

## 25.1 Environmental Setting/Affected Environment

### 25.1.1 Potential Environmental Effects Area

#### 25.1.1.1 Drinking Water

##### Constituents of Concern

##### Trace Metals

Trace metals occur naturally in the environment, and can be toxic to human and aquatic life in high concentrations. Trace metals include aluminum, arsenic, cadmium, copper, iron, lead, nickel, silver, and zinc. The beneficial uses of Delta waters most affected by trace metal concentrations include aquatic life uses (cold freshwater habitat, warm freshwater habitat, and estuarine habitat), harvesting activities that depend on aquatic life (shellfish harvesting, commercial and sport fishing), and drinking water supplies (municipal and domestic supply) (See Table 8-1 in Chapter 8, *Water Quality*).

#### 25.1.1.3 Pathogens

The Delta is commonly used for various recreational activities such as boating, swimming, and fishing. Because the waterways within the Delta have the potential to contain common pathogens (disease-causing micro-organisms), direct contact or ingestion can affect human health. Pathogens of concern include bacteria, such as *Escherichia coli* (*E. coli*) and *Campylobacter*; viruses, such as hepatitis and rotavirus; and protozoa, such as *Giardia* and *Cryptosporidium*. Sampling for bacterial and viral pathogens involves collection of data for fecal indicators, such as total coliform or fecal coliform.

##### Overview

Sources of pathogens include wild and domestic animals, aquatic species, urban stormwater runoff, discharge from wastewater treatment plants, and agricultural point and nonpoint sources such as confined feeding lots. Pathogens that have animal hosts can be transported from the watershed to source waters from grazed lands and cattle operations; aquatic species such as waterfowl also contribute pathogens directly to water bodies. Stormwater runoff from urban or rural areas can contain pathogens carried in waste from domestic pets, birds, or rodents, as well as sewage spills. Although some pathogens have the ability to colonize within sediments, current research has not addressed this behavior in the Central Valley (Tetra Tech 2007), so information regarding effects of colonization within sediments is limited. Furthermore, sediment disturbance would be limited to localized areas under the alternatives since, based on the pathogen conceptual model (discussed in Section 25.3.1.2, *Pathogens and Water Quality*), pathogen concentrations experience a rapid die-off the farther they travel from their source; thus, this issue is not discussed further.

1 Pathogen transport into Delta waterways can be expected to be higher during initial wet weather  
2 events, since they are carried by stormwater and agricultural runoff into the study area (as was  
3 observed with fecal coliform indicators by Tetra Tech (2007). ~~Although transport rates are initially~~  
4 ~~increased during wet weather events, the increased availability of water to the Delta helps to reduce~~  
5 ~~pathogen viability during these instances.~~ Other sources of pathogens include wetland and  
6 inundated restoration areas due to increased biological activity associated with these habitats (e.g.,  
7 birds and fish species).

8 ~~In most instances, pathogens in drinking water sources are removed by filtration or bio-membranes,~~  
9 ~~or are destroyed by disinfection. Infections in humans may arise from pathogens that break through~~  
10 ~~standard treatment processes implemented at drinking water sources. Humans can be exposed to~~  
11 ~~and infected by certain pathogens (e.g., *E. coli*) in contaminated rivers, lakes, and coastal waters~~  
12 ~~while participating in recreational activities including swimming, water skiing, surfing, and boating.~~  
13 ~~Waterborne pathogenic microbes are capable of causing illness in people in a dose-dependent way~~  
14 ~~and depending on the physical condition of the individual(s) exposed. Exposure to waterborne~~  
15 ~~pathogens does not always result in infection, and infection with a pathogen does not always result~~  
16 ~~in clinical illness (Pond 2005). Infection in humans may also result from food ingestion or the~~  
17 ~~ingestion of untreated water during recreation.~~

18 Although there are many potential pathogens that enter Delta waterways, the presence of pathogens  
19 identified in Table 25-33 is tested by wastewater treatment service districts, public drinking water  
20 service districts, and other public agencies as needed (e.g., Department of Public Health).

1 **Table 25-3. Pathogens**

Pathogen	Description and Source	Method of Transmittal	Public Health Concern
<i>Escherichia coli</i>	Anaerobic bacterium that lives in the gastrointestinal tract of warm-blooded animals	Fecal contamination by human waste, wastewater, or animal wastes	Generates toxicants that can result in diarrhea, inflammation, fever, and bacillary dysentery. Certain strains of <i>E. coli</i> can be severely toxic to some patients, particularly children, causing destruction of red blood cells and occasional kidney failure (Tetra Tech 2007)
<i>Campylobacter</i>	Present in the gastrointestinal tract of cattle, pigs, and poultry	Natural waters	Causes bacterial gastroenteritis. In rare cases, <i>Campylobacter</i> infection may be followed by Guillain-Barre Syndrome, a form of neuromuscular paralysis
Hepatitis	Viruses such as Hepatitis A and E	Fecal-oral route and via contaminated food and water	Causes liver inflammation
Rotavirus	Virus	Fecal-oral route and via contaminated food and water	Causes diarrhea
Giardia	Parasite found in the intestinal linings of a wide range of animals and their feces, and in contaminated water	Wastewater	Causes diarrhea and abdominal pain
<i>Cryptosporidium</i>	Single-celled, intestinal parasites that infect humans and a variety of animals	Wastewater	Diarrhea, stomach cramps, upset stomach, and slight fever; more serious symptoms can result in weakened immune systems (U.S. Environmental Protection Agency 1999). Major cause of gastrointestinal illness

2

3 **Water Treatment**

4 EPA's Surface Water Treatment Rules (SWTR [\[discussed in detail in Section 25.2.2.5\]](#)) require that  
5 [public water](#) systems using surface water or groundwater under the direct influence of surface  
6 water (1) disinfect water to destroy pathogens, and (2) either meet criteria for avoiding filtration or  
7 filter water to remove pathogens so that the contaminants are controlled at the following levels (U.S.  
8 Environmental Protection Agency 2013).

- 9
- 10 • Total Coliform: No more than 5.0% of samples for total coliform are positive in a month (for  
11 water systems that collect fewer than 40 routine samples per month, no more than one sample  
12 can be total coliform-positive per month). Every sample that is positive for total coliform must  
13 be analyzed for either fecal coliform or *E. coli*. If two consecutive total coliform-positive samples  
14 occur, and one is also positive for *E. coli*/fecal coliform, the system is deemed as having an acute  
maximum contaminant level (MCL) violation.

- 1 • Viruses: 99.99% removal/inactivation.
- 2 • *Giardia lamblia*: 99.9% removal/inactivation.
- 3 • *Cryptosporidium*: 99% removal.

4 Water treatment processes that are focused on the removal of particulates, such as filtration and  
 5 bio-membranes, are generally effective at removing pathogens. Disinfection of bacteria pathogens  
 6 can be achieved effectively through either chemical oxidation using chlorine or ozone, or through  
 7 exposure to ultraviolet light. Viruses can also be removed effectively through chlorine or ozone  
 8 oxidation. The treatment of protozoa is more challenging, as cysts and oocysts of protozoa cannot be  
 9 fully removed by sand filtration and are resistant to chemical disinfection; however, disinfection  
 10 using ultraviolet light and ozonation has been found to be effective (Tetra Tech 2007).

## 11 Study Area

12 There are numerous potential sources of pathogens in the study area, including urban runoff,  
 13 wastewater treatment discharges, agricultural discharges, and wetlands (Tetra Tech 2007).  
 14 Specifically, tidal wetlands are known to be sources of coliforms originating from aquatic, terrestrial,  
 15 and avian wildlife that inhabit these areas (Desmarais et al. 2001; Grant et al. 2001; Evanson and  
 16 Ambrose 2006; Tetra Tech 2007).

17 Although this chapter represents an effort to fully disclose existing conditions of pathogens in the  
 18 study area, the variable nature of pathogen and indicator concentrations in surface waters, and the  
 19 rapid die-off of many of these organisms in the ambient environment, makes it very difficult to  
 20 quantify the importance of different sources on a scale as large as the Central Valley, especially for  
 21 coliforms that are widely present in water under a variety of conditions. A single source in proximity  
 22 to the sampling location can dominate the coliform concentrations observed at a location  
 23 downstream of several thousand square miles of watershed.

24 Of the known sources that deposit coliforms into the waters of the Central Valley, it was found that  
 25 wastewater total coliform concentrations for most plants were low (less than 1,000 most probable  
 26 number [MPN]/100 milliliters [ml]), whereas the highest total coliform concentrations in water  
 27 (greater than 10,000 MPN/100 ml) were observed near samples influenced by urban areas (Tetra  
 28 Tech 2007). In the San Joaquin Valley, comparably high concentrations of *E. coli* were observed for  
 29 waters affected by urban areas and intensive agriculture (Tetra Tech 2007). Fecal indicator data  
 30 showed minimal relationships with flow rates, although most of the high concentrations were  
 31 observed during the wet months of the years, possibly indicating the contribution of stormwater  
 32 runoff (Tetra Tech 2007).

33 Data for *Cryptosporidium* and *Giardia* along the Sacramento River showed that these parameters  
 34 were often not detected, and when detected the concentrations were generally low, typically less  
 35 than one organism per liter (Tetra Tech 2007). The incidence of these pathogens could be caused by  
 36 the presence of natural or artificial barriers that limit transport to water and by the significant die-  
 37 off of oocysts that do reach the water, as well as by limitations in the analytical detection of  
 38 *Cryptosporidium* oocysts in natural waters (Tetra Tech 2007).

39 There was limited pathogen data at the locations examined, as indicated by Tetra Tech (2007).  
 40 Where data were collected, these parameters were often not detected. However, when they were  
 41 detected, the concentrations were typically less than one organism per liter. Pathogen

1 concentrations are highly variable in time and space; monitoring programs that adequately address  
2 these constraints are very limited.

3 Pathogens are listed on the Section 303(d) list for the Stockton Deep Water Ship Channel (SDWSC),  
4 with sources including recreational and tourism activities (non-boating) and urban runoff/storm  
5 sewers. The Basin Plan addresses this on the basis of water contact recreation such that fecal  
6 coliform (minimum 5 samples in any 30-day period) shall not exceed a geometric mean of 200  
7 organisms/100 ml, nor shall more than 10% of the total number of samples taken during any 30-day  
8 period exceed 400 organisms/100 ml. These criteria have been exceeded at several of the water  
9 quality sampling locations in the Delta (Tetra Tech 2007). The Basin Plan water quality objectives  
10 for pathogens are detailed in Appendix 8A of Chapter 8, *Water Quality*. ~~It was determined in the  
11 report by Tetra Tech (2007) that the data are inadequate to assess if the sites examined exceeded  
12 these standards. California drinking water MCLs do not exist for pathogens.~~

### 13 25.1.1.4 Microcystis

14 Microcystis aeruginosa (Microcystis) is a species of cyanobacteria or blue-green algae that produces  
15 the cyanotoxin microcystin. Microcystin is a liver toxin and is the most widespread of the  
16 cyanotoxins. Microcystis is a photosynthetic bacterium which is naturally occurring in lakes,  
17 streams, ponds, and other surface waters. Because Microcystis is commonly found in surface water,  
18 microcystin is of relevance to drinking water supplies and recreational waters, and therefore to  
19 public health. In addition to producing surface scums that interfere with recreation and cause  
20 aesthetic problems, microcystin also produces taste and odor compounds.

#### 21 Overview

22 There are at least 80 known microcystins, including microcystin-LR, which is generally considered  
23 one of the most toxic (U.S. Environmental Protection Agency 2012c). Microcystin-LR is the most  
24 widely studied congener of the known microcystins, and it has been associated with most incidents  
25 of toxicity involving microcystins. Microcystis blooms can cause toxicity to phytoplankton,  
26 zooplankton, and fish, and also can affect feeding success or food quality for zooplankton and fish.  
27 Although cyanotoxins break down slowly over time in full sunlight, they are very stable and can  
28 withstand boiling, indicating that cooking is not sufficient to destroy the toxins (California  
29 Environmental Protection Agency 2009). There are many reports of a variety of health effects in  
30 addition to liver damage(e.g., diarrhea, vomiting, blistering at the mouth, headache) following  
31 human exposure to blue-green algae toxins (cyanobacteria) in drinking water or from swimming in  
32 water in which are present. Such effects can occur within minutes to days following exposure to  
33 cyanotoxins (World Health Organization 2003). However, there are no reported cases of human  
34 deaths occurring from microcystin ingestion (California Environmental Protection Agency 2009).

35 Water treatment can effectively remove cyanotoxins in drinking water supplies. However, some  
36 treatment options are effective for some cyanotoxins, but not for others (U.S. Environmental  
37 Protection Agency 2012d). Thus, operators of drinking water treatment systems must remain  
38 informed about the growth patterns and species of blue-green algae blooming in their surface water  
39 supplies to determine appropriate treatment or actions, and monitor treated water for cyanotoxins.

40 Blooms of Microcystis require high levels of nutrients and low turbidity, but also require sufficiently  
41 high water temperature (i.e., above 19°C) and long hydraulic residence time (low flow), since the  
42 species is fairly slow growing (Lehman et al. 2008; Lehman et al. 2013). In addition, low vertical

1 mixing associated with long hydraulic residence time allows *Microcystis* colonies to float to the  
 2 surface of the water column, where they out compete other species for light.

3 The World Health Organization released a provisional drinking water guideline for microcystin-LR  
 4 in 1998. The guideline value for drinking water for microcystin-LR is 1.0 micrograms per liter  
 5 (µg/L), which is an advisory value developed to protect against adverse liver effects associated with  
 6 human consumption of this toxin. For recreational waters, the World Health Organization has issued  
 7 multiple guidance values for the relative probability of acute health effects due to recreational  
 8 exposure to cyanobacteria and microcystins because of the variety of possible exposures routes via  
 9 recreational activities (e.g., direct contact, ingestion, and inhalation) (Table 25-4). No federal  
 10 regulatory guidelines for cyanobacteria or their toxins in drinking water or recreational waters exist  
 11 at this time in the United States. Guidance values for microcystin and other cyanotoxins in drinking  
 12 water have been adopted by three states (Minnesota, Ohio, and Oregon) and guidance values for  
 13 recreational water have been adopted by 20 states, including California (U.S. Environmental  
 14 Protection Agency 2014). The advisory value for microcystin for recreational waters in California is  
 15 0.8 µg/L.

16 **Table 25-4. World Health Organization Guidance Values for the Relative Probability of Acute**  
 17 **Health Effects During Recreational Exposure to Cyanobacteria and Microcystins**

<u>Relative Probability of Acute Health Effects</u>	<u>Cyanobacteria (cells/ml)</u>	<u>Microcystin-LR (µg/L)</u>
<u>Low</u>	<u>&lt; 20,000</u>	<u>&lt; 10</u>
<u>Moderate</u>	<u>20,000 – 100,000</u>	<u>10 – 20</u>
<u>High</u>	<u>100,000 – 10,000,000</u>	<u>20 – 2,000</u>
<u>Very High</u>	<u>&gt; 10,000,000</u>	<u>&gt; 2,000</u>

Source: U.S. Environmental Protection Agency 2014  
 Notes: cells/ml = cells per milliliter; µg/L = micrograms per liter.

## 19 Study Area

20 Like other types of algae, under favorable conditions *Microcystis* can multiply rapidly in surface  
 21 water and cause algal “blooms” (U.S. Environmental Protection Agency 2012c). As described in  
 22 Chapter 8, *Water Quality*, water temperatures greater than 19°C, low water velocities, and high  
 23 water clarity are conditions necessary for *Microcystis* levels to reach bloom-forming scale (Paerl  
 24 1988; Lehman et al. 2008; Lehman et al. 2013). Water temperature is considered the primary factor  
 25 that restricts bloom development to the months of June through September (Lehman et al. 2013).

26 Sufficiently high water temperature (i.e., 19°C), low flow and thus sufficiently long hydraulic  
 27 residence time, and increased clarity enable bloom formation, which occurs in the San Joaquin River,  
 28 Old River, and Middle River earlier than other areas of the Delta. Blooms of *Microcystis* have been  
 29 observed from June to November throughout the freshwater Delta since 1999 (Lehman et al. 2005,  
 30 2008), with peaks in abundance in September (Acuña et al. 2012). Lehman and coauthors (2010)  
 31 found abundance greatest in the western and central Delta, with the highest densities near Old River  
 32 at Rancho Del Rio and the San Joaquin River at Antioch. The Delta’s shallow, submerged islands  
 33 sustain high levels of *Microcystis* during the growing season because the physical drivers of bloom  
 34 formation are amplified in these areas due to low flushing rates (Lehman et al. 2008). Although  
 35 elevated pH is tolerated by *Microcystis*, pH is not currently thought to be a primary driver of

1 seasonal and interannual variation in bloom formation (Lehman et al. 2013). Similarly, nutrient  
 2 concentrations/ratios for constituents such as nitrogen and phosphorus do not appear to control  
 3 seasonal or interannual variation in bloom formation.

4 As discussed in Chapter 8, Water Quality, issues related to *Microcystis* blooms upstream of the Delta  
 5 have only occurred in highly eutrophic lakes, such as Clear Lake, because most upstream reservoirs  
 6 have relatively low nutrient levels. Hydrodynamic conditions of upstream rivers and watersheds are  
 7 not conducive to *Microcystis* bloom formation. Problematic *Microcystis* blooms have not occurred in  
 8 the Export Service Areas, but microcystins produced in waters of the Delta have been exported from  
 9 Banks and Jones pumping plants to the SWP and CVP (Sanitary Survey Update 2011).

## 10 **25.1.1.425.1.1.5 Vectors**

11 The vector of most concern in the study area is the mosquito because it is considered a nuisance to  
 12 the public through irritating bites and can transmit various diseases, including the West Nile virus  
 13 (WNV), to birds and humans. Recently, two invasive species of mosquitoes that can potentially  
 14 transmit dengue<sup>1</sup> and chikungunya<sup>2</sup> viruses have been detected in Madera, Fresno, San Diego, San  
 15 Mateo, Kern, and Tulare counties (*Aedes aegypti*), and in Los Angeles County (*Aedes albopictus* and  
 16 *Aedes aegypti*) (California Department of Public Health 2014c). *Aedes albopictus* (Asian tiger  
 17 mosquito) and *Aedes aegypti* (yellow fever mosquito). Currently, the risk of local dengue or  
 18 chikungunya transmission is low, and there have been no reported cases of either of these diseases  
 19 that have been acquired in California. Therefore, these mosquito species and diseases are not  
 20 discussed further.

21 The focus of this section is on public nuisances associated with mosquito-borne diseases  
 22 transmitted to humans. This section provides a description of the habitat and life history of  
 23 mosquito species that exist in the study area.

### 24 **Overview**

25 Different cropping and land use patterns create differing amounts of suitable mosquito breeding  
 26 habitat, which affect mosquito prevalence in the study area. Currently, the Delta consists primarily  
 27 of agricultural lands and tidal, riparian and other water-related habitat that can provide suitable  
 28 habitat for mosquitoes to breed and multiply. Deep, open-water habitats are poor mosquito  
 29 breeding areas because the wave action generated over water bodies disrupts the ability of larvae to  
 30 penetrate the water surface, and because vegetation necessary for egg laying and larvae survival is  
 31 lacking (U.S. Fish and Wildlife Service 1992). Tidally influenced marshes that lack sufficient tidal  
 32 flow can provide suitable breeding habitat for mosquitoes (Kramer et al. 1992, 1995). The optimal  
 33 conditions for mosquitoes to carry out their complete growth and reproduction cycles can be found  
 34 in areas of standing water with non-stagnant pond surface water, such as ponds subject to daily tide

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<sup>1</sup> Dengue is a mosquito-borne infection transmitted principally by the yellow fever mosquito and secondarily  
by the Asian tiger mosquito. With the exception of parts of Mexico, Puerto Rico, and small areas in southern  
Texas and southern Florida, dengue transmission does not occur in North America. Dengue virus cannot be  
transmitted from person to person (California Department of Public Health 2014a).

<sup>2</sup> Chikungunya is a viral disease transmitted by the yellow fever mosquito and the Asian tiger mosquito. In  
California, chikungunya infections have been documented only in people who acquired the virus while  
travelling outside the United States; Chikungunya is not a contagious disease (California Department of Public  
Health 2014b).



1 flushes or wind-driven wave action. The majority of mosquitoes lay eggs on the surface of fresh or  
 2 stagnant water. The water may be in various stagnant water locations, such as tin cans, barrels,  
 3 horse troughs, ornamental ponds, swimming pools, puddles, creeks, ditches, catch basins, or marshy  
 4 areas. The breeding habitat varies depending on the species of mosquito. The majority of mosquito  
 5 species prefer water sheltered from the wind by grass and weeds.

6 The availability of preferable mosquito breeding habitat varies by season, and is reduced during dry  
 7 periods of the year. Available open water habitat can be expected to increase during the wet season;  
 8 however, changes in flow volume in the Delta would result in increased flow velocities, limiting  
 9 preferable mosquito breeding habitat.

10 Suitable mosquito breeding habitat is in close proximity to urban areas along the Sacramento River  
 11 and the south Delta; therefore, the current urban population is already exposed to vector-borne  
 12 diseases (See *Potential Mosquito-Borne Diseases in Delta* below for additional information).

13 The islands and tracts within the Delta presently have mosquitoes and require varying degrees of  
 14 mosquito control by existing mosquito and vector control districts (MVCDs). Mosquito control  
 15 techniques employed by different MVCDs generally emphasize minimization and disruption of  
 16 suitable habitat and control of larvae through chemical and biological means (Kwansy et al. 2004).  
 17 Control techniques most often include source reduction and source prevention (e.g., drainage of  
 18 water bodies that produce mosquitoes), application of larvicides, use of chemical larvicides, use of  
 19 biological agents such as mosquitofish as larval predators, and monitoring of mosquito populations  
 20 and vector-borne diseases (Kwansy et al. 2004). Furthermore, to address public health concerns  
 21 about mosquito production in existing managed wetlands and tidal areas, MVCDs have developed  
 22 guides and habitat management strategies to reduce mosquito production. MVCDs encourage  
 23 Integrated Pest Management (IPM), which incorporates multiple strategies to achieve effective  
 24 control of mosquitoes and includes the following.

- 25 ● Source reduction – designing wetlands and agricultural operations to be inhospitable to  
 26 mosquitoes.
- 27 ● Monitoring – implementing monitoring and sampling programs to detect early signs of mosquito  
 28 population problems.
- 29 ● Biological control – use of biological agents such as mosquitofish (*Gambusia affinis*) to limit  
 30 larval mosquito populations.
- 31 ● Chemical control – use of larvicides and adulticides.
- 32 ● Cultural control – changing the behavior of people so their actions prevent the development of  
 33 mosquitoes or the transmission of vector-borne disease.

34 Specifically, the following guidelines are incorporated for habitat management plans in different  
 35 MVCDs in the study area.

- 36 ● *Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands*, 2004.
- 37 ● *Best Management Practices for Mosquito Control on California State Properties*, California  
 38 Department of Public Health, June 2008.
- 39 ● *Mosquito Reduction Best Management Practices, Sacramento-Yolo County Mosquito and Vector  
 40 Control District*, 2008.



## 1 Study Area

2 The islands and tracts within the Delta presently have mosquitoes and require varying degrees of  
 3 mosquito control by MVCDs. The change in mosquito prevalence in the study area is attributable to  
 4 changes in cropping and land use patterns. Different cropping and land use patterns create differing  
 5 amounts of suitable mosquito breeding habitat. Currently, the Delta consists primarily of  
 6 agricultural lands and tidal, riparian and other water-related habitat that can provide suitable  
 7 habitat for mosquitoes to breed and multiply.

8 Tidally influenced marshes that lack sufficient tidal flow can provide suitable breeding habitat for  
 9 mosquitoes (Kramer et al. 1992 and 1995). However, functional tidal marshes do not provide high-  
 10 quality habitat for many mosquito species, such as *Aedes dorsalis* (Meigen) and *Aedes squamiger*  
 11 (Coquillett), and maintenance and restoration of natural tidal flushing in marshes is effective at  
 12 limiting mosquito populations (Kramer et al. 1995; Williams and Faber 2004). Problems can occur  
 13 in seasonally ponded wetlands, in densely vegetated tidal areas that pond water between tides, or  
 14 where tidal drainage has been interrupted (Williams and Faber 2004). Therefore, tidal wetland  
 15 restoration can reduce mosquito populations as tidal fluctuations keep water moving so that  
 16 mosquitoes do not have standing water in which to breed (Williams and Faber 2004; Kramer et al.  
 17 1995). Semi-permanent and permanent non-tidal wetlands can produce *An. freeborni* and *Cx.*  
 18 *tarsalis*; however, because of their limited acreage, stable water levels, and abundance of mosquito  
 19 predators (fish, dragonflies, and other predatory invertebrates) such wetlands are not typically  
 20 considered mosquito production areas (Kwansy et al. 2004).

21 Existing land uses in the Delta are currently located in relatively close proximity to urban areas  
 22 along the Sacramento River and the south Delta; therefore, the current urban population is already  
 23 exposed to mosquitoes and the vector-borne diseases that mosquitoes carry.

24 ~~The number of documented human cases of West Nile Virus (WNV) in Delta counties is relatively~~  
 25 ~~low compared with the population of the counties, and the number of documented WNV-positive~~  
 26 ~~dead birds in Delta counties is less than 200 per year in Delta counties (Table 25-7). Therefore,~~  
 27 ~~while WNV is a concern and a potential threat to the study area and California, the documented~~  
 28 ~~human occurrences have been relatively limited.~~

## 29 Common Mosquito Species

30 There are multiple species of mosquito known to occur in the study area. Factors that affect the  
 31 productivity and breeding of mosquitoes include water circulation, organic content, vegetation,  
 32 temperature, humidity, and irrigation and flooding practices.

33 The habitat for the breeding of mosquitoes varies depending on the combination of habitat  
 34 conditions. The following discussion presents an overview of mosquito species located in the study  
 35 area that are known to transmit diseases and their habitat. Table 25-45 identifies the seasonal  
 36 presence of mosquitoes.

1 **Table 25-45. Seasonal Presence of Mosquito**

General Water Source/Preferred Habitat	Most Active Season			
	Winter	Spring	Summer	Fall
Standing Water (e.g., permanent wetlands or foul standing water sources; brackish or freshwater)	<ul style="list-style-type: none"> <li>Cool weather mosquito (<i>Culiseta incidens</i>)<sup>2</sup></li> <li>California salt marsh mosquito (<i>Ochlerotatus squamiger</i>)<sup>3</sup></li> <li>Winter salt marsh mosquito (<i>Aedes squamiger</i>)</li> </ul>	<ul style="list-style-type: none"> <li>California salt marsh mosquito (<i>Ochlerotatus squamiger</i>)<sup>3</sup></li> </ul>	<ul style="list-style-type: none"> <li>Encephalitis mosquito (<i>Culex tarsalis</i>)</li> <li>Northern house mosquito (<i>Culex pipiens</i>)</li> <li>Western malaria mosquito (<i>Anopheles freeborni</i>)</li> </ul>	<ul style="list-style-type: none"> <li>Encephalitis mosquito (<i>Culex tarsalis</i>)</li> <li>Northern house mosquito (<i>Culex pipiens</i>)</li> <li>Western malaria mosquito (<i>Anopheles freeborni</i>)</li> <li>Cool Weather Mosquito (<i>Culiseta incidens</i>)<sup>2</sup></li> </ul>
Flood waters (e.g., seasonal/semi-permanent wetlands, including pastures and rice fields)		<ul style="list-style-type: none"> <li>Wetlands mosquito (<i>Aedes melanimon</i>)</li> <li>Inland floodwater mosquito (<i>Aedes vexans</i>)</li> <li>Pale marsh mosquito (<i>Ochlerotatus dorsalis</i>)<sup>1</sup></li> </ul>	<ul style="list-style-type: none"> <li>Inland floodwater mosquito (<i>Aedes vexans</i>)</li> <li>Western malaria mosquito (<i>Anopheles freeborni</i>)<sup>5</sup></li> </ul>	<ul style="list-style-type: none"> <li>Wetlands mosquito (<i>Aedes melanimon</i>)</li> <li>Inland floodwater mosquito (<i>Aedes vexans</i>)</li> </ul>
Tule and Grasses		Tule mosquito ( <i>Culex erythrothorax</i> ) <sup>4</sup>	Tule mosquito ( <i>Culex erythrothorax</i> ) <sup>4</sup>	
Containers (e.g., holes in oak woodlands, containers of standing water, sumps)	Western treehole mosquito ( <i>Aedes sierrensis</i> )	Western treehole mosquito ( <i>Aedes sierrensis</i> )	Northern house mosquito ( <i>Culex pipiens</i> )	Northern house mosquito ( <i>Culex pipiens</i> )
Wooded areas, seasonal creeks and year-round rivers	Woodland malaria mosquito ( <i>A. punctipennis</i> ) *			

Unless otherwise noted, sources in this table are from [http://www.fightthebite.net/download/ecomanagement/SYMVCD\\_BMP\\_Manual.pdf](http://www.fightthebite.net/download/ecomanagement/SYMVCD_BMP_Manual.pdf).

<sup>1</sup> Solano County Mosquito Abatement District 2005<sup>a</sup>; Napa County Mosquito Abatement District 2006

<sup>2</sup> Alameda County Mosquito Abatement District 2011

<sup>3</sup> Solano County Mosquito Abatement District 2005<sup>b</sup>

<sup>4</sup> Santa Cruz County Government Environmental Health Services 2011. Available: <[http://sccounty01.co.santa-cruz.ca.us/eh/Medical\\_Waste/mosquito\\_species.htm](http://sccounty01.co.santa-cruz.ca.us/eh/Medical_Waste/mosquito_species.htm)>. Accessed: December 23, 2011

<sup>5</sup> Marin/Sonoma Mosquito and Vector Control District 2009; Solano County Mosquito Abatement District 2005

\* Unknown what season the woodland malaria mosquito is most active.

2

## 1 **Potential Mosquito-Borne Diseases in the Delta**

2 Mosquitoes in the study area are known to carry six major diseases: malaria, cerebral encephalitis  
3 (CE), ~~West Nile virus (WNV)~~, St. Louis Encephalitis (SLE), dog heartworms, and Western Equine  
4 Encephalitis (WEE). Table 25-~~56~~ summarizes the types of mosquitoes known to occur in the study  
5 area and the types of diseases they commonly carry. Brief descriptions of these diseases are  
6 provided below the table.

1 **Table 25-56. Mosquitoes Known to Occur in the Delta and the Diseases They Commonly Carry**

Mosquito	Distance Travels from Breeding Ground	Diseases
Pale marsh mosquito <sup>a</sup>	20 miles	<u>Cerebral Encephalitis (CE) virus</u> ; Dog heartworms
Cool weather mosquito <sup>b</sup>	5 miles	<u>Western Equine Encephalitis (WEE) virus</u> *
Western encephalitis mosquito <sup>c,d</sup>	<u>Unavailable Up to 16 miles</u>	WEE virus; St. Louis Encephalitis (SLE) West Nile Virus (WNV)
California salt marsh mosquito <sup>d</sup>	<u>Unavailable Up to 20 miles or more</u>	CE virus <u>WNV in a limited number of this species in 2004</u>
Western treehole mosquito <sup>e</sup>	Limited	Dog heartworms
Wetlands mosquito <sup>fd</sup>	10 or more miles	Secondary vector of the WEE virus Primary carrier of the CE virus Recently linked as a potential vector of the WNV
House mosquito <sup>d,ef</sup>	<u>Unavailable 3 – 5 miles</u>	Major vector of the SLE virus and the WNV**
<u>Inland floodwater mosquito<sup>e</sup></u>	<u>10 or more miles</u>	<u>WEE virus; CE virus; and secondary vector for dog heartworms</u>
Tule mosquito <sup>hg</sup>	Unavailable	SLE virus WEE virus
Salt marsh mosquito <sup>hi</sup>	30 miles	Secondary vector of SLE virus Secondary vector of WEE virus
Winter salt marsh mosquito <sup>ij</sup>	20 miles	Seasonal nuisance not considered a disease or virus vector
Western malaria mosquito <sup>jk</sup>	5 miles	Malaria
Woodland malaria mosquito <sup>lk</sup>	Less than 1 mile	Malaria

<sup>a</sup> Marin/Sonoma Mosquito and Vector Control District 2009; Solano County Mosquito Abatement District 2005.

<sup>b</sup> Napa County Mosquito Abatement District 2006; Solano County Mosquito Abatement District 2005

<sup>c</sup> Marin/Sonoma Mosquito and Vector Control District 2009; Napa County Mosquito Abatement District 2006; Alameda County Mosquito Abatement District 2011; Reisen 1993

<sup>d</sup> Solano County Mosquito Abatement District 2005

<sup>e</sup> Sacramento-Yolo Mosquito and Vector Control District 2009

<sup>f</sup> ~~Solano County Mosquito Abatement District 2005~~

<sup>ef</sup> Marin/Sonoma Mosquito and Vector Control District 2009

<sup>hg</sup> Marin/Sonoma Mosquito and Vector Control District 2009

<sup>hi</sup> Solano County Mosquito Abatement District 2005 and Napa County Mosquito Abatement District 2006

<sup>ij</sup> Napa County Mosquito Abatement District 2006

<sup>jk</sup> Marin/Sonoma Mosquito and Vector Control District 2009, Solano County Mosquito Abatement District 2005 and Marin/Sonoma Mosquito and Vector Control District 2009, Solano County Mosquito Abatement District 2005

<sup>lk</sup> Napa County Mosquito Abatement District 2006

\* Recently identified under laboratory conditions as a vector for WEE, but has not yet been found in wild populations.

\*\* Not considered a strong virus vector for humans in northern California but identified in southern California and the Gulf Coast as human virus vector.

2

3 **Malaria**

4 Malaria is a mosquito-borne disease caused by a single-celled parasite, *Plasmodium* (Reiter 2001).  
5 This parasite infects and destroys the red blood cells of its host. The disease is usually transmitted

1 through the bite of an infected mosquito; a mosquito becomes infected from feeding on people  
2 carrying malaria in the blood (Zucker 1996). Malaria occurs in tropical and subtropical areas with  
3 high humidity and temperatures, including Africa and Central and South America. Although no  
4 longer considered an endemic disease in California, malaria cases continue to be reported in the  
5 United States (CalSurv 2012). In the United States there are approximately 1,200 diagnosed cases  
6 each year (Marin/Sonoma Mosquito and Vector Control District 2009). In California, the primary  
7 vectors of this disease are female western malaria mosquitoes.

### 8 **Encephalitis**

9 Encephalitis is a virus with symptoms characterized by swelling or inflammation of the brain and  
10 spinal cord. Mosquito-borne encephalitis is directly transmitted to humans by mosquitoes and  
11 maintained through the contact between virus-carrying birds and mosquitoes. It is most commonly  
12 found in California as a consequence of the WNV, SLE virus, and WEE virus. Horses and birds are  
13 usually the most important carriers and also the most vulnerable and susceptible to these viruses  
14 (California Department of Public Health 2010a, 2010b).

### 15 **West Nile Virus**

16 WNV is a mosquito-borne virus introduced to North America in 1999 (San Joaquin County Mosquito  
17 and Vector Control District 2009). The *Culex* mosquito genus has been identified as the primary  
18 transmitting vector of the virus (Goodard et al. 2002). The majority of victims of this virus develop  
19 very few or no symptoms. Some of the common symptoms identified are fever, nausea, body aches,  
20 headache, and mild skin rash. A very small proportion (less than 1%) of victims may also develop  
21 brain inflammation (encephalitis), which could lead to partial paralysis and death (Marin/Sonoma  
22 Mosquito and Vector Control District 2009).

