluminum	7429905	Ambient Water Quality	87	50	EPA 6020/200.8
1	Antimony	7440360	Primary MCL	6	5	EPA 6020/200.8
2	Arsenic	7440382	Ambient Water Quality	0.018	0.01	EPA 1632
15	Asbestos	1332214	National Toxics Rule/ Primary MCL	7 MFL	0.2 MFL >10um	EPA/600/R-93/116(PCM)
	Barium	7440393	Basin Plan Objective	100	100	EPA 6020/200.8
3	Beryllium	7440417	Primary MCL	4	1	EPA 6020/200.8
4	Cadmium	7440439	Public Health Goal	0.07	0.25	EPA 1638/200.8
5a	Chromium (total)	7440473	Primary MCL	50	2	EPA 6020/200.8
5b	Chromium (VI)	18540299	Public Health Goal	0.2	0.5	EPA 7199/ 1636
6	Copper	7440508	National Toxics Rule	4.1 (2)	0.5	EPA 6020/200.8
14	Cyanide	57125	National Toxics Rule	5.2	5	EPA 9012A
	Fluoride	7782414	Public Health Goal	1000	0.1	EPA 300
	Iron	7439896	Secondary MCL	300	100	EPA 6020/200.8
7	Lead	7439921	Calif. Toxics Rule	0.92 (2)	0.5	EPA 1638
8	Mercury	7439976	TMDL Development		0.0002 (11)	EPA 1669/1631
	Manganese	7439965	Secondary MCL/ Basin Plan Objective	50	20	EPA 6020/200.8
9	Nickel	7440020	Calif. Toxics Rule	24 (2)	5	EPA 6020/200.8
10	Selenium	7782492	Calif. Toxics Rule	5 (8)	5	EPA 6020/200.8
11	Silver	7440224	Calif. Toxics Rule	0.71 (2)	1	EPA 6020/200.8
12	Thallium	7440280	National Toxics Rule	1.7	1	EPA 6020/200.8
	Tributyltin	688733	Ambient Water Quality	0.063	0.002	EV-024/025
13	Zinc	7440666	Calif. Toxics Rule/ Basin Plan Objective	54/ 16 (2)	10	EPA 6020/200.8
PESTICIDES - PCBs						
110	4,4'-DDD	72548	Calif. Toxics Rule	0.00083	0.02	EPA 8081A
109	4,4'-DDE	72559	Calif. Toxics Rule	0.00059	0.01	EPA 8081A
108	4,4'-DDT	50293	Calif. Toxics Rule	0.00059	0.01	EPA 8081A
112	alpha-Endosulfan	959988	National Toxics Rule	0.056 (9)	0.02	EPA 8081A
103	alpha-Hexachlorocyclohexane (BHC)	319846	Calif. Toxics Rule	0.0039	0.01	EPA 8081A
	Alachlor	15972608	Primary MCL	2	1	EPA 8081A
102	Aldrin	309002	Calif. Toxics Rule	0.00013	0.005	EPA 8081A
113	beta-Endosulfan	33213659	Calif. Toxics Rule	0.056 (9)	0.01	EPA 8081A
104	beta-Hexachlorocyclohexane	319857	Calif. Toxics Rule	0.014	0.005	EPA 8081A
107	Chlordane	57749	Calif. Toxics Rule	0.00057	0.1	EPA 8081A
106	delta-Hexachlorocyclohexane	319868	No Criteria Available		0.005	EPA 8081A
111	Dieldrin	60571	Calif. Toxics Rule	0.00014	0.01	EPA 8081A
114	Endosulfan sulfate	1031078	Ambient Water Quality	0.056	0.05	EPA 8081A
115	Endrin	72208	Calif. Toxics Rule	0.036	0.01	EPA 8081A
116	Endrin Aldehyde	7421934	Calif. Toxics Rule	0.76	0.01	EPA 8081A
117	Heptachlor	76448	Calif. Toxics Rule	0.00021	0.01	EPA 8081A
118	Heptachlor Epoxide	1024573	Calif. Toxics Rule	0.0001	0.01	EPA 8081A
105	Lindane (gamma-Hexachlorocyclohexane)	58899	Calif. Toxics Rule	0.019	0.019	EPA 8081A
119	PCB-1016	12674112	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
120	PCB-1221	11104282	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082

121	PCB-1232	11141165	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
122	PCB-1242	53469219	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
123	PCB-1248	12672296	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
124	PCB-1254	11097691	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
125	PCB-1260	11096825	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
126	Toxaphene	8001352	Calif. Toxics Rule	0.0002	0.5	EPA 8081A
	Atrazine	1912249	Public Health Goal	0.15	1	EPA 8141A
	Bentazon	25057890	Primary MCL	18	2	EPA 643/ 515.2
	Carbofuran	1563662	CDFG Hazard Assess.	0.5	5	EPA 8318
	2,4-D	94757	Primary MCL	70	10	EPA 8151A
	Dalapon	75990	Ambient Water Quality	110	10	EPA 8151A
	1,2-Dibromo-3-chloropropane (DBCP)	96128	Public Health Goal	0.0017	0.01	EPA 8260B
	Di(2-ethylhexyl)adipate	103231	USEPA IRIS	30	5	EPA 8270C
	Dinoseb	88857	Primary MCL	7	2	EPA 8151A
	Diquat	85007	Ambient Water Quality	0.5	4	EPA 8340/ 549.1/HPLC
	Endothal	145733	Primary MCL	100	45	EPA 548.1
	Ethylene Dibromide	106934	OEHHA Cancer Risk	0.0097	0.02	EPA 8260B/ 504
	Glyphosate	1071836	Primary MCL	700	25	HPLC/ EPA 547
	Methoxychlor	72435	Public Health Goal	30	10	EPA 8081A
	Molinate (Ordram)	2212671	CDFG Hazard Assess.	13	2	EPA 634
	Oxamyl	23135220	Public Health Goal	50	20	EPA 8318/ 632
	Picloram	1918021	Primary MCL	500	1	EPA 8151A
	Simazine (Princep)	122349	USEPA IRIS	3.4	1	EPA 8141A
	Thiobencarb	28249776	Basin Plan Objective/ Secondary MCL	1	1	HPLC/ EPA 639
16	2,3,7,8-TCDD (Dioxin)	1746016	Calif. Toxics Rule	1.30E-08	5.00E-06	EPA 8290 (HRGC) MS
	2,4,5-TP (Silvex)	93765	Ambient Water Quality	10	1	EPA 8151A
	Diazinon	333415	CDFG Hazard Assess.	0.05	0.25	EPA 8141A/ GCMS
	Chlorpyrifos	2921882	CDFG Hazard Assess.	0.014	1	EPA 8141A/ GCMS

OTHER CONSTITUENTS						
	Ammonia (as N)	7664417	Ambient Water Quality	1500 (4)		EPA 350.1
	Chloride	16887006	Agricultural Use	106,000		EPA 300.0
	Flow			1 CFS		
	Hardness (as $CaCO_3$)			5000		EPA 130.2
	Foaming Agents (MBAS)		Secondary MCL	500		SM5540C
	Nitrate (as N)	14797558	Primary MCL	10,000	2,000	EPA 300.0
	Nitrite (as N)	14797650	Primary MCL	1000	400	EPA 300.0
	pH		Basin Plan Objective	6.5-8.5	0.1	EPA 150.1
	Phosphorus, Total (as P)	7723140	USEPA IRIS	0.14		EPA 365.3
	Specific conductance (EC)		Agricultural Use	700 umhos/cm		EPA 120.1
	Sulfate		Secondary MCL	250,000	500	EPA 300.0
	Sulfide (as S)		Taste and Odor	0.029		EPA 376.2
	Sulfite (as SO_3)		No Criteria Available			SM4500-SO3
	Temperature		Basin Plan Objective	^{o}F		
	Total Disolved Solids (TDS)		Agricultural Use	450,000		EPA 160.1

