SECTION 4 CONTENTS

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4.0 HISTORICAL, CURRENT AND PROJECTED WATER SUPPLY

This appendix describes the East Contra Costa (ECC) Subbasin land uses, population, and metered historical, current and projected water supplies. Water supply amounts were provided by the Groundwater Sustainability Agencies (GSA) and Contra Costa Water District (CCWD). When historical or projected water supply were not provided, land uses and population data was used to estimate these data. This information is integrated into the subbasin surface water/groundwater model (GSP **Appendix 4.a**).

4.1 Land Uses

Since the 1950s, the DWR has periodically conducted detailed and high-quality land use surveys. The project began as an effort to understand water and land use and to understand current and projected water demands. DWR land use surveys conducted in Contra Costa County provide historical land use details of the Subbasin for the years 1976 and 1995 (**Figures 2-11 and 2-10**, respectively). The most current land use conditions for the Subbasin are derived from a Delta crop map for 2015 (**Figure 2-9)** integrated with a 2014 statewide map to fill in areas not covered by the former. The resultant map does not cover the entire Subbasin leaving small areas along the western boundary, which are labeled as "Not Designated" in the spatial dataset. However, the total area of the "Not Designated" lands is approximately 6,200 acres, which is about 6 percent of the area of the Subbasin, and of these lands were designated as native vegetation or idle lands in previous surveys. The total area of the Subbasin is 107, 596[1] acres.

A breakdown of land use categories reported in historical and current surveys is given in **Table 2-3**. In 1976, native vegetation and field crops were the major land use categories (about 25,000 and 23,000 acres, respectively), which collectively accounted for about 45 percent of the area within the Subbasin. Surface water and pasture (about 14,000 and 13,000 acres, respectively) covered about 25 percent of the land area. After field crops, deciduous trees and truck crops were the major cultivated crops (about 12,000 and 8,000 acres, respectively) accounting for about 18 percent of the area. Approximately 9 percent of the area in the Subbasin (about 9,700 acres) was designated as urban areas. The remaining land cover was comprised of semi-agricultural lands, idle lands, and vineyards.

Between 1976 and 1995, acreage of urban lands (**Figure 2-12**) increased to about 19,000 acres (about 18 percent of the Subbasin area). Area of the idle lands increased from about 900 acres in 1976 to 5,800 acres in 1995 (from about 1 percent to 5 percent of the Subbasin area). During this period, both deciduous trees and field crops acreages decreased by about 5,700 and 5,000 acres, respectively. Decrease of pasture, native vegetation and truck crops were about 1,900, 1,600 and 950 acres, respectively. Acreages of the other land use categories remained nearly unchanged during this period.

In 2015, the total area of urban lands was about 23,500 acres (22 percent of the Subbasin area), making it the largest single land use category within the Subbasin. Native vegetation coverage was about 15,500

[1] The California Department of Water Resources ECC subbasin boundary shape file was used to calculate the area in GIS based on the map projection.

acres (14 percent of the Subbasin area), which was a decrease of about 9,500 acres from 1995. A part of this decrease, approximately 4,000 acres may be attributed to the lands that were designated as native vegetation in previous surveys but categorized as "Not Designated" in the 2015 survey. Pasture and surface water bodies each covered about 14 percent of the Subbasin area (each about 15,000 acres). The total area of all crop lands was about 23,000 acres (21 percent of the Subbasin area) in 2015. Field crops, which accounted for about 13,500 acres (13 percent of the Subbasin area) was the major crop category, and it showed a decrease of about 4,700 acres from 1995. Areas of truck crops, deciduous trees and vineyards totaled about 9,400 acres (about 9 percent of the Subbasin area). Semi-agricultural lands, which include farmsteads, feed lots (livestock and poultry), and dairies, increased from about 900 acres in 1995 to 6,300 acres in 2015 (6 percent of the Subbasin area). These figures indicate a transition from a predominantly agricultural area of field crops and other deciduous crops to a roughly even split between urban and agriculture. Within the Subbasin, a large area of native vegetation has been preserved over the time period evaluated (15,000 acres in 2015).

The county is currently working to develop its 2040 General Plan that will outline the planned land use for the area. The current General Plan (CCC, 2005) extends until 2020 and the 2040 plan is expected to be available in 2020.