### 23 **St. Louis Encephalitis**

24 SLE is distributed throughout California and generally affects non-human mammals, principally  
25 horses. The western encephalitis and house mosquitoes are the main transmitting vectors (CalSurv  
26 2012). The main sources of infection for mosquitoes are birds; once infected, the mosquito can  
27 transmit the virus to other animals and, on few occasions, humans. Symptoms tend to be very mild  
28 and usually include fever, headache, and dizziness. However, the disease may also lead to  
29 convulsions and death, and carries a fatality rate that ranges from 3–30% (Contra Costa Mosquito  
30 and Vector Control District 2011; CalSurv 2012). From 1964 through 2009, an average of 102 cases  
31 were reported annually in the United States. From 1964 through 2010, 123 cases of SLE were  
32 reported in California (Centers for Disease Control and Prevention 2011)

### 33 **Western Equine Encephalitis**

34 Seasonal viral activity is at its highest for WEE from late spring to early summer, especially in areas  
35 with highly irrigated agriculture and stream drainages. The disease has a fatality rate of 33% and  
36 affects young children most severely (Marin/Sonoma Mosquito and Vector Control District 2009).  
37 The western encephalitis mosquitoes are generally identified as primary transmitters. In California,  
38 the pale marsh mosquito is also a major vector. Symptoms range from mild flu-like illness to  
39 encephalitis, which could lead victims into a coma and death (Napa County Mosquito Abatement  
40 District 2006). Between 1964 and 2005, 639 cases of WEE were reported in the United States  
41 (Centers for Disease Control 2005).

## 1 Mosquito-Borne Disease Incidence

2 Each county, following public health and safety code regulations, designs its individual Mosquito and  
 3 Vector Control District Programs to control mosquito-borne disease incidence in its individual  
 4 district. The most common mosquito-borne diseases each district is expected to control include  
 5 WNV, WEE virus, SLE virus, heartworm disease, and malaria. Based on mosquito-borne disease  
 6 surveillance and activity data, yearly reports show that WNV has the highest incidence reported  
 7 within the Delta counties. This virus is commonly identified in small animals, such as squirrels and  
 8 birds, and can also affect large mammals, including horses and humans. The ratio of dead birds  
 9 infected with WNV to reported human cases within the statutory Delta counties is approximately  
 10 10:1 (Table 25-67 and Table 25-78). The number of documented human cases of WNV in Delta  
 11 counties is relatively low compared with the population of the counties, and the number of  
 12 documented WNV-positive dead birds in Delta counties is less than 200 per year (Table 25-78).  
 13 Therefore, while WNV is a concern and a potential threat to the study area and California, the  
 14 documented human occurrences have been relatively limited.

15 **Table 25-67. Confirmed West Nile Virus Cases in California 2008–2010**

Cases	2008	2009	2010
Number of Counties	49	42	35
Human Cases	445	112	105
Horses	32	18	19
Dead Birds	2,569	515	412
Mosquito Samples	2,003	1,063	1,305
Sentinel Chickens	585	443	281
Squirrels	32	10	24

Source: The California Department of Public Health West Nile Virus Website 2009, 2010.

16

17 **Table 25-78. West Nile Virus Activity by County in Study Area, 2008–2010**

County	2008				2009				2010			
	Human Case	Horses	Dead Birds	Mosquito Samples	Human Case	Horses	Dead Birds	Mosquito Samples	Human Cases	Horses	Dead Birds	Mosquito Samples
Alameda	1	N/A	12	1	-	-	10	1	1	-	1	-
Contra Costa	4	3	88	31	5	1	45	17	4	-	8	4
Sacramento	18	N/A	N/A	N/A	-	2	28	36	12	2	115	205
San Joaquin	12	N/A	69	207	10	3	24	83	6	1	26	57
Solano	1	N/A	7	1	-	1	3	2	-	1	1	1
Sutter			22	1212				25			1	26
Yolo	1	1	9	19	2	-	7	16	-	-	14	11

Source: The California Department of Public Health West Nile Virus Website 2009, 2010.

N/A = not available.

- = No record.

18

## 1 ~~25.1.1.5~~ 25.1.1.6 **Electromagnetic Fields**

2 An EMF is an invisible line of force that is produced by an electrically charged object. It affects the  
3 behavior of other charged objects in the vicinity of the field. The EMF extends indefinitely  
4 throughout space and can be viewed as the combination of an electric field and a magnetic field.  
5 Electric fields are produced by voltage and increase in strength as the voltage increases. The electric  
6 field strength is measured in units of volts per meter. Magnetic fields result from the flow of current  
7 through wires or electrical devices and increase in strength as the current increases. Magnetic fields  
8 are measured in units of gauss or tesla. Most electrical equipment has to be turned on (i.e., current  
9 must be flowing) for a magnetic field to be produced. If current does flow, the strength of the  
10 magnetic field will vary with power consumption. Electric fields, on the other hand, are present and  
11 constant even when the equipment is switched off, as long as the equipment remains connected to  
12 the source of electric power (World Health Organization 2012.)

13 Electric fields are shielded or weakened by materials that conduct electricity (including trees,  
14 buildings, and human skin). Magnetic fields, on the other hand, pass through most materials and are  
15 therefore more difficult to shield. Both electric and magnetic fields decrease as the distance from the  
16 source increases (California Public Utility Commission 2007).

17 Electromagnetic fields are present everywhere in our environment but are invisible to the human  
18 eye. Besides natural sources, such as thunderstorms, the electromagnetic spectrum includes fields  
19 generated by human-made sources, such as X-rays. The electricity that comes out of every power  
20 socket has associated low-frequency electromagnetic fields, and various kinds of higher frequency  
21 radio waves are used to transmit information (World Health Organization 2012).

22 Electric fields and magnetic fields can be characterized by their wavelength, frequency, and  
23 amplitude or strength. The frequency of the field, measured in hertz (Hz), describes the number of  
24 cycles that occur in one second. Electricity in North America alternates through 60 cycles per  
25 second, or 60 Hz. The time-varying electromagnetic fields produced by electrical appliances are an  
26 example of extremely low-frequency (ELF) fields. ELF fields generally have frequencies up to 300  
27 Hz. Other technologies produce intermediate-frequency (IF) fields with frequencies from 300 Hz to  
28 10 megahertz (MHz) and radiofrequency (RF) fields with frequencies of 10 MHz to 300 gigahertz  
29 (GHz). The effects of electromagnetic fields on the human body depend not only on their field level  
30 but on their frequency and energy. Our electricity power supply and all appliances using electricity  
31 are the main sources of ELF fields; computer screens, anti-theft devices, and security systems are the  
32 main sources of IF fields; radio, television, radar, cellular telephone antennas, and microwave ovens  
33 are the main sources of RF fields (World Health Organization 2012). Electromagnetic fields are  
34 commonly measured in units of gauss; a milligauss (mG) is 1,000 times smaller than a gauss. High  
35 voltage transmission line EMF levels range from 30–90 mG underneath the wires, based on the  
36 voltage, height, and placement of the lines. Most household appliances' EMF levels range from 3 mG–  
37 1,600 mG.

### 38 **Potential Health Concerns**

39 There has been extensive research done over the past 20 years on the relationship of EMF exposure  
40 and human health risks. To date, the potential health risk caused by EMF exposure remains  
41 unknown and inconclusive. Two national research organizations (the National Research Council and  
42 the National Institute of Health) have concluded that there is no strong evidence showing that EMF  
43 exposures pose a health risk. However, some studies have shown an association between household  
44 EMF exposure and a small increased risk of childhood leukemia at average exposures greater than 3



1 mG ([Greenland et al. 2000](#)). For cancers other than childhood leukemia, there is less evidence for an  
 2 effect. For example, workers that repair power lines and railway workers can be exposed to much  
 3 higher EMF levels than the general public. The results of cancer studies in these workers are mixed.  
 4 Some studies have suggested a link between EMF exposure in electrical workers and leukemia and  
 5 brain cancer ~~while~~ other similar studies have not found such associations ([Ahlbom et al. 2001](#)).  
 6 There is also some evidence that utility workers exposed to high levels of EMF may be at increased  
 7 risk of developing amyotrophic lateral sclerosis (ALS, or Lou Gehrig's disease). The current scientific  
 8 evidence provides no definitive answers as to whether EMF exposure can increase health risks  
 9 (California Public Utilities Commission 2007).

## 10 Proximity to Power Lines

11 Residences and other sensitive receptors located 300 feet or more from power lines with kilovolts  
 12 (kV) of 230 kV or less are not considered to be at risk of high EMF exposure (National Institute of  
 13 Environmental Health Sciences and National Institutes of Health 2002). At this distance, EMF  
 14 exposure from power lines is no different than from typical levels around the home. Furthermore,  
 15 recognizing that transmission lines carry different voltages, the California Department of Education  
 16 created regulations that require schools to be set back from transmission line right-of-ways based  
 17 on the voltage of the lines. Schools must be placed 100 feet or greater from 50–133 kV lines; 150 feet  
 18 or greater from 220–230 kV lines; and 350 feet or greater from 500–550 kV lines. Similar to the  
 19 National Institute of Health's 300-foot setback for sensitive receptors, these distances were based on  
 20 the fact that the electrical fields from the transmission lines decrease to background levels at the  
 21 corresponding distances (California Department of Public Health 1999).

22 There are currently approximately 621 miles of transmission lines in the study area. Sensitive  
 23 receptors to EMFs include schools, hospitals, parks and fire stations. Parks and schools provide a  
 24 location for people to congregate, and fire stations and hospitals could have sensitive  
 25 communications and health equipment that could be affected by EMF interference. The following list  
 26 summarizes the types of existing transmission lines and sensitive receptors within the study area or  
 27 immediately adjacent to the study area.

- 28 • No hospitals are located within 300 feet of existing 230 kV or 69 kV lines.
- 29 • No schools are located within 300 feet of existing 230 kV or 69 kV lines.
- 30 • One fire station (Station 52 of Sacramento Metro District at 9780 Elder Creek Road, Sacramento)  
 31 is within 300 feet of existing 230 kV lines located just outside the study area.
- 32 • Three sections of Cosumnes River Ecological Reserve and the Woods (Jones) park (part of  
 33 Cosumnes River Admin Area) are within 300 feet of existing 230 kV lines (lines run through  
 34 parks).

## 1 25.2 Regulatory Setting

### 2 25.2.2 Federal Plans, Policies, and Regulations

#### 3 25.2.2.4 Safe Drinking Water Act

4 The Safe Drinking Water Act (SDWA) was established to protect the public health and quality of  
 5 drinking water in the United States, whether from aboveground or underground sources. The SDWA  
 6 directed EPA to set national standards for drinking water quality. It required EPA to set MCLs for a  
 7 wide variety of potential drinking water pollutants (see Appendix 8A of Chapter 8, *Water Quality*).  
 8 The owners or operators of public water systems are required to comply with federal primary  
 9 (health-related) MCLs and encouraged to comply with federal secondary (nuisance- or aesthetics-  
 10 related) MCLs. SDWA drinking water standards apply to treated water as it is served to consumers.  
 11 See Section 25.2.3.2, California Safe Drinking Water Act, for applicable state drinking water  
 12 regulations.

### 13 25.2.3 State Plans, Policies, and Regulations

#### 14 25.2.3.2 California Safe Drinking Water Act

15 EPA has designated CDPH as the primary agency to administer and enforce the requirements of the  
 16 federal SDWA in California. A state or a tribe with primacy has direct oversight of the regulated  
 17 public water systems and is responsible for ensuring that the systems meet all of the requirements  
 18 of the drinking water regulations. Public water systems are required to be monitored for regulated  
 19 contaminants in their drinking water supply. California's drinking water standards (e.g., MCLs) are  
 20 the same as or more stringent than the federal standards, and include additional contaminants not  
 21 regulated by EPA. Like the federal enforceable MCLs, California's primary MCLs address health  
 22 concerns, while secondary MCLs address aesthetics, such as taste and odor. Although federal  
 23 secondary drinking water standards are established only as guidelines, California secondary MCLs,  
 24 like primary MCLs, are legally enforceable. The California SDWA is administered by CDPH, primarily  
 25 through a permit system.

#### 26 25.2.3.4 The California Department of Public Health's Best Management 27 Practices for Mosquito Control in California

28 The Best Management Practices for Mosquito Control in California was prepared by the California  
 29 Department of Public Health in collaboration with the Mosquito and Vector Control Association of  
 30 California to promote mosquito control on California properties and enhance early detection of  
 31 WNV. This plan describes mosquito control Best Management Practices (BMPs) to be implemented  
 32 by property owners and managers to reduce mosquito populations through a variety of ways  
 33 including: 1) reducing or eliminating breeding sites; 2) increasing the efficacy of biological control,  
 34 and 3) decrease the amount of pesticides applied while increasing the efficacy of chemical control  
 35 measures (California Department of Public Health 2012). In addition to these recommended  
 36 practices, the plan stresses coordination between property owners and local vector control agencies  
 37 regarding control practices on lands located within or near a local agency's jurisdiction and  
 38 appropriate integrated pest management strategies that are most suitable for specific land-use  
 39 types.

## 25.2.4 Regional Agencies and Programs Responsible for Regulating Drinking Water

### 25.2.4.5 California Drinking Water Standards Incorporated by Reference in Basin Plans

CDPH establishes state drinking water standards, enforces both federal and state standards, administers water quality testing programs, and issues permits for public water system operations. The drinking water regulations are found in Title 22 of the California Code of Regulations. The state drinking water standards [for public water systems](#) consist of [enforceable](#) primary and secondary maximum MCLs. Primary MCLs are established for the protection of environmental health and secondary MCLs are established for constituents that affect the aesthetic qualities of drinking water, such as taste and odor. Both the Central Valley and San Francisco Bay Basin Plans incorporate by reference the CDPH numerical drinking water MCLs. The incorporation into the Basin Plans of the MCLs, ~~which are normally applicable to treated drinking water systems regulated by CDPH~~, makes [these MCLs standards](#) also applicable to ambient receiving waters regulated by the Regional Water Boards. The state primary and secondary MCLs applicable to the Central Valley and San Francisco Bay Basin Plans are provided in Appendix 8A of Chapter 8, *Water Quality*.

## 25.2.5 Regional Agencies and Programs Responsible for Vector Control

California's Health and Safety Code (Sections 2001–2007; 2060–2067 and 2001 b[2]) provide the legal procedures that each district in the State of California must follow to achieve effective vector control programs. The Health and Safety Code outlines the physical, biological, and chemical controls by which each district must achieve effective mosquito abatement.

[Under the Health and Safety Code, local mosquito and vector control agencies have the authority to conduct surveillance for vectors, prevent the occurrence of vectors, and legally abate production of vectors, any water that is a breeding place for vectors, and "any activity that supports the development, attraction, or harborage of vectors, or that facilitates the introduction or spread of vectors \(Section 2002\[j\] and 2040\). Further, vector control agencies are authorized to participate in review, comment, and make recommendations regarding local, state, or federal land use planning and environmental quality processes, permits, licenses, entitlements, and documents for projects with potential effects with respect to vector production \(Section 2041\).](#)

## 25.3 Environmental Consequences

### 25.3.1 Methods for Analysis

The proposed BDCP action alternatives may affect public health in the study area through the following mechanisms.

- Construction of the water conveyance facilities and water supply operations under all action alternatives would result in an increase in sedimentation basins and solids lagoons. These new

1 features could result in an increase in standing water, thereby potentially increasing vector  
2 breeding locations and vector-borne diseases in the study area.

- 3 ● Water conveyance facilities operation activities could mobilize or increase the amount of trace  
4 metals or pesticides in surface waters.
- 5 ● Water conveyance facilities operation activities under all action alternatives could change  
6 hydraulic residence times and increase water temperatures under the action alternatives, which  
7 could cause an increase in the frequency, magnitude, and geographic extent of *Microcystis*  
8 blooms. This could result in negative effects on drinking water quality and recreational waters,  
9 which would represent a potential public health concern.
- 10 ● Habitat restoration and enhancement activities under all action alternatives could change  
11 hydraulic residence times and increase water temperatures under the action alternatives, which  
12 could cause an increase in the frequency, magnitude, and geographic extent of *Microcystis*  
13 blooms. This could result in negative effects on drinking water quality and recreational waters,  
14 which would represent a potential public health concern.
- 15 ● Water conveyance facilities operation activities under all action alternatives would generally  
16 result in a change in source water inflow to the study area, thereby potentially influencing  
17 parameters that bioaccumulate (e.g., methylmercury).
- 18 ● Water conveyance facilities operation activities under all action alternatives would require new  
19 transmission lines (with lines at 69 kV and 230 kV), thereby potentially increasing exposure of  
20 people to EMFs.
- 21 ● Habitat restoration and enhancement activities under all action alternatives would increase the  
22 amount of tidal and wetland areas in the study area (including Suisun Marsh and the Yolo  
23 Bypass), which are known to generate pathogens that represent a potential public health  
24 concern to recreational activities.
- 25 ● Habitat restoration activities under all action alternatives could increase standing water in the  
26 Delta throughout the year, thereby potentially resulting in an increase in vector breeding  
27 locations and in vector-borne diseases in the study area.
- 28 ● Habitat restoration activities under all action alternatives could change the water quality such  
29 that there is an increase DOC in the study area, thereby potentially increasing the amount of  
30 DBPs in the water, which represents a potential drinking water public health concern.
- 31 ● Restoration and certain habitat enhancement activities (e.g., channel margin enhancement)  
32 under all action alternatives could disturb and re-suspend existing sediment that is  
33 contaminated with parameters which bioaccumulate (e.g., methylmercury) or result in  
34 mobilization of toxic constituents into the food chain (e.g., methylation of mercury).
- 35 ● The methodologies to evaluate these different mechanisms are described below.

### 36 **25.3.1.3 Microcystis**

37 The conceptual model for evaluating effects of the action alternatives on *Microcystis* in the Plan Area  
38 is described in Chapter 8, *Water Quality* (Section 8.3.1.7), and includes consideration of abiotic  
39 factors considered to be the primary drivers of seasonal and interannual variation in abundance of  
40 *Microcystis* in the Delta. These factors include water temperature, hydraulic residence time,  
41 nutrients, and water clarity. Nutrient (i.e., ammonia, nitrate, and phosphorus) and water clarity

1 effects on *Microcystis* abundance under the action alternatives relative to Existing Conditions and  
 2 the No Action Alternative were determined to not be substantial (See Chapter 8, *Water Quality*).

3 In Chapter 8, *Water Quality*, a qualitative evaluation was done to determine if the action alternatives  
 4 would result in an increase in frequency, magnitude, and geographic extent of *Microcystis* blooms in  
 5 the Delta based on the following two additional abiotic factors that may affect *Microcystis*: 1)  
 6 changes to water operations and creation of tidal and floodplain restoration areas that change  
 7 hydraulic residence times within Delta channels, and 2) increases in Delta water temperatures. The  
 8 findings from Chapter 8, *Water Quality*, are summarized for each action alternative and a qualitative  
 9 determination is made as to whether recreationists would experience a substantial increase in  
 10 exposure to *Microcystis* and whether there would be adverse effects on drinking due to increases in  
 11 *Microcystis*.

## 12 ~~25.3.1.3~~ **25.3.1.4** Constituents of Concern and Water Quality

13 As discussed in Chapter 8, *Water Quality* (Section 8.1.1.6), numerical water quality objectives and  
 14 standards have been established to protect beneficial uses, and therefore represent concentrations  
 15 or values that should not be exceeded. The beneficial uses provide standards that indirectly  
 16 maintain public health, such as contact recreation to protect individuals against illness. Chapter 8,  
 17 *Water Quality*, discusses the different water quality standards evaluated through modeling and  
 18 determines whether these standards would be exceeded as a result of implementation of the action  
 19 alternatives. Therefore, this analysis summarizes the qualitative and quantitative results presented  
 20 in Chapter 8 to identify whether the construction and operation of the facilities associated with the  
 21 alternatives would exceed water quality standards for pesticides that do not bioaccumulate (for this  
 22 assessment, only present use pesticides for which substantial information is available, namely  
 23 diazinon, chlorpyrifos, pyrethroids, and diuron, are addressed); trace metals of human health and  
 24 drinking water concern (i.e., arsenic, iron, and manganese); and DBP precursors, DOC and  
 25 bromide<sup>3</sup>s, including HAA5, bromated, chlorite, and THMs via the THM formation potential<sup>4</sup>  
 26 (THMFP). It should be noted that the water quality analysis did not assess HAA5 or THMFP directly,  
 27 but rather assessed changes in organic carbon. As indicated in Section 25.1.1.1, because organic  
 28 carbon, such as DOC, can react with disinfectants during the water treatment disinfection process to  
 29 form DBPs, such as THMs and HAAs, DOC concentrations can be an indicator of DBPs (discussed in  
 30 detail in Chapter 8, *Water Quality*, Section 8.1.3.11).

31 Qualitative assessments were conducted to determine whether operation of the action alternatives  
 32 would result in adverse effects on drinking water quality as represented by an exceedance in water  
 33 quality standards for these constituents of concern. Drinking water is generally treated for various  
 34 standard constituents prior to distribution and use in the drinking water supply.

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<sup>3</sup> Because organic carbon, such as DOC, and bromide can react with disinfectants during the water treatment disinfection process to form DBPs, such as THMs and HAAs, as described in Section 25.1.1.1, DOC and bromide concentrations can be an indicator of DBPs (discussed in detail in Chapter 8, *Water Quality*, Section 8.1.3.11).

<sup>4</sup> This evaluates the potential for trihalomethanes to form as a result of the level of dissolved organic carbon, bromide, and chloride in a water source.

## 25.3.2 Determination of Effects

Implementation of an alternative could result in an adverse effect under NEPA and a significant impact under CEQA if it would result in any of the following.

- Substantial increase in the public’s risk of exposure to vector-borne diseases. For purposes of this analysis, “substantial increase” is evaluated qualitatively, depending on the location of the alternative, in accordance with Section 15064(b) of the State CEQA Guidelines (see footnote 4, Section 25.3.1.1, *Vectors*).
- Exceedance(s) of water quality criteria for constituents of concern such that an adverse effect would occur to public health from drinking water sources. This analysis is based on the qualitative and quantitative results presented in Chapter 8, *Water Quality*, to identify whether the construction and operation of the alternatives would exceed water quality standards for pesticides that do not bioaccumulate (present use pesticides for which substantial information is available, namely diazinon, chlorpyrifos, pyrethroids, and diuron); trace metals of human health and drinking water concern (i.e., arsenic, iron, and manganese); and DBP precursors, DOC and bromide DBPs, including HAA5, bromated, chlorite; and THMs via the THMFP.
- Substantial mobilization or substantial increase of constituents known to bioaccumulate. For purposes of this analysis, an expected increase in bioaccumulation above existing conditions (levels and locations) in fish in the study area as a result of implementing an alternative would be considered a potential effect and is discussed qualitatively in terms of the populations affected and potential public health concerns. (See also Section 25.3.1.4, *Bioaccumulation*.)
- Exposing substantially more people to transmission lines that provide new sources of EMFs. Exposure to EMFs from new transmission lines is dependent on the location of the transmission lines in relation to sensitive receptors. For purposes of this analysis, schools, hospitals, parks, and fire stations are considered to be sensitive receptors. Residences and other sensitive receptors located 300 feet or more from power lines are not considered to be at risk of high EMF exposure (National Institute of Environmental Health Sciences and National Institutes of Health 2002). (See the discussion in Section 25.3.1.5, *Electromagnetic Fields*.) Temporary transmission lines are those that would be removed once construction was completed.
- Substantial increase in recreationists’ exposure to pathogens. For purposes of this analysis, a “substantial increase in recreationists’ exposure” is based on the amount of tidal habitat restored under CM 4 (the most of all the habitat restoration components), because pathogens in drinking water are effectively removed prior to distribution and have little effect on drinking water; and findings in Chapter 8, *Water Quality* (See also Section 25.3.1.2, *Pathogens and Water Quality*.)

Increase in *Microcystis* in water bodies in the study area such that municipal and domestic supply and water contact recreation beneficial uses are negatively affected. This analysis is based on the results of the qualitative analysis presented in Chapter 8, *Water Quality*. As described in Chapter 8, *Water Quality*, assumptions regarding how certain habitat restoration activities (CM2, *Yolo Bypass Fisheries Enhancement*, and CM4, *Tidal Natural Communities Restoration*) would affect Delta hydrodynamics were included in the modeling scenario assumptions. To the extent that BDCP restoration actions would alter hydrodynamics within the Delta, which would affect mixing of source waters, these effects are included in the assessment of operations-related changes of hydraulic residence times and its effects on *Microcystis* production (Impact PH-8). Other effects of CM2 - CM21 not attributable to hydrodynamics are discussed under Impact PH-9.

1 Table 25-89. Potential Range of New Permanent and Temporary Transmission Lines (miles)

Alternative	Permanent Transmission Lines (69 kV)		Temporary Transmission Lines (69 kV)		Permanent Transmission Lines (230 kV)		Temporary Transmission Lines (230 kV)		Temporary Transmission Lines (34.5 kV)	
	Miles	New Sensitive Receptor	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors
1A (Dual Conveyance with Pipeline/Tunnel)	8.94	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	N/A <sup>a</sup>	N/A	N/A	N/A
1B (Dual Conveyance with East Alignment)	36.79	Stone Lakes National Wildlife Refuge (Elk Grove)	13.49	None	16.35	None	N/A	N/A	N/A	N/A
1C (Dual Conveyance with West Alignment)	17.61	None	13.73	Fire Station 63 (9699 Highway 220, Walnut Grove)	18.45	None	N/A	N/A	N/A	N/A
2A (Dual Conveyance with Pipeline/Tunnel)	14.46	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	N/A	N/A	N/A	N/A
2B (Dual Conveyance with East Alignment)	40.5	Stone Lakes National Wildlife Refuge (Elk Grove)	13.49	None	16.35	None	N/A	N/A	N/A	N/A
2C (Dual Conveyance with West Alignment)	17.61	None	13.73	Fire Station 63 (9699 Highway 220, Walnut Grove)	18.45	None	N/A	N/A	N/A	N/A
3 (Dual Conveyance with Pipeline/Tunnel)	8.68	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	N/A	N/A	N/A	N/A
4 (Dual Conveyance with Modified Pipeline/Tunnel)	<del>5.87</del> None	None	<del>N/A</del> 6.0	<del>N/A</del> None	<del>14.17</del> <del>13.79</del> 15.96	None	<del>34.73</del> <del>30.44</del> 30.00	None	<del>3.259</del> <del>63</del> N/A	<del>None</del> N/A



Alternative	Permanent Transmission Lines (69 kV)		Temporary Transmission Lines (69 kV)		Permanent Transmission Lines (230 kV)		Temporary Transmission Lines (230 kV)		Temporary Transmission Lines (34.5 kV)	
	Miles	New Sensitive Receptor	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors
5 (Dual Conveyance with Pipeline/Tunnel)	8.68	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	N/A	N/A	N/A	N/A
6A (Isolated Conveyance with Pipeline/Tunnel)	8.94	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	N/A	N/A	N/A	N/A
6B (Isolated Conveyance with East Alignment)	36.79	Stone Lakes National Wildlife Refuge (Elk Grove)	13.49	None	16.35	None	N/A	N/A	N/A	N/A
6C (Isolated Conveyance with West Alignment)	17.61	None	13.73	Fire Station 63 (9699 Highway 220, Walnut Grove)	18.45	None	N/A	N/A	N/A	N/A
7 (Dual Conveyance with Pipeline/Tunnel)	7.03	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	N/A	N/A	N/A	N/A
8 (Dual Conveyance with Pipeline/Tunnel)	7.03	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	N/A	N/A	N/A	N/A
9 (Through Delta/Separate Corridors)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

<sup>a</sup>N/A: not applicable.

1

- ~~Substantial increase in recreationists' exposure to pathogens. For purposes of this analysis, a "substantial increase in recreationists' exposure" is based on the amount of tidal habitat restored under CM 4 (the most of all the habitat restoration components), because pathogens in drinking water are effectively removed prior to distribution and have little effect on drinking water; and findings in Chapter 8, *Water Quality* (See also Section 25.3.1.2, *Pathogens and Water Quality*.)~~

## Compatibility with Plans and Policies

Constructing the proposed water conveyance facilities (CM1) and implementing CM2–~~CM22~~CM21 could potentially result in incompatibilities with plans and policies related to the effects of water quality constituents and vector-borne diseases on public health. Section 25.2, *Regulatory Setting*, provides an overview of federal, state, regional, and agency-specific plans and policies applicable to the public health effects of water quality and vector-borne diseases. This section summarizes ways in which BDCP is compatible or incompatible with those plans and policies. Potential incompatibilities with local plans or policies do not necessarily translate into adverse environmental effects under NEPA or CEQA. Even where an incompatibility "on paper" exists, it does not by itself constitute an adverse physical effect on the environment, but rather may indicate the potential for a proposed activity to have a physical effect on the environment. The relationship among plans, policies, and regulations, and impacts on the physical environment is discussed in Chapter 13, *Land Use*, Section 13.2.3.

Consistent with requirements of California's Health and Safety Code (Sections 2001–2007; 2060–2067 and 2001 b[2]), the Alameda County Vector Control Services District, Contra Costa Mosquito and Vector Control District, Sacramento-Yolo Mosquito and Vector Control District, San Joaquin County Mosquito and Vector Control District, Solano County Mosquito Abatement District, and the Sutter-Yuba County Mosquito Abatement District (MVCDs), with jurisdictions in the study area, all have policies related to maintaining and protecting public health and quality of life by preventing the spread of mosquito-borne diseases and relieving pest nuisance. Implementing a selected BDCP alternative could potentially create temporary, additional breeding habitat for mosquitoes during construction of the water conveyance facilities; and permanently increase mosquito breeding habitat as a result of restoration activities under conservation measures, as described under Impact PH-1: *Increase in vector-borne diseases as a result of construction and operation of the ~~intakes, solids lagoons, and/or sedimentation basins associated with the~~ water conveyance facilities*; and Impact PH-5: *Increase in vector-borne diseases as a result of implementing CM2–CM7, CM10, and CM11*. The BDCP proponents would implement an environmental commitment to conduct pre-construction consultation and coordinate with local MVCDs, and to prepare MMPs (Appendix 3B, *Environmental Commitments*). As part of that environmental commitment, BDCP proponents would also follow guidelines provided in the Central Valley Joint Venture's Technical Guide to *Best Management Practices for Mosquito Control in Managed Wetlands* and the California Department of Public Health's *Best Management Practices for Mosquito Control in California* to develop and implement BMPs to manage and control the risk of mosquito-borne disease. This environmental commitment would ensure that the BDCP is compatible with the mission and goals of the applicable MVCDs.

California Water Code Section 13240 requires preparation and adoption of water quality control plans (WQCPs). WQCPs are regulatory references for meeting the state and federal requirements for water quality control, and are primarily implemented through the National Pollutant Discharge Elimination System (NPDES) permitting system. Basin plans provide the technical basis for

1 determining waste discharge requirements and authorize the Regional Water Boards to take  
 2 regulatory enforcement actions if deemed necessary. Accordingly, the *Water Quality Control Plan for*  
 3 *the Sacramento River and San Joaquin River Basins*, *Water Quality Control Plan for the San Francisco*  
 4 *Bay Basin*, and the *Central Valley Regional Water Quality Control Board Drinking Water Policy* deal  
 5 with beneficial uses, water quality objectives, implementation programs, and surveillance and  
 6 monitoring programs for waters in their respective jurisdictions. California Drinking Water  
 7 Standards for primary and secondary maximum MCLs, found in Title 22 of the California Code of  
 8 Regulations, are incorporated by reference in Central Valley and San Francisco Bay Basin Plans.  
 9 DWR and/or BDCP proponents would be required to apply for and comply with NPDES permits, and  
 10 thereby would be compatible with these plans and policies.

11 The potential effects of implementing the BDCP alternatives on constituents of concern and  
 12 *Microcystis and microcystin* related to drinking water and recreationists' exposure to pathogens and  
 13 *Microcystis and microcystin* are discussed under Impact PH-2: *Exceedances of water quality criteria*  
 14 *for constituents of concern such that there is an adverse effect on public health as a result of operation*  
 15 *of the water conveyance facilities* (for constituents that do not bioaccumulate); Impact PH-3:  
 16 *Substantial mobilization of or increase in constituents known to bioaccumulate as a result of*  
 17 *construction, operation or maintenance of the water conveyance facilities* (which assesses risk in  
 18 terms of bioaccumulation in fish that people might eat); and Impact PH-6: *Substantial increase in*  
 19 *recreationists' exposure to pathogens as a result of implementing the restoration conservation*  
 20 *measures*; [which examines the extent of potential for recreationists to come in contact with  
 21 pathogens in water while using restored tidal habitat]; Impact PH-8: *Increase in Microcystis bloom*  
 22 *formation as a result of operation of the water conveyance facilities (which examines the potential for*  
 23 *public health impacts due to Microcystis and microcystin in drinking water and recreational waters*  
 24 *due to operation of CM1 and hydrodynamic effects of CM2 and CM4);* and Impact PH-9: *Increase in*  
 25 *Microcystis bloom formation as a result of implementing CM2 and CM4 (which examines the potential*  
 26 *for public health impacts implementation of restoration activities of CM2 CM4).* Under most of the  
 27 proposed alternatives, BDCP would not create an adverse effect under NEPA or a significant impact  
 28 under CEQA for Impacts PH-2, PH-3, and PH-6, and therefore is compatible with the plans and  
 29 policies related to water quality. However, implementing the proposed BDCP action alternatives has  
 30 the potential to be incompatible with the Basin Plan because projected increases in Microcystis and  
 31 microcystin would affect beneficial uses of waters in the Delta and would result in an adverse effect  
 32 under NEPA and a significant and unavoidable impact under CEQA. While Mitigation Measure WQ-  
 33 32a, Design Restoration Sites to Reduce Potential for Increased Microcystis Blooms and Mitigation  
 34 Measure WQ-32b, Investigate and Implement Operational Measures to Manage Water Residence Time  
 35 would reduce the severity of the impact, the effectiveness of these mitigation measures to result in  
 36 feasible measures for reducing water quality effects, and therefore potential public health effects, is  
 37 uncertain.

38 However, implementing the proposed BDCP action alternatives has the potential to be incompatible  
 39 with the Basin Plan, because long-term average concentrations of DOC (Alternatives 6A – 6C, and 7 –  
 40 9) and bromide (Alternatives 1A – 9) and, by extension, DBPs are estimated to substantially increase  
 41 various Delta locations in the study area as described under these alternatives in Impact PH-2:  
 42 *Exceedances of water quality criteria for constituents of concern such that there is an adverse effect on*  
 43 *public health as a result of operation of the water conveyance facilities.* Such increases could trigger  
 44 the need for substantial and costly changes in drinking water treatment plant design or operations  
 45 in order to achieve EPA Stage 1 Disinfectants and Disinfection Byproduct Rule action thresholds. If  
 46 upgrades were not undertaken, the increase in DOC and/or bromide concentrations could create an

1 increased risk of adverse effects on public health from increases in DBPs in drinking water. While  
 2 Mitigation Measure WQ-5, *Avoid, minimize, or offset, as feasible, adverse water quality conditions; site*  
 3 *and design restoration sites to reduce bromide increases in Barker Slough* and implementing the  
 4 North Bay Aqueduct Alternative Intake Project (AIP) could reduce the effects of bromide, and  
 5 Mitigation Measure WQ-17, *Consult with Delta water purveyors to identify means to avoid, minimize,*  
 6 *or offset increases in long-term average DOC concentrations*, is available to reduce the effects of DOC,  
 7 the feasibility and effectiveness of these measures are uncertain, and it is not known if  
 8 implementation would reduce the severity such that it would not be an adverse effect.