FOOTNOTES:

(1) - The Criterion Concentrations serve only as a point of reference for the selection of the appropriate analytical method. They do not indicate a regulatory decision that the cited concentration is either necessary or sufficient for full protection of beneficial uses. Available technology may require that effluent limits be set lower than these values.
(2) - Freshwater aquatic life criteria for metals are expressed as a function of total hardness (mg/L) in the water body. Values displayed correspond to a total hardness of 40 mg/L.
(3) - For haloethers
(4) - Freshwater aquatic life criteria for ammonia are expressed as a function of pH and temperature of the water body. Values displayed correspond to pH 8.0 and temperature of 22 C.
(5) - For nitrophenols.
(6) - For chlorinated naphthalenes.
(7) - For phthalate esters.
(8) - Basin Plan objective = 2 ug/L for Salt Slough and specific constructed channels in the Grassland watershed.
(9) - Criteria for sum of alpha- and beta- forms.
(10) - Criteria for sum of all PCBs.
(11) - Mercury monitoring shall utilize "ultra-clean" sampling and analytical methods. These methods include: Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels, US EPA; and Method 1631: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluoresence, US EPA

ITEMS TO BE INCLUDED IN A MONITORING WELL INSTALLATION WORKPLAN AND A MONITORING WELL INSTALLATION REPORT OF RESULTS

Prior to installation of groundwater monitoring wells, the Discharger shall submit a workplan containing the minimum listed information. Wells may be installed after staff approves the workplan. Upon installation of the monitoring wells, the Discharger shall submit a report of results, as described below. All workplans and reports must be signed by a registered geologist, certified engineering geologist, or civil engineer registered or certified by the State of California.

Monitoring Well Installation Workplan

A. General Information:
   - Monitoring well locations and rationale
   - Survey details
   - Equipment decontamination procedures
   - Health and safety plan
   - Topographic map showing any existing monitoring wells, proposed wells, waste handling facilities, utilities, and other major physical and man-made features.

B. Drilling Details: describe drilling and logging methods

C. Monitoring Well Design:
   - Casing diameter
   - Borehole diameter
   - Depth of surface seal
   - Well construction materials
   - Diagram of well construction
   - Type of well cap
   - Size of perforations and rationale
   - Grain size of sand pack and rationale
   - Thickness and position of bentonite seal and sand pack
   - Depth of well, length and position of perforated interval

D. Well Development:
   - Method of development to be used
   - Method of determining when development is complete
   - Method of development water disposal

E. Surveying Details: discuss how each well will be surveyed to a common reference point

F. Soil Sampling (if applicable):
- Cuttings disposal method
- Analyses to be run and methods
- Sample collection and preservation method
- Intervals at which soil samples are to be collected
- Number of soil samples to be analyzed and rationale
- Location of soil samples and rationale
- QA/QC procedures

G. Well Sampling:
- Minimum time after development before sampling (48 hours)
- Well purging method and amount of purge water
- Sample collection and preservation method
- Table describing sample volumes, sample containers, preservation agents, and hold times
- QA/QC procedures

H. Water Level Measurement:
The elevation reference point at each monitoring well shall be within 0.01 foot. Ground surface elevation at each monitoring well shall be within 0.1 foot. Method and time of water level measurement shall be specified.

I. Proposed time schedule for work.

Monitoring Well Installation Report of Results

A. Well Construction:
- Number and depth of wells drilled
- Date(s) wells drilled
- Description of drilling and construction
- Approximate locations relative to facility site(s)
- A well construction diagram for each well must be included in the report, and contain the following information:
  - Total depth drilled
  - Depth of open hole (same as total depth drilled if no caving occurs)
  - Footage of hole collapsed
  - Length of slotted casing installed
  - Depth of bottom of casing
  - Depth to top of sand pack
  - Thickness of sand pack
  - Depth to top of bentonite seal
  - Thickness of bentonite seal
  - Thickness of concrete grout

Boring diameter
Casing diameter
Casing material

Size of perforations
Number of bags of sand
Well elevation at top of casing
Depth to ground water
Date of water level measurement
Monitoring well number
Date drilled
Location

B. Well Development:
- Date(s) of development of each well
- Method of development
- Volume of water purged from well
- How well development completion was determined
- Method of effluent disposal
- Field notes from well development should be included in report.

C. Well Surveying: provide reference elevations for each well and surveyor's notes

D. Water Sampling:
- Date(s) of sampling
- How well was purged
- How many well volumes purged
- Levels of temperature, EC, and pH at stabilization
- Sample collection, handling, and preservation methods
- Sample identification
- Analytical methods used
- Laboratory analytical data sheets
- Water level elevation(s)
- Groundwater contour map

E. Soil Sampling (if applicable):
- Date(s) of sampling
- Sample collection, handling, and preservation method
- Sample identification
- Analytical methods used
- Laboratory analytical data sheets

FACT SHEET

ORDER NO. R5-2006-XXXX
UNIVERSITY OF CALIFORNIA
CENTER FOR AQUATIC BIOLOGY AND AQUACULTURE
YOLO AND SOLANO COUNTIES
NPDES NO. CA0083348

SCOPE OF PERMIT

This renewed Order regulates the discharge of a combined effluent design flow of up to 2.88 million gallons per day (mgd) from the University of California Center for Aquatic Biology and Aquaculture (CABA) facilities. This Order includes effluent and surface water limitations, monitoring and reporting requirements, additional study requirements, and permit re-opener provisions for effluent constituents.

BACKGROUND INFORMATION

The University of California (Discharger) owns and operates two fish research facilities that comprise the CABA facility. The CABA is not a commercial hatchery and does not release fish into the environment. The Aquaculture and Fisheries Program at the University of California, Davis, conducts research focused in toxicology, nutrition, stress, genetics, general and physiology ecology, engineering, endocrinology, infectious diseases, and reproduction. About fifteen different aquatic species may be under study at any one time. The Aquatic Center facility is in Section 19, T8N, R2E, MDB&M and the Putah Creek Research facility is in Section 24, T8N, R1E, MDB&M as shown on Attachment A, a part of this Order.

Facility wastewater from the Aquatic Center facility is circulated through a pond, Jamison Pond, prior to discharge to the South Fork of Putah Creek, a water of the United States, at the points, latitude 38°, 31', 32" and longitude 121°, 47', 20" (D-001). Wastewater from the Putah Creek Research Facility is circulated through two ponds, Beaver Pond and Curve Pond, prior to discharge to the South Fork of Putah Creek at latitude 38°, 31', 39" and longitude 121°, 48', 18" (D-002).

Effluent from the Aquatic Center facility may be used for irrigation of agricultural land, owned by the Discharger, on an as-needed basis. Effluent from the Putah Creek Research Facility may be diverted to a series of ponds used for wetlands and ecosystems studies. There is no discharge of water from these wetlands. The wetlands are considered part of the research process and not a water of the State. The wetlands are managed and effluent limitations and requirements have been included to prevent vector problems, nuisance, direct toxicity to wildlife, and to minimize the occurrence of avian botulism and other infectious diseases and bioaccumulation in the food chain.

Due to attraction of wildlife to the wetlands, this Order requires that no toxic pollutants shall be present in the water column, sediments, or biota in concentrations that produce detrimental response in human, plant, animal, or aquatic life or bioaccumulate in concentrations that are harmful to human health or aquatic resources.

The source water for the facilities includes dedicated wells and irrigation water from Lake Berryessa. The source water is high in nitrogen gas and low in dissolved oxygen. Therefore, the Discharger must treat the source water so that it is suitable for the fish population. Prior to being routed to the fish laboratories, the supply water is processed through stripping towers to remove the nitrogen and then pressurized to increase the oxygen concentration.