9 The CPUC regulates electric utilities in the state and has established design guidelines for regulating  
 10 EMFs. Recognizing that there is scientific uncertainty as to the health effects of EMFs on receptors in  
 11 proximity to power lines, the CPUC affirmed that setting numeric exposure limits is not appropriate  
 12 but established precautionary no-cost and low-cost policies that utilities would follow for proposed  
 13 electrical facilities. The various electrical utilities in the Delta region that might be selected to  
 14 provide power to the BDCP generally follow CPUC guidelines. The CPUC ranked land use categories  
 15 for mitigation priority. In descending order these are: schools and licensed day care; residential;  
 16 commercial/industrial; recreational; agricultural; and undeveloped land. The California Department  
 17 of Education established minimum set-back distances for schools in relation to power lines of  
 18 different voltages. These are similar to the National Institute of Health's 300- foot setback for  
 19 sensitive receptors. BDCP would be generally compatible with the policies established by CPUC and  
 20 adopted by the selected utility because most new permanent and temporary power lines would be  
 21 in sparsely populated areas, would be at least 300 feet from sensitive receptors, and would not  
 22 expose new receptors or increase the exposure of current receptors. However, BDCP could be  
 23 considered incompatible with the guidelines because one or both of two new sensitive receptors,  
 24 one fire station and one park, would be affected by alternatives. BDCP would become compatible  
 25 because the proponents would implement an environmental commitment that the location and  
 26 design of the proposed new transmission lines would be conducted in accordance with CPUC's EMF  
 27 Design Guidelines for Electrical Facilities, and would include one or more of three measures to  
 28 reduce EMF exposure.

- 29 • Shielding by placing trees or other physical barriers along the transmission line right-of-way.
- 30 • Cancellation by configuring the conductors and other equipment on the transmission towers.
- 31 • Increasing the distance between the source of the EMF and the receptor either by increasing the  
 32 height of the tower or increasing the width of the right-of-way.

33 The *Sacramento County General Plan of 2005–2030* and Alameda County East Area General Plan have  
 34 policies related to safety concerns about electromagnetic fields. These policies reference power line  
 35 setbacks for sensitive receptors such as schools. By implementing the environmental commitment to  
 36 comply with CPUC's EMF Design Guidelines for Electrical Facilities, the BDCP would be compatible  
 37 with these policies.

## 25.3.3 Effects and Mitigation Approaches

### 25.3.3.1 No Action Alternative

#### Water Supply Facilities

New water supply facilities would be constructed under the No Action Alternative as listed in Table 25-910; therefore, there could be a disruption to existing sources of methylmercury associated with this type of construction. Water supply operations under the No Action Alternative likely would not involve the operation of solids lagoons or sedimentation basins; therefore, there would be no increase in the public's risk of exposure to vector-borne diseases. Under the No Action Alternative, there would be a change in various source waters throughout the Delta (i.e., upstream water, Bay water, agricultural return flow), due to potential changes in inflows, particularly from the Sacramento River watershed because of increased water demands or changes to climate and precipitation levels. Water supply operations under the No Action Alternative would continue to use the existing source(s) of drinking water from the study area. These sources generally meet regulatory standards for most constituents or experience some exceedances for constituents such as arsenic (see Chapter 8, *Water Quality*, Section 8.3.3.1). However, under the No Action Alternative, existing exceedances would not increase above baseline conditions (see Chapter 8) to levels that adversely affect any beneficial uses or substantially degrade water quality. Furthermore, drinking water from the study area would continue to be treated prior to distribution into the drinking water system. ~~Therefore, there would be no adverse effect on drinking water due to new water conveyance facilities.~~

Any modified reservoir operations under the No Action Alternative are not expected to promote *Microcystis* production upstream of the Delta since large reservoirs upstream of the Delta are typically low in nutrient concentrations and phytoplankton outcompete cyanobacteria, including *Microcystis*. As indicated in Chapter 8, *Water Quality*, modeled hydraulic residence times in the Delta during *Microcystis* bloom season (June through September) would increase somewhat in most Delta areas, with hydraulic residence times in the East Delta having the greatest increase. The changes in hydraulic residence times are driven by several factors accounted for in the modeling, including climate change, sea level rise, and changes in operations and maintenance that affect net Delta outflows. Because the change is relatively small, it is unknown whether the increase in modeled hydraulic residence times expected under the No Action Alternative relative to Existing Conditions would result in measurable increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms throughout the Delta. Projected future water temperature changes in the Delta under the No Action Alternative indicate that water temperatures would increase due to climate change. This increase in temperature could lead to earlier attainment of the water temperature threshold of 19°C required to initiate *Microcystis* bloom formation, and thus earlier occurrences of *Microcystis* blooms in the Delta. As explained in Chapter 8, *Water Quality*, ambient meteorological conditions are anticipated to be the primary driver of the projected increase of water temperatures in the Delta, and not CM1 water operations. However, because it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to increased water temperatures from climate change under the No Action Alternative, long-term water quality degradation may occur in the Delta and water exported from the Delta to the SWP and CVP Export Service Areas. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and, as such, public health could be affected. Accordingly, this would be considered an adverse effect.

## 1      **Catastrophic Seismic Risks**

2      The Delta and vicinity are within a highly active seismic area, with a generally high potential for  
 3      major future earthquake events along nearby and/or regional faults, and with the probability for  
 4      such events increasing over time. Based on the location, extent and non-engineered nature of many  
 5      existing levee structures in the Delta area, the potential for significant damage to, or failure of, these  
 6      structures during a major local seismic event is generally moderate to high. In the instance of a large  
 7      seismic event, levees constructed on liquefiable foundations are expected to experience large  
 8      deformations (in excess of 10 feet) under a moderate to large earthquake in the region. A major  
 9      earthquake event could result in breaching/failure of existing levees within the Delta area, with a  
 10     substantial number of these structures exhibiting moderate to high failure probabilities. The most  
 11     immediate and significant effect to water quality under such a scenario would be the influx of large  
 12     volumes of seawater and/or brackish water into the Delta, which would alter the “normal” balance  
 13     of freshwater/seawater flows and result in flooding of the associated islands. The corresponding  
 14     shift in Delta water quality conditions would be characterized by an increase in salinity levels,  
 15     including specific associated constituents such as bromide (which affects total dissolved solids  
 16     concentrations and can contribute to the formation of undesirable chemical byproducts in treated  
 17     drinking water). (See Appendix 3E, *Potential Seismic and Climate Change Risks to SWP/CVP Water*  
 18     *Supplies* for more detailed discussion). Flooding caused by levee failure could result in a substantial  
 19     increase in the public’s risk of exposure to vector-borne diseases due to large bodies of standing  
 20     water prior to flood waters being pumped off inundated Delta islands. Additionally, flood events  
 21     could cause exceedance(s) of water quality criteria for constituents of concern such that an adverse  
 22     effect would occur to public health from drinking water sources.

23     **CEQA Conclusion:** It is expected that implementation of existing plans, or existing and reasonably  
 24     foreseeable habitat restoration projects, would not result in a substantial increase in the public’s  
 25     risk of exposure to vector-borne diseases because of the location of existing vector habitat,  
 26     restoration design, and consultation with MVCDS. This is because habitat restoration would be  
 27     located in areas that are already potential sources of vectors, such as existing channels or  
 28     agricultural areas. Furthermore, activities would be designed to maximize water exchange and flow,  
 29     thereby minimizing stagnant water and the production of mosquitoes. Finally, all of the restoration  
 30     activities would occur in consultation with existing MVCDS. Therefore, it is not expected that habitat  
 31     restoration under the No Action Alternative would result in a substantial increase in the public’s risk  
 32     of exposure to vector-borne diseases.

33     Construction impacts associated with No Action Alternative habitat restoration projects would not  
 34     be adverse because the mobilization of existing sediment-bound contaminants (e.g., methylmercury)  
 35     would occur during a limited time and would be localized around the area of construction. Once  
 36     operational, other habitat restoration projects could result in an increase of methylmercury as a  
 37     result of biogeochemical processes and sediment conditions established in tidal wetlands. However,  
 38     it is expected these projects either have, or would evaluate the potential for, methylmercury  
 39     production and would implement measures to monitor and adaptively manage methylmercury  
 40     production.

41     Water supply operations under the No Action Alternative would continue to use the existing  
 42     source(s) of drinking water from the study area. These sources generally meet regulatory standards  
 43     for most constituents or experience some exceedances for constituents such as arsenic (see Chapter  
 44     8, *Water Quality*, Section 8.3.1.16). Under the No Action Alternative, existing exceedances would not  
 45     increase above baseline conditions (see Chapter 8, Section 8.3.3.1).



1 It is unknown where new transmission lines would be and if they would be located in close  
 2 proximity to sensitive receptors (e.g., hospitals, schools, parks); however, it is likely some of them  
 3 would be within close proximity to sensitive receptors and present new sources of EMFs. Utilities  
 4 must implement the CPUC design criteria and guidelines regarding EMFs, and CPUC reviews all  
 5 proposals for transmission lines.

6 Because it is possible that increases in the frequency, magnitude, and geographic extent of  
 7 Microcystis blooms in the Delta would occur due to increased water temperatures associated with  
 8 climate change under the No Action Alternative, long-term water quality degradation may occur in  
 9 the Delta and in water exported from the Delta to the SWP and CVP Export Service Areas. Thus,  
 10 impacts on beneficial uses, including drinking water and recreational waters, could occur and could  
 11 affect public health. As such, this would be considered significant impact.~~It is unknown where new~~  
 12 ~~transmission lines would be and if they would be located in close proximity to sensitive receptors~~  
 13 ~~(e.g., hospitals, schools, parks); however, it is likely some of them would be within close proximity to~~  
 14 ~~sensitive receptors and present new sources of EMFs. Utilities must implement the CPUC design~~  
 15 ~~criteria and guidelines regarding EMFs, and CPUC reviews all proposals for transmission lines.~~

16 ~~Therefore, under the No Action Alternative, impacts related to public health would be less than~~  
 17 ~~significant.~~

### 18 **25.3.3.2 Alternative 1A—Dual Conveyance with Pipeline/Tunnel and** 19 **Intakes 1–5 (15,000 cfs; Operational Scenario A)**

#### 20 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of** 21 **~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water** 22 **Conveyance Facilities**

23 **NEPA Effects:** Five intakes, up to 15 solids lagoons, ~~and~~ five sedimentation basins, two forebays and  
 24 a forebay inundation area would be constructed and operated under Alternative 1A. The  
 25 sedimentation basins would be approximately 120 feet long by 40 feet wide by 55 feet deep, and the  
 26 solids lagoons would be approximately 165 feet long by 86 feet wide by 10 feet deep. Construction  
 27 of ~~the intake~~ cofferdams would take place from June through October, and it is expected that  
 28 dewatering of the cofferdams (i.e., removing water from behind the cofferdams) would occur after  
 29 the construction of the cofferdams, when generally there are fewer mosquitoes breeding, as  
 30 mosquitoes in northern California typically breed April–October (Sacramento–Yolo Mosquito and  
 31 Vector Control District 2008). Under DWR would consult and coordinate with San Joaquin County  
 32 and Sacramento-Yolo County MVEDs and prepare and implement Mosquito Management Plans  
 33 (MMPs) (Appendix 3B, *Environmental Commitments*). BMPs to be implemented as part of the MMPs  
 34 would help control mosquitoes and would be consistent with practices presented in the California  
 35 Department of Public Health’s Best Management Practices for Mosquito Control in California  
 36 (California Department of Public Health 2012). BMP activities will include, but not necessarily be  
 37 limited to, the following.

- 38 ● Maintain stable water levels.
- 39 ● Circulate water to avoid stagnation.
- 40 ● Implement monitoring and sampling programs to detect early signs of mosquito population
- 41 problems.
- 42 ● Use biological agents such as mosquito fish to limit larval mosquito populations.



- 1       • Use larvicides and adulticides, as necessary.
- 2       • Test for mosquito larvae during the high mosquito season (June through September).
- 3       • Reduce or eliminate emergent vegetation in and along the edges of water.
- 4       • Manage the spread and density of floating and submerged vegetation that encourages mosquito  
5       production.
- 6       • ~~Introduce biological controls such as mosquitofish to areas of standing water if mosquitoes are~~  
7       ~~present.~~
- 8       • Introduce physical controls to areas of standing water (e.g., discharging water more frequently  
9       or increasing circulation) if mosquitoes are present.

10       Implementation of these BMPs would reduce the likelihood that BDCP operations would require an  
11       increase in abatement activities by the local MVCDs.

12       The sedimentation basins and solids lagoons of Intakes 1 and 2 would be located within 1 mile of  
13       Clarksburg, and the sedimentation basins and solids lagoons of Intakes 3 and 4 would be located  
14       within 1 mile of Hood. The sedimentation basin and solids lagoons of Intake 5 would be located  
15       within 2.5 miles of Hood. The sedimentation basins would have a mat slab foundation and interior  
16       concrete walls to create separate sedimentation channels. The solids lagoons would be concrete-  
17       lined and approximately 10 feet deep. Up to three solids lagoons would be used in a rotating cycle  
18       for each intake, with one basin filling, one settling, and the third being emptied of settled and  
19       dewatered solids. The rate of filling and settling would depend on the volume of water pumped by  
20       the intakes; however, water would continuously move through the basins at a relatively slow but  
21       regulated rate so that the solids and sediments can be removed from the water prior to discharge  
22       into the conveyance facilities (e.g.i.e., fall out of the water via gravity) (Figure 25-1). The flow rates  
23       would be high enough to prevent water from stagnating, as stagnant water would not facilitate  
24       conveying the water to the conveyance system or removing the sediment from the water. As  
25       discussed in Section 25.1.1.4, mosquitoes typically prefer shallow stagnant water with little  
26       movement. The sedimentation basins and solids lagoons would be considered too deep and have too  
27       much regulated water movement to provide suitable mosquito habitat. Furthermore, during  
28       sediment drying and basin cleaning operations, flow would be stopped completely and the moisture  
29       in the sediment would be reduced to a point at which the sediment would not support  
30       insect/mosquito larvae production. Therefore, these basins would not substantially increase  
31       suitable vector habitat and would not substantially increase the public's exposure to vector-borne  
32       diseases. Accordingly, adverse effects on public health with respect to vector-borne diseases are not  
33       expected.

34       There would be an approximately 350-acre inundation area adjacent to the proposed intermediate  
35       forebay to accommodate emergency overflow from the forebay. Water would enter this area only  
36       during forebay emergency overflow situations; however, these situations could result in standing  
37       water approximately 2 feet deep. While water of this depth would be suitable habitat for  
38       mosquitoes, such events would be more likely to occur during high flow events in winter, when  
39       fewer mosquitoes are breeding (Sacramento–Yolo Mosquito and Vector Control District 2008).  
40       Water in the emergency overflow area would be pumped out and back to the intermediate forebay.  
41       The pumping would create circulation that would minimize the amount of suitable habitat for  
42       mosquitoes. Because the area would be used only during emergencies and the water would be

1 pumped from the area, the potential for creating suitable mosquito habitat would be low and  
2 adverse effects on public health with respect to vector-borne diseases are not expected.

3 Although the proposed intermediate forebay and Byron Tract Forebay would increase surface water  
4 within the study area, it is unlikely that these water bodies would provide suitable breeding habitat  
5 for mosquitoes given that the water in these forebays would not be stagnant and would be too deep.  
6 However, the shallow edges of the forebays could provide suitable mosquito breeding habitat if  
7 emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as  
8 part of the regular maintenance of these forebay areas, floating vegetation such pond weed would be  
9 harvested to maintain flow and forebay capacity. Further, BMPs to control mosquitoes would be  
10 implemented as part of this alternative. As such, operation of these forebays is not expected to result  
11 in an increase in mosquitoes or vector-borne diseases in the Plan Area.

12 In summary, although construction and operation of the water conveyance facilities would increase  
13 surface water area in the Plan Area and therefore potentially provide habitat for vectors that  
14 transmit diseases (e.g., mosquitoes), consultation and coordination with San Joaquin County and  
15 Sacramento-Yolo County MVCs and preparation and implementation of MMPs would ensure that  
16 there would be no~~Therefore,~~ adverse effects on public health with respect to mosquito-borne  
17 diseases ~~are not expected.~~

18 **CEQA Conclusion:** Sedimentation basins, solids lagoons, the Byron Tract Forebay, an intermediate  
19 forebay, and the intermediate forebay inundation area have the potential to provide habitat for  
20 vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would  
21 be held within these areas. ~~However, DWR would consult and coordinate with San Joaquin County~~  
22 ~~and Sacramento-Yolo County MVCs and prepare and implement MMPs. BMPs to be implemented~~  
23 ~~as part of the MMPs would help control mosquitoes reducing the need for local MVCs to increase~~  
24 ~~abatement activities in response to BDCP operations.~~ During operations, the depth, design, and  
25 operation of the sedimentation basins and solids lagoons would prevent the development of suitable  
26 mosquito habitat. Specifically, the basins would be too deep and the constant movement of water  
27 would prevent mosquitoes from breeding and multiplying. Furthermore, the 350-acre inundation  
28 area adjacent to the intermediate forebay would be limited to forebay emergency overflow  
29 situations and water would be physically pumped back to the intermediate forebay, creating  
30 circulation such that the area would have a low potential for creating suitable vector habitat.  
31 Similarly, water in the intermediate forebay and Byron Tract Forebay would be circulated regularly  
32 and, with the exception of shallower areas around the periphery, would be too deep to provided  
33 suitable mosquito breeding habitat. However, the shallow edges of the forebays could provide  
34 suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed)  
35 were allowed to grow. As part of the regular maintenance of these forebays, floating vegetation such  
36 pond weed would be harvested to maintain flow and forebay capacity.

37 To minimize the potential for any impacts related to increasing suitable vector habitat within the  
38 study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo  
39 County MVCs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs  
40 would help control mosquitoes, thereby reducing the need for local MVCs to increase abatement  
41 activities in response to BDCP operations. These BMPs would be consistent with practices presented  
42 in the California Department of Public Health's *Best Management Practices for Mosquito Control in*  
43 California (California Department of Public Health 2012). Therefore, construction and operation of  
44 Alternative 1A would not result in a substantial increase in vector-borne diseases and the impact on  
45 public health would be less than significant. No mitigation is required.

1 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
 2 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
 3 **Facilities**

4 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
 5 **Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
 6 **Slough**

7 It remains to be determined whether, or to what degree, the available and existing salinity  
 8 response and countermeasure actions of SWP and CVP facilities or municipal water purveyors  
 9 would be capable of offsetting the actual level of changes in bromide that may occur from  
 10 implementation of Alternative 1A. Therefore, to determine the feasibility of reducing the effects  
 11 of increased bromide levels, and potential adverse effects on beneficial uses associated with  
 12 CM1 operations (and hydrodynamic effects of tidal restoration under CM4), the proposed  
 13 mitigation requires a series of phased actions to identify and evaluate existing and possible  
 14 feasible actions, followed by development and implementation of the actions, if determined to  
 15 be necessary. The development and implementation of any mitigation actions shall be focused  
 16 on those incremental effects attributable to implementation of Alternative 1A operations only.  
 17 Development of mitigation actions for the incremental bromide effects attributable to climate  
 18 change/sea level rise are not required because these changed conditions would occur with or  
 19 without implementation of Alternative 1A. The goal of specific actions would be to reduce/avoid  
 20 additional degradation of Barker Slough water quality conditions with respect to the CALFED  
 21 bromide goal.

22 Following commencement of initial operations of CM1, the BDCP proponents will conduct  
 23 additional evaluations described herein, and develop additional modeling (as necessary), to  
 24 define the extent to which modified operations could reduce or eliminate the increased bromide  
 25 concentrations currently modeled to occur under Alternative 1A. The additional evaluations  
 26 should also consider specifically the changes in Delta hydrodynamic conditions associated with  
 27 tidal habitat restoration under CM4 (in particular the potential for increased bromide  
 28 concentrations that could result from increased tidal exchange) once the specific restoration  
 29 locations are identified and designed. If sufficient operational flexibility to offset bromide  
 30 increases is not practicable/feasible under Alternative 1A operations, achieving bromide  
 31 reduction pursuant to this mitigation measure would not be feasible under this alternative.

32 **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water**  
 33 **Conveyance Facilities.**

34 Any modified reservoir operations under Alternative 1A are not expected to promote *Microcystis*  
 35 production upstream of the Delta since large reservoirs upstream of the Delta are typically low in  
 36 nutrient concentrations and phytoplankton outcompete cyanobacteria, including *Microcystis*.  
 37 Further, in the rivers and streams of the Sacramento River watershed, watersheds of the eastern  
 38 tributaries (Cosumnes, Mokelumne, and Calaveras Rivers), and the San Joaquin River upstream of  
 39 the Delta, bloom development would be limited by high water velocity and low hydraulic residence  
 40 times.

41 As described in Chapter 8, Water Quality, *Microcystis* blooms in the Export Service Areas could  
 42 increase due to increased water temperatures resulting from climate change, but not due to water  
 43 conveyance facility operations. Similarly, hydraulic residence times in the Export Service Area

1 would not be affected by operations of CM1. Accordingly, conditions would not be more conducive  
2 to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north Delta is  
3 expected to be unaffected by *Microcystis*, but the fraction of water flowing through the Delta that  
4 reaches the existing south Delta intakes is expected to be influenced by an increase *Microcystis*  
5 blooms. Therefore, relative to the No Action Alternative, the addition of Sacramento River water  
6 from the north Delta under Alternative 1A would dilute *Microcystis* and microcystins in water  
7 diverted from the south Delta. Because the degree to which *Microcystis* blooms, and thus  
8 microcystins concentrations, will increase in source water from the south Delta is unknown, it  
9 cannot be determined whether Alternative 1A will result in increased or decreased levels of  
10 microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

11 Ambient meteorological conditions are the primary driver of Delta water temperatures, and  
12 therefore climate warming, and not water operations, would determine future water temperatures  
13 in the Delta. Increasing water temperatures due to climate change could lead to earlier attainment  
14 of the water temperature threshold of 19°C required to initiate *Microcystis* bloom formation, and  
15 therefore earlier occurrences of *Microcystis* blooms in the Delta, as well as increases in the duration  
16 and magnitude. However, these temperature-related changes under Alternative 1A would not be  
17 different from what would occur under the No Action Alternative. Siting and design of restoration  
18 areas would have a substantial influence on the magnitude of hydraulic residence time increases  
19 under Alternative 1A. The modeled increase in residence time in the Delta could result in an  
20 increase in the frequency, magnitude, and geographic extent of *Microcystis* blooms, and thus  
21 microcystin levels, throughout the Delta. Therefore, impacts on beneficial uses, including drinking  
22 water and recreational waters, could occur and, as such, public health could be affected. Accordingly,  
23 this would be considered an adverse effect. Mitigation Measure WQ-32a and WQ-32b are available to  
24 reduce the effects of degraded water quality, and therefore potential public health effects, in the  
25 Delta due to *Microcystis*. However, because the effectiveness of these mitigation measures to result  
26 in feasible measures for reducing water quality effects, and therefore potential public health effects,  
27 is uncertain, the effect would still be considered adverse.

28 **CEQA Conclusion:** Under Alternative 1A, operation of the water conveyance facilities is not expected  
29 to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta  
30 because large reservoirs upstream are typically low in nutrient concentrations and phytoplankton  
31 outcompete cyanobacteria, including *Microcystis*, and high water velocity and low hydraulic  
32 residence times in the upstream area limit the development of *Microcystis* blooms. *Microcystis*  
33 blooms in the Export Service Areas could increase due to increased water temperatures resulting  
34 from climate change, but not water conveyance facility operations. Hydraulic residence times in the  
35 Export Service Area would not be affected by operations of CM1, and therefore conditions would not  
36 be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export  
37 Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta  
38 intakes and unaffected source water from the Sacramento River. Because of this, it cannot be  
39 determined whether operations and maintenance under Alternative 1A would result in increased or  
40 decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from  
41 Banks and Jones pumping plants.

42 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
43 would result in an increase in the frequency, magnitude and geographic extent of *Microcystis*, and  
44 therefore microcystin levels. However, the potential water quality effects due to temperature  
45 increases would be due to climate change, not effects resulting from operation of the water  
46 conveyance facilities. Increases in Delta residence times would be due in small part to climate

1 change and sea level rise, but due to a greater degree to operation of the water conveyance facilities  
 2 and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible  
 3 that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta  
 4 would occur due to the operations and maintenance of the water conveyance facilities and the  
 5 hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including  
 6 drinking water and recreational waters would potentially be impacted and therefore, so would  
 7 public health. Therefore this impact would be significant.

8 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
 9 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time  
 10 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
 11 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
 12 proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods  
 13 to determine whether increases in abundance are significant. This mitigation measure also requires  
 14 that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will  
 15 investigate and evaluate measures that could be taken to reduce residence time in the affected areas  
 16 of the Delta. However, because the effectiveness of these mitigation measures to result in feasible  
 17 measures for reducing water quality effects, and therefore potential public health effects, is  
 18 uncertain, this impact would be significant and unavoidable.

19 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 20 ***Microcystis* Blooms**

21 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 22 in Chapter 8, *Water Quality*.

23 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 24 **Water Residence Time**

25 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 26 in Chapter 8, *Water Quality*.

27 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
 28 **CM4.**

29 **NEPA Effects:** As described in Chapter 8, *Water Quality*, implementation of CM3 and CM6–CM21 is  
 30 unlikely to affect *Microcystis* abundance in the rivers and reservoirs upstream of the Delta, in the  
 31 Delta region, or the waters exported to the CVP and SWP service areas. Implementation of CM5,  
 32 Seasonally Inundated Floodplain Restoration, could result in increased local water temperatures in  
 33 areas near restored seasonally inundated floodplains. However, floodplain inundation typically  
 34 occurs during spring and winter months when *Microcystis* growth is limited in general by low water  
 35 temperatures and by insufficient surface water irradiance. Water temperatures would not increase  
 36 sufficiently due to floodplain inundation such that effects on *Microcystis* growth would occur.  
 37 Therefore, implementation of CM5 is unlikely to affect *Microcystis* blooms in the study area.  
 38 Implementation of CM13, Invasive Aquatic Vegetation Control, may increase turbidity and flow  
 39 velocity, particularly in restored aquatic habitats, which could discourage *Microcystis* growth in  
 40 these areas. To the extent that invasive aquatic vegetation (IAV) removal would affect turbidity and  
 41 water velocity, it is possible that IAV removal could, to some degree, help offset the increase in  
 42 *Microcystis* production expected under Alternative 1A, relative to the No Action Alternative.

1 As discussed under Impact PH-8, development of restoration areas under CM2 and CM4 could  
 2 potentially increase the frequency, magnitude, and geographic extent of *Microcystis* blooms due to  
 3 the hydrodynamic impacts that are expected to increase hydraulic residence times throughout the  
 4 Delta. Additionally, restoration activities implemented under CM2 and CM4 that create shallow  
 5 backwater areas could result in local increases in water temperature that may encourage *Microcystis*  
 6 growth during the summer bloom season, which could result in further degradation of water quality  
 7 to the extent that beneficial uses are affected. Were *Microcystis* blooms to increase with  
 8 implementation of CM2 and CM4, there would be an increase in the potential for impacts on public  
 9 health as a result of potential effects on drinking water quality and recreational waters. Mitigation  
 10 Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local  
 11 water temperatures and water residence time. However this would be an adverse effect.

12 **CEQA Conclusion:** Restoration activities implemented under CM2 and CM4 that create shallow  
 13 backwater areas could result in local increases in water temperature conducive to *Microcystis*  
 14 growth during summer bloom season. This could compound the water quality degradation that may  
 15 result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in  
 16 additional water quality degradation such that beneficial uses are affected. An increase in  
 17 *Microcystis* blooms could potentially result in impacts on public health through exposure via  
 18 drinking water quality and recreational waters. Therefore, this impact would be significant.  
 19 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
 20 increased local water temperatures and hydraulic residence time. The effectiveness of these  
 21 mitigation measures to result in feasible measures for reducing water quality effects, and therefore  
 22 potential public health effects, is uncertain. Therefore, this impact would be significant and  
 23 unavoidable.

24 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 25 **Microcystis Blooms**

26 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 27 in Chapter 8, *Water Quality*.

28 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 29 **Water Residence Time**

30 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 31 in Chapter 8, *Water Quality*.

32 **25.3.3.3 Alternative 1B—Dual Conveyance with East Alignment and**  
 33 **Intakes 1–5 (15,000 cfs; Operational Scenario A)**

34 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of**  
 35 **~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water**  
 36 **Conveyance Facilities**

37 **NEPA Effects:** As with Alternative 1A, implementation of CM1 under Alternative 1B would involve  
 38 construction and operation of five north Delta intakes, up to 15 solids lagoons, ~~and five~~  
 39 ~~sedimentation basins, and Byron Tract Forebay. Sedimentation basins and solids lagoons~~ ~~These~~  
 40 ~~facilities~~ have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes)  
 41 because of the large volumes of water that would be held within these areas. ~~However, DWR would~~



1 ~~consult and coordinate with San Joaquin County and Sacramento-Yolo County MVEDs and prepare~~  
 2 ~~and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes~~  
 3 ~~during construction. See Impact PH-1 under Alternative 1A.~~

4 Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons  
 5 would be 165 feet long by 86 feet wide by 10 feet deep. ~~During operation, t~~The depth, design, and  
 6 operation of the sedimentation basins and solids lagoons would prevent the development of suitable  
 7 mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant  
 8 movement of water would prevent mosquitoes from breeding and multiplying. ~~As described under~~  
 9 ~~Alternative 1A, implementation of CM1 under Alternative 1B would not substantially increase~~  
 10 ~~suitable vector habitat and would not substantially increase vector-borne diseases. Accordingly, no~~  
 11 ~~adverse effects on public health would result.~~

12 ~~Although the proposed Byron Tract Forebay would increase surface water within the study area, it~~  
 13 ~~is unlikely that the forebay would provide suitable breeding habitat for mosquitoes given that the~~  
 14 ~~water in this forebay would not be stagnant and would be too deep. However, the shallow edges of~~  
 15 ~~the forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or~~  
 16 ~~other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular~~  
 17 ~~maintenance of the forebay, floating vegetation such as pond weed would be harvested to maintain~~  
 18 ~~flow and forebay capacity.~~

19 ~~Although construction and operation of the water conveyance facilities would increase surface~~  
 20 ~~water area in the Plan Area and therefore potentially provide habitat for vectors that transmit~~  
 21 ~~diseases (e.g., mosquitoes), DWR would consult and coordinate with San Joaquin County and~~  
 22 ~~Sacramento-Yolo County MVEDs and prepare and implement MMPs. BMPs to be implemented as~~  
 23 ~~part of the MMPs would help control mosquitoes during construction and operation of the water~~  
 24 ~~conveyance facilities. These BMPs would be consistent with practices presented in the California~~  
 25 ~~Department of Public Health's Best Management Practices for Mosquito Control in California~~  
 26 ~~(California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore,~~  
 27 ~~construction and operation of the water conveyance facilities under Alternative 1B would not result~~  
 28 ~~in a substantial increase in vector-borne diseases and the impact would be less than significant. No~~  
 29 ~~mitigation is required.~~

30 **CEQA Conclusion:** As with Alternative 1A, implementation of CM1 under Alternative 1B would  
 31 involve construction and operation of solids lagoons, ~~and~~ sedimentation basins, ~~and the Byron Tract~~  
 32 ~~Forebay. Public exposure to vector-borne diseases would not substantially increase because water~~  
 33 ~~depth and movement circulation in sedimentation basins and the Byron Tract Forebay would~~  
 34 ~~prevent development of suitable mosquito habitat. However, the shallow edges on the periphery of~~  
 35 ~~Byron Tract Forebay could potentially provide suitable mosquito breeding habitat if emergent~~  
 36 ~~vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. To minimize the~~  
 37 ~~potential for impacts related to increasing suitable vector habitat within the study area.~~  
 38 ~~Furthermore,~~ DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo  
 39 County MVEDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs  
 40 would help control mosquitoes. See Impact PH-1 for Alternative 1A. ~~These BMPs would be~~  
 41 ~~consistent with practices presented in the California Department of Public Health's Best~~  
 42 ~~Management Practices for Mosquito Control in California (California Department of Public Health~~  
 43 ~~2012). During operations, water depth and circulation would prevent the areas from substantially~~  
 44 ~~increasing suitable vector habitat. Therefore, construction and operation of the water conveyance~~



1 facilities ~~in~~under Alternative 1B would not result in a substantial increase in vector-borne diseases  
2 and the impact would be less than significant. No mitigation is required.

3 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
4 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
5 **Facilities**

6 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
7 **Conditions: Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
8 **Slough**

9 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

10 **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water**  
11 **Conveyance Facilities.**

12 NEPA Effects: Water operations under Alternative 1B would be the same as under Alternative 1A.  
13 Therefore, potential effects on public health due to changes in water quality and beneficial uses as a  
14 result of *Microcystis* blooms and microcystin levels would be the same. Any modified reservoir  
15 operations under Alternative 1B are not expected to promote *Microcystis* production upstream of  
16 the Delta or in the rivers and streams of the Sacramento River watershed, watersheds of the eastern  
17 tributaries (Cosumnes, Mokelumne, and Calaveras Rivers), and the San Joaquin River upstream of  
18 the Delta.

19 As described in Chapter 8, Water Quality, *Microcystis* blooms in the Export Service Areas could  
20 increase due to increased water temperatures resulting from climate change, but not due to water  
21 conveyance facility operations. Similarly, hydraulic residence times in the Export Service Area  
22 would not be affected by operations of CM1. Accordingly, conditions would not be more conducive  
23 to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north Delta is  
24 expected to be unaffected by *Microcystis*. However, the fraction of water flowing through the Delta  
25 that reaches the existing south Delta intakes is expected to be influenced by an increase *Microcystis*  
26 blooms, as discussed below. Therefore, relative to the No Action Alternative, the addition of  
27 Sacramento River water from the north Delta under Alternative 1B would dilute *Microcystis* and  
28 microcystins in water diverted from the south Delta. Because the degree to which *Microcystis*  
29 blooms, and thus microcystins concentrations, will increase in source water from the south Delta is  
30 unknown, it cannot be determined whether Alternative 1B would result in increased or decreased  
31 levels of microcystins in the mixture of source waters exported from Banks and Jones pumping  
32 plants.

33 Ambient meteorological conditions would be the primary driver of Delta water temperatures, and  
34 climate warming, not water operations, would determine future water temperatures in the Delta.  
35 Increasing water temperatures due to climate change could lead to earlier attainment of the water  
36 temperature threshold required to initiate *Microcystis* bloom formation, and therefore earlier  
37 occurrences of *Microcystis* blooms in the Delta, as well as increases in the duration and magnitude.  
38 However, these temperature-related changes would not be different from what would occur under  
39 the No Action Alternative. Modeled hydraulic residence times in the Delta are projected to increase  
40 in the summer and fall periods in the north and west Delta and in the summer in Cache Slough, the  
41 east Delta, and south Delta relative to the No Action Alternative. Siting and design of restoration  
42 areas would have a substantial influence on the magnitude of residence time increases under

1 Alternative 1B. The modeled increase in hydraulic residence time in the Delta could result in an  
2 increase in the frequency, magnitude, and geographic extent of Microcystis blooms, and thus  
3 microcystin levels. Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of  
4 degraded water quality, and therefore potential public health effects, in the Delta due to Microcystis.  
5 However, because the effectiveness of these mitigation measures to result in feasible measures for  
6 reducing water quality effects, and therefore potential public health effects, is uncertain, the effect  
7 would still be considered adverse.