RECEIVING WATER BENEFICIAL USES AND ASSIMILATIVE CAPACITY

The *Water Quality Control Plan*, *Fourth Edition, for the Sacramento and San Joaquin River Basins* (hereafter Basin Plan) states, on page II-1.00, "*Protection and enhancement of existing and potential beneficial uses are primary goals of water quality planning…*" and "*disposal of wastewaters is* [not] *a prohibited use of waters of the state; it is merely a use which cannot be satisfied to the detriment of beneficial uses*." The existing and beneficial uses that currently apply to surface waters of the basins are presented in Figure II-1 and Table II-1 of the Basin Plan. The beneficial uses of Putah Creek downstream of the discharge, as identified in Table II-1 of the Basin Plan are as follows:

- Municipal and domestic supply,
- Agricultural irrigation,
- Agricultural stock watering,
- Water contact recreation,
- Canoeing and rafting,
- Non-contact water recreation,
- Warm freshwater aquatic habitat,
- Potential cold freshwater aquatic habitat,
- Warm spawning habitat and
- Wildlife habitat.

In 1995, 1997 and 1998, University of California, Davis students under the direction of Dr. Peter Moyle observed juvenile and adult salmon in the South Fork Putah Creek. Some salmon were observed spawning in December 1997 and January 1998. Since that time the University has continued its research and the potential beneficial use of cold freshwater aquatic habitat has been confirmed to exist in Putah Creek.

The South Fork of Putah Creek contains continuous flow year around as a result of the Putah Creek Accord, a legal settlement agreement that requires the Solano Irrigation District to maintain a minimum required flow in the creek. Nevertheless, for the development of this permit, the worst-case dilution is assumed to be zero to provide maximum protection of the receiving water beneficial uses. The impact of assuming zero assimilative capacity within the receiving water is that discharge limitations are end-of-pipe limits with no allowance for dilution within the receiving water. The lack of dilution results in more stringent effluent limitations to protect contact recreational uses, agricultural water quality goals and aquatic life.

In a 12 July 2006 letter to the Regional Water Board, the Discharger states that mercury may potentially be used in research activities. The CTR contains a human health criterion (based on a one-in-a-million cancer risk) of 0.050 µg/L for waters from which both water and aquatic organisms are consumed. Typically, effluent limitations are established for mercury based on the most stringent criteria such as the CTR criteria shown above. Putah Creek and the Delta are CWA Section 303(d)-listed impaired water bodies due to high concentration of methyl mercury in fish. The background effluent methyl mercury concentration, in September and November 2004, measured 0.032 ng/L, which is lower than the CTR criterion of 0.050 µg/L. However, due to the bioaccumulative nature of methyl mercury, an increase in loading will not be allowed. Therefore, this Order contains total mercury effluent limitations and prohibits the discharge of total mercury (and methyl mercury) in amounts greater than the existing discharge.

Due to the lack of effluent monitoring data, the concentration and loading of total mercury and methyl mercury currently discharged is unknown. This Order requires the Discharger to monitor and report priority pollutant concentrations, including total mercury and methyl mercury. If necessary, this Order will be reopened and an effluent limitation for methyl mercury will be established to protect downstream water quality.

REASONABLE POTENTIAL AND EFFLUENT LIMITATIONS

The previous Order R5-99-017 required the Discharger to conduct a study of U.S. Environmental Protection Agency (USEPA) priority pollutants and/or National Toxic Rule (NTR) constituents that could potentially affect the receiving waters. This study was to be completed and submitted to the Regional Water Board by 1 September 2002. The Discharger was also required, by a California Water Code Section 13267 technical report requirement (CWC Section 13267 letter) issued by the Executive Officer on 10 May 2002, to fully characterize the wastewater discharge for conformance with California Toxic Rule (CTR), NTR and Basin Plan water quality standards and objectives. On 7 May 2003, the Discharger submitted a partial set of monitoring data but failed to submit all the data required by previous Order R5-99-017 and the CWC Section13267 letter. This Order directs the Discharger to conduct the special monitoring study required by the CWC Section 3267 letter with a time schedule. Effluent data that was submitted as part of the previous Order R5-99-017, and used to establish the requirements of this Order, is presented in Table 1.

Reasonable Potential Analysis

A Reasonable Potential Analysis was conducted on the monitoring results to determine reasonable potential for monitored constituents to exceed water quality criteria. If there is a reasonable potential to cause or contribute to an exceedance of water quality criteria, objectives or limits, effluent limitations are included in the Order to protect the beneficial uses of the receiving stream and to ensure that the discharge complies with the Basin Plan numeric and narrative objectives and requirements. Unless otherwise noted, all mass limitations this Order were calculated by multiplying the concentration limitation by the long term average flow from each facility and the appropriate unit conversion factors.

Reasonable potential (RP) is determined using either the method prescribed in (1) the *Policy for Implementation of Toxics Standards for Inland Surface Waters*, Enclosed Bays, and Estuaries of California (also referred to as the State Implementation Plan or SIP), adopted 2 March 2000 and amended on 24 February 2005 by the State Water Resources Control Board (State Water Board) or (2) the U.S. EPA Technical Support Document (TSD) for Water Quality-Based Toxics Control [EPA/505/2-90-001], whichever is applicable to the constituent being evaluated. In each instance the reasonable potential is evaluated by calculating the projected maximum effluent concentration (MEC) of each constituent and comparing it to applicable water quality criteria, objective or limits; if the projected MEC exceeds the criterion, objective or limit, the discharge is determined to have reasonable potential to cause or contribute to an exceedance of a water quality criteria, objective or limit for that constituent.

The projected MEC is determined by multiplying the observed MEC by a factor that accounts for statistical variation. The multiplying factor is determined (for 99% confidence level and 99% probability basis) using the number of results available and the coefficient of variation (standard deviation divided by the mean) of the sample results. Using the SIP as guidance, non-detect results will be counted as one-half the detection level when calculating the mean. For constituents where the source of the applicable water quality standard is the CTR or NTR, the multiplying factor is 1.

If the reasonable potential analysis indicates that water quality-based effluent limitations are necessary, the limitations will be calculated in accordance with Section 1.4 of the SIP and the TSD. The general methodology for calculating effluent limitations is as follows:

Calculations for Effluent Limitations

In calculating maximum effluent limitations, the effluent concentration allowances (ECA) are set equal to the receiving water criteria/standards/objectives.

$$ECA_{acute} = CMC \qquad ECA_{chronic} = CCC \qquad ECA_{HH} = HH$$

where:

ECA_{acute} =concentration allowance for acute (one-hour average) toxicity criterion effluent

$ECA_{chronic}$= effluent concentration allowance for chronic (four-day average) toxicity
ECA_{HH} = effluent concentration allowance for human health
CMC = criteria maximum concentration (one-hour average)
CCC = criteria continuous concentration (four-day average, unless otherwise noted), and
HH = human health

Acute and chronic toxicity ECAs are converted to equivalent long-term averages (LTA) using statistical multipliers and the lowest LTA is used. Additional statistical multipliers are used to calculate the maximum daily effluent limitation (MDEL) and the average monthly effluent limitation (AMEL).

$$AMEL = mult_{AMEL}\left[\min\left(\overbrace{M_A ECA_{acute}}^{LTA_{acute}}, M_C ECA_{chronic}\right)\right]$$
$$MDEL = mult_{MDEL}\left[\min\left(M_A ECA_{acute}, \underbrace{M_C ECA_{chronic}}_{LTA_{chronic}}\right)\right]$$

where: $mult_{AMEL}$ = statistical multiplier converting minimum LTA to AMEL
$mult_{MDEL}$ = statistical multiplier converting minimum LTA to MDEL
M_A = statistical multiplier converting CMC to LTA
M_C = statistical multiplier converting CCC to LTA

Human health ECAs are set equal to the AMEL and a statistical multiplier is used to calculate the MDEL.

$$MDEL_{HH} = \left(\frac{mult_{MDEL}}{mult_{AMEL}}\right) AMEL_{HH}$$

where: $mult_{AMEL}$ = statistical multiplier converting minimum LTA to AMEL
$mult_{MDEL}$ = statistical multiplier converting minimum LTA to MDEL
M_A = statistical multiplier converting CMC to LTA
M_C = statistical multiplier converting CCC to LTA

Table 1. UC Davis Center for Aquatic Biology and Aquaculture

Facility Effluent Data

	Aquatic Center Facility							Putah Creek Research Facility						
Date	Flow mgd	Cl mg/L	BOD mg/L	TSS mg/L	EC	Settleable Matter mg/L	Temperature °F	Flow	Cl mg/L	BOD mg/L	TSS mg/L	EC µMhos/cm	Settleable Matter mg/L	Temperature °F
Sep-03	0.8835				750	<0.1	65.5	0.3676				475	<0.1	61.7
Aug-03	0.6949				650	<0.1	64.9	0.5198				500	<0.1	63.5
Jul-03	0.8103	0.02	1.3	<5	690	<0.1	66.4	0.4698	0.02	2.6	<5	780	<0.1	66
Jun-03	0.7764				650	<0.1	63.5	0.6471				500	<0.1	63
May-03	0.837				640	<0.1	64.6	0.5921				540	<0.1	63.3
Apr-03	0.786	0.02	<1	<5	580	<0.1	64	0.5782	0.02	1.7	<5	540	<0.1	61.3
Mar-03	0.8597				700	<0.1	63.5	0.5867				550	<0.1	60.8
Feb-03	0.8984				650	<0.1	64.4	0.613				570	<0.1	60.8
Jan-03	0.9444	0.02	<1	6.3	700	<0.1	64	0.5725	0.02	<1	<5	500	<0.1	60
Dec-02	0.8999				650	<0.1	62.6	0.4412				350	<0.1	59
Nov-02	0.8844				650	<0.1	63.3	0.6001				350	<0.1	60.1
Oct-02	0.7636	0.02	2.4	5.3	500	<0.1	63.9	0.464	0.02	1.1	<5	400	<0.1	60.4
Sep-02	0.7203				500	<0.1	64	0.8084				350	<0.1	62.6
Aug-02	0.6981				500	<0.1	65.3	0.9571				350	<0.1	64
Jul-02	0.6595	0.02	1.8	1.8	500	<0.1	65.1	0.989	0.02	<1	<5	350	<0.1	63.3
Jun-02	0.6306				450	<0.1	65.2	0.7369				300	<0.1	64.6
May-02	0.6051				450	<0.1	64	0.6754				300	<0.1	63.2
Apr-02	0.5821	0.02	<1	<5	450	<0.1	62.6	0.647	0.02	1.4	<5	300	<0.1	63
Jan-02	0.6732				450	<0.1	63.5	0.6484				350	<0.1	62.2
Feb-02	0.7185				500	<0.1	61.5	0.7175				350	<0.1	59.9
Jan-02	0.7484	0.02	5.1	8.4	500	<0.1	60.4	0.705	0.02	1.3	<5	400	<0.1	58.5
Dec-01	0.612				500	<0.1	62.6	0.5118				350	<0.1	59.9
Nov-01	0.6079				450	<0.1	63.5	0.4269				300	<0.1	61.3
Oct-01	0.7636	0.02	5.9	12	450	<0.1	64.4	0.464	0.02	<1	<5	400	<0.1	61.7
Sep-01	0.7856				450	<0.1	64.4	0.5329				400	<0.1	61.7

Table 1. UC Davis Center for Aquatic Biology and Aquaculture

Facility Effluent Data

	Aquatic Center Facility							Putah Creek Research Facility						
Date	Flow mgd	Cl mg/L	BOD mg/L	TSS mg/L	EC	Settleable Matter mg/L	Temperature °F	Flow	Cl mg/L	BOD mg/L	TSS mg/L	EC µMhos/cm	Settleable Matter mg/L	Temperature °F
Aug-01	0.728				500	<0.1	65.3	0.6228				450	<0.1	63.1
Jul-01	0.5927	0.02	4.1	13	450	<0.1	64.4	0.535	0.02	<1	<5	300	<0.1	62.6
Jun-01	0.6086				500	<0.1	65.1	0.4858				400	<0.1	62.6
May-01	0.6639				525	<0.1	64.8	0.5723				400	<0.1	62.2
Apr-01	0.6552	0.02	2.7	9.5	500	<0.1	63.3	0.569	0.02	1.3	<5	450	<0.1	61
Mar-01	0.6108				500	<0.1	63	0.617				400	<0.1	59.7
Feb-01	0.7013				450	<0.1	63.5	0.6737				350	<0.1	59
Jan-01	0.691	0.02	1.9	<5	450	<0.1	61.7	0.6163	0.02	1	<5	300	<0.1	57.9
Dec-00	0.6868				450	<0.1	63.9	0.6481				350	<0.1	60.2
Nov-00	0.7001				450	<0.1	64.4	0.6377				300	<0.1	61.7
Oct-00	0.6934	0.02	<1	<5	550	<0.1	64.4	0.6517	0.02	<1	<5	400	<0.1	60.8
Sep-00	0.7112				550	<0.1	65.3	0.6325				400	<0.1	63
Aug-00	0.7861				450	<0.1	65.3	0.7407				350	<0.1	62.6
	Flow	Cl	BOD	TSS	EC	Settleable Matter	TEMP	Flow	Cl	BOD	TSS	EC	Settleable Matter	TEMP
AVERAGE	0.73	0.02	2.1	4.7	533	<0.1	63.99	0.62	0.02	0.87	<5	405	<0.1	61.64
MAX	0.94	0.02	5.9	13	750	<0.01	66.4	0.99	0.02	2.6	<5	780	<0.1	66

EFFLUENT LIMITATIONS

Federal regulations at 40 CFR 122.45(b)(2)(i) require that the calculation of any permit limitations, standards, or prohibitions be based not upon the designed production capacity (or other measure of operation) but rather upon a reasonable measure of actual production of the facility. The mass limitations in the previous Order were based on the design flow of the treatment facilities, which is 1.44 mgd each for the Aquatic Center facility and Putah Creek Research Facility. This Order contains mass limitations based on the long-term average discharge flow from both the Aquatic Center facility and the Putah Creek Research Facility. The long-term average flow for each discharge was based on flow data submitted from the Discharger in accordance with the prior Order (Table 1). The flow bases used to calculate the mass limitations are 0.74 million gallons per day (mgd) for the Aquatic Center facility and 0.62 mgd for the Putah Creek Research Facility.

WATER QUALITY-BASED EFFLUENT LIMITATIONS

1. **Chlorine:** Aquatic habitat is a beneficial use of Putah Creek. The Basin Plan includes a narrative water quality objective that "[a]*ll waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life*." Chlorine can cause toxicity to aquatic organisms when discharged to surface waters. U.S. EPA recommends, in its Ambient Water Quality Criteria for the protection of fresh water aquatic life, maximum 1-hour average and 4-day average chlorine concentrations of 0.02 mg/*l* and 0.01 mg/*l*, respectively.

   Chlorine and chlorine-containing solutions are occasionally used by the Discharger to clean and sanitize tanks and other components of the facility. Chlorine can cause toxicity to aquatic organisms when discharged to surface waters. The use of chlorine as a disinfectant presents a reasonable potential of a discharge in toxic concentrations.