8 **CEQA Conclusion:** Under Alternative 1B, operation of the water conveyance facilities is not expected  
9 to promote Microcystis bloom formation in the reservoirs and watersheds upstream of the Delta.  
10 Microcystis blooms in the Export Service Areas could increase due to increased water temperatures  
11 resulting from climate change, but not due to water conveyance facility operations. Hydraulic  
12 residence times in the Export Service Area would not be affected by operations of CM1, and  
13 therefore conditions in those areas would not be more conducive to Microcystis bloom formation.  
14 Water exported from the Delta to the Export Service Area is expected to be a mixture of Microcystis-  
15 affected source water from the south Delta intakes and unaffected source water from the  
16 Sacramento River. Because of this, it cannot be determined whether operations and maintenance  
17 under Alternative 1B would result in increased or decreased levels of Microcystis and microcystins  
18 in the mixture of source waters exported from Banks and Jones pumping plants.

19 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
20 could result in an increase in Microcystis blooms and therefore microcystin levels. However, the  
21 water temperature increases in the Delta would be due to climate change primarily and not due to  
22 operation of the water conveyance facilities. Increases in Delta residence times would be due in  
23 small part to climate change and sea level rise, but due to a greater degree to operation of the water  
24 conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4.  
25 Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of  
26 Microcystis blooms in the Delta would occur due to the operations and maintenance of the water  
27 conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4.  
28 Accordingly, beneficial uses including drinking water and recreational waters would be impacted  
29 and, as a result, public health. Therefore, this impact would be significant.

30 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
31 quality due to Microcystis. Mitigation Measure WQ-32a requires that hydraulic residence time  
32 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
33 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
34 proponents monitor for Microcystis abundance in the Delta and use appropriate statistical methods  
35 to determine whether increases in abundance are significant. This mitigation measure also requires  
36 that if Microcystis abundance increases (relative to Existing Conditions), the project proponents will  
37 investigate and evaluate measures that could be taken to reduce hydraulic residence time in the  
38 affected areas of the Delta. However, because the effectiveness of these mitigation measures to  
39 result in feasible measures for reducing water quality effects, and therefore potential public health  
40 effects, is uncertain, this impact would be significant and unavoidable.

41 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
42 **Microcystis Blooms**

43 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
44 in Chapter 8, *Water Quality*.

1 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
2 **Water Residence Time**

3 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
4 in Chapter 8, *Water Quality*.

5 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
6 **CM4.**

7 **NEPA Effects:** The amount and location of habitat restoration and enhancement that would occur  
8 under Alternative 1B would be the same as that described under Alternative 1A. Restoration  
9 activities implemented under CM2 and CM4 that would create shallow backwater areas could result  
10 in local increases in water temperature that may encourage *Microcystis* growth during the summer  
11 bloom season. This would result in further degradation of water quality beyond the hydrodynamic  
12 effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis*  
13 blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public  
14 health through exposure via drinking water quality and recreational waters. Mitigation Measures  
15 WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water  
16 temperatures and water residence time. The effectiveness of these mitigation measures to result in  
17 feasible measures for reducing water quality effects, and therefore potential public health effects, is  
18 uncertain. This would be an adverse effect.

19 **CEQA Conclusion:** Restoration activities implemented under CM2 and CM4 that create shallow  
20 backwater areas could result in local increases in water temperature conducive to *Microcystis*  
21 growth during summer bloom season. This could compound the water quality degradation that may  
22 result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in  
23 additional water quality degradation such that beneficial uses are affected. An increase in  
24 *Microcystis* blooms could potentially result in impacts on public health through exposure via  
25 drinking water quality and recreational waters. Therefore, this impact would be significant.  
26 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
27 increased local water temperatures and water residence time. The effectiveness of these mitigation  
28 measures to result in feasible measures for reducing water quality effects, and therefore potential  
29 public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

30 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
31 ***Microcystis* Blooms**

32 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
33 in Chapter 8, *Water Quality*.

34 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
35 **Water Residence Time**

36 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
37 in Chapter 8, *Water Quality*.

### 25.3.3.4 Alternative 1C—Dual Conveyance with West Alignment and Intakes W1–W5 (15,000 cfs; Operational Scenario A)

#### Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of ~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water Conveyance Facilities

**NEPA Effects:** As with Alternative 1A, implementation of CM1 under Alternative 1C would involve construction and operation of five north Delta intakes, up to 15 solids lagoons, ~~and five~~ sedimentation basins, ~~and Byron Tract Forebay~~. Sedimentation basins and solids lagoons near the intakes have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. ~~Activities will include, but not be limited to: testing for mosquito larvae during the high mosquito season (June through September), introducing biological controls such as mosquitofish if mosquitoes are present, and introducing physical controls (e.g., discharging water more frequently or increasing circulation) if mosquitoes are present. During operation,~~ The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep.

Although the proposed Byron Tract Forebay would increase surface water within the study area, it is unlikely that the forebay would provide suitable breeding habitat for mosquitoes given that the water in these forebay would not be stagnant and would be too deep. However, the shallow edges of the forebay could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular maintenance of the forebay, floating vegetation such pond weed would be harvested to maintain flow and forebay capacity.

Although construction and operation of the water conveyance facilities would increase surface water area in the Plan Area and therefore potentially provide habitat for vectors that transmit diseases (e.g., mosquitoes), DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVEDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent with practices presented in the California Department of Public Health's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Activities will include, but not be limited to: testing for mosquito larvae during the high mosquito season (June through September), introducing biological controls such as mosquitofish if mosquitoes are present, and introducing physical controls (e.g., discharging water more frequently or increasing circulation) if mosquitoes are present. Accordingly, as described under Alternative 1A, construction and operation of the intakes, solids lagoons, and/or sedimentation basins under Alternative 1C would not substantially increase suitable vector habitat, and would not substantially increase vector-borne diseases. Therefore, no adverse effects would result.

**CEQA Conclusion:** As with Alternative 1A, implementation of CM1 under Alternative 1C would involve construction and operation of solids lagoons, ~~and~~ sedimentation basins ~~and Byron Tract Forebay~~. These areas could provide suitable habitat for vectors (i.e., mosquitoes). ~~However,~~ During operations, water depth and circulation would prevent the solids lagoons and sedimentation basins from substantially increasing suitable vector habitat. However, the shallow edges on the periphery

1 of Byron Tract Forebay could potentially provide suitable mosquito breeding habitat if emergent  
 2 vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. To minimize the  
 3 potential for impacts related to increasing suitable vector habitat within the study area, DWR would  
 4 consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare  
 5 and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes  
 6 (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with practices presented  
 7 in the California Department of Public Health's *Best Management Practices for Mosquito Control in*  
 8 *California* (California Department of Public Health 2012). Accordingly, construction and operation of  
 9 the water conveyance facilities under Alternative 1C would not result in a substantial increase in  
 10 vector-borne diseases and the impact would be less than significant. No mitigation is required.

11 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
 12 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
 13 **Facilities**

14 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
 15 **Conditions: Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
 16 **Slough**

17 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

18 **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water**  
 19 **Conveyance Facilities.**

20 *NEPA Effects:* Water operations under Alternative 1C would be the same as under Alternative 1A.  
 21 Therefore, potential effects on public health due to changes in water quality and beneficial uses as a  
 22 result of *Microcystis* blooms and microcystin levels would be the same. Any modified reservoir  
 23 operations under Alternative 1C are not expected to promote *Microcystis* production upstream of  
 24 the Delta or in the rivers and streams of the Sacramento River watershed, watersheds of the eastern  
 25 tributaries (Cosumnes, Mokelumne, and Calaveras Rivers), and the San Joaquin River upstream of  
 26 the Delta.

27 As described in Chapter 8, *Water Quality*, *Microcystis* blooms in the Export Service Areas could  
 28 increase due to increased water temperatures resulting from climate change, but not due to water  
 29 conveyance facility operations. Similarly, hydraulic residence times in the Export Service Area  
 30 would not be affected by operations of CM1. Accordingly, conditions would not be more conducive  
 31 to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north Delta is  
 32 expected to be unaffected by *Microcystis*. However, the fraction of water flowing through the Delta  
 33 that reaches the existing south Delta intakes is expected to be influenced by an increase *Microcystis*  
 34 blooms, as discussed below. Therefore, relative to the No Action Alternative, the addition of  
 35 Sacramento River water from the north Delta under Alternative 1C would dilute *Microcystis* and  
 36 microcystins in water diverted from the south Delta. Because the degree to which *Microcystis*  
 37 blooms, and thus microcystins concentrations, will increase in source water from the south Delta is  
 38 unknown, it cannot be determined whether Alternative 1C would result in increased or decreased  
 39 levels of microcystins in the mixture of source waters exported from Banks and Jones pumping  
 40 plants.

41 Ambient meteorological conditions would be the primary driver of Delta water temperatures, and  
 42 climate warming, not water operations, would determine future water temperatures in the Delta.

1 Increasing water temperatures due to climate change could lead to earlier attainment of the water  
2 temperature threshold required to initiate *Microcystis* bloom formation, and therefore earlier  
3 occurrences of *Microcystis* blooms in the Delta, as well as increases in the duration and magnitude.  
4 However, these temperature-related changes would not be different from what would occur under  
5 the No Action Alternative. Modeled hydraulic residence times in the Delta are projected to increase  
6 in the summer and fall periods in the north and west Delta and in the summer in Cache Slough, the  
7 east Delta, and south Delta relative to the No Action Alternative. Siting and design of restoration  
8 areas would have a substantial influence on the magnitude of residence time increases under  
9 Alternative 1C. The modeled increase in residence time in the Delta could result in an increase in  
10 the frequency, magnitude, and geographic extent of *Microcystis* blooms, and thus microcystin levels.  
11 Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur  
12 and public health could be affected. Accordingly, this would be considered an adverse effect.

13 Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water  
14 quality, and therefore potential public health effects, in the Delta due to *Microcystis*. However,  
15 because the effectiveness of these mitigation measures to result in feasible measures for reducing  
16 water quality effects, and therefore potential public health effects, is uncertain, the effect would still  
17 be considered adverse.

18 **CEQA Conclusion:** Under Alternative 1C, operation of the water conveyance facilities is not expected  
19 to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta.  
20 *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures  
21 resulting from climate change, but not due to water conveyance facility operations. Residence times  
22 in the Export Service Area would not be affected by operations of CM1, and therefore conditions in  
23 those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the  
24 Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water  
25 from the south Delta intakes and unaffected source water from the Sacramento River. Because of  
26 this, it cannot be determined whether operations and maintenance under Alternative 1C would  
27 result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source  
28 waters exported from Banks and Jones pumping plants.

29 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
30 could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the  
31 water temperature increases in the Delta would be due to climate change primarily and not due to  
32 operation of the water conveyance facilities. Increases in Delta residence times would be due in  
33 small part to climate change and sea level rise, but due to a greater degree to operation of the water  
34 conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4.  
35 Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of  
36 *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water  
37 conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4.  
38 Accordingly, beneficial uses including drinking water and recreational waters would be impacted  
39 and, as a result, public health. Therefore, this impact would be significant.

40 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
41 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time  
42 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
43 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
44 proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods  
45 to determine whether increases in abundance are significant. This mitigation measure also requires



1 that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will  
2 investigate and evaluate measures that could be taken to reduce residence time in the affected areas  
3 of the Delta. However, because the effectiveness of these mitigation measures to result in feasible  
4 measures for reducing water quality effects, and therefore potential public health effects, is  
5 uncertain, this impact would be significant and unavoidable.

6 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
7 **Microcystis Blooms**

8 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
9 in Chapter 8, *Water Quality*.

10 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
11 **Water Residence Time**

12 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
13 in Chapter 8, *Water Quality*.

14 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
15 **CM4.**

16 **NEPA Effects:** The amount and location of habitat restoration and enhancement that would occur  
17 under Alternative 1C would be the same as that described under Alternative 1A. Restoration  
18 activities implemented under CM2 and CM4 that would create shallow backwater areas could result  
19 in local increases in water temperature that may encourage *Microcystis* growth during the summer  
20 bloom season. This would result in further degradation of water quality beyond the hydrodynamic  
21 effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis*  
22 blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public  
23 health through exposure via drinking water quality and recreational waters. Mitigation Measures  
24 WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water  
25 temperatures and water residence time. The effectiveness of these mitigation measures to result in  
26 feasible measures for reducing water quality effects, and therefore potential public health effects, is  
27 uncertain. This would be an adverse effect.

28 **CEQA Conclusion:** Restoration activities implemented under CM2 and CM4 that create shallow  
29 backwater areas could result in local increases in water temperature conducive to *Microcystis*  
30 growth during summer bloom season. This could compound the water quality degradation that may  
31 result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in  
32 additional water quality degradation such that beneficial uses are affected. An increase in  
33 *Microcystis* blooms could potentially result in impacts on public health through exposure via  
34 drinking water quality and recreational waters. Therefore, this impact would be significant.  
35 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
36 increased local water temperatures and hydraulic residence time. The effectiveness of these  
37 mitigation measures to result in feasible measures for reducing water quality effects, and therefore  
38 potential public health effects, is uncertain. Therefore, this impact would be significant and  
39 unavoidable.



1 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 2 **Microcystis Blooms**

3 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 4 in Chapter 8, *Water Quality*.

5 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 6 **Water Residence Time**

7 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 8 in Chapter 8, *Water Quality*.

9 **25.3.3.5 Alternative 2A—Dual Conveyance with Pipeline/Tunnel and Five**  
 10 **Intakes (15,000 cfs; Operational Scenario B)**

11 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of**  
 12 **~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water**  
 13 **Conveyance Facilities**

14 *NEPA Effects:* As with Alternative 1A, implementation of CM1 under Alternative 2A would involve  
 15 construction and operation of up to 15 solids lagoons, five sedimentation basins, Byron Tract  
 16 Forebay, an intermediate forebay, and a 350-acre inundation area adjacent to the intermediate  
 17 forebay. Sedimentation basins, solids lagoons, ~~and a 350-acre~~ the intermediate forebay inundation  
 18 area, and the periphery of the intermediate forebay and Byron Tract Forebay adjacent to the  
 19 intermediate forebay have the potential to provide habitat for vectors that transmit diseases (e.g.,  
 20 mosquitoes) because of the large volumes of water that would be held within these areas. ~~However,~~  
 21 ~~Implementation of these BMPs would reduce the likelihood that BDCP operations would require an~~  
 22 ~~increase in abatement activities by the local MVCDS. During operation,~~ ~~the~~ The depth, design, and  
 23 operation of the sedimentation basins and solids lagoons would prevent the development of suitable  
 24 mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant  
 25 movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation  
 26 basins would be approximately 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons  
 27 would be approximately 165 feet long by 86 feet wide by 10 feet deep. Furthermore, use of the 350-  
 28 acre inundation area would be limited to forebay emergency overflow situations and water would  
 29 be ~~physically~~ pumped, creating circulation such that the area would have a low potential for creating  
 30 suitable vector habitat. Similarly, water in the intermediate forebay and the Byron Tract Forebay  
 31 would be circulated regularly and, with the exception of shallower areas around the periphery,  
 32 would be too deep to provide suitable mosquito habitat. The shallower edges of the forebays could  
 33 provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g.,  
 34 pond weed) were allowed to grow.

35 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 36 area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County  
 37 MVCDS and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help  
 38 control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with  
 39 practices presented in the California Department of Public Health's Best Management Practices for  
 40 Mosquito Control in California (California Department of Public Health 2012). Implementation of  
 41 these BMPs would reduce the likelihood that BDCP operations would require an increase in  
 42 abatement activities by the local MVCDS. Therefore, as described under Alternative 1A, construction

1 and operation of the intakes, solids lagoons, ~~and/or~~ sedimentation basins, the forebays, and the  
 2 intermediate forebay inundation area under Alternative 2A would not substantially increase  
 3 suitable vector habitat and would not substantially increase vector-borne diseases. Accordingly, no  
 4 adverse effects on public health would result.

5 **CEQA Conclusion:** As with Alternative 1A, implementation of CM1 under Alternative 2A would  
 6 involve construction and operation of solids lagoons, sedimentation basins, an intermediate forebay  
 7 and associated 350-acre inundation area, and Byron Tract Forebay adjacent to the intermediate  
 8 forebay. While these ~~areas~~ facilities could provide suitable habitat for vectors (e.g., mosquitoes),  
 9 water depth and circulation would prevent the areas from substantially increasing suitable vector  
 10 habitat. ~~In addition,~~ The inundation area would only be used during emergency overflow situations  
 11 and water would be pumped back into the intermediate forebay, creating circulation that would  
 12 discourage mosquito breeding. The shallower periphery of the intermediate forebay and Bryon  
 13 Tract Forebay could provide suitable mosquito breeding habitat.

14 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 15 area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County  
 16 MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help  
 17 control mosquitoes. These BMPs would be consistent with practices presented in the California  
 18 Department of Public Health's Best Management Practices for Mosquito Control in California  
 19 (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Accordingly,  
 20 construction and operation of the water conveyance facilities ~~is~~ under Alternative 2A would not  
 21 result in a substantial increase in vector-borne diseases and the impact on public health would be  
 22 less than significant. No mitigation is required.

23 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
 24 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
 25 **Facilities**

26 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
 27 **Conditions: Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
 28 **Slough**

29 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

30 **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water**  
 31 **Conveyance Facilities.**

32 NEPA Effects: Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in  
 33 the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change  
 34 under Alternative 2A, *Microcystis* abundance, and thus microcystins concentrations, in water bodies  
 35 of the affected environment under Alternative 2A would be very similar (i.e., nearly the same) to  
 36 those discussed for Alternative 1A.

37 As described in Chapter 8, Water Quality, although *Microcystis* blooms have not occurred in the  
 38 Export Service Areas, conditions in the Export Service Areas under Alternative 2A may become more  
 39 conductive to *Microcystis* bloom formation because water temperatures will increase in the Export  
 40 Service Areas due to the expected increase in ambient air temperatures resulting from climate  
 41 change, but not from operation of the water conveyance facilities.

1 Like Alternative 1A, elevated ambient water temperatures would occur in the Delta under  
2 Alternative 2A, which could lead to earlier occurrences of Microcystis blooms in the Delta, and  
3 increase the overall duration and magnitude of blooms. However, as described in Chapter 8, Water  
4 Quality, the increase in Delta water temperatures, and consequent potential increase in Microcystis  
5 blooms, would be driven entirely by climate change, not by operation of water conveyance facilities.  
6 There would be differences in the direction and magnitude of hydraulic residence time changes  
7 during the Microcystis bloom period due to operation of the water conveyance facilities under  
8 Alternative 2A compared to Alternative 1A, relative to the No Action Alternative. As a result,  
9 Microcystis blooms, and therefore microcystin, could increase in surface waters throughout the  
10 Delta. Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water  
11 quality in the Delta. Although there is uncertainty regarding this impact, the effects on Microcystis  
12 from implementing CM1 is determined to be adverse.

13 **CEQA Conclusion:** Under Alternative 2A, operation of the water conveyance facilities is not expected  
14 to promote Microcystis bloom formation in the reservoirs and watersheds upstream of the Delta.  
15 Microcystis blooms in the Export Service Areas could increase due to increased water temperatures  
16 resulting from climate change, but not due to water conveyance facility operations. Residence times  
17 in the Export Service Area would not be affected by operations of CM1, and therefore conditions in  
18 those areas would not be more conducive to Microcystis bloom formation. Water exported from the  
19 Delta to the Export Service Area is expected to be a mixture of Microcystis-affected source water  
20 from the south Delta intakes and unaffected source water from the Sacramento River. Because of  
21 this, it cannot be determined whether operations and maintenance under Alternative 2A would  
22 result in increased or decreased levels of Microcystis and microcystins in the mixture of source  
23 waters exported from Banks and Jones pumping plants.

24 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
25 could result in an increase in Microcystis blooms and therefore microcystin levels. However, the  
26 water temperature increases in the Delta would be due to climate change and not due to operation  
27 of the water conveyance facilities. Increases in Delta residence times would be due in small part to  
28 climate change and sea level rise, but due to a greater degree to operation of the water conveyance  
29 facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is  
30 possible that increases in the frequency, magnitude, and geographic extent of Microcystis blooms in  
31 the Delta would occur due to the operations and maintenance of the water conveyance facilities and  
32 the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including  
33 drinking water and recreational waters would be impacted and, as a result, public health. Therefore,  
34 this impact would be significant.

35 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
36 quality due to Microcystis. Mitigation Measure WQ-32a requires that hydraulic residence time  
37 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
38 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
39 proponents monitor for Microcystis abundance in the Delta and use appropriate statistical methods  
40 to determine whether increases in abundance are significant. This mitigation measure also requires  
41 that if Microcystis abundance increases (relative to Existing Conditions), the project proponents will  
42 investigate and evaluate measures that could be taken to reduce residence time in the affected areas  
43 of the Delta. However, because the effectiveness of these mitigation measures to result in feasible  
44 measures for reducing water quality effects, and therefore potential public health effects, is  
45 uncertain, this impact would be significant and unavoidable.

1 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
2 **Microcystis Blooms**

3 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
4 in Chapter 8, *Water Quality*.

5 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
6 **Water Residence Time**

7 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
8 in Chapter 8, *Water Quality*.

9 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
10 **CM4.**

11 **NEPA Effects:** The amount and location of habitat restoration and enhancement that would occur  
12 under Alternative 2A would be the same as that described under Alternative 1A. Restoration  
13 activities implemented under CM2 and CM4 that would create shallow backwater areas could result  
14 in local increases in water temperature that may encourage *Microcystis* growth during the summer  
15 bloom season. This would result in further degradation of water quality beyond the hydrodynamic  
16 effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis*  
17 blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public  
18 health through exposure via drinking water quality and recreational waters. Mitigation Measures  
19 WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water  
20 temperatures and water residence time. The effectiveness of these mitigation measures to result in  
21 feasible measures for reducing water quality effects, and therefore potential public health effects, is  
22 uncertain. This would be an adverse effect.

23 **CEQA Conclusion:** The effects of CM2 and CM4 on *Microcystis* under Alternative 2A are the same as  
24 those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that  
25 create shallow backwater areas could result in local increases in water temperature conducive to  
26 *Microcystis* growth during summer bloom season. This could compound the water quality  
27 degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact  
28 PH-8 and result in additional water quality degradation such that beneficial uses are affected. An  
29 increase in *Microcystis* blooms could potentially result in impacts on public health through exposure  
30 via drinking water quality and recreational waters. Therefore, this impact would be significant.  
31 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
32 increased local water temperatures and water residence time. The effectiveness of these mitigation  
33 measures to result in feasible measures for reducing water quality effects, and therefore potential  
34 public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

35 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
36 **Microcystis Blooms**

37 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
38 in Chapter 8, *Water Quality*.

1 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 2 **Water Residence Time**

3 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 4 in Chapter 8, Water Quality.

5 **25.3.3.6 Alternative 2B—Dual Conveyance with East Alignment and Five**  
 6 **Intakes (15,000 cfs; Operational Scenario B)**

7 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of**  
 8 **~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water**  
 9 **Conveyance Facilities**

10 **NEPA Effects:** As with Alternative 1A, implementation of CM1 under Alternative 2B would involve  
 11 construction and operation of up to 15 solids lagoons, ~~and~~ 5 sedimentation basins ~~and Byron Tract~~  
 12 ~~Forebay. Sedimentation basins and solids lagoons~~ These facilities have the potential to provide  
 13 habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water  
 14 that would be held within these areas. ~~However, During operation, the depth, design, and operation~~  
 15 ~~of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito~~  
 16 ~~habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of~~  
 17 ~~water would prevent mosquitoes from breeding and multiplying.~~ Sedimentation basins would be  
 18 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet  
 19 wide by 10 feet deep. ~~The depth, design, and operation of the sedimentation basins and solids~~  
 20 ~~lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the~~  
 21 ~~basins would be too deep and the constant movement of water would prevent mosquitoes from~~  
 22 ~~breeding and multiplying.~~

23 Although the proposed Byron Tract Forebay would increase surface water within the study area, it  
 24 is unlikely that the forebay would provide suitable breeding habitat for mosquitoes given that the  
 25 water in this forebay would not be stagnant and would be too deep. However, the shallow edges of  
 26 the forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or  
 27 other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular  
 28 maintenance of the forebay, floating vegetation such as pond weed would be harvested to maintain  
 29 flow and forebay capacity.

30 To minimize the potential for causing impacts related to increasing suitable mosquito habitat in the  
 31 Plan Area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo  
 32 County MVEDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs  
 33 would help control mosquitoes. These BMPs would be consistent with practices presented in the  
 34 California Department of Public Health's Best Management Practices for Mosquito Control in  
 35 California (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A.  
 36 Therefore, as described for Alternative 1A, construction and operation of the ~~intakes, solids lagoons,~~  
 37 ~~and/or sedimentation basins~~ water conveyance facilities under Alternative 2B would not  
 38 substantially increase suitable vector habitat and would not substantially increase vector-borne  
 39 diseases. No adverse effects would result.

40 **CEQA Conclusion:** As with Alternative 1A, implementation of CM1 under Alternative 2B would  
 41 involve construction and operation of solids lagoons, ~~lagoons, and~~ sedimentation basins, ~~and the~~  
 42 ~~Byron Tract Forebay.~~ These areas could provide suitable habitat for vectors (e.g., mosquitoes).

1 ~~However,~~ During operations, water depth and circulation would prevent these areas from  
 2 substantially increasing suitable vector habitat. However, the shallow edges on the periphery of  
 3 Byron Tract Forebay could potentially provide suitable mosquito breeding habitat if emergent  
 4 vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. To minimize the  
 5 potential for impacts related to increasing suitable vector habitat within the study area. These  
 6 BMPs would be consistent with practices presented in the California Department of Public Health's  
 7 Best Management Practices for Mosquito Control in California (California Department of Public  
 8 Health 2012). Therefore, construction and operation of the water conveyance facilities ~~in~~ under  
 9 Alternative 2B would not result in a substantial increase in vector-borne diseases and the impact  
 10 would be less than significant. No mitigation is required.

11 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
 12 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
 13 **Facilities**

14 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
 15 **Conditions: Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
 16 **Slough**

17 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

18 **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water**  
 19 **Conveyance Facilities.**

20 NEPA Effects: Water operations under Alternative 2B would be the same as under Alternative 2A.  
 21 Therefore, potential effects on public health due to changes in water quality and beneficial uses as a  
 22 result of *Microcystis* blooms and microcystin levels would be the same.

23 Any modified reservoir operations under Alternative 2B are not expected to promote *Microcystis*  
 24 production in waters upstream of the Delta. As described in Chapter 8, *Water Quality*, *Microcystis*  
 25 blooms in the Export Service Areas could increase due to increased water temperatures resulting  
 26 from climate change, but not due to water conveyance facility operations. Similarly, hydraulic  
 27 residence times in the Export Service Area would not be affected by operations of CM1. Accordingly,  
 28 conditions would not be more conducive to *Microcystis* bloom formation. Water diverted from the  
 29 Sacramento River in the north Delta is expected to be unaffected by *Microcystis*. However, the  
 30 fraction of water flowing through the Delta that reaches the existing south Delta intakes is expected  
 31 to be influenced by an increase *Microcystis* blooms, as discussed below. Therefore, relative to the No  
 32 Action Alternative, the addition of Sacramento River water from the north Delta under Alternative  
 33 2B would dilute *Microcystis* and microcystins in water diverted from the south Delta. Because the  
 34 degree to which *Microcystis* blooms, and thus microcystins concentrations, will increase in source  
 35 water from the south Delta is unknown, it cannot be determined whether Alternative 2B would  
 36 result in increased or decreased levels of microcystins in the mixture of source waters exported  
 37 from Banks and Jones pumping plants.

38 Ambient meteorological conditions would be the primary driver of Delta water temperatures, and  
 39 climate warming, not water operations, would determine future water temperatures in the Delta.  
 40 Increasing water temperatures could lead to earlier attainment of the water temperature threshold  
 41 required to initiate *Microcystis* bloom formation, and therefore earlier occurrences of *Microcystis*  
 42 blooms in the Delta, as well as increases in the duration and magnitude. However, these



1 temperature-related changes would not be different from what would occur under the No Action  
2 Alternative. Siting and design of restoration areas would have a substantial influence on the  
3 magnitude of hydraulic residence time increases under Alternative 2B. The modeled increase in  
4 residence time in the Delta could result in an increase in the frequency, magnitude, and geographic  
5 extent of *Microcystis* blooms, and thus microcystin levels. Therefore, impacts on beneficial uses,  
6 including drinking water and recreational waters, could occur and public health could be affected.  
7 Accordingly, this would be considered an adverse effect.

8 Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water  
9 quality, and therefore potential public health effects, in the Delta due to *Microcystis*. However,  
10 because the effectiveness of these mitigation measures to result in feasible measures for reducing  
11 water quality effects, and therefore potential public health effects, is uncertain, the effect would still  
12 be considered adverse.

13 **CEQA Conclusion:** Under Alternative 2B, operation of the water conveyance facilities is not expected  
14 to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta.  
15 *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures  
16 resulting from climate change, but not due to water conveyance facility operations. Residence times  
17 in the Export Service Area would not be affected by operations of CM1, and therefore conditions in  
18 those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the  
19 Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water  
20 from the south Delta intakes and unaffected source water from the Sacramento River. Because of  
21 this, it cannot be determined whether operations and maintenance under Alternative 2B would  
22 result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source  
23 waters exported from Banks and Jones pumping plants.

24 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
25 could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the  
26 water temperature increases in the Delta would be due to climate change primarily and not due to  
27 operation of the water conveyance facilities. Increases in Delta residence times would be due in  
28 small part to climate change and sea level rise, but due to a greater degree to operation of the water  
29 conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4.  
30 Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of  
31 *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water  
32 conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4.  
33 Accordingly, beneficial uses including drinking water and recreational waters would be impacted  
34 and, as a result, there could be potential impacts on public health. Therefore, this impact would be  
35 significant.

36 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
37 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time  
38 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
39 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
40 proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods  
41 to determine whether increases in abundance are significant. This mitigation measure also requires  
42 that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will  
43 investigate and evaluate measures that could be taken to reduce residence time in the affected areas  
44 of the Delta. However, because the effectiveness of these mitigation measures to result in feasible



1 measures for reducing water quality effects, and therefore potential public health effects, is  
2 uncertain, this impact would be significant and unavoidable.

3 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
4 **Microcystis Blooms**

5 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
6 in Chapter 8, *Water Quality*.

7 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
8 **Water Residence Time**

9 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
10 in Chapter 8, *Water Quality*.

11 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
12 **CM4.**

13 **NEPA Effects:** The amount and location of habitat restoration and enhancement that would occur  
14 under Alternative 2B would be the same as that described under Alternative 1A. Restoration  
15 activities implemented under CM2 and CM4 that would create shallow backwater areas could result  
16 in local increases in water temperature that may encourage *Microcystis* growth during the summer  
17 bloom season. This would result in further degradation of water quality beyond the hydrodynamic  
18 effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis*  
19 blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public  
20 health through exposure via drinking water quality and recreational waters. Mitigation Measures  
21 WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water  
22 temperatures and water residence time. The effectiveness of these mitigation measures to result in  
23 feasible measures for reducing water quality effects, and therefore potential public health effects, is  
24 uncertain. This would be an adverse effect.

25 **CEQA Conclusion:** The effects of CM2 and CM4 on *Microcystis* under Alternative 2B are the same as  
26 those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that  
27 create shallow backwater areas could result in local increases in water temperature conducive to  
28 *Microcystis* growth during summer bloom season. This could compound the water quality  
29 degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact  
30 PH-8 and result in additional water quality degradation such that beneficial uses are affected. An  
31 increase in *Microcystis* blooms could potentially result in impacts on public health through exposure  
32 via drinking water quality and recreational waters. Therefore, this impact would be significant.  
33 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
34 increased local water temperatures and water residence time. The effectiveness of these mitigation  
35 measures to result in feasible measures for reducing water quality effects, and therefore potential  
36 public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

37 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
38 **Microcystis Blooms**

39 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
40 in Chapter 8, *Water Quality*.

1 Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage  
 2 Water Residence Time

3 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 4 in Chapter 8, Water Quality.

5 **25.3.3.7 Alternative 2C—Dual Conveyance with West Alignment and**  
 6 **Intakes W1–W5 (15,000 cfs; Operational Scenario B)**

7 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of**  
 8 **~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water**  
 9 **Conveyance Facilities**

10 *NEPA Effects:* As with Alternative 1A, implementation of CM1 under Alternative 2C would involve  
 11 construction and operation of five north Delta intakes; up to 15 solids lagoons; ~~and five~~  
 12 ~~sedimentation basins; and Byron Tract Forebay. Sedimentation basins and solids lagoons~~ These  
 13 facilities have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes)  
 14 because of the large volumes of water that would be held within these areas. ~~However, During~~  
 15 ~~operation~~ ~~†~~ The depth, design, and operation of the sedimentation basins and solids lagoons would  
 16 prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would  
 17 be too deep and the constant movement of water would prevent mosquitoes from breeding and  
 18 multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids  
 19 lagoons would be 165 feet long by 86 feet wide by 10 feet deep.

20 Although the proposed Byron Tract Forebay would increase surface water within the study area, it  
 21 is unlikely that the forebay would provide suitable breeding habitat for mosquitoes given that the  
 22 water in this forebay would not be stagnant and would be too deep. However, the shallow edges of  
 23 the forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or  
 24 other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular  
 25 maintenance of the forebay, floating vegetation such as pond weed would be harvested to maintain  
 26 flow and forebay capacity.

27 To minimize the potential for impacts related to increasing suitable mosquito habitat in the Plan  
 28 Area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County  
 29 MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help  
 30 control mosquitoes. These BMPs would be consistent practices presented in the California  
 31 Department of Public Health’s Best Management Practices for Mosquito Control in California  
 32 (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore, as  
 33 described for Alternative 1A, construction and operation of the intakes, solids lagoons, and/or  
 34 sedimentation basins under Alternative 2C would not substantially increase suitable vector habitat  
 35 and would not substantially increase vector-borne diseases. Accordingly, there would be no adverse  
 36 effects on public health.

37 *CEQA Conclusion:* As with Alternative 1A, implementation of CM1 under Alternative 2C would  
 38 involve construction and operation of solids lagoons, ~~and~~ sedimentation basins, ~~and Byron Tract~~  
 39 ~~Forebay.~~ These areas could provide suitable habitat for vectors (e.g., mosquitoes). ~~DWR would~~  
 40 ~~consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare~~  
 41 ~~and implement MMPs. BMPs to be implemented as part of the MMPs would help control~~  
 42 ~~mosquitoes. See Impact PH-1 under Alternative 1A.~~ During operations, water depth and circulation

would prevent these areas from substantially increasing suitable vector habitat. However, the shallow edges on the periphery of Byron Tract Forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. See Impact PH-1 under Alternative 1A. These BMPs would be consistent practices presented in the California Department of Public Health's Best Management Practices for Mosquito Control in California (California Department of Public Health 2012).

Therefore, construction and operation of the water conveyance facilities ~~in~~under Alternative 2C would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

### **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities**

#### **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough**

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

#### **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities.**

NEPA Effects: Water operations under Alternative 2C would be the same as under Alternative 2A. Therefore, potential effects on public health due to changes in water quality and beneficial uses as a result of *Microcystis* blooms and microcystin levels would be the same.