   The previous Order contained a daily maximum limitation for residual chlorine of 0.02 mg/l. USEPA recommends, in their Ambient Water Quality Criteria for the protection of fresh water aquatic life, a maximum 1-hour average and a 4-day average chlorine concentrations of 0.019 mg/*l* and 0.011 mg/*l*, respectively. The previous limitation is not protective of aquatic habitat. Revised effluent limitations for chlorine, based on the Basin Plan narrative toxicity objective and Ambient Water Quality Criteria, have been included in this Order to protect the receiving stream aquatic life beneficial uses. A Maximum Daily Effluent Limitation (MDEL) was established by converting the 1-hour average criteria of 0.19 mg/L and 4-day average criteria of 0.011 mg/L into 99th percentile long-term average (LTA) values. The lowest LTA was then converted to an MDEL with a conversion factor based on the 99th

percentile and a 30-day frequency in sampling. Due to the intermittent nature of chlorine application at the CABA facility, a 4-day effluent limitation of 0.011 mg/L is included in this Order to protect against chronic impacts to aquatic life. The Discharger is expected to be able to comply with the new limitations upon adoption of this Order.

2. **Formalin and Malachite Green:** In information provided by Discharger on 8 October 2004, 20 October 2004, and 23 June 2006, formalin is administered in fish tanks by dissolving the mixture at an application rate of 150 ppm (or 150 mg/L). For each treatment, the application is once per day for five consecutive days. There are approximately 15 treatments per year.

   Formalin is approved through the US Food and Drug Administration's New Animal Drug Application (NADA) program for use in controlling external protozoa and monogenetic trematodes on fish, and for controlling fungi of the family *Saprolegniacae* in food-producing aquatic species (including trout and salmon). For control of other fungi, formalin may be used under an Investigational New Animal Drug (INAD) exemption. Information submitted with the Report of Waste Discharge indicates a typical usage rate and a historical minimum flow of 300 gallons per minute. Therefore, the estimated maximum calculated concentration of formalin in the discharge from Outfall 001, assuming no removal of formaldehyde, would be 90 µg/L formalin (33.4 µg/L as formaldehyde).

   As a Discharger at other fishery locations, the California Department of Fish and Game (DFG) Pesticide Unit conducted biotoxicity studies to determine the aquatic toxicity of formalin using *Pimephales promelas* and *Ceriodaphnia dubia* in accordance with the analytical methods specified in EPA600/4-91-002, *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*. These "short-term chronic tests" measure effects such as reduced growth of the organism, reduced reproduction rates, and lethality. Results were reported as a No Observed Effect Concentration (NOEC) and a Lowest Observed Effect Concentration (LOEC).

   The DFG Pesticide Unit also conducted acute toxicity tests using *Ceriodaphnia dubia* in accordance with methods specified in EPA600/4-90/027, *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms.* Acute toxicity test results typically are reported as the No Observed Adverse Effect Level (NOAEL), Lowest Observed Adverse Effect Level (LOAEL), and Lethal Concentration to fifty percent of the population (LC_{50}). Results of the DFG acute and chronic aquatic life toxicity testing and the Basin Plan narrative toxicity objective were considered in determining if water quality-based effluent limitations for formalin as formaldehyde are necessary.

Results of 7-day chronic toxicity tests indicated *Ceriodaphnia dubia* was the most sensitive species, with a 7-day NOEC value of 1.3 mg/l formaldehyde for survival and <1.3 mg/L for reproduction (the Regional Water Board used a NOEC of 1.3 mg/L). Acute toxicity tests conducted using *Ceriodaphnia dubia* showed a 96-hour NOAEL of 1.3 mg/l formaldehyde. Additional acute toxicity tests with *Ceriodaphnia dubia* were conducted using only an 8-hour exposure, resulting in a 96-hour NOAEL concentration of 6.7 mg/L formaldehyde. The USEPA Integrated Risk Information System (IRIS) reference dose, as a drinking water level, is 1.4 mg/L and the USEPA Drinking Water Health Advisory level is 1.0 mg/L. The taste and odor threshold for formaldehyde is 0.6 mg/l.

Based on the results of the toxicity tests and estimates of potential discharges of formaldehyde from the facility, formaldehyde may be discharged at levels that cause, or have the reasonable potential to cause, or contribute to an excursion of the narrative water quality objective for toxicity in the Basin Plan. Accordingly, this Order includes water quality-based effluent limitations for formaldehyde based on Basin Plan narrative toxicity objectives. The taste and odor threshold for formaldehyde has been established as a 30-day average effluent limitation based on the Basin Plan's chemical constituents objective.

The Discharger uses malachite green during treatments with formalin. Malachite green is used to treat ectoparasites such as gill flukes, Ich and Trichodina as well as bacteria and fungal infections. Information submitted with the Report of Waste Discharge shows the typical usage rate and a historical minimum flow of 300 gallons per minute. However, the Discharger has concern regarding the environmental impact of Malachite-Green and is therefore discontinuing the use of this chemical at the CABA facility

3. **Oxytetracycline:** The discharge of uneaten fish food contains some of the most significant pollutants discharged from CAAP facilities. In a letter dated 23 June 2006, the Discharger states that the antibiotic oxytetracycline is administered in feed formulations and dissolved in tanks to control acute disease outbreaks. However, the Regional Water Board has determined that oxytetracycline can be safely discharged when used in feed formulations. Oxytetracycline, used as a food additive in a manner consistent with associated BMPs, is released in minimal amounts in the facility effluent. Therefore, oxytetracycline, when used in feed formulations, is not likely to be discharged from the CABA facility at levels that would cause, have the reasonable potential to cause, or contribute to an excursion of Basin Plan narrative water quality objectives for toxicity. Effluent limitations for total suspended solids contained in this Order limit the amount of uneaten food to be released in the facility effluent.

Oxytetracycline is dissolved in tanks at an application rate of 20 mg/L. The typical usage rate and a historical minimum flow of 300 gallons per minute provides an estimated maximum calculated concentration of oxytetracycline in the discharge from

Outfalls D-001 and D-002 of 0.20 mg/L. The Regional Water Board considered the results of acute and chronic aquatic life toxicity testing conducted by the DFG Pesticide Unit for oxytetracycline used in an immersion bath treatment. Results of acute toxicity tests using *C. dubia* showed a 96-hour NOAEL of 40.4 mg/L. Results of chronic toxicity tests using *C. dubia* showed a 7-day NOEC for reproduction of 48 mg/L. The estimated maximum discharge concentration of 0.2 mg/L of oxytetracycline from the immersion treatments and the estimated maximum discharge concentration of 2.0 mg/L from the food treatment are both less than the lowest NOEC and NOAEL.

The DFG toxicity testing was based on immersion that introduces the antibiotic directly into the water column. The maximum concentration of oxytetracycline estimated in the Discharger's effluent from food formulation treatments is based on the conservative assumption that all of the Oxytetracycline would be discharged to the receiving waters. Accordingly, this Order does not include water quality-based effluent limitations for this substance; however, it does require reporting of its use as specified in the attached Monitoring and Reporting Program. When additional information becomes available regarding the use or toxicity of any of these substances, the Regional Water Board will re-evaluate whether their corresponding discharge may cause, have the reasonable potential to cause, or contribute to an excursion of Basin Plan objectives for toxicity. If necessary, this Order will be re-opened to include numeric effluent limitations.