Any modified reservoir operations under Alternative 2C are not expected to promote *Microcystis* production in waters upstream of the Delta. As described in Chapter 8, *Water Quality*, *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Similarly, hydraulic residence times in the Export Service Area would not be affected by operations of CM1. Accordingly, conditions would not be more conducive to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north Delta is expected to be unaffected by *Microcystis*. However, the fraction of water flowing through the Delta that reaches the existing south Delta intakes is expected to be influenced by an increase *Microcystis* blooms, as discussed below. Therefore, relative to the No Action Alternative, the addition of Sacramento River water from the north Delta under Alternative 2C would dilute *Microcystis* and microcystins in water diverted from the south Delta. Because the degree to which *Microcystis* blooms, and thus microcystins concentrations, will increase in source water from the south Delta is unknown, it cannot be determined whether Alternative 2C would result in increased or decreased levels of microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Ambient meteorological conditions would be the primary driver of Delta water temperatures, and climate warming, not water operations, would determine future water temperatures in the Delta. Increasing water temperatures could lead to earlier attainment of the water temperature threshold

1 required to initiate *Microcystis* bloom formation, and therefore earlier occurrences of *Microcystis*  
2 blooms in the Delta, as well as increases in the duration and magnitude. However, these  
3 temperature-related changes would not be different from what would occur under the No Action  
4 Alternative. Siting and design of restoration areas would have a substantial influence on the  
5 magnitude of hydraulic residence time increases under Alternative 2C. The modeled increase in  
6 residence time in the Delta could result in an increase in the frequency, magnitude, and geographic  
7 extent of *Microcystis* blooms, and thus microcystin levels. Mitigation Measure WQ-32a and WQ-32b  
8 are available to reduce the effects of degraded water quality, and therefore potential public health  
9 effects, in the Delta due to *Microcystis*. However, because the effectiveness of these mitigation  
10 measures to result in feasible measures for reducing water quality effects, and therefore potential  
11 public health effects, is uncertain, the effect would still be considered adverse.

12 **CEQA Conclusion:** Under Alternative 2C, operation of the water conveyance facilities is not expected  
13 to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta.  
14 *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures  
15 resulting from climate change, but not due to water conveyance facility operations. Hydraulic  
16 residence times in the Export Service Area would not be affected by operations of CM1, and  
17 therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation.  
18 Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-  
19 affected source water from the south Delta intakes and unaffected source water from the  
20 Sacramento River. Because of this, it cannot be determined whether operations and maintenance  
21 under Alternative 2C would result in increased or decreased levels of *Microcystis* and microcystins  
22 in the mixture of source waters exported from Banks and Jones pumping plants.

23 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
24 could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the  
25 water temperature increases in the Delta would be due to climate change primarily and not due to  
26 operation of the water conveyance facilities. Increases in Delta residence times would be due in  
27 small part to climate change and sea level rise, but due to a greater degree to operation of the water  
28 conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4.  
29 Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of  
30 *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water  
31 conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4.  
32 Accordingly, beneficial uses including drinking water and recreational waters would be impacted  
33 and, as a result, there could be potential impacts on public health. Therefore, this impact would be  
34 significant.

35 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
36 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time  
37 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
38 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
39 proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods  
40 to determine whether increases in abundance are significant. This mitigation measure also requires  
41 that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will  
42 investigate and evaluate measures that could be taken to reduce residence time in the affected areas  
43 of the Delta. However, because the effectiveness of these mitigation measures to result in feasible  
44 measures for reducing water quality effects, and therefore potential public health effects, is  
45 uncertain, this impact would be significant and unavoidable.

1 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
2 **Microcystis Blooms**

3 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
4 in Chapter 8, *Water Quality*.

5 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
6 **Water Residence Time**

7 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
8 in Chapter 8, *Water Quality*.

9 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
10 **CM4.**

11 ***NEPA Effects:*** The amount and location of habitat restoration and enhancement that would occur  
12 under Alternative 2C would be the same as that described under Alternative 1A. Restoration  
13 activities implemented under CM2 and CM4 that would create shallow backwater areas could result  
14 in local increases in water temperature that may encourage *Microcystis* growth during the summer  
15 bloom season. This would result in further degradation of water quality beyond the hydrodynamic  
16 effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis*  
17 blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public  
18 health through exposure via drinking water quality and recreational waters. Mitigation Measures  
19 WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water  
20 temperatures and water residence time. The effectiveness of these mitigation measures to result in  
21 feasible measures for reducing water quality effects, and therefore potential public health effects, is  
22 uncertain. This would be an adverse effect.

23 ***CEQA Conclusion:*** The effects of CM2 and CM4 on *Microcystis* under Alternative 2C are the same as  
24 those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that  
25 create shallow backwater areas could result in local increases in water temperature conducive to  
26 *Microcystis* growth during summer bloom season. This could compound the water quality  
27 degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact  
28 PH-8 and result in additional water quality degradation such that beneficial uses are affected. An  
29 increase in *Microcystis* blooms could potentially result in impacts on public health through exposure  
30 via drinking water quality and recreational waters. Therefore, this impact would be significant.  
31 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
32 increased local water temperatures and water residence time. The effectiveness of these mitigation  
33 measures to result in feasible measures for reducing water quality effects, and therefore potential  
34 public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

35 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
36 **Microcystis Blooms**

37 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
38 in Chapter 8, *Water Quality*.

1 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 2 **Water Residence Time**

3 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 4 in Chapter 8, Water Quality.

5 **25.3.3.8 Alternative 3—Dual Conveyance with Pipeline/Tunnel and**  
 6 **Intakes 1 and 2 (6,000 cfs; Operational Scenario A)**

7 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of**  
 8 **~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water**  
 9 **Conveyance Facilities**

10 **NEPA Effects:** Alternative 3 would be similar to Alternative 1A, but the water conveyance facilities  
 11 would involve construction and operation of up to six solids lagoons, two sedimentation basins,  
 12 Byron Tract Forebay, an intermediate forebay, and a 350-acre inundation area adjacent to the  
 13 intermediate forebay. The mechanisms for potential public health effects from construction and  
 14 operation of the water conveyance facilities are similar to those described for Alternative 1A.  
 15 Specifically, sedimentation basins, solids lagoons, the intermediate forebay and associated the  
 16 inundation area, and Byron Tract Forebay have the potential to provide habitat for vectors that  
 17 transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within  
 18 these areas.

19 However, During operation, tThe depth, design, and operation of the sedimentation basins and  
 20 solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1).  
 21 Specifically, the basins would be too deep and the constant movement of water would prevent  
 22 mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet  
 23 wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep.  
 24 Furthermore, use of the 350-acre inundation area would be limited to forebay emergency overflow  
 25 situations and water would be physically pumped back to the intermediate forebay, creating  
 26 circulation such that the area would have a low potential for creating suitable vector habitat.  
 27 Similarly, water in the Byron Tract Forebay and intermediate forebay would be circulated regularly  
 28 and, with the exception of shallower areas around the periphery, would be too deep to provide  
 29 suitable mosquito habitat. The shallower edges of the forebays could provide suitable mosquito  
 30 breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to  
 31 grow.

32 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 33 area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County  
 34 MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help  
 35 control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with  
 36 practices presented in the California Department of Public Health's Best Management Practices for  
 37 Mosquito Control in California (California Department of Public Health 2012). Implementation of  
 38 these BMPs would reduce the likelihood that BDCP operations would require an increase in  
 39 abatement activities by the local MVCDs. Therefore, Alternative 3 would not substantially increase  
 40 suitable vector habitat, and would not substantially increase vector-borne diseases. Accordingly, no  
 41 adverse effects on public health would result.



1 **CEQA Conclusion:** Implementation of CM1 under Alternative 3 would involve construction and  
 2 operation of an intermediate forebay and associated 350-acre inundation area adjacent to the  
 3 intermediate forebay, and Bryon Tract Forebay, but fewer solids lagoons and sedimentation basins  
 4 would be constructed under this alternative relative to Alternative 1A. These areas could provide  
 5 suitable habitat for vectors (e.g., mosquitoes). ~~However,~~ During operations, water depth and  
 6 circulation would prevent the areas from substantially increasing suitable vector habitat. However,  
 7 the shallower periphery of the intermediate forebay and Bryon Tract Forebay could provide suitable  
 8 mosquito breeding habitat.

9 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 10 area, These BMPs would be consistent with practices presented in the California Department of  
 11 Public Health's Best Management Practices for Mosquito Control in California (California Department  
 12 of Public Health 2012). Therefore, construction and operation of the water conveyance facilities  
 13 ~~in~~ under Alternative 3 would not result in a substantial increase in vector-borne diseases and the  
 14 impact on public health would be less than significant. No mitigation is required.

15 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
 16 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
 17 **Facilities**

18 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
 19 **Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
 20 **Slough**

21 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

22 **Impact PH-8: Increase in Microcystis Bloom Formation as a Result of Operation of the Water**  
 23 **Conveyance Facilities.**

24 NEPA Effects: Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in  
 25 the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change  
 26 under Alternative 3, *Microcystis* abundance, and thus microcystin concentrations, in water bodies of  
 27 the affected environment under Alternative 3 would be very similar (i.e., nearly the same) to those  
 28 discussed for Alternative 1A.

29 As described in Chapter 8, Water Quality, although Microcystis blooms have not occurred in the  
 30 Export Service Areas, conditions in the Export Service Areas under Alternative 3 may become more  
 31 conductive to Microcystis bloom formation because water temperatures will increase in the Export  
 32 Service Areas due to the expected increase in ambient air temperatures resulting from climate  
 33 change, but not from operation of the water conveyance facilities. Under Alternative 3, relative to No  
 34 Action Alternative, water exported to the SWP/CVP Export Service Area will be a mixture of  
 35 Microcystis-affected source water from the south Delta intakes and unaffected source water from  
 36 the Sacramento River, diverted at the north Delta intakes. It cannot be determined whether  
 37 operations and maintenance under Alternative 3 will result in increased or decreased levels of  
 38 Microcystis and microcystins in the mixture of source waters exported from Banks and Jones  
 39 pumping plants.

40 Like Alternative 1A, elevated ambient water temperatures would occur in the Delta under  
 41 Alternative 3, which could lead to earlier occurrences of Microcystis blooms in the Delta, and  
 42 increase the overall duration and magnitude of blooms. However, as described in Chapter 8, Water



1 Quality, the increase in Delta water temperatures, and consequent potential increase in *Microcystis*  
2 blooms, would be driven entirely by climate change, not by operation of water conveyance facilities.  
3 There would be differences in the direction and magnitude of water residence time changes during  
4 the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative 3  
5 compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms,  
6 and therefore microcystin, could increase in surface waters throughout the Delta. **CEQA Conclusion:**  
7 Under Alternative 3, operation of the water conveyance facilities is not expected to promote  
8 *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis*  
9 blooms in the Export Service Areas could increase due to increased water temperatures resulting  
10 from climate change, but not due to water conveyance facility operations. Hydraulic residence times  
11 in the Export Service Area would not be affected by operations of CM1, and therefore conditions in  
12 those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the  
13 Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water  
14 from the south Delta intakes and unaffected source water from the Sacramento River. Because of  
15 this, it cannot be determined whether operations and maintenance under Alternative 3 would result  
16 in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters  
17 exported from Banks and Jones pumping plants.

18 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
19 could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the  
20 water temperature increases in the Delta would be due to climate change and not due to operation  
21 of the water conveyance facilities. Increases in Delta residence times would be due in small part to  
22 climate change and sea level rise, but due to a greater degree to operation of the water conveyance  
23 facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is  
24 possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in  
25 the Delta would occur due to the operations and maintenance of the water conveyance facilities and  
26 the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including  
27 drinking water and recreational waters would be impacted and, as a result, public health. Therefore,  
28 this impact would be significant.

29 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
30 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time  
31 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
32 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
33 proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods  
34 to determine whether increases in abundance are significant. This mitigation measure also requires  
35 that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will  
36 investigate and evaluate measures that could be taken to reduce residence time in the affected areas  
37 of the Delta. However, because the effectiveness of these mitigation measures to result in feasible  
38 measures for reducing water quality effects, and therefore potential public health effects, is  
39 uncertain, this impact would be significant and unavoidable.

#### 40 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased** 41 ***Microcystis* Blooms**

42 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
43 in Chapter 8, *Water Quality*.

1 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
2 **Water Residence Time**

3 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
4 in Chapter 8, *Water Quality*.

5 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
6 **CM4.**

7 **NEPA Effects:** The amount and location of habitat restoration and enhancement that would occur  
8 under Alternative 3 would be the same as that described under Alternative 1A. Restoration activities  
9 implemented under CM2 and CM4 that would create shallow backwater areas could result in local  
10 increases in water temperature that may encourage *Microcystis* growth during the summer bloom  
11 season. This would result in further degradation of water quality beyond the hydrodynamic effects  
12 of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms  
13 with implementation of CM2 and CM4 could potentially result in adverse effects on public health  
14 through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a  
15 and WQ-32b may reduce the combined effect on *Microcystis* from increased local water  
16 temperatures and water residence time. The effectiveness of these mitigation measures to result in  
17 feasible measures for reducing water quality effects related to *Microcystis* is uncertain. This would  
18 be an adverse effect.

19 **CEQA Conclusion:** The effects of CM2 and CM4 on *Microcystis* under Alternative 3 are the same as  
20 those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that  
21 create shallow backwater areas could result in local increases in water temperature conducive to  
22 *Microcystis* growth during summer bloom season. This could compound the water quality  
23 degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact  
24 PH-8 and result in additional water quality degradation such that beneficial uses are affected. An  
25 increase in *Microcystis* blooms could potentially result in impacts on public health through exposure  
26 via drinking water quality and recreational waters. Therefore, this impact would be significant.  
27 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
28 increased local water temperatures and water residence time. The effectiveness of these mitigation  
29 measures to result in feasible measures for reducing water quality effects, and therefore potential  
30 public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

31 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
32 ***Microcystis* Blooms**

33 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
34 in Chapter 8, *Water Quality*.

35 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
36 **Water Residence Time**

37 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
38 in Chapter 8, *Water Quality*.

### 25.3.3.9 Alternative 4—Dual Conveyance with Modified Pipeline/Tunnel and Intakes 2, 3, and 5 (9,000 cfs; Operational Scenario H)

#### Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of ~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water Conveyance Facilities

*NEPA Effects:* Alternative 4 would involve construction and operation of three intakes (Intakes 2, 3, and 5); ~~up to nine solids lagoons, three-six~~ sedimentation basins; ~~12 solids lagoons;~~ a 2453-acre intermediate forebay with a water surface area of ~~37410~~ acres, ~~and a 125131~~-acre inundation (emergency overflow) area adjacent to the intermediate forebay on Glannvale Tract, ~~and an expanded Clifton Court Forebay. The Clifton Court Forebay would be expanded by approximately 590 acres; the north cell of the expanded Clifton Court Forebay would have a surface area of approximately 806 acres at maximum operation level, and the south cell would have surface area of approximately 1,691 acres.~~ A map and a schematic diagram depicting the conveyance facilities associated with Alternative 4 are provided in Figures 3-2 and 3-9. Figure 3-2 shows the major construction features (including work and borrow/spoil areas) associated with this proposed water conveyance facility alignment; a detailed depiction is provided in Figure M3-4 in the Mapbook Volume.

Each intake site would require a temporary cofferdam to create a dewatered construction area encompassing the entire intake site. Construction of the cofferdams would take place from June through October, and it is expected that dewatering of the cofferdams (i.e., removing water from behind the cofferdams) would occur after the construction of the cofferdams, when generally there are fewer mosquitoes breeding, as mosquitoes in northern California typically breed April–October (Sacramento–Yolo Mosquito and Vector Control District 2008).

~~In addition, sedimentation basins, solids lagoons, and the intermediate forebay inundation area, the periphery of the intermediate forebay, and the expanded Clifton Court Forebay~~ have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (see Chapter 3, Section 3.6.1 Figure 25-1). Specifically, the basins would be too deep (25 feet) and the constant movement of water would prevent mosquitoes from breeding and multiplying. ~~The S~~sedimentation basins ~~would be triangular in shape and would be approximately 250 to 677 feet wide (with the maximum width facing the intake channels), 660 feet long would be divided into three sedimentation channels. Each channel would be 500 feet long by 200 feet wide by and 235 feet deep, and s~~Solids lagoons would ~~be approximately 160 feet wide at the bottom, and 350 feet long, be 400 feet long by 200 feet~~ The lagoons would be ~~wide by~~ 15 feet deep. ~~Furthermore, u~~Use of the inundation area adjacent to the intermediate forebay would be limited to forebay emergency overflow situations and water would be physically pumped back to the intermediate forebay, creating circulation such that the area would have a low potential for creating suitable vector habitat. ~~Similarly, water in the intermediate forebay and the expanded Clifton Court Forebay would be circulated regularly and, with the exception of shallower areas around the periphery, would be too deep to provide suitable mosquito breeding habitat.~~

The sedimentation basins and solids lagoons ~~of at~~ Intake 2 would be located within 1 mile of and across the Sacramento River from Clarksburg, and the sedimentation basins and solids lagoons ~~of at~~ Intake 3 would be located within 1 mile of Hood. The sedimentation basins ~~s~~ and solids lagoons ~~of at~~

1 Intake 5 would be located within 1.5 miles (south) of Hood and 2 miles (north) of Courtland. The  
2 sedimentation basins would have a mat slab foundation and interior concrete walls to create  
3 separate sedimentation channels. The solids lagoons would be concrete-lined and approximately 10  
4 feet deep. Up to three solids lagoons would be used in a rotating cycle for each intake, with one basin  
5 filling, one settling, and the third being emptied of settled and dewatered solids. The rate of filling  
6 and settling would depend on the volume of water pumped by the intakes; however, water would  
7 continuously move through the basins at a relatively slow but regulated rate so that the solids and  
8 sediments can be removed from the water, via settling, prior to discharge into the conveyance  
9 facilities (Figure 25-1). The flow rates would be high enough to prevent water from stagnating, as  
10 stagnant water would not facilitate conveying the water to the conveyance system or removing the  
11 sediment from the water. As discussed in Section 25.1.1.4, mosquitoes typically prefer shallow  
12 stagnant water with little movement. The sedimentation basins and solids lagoons would be  
13 considered too deep and have too much regulated water movement to provide suitable mosquito  
14 habitat. Furthermore, during sediment drying and basin cleaning operations, flow would be stopped  
15 completely and the moisture in the sediment would be reduced to a point at which the sediment  
16 would not support insect/mosquito larvae production. Therefore, it is anticipated that these basins  
17 would not substantially increase suitable vector habitat and would not substantially increase the  
18 public's exposure to vector-borne diseases. Accordingly, adverse effects are not expected.

19 There would be an approximately ~~125131~~-acre inundation area adjacent to the 24~~53~~-acre  
20 intermediate forebay to accommodate emergency overflow from the forebay. Water would enter  
21 this inundation area only during forebay emergency overflow situations; however, these situations  
22 could result in standing water approximately 2 feet deep. While water of this depth would be  
23 suitable habitat for mosquitoes, such events would be more likely to occur during high flow events  
24 in winter, when fewer mosquitoes are breeding (Sacramento-Yolo Mosquito and Vector Control  
25 District 2008). Water in the emergency overflow area would be pumped out and back to the  
26 intermediate forebay once the danger of overflow has passed. This pumping would create  
27 circulation that would minimize the amount of suitable habitat for mosquitoes. Because the area  
28 would be used only during emergencies and the water would be pumped from the area, the  
29 potential for creating suitable mosquito habitat would be low. Therefore, adverse effects are not  
30 expected.

31 Although the proposed intermediate forebay and the expanded Clifton Court Forebay will increase  
32 surface water within the study area, it is unlikely that these water bodies would provide suitable  
33 breeding habitat for mosquitoes given that the water in these forebays would not be stagnant and  
34 would be too deep. However, the shallow edges of the forebays could provide suitable mosquito  
35 breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to  
36 grow. However, as part of the regular maintenance of these forebay areas, floating vegetation such  
37 pond weed would be harvested to maintain flow and forebay capacity. Further, BMPs to control  
38 mosquitoes would be implemented as part of this alternative. As such, the intermediate forebay and  
39 the expanded Clifton Court Forebay would not likely increase mosquito breeding habitat in the Plan  
40 Area.

41 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
42 area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County  
43 MVCDs and prepare and implement MMPs, as necessary, to control mosquitoes and reduce the  
44 likelihood that construction and operation of the water conveyance facilities would require an  
45 increase in mosquito abatement activities by the local MVCDs (Appendix 3B, Environmental  
46 Commitments). BMPs to be implemented as part of the MMPs would help control mosquitoes during

1 construction and operation of the sedimentation basins, solids lagoons, ~~and intermediate forebay,~~  
 2 intermediate forebay inundation area, and the expanded Clifton Court Forebay. BMP activities  
 3 would be consistent with the CDPH's Best Management Practices for Mosquito Control plan  
 4 (described in Section 25.2.3.4) include, but not necessarily be limited to, the following.

- 5 • Maintain stable water levels.
- 6 • Circulate water.
- 7 • Implement monitoring and sampling programs to detect early signs of mosquito population
- 8 problems.
- 9 • Use biological agents such as mosquito fish to limit larval mosquito populations, and introduce  
 10 biological agents to areas of standing water if mosquitoes are present.
- 11 • Use larvicides and adulticides, as necessary.
- 12 • Test for mosquito larvae during the high mosquito season (June through September).
- 13 • Reduce or eliminate emergent vegetation in and along the edges of water
- 14 ~~• Introduce biological controls such as mosquitofish to areas of standing water if mosquitoes are~~  
 15 ~~present.~~
- 16 • Introduce physical controls to areas of standing water (e.g., discharging water more frequently  
 17 or increasing circulation) if mosquitoes are present.

18 Accordingly, Alternative 4 would not substantially increase suitable vector habitat, and would not  
 19 substantially increase vector-borne diseases. No adverse effects on public health would result.

20 **CEQA Conclusion:** Sedimentation basins, solids lagoons, and the intermediate forebay inundation  
 21 area have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes)  
 22 because of the large volumes of water that would be held within these areas. However, during  
 23 operations, the depth, design, and operation of the sedimentation basins and solids lagoons would  
 24 prevent the development of suitable mosquito habitat. Specifically, the basins would be too deep and  
 25 the constant movement of water would prevent mosquitoes from breeding and multiplying.  
 26 Furthermore, the ~~13125~~-acre inundation area adjacent to the intermediate forebay would be limited  
 27 to forebay emergency overflow situations and water would be ~~physically~~ pumped back to the  
 28 intermediate forebay, creating circulation such that the area would have a low potential for creating  
 29 suitable vector habitat. In addition, although the proposed intermediate forebay and the expanded  
 30 Clifton Court Forebay would increase surface water within the study area, it is unlikely that these  
 31 water bodies would provide suitable breeding habitat for mosquitoes given that the water in these  
 32 forebays would not be stagnant and would be too deep. However, the shallow edges of the forebays  
 33 could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants  
 34 (e.g., pond weed) were allowed to grow.

35 Further, DTo minimize the potential for impacts related to increasing suitable vector habitat within  
 36 the study area, DWDR would consult and coordinate with San Joaquin County and Sacramento-Yolo  
 37 County MVEDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs  
 38 would help control mosquitoes during construction and operation of the sedimentation basins,  
 39 solids lagoons, the expanded Clifton Court Forebay, the intermediate forebay, and the intermediate  
 40 forebay inundation area. Therefore, construction and operation of Alternative 4 would not result in  
 41 a substantial increase in vector-borne diseases and the impact on public health would be less than  
 42 significant. No mitigation is required.

1 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
 2 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
 3 **Facilities**

4 Facilities under Alternative 4 would be operated to provide diversions up to a total of 9,000 cfs from  
 5 the new north Delta intakes. Alternative 4 water conveyance operations would follow the guidelines  
 6 described as Operational Scenario H and would include criteria for north Delta diversion bypass  
 7 flows; south Delta OMR flows; south Delta E/I Ratio; flows over Fremont Weir into Yolo Bypass;  
 8 Delta inflow; Delta outflow, as determined by the outcome of a decision tree process needed to  
 9 account for uncertainties related to delta smelt and longfin smelt flow requirements; Delta Cross  
 10 Channel gate operations; Rio Vista minimum in-stream flow; operations for Delta water quality and  
 11 residence; and water quality for agricultural and municipal/industrial diversions. These criteria are  
 12 discussed in detail in Chapter 3, *Description of Alternatives*, Section 3.6.4.2.

13 **NEPA Effects:**

14 **Disinfection Byproducts**

15 As described in Chapter 8, *Water Quality*, modeling scenarios included assumptions regarding how  
 16 certain habitat restoration activities (CM2 and CM4) would affect Delta hydrodynamics. To the  
 17 extent that restoration actions alter hydrodynamics within the Delta region, which affects mixing of  
 18 source waters, these effects are included in this assessment of operations-related water quality  
 19 changes (i.e., CM1).

20 Changes to DOC and bromide concentrations and, by extension, DBPs, under Alternative 4  
 21 operational scenarios (H1–H4) suggest that there would not be exceedances of DBP criteria due to  
 22 operations, because long-term average DOC and bromide concentrations would be only slightly  
 23 higher under this alternative relative to the No Action Alternative. For all of the operational  
 24 scenarios relative to the No Action Alternative, the modeled DOC effects would be greatest at Franks  
 25 Tract, Rock Slough, and Contra Costa Pumping Plant Number 1. Increased long-term average DOC  
 26 concentrations at these locations would be greatest under Scenario H4 and would be least under  
 27 Scenario H1, although differences would generally be small (i.e.,  $\leq 0.2$  mg/L). Under Scenario H4,  
 28 maximum increases of DOC would be  $\leq 12\%$  for these locations. In addition, relative to the No Action  
 29 Alternative, the frequency which long-term average DOC concentrations would exceed 4 mg/L  
 30 during the modeled drought period at Buckley Cove would increase by 8%. In general, substantial  
 31 change in ambient DOC concentrations would need to occur before significant changes in drinking  
 32 water treatment plant design or operations are triggered. The increases in long-term average DOC  
 33 concentrations estimated to occur at various Delta locations under the four alternative operational  
 34 scenarios of Alternative 4 are of sufficiently small magnitude that they would not require existing  
 35 drinking water treatment plants to substantially upgrade treatment for DOC removal above levels  
 36 currently employed.

37 Under operational Scenarios H1-H4, modeled long-term average bromide concentrations would  
 38 increase at Buckley Cove, Staten Island, Emmaton, and Barker Slough, and would decrease at other  
 39 assessment locations, relative to the No Action Alternative. Overall effects would be greatest under  
 40 Scenario H2 at Barker Slough, source of the North Bay Aqueduct, where long-term average  
 41 concentrations are predicted to increase by 44% (97% during the drought period). Although  
 42 Scenario H2 would result in the greatest relative increase in long-term average bromide  
 43 concentrations at Barker Slough, the difference between operational scenarios is very small (see  
 44 Chapter 8, *Water Quality*, Section 8.3.3.9, for detail). Regardless of particular Alternative 4



1 operational scenario, the increase in long-term average bromide concentrations at Barker Slough  
2 could necessitate changes in water treatment plant operations or require treatment plant upgrades  
3 in order to maintain DBP compliance.

4 Important to the results presented above is the assumed habitat restoration footprint on both the  
5 temporal and spatial scales incorporated into the modeling. Modeling sensitivity analyses have  
6 indicated that habitat restoration (which is reflected in the modeling—see Section 8.3.1.3), not  
7 operations covered under CM1, are the driving factor in the modeled bromide increases. The timing,  
8 location, and specific design of habitat restoration will have effects on Delta hydrodynamics, and any  
9 deviations from modeled habitat restoration and implementation schedule will lead to different  
10 outcomes. Although habitat restoration near Barker Slough is an important factor contributing to  
11 modeled bromide concentrations at the North Bay Aqueduct, BDCP habitat restoration elsewhere in  
12 the Delta can also have large effects. Because of these uncertainties, and the possibility of adaptive  
13 management changes to BDCP restoration activities, including location, magnitude, and timing of  
14 restoration, the estimates are not predictive of the bromide levels that would actually occur in  
15 Barker Slough or elsewhere in the Delta.

16 The Stage 1 Disinfectants and Disinfection Byproduct Rule, adopted by EPA in 1998 as part of the  
17 SDWA, requires drinking water utilities to reduce TOC concentrations by specified percentages prior  
18 to disinfection. These requirements were adopted because organic carbon, such as DOC, can react  
19 with disinfectants during the water treatment disinfection process to form DBPs such as THMs and  
20 HAAs, which can pose potential lifetime carcinogenic risks to humans. Water treatment plants that  
21 utilize Delta water are designed and operated to meet EPA's 1998 requirements based on the  
22 ambient concentrations and seasonal variability that currently exists in the Delta. Ambient DOC and  
23 bromide concentrations would need to change substantially to trigger significant changes in plant  
24 design or operations. Although the increases in long-term average DOC and bromide concentrations  
25 estimated to occur at most modeled Delta locations under Alternative 4 operational scenarios are of  
26 sufficiently small magnitude that they would not require existing drinking water treatment plants to  
27 substantially upgrade treatment, the modeled average bromide concentration increase predicted for  
28 the North Bay Aqueduct at Barker Slough could necessitate upgrades or changes in operations at  
29 certain water treatment plants, and this would be considered an adverse effect.

30 While treatment technologies sufficient to achieve the necessary bromide removal exist,  
31 implementation of such technologies would likely require substantial investment in new or modified  
32 infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in  
33 long-term average bromide concentrations in drinking water sources would represent an increased  
34 risk for adverse effects on public health from DBPs in drinking water sources. Mitigation Measure  
35 WQ-5 is available to reduce these effects (implementation of this measure along with a separate,  
36 non-environmental commitment as set forth in EIR/EIS Appendix 3B, *Environmental Commitments*,  
37 relating to the potential increased treatment costs associated with bromide-related changes would  
38 reduce these effects). Further, DWR issued a Notice of Preparation on December 2, 2009 to  
39 construct and operate the AIP that would establish an alternative surface water intake on the  
40 Sacramento River upstream of the Sacramento Regional Wastewater Treatment Plant discharge. The  
41 AIP would connect to the existing North Bay Aqueduct system by a new segment of pipe. The  
42 proposed alternative intake would be operated in conjunction with the existing North Bay Aqueduct  
43 intake at Barker Slough. The proposed project would be designed to improve water quality and to  
44 provide reliable deliveries of SWP supplies to its contractors, the Solano County Water Agency and  
45 the Napa County Flood Control and Water Conservation District. The timing of DWR's  
46 implementation of the AIP is uncertain at this time. The adverse water quality effects on the North

1 Bay Aqueduct at Barker Slough due to increased bromide may be minimized by implementation of  
2 the AIP.

### 3 **Trace Metals**

4 Water quality modeling results indicate that water conveyance facilities operations would not  
5 substantially change concentrations of metals of primarily human health and drinking water  
6 concern (arsenic, iron, manganese) in Delta waters relative to the No Action Alternative. The arsenic  
7 criterion was established to protect human health from the effects of long-term chronic exposure,  
8 while secondary ~~maximum contaminant level~~MCLs for iron and manganese were established as  
9 reasonable federal regulatory goals for drinking water quality, and enforceable standards in  
10 California. Average concentrations for arsenic, iron, and manganese in the primary source water  
11 (Sacramento River, San Joaquin River, and the bay at Martinez) are below these criteria. No mixing  
12 of these three source waters could result in a metal concentration greater than the highest source  
13 water concentration, and, given that the modeled average water concentrations for arsenic, iron,  
14 and manganese do not exceed water quality criteria, more frequent exceedances of drinking water  
15 criteria in the Delta would not be an expected result under this alternative. Accordingly, no adverse  
16 effect on public health related to the trace metals arsenic, iron, or manganese from drinking water  
17 sources is anticipated.

### 18 **Pesticides**

19 Sources of pesticides to the study area include direct input of surface runoff from in-Delta  
20 agriculture and Delta urbanized areas as well as inputs from rivers upstream of the Delta. These  
21 sources would not be affected by implementing Alternative 4. However, under Alternative 4  
22 Scenarios H1-H4, the distribution and mixing of Delta source waters would change. Changes in  
23 source water fractions at the modeled Delta assessment locations would vary depending on  
24 operational scenario, but relative differences between the operational scenarios would be small. As  
25 described in Chapter 8, *Water Quality* (Section 8.3.3.9), at most modeled Delta locations, these  
26 modeled changes in the source water fractions of Sacramento, San Joaquin and Delta agriculture  
27 water would not be of sufficient magnitude to substantially increase pesticide concentrations in  
28 Delta waters and would not adversely affect beneficial uses of the Delta relative to the No Action  
29 Alternative. However, depending on operational scenario, modeled San Joaquin River fractions at  
30 Buckley Cove would increase between 16–17% in July (31–34% for the modeled drought period)  
31 and 24–25% in August (47–49% for the modeled drought period). These increases would primarily  
32 balance through decreases in Sacramento River and eastside tributary waters. While the source  
33 water and potential pesticide related toxicity co-occurrence predictions do not mean adverse effects  
34 would occur, such considerable modeled increases in summer San Joaquin River source water  
35 fraction for all operational scenarios at Buckley Cove could substantially alter the long-term risk of  
36 pesticide-related toxicity to aquatic life, given the apparent greater incidence of pesticides in the San  
37 Joaquin River. A conclusion regarding the risk to human health at this location, based on the  
38 predicted adverse effects from pesticides on aquatic life, cannot be made. However, because the  
39 modeled increase would only occur at one location, and over a very short period during the year, it  
40 is expected that the potential for affecting public health would be relatively low. Additionally, the  
41 prediction of adverse effects of pesticides relative to the No Action Alternative fundamentally  
42 assumes that the present pattern of pesticide incidence in surface water would occur at similar  
43 levels into the future. In reality, the makeup and character of the pesticide use market during the  
44 late long-term would not be exactly as it is today. Use of chlorpyrifos and diazinon is on the decline  
45 with their replacement by pyrethroids on the rise (see Chapter 8, *Water Quality*, Section 8.1.3.13, for

1 a detailed discussion on pesticide fate and transport in the Delta). Yet in this assessment it is the  
2 apparent greater incidence of diazinon and chlorpyrifos in the San Joaquin River that serves as the  
3 basis for concluding that substantially increased San Joaquin River source water fraction would  
4 correspond to an increased risk of pesticide-related toxicity to aquatic life. Furthermore, drinking  
5 water from the study area would continue to be treated prior to distribution into the drinking water  
6 system, and water treatment plants are required to meet drinking water requirements set forth in  
7 the California Safe Drinking Water Act (Health and Safety Code Section 116275 et seq.) and the  
8 regulations adopted by CDPH. Therefore, it is not anticipated that there would be adverse effects on  
9 public health related to pesticides from drinking water sources.

10 **CEQA Conclusion:** Under Alternative 4, water supply operations would increase contributions from  
11 the San Joaquin River relative to the Sacramento River, and decrease the dilution capacity of the  
12 Sacramento River for contaminants. This could result in changes in water quality. Water quality  
13 modeling results (Chapter 8, *Water Quality*, Section 8.3.3.9) indicate that changes in flows under  
14 Alternative 4 operational scenarios would not, for the most part, result in increased exceedances of  
15 water quality criteria for constituents of concern (DBPs, trace metals and pesticides) in the study  
16 area. Long-term average DOC concentrations for the modeled 16-year hydrologic period and the  
17 modeled drought period would be predicted to increase by  $\leq 14\%$ . Under Scenario H4, increases in  
18 long-term average DOC concentrations at Franks Tract, Rock Slough, and Contra Costa Pumping  
19 Plant would correspond to more frequent concentration threshold exceedances, with the greatest  
20 change occurring at Rock Slough and Contra Costa Pumping Plant (see Chapter 8, *Water Quality*,  
21 Section 8.3.3.9). However, this predicted change would not be expected to adversely affect MUN  
22 beneficial uses, or any other beneficial use.

23 Further, relative to Existing Conditions, Scenario H1-H4 long-term average bromide concentrations  
24 would increase at the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton on the  
25 Sacramento River under Alternative 4. Overall effects would be greatest at Barker Slough, with the  
26 smallest model predicted increases occurring under Scenario H3 (21%; 72% increase during the  
27 drought period), and the largest model predicted increases occurring under Scenario H2 (40%; 98%  
28 increase during the drought period). The increase in long-term average bromide concentrations  
29 predicted for Barker Slough would result in a substantial change in source water quality to existing  
30 drinking water treatment plants drawing water from the North Bay Aqueduct. These modeled  
31 increases in bromide at Barker Slough could contribute to lead to adverse changes in the formation  
32 of DBPs and could potentially result in an exceedance of the MCL for DBPs at drinking water  
33 treatment plants ultimately resulting in impacts on public health. Accordingly, this would be a  
34 significant impact.

35 The increase in bromide concentrations in drinking water sources could require considerable water  
36 treatment plant upgrades in order to achieve equivalent levels of drinking water health protection.  
37 While treatment technologies sufficient to achieve the necessary bromide removal exist,  
38 implementation of such technologies would likely require substantial investment in new or modified  
39 infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in  
40 long-term average bromide concentrations in drinking water sources would represent an increased  
41 risk for adverse effects on public health from DBPs in drinking water sources. Assuming the adverse  
42 water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by  
43 implementation of the AIP, the potential adverse water quality effects on the municipal beneficial  
44 uses potentially provided in Barker Slough would remain significant.

~~such that considerable water treatment plant upgrades would be necessary in order to achieve equivalent levels of drinking water health protection. This would be a significant impact.~~

~~Implementation of Mitigation Measure WQ-5 would reduce the severity of this impact. The proposed mitigation requires a series of phased actions to identify and evaluate existing and possible feasible actions to avoid, minimize, or offset increased bromide concentrations, followed by development and implementation of the actions, if determined to be necessary. While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs in drinking water sources. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact. However, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information.~~

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments*, a separate, non-environmental commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B, *Environmental Commitments*, for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

**Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions: Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough**

It remains to be determined whether, or to what degree, the available and existing salinity response and countermeasure actions of SWP and CVP facilities or municipal water purveyors would be capable of offsetting the actual level of changes in bromide that may occur from implementation of Alternative 4. Therefore, in order to determine the feasibility of reducing the effects of increased bromide levels, and potential adverse effects on beneficial uses associated with CM1 operations (and hydrodynamic effects of tidal restoration under CM4), the proposed

1 mitigation requires a series of phased actions to identify and evaluate existing and possible  
 2 feasible actions, followed by development and implementation of the actions, if determined to  
 3 be necessary. The development and implementation of any mitigation actions shall be focused  
 4 on those incremental effects attributable to implementation of Alternative 4 operations only.  
 5 Development of mitigation actions for the incremental bromide effects attributable to climate  
 6 change/sea level rise are not required because these changed conditions would occur with or  
 7 without implementation of Alternative 4. The goal of specific actions would be to reduce/avoid  
 8 additional degradation of Barker Slough water quality conditions with respect to the CALFED  
 9 bromide goal.

10 BDCP proponents shall also consider effects of site-specific restoration areas proposed under  
 11 CM4 on bromide concentrations in Barker Slough. Design and siting of restoration areas shall  
 12 attempt to reduce potential effects to the extent possible without compromising proposed  
 13 benefits of the restoration areas. It is anticipated that these efforts will be able to reduce the  
 14 level of projected increase, though it is unknown whether it would be able to completely  
 15 eliminate any increases.

16 In addition, Following following commencement of initial operations of CM1, the BDCP  
 17 proponents will conduct additional evaluations described herein, and develop additional  
 18 modeling (as necessary), to define the extent to which modified operations could reduce or  
 19 eliminate the increased bromide concentrations currently modeled to occur under Alternative 4.  
 20 The additional evaluations should also consider specifically the changes in Delta hydrodynamic  
 21 conditions associated with tidal habitat restoration under CM4 (in particular the potential for  
 22 increased bromide concentrations that could result from increased tidal exchange) once the  
 23 specific restoration locations are identified and designed. The evaluations will also consider up-  
 24 to-date estimates of climate change an sea level rise, if and when such information is available.

25 If sufficient operational flexibility to offset bromide increases is not practicable/feasible under  
 26 Alternative 4 operations, and/or siting and design of restoration areas cannot feasibly reduce  
 27 bromide increases to a less than significant level without compromising the benefits of the  
 28 proposed areas-achieving, achieving bromide reduction pursuant to this mitigation measure  
 29 would not be feasible under this alternative.

### 30 **Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate** 31 **as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities**

32 **NEPA Effects:** Three intakes would be constructed and operated under Alternative 4. sSediment-  
 33 disturbing activities during construction and maintenance of these intakes and other water  
 34 conveyance facilities proposed near or in surface waters under this alternativeAlternative 4 could  
 35 result in the disturbance of existing constituents in sediment, such as pesticides or methylmercury.  
 36 ~~iii.~~ In-channel construction activities, such as pile driving during the construction of cofferdams at  
 37 the intakes and pier construction at the barge unloading facilities, which would occur during a over a  
 38 period of 5- months-time window, would result in the localized disturbance of river sediment. In  
 39 addition, maintenance of the five-three proposed north Delta intakes and the intermediate forebay  
 40 would entail periodic dredging for sediment removal at these locations. Sediment accumulation in  
 41 both the northern and southern portion of the expanded Clifton Court Forebay is expected to be  
 42 minimal over the 50-year permit period. However, it is anticipated that there may be some sediment  
 43 accumulation at the inlet structure of the northern portion of Clifton Court Forebay. Therefore, while  
 44 overall sediment accumulation in this forebay is not expected to be substantial, some dredging may

1 be required at the inlet structure to maintain an even flow path. Under the various Alternative 4  
 2 operational scenarios (H1–H4), changes in dilution and mixing of sources of water could result in a  
 3 change in constituents known to bioaccumulate. For example, the reduction of flows in the  
 4 Sacramento River downstream of the proposed north Delta intakes may result in a decreased  
 5 dilution of constituents known to bioaccumulate in the study area.

## 6 **Pesticides**

7 Legacy pesticides, such as organochlorines, have low water solubility; they do not readily volatilize  
 8 and have a tendency to bond to particulates (e.g., soil and sediment), settle out into the sediment,  
 9 and not be transported far from the source. If present in sediment within in-water construction  
 10 areas, legacy pesticides would be disturbed locally and would not be expected to partition into the  
 11 water column to any substantial degree. Therefore, no significant adverse effect on public health  
 12 would result from construction.

13 Numerous pesticides are currently used throughout the affected environment. While some of these  
 14 pesticides may be bioaccumulative, those present-use pesticides for which there is sufficient  
 15 evidence of their presence in waters affected by SWP and CVP operations (i.e., organophosphate  
 16 pesticides, such as diazinon, chlorpyrifos, diuron, and pyrethroids) are not considered  
 17 bioaccumulative. Thus, changes in their concentrations would not directly cause bioaccumulative  
 18 problems in aquatic life or humans. Furthermore, Alternative 4 would not result in increased  
 19 tributary flows that would mobilize organochlorine pesticides in sediments. Thus, the change in  
 20 source water in the Delta associated with the change in water supply operations is not expected to  
 21 adversely affect public health with respect to bioaccumulation of pesticides.

## 22 **Methylmercury**

23 If mercury is sequestered in sediments at water facility construction sites, it could become  
 24 suspended in the water column during construction activities, opening up a new pathway into the  
 25 food chain. Disturbance of sediment associated with construction activities (e.g., pile driving and  
 26 cofferdam installation) at intake sites or barge landing locations would result in a localized, short-  
 27 term increase in turbidity during the construction activity, which may suspend sediment that  
 28 contains methylmercury. Please see Chapter 8, Section 8.1.3.9, *Mercury*, for a discussion of  
 29 methylmercury concentrations in sediments.

30 As environmental commitments DWR would develop and implement Erosion and Sediment Control  
 31 Plans and SWPPPs (Appendix 3B, *Environmental Commitments*). BMPs implemented under the  
 32 Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep  
 33 sediment that may contain legacy organochlorine pesticides and methylmercury within the area of  
 34 disturbance. These BMPs would include, but not necessarily be limited to the following.

- 35 ● Install physical erosion control stabilization features (hydroseeding, mulch, silt fencing, fiber  
 36 rolls, sand bags, and erosion control blankets) to capture sediment and control both wind and  
 37 water erosion.
- 38 ● Retain trees and natural vegetation to the extent feasible to stabilize hillsides, retain moisture,  
 39 and reduce erosion.
- 40 ● Limit construction, clearing of vegetation, and disturbance of soils to areas of proven stability.
- 41 ● Use sediment ponds, silt traps, wattles, straw bale barriers or similar measures to retain  
 42 sediment transported by runoff water onsite.



- 1       • Collect and direct surface runoff at non-erosive velocities to the common drainage courses.
- 2       • Deposit or store excavated materials away from drainage courses.
- 3       • Prevent transport of sediment at the construction site perimeter, toe of erodible slopes, soil
- 4       stockpiles, and into storm drains.
- 5       • Reduce runoff velocity on exposed slopes.
- 6       • Reduce offsite sediment tracking.

7       Implementation of these measures would help ensure that construction activities would not  
 8       substantially increase or substantially mobilize methylmercury. Accordingly, there would be no  
 9       adverse effect.

10       Water quality and fish tissue modeling results showed small, insignificant changes in total mercury  
 11       and methylmercury levels in water and fish tissues resulting from Alternative 4 water operations  
 12       (see Chapter 8, Section 8.3.3.9, *Alternative 4—Dual Conveyance with Modified Pipeline/Tunnel and*  
 13       *Intakes 1–2, 3, and 5 [9,000 cfs; Operational Scenario H]*), for a detailed discussion). Upstream  
 14       mercury contributions and methylmercury production in Delta waters would not be altered by the  
 15       operation of Alternative 4, as it would not change existing mercury sources and would not  
 16       substantially alter methylmercury concentrations in the Sacramento River or San Joaquin River.  
 17       Water quality modeling results indicate that the percentage change in assimilative capacity of  
 18       waterborne total mercury relative to the 25 ng/L Ecological Risk Benchmark was greatest for  
 19       Scenario H4 relative to the No Action Alternative. These changes ranged, from 5.0% at the Jones  
 20       Pumping Plant to -2.3% at Old River at Rock Slough. These same sites show the smallest range of  
 21       effects on assimilative capacity for Alternative 4 H1, with 4.3% and -1.4% for these same two  
 22       stations, respectively. Operational Scenarios H2 and H3 fall between these two extremes. The  
 23       changes are not expected to result in adverse effects on beneficial uses. Similarly, changes in  
 24       methylmercury concentration are expected to be very small as predicted by modeling.

25       Fish tissue estimates showed small or no increase in exceedance quotient based on long-term  
 26       annual average mercury concentrations at the nine Delta locations modeled. The greatest increases  
 27       in exceedance quotients relative to the No Action Alternative were estimated to be 12% for both Old  
 28       River at Rock Slough, and for Franks Tract. The lowest percentage change in modeled bass mercury  
 29       concentrations is predicted to occur under Operational Scenario H1 relative to the No Action  
 30       Alternative for these locations.

31       Currently, mercury concentrations in fish tissues exceed Delta TMDL guidance targets, which are set  
 32       for human health rather than effects on fish, and operation of Alternative 4 is not expected to  
 33       substantially alter this condition. Large sport fish throughout the Delta are currently uniformly in  
 34       exceedance of consumption guidelines for mercury, and Alternative 4 is not expected to  
 35       substantially alter that condition. Although methylmercury currently exceeds the TMDL, little to no  
 36       change in mercury or methylmercury concentrations in water is expected under Alternative 4  
 37       operational scenarios. Thus, the alternative would not result in increased exceedances of water  
 38       quality criteria. Because water operations would not substantially increase methylmercury above  
 39       what currently exists in the study area and would not expose people to an **additional** public health  
 40       hazard, adverse effects on public health are not expected to result. **In addition, because these**  
 41       **increases are relatively small, and it is not evident that substantive increases are expected at**  
 42       **numerous locations throughout the Delta, these changes are expected to be within the uncertainty**

1 [inherent in the modeling approach, and would likely not be measurable in the environment. See](#)  
2 [Appendix 8I for a discussion of the uncertainty associated with the fish tissue estimates.](#)

3 **CEQA Conclusion:** Intermittent and/or short-term construction-related activities (as would occur  
4 for in-river construction) would not be anticipated to result in contaminant discharges of sufficient  
5 magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable  
6 long-term degradation such that existing 303(d) impairments would be made discernibly worse or  
7 TMDL actions to reduce loading would be adversely affected. Legacy organochlorine pesticides  
8 typically bond to particulates, and do not mobilize easily. Construction and maintenance of  
9 Alternative 4 would not cause these legacy pesticides to be transported far from the source or to  
10 partition into the water column. Other pesticides which are currently present in waters affected by  
11 SWP and CVP operations are not considered bioaccumulative. Although methylmercury currently  
12 exceeds the TMDL, little to no change in methylmercury concentrations in water are expected under  
13 Alternative 4 water conveyance construction.

14 Alternative 4 would not result in increased flows in the tributaries that would mobilize legacy  
15 organochlorine pesticides in sediments. Other pesticides that are present in study area water  
16 channels are not considered bioaccumulative and any changes in concentrations due to Alternative  
17 4 operations would not cause them to become bioaccumulative.

18 Water quality modeling results indicated small, insignificant changes in mercury and  
19 methylmercury levels in water at certain Delta locations and in mercury in fish tissues due to  
20 Alternative 4 operational scenarios (H1–H4). Specifically, modeling results indicate that the  
21 percentage change in assimilative capacity of waterborne total mercury relative to the 25 ng/L  
22 Ecological Risk Benchmark for this alternative relative to Existing Conditions would show the  
23 greatest decrease (2.4%) in the Old River at Rock Slough and at the Contra Costa Pumping Plant.  
24 These are bounded by Alternative 4 H1 estimates of -1.4% and -1.5% at these two locations,  
25 respectively. In contrast the greatest increase in assimilative capacity relative to Existing Conditions  
26 would be 4.4% for operational Scenario H4 at the Jones Pumping Plant. Scenarios H2 and H3 range  
27 in changes in assimilative capacity in relation to Existing Conditions from -2.1% (H3 at Contra Costa  
28 Pumping Plant to 4.1% (H2 at Banks). These small changes in assimilative capacity are not expected  
29 to result in significant impacts to beneficial uses. Fish tissue estimates show only small or no  
30 increases in exceedance quotients based on long-term annual average concentrations for mercury at  
31 the nine Delta locations modeled. The greatest increase over Existing Conditions was for Scenario  
32 H4 and was 15% at Old River at Rock Slough and 13% for Franks Tract as compared to Scenario H1  
33 estimates for both of those locations of 9%. [Because these increases are relatively small, and it is not](#)  
34 [evident that substantive increases are expected at numerous locations throughout the Delta, these](#)  
35 [changes are expected to be within the uncertainty inherent in the modeling approach, and would](#)  
36 [likely not be measurable in the environment. See Appendix 8I for a discussion of the uncertainty](#)  
37 [associated with the fish tissue estimates.](#)

38 BMPs implemented as part of Erosion and Sediment Control Plans and SWPPPs would help ensure  
39 that construction activities would not substantially increase or substantially mobilize legacy  
40 organochlorine pesticides or methylmercury during construction and maintenance. Further,  
41 because mercury concentrations are not expected to increase substantially, no long-term water  
42 quality degradation is expected to occur and, thus, no adverse effects to beneficial uses would occur.  
43 Because any increases in mercury or methylmercury concentrations are not likely to be measurable,  
44 changes in mercury concentrations or fish tissue mercury concentrations would not make any  
45 existing mercury-related impairment measurably worse. In comparison to Existing Conditions,

1 Alternative 4 would not increase levels of mercury by frequency, magnitude, and geographic extent  
 2 such that the affected environment would be expected to have measurably higher body burdens of  
 3 mercury in aquatic organisms or humans consuming those organisms.

4 Therefore, construction, operation and maintenance of Alternative 4 would not cause increased  
 5 exposure of the public to these bioaccumulative sediment constituents. Since construction,  
 6 maintenance, or operation of the water conveyance facilities ~~is~~ under Alternative 4 would not cause  
 7 substantial mobilization or a substantial increase of constituents known to bioaccumulate, impacts  
 8 on public health would be less than significant. No mitigation is required.

9 **Impact PH-4: Expose Substantially More People to Transmission Lines Generating New**  
 10 **Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance**  
 11 **Facilities**

12 **NEPA Effects:** Approximately 621 miles of existing transmission lines are located within the study  
 13 area. Under Alternative 4, the method of delivering power to construct and operate the water  
 14 conveyance facilities is assumed to be a “split” system that would connect to the existing grid in two  
 15 different locations—one in the northern section of the alignment, and one in the southern section of  
 16 the alignment. As described in Table 25-89, a total of ~~5.876.08~~ miles of new ~~permanent temporary~~  
 17 69 kV transmission lines; ~~303430.73-44~~ miles of new temporary 230 kV transmission lines; ~~and~~  
 18 ~~14.1713.7915.96~~ miles of new permanent 230 kV transmission lines; ~~and 3.259.63 miles of new~~  
 19 ~~temporary 34.5 kV transmission lines~~ would be constructed and operated under Alternative 4. In  
 20 addition, an existing 500 kV transmission line south/southeast of the Clifton Court Forebay will be  
 21 relocated to an area less than half a mile southeast of the current location of the existing towers.

22 Any new temporary and permanent transmission lines constructed and operated under Alternative  
 23 4 would, for the most part, be located in areas that are not densely populated (Figure 25-2) and,  
 24 therefore, would not expose substantially more people to EMF from transmission lines. None of the  
 25 proposed temporary or permanent transmission lines for this alternative would be located within  
 26 300 feet of sensitive receptors.

27 As discussed in Section 25.1.1.5, the current scientific evidence does not show conclusively that EMF  
 28 exposure can increase health risks. In 2006, CPUC updated its EMF policy and reaffirmed that health  
 29 hazards from exposures to EMF have not been established. State and federal public health  
 30 regulatory agencies have determined that setting numeric exposure limits is not appropriate. CPUC  
 31 also reaffirmed that the existing no-cost and low-cost precautionary-based EMF policy should be  
 32 continued. Based on this, utility companies are required to establish and maintain EMF Design  
 33 Guidelines in order to reduce potential health risks associated with power lines. These guidelines  
 34 would be implemented for any new temporary or new permanent transmission lines constructed  
 35 and operated under Alternative 4, depending on which electric provider is selected by DWR.  
 36 Furthermore, as described in Appendix 3B, *Environmental Commitments*, the location and design of  
 37 the proposed new transmission lines would be conducted in accordance with CPUC’s EMF Design  
 38 Guidelines for Electrical Facilities, and would include one or more of three measures to reduce EMF  
 39 exposure.

- 40 ● Shielding by placing trees or other physical barriers along the transmission line right-of-way.
- 41 ● Cancellation by configuring the conductors and other equipment on the transmission towers.
- 42 ● Increasing the distance between the source of the EMF and the receptor either by increasing the  
 43 height of the tower or increasing the width of the right-of-way.

1 Therefore, operation of the transmission line corridors would not expose substantially more people  
2 to transmission lines generating EMFs, and there would be no adverse effect on public health.

3 **CEQA Conclusion:** Under Alternative 4, the majority of proposed temporary (~~34-69.5~~ kV and 230 kV)  
4 and permanent (~~69 kV and~~ 230 kV) transmission lines would be located within the rights-of-way of  
5 existing transmission lines; any new temporary or permanent transmission lines not within the  
6 right-of-way of existing transmission lines would, for the most part, be located in sparsely populated  
7 areas generally away from existing sensitive receptors. None of the proposed temporary or  
8 permanent transmission lines would be within 300 feet of sensitive receptors. Further, the  
9 temporary transmission lines would be removed when construction of the water conveyance facility  
10 features is completed, so there would be no potential permanent effects. Therefore, these  
11 transmission lines would not substantially increase people's exposure to EMFs.

12 Additionally, design and implementation of new proposed temporary or permanent transmission  
13 lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design  
14 Guidelines for Electrical Facilities and would implement shielding, cancelation, or distance measures  
15 to reduce EMF exposure. Since construction and operation of Alternative 4 would not expose  
16 substantially more people to transmission lines that provide new sources of EMFs, impacts on public  
17 health would be less than significant. No mitigation is required.

#### 18 **Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10** 19 **and CM11**

20 **NEPA Effects:** Implementation of CM2-CM7, CM10 and CM11 under Alternative 4 would include  
21 fisheries enhancement (CM2); the restoration of up to 65,000 acres of tidal and freshwater habitat  
22 (CM3 and CM4), 10,000 acres of seasonally inundated floodplain (CM5), and 1,200 acres of nontidal  
23 marsh and 500 acres of managed wetlands (CM10); enhancement of channel margin and riparian  
24 habitat (CM6 and CM7); and protection of 150 acres of alkali seasonal wetland complex and 1,500  
25 acres of managed wetlands (CM3 and CM11). These activities could potentially increase suitable  
26 mosquito habitat within the study area.

27 Under CM2, *Yolo Bypass Fisheries Enhancement*, the frequency, duration, and magnitude of  
28 inundation of the Yolo Bypass would increase. The increased floodplain inundation and water  
29 surface may result in an increase in mosquitoes in the Yolo Bypass.

30 Of the approximate 65,000-acre tidal and freshwater habitat restoration target, approximately  
31 55,000 acres of this restoration will consist of tidal perennial aquatic, tidal mudflat, tidal freshwater  
32 emergent wetland, and tidal brackish emergent wetland natural communities, and the remaining up  
33 to 10,000 acres will consist of transitional uplands to accommodate sea level rise. Of the  
34 approximate 55,000 acres of tidally influenced natural community, approximately 20,600 acres  
35 must occur in particular ROAs as listed below.

- 36 ● 7,000 acres of brackish tidal habitat, of which at least 4,800 acres would be tidal brackish  
37 emergent wetland and the remainder would be tidal perennial aquatic and tidal mudflat, in  
38 Suisun Marsh (ROA).
- 39 ● 5,000 acres of freshwater tidal habitat in the Cache Slough ROA.
- 40 ● 1,500 acres of freshwater tidal habitat in the Cosumnes/Mokelumne ROA.
- 41 ● 2,100 acres of freshwater tidal habitat in the West Delta ROA.

- 1       • 5,000 acres of freshwater tidal habitat in the South Delta ROA.

2       The remaining 34,400 acres would be distributed among the ROAs or may occur outside the ROAs.  
3       The areas within the ROAs currently have potentially suitable habitat for mosquitoes and aquatic  
4       habitat restoration in these areas may increase mosquito populations.

5       Potentially suitable mosquito habitat resulting from the implementation of CM2--CM7, CM10 and  
6       CM11 would generally not be located near densely populated areas (Figure 25-3). Table 25-56  
7       outlines the distances travelled from breeding grounds for the species listed. These distances range  
8       from less than 1 mile to up to 30 miles. The conservation measures would generally expand existing  
9       habitat or replace existing agricultural areas, both of which are currently sources for mosquitoes. Of  
10      the ROAs, the South Delta ROA and West Delta ROA currently have the fewest acres of habitat  
11      suitable for mosquitoes and are the closest to more densely populated areas (Figure 25-3). Similarly,  
12      although much of Yolo Bypass is not proximate to densely populated areas, there are areas of Yolo  
13      Bypass near populated areas including El Macero, Davis, and West Sacramento. Therefore, habitat  
14      restoration in these ROAs and in the Yolo Bypass may result in an increase in mosquitoes and  
15      exposure to vector-borne diseases when compared with restoration of aquatic habitat within the  
16      other ROAs.

17      The habitat restoration and enhancement under all of these CMs would be performed in accordance  
18      with Natural Communities Enhancement and Management (CM11), which would require  
19      preparation and implementation of management plans for the protected natural communities and  
20      covered species habitats. The preparation and implementation of the management plans would be  
21      performed in consultation with the appropriate MVCDs. This consultation would occur when  
22      specific restoration and enhancement projects and locations are identified within the ROAs and  
23      prior to implementation of CM2. It is standard practice to use IPM to control mosquitoes, and, as  
24      part of the consultation with the MVCDs, BDCP proponents would prepare and implement MMPs  
25      (Appendix 3B, *Environmental Commitments*). In addition, BMPs from the guidelines outlined in  
26      Section 25.2.5.7 and detailed in Appendix 3B would be incorporated into the proposed project and  
27      executed to maintain proper water circulation and flooding during appropriate times of the year  
28      (e.g., fall) to prevent stagnant water and habitat for mosquitoes. BMPs to be implemented as part of  
29      the MMPs would include, but not necessarily be limited to, the following.

- 30      • Delay or phase fall flooding—phased flooding involves flooding habitat throughout the fall and  
31      winter in proportion to wildlife need and takes into consideration other wetland habitat that  
32      may be available in surrounding areas.
- 33      • Use rapid fall flooding
- 34      • Use deep initial flooding
- 35      • Subsurface irrigate
- 36      • Utilize water sources with mosquito predators for flooding
- 37      • Drain irrigation water into ditches or other water bodies with abundant mosquito predators
- 38      • Employ vegetation management practices to reduce mosquito production in managed wetlands  
39      (e.g., mowing, burning, discing of vegetation that serves as mosquito breeding substrate)
- 40      • Design wetlands and operations to be inhospitable to mosquitoes
- 41      • Implement monitoring and sampling programs to detect early signs of mosquito population  
42      problems

- 1       • Use biological agents such as mosquito fish to limit larval mosquito populations.
- 2       • Use larvicides and adulticides, as necessary
- 3       • Test for mosquito larvae during the high mosquito season (June through September)

4       Finally, restoration of different types of habitat would potentially increase mosquito predators, such  
 5       as birds and bats, using the habitat. Therefore, implementation of the habitat restoration and  
 6       enhancement conservation measures would not significantly increase the public's risk of exposure  
 7       to vector-borne diseases. Accordingly, there would be no adverse effect.

8       **CEQA Conclusion:** Although implementing Alternative 4 would increase restored and enhanced  
 9       habitat in the study area that could result in a significant increase in vectors such as mosquitoes,  
 10       implementation of environmental commitments, including consultation with the MVCs and  
 11       implementation of BMPs as part of MMPs as set forth in Appendix 3B, would reduce the potential for  
 12       an increase in mosquito breeding habitat, and, as such, an associated substantial increase in vector-  
 13       borne diseases would not result. Furthermore, habitat would be restored in areas where existing  
 14       potentially suitable habitat for mosquitoes already exists. Finally, predators on mosquitoes would  
 15       likely increase as a result of restoration and enhancement, which would keep mosquito populations  
 16       in check. Accordingly, implementation of CM2-CM7, CM10 and CM11 under Alternative 4 would not  
 17       substantially increase the public's risk of exposure to vector-borne diseases beyond what currently  
 18       exists and would be less than significant. No mitigation is required.

19       **Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of**  
 20       **Implementing the Restoration Conservation Measures**

21       **NEPA Effects:** The study area currently supports habitat types, such as tidal habitat, upland  
 22       wetlands, and agricultural lands, that produce pathogens as a result of the biological productivity in  
 23       these areas (e.g., migrating birds, application of fertilizers, waste products of animals). The study  
 24       area does not currently have pathogen concentrations that rise to the level of adversely affecting  
 25       beneficial uses of recreation. Restored habitat and protected agricultural lands under Alternative 4  
 26       could result in an increase in pathogen loading in the study area because these land uses are known  
 27       to generate pathogens. However, as exemplified by the Pathogen Conceptual Model, any potential  
 28       increase in pathogens associated with the proposed habitat restoration and enhancement (as part of  
 29       implementation of restoration conservation measure) would be localized and within the vicinity of  
 30       the actual restoration. The result would be similar for lands protected for agricultural uses. This  
 31       localized increase is not expected to be of sufficient magnitude and duration to result in adverse  
 32       effects on recreationists as described in Chapter 8, *Water Quality* (Section 8.3.3.9). Furthermore,  
 33       depending on the level of recreational access granted by management plans, habitat restoration and  
 34       enhancement could increase or decrease opportunities for recreationists within the study area.  
 35       Mechanisms that permit public access could increase opportunities related to upland hunting,  
 36       hiking, walking, wildlife and botanical viewing, nature photography, picnicking, and sightseeing.  
 37       Alternatively, land acquisition that would exclude public recreational use would decrease  
 38       opportunities for these activities, thus limiting recreationists' potential exposure to pathogens. Even  
 39       if recreationists were allowed in the ROAs, the characteristics of pathogens in water as described by  
 40       the conceptual model would not substantially increase recreationists' exposure. Accordingly,  
 41       implementation of the restoration conservation measures under Alternative 4 would not result in a  
 42       substantial increase in recreationists' exposure to pathogens. There would be no adverse effect.



1 **CEQA Conclusion:** Implementation of the restoration conservation measures would support habitat  
2 types, such as wetlands and agricultural lands, that could produce pathogens as a result of the  
3 biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products  
4 of animals). However, the localized nature of pathogen generation, as well as the quick die-off of  
5 pathogens once released into water bodies, would generally prevent substantial pathogen exposure  
6 to recreationists. Therefore, impacts would be less than significant. No mitigation is required.

7 **Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate**  
8 **as a Result of Implementing CM2, CM4, CM5, and CM10**

9 **NEPA Effects:** The primary concern with habitat restoration regarding constituents known to  
10 bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly  
11 inundated floodplains and marshes. The mobilization depends on the presence of the constituent  
12 and the biogeochemical behavior of the constituent to determine whether it could re-enter the  
13 water column or be reintroduced into the food chain.

14 **Pesticides**

15 Organochlorines and other relatively water insoluble pesticides would likely be sequestered in the  
16 former agricultural soils in ROAs. Additionally, because these chemicals tend to bind to particulates,  
17 concentrations are typically highest in sediment. Flooding of former agricultural land, as would  
18 occur under CM4, CM5, and CM10, is expected to result in some level of accessibility to biota through  
19 uptake by benthic organisms. Moreover, CM2 and CM5 may be managed alongside continuing  
20 agriculture, where pesticides may be used on a seasonal basis and where water during flood events  
21 may come in contact with residues of these pesticides. However, rapid dissipation would be  
22 expected, particularly in the large volumes of water involved in flooding; therefore, it is unlikely that  
23 a substantial increase in bioaccumulation by fish would result. Further, implementation of CM2,  
24 CM4, CM5, and CM10 would not include the use of bioaccumulative pesticides. Additionally,  
25 significant increases in concentrations of organochlorine and other legacy pesticides are not  
26 expected in the water column because these lipophilic chemicals strongly partition to sediments,  
27 and concentrations in the water column would be relatively short-lived because these pesticides  
28 settle out of the water column via sediment adsorption in low-velocity flow.

29 As described in Section D.4.6.1 of BDCP Appendix 5.D, if pesticide-laden sediment erodes and is  
30 transported from an ROA, it is likely that the pesticides would not be transported very far from the  
31 source area, and would settle out with suspended particulates and be deposited close to the ROA.  
32 For these reasons, a substantial mobilization of, or a substantial increase in, bioaccumulative  
33 pesticides in the study area is not anticipated. Therefore, no adverse effect on public health with  
34 respect to bioaccumulation of pesticides is expected.

35 **Methylmercury**

36 Conversion of inorganic mercury to methylmercury occurs in flooded fine sediments subjected to  
37 periodic drying-out periods and is associated with anaerobic (oxygen-depleted), reducing  
38 environments (Alpers et al. 2008; Ackerman and Eagles-Smith 2010). Methylmercury production is  
39 greatest in high marshes that are subjected to wet and dry periods over the highest monthly tidal  
40 cycles; production appears to be less in low marshes that are always inundated and not subject to  
41 dry periods (Alpers et al. 2008).

1 Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the  
2 soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport  
3 of mercury and methylmercury are very complex. Restoration would involve inundation of areas  
4 where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would  
5 be mobilized into the aquatic system. Results of the CALFED Mercury Project Annual Report for  
6 2007 (Stephenson et al. 2007) indicate that river inputs (11.5 grams per day [g/day]  
7 methylmercury) and in-situ production from wetland/marsh sediments (11.3 g/day  
8 methylmercury) are the leading sources of methylmercury to the Delta waters, and have roughly  
9 comparable levels of input. Wood (2010) estimates that in-situ methylmercury production in open  
10 water and wetlands contributes approximately 36% of the overall methylmercury load to the Delta  
11 (approximately 5 g/day) but is less than riverine/tributary inputs (8 g/day). The higher estimate of  
12 methylmercury production from sediments reported by Stephenson is based on periods of higher  
13 water (wet) and may be more representative of what might occur when new ROAs are opened for  
14 inundation. Once in the aquatic system, the methylmercury can be transported with water flow,  
15 taken up by biota, volatilized, demethylated, or returned to sediment (but not necessarily at the  
16 original restoration site).

17 The Sacramento River watershed, and specifically the Yolo Bypass, is the primary source of mercury  
18 in the study area. The highest concentrations of mercury and methylmercury are in the Cache Creek  
19 area and the Yolo Bypass. The amount of methylmercury produced in the Yolo Bypass has been  
20 estimated to represent 40% of the total methylmercury production for the entire Sacramento River  
21 watershed (Foe et al. 2008). Water discharging from the Yolo Bypass at Prospect Slough has a  
22 reported average annual methylmercury concentration of 0.27 ng/L, more than four times greater  
23 than the 0.06 ng/L TMDL.

24 The highest levels of methylmercury generation, mobilization, and bioavailability are expected in  
25 the Yolo Bypass with implementation of CM2 under Alternative 4. Implementation of CM2 would  
26 subject Yolo Bypass to more frequent and wider areas of inundation. The concentrations of  
27 methylmercury in water exiting the Yolo Bypass would depend on many variables. However,  
28 implementation of CM2 has the potential to significantly increase the loading, concentrations, and  
29 bioavailability of methylmercury in the aquatic system.

30 As part of the implementation of conservation measures under Alternative 4, measures would be  
31 developed to reduce the production of methylmercury in ROAs, and these measures would be  
32 implemented as part of CM12, *Methylmercury Management*. These measures may include  
33 construction and grading in a way that minimizes exposure of mercury-containing soils to the water  
34 column; designing areas to support/enhance photodegradation; and pre-design field studies to  
35 identify depositional areas where mercury accumulation is most likely and characterization and/or  
36 design that avoids these areas. CM12 provides for consideration of new information related to  
37 methylmercury degradation that could effectively mitigate methylmercury production and  
38 mobilization.

39 In summary, Alternative 4 restoration actions are likely to result in increased production,  
40 mobilization, and bioavailability of methylmercury in the aquatic system. Methylmercury would be  
41 generated by inundation of restoration areas, with highest concentrations expected in the Yolo  
42 Bypass, Cosumnes River and Mokelumne River, and at ROAs closest to these source areas as a result  
43 of the BDCP actions. An increase in bioavailability in the aquatic system could result in a  
44 corresponding increase in bioaccumulation in fish tissue, biomagnification through the food chain,  
45 and human exposure. Because the increase in bioavailability in the food chain cannot be quantified,

1 the increase in human exposure also cannot be quantified. OEHHA standards would continue to be  
 2 implemented for the consumption of study area fish and thus would serve to protect people against  
 3 the overconsumption of fish with increased body burdens of mercury. Furthermore, implementation  
 4 of CM12, *Methylmercury Management*, would minimize effects because it provides for project-  
 5 specific mercury management plans including a QA/QC program, and specific tidal habitat  
 6 restoration design elements to reduce the potential for methylation of mercury and its  
 7 bioavailability in tidal habitats. As such, adverse effects on public health due to the substantial  
 8 mobilization of or increase in methylmercury are not expected to occur.

9 **CEQA Conclusion:** Flooding of former agricultural land under CM4, CM5, and CM10, could result in  
 10 some level of accessibility of legacy organochlorine pesticides to biota through uptake by benthic  
 11 organisms. Further, CM2 and CM5 may be managed alongside continuing agriculture, where  
 12 pesticides may be used on a seasonal basis and where water during flood events may come in  
 13 contact with organochlorine and legacy pesticide residues. However, rapid dissipation would be  
 14 expected, particularly in the large volumes of water involved in flooding; therefore, it is unlikely that  
 15 a substantial increase in bioaccumulation by fish would result. Additionally, while there would likely  
 16 be an increase in mobilization of and potentially an increase in bioaccumulation of methylmercury  
 17 in the study area's aquatic systems (e.g., fish and water) in the near term, it is unlikely to be  
 18 substantial. Further, CM12, *Methylmercury Management*, as well as existing OEHHA standards,  
 19 would serve to reduce the public's exposure to contaminated fish. Implementation of CM2, CM4,  
 20 CM5, and CM10 under Alternative 4 would not substantially mobilize or substantially increase the  
 21 public's exposure to constituents known to bioaccumulate and would be less than significant. No  
 22 mitigation is required.