4. **Nitrofurazone:** Nitrofurazone is bactericidal for many gram-positive and gram-negative bacteria that cause disease in fresh water and marine fishes. This antibacterial is effective for control of Aeromonas, Vibrio, and related species. Nitrofurazone is particularly useful for control of minor topical skin infections of marine fishes that have not become systemic (internal). The FDA has withdrawn approval for nitrofurazone to be used to treat food-producing animals, although nitrofurazone is allowed to be used for non-food producing animals. However, the Discharger has concern regarding Nitrofurazone as it is listed on the California Regulatory Notice Register of chemicals known to the State to cause cancer or reproductive toxicity (24 October 2003), and is therefore discontinuing the use of this chemical at the CABA facility.

5. **Sodium Chloride:** The Discharger reports that sodium chloride (salt) is used at the CABA facility at a rate of up to 35,000 mg/L. Sodium chloride is used as a stress reducer, an osmo-regulatory enhancer, and as a treatment for fish lice. The U.S. Food and Drug Administration (FDA) considers sodium chloride an unapproved new animal drug of low regulatory priority (LRP drug) for use in aquaculture. Consequently, the FDA is unlikely to take regulatory action if an appropriate grade is used, good management practices are followed, and local environmental requirements are met. The Discharger reports that the treatment level for fish lice is 3.5% (30,000mg/L) in a static bath. A maximum estimated effluent concentration of

sodium chloride is estimated to be approximately 30 mg/L sodium chloride following treatment.

In water, sodium chloride dissociates into sodium and chloride ions that contribute to total dissolved solids (TDS) concentrations. TDS are solids that can be dissolved in water. These solids may include carbonate, bicarbonate, chloride, sulfate, phosphate, nitrate, calcium magnesium, sodium, organic ions, and other ions. The salinity of wastewater is determined by measuring electrical conductivity (EC) to measure the ability of a water molecule to carry an electrical current, a property that is proportional to the concentration of ions in solution. When salts dissolve in water, ions are formed and the solution will conduct electricity. EC increases with salinity because of the increasing presence of ions (usually sodium and chloride ions).

There are no numeric water quality objectives for EC, TDS, or chloride in the NTR, CTR, or Basin Plan for Putah Creek. Domestic and municipal use as well as agricultural irrigation is a beneficial use of the receiving water. *Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1* (R.S. Ayers and D.W. Westcot, Rome, 1985), recommends that the EC level in waters used for agricultural irrigation not exceed 700 μmhos/cm (Agricultural Water Quality Goal) because it will reduce crop yield for sensitive plants. The Agricultural Water Quality Goal for TDS is 450 mg/L and the Secondary MCL for EC is 900 μmhos/cm. USEPA's recommended ambient water quality criteria for chloride for the protection of freshwater aquatic life, are 860 mg/l as a one-hour average and 230 mg/l as a four-day average. The Agricultural Water Quality Goal for chloride is 106 mg/L.

Electrical Conductivity: Because dissolved ions in water increase EC, the measures of TDS, chloride ions, and EC are related. Therefore, effectively controlling the level of EC in an effluent will also result in the presence of less TDS and chloride in the effluent. Due to the direct application of salt to water flowing through the facility and, therefore, the potential discharge of salt, the Regional Water Board has determined that the discharger may cause, have the reasonable potential to cause, or contribute to an in-stream excursion of the narrative water quality objective for chemical constituents. The receiving water, Putah Creek, periodically exceeds the 700 μmhos/cm recommended value for agricultural use.

Information submitted by the Discharger indicates that water for the CABA facility is supplied by pumped groundwater and Lake Berryessa surface water. Groundwater EC levels range from 620 umhos/cm to 873 umhos/cm. Lake Berryessa supply water EC levels range from 240 umhos/cm to 475 umhos/cm. Receiving water monitoring information submitted by the Discharger indicates that the EC level in Putah Creek upstream and downstream of the two discharge locations range from 238 umhos/cm to 569 umhos/cm.

The Discharger's effluent EC data for September 2003 through July 2006 indicates that the EC in the two discharges range from 542 umhos/cm to 795 umhos/cm for the Aquatic Center and from 450 umhos/cm to 800 umhos/cm for the Putah Creek Research Facility. Therefore, EC effluent limitations have been included in this Order to protect the beneficial uses of the receiving water. To be consistent with the Regional Water Board's current strategy of not allowing an increase of salinity discharges into surface waters that drain into the Delta, an average monthly effluent limitation (AMEL) of 800 μmhos/cm for the Aquatic Center and the Putah Creek Research Center have been established. These EC effluent limitations: (1) allow the Discharger to continue discharging their current amount of salinity until results of the Salinity Minimization Study, as required in this Order, are implemented, and (2) prevent the Discharger from increasing its current salinity loading to the receiving water. Data submitted by the Discharger demonstrates that the Discharger shall be able to comply with the EC limitations and consideration of a compliance schedule for EC is not necessary.

The Regional Water Board may reopen this Order to revise the EC effluent limitation if further information becomes available that concludes the monthly average EC limitation should be less than 800 umhos/cm to protect the beneficial uses of the receiving waters.

Additionally, given that an effluent limitation for EC is included, and because of the direct relationship between EC, TDS, and chloride, this Order does not include effluent limitations for TDS or chloride. However, in order to establish the specific relationship between EC and chloride in the effluent, EC and chloride monitoring are required when salt is being applied at the facility. Because the Discharger has control over the use of salt, the Discharger is expected to be able to comply with final limitations for EC upon adoption of this Order.

CTR CONSTITUENTS

1. **Cadmium:** In a 12 July 2006 letter to the Regional Water Board, the Discharger states that cadmium may potentially be used in future research activities. The CTR criterion for cadmium for aquatic life, after adjusted for hardness, is 2.65 μg/L, and the California primary MCL for cadmium is 5 μg/L. Effluent limitations have been established for cadmium based on the CTR criterion. Because the Discharger has control over the use of cadmium the Discharger is expected to be able to comply with final limitations upon adoption of this Order.

2. **Chromium:** Monitoring data provided by the Discharger included one sampling event that included detectable concentrations for total chromium. Total chromium was detected in effluent, at a maximum concentration of 23 μg/L for the Aquatic Center facility and 13 μg/L for the Putah Creek Research Facility. As stated in this Order, the Discharger failed to complete sampling as required in the previous

Order and in a CWC Section 13267 technical report requirement. In the limited sampling conducted, the Discharger did not differentiate between trivalent and hexavalent speciation of chromium.

In a 12 July 2006 letter to the Regional Water Board, the Discharger states that chromium may potentially be used in future research activities. The California primary MCL for total chromium is 50 μg/L. Effluent Limitations have been established for chromium based on the primary MCL criteria for human health. Because the Discharger has control over the use of chromium the Discharger is expected to be able to comply with final limitations upon adoption of this Order.

The Discharger is also required to monitor both hexavalent and trivalent chromium in the effluents from the Aquatic Center and the Putah Creek Research Facility in order to determine if limitations are necessary to protect water quality.

3. **Mercury:** In a 12 July 2006 letter to the Regional Water Board, the Discharger states that mercury compounds may potentially be used in research activities. The CTR human health criterion for mercury is 0.05 μg/L. Effluent Limitations have been established for mercury based on the CTR criterion. Because the Discharger has control over the use of mercury, and mercury compounds, the Discharger is expected to be able to comply with final limitations upon adoption of this Order.

4. **Selenium:** In a 12 July 2006 letter to the Regional Water Board, the Discharger states that selenium may potentially be used in research activities. The CTR aquatic life criterion for selenium is 5 μg/L. Effluent Limitations have been established for selenium based on the CTR. Because the Discharger has control over the use of selenium the Discharger is expected to be able to comply with final limitations upon adoption of this Order.

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

The following limitations were developed using the Best Professional Judgment of the Regional Water Board staff. These limitations are as stringent, or more stringent, than water quality based effluent limitations and will be protective of designated uses for the receiving stream.

Biochemical Oxygen Demand (5-day): Biochemical oxygen demand (BOD) is a measure of the amount of oxygen used in the biochemical oxidation of organic matter. Organic matter is discharged from aquaculture facilities primarily from feces and uneaten feed. Elevated levels of organic compounds contribute to eutrophication and oxygen depletion. The U.S. EPA has collected data from aquaculture facilities throughout the nation in support of the Effluent Limitation Guidelines and New Source Performance

Standards for the Concentrated Aquatic Animal Production Point Source Category, 40 CFR Part 451. Though not directly applicable to the Discharger, data contained in the Technical Development Document (EPA-821-R-04-012) demonstrate that the limitations for BOD (5-day) in the previous Order are protective of water quality. Order 99-017 established effluent limitations for BOD (5-day) of 10 mg/L monthly average, 15 mg/L weekly average, and 25 mg/L daily maximum that were technology-based limitations developed using best professional judgment. To protect beneficial uses, this Order maintains the BOD_5 Effluent Limitations established by the previous Order.

Total Suspended Solids (TSS): Solids are the largest pollutant loadings from aquaculture facilities. Proper management of flow through systems captures most of the generated solids. As stated in the Technical Development Document (EPA-821-R-04-012), "Suspended solids can degrade aquatic ecosystems by increasing turbidity and reducing the depth to which sunlight can penetrate, which decreases photosynthetic activity and oxygen production by plants and phytoplankton. Increased suspended solids can also increase the temperature of surface water since the particles absorb heat from the sunlight. Higher temperatures can result in lower dissolved oxygen (DO) levels and impact aquatic habitat.

Suspended solids can abrade and damage fish gills, increasing the risk of infection and disease. They can also cause a shift toward more sediment-tolerant species, reduce filtering efficiency for zooplankton in lakes and estuaries, carry nutrients and metals, adversely affect aquatic insects that are at the base of the food chain (Schueler and Holland, 2000), and harm fish development (Colt and Tomasso, 2001)." The previous Order established effluent limitations for TSS of 25 mg/L monthly average, 40 mg/L weekly average, and 65 mg/L daily maximum, which were technology-based limits developed using best professional judgment. These limitations will be protective of the narrative water quality objective for suspended material from the Basin Plan. In order to protect beneficial uses, this Order maintains the TSS Effluent Limitations established by the previous Order.

Settleable Solids: Solids are the largest pollutant loadings from aquaculture facilities. Proper management of flow through systems captures most of the generated solids. As stated in the Technical Development Document (EPA-821-R-04-012), "As sediment settles, it can smother fish eggs and bottom-dwelling organisms, interrupt the reproduction of aquatic species, destroy habitat for benthic organisms (USEPA, 2000) and fish spawning areas. Deposited sediments also increase the sediment oxygen demand, which can deplete DO in lakes or streams (Schueler and Holland, 2000). Order No. 99-017 established effluent limitations for Settleable Solids of 0.1 mg/L daily maximum. This limitation complies with the narrative water quality objective from the Basin Plan that states "waters shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses". In order to ensure attainment of beneficial uses, this Order carries over the Settleable Solids Effluent Limitations established by the previous Order.

OTHER CONSTITUENTS

pH: In accordance with Basin Plan requirements, the previous Order established a discharge pH range of not less than 6.5 or greater than 8.5. To insure that the discharge from this facility is not a detriment to the aquatic life in the receiving water, the discharge to the South Fork of Putah Creek shall not have a pH less than 6.5 or greater than 8.5.

Toxicity: The Basin Plan states that "All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. This objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances….The survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality factors shall not be less than that for the same water body in areas unaffected by the waste discharge…." The Basin Plan requires that "as a minimum, compliance with this objective…shall be evaluated with a 96-hour bioassay." This Order requires both acute and chronic toxicity monitoring to evaluate compliance with this water quality objective. The Basin Plan also states: "…effluent limits based upon acute biotoxicity tests of effluents will be prescribed where appropriate…" Effluent limitations for acute toxicity are included in this Order.

The frequency of chronic toxicity monitoring, including Whole Effluent Toxicity Testing, is continued from the previous Order. If a trend of toxicity is observed, the Discharger shall be required to develop and conduct a toxicity identification evaluation (TIE) and toxicity reduction evaluation (TRE) plan that includes a schedule for plan implementation.

PONDS SPECIFICATIONS

The Discharger utilizes an evaporation/percolation pond for the disposal of wastewater from the Aquatic Disease Lab located at the Aquatic Center facility. Wastewater from all other laboratories in the Aquatic Center facility and from the Putah Creek Research Facility is circulated through settling ponds (Jamison Pond and Beaver Pond) prior to discharge to the South Fork of Putah Creek. This Order contains monitoring and reporting requirements for the settling ponds assure degradation of the groundwater does not take place and requires the Discharger to implement best management practices for mosquito and vector control measures.

Aquatic Center facility wastewater may be used for irrigation of adjacent agricultural land owned by the Discharger. This Order contains effluent limitations for Aquatic Center facility that supports the use of this effluent for agricultural irrigation purposes. Putah Creek Research Facility wastewater may be diverted to a series of ponds used for ecosystem studies. This Order requires that no wastewater be discharged from an evaporation/percolation pond and that it be free from nuisance conditions. Nuisance conditions from ponds are typically found when strong odors occur when the dissolved oxygen concentration is allowed to drop below 1.0 mg/L. This Order requires that the dissolved oxygen concentration be maintained above 1.0 mg// in the upper one-foot of water in the ponds and that a minimum pond freeboard of one foot be maintained to prevent overtopping.

RECEIVING WATER LIMITATIONS AND MONITORING

Dissolved Oxygen: Potential cold freshwater aquatic habitat is designated as a beneficial use of Putah Creek. For water bodies designated as having cold freshwater aquatic habitat as a beneficial use, the Basin Plan includes a water quality objective of maintaining a minimum of 7.0 mg/L of dissolved oxygen. In order to assure attainment of the Basin Plan requirement for the protection of the cold freshwater aquatic habitat beneficial use, this Order contains a new receiving water limitation of 7.0 mg/L for dissolved oxygen.

For surface water bodies outside of the Delta, the Basin Plan requires that "…the monthly median of the mean daily DO concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percentile concentration shall not fall below 75 percent of saturation." This objective is included as a receiving water limitation in the Order. In addition, this Order requires DO monitoring of the facility's effluent to better understand the relationship between the effluent and the condition of the receiving stream.

pH: For all surface water bodies in the Sacramento River and San Joaquin River basins, the Basin Plan includes a water quality objective for pH in surface waters, which states: "The pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh water with designated COLD and WARM beneficial uses." This Order requires monitoring upstream and downstream from both discharge locations to ensure compliance with this requirement.

Temperature: The Basin Plan includes the following objective: "At no time or place shall the temperature of COLD or WARM intrastate waters be increased more than 5ºF above natural receiving water temperature." This Order applies the Basin Plan water quality objective for temperature directly as a receiving water limitation, based on Basin Plan and Thermal Plan requirements at locations R-1, R-2, R-3, and R-4.