### 23 **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water** 24 **Conveyance Facilities.**

25 Any modified reservoir operations under Alternative 4 are not expected to promote *Microcystis*  
 26 production upstream of the Delta since large reservoirs upstream of the Delta are typically low in  
 27 nutrient concentrations and phytoplankton outcompete cyanobacteria, including *Microcystis*.  
 28 Further, in the rivers and streams of the Sacramento River watershed, watersheds of the eastern  
 29 tributaries (Cosumnes, Mokelumne, and Calaveras Rivers), and the San Joaquin River upstream of  
 30 the Delta, bloom development would be limited by high water velocity and low hydraulic residence  
 31 times.

32 Conditions in the Export Service Areas under the four operational scenarios of Alternative 4 are not  
 33 expected to become more conducive to *Microcystis* bloom formation, relative to the No Action  
 34 Alternative, because neither water residence time nor water temperatures will increase in the  
 35 Export Service Areas. As described in Chapter 8, *Water Quality*, *Microcystis* blooms in the Export  
 36 Service Areas could increase due to increased water temperatures resulting from climate change,  
 37 but not due to water conveyance facility operations. Similarly, residence times in the Export Service  
 38 Area would not be affected by operations of CM1. Accordingly, conditions would not be more  
 39 conductive to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north  
 40 Delta is expected to be unaffected by *Microcystis*, but the fraction of water flowing through the Delta  
 41 that reaches the existing south Delta intakes is expected to be influenced by an increase *Microcystis*  
 42 blooms. Therefore, relative to the No Action Alternative, the addition of Sacramento River water  
 43 from the north Delta under Alternative 4 would dilute *Microcystis* and microcystins in water  
 44 diverted from the south Delta. Because the degree to which *Microcystis* blooms, and thus  
 45 microcystins concentrations, will increase in source water from the south Delta is unknown, it

1 cannot be determined whether Alternative 4 will result in increased or decreased levels of  
2 microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

3 Ambient meteorological conditions are the primary driver of Delta water temperatures, and  
4 therefore climate warming, and not water operations, would determine future water temperatures  
5 in the Delta. Increasing water temperatures due to climate change could lead to earlier attainment  
6 of the water temperature threshold of 19°C required to initiate *Microcystis* bloom formation, and  
7 therefore earlier occurrences of *Microcystis* blooms in the Delta, as well as increases in the duration  
8 and magnitude. However, these temperature-related changes under Alternative 4 would not be  
9 different from what would occur under the No Action Alternative. Under H1-H4 operational  
10 scenarios, the modeled increase in hydraulic residence time in the Delta indicate varying levels of  
11 change depending on Delta location and timeframe (see Chapter 8, *Water Quality*). The changes in  
12 hydraulic residence time are driven by several factors accounted for in the modeling, including the  
13 hydrodynamic effects of restoration actions planned under CM2 and CM4, diversion of Sacramento  
14 River water at the proposed north Delta intake facility, as well as changes in net Delta outflows.  
15 Siting and design of restoration areas would have a substantial influence on the magnitude of  
16 residence time increases under Alternative 4. The modeled increase in hydraulic residence time in  
17 the Delta under operational scenarios H1-H4 could potentially increase the frequency, magnitude,  
18 and geographic extent of *Microcystis* blooms, and therefore microcystin in the Delta. Therefore,  
19 impacts on beneficial uses, including drinking water and recreational waters, could occur and, as  
20 such, public health could be affected. Accordingly, this would be considered an adverse effect.  
21 Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water  
22 quality, and therefore potential public health effects due to *Microcystis*. However, because the  
23 effectiveness of these mitigation measures to result in feasible measures for reducing water quality  
24 effects, and therefore potential public health effects, is uncertain, the effect would still be considered  
25 adverse.

26 **CEQA Conclusion:** Under Alternative 4, operation of the water conveyance facilities is not expected  
27 to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta  
28 because large reservoirs upstream are typically low in nutrient concentrations and phytoplankton  
29 outcompete cyanobacteria, including *Microcystis*, and high water velocity and low hydraulic  
30 residence times in the upstream area limit the development of *Microcystis* blooms. *Microcystis*  
31 blooms in the Export Service Areas could increase due to increased water temperatures resulting  
32 from climate change, but not water conveyance facility operations. Residence times in the Export  
33 Service Area would not be affected by operations of CM1, and therefore conditions would not be  
34 more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export  
35 Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta  
36 intakes and unaffected source water from the Sacramento River. Because of this, it cannot be  
37 determined whether operations and maintenance under Alternative 4 would result in increased or  
38 decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from  
39 Banks and Jones pumping plants.

40 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
41 would result in an increase in the frequency, magnitude and geographic extent of *Microcystis*, and  
42 therefore microcystin levels. However, the potential water quality effects due to temperature  
43 increases would be due to climate change, not effects resulting from operation of the water  
44 conveyance facilities. Increases in Delta residence times under all Alternative 4 operational  
45 scenarios (i.e., H1-H4) would be due in small part to climate change and sea level rise, but due to a  
46 greater degree to operation of the water conveyance facilities and hydrodynamic impacts of

1 restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency,  
 2 magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the  
 3 operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of  
 4 restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and  
 5 recreational waters would potentially be impacted and therefore, so would public health. Therefore  
 6 this impact would be significant.

7 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
 8 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time  
 9 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
 10 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
 11 proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods  
 12 to determine whether increases in abundance are significant. This mitigation measure also requires  
 13 that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will  
 14 investigate and evaluate measures that could be taken to manage hydraulic residence time in the  
 15 affected areas of the Delta. However, because the effectiveness of these mitigation measures to  
 16 result in feasible measures for reducing water quality effects, and therefore potential public health  
 17 effects, is uncertain, this impact would be significant and unavoidable.

18 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 19 ***Microcystis* Blooms**

20 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 21 in Chapter 8, *Water Quality*.

22 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 23 **Water Residence Time**

24 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 25 in Chapter 8, *Water Quality*.

26 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
 27 **CM4.**

28 **NEPA Effects:** As described in Chapter 8, *Water Quality*, implementation of CM3 and CM6–CM21 is  
 29 unlikely to affect *Microcystis* abundance in the rivers and reservoirs upstream of the Delta, in the  
 30 Delta region, or the waters exported to the CVP and SWP service areas. Implementation of CM5,  
 31 *Seasonally Inundated Floodplain Restoration*, could result in increased local water temperatures in  
 32 areas near restored seasonally inundated floodplains. However, floodplain inundation typically  
 33 occurs during spring and winter months when *Microcystis* growth is limited in general by low water  
 34 temperatures and by insufficient surface water irradiance. Water temperatures would not increase  
 35 sufficiently due to floodplain inundation such that effects on *Microcystis* growth would occur.  
 36 Therefore, implementation of CM5 is unlikely to affect *Microcystis* blooms in the study area.  
 37 Implementation of CM13, *Invasive Aquatic Vegetation Control*, may increase turbidity and flow  
 38 velocity, particularly in restored aquatic habitats, which could discourage *Microcystis* growth in  
 39 these areas. To the extent that IAV removal would affect turbidity and water velocity, it is possible  
 40 that IAV removal could, to some degree, help offset the increase in *Microcystis* production expected  
 41 under Alternative 4, relative to the No Action Alternative.

1 As discussed under Impact PH-8, development of restoration areas under CM2 and CM4 could  
 2 potentially increase the frequency, magnitude, and geographic extent of *Microcystis* blooms due to  
 3 the hydrodynamic impacts that are expected to increase water residence times throughout the  
 4 Delta. Additionally, restoration activities implemented under CM2 and CM4 that create shallow  
 5 backwater areas could result in local increases in water temperature that may encourage *Microcystis*  
 6 growth during the summer bloom season, which could result in further degradation of water quality  
 7 to the extent that beneficial uses are affected. Were *Microcystis* blooms to increase with  
 8 implementation of CM2 and CM4, there would be an increase in the potential for impacts on public  
 9 health as a result of potential effects on drinking water quality and recreational waters. Mitigation  
 10 Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local  
 11 water temperatures and water residence time, but the effects would be adverse.

12 **CEQA Conclusion:** Restoration activities implemented under Alternative 4 for CM2 and CM4 that  
 13 create shallow backwater areas could result in local increases in water temperature conducive to  
 14 *Microcystis* growth during summer bloom season. This could compound the water quality  
 15 degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact  
 16 PH-8 and result in additional water quality degradation such that beneficial uses are affected. An  
 17 increase in *Microcystis* blooms could potentially result in impacts on public health through exposure  
 18 via drinking water quality and recreational waters. Therefore, this impact would be significant.  
 19 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
 20 increased local water temperatures and water residence time. The effectiveness of these mitigation  
 21 measures to result in feasible measures for reducing water quality effects, and therefore potential  
 22 public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

23 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 24 ***Microcystis* Blooms**

25 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 26 in Chapter 8, *Water Quality*.

27 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 28 **Water Residence Time**

29 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 30 in Chapter 8, *Water Quality*.

31 **25.3.3.10 Alternative 5—Dual Conveyance with Pipeline/Tunnel and**  
 32 **Intake 1 (3,000 cfs; Operational Scenario C)**

33 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of**  
 34 **~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water**  
 35 **Conveyance Facilities**

36 **NEPA Effects:** Alternative 5 would involve construction and operation of up to three solids lagoons,  
 37 one sedimentation basin, an intermediate forebay and associated-350-acre inundation area  
 38 adjacent, and Bryon Tract Forebay, to the intermediate forebay; however, the mechanisms for  
 39 potential public health effects are similar to those described above for Alternative 1A. Specifically,  
 40 the sedimentation basin, solids lagoons, Byron Tract Forebay, the intermediate forebay, and the  
 41 inundation area have the potential to provide habitat for vectors that transmit diseases (e.g.,



1 mosquitoes) because of the large volumes of water that would be held within these areas. ~~However,~~  
 2 ~~During operation,~~ the depth, design, and operation of the sedimentation basin and solids lagoons  
 3 would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins  
 4 would be too deep and the constant movement of water would prevent mosquitoes from breeding  
 5 and multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and  
 6 solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep. Furthermore, use of the 350-  
 7 acre inundation area adjacent to the intermediate forebay would be limited to forebay emergency  
 8 overflow situations and water would be ~~physically~~ pumped back to the intermediate forebay,  
 9 creating circulation such that the inundation area would have a low potential for creating suitable  
 10 vector habitat. Similarly, water in the Byron Tract Forebay and intermediate forebay would be  
 11 circulated regularly and, with the exception of shallower areas around the periphery, would be too  
 12 deep to provide suitable mosquito habitat. The shallower edges of the forebays could provide  
 13 suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed)  
 14 were allowed to grow.

15 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 16 area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County  
 17 MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help  
 18 control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with  
 19 practices presented in the California Department of Public Health's Best Management Practices for  
 20 Mosquito Control in California (California Department of Public Health 2012). Implementation of  
 21 these BMPs would reduce the likelihood that BDCP operations would require an increase in  
 22 abatement activities by the local MVCDs. Accordingly, as described under Alternative 1A,  
 23 construction and operation of the intakes, solids lagoons, ~~and/or~~ sedimentation basins, the forebays,  
 24 and the intermediate forebay inundation area under Alternative 5 would not substantially increase  
 25 suitable vector habitat, and would not substantially increase vector-borne diseases. Therefore, no  
 26 adverse effects would result.

27 **CEQA Conclusion:** Implementation of CM1 under Alternative 5 would involve the construction and  
 28 operation of four fewer solids lagoons and one sedimentation basin relative to Alternative 1A, and  
 29 construction and operation of an intermediate forebay and associated 350-acre inundation area, and  
 30 Byron Tract Forebay adjacent to the intermediate forebay. While these facilities could provide  
 31 suitable habitat for vectors (e.g., mosquitoes), water depth and circulation would prevent the areas  
 32 from substantially increasing suitable vector habitat. These areas could provide suitable habitat for  
 33 vectors (e.g., mosquitoes). The inundation area would only be used during emergency overflow  
 34 situations and water would be pumped back into the intermediate forebay, creating circulation that  
 35 would discourage mosquito breeding. The shallower periphery of the intermediate forebay and  
 36 Byron Tract Forebay could provide suitable mosquito breeding habitat.

37 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 38 area, These BMPs would be consistent with practices presented in the California Department of  
 39 Public Health's Best Management Practices for Mosquito Control in California (California Department  
 40 of Public Health 2012). In addition, ~~During operations, water depth and circulation would prevent~~  
 41 ~~the intakes, solids lagoons, and/or sedimentation basins from substantially increasing suitable~~  
 42 ~~vector habitat.~~ Therefore, construction and operation of the water conveyance facilities ~~in~~ under  
 43 Alternative 5 would not result in a substantial increase in vector-borne diseases and the impact on  
 44 public health would be less than significant. No mitigation is required.

1 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
 2 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
 3 **Facilities**

4 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
 5 **Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
 6 **Slough**

7 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

8 **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water**  
 9 **Conveyance Facilities.**

10 NEPA Effects: Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in  
 11 the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change  
 12 under Alternative 5, *Microcystis* abundance, and thus microcystin concentrations, in water bodies of  
 13 the affected environment under Alternative 5 would be very similar (i.e., nearly the same) to those  
 14 discussed for Alternative 1A.

15 As described in Chapter 8, *Water Quality*, although *Microcystis* blooms have not occurred in the  
 16 Export Service Areas, conditions in the Export Service Areas under Alternative 5 may become more  
 17 conductive to *Microcystis* bloom formation because water temperatures will increase in the Export  
 18 Service Areas due to the expected increase in ambient air temperatures resulting from climate  
 19 change, but not from operation of the water conveyance facilities. Under Alternative 5, relative to No  
 20 Action Alternative, water exported to the SWP/CVP Export Service Area will be a mixture of  
 21 *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the  
 22 Sacramento River, diverted at the north Delta intakes. It cannot be determined whether operations  
 23 and maintenance under Alternative 5 will result in increased or decreased levels of *Microcystis* and  
 24 microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

25 Like Alternative 1A, elevated ambient water temperatures would occur in the Delta under  
 26 Alternative 5, which could lead to earlier occurrences of *Microcystis* blooms in the Delta, and  
 27 increase the overall duration and magnitude of blooms. However, as described in Chapter 8, *Water*  
 28 *Quality*, the increase in Delta water temperatures, and consequent potential increase in *Microcystis*  
 29 blooms, would be driven entirely by climate change, not by operation of water conveyance facilities.  
 30 There would be differences in the direction and magnitude of water residence time changes during  
 31 the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative 5  
 32 compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms,  
 33 and therefore microcystin, could increase in surface waters throughout the Delta. Therefore, impacts  
 34 on beneficial uses, including drinking water and recreational waters, could occur and public health  
 35 could be affected. Although Mitigation Measure WQ-32a and WQ-32b are available to reduce the  
 36 severity of degraded water quality in the Delta due to *Microcystis* blooms, this would be an adverse  
 37 effect.

38 CEQA Conclusion: Under Alternative 5, operation of the water conveyance facilities is not expected  
 39 to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta.  
 40 *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures  
 41 resulting from climate change, but not due to water conveyance facility operations. Hydraulic  
 42 residence times in the Export Service Area would not be affected by operations of CM1, and  
 43 therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation.

1 Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-  
 2 affected source water from the south Delta intakes and unaffected source water from the  
 3 Sacramento River. Because of this, it cannot be determined whether operations and maintenance  
 4 under Alternative 5 would result in increased or decreased levels of *Microcystis* and microcystins in  
 5 the mixture of source waters exported from Banks and Jones pumping plants.

6 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
 7 could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the  
 8 water temperature increases in the Delta would be due to climate change and not due to operation  
 9 of the water conveyance facilities. Increases in Delta hydraulic residence times would be due in  
 10 small part to climate change and sea level rise, but due to a greater degree to operation of the water  
 11 conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4.  
 12 Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of  
 13 *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water  
 14 conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4.  
 15 Accordingly, beneficial uses including drinking water and recreational waters would be impacted  
 16 and, as a result, public health. Therefore, this impact would be significant.

17 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
 18 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that residence time considerations  
 19 be incorporated into restoration area site design for CM2 and CM4 using the best available science at  
 20 the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for  
 21 *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether  
 22 increases in abundance are significant. This mitigation measure also requires that if *Microcystis*  
 23 abundance increases (relative to Existing Conditions), the project proponents will investigate and  
 24 evaluate measures that could be taken to manage hydraulic residence time in the affected areas of  
 25 the Delta. However, because the effectiveness of these mitigation measures to result in feasible  
 26 measures for reducing water quality effects, and therefore potential public health effects, is  
 27 uncertain, this impact would be significant and unavoidable.

28 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 29 ***Microcystis* Blooms**

30 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 31 in Chapter 8, *Water Quality*.

32 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 33 **Water Residence Time**

34 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 35 in Chapter 8, *Water Quality*.

36 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
 37 **CM4.**

38 **NEPA Effects:** The amount and location of habitat restoration and enhancement that would occur  
 39 under Alternative 5 would be the same as that described under Alternative 1A, except that 25,000  
 40 rather than 65,000 acres of tidal habitat would be restored under CM4. Restoration activities  
 41 implemented under CM2 and CM4 that would create shallow backwater areas could result in local  
 42 increases in water temperature that may encourage *Microcystis* growth during the summer bloom

1 season. This would result in further degradation of water quality beyond the hydrodynamic effects  
 2 of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms  
 3 with implementation of CM2 and CM4 could potentially result in adverse effects on public health  
 4 through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a  
 5 and WQ-32b may reduce the combined effect on *Microcystis* from increased local water  
 6 temperatures and water residence time. The effectiveness of these mitigation measures to result in  
 7 feasible measures for reducing water quality effects related to *Microcystis* is uncertain. This would  
 8 be an adverse effect.

9 **CEQA Conclusion:** The effects of CM2 and CM4 on *Microcystis* under Alternative 5 are similar to  
 10 those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that  
 11 create shallow backwater areas could result in local increases in water temperature conducive to  
 12 *Microcystis* growth during summer bloom season. This could compound the water quality  
 13 degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact  
 14 PH-8 and result in additional water quality degradation such that beneficial uses are affected. An  
 15 increase in *Microcystis* blooms could potentially result in impacts on public health through exposure  
 16 via drinking water quality and recreational waters. Therefore, this impact would be significant.  
 17 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
 18 increased local water temperatures and water residence time. The effectiveness of these mitigation  
 19 measures to result in feasible measures for reducing water quality effects, and therefore potential  
 20 public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

21 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 22 ***Microcystis* Blooms**

23 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 24 in Chapter 8, *Water Quality*.

25 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 26 **Water Residence Time**

27 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 28 in Chapter 8, *Water Quality*.

29 **25.3.3.11 Alternative 6A—Isolated Conveyance with Pipeline/Tunnel and**  
 30 **Intakes 1–5 (15,000 cfs; Operational Scenario D)**

31 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of**  
 32 **~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water**  
 33 **Conveyance Facilities**

34 **NEPA Effects:** As described for Alternative 1A, Alternative 6A would involve similar construction  
 35 and operation of up to 15 solids lagoons, five sedimentation basins, Byron Tract Forebay, and an  
 36 intermediate forebay and associated 350-acre inundation area adjacent to the intermediate forebay.  
 37 These Sedimentation basins, solids lagoons, and the inundation area have features have the potential  
 38 to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes  
 39 of water that would be held within these areas. However, Implementation of these BMPs would  
 40 reduce the likelihood that BDCP operations would require an increase in abatement activities by the  
 41 local MFGDs. During operation, the depth, design, and operation of the sedimentation basins and

1 solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1).  
 2 Specifically, the basins would be too deep and the constant movement of water would prevent  
 3 mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet  
 4 wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep.  
 5 Furthermore, use of the inundation area would be limited to forebay emergency overflow situations  
 6 and water would be physically pumped back to the intermediate forebay, creating circulation such  
 7 that the inundation area would have a low potential for creating suitable vector habitat. Similarly,  
 8 water in the Byron Tract Forebay and intermediate forebay would be circulated regularly and, with  
 9 the exception of shallower areas around the periphery, would be too deep to provide suitable  
 10 mosquito habitat. The shallower edges of the forebays could provide suitable mosquito breeding  
 11 habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow.

12 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 13 area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County  
 14 MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help  
 15 control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with  
 16 practices presented in the California Department of Public Health's Best Management Practices for  
 17 Mosquito Control in California (California Department of Public Health 2012). Implementation of  
 18 these BMPs would reduce the likelihood that BDCP operations would require an increase in  
 19 abatement activities by the local MVCDs. Therefore, as described for Alternative 1A, construction  
 20 and operation of the intakes, solids lagoons, ~~and/or~~ sedimentation basins, the forebays and the  
 21 intermediate forebay inundation area under Alternative 6A would not substantially increase  
 22 suitable vector habitat, and would not substantially increase in vector-borne diseases. Accordingly,  
 23 no adverse effects would result.

24 **CEQA Conclusion:** As described for Alternative 1A, implementation of CM1 under Alternative 6A  
 25 would involve construction and operation of solids lagoons, sedimentation basins, intermediate  
 26 forebay and associated 350-acre inundation area, and Bryon Tract Forebay adjacent to the  
 27 intermediate forebay, which would have the potential to provide habitat for vectors that transmit  
 28 diseases (e.g., mosquitoes). While these facilities could provide suitable habitat for vectors (e.g.,  
 29 mosquitoes), water depth and circulation would prevent the areas from substantially increasing  
 30 suitable vector habitat. The shallower periphery of the intermediate forebay and Bryon Tract  
 31 Forebay could provide suitable mosquito breeding habitat.

32 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 33 area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County  
 34 MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help  
 35 control mosquitoes. These BMPs would be consistent with practices presented in the California  
 36 Department of Public Health's Best Management Practices for Mosquito Control in California  
 37 (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A~~However,~~  
 38 ~~DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs~~  
 39 ~~and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control~~  
 40 ~~mosquitoes. See Impact PH-1 under Alternative 1A. During operations, water depth and circulation~~  
 41 ~~would prevent the areas from substantially increasing suitable vector habitat.~~ Therefore,  
 42 construction and operation of the water conveyance facilities ~~in~~ under Alternative 6A would not  
 43 result in a substantial increase in vector-borne diseases and the impact on public health would be  
 44 less than significant. No mitigation is required.

1 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
2 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
3 **Facilities**

4 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
5 **Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
6 **Slough**

7 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

8 **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water**  
9 **Conveyance Facilities.**

10 **NEPA Effects:** *Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in*  
11 *the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change*  
12 *under Alternative 6A, *Microcystis* abundance, and thus microcystin concentrations, in water bodies*  
13 *of the affected environment under Alternative 6A would be nearly the same as those discussed for*  
14 *Alternative 1A.*

15 *As described in Chapter 8, *Water Quality*, although *Microcystis* blooms have not occurred in the*  
16 *Export Service Areas, conditions in the Export Service Areas under Alternative 6A may become more*  
17 *conductive to *Microcystis* bloom formation because water temperatures will increase in the Export*  
18 *Service Areas due to the expected increase in ambient air temperatures resulting from climate*  
19 *change, but not from operation of the water conveyance facilities. In contrast to Alternative 1A, the*  
20 *effects of *Microcystis* on water exported to the SWP/CVP Export Service Areas could be lower under*  
21 *Alternative 6A relative to Alternative 1A.*

22 *Like Alternative 1A, elevated ambient water temperatures would occur in the Delta under*  
23 *Alternative 6A, which could lead to earlier occurrences of *Microcystis* blooms in the Delta, and*  
24 *increase the overall duration and magnitude of blooms. However, as described in Chapter 8, *Water**  
25 *Quality, the increase in Delta water temperatures, and consequent potential increase in *Microcystis**  
26 *blooms, would be driven entirely by climate change, not by operation of water conveyance facilities.*  
27 *There would be differences in the direction and magnitude of water residence time changes during*  
28 *the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative*  
29 *6A compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms,*  
30 *and therefore microcystin, could increase in surface waters throughout the Delta, similar to*  
31 *Alternative 1A.*

32 **CEQA Conclusion:** *Under Alternative 6A, operation of the water conveyance facilities is not expected*  
33 *to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta.*  
34 **Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures*  
35 *resulting from climate change, but not due to water conveyance facility operations. Hydraulic*  
36 *residence times in the Export Service Area would not be affected by operations of CM1, and*  
37 *therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation.*  
38 *Water exported from the Delta to the Export Service Area is expected to be diverted entirely from*  
39 *the Sacramento River from the north Delta, which is not affected by *Microcystis*. Therefore the effects*  
40 *of *Microcystis* on water exported to the SWP/CVP Export Service Areas could be lower under*  
41 *Alternative 6A relative to Alternative 1A.*



1 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
 2 could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the  
 3 water temperature increases in the Delta would be due to climate change and not due to operation  
 4 of the water conveyance facilities. Increases in Delta residence times would be due in small part to  
 5 climate change and sea level rise, but due to a greater degree to operation of the water conveyance  
 6 facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is  
 7 possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in  
 8 the Delta would occur due to the operations and maintenance of the water conveyance facilities and  
 9 the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including  
 10 drinking water and recreational waters would be impacted and, as a result, public health. Therefore,  
 11 this impact would be significant.

12 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
 13 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time  
 14 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
 15 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
 16 proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods  
 17 to determine whether increases in abundance are significant. This mitigation measure also requires  
 18 that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will  
 19 investigate and evaluate measures that could be taken to reduce hydraulic residence time in the  
 20 affected areas of the Delta. However, because the effectiveness of these mitigation measures to  
 21 result in feasible measures for reducing water quality effects, and therefore potential public health  
 22 effects, is uncertain, this impact would be significant and unavoidable.

23 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 24 ***Microcystis* Blooms**

25 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 26 in Chapter 8, *Water Quality*.

27 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 28 **Water Residence Time**

29 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 30 in Chapter 8, *Water Quality*.

31 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
 32 **CM4.**

33 **NEPA Effects:** The amount and location of habitat restoration and enhancement that would occur  
 34 under Alternative 6A would be the same as that described under Alternative 1A. Restoration  
 35 activities implemented under CM2 and CM4 that would create shallow backwater areas could result  
 36 in local increases in water temperature that may encourage *Microcystis* growth during the summer  
 37 bloom season. This would result in further degradation of water quality beyond the hydrodynamic  
 38 effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis*  
 39 blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public  
 40 health through exposure via drinking water quality and recreational waters. Mitigation Measures  
 41 WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water  
 42 temperatures and water residence time. The effectiveness of these mitigation measures to result in

1 feasible measures for reducing water quality effects related to *Microcystis* is uncertain. This would  
 2 be an adverse effect.

3 **CEQA Conclusion:** The effects of CM2 and CM4 on *Microcystis* under Alternative 6A would be the  
 4 same as those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4  
 5 that create shallow backwater areas could result in local increases in water temperature conducive  
 6 to *Microcystis* growth during summer bloom season. This could compound the water quality  
 7 degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact  
 8 PH-8 and result in additional water quality degradation such that beneficial uses are affected. An  
 9 increase in *Microcystis* blooms could potentially result in impacts on public health through exposure  
 10 via drinking water quality and recreational waters. Therefore, this impact would be significant.  
 11 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
 12 increased local water temperatures and water residence time. The effectiveness of these mitigation  
 13 measures to result in feasible measures for reducing water quality effects is uncertain. Therefore,  
 14 this impact would be significant and unavoidable.

15 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 16 ***Microcystis* Blooms**

17 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 18 in Chapter 8, *Water Quality*.

19 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 20 **Water Residence Time**

21 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 22 in Chapter 8, *Water Quality*.

23 **25.3.3.12 Alternative 6B—Isolated Conveyance with East Alignment and**  
 24 **Intakes 1–5 (15,000 cfs; Operational Scenario D)**

25 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of**  
 26 **~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water**  
 27 **Conveyance Facilities**

28 **NEPA Effects:** As described for Alternative 1A, Alternative 6B would involve construction and  
 29 operation of five north Delta intakes, up to 15 solids lagoons, ~~and~~ five sedimentation basins, and  
 30 Byron Tract Forebay. Sedimentation basins and solids lagoons These facilities have the potential to  
 31 provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of  
 32 water that would be held within these areas. ~~However, Implementation of these BMPs would reduce~~  
 33 ~~the likelihood that BDCP operations would require an increase in abatement activities by the local~~  
 34 ~~MVGDs. During operation, †The depth, design, and operation of the sedimentation basins, †and~~ solids  
 35 lagoons and Byron Tract Forebay would prevent the development of suitable mosquito habitat  
 36 (Figure 25-1). ~~Specifically, †The sedimentation~~ basins would be too deep and the constant  
 37 movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation  
 38 basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet  
 39 long by 86 feet wide by 10 feet deep.

40 Although the proposed Byron Tract Forebay would increase surface water within the study area, it  
 41 is unlikely that the forebay would provide suitable breeding habitat for mosquitoes given that the

1 water in this forebay would not be stagnant and would be too deep. However, the shallow edges of  
 2 the forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or  
 3 other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular  
 4 maintenance of the forebay, floating vegetation such as pond weed would be harvested to maintain  
 5 flow and forebay capacity.

6 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 7 area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County  
 8 MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help  
 9 control mosquitoes. These BMPs would be consistent with practices presented in the California  
 10 Department of Public Health's Best Management Practices for Mosquito Control in California  
 11 (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore, as  
 12 described for Alternative 1A, construction and operation of the water conveyance facilities intakes,  
 13 solids lagoons, and/or sedimentation basins under Alternative 6B would not substantially increase  
 14 suitable vector habitat, and would not substantially increase vector-borne diseases. Accordingly, no  
 15 adverse effects would result.

16 **CEQA Conclusion:** As described for Alternative 1A, implementation of CM1 under Alternative 6B  
 17 would involve construction and operation of solids lagoons, ~~and~~ sedimentation basins, ~~and the~~  
 18 Byron Tract Forebay. These areas could provide suitable habitat for vectors (e.g., mosquitoes).  
 19 ~~However,~~ During operations, water depth and circulation would prevent the areas from  
 20 substantially increasing suitable vector habitat. However, the shallow edges on the periphery of  
 21 Byron Tract Forebay could potentially provide suitable mosquito breeding habitat if emergent  
 22 vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. To minimize the  
 23 potential for impacts related to increasing suitable vector habitat within the study area. These  
 24 BMPs would be consistent with practices presented in the California Department of Public Health's  
 25 Best Management Practices for Mosquito Control in California (California Department of Public  
 26 Health 2012). Therefore, construction and operation of the water conveyance facilities ~~in~~under  
 27 Alternative 6B would not result in a substantial increase in vector-borne diseases and the impact on  
 28 public health would be less than significant. No mitigation is required.

29 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
 30 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
 31 **Facilities**

32 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
 33 **Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
 34 **Slough**

35 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

36 **Impact PH-8: Increase in Microcystis Bloom Formation as a Result of Operation of the Water**  
 37 **Conveyance Facilities.**

38 **NEPA Effects:** Water operations under Alternative 6B would be the same as under Alternative 6A.  
 39 **Therefore, potential effects on public health due to changes in water quality and beneficial uses as a**  
 40 **result of Microcystis blooms and microcystin levels would be the same.**

41 **Any modified reservoir operations under Alternative 6B are not expected to promote Microcystis**  
 42 **production in waters upstream of the Delta. As described in Chapter 8, Water Quality, Microcystis**

1 blooms in the Export Service Areas could increase due to increased water temperatures resulting  
2 from climate change, but not due to water conveyance facility operations. Similarly, hydraulic  
3 residence times in the Export Service Area would not be affected by operations of CM1. Accordingly,  
4 conditions would not be more conducive to *Microcystis* bloom formation. Water diverted from the  
5 Sacramento River in the north Delta is expected to be unaffected by *Microcystis*. Under Alternative  
6 6B the effects of *Microcystis* on water exported to the SWP/CVP Export Service Areas could be lower  
7 under Alternative 6B relative to Alternative 1A.

8 Ambient meteorological conditions would be the primary driver of Delta water temperatures, and  
9 climate warming, not water operations, would determine future water temperatures in the Delta.  
10 Increasing water temperatures could lead to earlier attainment of the water temperature threshold  
11 required to initiate *Microcystis* bloom formation, and therefore earlier occurrences of *Microcystis*  
12 blooms in the Delta, as well as increases in the duration and magnitude. However, these  
13 temperature-related changes would not be different from what would occur under the No Action  
14 Alternative. Siting and design of restoration areas would have a substantial influence on the  
15 magnitude of residence time increases under Alternative 6B. The modeled increase in hydraulic  
16 residence time in the Delta could result in an increase in the frequency, magnitude, and geographic  
17 extent of *Microcystis* blooms, and thus microcystin levels. Mitigation Measure WQ-32a and WQ-32b  
18 are available to reduce the effects of degraded water quality, and therefore potential public health  
19 effects, in the Delta due to *Microcystis*. However, because the effectiveness of these mitigation  
20 measures to result in feasible measures for reducing water quality effects, and therefore potential  
21 public health effects, is uncertain, the effect would still be considered adverse.

22 **CEQA Conclusion:** Under Alternative 6B, operation of the water conveyance facilities is not expected  
23 to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta.  
24 *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures  
25 resulting from climate change, but not due to water conveyance facility operations. Hydraulic  
26 residence times in the Export Service Area would not be affected by operations of CM1, and  
27 therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation.  
28 Water exported from the Delta to the Export Service Area is expected to be diverted entirely from  
29 the Sacramento River from the north Delta, which is not affected by *Microcystis*. Therefore the effects  
30 of *Microcystis* on water exported to the SWP/CVP Export Service Areas could be lower under  
31 Alternative 6B relative to Alternative 1A.

32 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
33 could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the  
34 water temperature increases in the Delta would be due to climate change primarily and not due to  
35 operation of the water conveyance facilities. Increases in Delta residence times would be due in  
36 small part to climate change and sea level rise, but due to a greater degree to operation of the water  
37 conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4.  
38 Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of  
39 *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water  
40 conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4.  
41 Accordingly, beneficial uses including drinking water and recreational waters would be impacted  
42 and, as a result, there could be potential impacts on public health. Therefore, this impact would be  
43 significant.

44 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
45 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time

1 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
 2 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
 3 proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods  
 4 to determine whether increases in abundance are significant. This mitigation measure also requires  
 5 that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will  
 6 investigate and evaluate measures that could be taken to reduce residence time in the affected areas  
 7 of the Delta. However, because the effectiveness of these mitigation measures to result in feasible  
 8 measures for reducing water quality effects, and therefore potential public health effects, is  
 9 uncertain, this impact would be significant and unavoidable.

10 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 11 ***Microcystis* Blooms**

12 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 13 in Chapter 8, *Water Quality*.

14 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 15 **Water Residence Time**

16 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 17 in Chapter 8, *Water Quality*.

18 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
 19 **CM4.**

20 **NEPA Effects:** The amount and location of habitat restoration and enhancement that would occur  
 21 under Alternative 6B would be the same as that described under Alternative 1A. Restoration  
 22 activities implemented under CM2 and CM4 that would create shallow backwater areas could result  
 23 in local increases in water temperature that may encourage *Microcystis* growth during the summer  
 24 bloom season. This would result in further degradation of water quality beyond the hydrodynamic  
 25 effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis*  
 26 blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public  
 27 health through exposure via drinking water quality and recreational waters. Mitigation Measures  
 28 WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water  
 29 temperatures and water residence time. The effectiveness of these mitigation measures to result in  
 30 feasible measures for reducing water quality effects, and therefore potential public health effects, is  
 31 uncertain. This would be an adverse effect.