Turbidity: The Basin Plan states that: "Waters shall be free of changes in turbidity that cause nuisance or adversely effect beneficial uses." Based on Basin Plan objectives, this Order requires that increases in turbidity attributable to controllable water quality factors not exceed the following:

- 1 Nephelometric Turbidity Unit (NTU) where natural turbidity is between 0 and 5 NTUs
- 20 percent where natural turbidity is between 5 and 10 NTUs
- 10 NTUs where natural turbidity is between 50 and 100 NTUs
- 10 percent where natural turbidity is greater than 100 NTUs

SPECIAL STUDIES AND ADDITIONAL MONITORING REQUIREMENTS

Constituent Study. On 2 March 2000, the State Water Resources Control Board adopted the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California*, also known as the State Implementation Policy (SIP). The SIP established methods of evaluating receiving water criteria and developing effluent limitation in NPDES Permits for the priority pollutants contained in the U.S. Environmental Protection Agency's (USEPA) *California Toxics Rule* and portions of USEPA's *National Toxics Rule*. Section 1.2 of the SIP directs the Regional Water Board to require all NPDES dischargers, pursuant to California Water Code Section 13267, to submit data sufficient to (1) determine if priority pollutants require effluent limitations (reasonable potential analysis) and (2) calculate water quality-based effluent limitations. Further, Section 2.4 of the SIP requires that each discharger submit to the Regional Water Boards reports necessary to determine compliance with effluent limitations for priority pollutants in permits. Sections 2.4.1 through 2.4.4 of the SIP provide minimum standards for analyses and reporting. (Copies of the SIP may be obtained from the State Water Resources Control Board, or downloaded from http://www.waterboards.ca.gov/iswp/index.html) To implement the SIP, effluent and

receiving water data are needed for all priority pollutants. Effluent and receiving water pH and hardness are required to evaluate the toxicity of certain priority pollutants (such a heavy metals) where the toxicity of the constituents varies with pH and/or hardness. Section 3 of the SIP prescribes mandatory monitoring of dioxin congeners.

In addition to the specific requirements of the SIP, the Regional Water Board is requiring the following monitoring needed for permit development:

Drinking water constituents. Constituents for which drinking water Maximum Contaminant Levels (MCLs) have been prescribed in the California Code of Regulation are included in the *Water Quality Control Plan, Fourth Edition, for the Sacramento and San Joaquin River Basins* (Basin Plan). The Basin Plan defines virtually all surface waters within the Central Valley Region as having existing or potential beneficial uses for municipal and domestic supply. The Basin Plan further requires that, at a minimum, water designated for use as domestic or municipal supply shall not contain concentrations of chemical constituents in excess of the MCLs contained in the California Code of Regulations.

Effluent and receiving water temperature. This is both a concern for application of certain temperature-sensitive constituents, such as fluoride, and for compliance with the Basin Plan's thermal discharge requirements.

Effluent and receiving water hardness and pH. These are necessary because several of the CTR constituents are hardness or pH dependent.

Dioxin and furan sampling. Section 3 of the SIP has specific requirements for the collection of samples for analysis of dioxin and furan congeners, which are detailed in Attachment B. Briefly, dischargers classified as minor must collect and analyze one wet season and one dry season sample.

Pursuant to Section 13267 of the California Water Code, this Order includes a requirement for the Discharger to submit monitoring data for the effluent and receiving water as described in Attachment B.

GROUNDWATER STUDIES AND MONITORING

The Water Quality Control Plan for the Basin Plan designates beneficial uses, establishes narrative and numerical water quality objectives, and contains implementation plans and policies for protecting all waters of the Basin. The Basin Plan includes plans and policies of the State Water Board incorporated by reference. Pursuant to CWC Section 13263(a), waste discharge requirements must implement the Basin Plan and, by extension, the beneficial uses of surface and groundwaters potentially affected by the discharge.

The Basin Plan defines groundwater as including "all subsurface waters that occur in fully saturated zones and fractures within soils and other geologic formations" (page I-1.00) and designates the beneficial uses of groundwater in the discharge area as municipal (MUN) and domestic supply, agricultural supply (AGR), industrial service supply (IND), and industrial process supply (PROC).

The Discharger is required to submit a *Monitoring Well Installation Work Plan* consistent with, and include the items listed in *Requirements for Monitoring Well Installation Work Plans and Monitoring Well Installation Reports.* The *Monitoring Well Installation Work Plan* must evaluate the hydrogeology of the groundwater aquifer between the Aquatic Center effluent pond and Putah Creek and address the potential hydraulic flow between the groundwater and the surface water. The plan must include supporting information that addresses whether data from a groundwater monitoring well between the Aquatic Center pond and Putah Creek will provide water quality information that differs from receiving water quality data. The Discharger is permitted to use existing groundwater monitoring wells 4A, 3A, and 14A, as shown in Attachment A, for monitoring of groundwater from the Putah Creek Research Facility.The network's monitoring wells will be constructed to yield representative samples from the first saturated zone, and deeper zones as necessary, to evaluate the discharge's impact on groundwater. All wells will comply with appropriate standards as described in *California Well Standards Bulletin 74-90* (June 1991) and *Water Well Standards: State of California Bulletin 94-81* (December 1981), and any more stringent standards adopted by the Discharger or Yolo County pursuant to CWC Section 13801. The proposed network should include existing monitoring wells where they will serve to measure compliance or provide other relevant information (e.g., depth to groundwater).

The Discharger will install approved monitoring wells, properly remove ineffective wells (as necessary), and monitor groundwater in accord with this Order's MRP. Following well installation, the Discharger shall submit a *Monitoring Well Installation Report* consistent with, and include the items listed in, Section 2 of *Requirements for Monitoring Well Installation Work Plans and Monitoring Well Installation Reports.* The Discharger will continue to monitor groundwater in existing monitoring wells in accordance with the MRP unless and until individual existing wells are removed from the approved network. After the first sampling event, the Discharger is required to report on its sampling protocol as specified in this Order's MRP. After one year of monitoring, the Discharger will characterize natural background quality of monitored constituents in a technical report. The report shall present a summary of monitoring data and determine natural background quality for each parameter/constituent identified in the MRP based on data from at least eight consecutive groundwater monitoring events using the methods described in Title 27, Section 20415(e)(10). For each parameter/constituent, the report shall compare measured concentrations in wells used to monitor impacts from the discharge against the calculated natural background concentration, as well as the interim numeric groundwater limitations.

The following compliance schedule in implementing the work is required:

Task	Compliance Date
Submit Monitoring Well Installation Work Plan (See Attachment C)	Within 120 days following Order adoption
Implement monitoring well installation work plan	30 days following completion of task A
Complete monitoring well installation and well destruction and commence groundwater monitoring from newly installed wells	60 days following completion of task B
Submit Monitoring Well Installation Report	30 days following completion of task C
Submit technical report on sampling procedures and proposed Data Analysis Methods as described in the MRP	1st day of the second month following the first sampling event
Submit technical report: natural background quality	365/730 days following completion of task E

Technical reports submitted pursuant to this Provision shall be subject to the requirements of the Standard Provisions and are subject to Executive Officer approval.

GENERAL EFFLUENT LIMITATION INFORMATION

Selected 40 CFR Section 122.2 definitions:

Average monthly effluent limitation (AMEL) means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

Average weekly discharge limitation means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week.

Continuous discharge means a "discharge" which occurs without interruption throughout the operating hours of the facility, except for infrequent shutdowns for maintenance, process changes, or other similar activities.

Daily discharge means the "discharge of a pollutant" measured during a calendar day or any 24-hour period that reasonable represents a calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

Maximum daily effluent limitation (MDEL) means the highest allowable "daily discharge".' 40 CFR §122.45 states that:

> (b)(2)(i) "Calculation of any permit limitations, standards, or prohibitions which are based on production (or other measure of operation) shall be based not upon the designed production capacity buy rather upon a reasonable measure of actual production of the facility."
>
> (f) "All pollutants limited in permits shall have limitations, standards, or prohibitions expressed in terms of mass except: [f]or pH, temperature, radiation, or other pollutants which cannot appropriately be expressed by mass…Pollutants limited in terms of mass additionally may be limited in terms of other units of measurement, and the permit shall require the permittee to comply with both limitations."

USEPA recommends a maximum daily limitation rather than an average weekly limitation for water quality based permitting.