32 **CEQA Conclusion:** The effects of CM2 and CM4 on *Microcystis* under Alternative 6B are the same as  
 33 those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that  
 34 create shallow backwater areas could result in local increases in water temperature conducive to  
 35 *Microcystis* growth during summer bloom season. This could compound the water quality  
 36 degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact  
 37 PH-8 and result in additional water quality degradation such that beneficial uses are affected. An  
 38 increase in *Microcystis* blooms could potentially result in impacts on public health through exposure  
 39 via drinking water quality and recreational waters. Therefore, this impact would be significant.  
 40 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
 41 increased local water temperatures and water residence time. The effectiveness of these mitigation

1 measures to result in feasible measures for reducing water quality effects, and therefore potential  
 2 public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

3 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 4 **Microcystis Blooms**

5 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 6 in Chapter 8, *Water Quality*.

7 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 8 **Water Residence Time**

9 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 10 in Chapter 8, *Water Quality*.

11 **25.3.3.13 Alternative 6C—Isolated Conveyance with West Alignment and**  
 12 **Intakes W1–W5 (15,000 cfs; Operational Scenario D)**

13 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of**  
 14 **~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water**  
 15 **Conveyance Facilities**

16 ***NEPA Effects:*** As described for Alternative 1A, Alternative 6C would involve construction and  
 17 operation of five north Delta intakes, up to 15 solids lagoons, ~~and~~ five sedimentation basins, ~~and the~~  
 18 ~~Bryon Tract Forebay. Sedimentation basins and solids lagoons~~ These facilities have the potential  
 19 provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of  
 20 water that would be held within these areas. ~~However, During operation, t~~he depth, design, and  
 21 operation of the sedimentation basins and solids lagoons would prevent the development of suitable  
 22 mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant  
 23 movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation  
 24 basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet  
 25 long by 86 feet wide by 10 feet deep.

26 Although the proposed Byron Tract Forebay would increase surface water within the study area, it  
 27 is unlikely that the forebay would provide suitable breeding habitat for mosquitoes given that the  
 28 water in this forebay would not be stagnant and would be too deep. However, the shallow edges of  
 29 the forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or  
 30 other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular  
 31 maintenance of the forebay, floating vegetation such as pond weed would be harvested to maintain  
 32 flow and forebay capacity.

33 To minimize the potential for causing impacts related to increasing suitable mosquito habitat in the  
 34 Plan Area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo  
 35 County MVEDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs  
 36 would help control mosquitoes. These BMPs would be consistent with practices presented in the  
 37 California Department of Public Health’s Best Management Practices for Mosquito Control in  
 38 California (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A.  
 39 Therefore, as described for Alternative 1A, construction and operation of the ~~intakes, solids lagoons,~~  
 40 ~~and/or sedimentation basins~~ water conveyance facilities under Alternative 6C would not



1 substantially increase suitable vector habitat, and would not substantially increase vector-borne  
2 diseases. Accordingly, there would be no adverse effects.

3 **CEQA Conclusion:** As described for Alternative 1A, implementation of CM1 under Alternative 6C  
4 would involve construction and operation of solids lagoons, ~~and~~ sedimentation basins, ~~and the~~  
5 ~~Byron Tract Forebay areas~~ could provide suitable habitat for vectors (e.g., mosquitoes). ~~However,~~  
6 ~~DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCs~~  
7 ~~and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control~~  
8 ~~mosquitoes. See Impact PH-1 under Alternative 1A.~~ During operations, water depth and circulation  
9 would prevent the areas from substantially increasing suitable vector habitat. ~~However, the shallow~~  
10 ~~edges on the periphery of Byron Tract Forebay could potentially provide suitable mosquito breeding~~  
11 ~~habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. To~~  
12 ~~minimize the potential for impacts related to increasing suitable vector habitat within the study~~  
13 ~~area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County~~  
14 ~~MVCs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help~~  
15 ~~control mosquitoes. See Impact PH-1 under Alternative 1A. These BMPs would be consistent with~~  
16 ~~practices presented in the California Department of Public Health's Best Management Practices for~~  
17 ~~Mosquito Control in California (California Department of Public Health 2012).~~ Therefore,  
18 construction and operation of the water conveyance facilities ~~under~~ Alternative 6C would not  
19 result in a substantial increase in vector-borne diseases and the impact on public health would be  
20 less than significant. No mitigation is required.

21 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
22 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
23 **Facilities**

24 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
25 **Conditions: Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
26 **Slough**

27 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

28 **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water**  
29 **Conveyance Facilities.**

30 **NEPA Effects:** Water operations under Alternative 6C would be the same as under Alternative 6A.  
31 Therefore, potential effects on public health due to changes in water quality and beneficial uses as a  
32 result of *Microcystis* blooms and microcystin levels would be the same.

33 Any modified reservoir operations under Alternative 6C are not expected to promote *Microcystis*  
34 production in waters upstream of the Delta. As described in Chapter 8, Water Quality, *Microcystis*  
35 blooms in the Export Service Areas could increase due to increased water temperatures resulting  
36 from climate change, but not due to water conveyance facility operations. Similarly, hydraulic  
37 residence times in the Export Service Area would not be affected by operations of CM1. Accordingly,  
38 conditions would not be more conducive to *Microcystis* bloom formation. Water diverted from the  
39 Sacramento River in the north Delta is expected to be unaffected by *Microcystis*. Under Alternative  
40 6C, water exported to the SWP/CVP Export Service Area will consist entirely of water from the  
41 Sacramento River from the north Delta, which is unaffected by *Microcystis*. Accordingly, the effects

1 of *Microcystis* on water exported to the SWP/CVP Export Service Areas could be lower under  
2 Alternative 6C relative to Alternative 1A.

3 Ambient meteorological conditions would be the primary driver of Delta water temperatures, and  
4 climate warming, not water operations, would determine future water temperatures in the Delta.  
5 Increasing water temperatures could lead to earlier attainment of the water temperature threshold  
6 required to initiate *Microcystis* bloom formation, and therefore earlier occurrences of *Microcystis*  
7 blooms in the Delta, as well as increases in the duration and magnitude. However, these  
8 temperature-related changes would not be different from what would occur under the No Action  
9 Alternative. Siting and design of restoration areas would have a substantial influence on the  
10 magnitude of hydraulic residence time increases under Alternative 6C. The modeled increase in  
11 residence time in the Delta could result in an increase in the frequency, magnitude, and geographic  
12 extent of *Microcystis* blooms, and thus microcystin levels. Mitigation Measure WQ-32a and WQ-32b  
13 are available to reduce the effects of degraded water quality, and therefore potential public health  
14 effects, in the Delta due to *Microcystis*. However, because the effectiveness of these mitigation  
15 measures to result in feasible measures for reducing water quality effects, and therefore potential  
16 public health effects, is uncertain, the effect would still be considered adverse.

17 **CEQA Conclusion:** Under Alternative 6C, operation of the water conveyance facilities is not expected  
18 to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta.  
19 *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures  
20 resulting from climate change, but not due to water conveyance facility operations. Hydraulic  
21 residence times in the Export Service Area would not be affected by operations of CM1, and  
22 therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation.  
23 Water exported from the Delta to the Export Service Area is expected to be diverted entirely from  
24 the Sacramento River from the north Delta, which is not affected by *Microcystis*. Therefore the effects  
25 of *Microcystis* on water exported to the SWP/CVP Export Service Areas could be lower under  
26 Alternative 6C relative to Alternative 1A.

27 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
28 could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the  
29 water temperature increases in the Delta would be due to climate change primarily and not due to  
30 operation of the water conveyance facilities. Increases in Delta residence times would be due in  
31 small part to climate change and sea level rise, but due to a greater degree to operation of the water  
32 conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4.  
33 Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of  
34 *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water  
35 conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4.  
36 Accordingly, beneficial uses including drinking water and recreational waters would be impacted  
37 and, as a result, there could be potential impacts on public health. Therefore, this impact would be  
38 significant.

39 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
40 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time  
41 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
42 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
43 proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods  
44 to determine whether increases in abundance are significant. This mitigation measure also requires  
45 that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will

1 investigate and evaluate measures that could be taken to reduce hydraulic residence time in the  
2 affected areas of the Delta. However, because the effectiveness of these mitigation measures to  
3 result in feasible measures for reducing water quality effects, and therefore potential public health  
4 effects, is uncertain, this impact would be significant and unavoidable.

5 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
6 **Microcystis Blooms**

7 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
8 in Chapter 8, *Water Quality*.

9 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
10 **Water Residence Time**

11 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
12 in Chapter 8, *Water Quality*.

13 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
14 **CM4.**

15 **NEPA Effects:** The amount and location of habitat restoration and enhancement that would occur  
16 under Alternative 6C would be the same as that described under Alternative 1A. Restoration  
17 activities implemented under CM2 and CM4 that would create shallow backwater areas could result  
18 in local increases in water temperature that may encourage *Microcystis* growth during the summer  
19 bloom season. This would result in further degradation of water quality beyond the hydrodynamic  
20 effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis*  
21 blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public  
22 health through exposure via drinking water quality and recreational waters. Mitigation Measures  
23 WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water  
24 temperatures and water residence time. The effectiveness of these mitigation measures to result in  
25 feasible measures for reducing water quality effects, and therefore potential public health effects, is  
26 uncertain. This would be an adverse effect.

27 **CEQA Conclusion:** The effects of CM2 and CM4 on *Microcystis* under Alternative 6C are the same as  
28 those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that  
29 create shallow backwater areas could result in local increases in water temperature conducive to  
30 *Microcystis* growth during summer bloom season. This could compound the water quality  
31 degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact  
32 PH-8 and result in additional water quality degradation such that beneficial uses are affected. An  
33 increase in *Microcystis* blooms could potentially result in impacts on public health through exposure  
34 via drinking water quality and recreational waters. Therefore, this impact would be significant.  
35 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
36 increased local water temperatures and water residence time. The effectiveness of these mitigation  
37 measures to result in feasible measures for reducing water quality effects, and therefore potential  
38 public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

1 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 2 **Microcystis Blooms**

3 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 4 in Chapter 8, *Water Quality*.

5 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 6 **Water Residence Time**

7 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 8 in Chapter 8, *Water Quality*.

9 **25.3.3.14 Alternative 7—Dual Conveyance with Pipeline/Tunnel, Intakes 2,**  
 10 **3, and 5, and Enhanced Aquatic Conservation (9,000 cfs;**  
 11 **Operational Scenario E)**

12 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of**  
 13 **~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water**  
 14 **Conveyance Facilities**

15 *NEPA Effects:* Alternative 7 would involve construction and operation of up to nine solids lagoons,  
 16 three sedimentation basins, Byron Tract Forebay, and an intermediate forebay and associated 350-  
 17 acre inundation area adjacent to the intermediate forebay; however, the area. The mechanisms for  
 18 potential public health effects are similar to those described for Alternative 1A. Specifically,  
 19 sedimentation these water conveyance features basins, solids and lagoons, and the inundation area  
 20 have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of  
 21 the large volumes of water that would be held within these areas. Implementation of these BMPs  
 22 would reduce the likelihood that BDCP operations would require an increase in abatement activities  
 23 by the local MVCs. During operation, tThe depth, design, and operation of the sedimentation basins  
 24 and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1).  
 25 Specifically, the basins would be too deep and the constant movement of water would prevent  
 26 mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet  
 27 wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep.  
 28 Furthermore, use of the inundation area would be limited to forebay emergency overflow situations  
 29 and water would be physically pumped back to the intermediate forebay, creating circulation such  
 30 that the inundation area would have a low potential for creating suitable vector habitat. Similarly,  
 31 water in the Byron Tract Forebay would be circulated regularly and, with the exception of shallower  
 32 areas around the periphery, would be too deep to provide suitable mosquito habitat. The shallower  
 33 edges of the forebay could provide suitable mosquito breeding habitat if emergent vegetation or  
 34 other aquatic plants (e.g., pond weed) were allowed to grow.

35 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 36 area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County  
 37 MVCs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help  
 38 control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with  
 39 practices presented in the California Department of Public Health's Best Management Practices for  
 40 Mosquito Control in California (California Department of Public Health 2012). Implementation of  
 41 these BMPs would reduce the likelihood that BDCP operations would require an increase in  
 42 abatement activities by the local MVCs. Therefore, as described under Alternative 1A, construction

1 and operation of the intakes, solids lagoons, ~~and/or~~ sedimentation basins, the forebays, and the  
 2 intermediate forebay inundation area under Alternative 7 would not substantially increase suitable  
 3 vector habitat, and would not substantially increase vector-borne diseases under Alternative 7.  
 4 Accordingly, no adverse effects on public health would result.

5 **CEQA Conclusion:** As described for Alternative 1A, implementation of CM1 under Alternative 7  
 6 would involve construction and operation of solids lagoons, sedimentation basins, intermediate  
 7 forebay and associated 350-acre inundation area, and Byron Tract Forebay adjacent to the  
 8 intermediate forebay. While these areas could provide suitable habitat for vectors (e.g.,  
 9 mosquitoes), water depth and circulation would prevent the areas from substantially increasing  
 10 suitable vector habitat. However, The inundation area would only be used during emergency  
 11 overflow situations and water would be pumped back into the intermediate forebay, creating  
 12 circulation that would discourage mosquito breeding. The shallower periphery of the intermediate  
 13 forebay and Bryon Tract Forebay could provide suitable mosquito breeding habitat.

14 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 15 area, These BMPs would be consistent with practices presented in the California Department of  
 16 Public Health's Best Management Practices for Mosquito Control in California (California Department  
 17 of Public Health 2012). Therefore, construction and operation of the water conveyance facilities  
 18 under Alternative 7 would not result in a substantial increase in vector-borne diseases and the  
 19 impact on public health would be less than significant. No mitigation is required.

20 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
 21 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
 22 **Facilities**

23 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
 24 **Conditions: Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
 25 **Slough**

26 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

27 **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water**  
 28 **Conveyance Facilities.**

29 **NEPA Effects:** Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in  
 30 the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change  
 31 under Alternative 7, *Microcystis* abundance, and thus microcystins concentrations, in water bodies  
 32 of the affected environment under Alternative 7 would be very similar to those discussed for  
 33 Alternative 1A.

34 As described in Chapter 8, Water Quality, although *Microcystis* blooms have not occurred in the  
 35 Export Service Areas, conditions in the Export Service Areas under Alternative 7 may become more  
 36 conductive to *Microcystis* bloom formation because water temperatures will increase in the Export  
 37 Service Areas due to the expected increase in ambient air temperatures resulting from climate  
 38 change, but not from operation of the water conveyance facilities.

39 Like Alternative 1A, elevated ambient water temperatures would occur in the Delta under  
 40 Alternative 7, which could lead to earlier occurrences of *Microcystis* blooms in the Delta, and  
 41 increase the overall duration and magnitude of blooms. However, as described in Chapter 8, Water

1 Quality, the increase in Delta water temperatures, and consequent potential increase in *Microcystis*  
2 blooms, would be driven entirely by climate change, not by operation of water conveyance facilities.  
3 There would be differences in the direction and magnitude of water residence time changes during  
4 the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative 7  
5 compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms,  
6 and therefore microcystin, could increase in surface waters throughout the Delta. Mitigation  
7 Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality in the  
8 Delta. Although there is uncertainty regarding this impact, the effects on *Microcystis* from  
9 implementing CM1 is determined to be adverse.

10 **CEQA Conclusion:** Under Alternative 7, operation of the water conveyance facilities is not expected  
11 to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta.  
12 *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures  
13 resulting from climate change, but not due to water conveyance facility operations. Hydraulic  
14 Residence times in the Export Service Area would not be affected by operations of CM1, and  
15 therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation.  
16 Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-  
17 affected source water from the south Delta intakes and unaffected source water from the  
18 Sacramento River. Because of this, it cannot be determined whether operations and maintenance  
19 under Alternative 7 would result in increased or decreased levels of *Microcystis* and microcystins in  
20 the mixture of source waters exported from Banks and Jones pumping plants.

21 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
22 could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the  
23 water temperature increases in the Delta would be due to climate change and not due to operation  
24 of the water conveyance facilities. Increases in Delta residence times would be due in small part to  
25 climate change and sea level rise, but due to a greater degree to operation of the water conveyance  
26 facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is  
27 possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in  
28 the Delta would occur due to the operations and maintenance of the water conveyance facilities and  
29 the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including  
30 drinking water and recreational waters would be impacted and, as a result, public health. Therefore,  
31 this impact would be significant.

32 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
33 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time  
34 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
35 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
36 proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods  
37 to determine whether increases in abundance are significant. This mitigation measure also requires  
38 that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will  
39 investigate and evaluate measures that could be taken to reduce residence time in the affected areas  
40 of the Delta. However, because the effectiveness of these mitigation measures to result in feasible  
41 measures for reducing water quality effects, and therefore potential public health effects, is  
42 uncertain, this impact would be significant and unavoidable.



1 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
2 **Microcystis Blooms**

3 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
4 in Chapter 8, *Water Quality*.

5 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
6 **Water Residence Time**

7 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
8 in Chapter 8, *Water Quality*.

9 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
10 **CM4.**

11 **NEPA Effects:** The amount and location of habitat restoration and enhancement that would occur  
12 under Alternative 7 would be the same as that described under Alternative 1A. Restoration activities  
13 implemented under CM2 and CM4 that would create shallow backwater areas could result in local  
14 increases in water temperature that may encourage *Microcystis* growth during the summer bloom  
15 season. This would result in further degradation of water quality beyond the hydrodynamic effects  
16 of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms  
17 with implementation of CM2 and CM4 could potentially result in adverse effects on public health  
18 through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a  
19 and WQ-32b may reduce the combined effect on *Microcystis* from increased local water  
20 temperatures and water residence time. The effectiveness of these mitigation measures to result in  
21 feasible measures for reducing water quality effects related to *Microcystis* is uncertain. This would  
22 be an adverse effect.

23 **CEQA Conclusion:** The effects of CM2 and CM4 on *Microcystis* under Alternative 7 are the same as  
24 those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that  
25 create shallow backwater areas could result in local increases in water temperature conducive to  
26 *Microcystis* growth during summer bloom season. This could compound the water quality  
27 degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact  
28 PH-8 and result in additional water quality degradation such that beneficial uses are affected. An  
29 increase in *Microcystis* blooms could potentially result in impacts on public health through exposure  
30 via drinking water quality and recreational waters. Therefore, this impact would be significant.  
31 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
32 increased local water temperatures and water residence time. The effectiveness of these mitigation  
33 measures to result in feasible measures for reducing water quality effects, and therefore potential  
34 public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

35 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
36 **Microcystis Blooms**

37 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
38 in Chapter 8, *Water Quality*.

1 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 2 **Water Residence Time**

3 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 4 in Chapter 8, Water Quality.

5 **25.3.3.15 Alternative 8—Dual Conveyance with Pipeline/Tunnel, Intakes 2,**  
 6 **3, and 5, and Increased Delta Outflow (9,000 cfs; Operational**  
 7 **Scenario F)**

8 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of**  
 9 **~~the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with~~ the Water**  
 10 **Conveyance Facilities**

11 **NEPA Effects:** Alternative 8 would involve CM1 construction and operation of three intakes, up to  
 12 nine solids lagoons, three sedimentation basins, Byron Tract Forebay, and an intermediate forebay  
 13 and associated 350-acre inundation area, ~~adjacent to the intermediate forebay~~. Alternative 8 would  
 14 have two fewer intakes than Alternative 1A would have. Accordingly, there would be fewer solids  
 15 lagoons and sedimentation basins ~~and fewer transmission lines~~.

16 Sedimentation basins, solids lagoons, Byron Tract Forebay, and the intermediate forebay and the  
 17 inundation area have the potential to provide habitat for vectors that transmit diseases (e.g.,  
 18 mosquitoes) because of the large volumes of water that would be held within these areas. However,  
 19 During operation, tThe depth, design, and operation of the sedimentation basins and solids lagoons  
 20 would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins  
 21 would be too deep and the constant movement of water would prevent mosquitoes from breeding  
 22 and multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and  
 23 solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep. Furthermore, use of the  
 24 inundation area adjacent to the intermediate forebay would be limited to forebay emergency  
 25 overflow situations and water would be ~~physically~~ pumped back to the intermediate forebay,  
 26 creating circulation such that the inundation area would have a low potential for creating suitable  
 27 vector habitat. Similarly, water in the Byron Tract Forebay would be circulated regularly and, with  
 28 the exception of shallower areas around the periphery, would be too deep to provide suitable  
 29 mosquito habitat. The shallower edges of the forebay could provide suitable mosquito breeding  
 30 habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow.

31 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 32 area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County  
 33 MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help  
 34 control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with  
 35 practices presented in the California Department of Public Health's Best Management Practices for  
 36 Mosquito Control in California (California Department of Public Health 2012). Implementation of  
 37 these BMPs would reduce the likelihood that BDCP operations would require an increase in  
 38 abatement activities by the local MVCDs. Therefore, construction and operation of the intakes, solids  
 39 lagoons, and/or sedimentation basins under Alternative 8 would not substantially increase suitable  
 40 vector habitat, and would not substantially increase vector-borne diseases. Accordingly, no adverse  
 41 effects would result.

1 **CEQA Conclusion:** As described for Alternative 7 and Alternative 1A, implementation of CM1 under  
 2 Alternative 8 would involve construction and operation of solids lagoons, sedimentation basins,  
 3 Byron Tract Forebay, and an intermediate forebay and associated and a 350-acre inundation area,  
 4 adjacent to the intermediate forebay, areas that could provide suitable habitat for vectors (e.g.,  
 5 mosquitoes). ~~While these facilities could provide suitable habitat for vectors (e.g., mosquitoes),~~  
 6 water depth and circulation would prevent the areas from substantially increasing suitable vector  
 7 habitat. The inundation area would only be used during emergency overflow situations and water  
 8 would be pumped back into the intermediate forebay, creating circulation that would discourage  
 9 mosquito breeding. The shallower periphery of the intermediate forebay and Bryon Tract Forebay  
 10 could provide suitable mosquito breeding habitat. However, During operations, water depth and  
 11 circulation would prevent the areas from substantially increasing suitable vector habitat.

12 To minimize the potential for impacts related to increasing suitable vector habitat within the study  
 13 area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County  
 14 MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help  
 15 control mosquitoes. These BMPs would be consistent with practices presented in the California  
 16 Department of Public Health's Best Management Practices for Mosquito Control in California  
 17 (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore,  
 18 construction and operation of the water conveyance facilities ~~in~~ under Alternative 8 would not result  
 19 in a substantial increase in vector-borne diseases and the impact on public health would be less than  
 20 significant. No mitigation is required.

21 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
 22 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
 23 **Facilities**

24 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
 25 **Conditions: Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
 26 **Slough**

27 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

28 **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water**  
 29 **Conveyance Facilities.**

30 NEPA Effects: Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in  
 31 the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change  
 32 under Alternative 8, *Microcystis* abundance, and thus microcystins concentrations, in water bodies  
 33 of the affected environment under Alternative 8 would be very similar to those discussed for  
 34 Alternative 1A.

35 As described in Chapter 8, Water Quality, although *Microcystis* blooms have not occurred in the  
 36 Export Service Areas, conditions in the Export Service Areas under Alternative 8 may become more  
 37 conducive to *Microcystis* bloom formation because water temperatures will increase in the Export  
 38 Service Areas due to the expected increase in ambient air temperatures resulting from climate  
 39 change, but not from operation of the water conveyance facilities.

40 Like Alternative 1A, elevated ambient water temperatures would occur in the Delta under  
 41 Alternative 8, which could lead to earlier occurrences of *Microcystis* blooms in the Delta, and  
 42 increase the overall duration and magnitude of blooms. However, as described in Chapter 8, Water

1 Quality, the increase in Delta water temperatures, and consequent potential increase in *Microcystis*  
2 blooms, would be driven entirely by climate change, not by operation of water conveyance facilities.  
3 There would be differences in the direction and magnitude of water residence time changes during  
4 the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative 8  
5 compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms,  
6 and therefore microcystin, could increase in surface waters throughout the Delta. Mitigation  
7 Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality in the  
8 Delta. Although there is uncertainty regarding this impact, the effects on *Microcystis* from  
9 implementing CM1 is determined to be adverse.

10 **CEQA Conclusion:** Under Alternative 8, operation of the water conveyance facilities is not expected  
11 to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta.  
12 *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures  
13 resulting from climate change, but not due to water conveyance facility operations. Hydraulic  
14 residence times in the Export Service Area would not be affected by operations of CM1, and  
15 therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation.  
16 Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-  
17 affected source water from the south Delta intakes and unaffected source water from the  
18 Sacramento River. Because of this, it cannot be determined whether operations and maintenance  
19 under Alternative 8 would result in increased or decreased levels of *Microcystis* and microcystins in  
20 the mixture of source waters exported from Banks and Jones pumping plants.

21 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
22 could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the  
23 water temperature increases in the Delta would be due to climate change and not due to operation  
24 of the water conveyance facilities. Increases in Delta residence times would be due in small part to  
25 climate change and sea level rise, but due to a greater degree to operation of the water conveyance  
26 facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is  
27 possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in  
28 the Delta would occur due to the operations and maintenance of the water conveyance facilities and  
29 the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including  
30 drinking water and recreational waters would be impacted and, as a result, public health. Therefore,  
31 this impact would be significant.

32 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
33 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time  
34 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
35 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
36 proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods  
37 to determine whether increases in abundance are significant. This mitigation measure also requires  
38 that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will  
39 investigate and evaluate measures that could be taken to reduce residence time in the affected areas  
40 of the Delta. However, because the effectiveness of these mitigation measures to result in feasible  
41 measures for reducing water quality effects is uncertain, and therefore potential public health  
42 effects, this impact would be significant and unavoidable.

1 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
2 **Microcystis Blooms**

3 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
4 in Chapter 8, *Water Quality*.

5 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
6 **Water Residence Time**

7 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
8 in Chapter 8, *Water Quality*.

9 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
10 **CM4.**

11 **NEPA Effects:** The amount and location of habitat restoration and enhancement that would occur  
12 under Alternative 8 would be the same as that described under Alternative 1A. Restoration activities  
13 implemented under CM2 and CM4 that would create shallow backwater areas could result in local  
14 increases in water temperature that may encourage *Microcystis* growth during the summer bloom  
15 season. This would result in further degradation of water quality beyond the hydrodynamic effects  
16 of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms  
17 with implementation of CM2 and CM4 could potentially result in adverse effects on public health  
18 through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a  
19 and WQ-32b may reduce the combined effect on *Microcystis* from increased local water  
20 temperatures and water residence time. The effectiveness of these mitigation measures to result in  
21 feasible measures for reducing water quality effects related to *Microcystis* is uncertain. This would  
22 be an adverse effect.

23 **CEQA Conclusion:** The effects of CM2 and CM4 on *Microcystis* under Alternative 8 are the same as  
24 those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that  
25 create shallow backwater areas could result in local increases in water temperature conducive to  
26 *Microcystis* growth during summer bloom season. This could compound the water quality  
27 degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact  
28 PH-8 and result in additional water quality degradation such that beneficial uses are affected. An  
29 increase in *Microcystis* blooms could potentially result in impacts on public health through exposure  
30 via drinking water quality and recreational waters. Therefore, this impact would be significant.  
31 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
32 increased local water temperatures and water residence time. The effectiveness of these mitigation  
33 measures to result in feasible measures for reducing water quality effects, and therefore potential  
34 public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

35 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
36 **Microcystis Blooms**

37 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
38 in Chapter 8, *Water Quality*.

1 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 2 **Water Residence Time**

3 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 4 in Chapter 8, Water Quality.

5 **25.3.3.16 Alternative 9—Through Delta/Separate Corridors (15,000 cfs;**  
 6 **Operational Scenario G)**

7 **Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of**  
 8 **the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with the Water**  
 9 **Conveyance Facilities**

10 **NEPA Effects:** Alternative 9 would not have solids lagoons or sedimentation basins. Should  
 11 construction activities create temporary areas of standing water that could provide suitable habitat  
 12 for mosquitoes to breed, DWR would consult and coordinate with San Joaquin County and  
 13 Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as  
 14 part of the MMPs would help control mosquitoes. ~~(See Impact PH-1 under Alternative 1A).~~ These  
 15 BMPs would be consistent with practices presented in the California Department of Public Health's  
 16 Best Management Practices for Mosquito Control in California (California Department of Public  
 17 Health 2012). Activities would include, but not be limited to: testing for mosquito larvae during the  
 18 high mosquito season (June through September); introducing biological controls such as  
 19 mosquitofish if mosquitoes are present; reducing or eliminating emergent vegetation; and  
 20 introducing physical controls (e.g., discharging water more frequently or increasing circulation) if  
 21 mosquitoes are present. Therefore, Alternative 9 would not significantly increase the public's risk of  
 22 exposure to vector-borne diseases. Accordingly, adverse effects on public health would not result.

23 **CEQA Conclusion:** Because solid lagoons or sedimentation basins would not be constructed or  
 24 operated, there would be no impacts. If necessary, DWR would consult and coordinate with San  
 25 Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be  
 26 implemented as part of the MMPs would help control mosquitoes. ~~(See Impact PH-1 under~~  
 27 ~~Alternative 1A~~ These BMPs would be consistent with practices presented in the California  
 28 Department of Public Health's Best Management Practices for Mosquito Control in California.  
 29 Therefore, construction and operation of the water conveyance facilities ~~in~~under Alternative 9  
 30 would not result in a substantial increase in vector-borne diseases and the impact on public health  
 31 would be less than significant. No mitigation is required.

32 **Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That**  
 33 **There Is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance**  
 34 **Facilities**

35 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
 36 **Conditions: Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
 37 **Slough**

38 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.



1 **Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water**  
2 **Conveyance Facilities.**

3 **NEPA Effects:** Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in  
4 the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change  
5 under Alternative 8, *Microcystis* abundance, and thus microcystins concentrations, in water bodies  
6 of the affected environment under Alternative 9 would be very similar to those discussed for  
7 Alternative 1A.

8 As described in Chapter 8, Water Quality, although *Microcystis* blooms have not occurred in the  
9 Export Service Areas, conditions in the Export Service Areas under Alternative 8 may become more  
10 conducive to *Microcystis* bloom formation because water temperatures will increase in the Export  
11 Service Areas due to the expected increase in ambient air temperatures resulting from climate  
12 change, but not from operation of the water conveyance facilities.

13 Like Alternative 1A, elevated ambient water temperatures relative would occur in the Delta under  
14 Alternative 9, which could lead to earlier occurrences of *Microcystis* blooms in the Delta, and  
15 increase the overall duration and magnitude of blooms. However, as described in Chapter 8, Water  
16 Quality, the increase in Delta water temperatures, and consequent potential increase in *Microcystis*  
17 blooms, would be driven entirely by climate change, not by operation of water conveyance facilities.  
18 There would be differences in the direction and magnitude of water residence time changes during  
19 the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative 9  
20 compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms,  
21 and therefore microcystin, could increase in surface waters throughout the Delta. Mitigation  
22 Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality in the  
23 Delta. Although there is uncertainty regarding this impact, the effects on *Microcystis* from  
24 implementing CM1 is determined to be adverse.

25 **CEQA Conclusion:** Under Alternative 9, operation of the water conveyance facilities is not expected  
26 to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta.  
27 *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures  
28 resulting from climate change, but not due to water conveyance facility operations. Hydraulic  
29 residence times in the Export Service Area would not be affected by operations of CM1, and  
30 therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation.  
31 Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-  
32 affected source water from the south Delta intakes and unaffected source water from the  
33 Sacramento River. Because of this, it cannot be determined whether operations and maintenance  
34 under Alternative 9 would result in increased or decreased levels of *Microcystis* and microcystins in  
35 the mixture of source waters exported from Banks and Jones pumping plants.

36 Water temperatures and hydraulic residence times in the Delta are expected to increase, which  
37 could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the  
38 water temperature increases in the Delta would be due to climate change and not due to operation  
39 of the water conveyance facilities. Increases in Delta residence times would be due in small part to  
40 climate change and sea level rise, but due to a greater degree to operation of the water conveyance  
41 facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is  
42 possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in  
43 the Delta would occur due to the operations and maintenance of the water conveyance facilities and  
44 the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including

1 drinking water and recreational waters would be impacted and, as a result, public health. Therefore,  
 2 this impact would be significant.

3 Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water  
 4 quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time  
 5 considerations be incorporated into restoration area site design for CM2 and CM4 using the best  
 6 available science at the time of design. Mitigation Measure WQ-32b requires that the project  
 7 proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods  
 8 to determine whether increases in abundance are significant. This mitigation measure also requires  
 9 that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will  
 10 investigate and evaluate measures that could be taken to reduce residence time in the affected areas  
 11 of the Delta. However, because the effectiveness of these mitigation measures to result in feasible  
 12 measures for reducing water quality effects, and therefore potential public health effects, is  
 13 uncertain, this impact would be significant and unavoidable.

14 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 15 ***Microcystis* Blooms**

16 Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A  
 17 in Chapter 8, *Water Quality*.

18 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 19 **Water Residence Time**

20 Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A  
 21 in Chapter 8, *Water Quality*.

22 **Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and**  
 23 **CM4.**

24 ***NEPA Effects:*** The amount of habitat restoration and enhancement that would occur under  
 25 Alternative 9 would be the same as that described under Alternative 1A. However, different  
 26 locations for restoration or enhancement activities could be chosen in the south Delta based on the  
 27 creation of separate corridors with differing purposes.

28 Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas  
 29 could result in local increases in water temperature that may encourage *Microcystis* growth during  
 30 the summer bloom season. This would result in further degradation of water quality beyond the  
 31 hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase  
 32 in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse  
 33 effects on public health through exposure via drinking water quality and recreational waters.  
 34 Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from  
 35 increased local water temperatures and water residence time. The effectiveness of these mitigation  
 36 measures to result in feasible measures for reducing water quality effects related to *Microcystis* is  
 37 uncertain. This would be an adverse effect.

38 ***CEQA Conclusion:*** The effects of CM2 and CM4 on *Microcystis* under Alternative 9 are the same as  
 39 those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that  
 40 create shallow backwater areas could result in local increases in water temperature conducive to  
 41 *Microcystis* growth during summer bloom season. This could compound the water quality

1 [degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact](#)  
 2 [PH-8 and result in additional water quality degradation such that beneficial uses are affected. An](#)  
 3 [increase in \*Microcystis\* blooms could potentially result in impacts on public health through exposure](#)  
 4 [via drinking water quality and recreational waters. Therefore, this impact would be significant.](#)  
 5 [Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on \*Microcystis\* from](#)  
 6 [increased local water temperatures and water residence time. The effectiveness of these mitigation](#)  
 7 [measures to result in feasible measures for reducing water quality effects, and therefore potential](#)  
 8 [public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.](#)

9 **Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased**  
 10 **Microcystis Blooms**

11 [Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A](#)  
 12 [in Chapter 8, \*Water Quality\*.](#)

13 **Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage**  
 14 **Water Residence Time**

15 [Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A](#)  
 16 [in Chapter 8, \*Water Quality\*.](#)

## 17 25.4 Cumulative Analysis

### 18 25.4.1.1 Assessment Methodology

19 **Impact PH-810: Cumulative Impact on Public Health from Constituents of Concern (DBPs and**  
 20 **Pesticides)**

21 **Alternatives 6A–C, 7, 8, and 9 (DBPs [from increases in DOC concentrations])**

22 **Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality**  
 23 **Conditions: Site and Design Restoration Sites to Reduce Bromide Increases in Barker**  
 24 **Slough**

25 Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

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