California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program (FMMP), has reported on the ECCC Subbasin land use. Land use data for the subbasin has been recorded since 1984 on a biannual basis. The FMMP has designated the following eight types of land use:

1. Prime Farmland- Irrigated land with the best combination of physical and chemical features able to sustain long term production of agricultural crops. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for production of irrigated crops at some time during the four years prior to the mapping date.
2. Farmland of Statewide Importance- Irrigated land similar to Prime Farmland that has a good combination of physical and chemical characteristics for the production of agricultural crops. This land has minor shortcomings, such as greater slopes or less ability to store soil moisture than Prime Farmland. Land must have been used for production of irrigated crops at some time during the four years prior to the mapping date.
3. Unique Farmland- Lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated but may include non-irrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.
4. Farmland of Local Importance- These lands (the Antioch area and the Delta) are typically used for livestock grazing. They are capable of producing dryland grain on a two-year summer fallow or longer rotation with volunteer hay and pasture. The farmlands in this category are included in the U.S. Natural Resources Conservation Service's Land Capability Classes I, II, III, and IV, and lack some irrigation water.
5. Grazing Land- Land on which the existing vegetation is suited to the grazing of livestock. This category is used only in California and was developed in cooperation with the California

Cattlemen's Association, University of California Cooperative Extension, and other groups interested in the extent of grazing activities.

6. Urban and Built-Up Land- Urban and Built-Up land is occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. Common examples include residential, industrial, commercial, institutional facilities, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, and water control structures.
7. Other land- Land which does not meet the criteria of any other category. Typical uses include low density rural development, heavily forested land, mined land, or government land with restrictions on use.
8. Water- Water areas with an extent of at least 40 acres.

All eight types of land use are present in the ECCC Subbasin. The majority of land use has consistently been a type of farmland. Prime farmland has been the highest percentage of land use in the subbasin since 1984 (**Figure 4-1**). Prime farmland had steady decline from 1984 to 2008 and from 2009 to 2016 the acreage was stable. Since 1984 there has been an increase in urban and farmland of local importance. The data produced by FMMP is not as detailed compared to DWR land use data. FMMP collects its data from aerial images, public review, computer mapping, and field inspections. The data provides the ECC Subbasin an approximation of changes in land use over time that supports the DWR land use data findings of increasing urban land and decreasing farmland.

The DWR has irrigation data for the 1976 and 1995 land use surveys. The 1995 land use surveys also detail the irrigation method used. About 52 percent of lands in the ECC Subbasin were designated as irrigated in 1976 survey. That percentage has decreased to about 45 percent in 1995, mainly due to increased urbanization. In the 1995 survey, DWR categorize irrigated lands into four groups based on irrigation methods employed in those lands:

- Gravity - Surface Irrigations (most common method in the Subbasin area)
- Micro - Low volume irrigation such as drip and micro spray
- Sprinkler- Permanent, solid set, and movable sprinkler systems
- Irrigation method unknown

The crop map data sets of 2014 and 2015 provided by the DWR do not include irrigation details. However, recent information on irrigation methods are available from local agencies that provides irrigation water. Byron Bethany Irrigation District (BBID) reports that in 2014 approximately 50 percent (3,100 acres) of irrigated lands in its service area uses drip and micro-spray methods (BBID, 2017 AWMP). Flood irrigation and sprinklers are used in about 39 percent and 11 percent of irrigated lands, respectively. Drip and micro-spray methods are the primary irrigation methods in the ECCID service area (personal communication, Aaron Trott, August 2020).

4.2 Population Trends

The East Contra Costa County region has exhibited variable rates of population growth over time (ECCC IRWMP, 2019). The Cities of Antioch, Brentwood, Oakley and the unincorporated communities of Town of Discovery Bay, Bethel Island, Byron, and Knightsen located within the East Contra Costa Subbasin have exhibited an increasing trend of population. Parts of Antioch and Brentwood are located outside

the ECC Subbasin. Therefore, in the following discussion, population of those two cities are proportioned based on the area located within the subbasin (74 percent of the City of Antioch and 90 percent of the City of Brentwood). The comparatively smaller populations in rural areas in the Subbasin (i.e., outside the boundaries of cities, towns, and service areas of public water supply entities) are uncertain and are not included in the estimates presented in this discussion.

Historical, current, and projected populations of the cities and unincorporated communities are given in **Table 4-1** and shown in graphical form in **Figure 4-2**. Populations for 1950 through 2010 are based on the US decennial census data. Estimated population of 2015 through 2040 are based on the projections presented in 2015 Urban Water Management Plans of Contra Costa Water District (CCWD), City of Antioch, City of Brentwood, Diablo Water District, and the Town of Discovery Bay, as well as the City of Antioch 2020 Water System Master Plan Update Technical Memorandum (Brown and Caldwell, 2020), and the DWD 2020 Facilities Plan (CDM Smith, 2020). Projections for 2045 and 2050 were obtained by applying the countywide population growth rate provided in CA Department of Finance Population Projections as detailed below.

According to the US census data, the total population within the ECC Subbasin in 2010 was about 176,000. Population in the Cities of Antioch, Brentwood and Oakley were about 75,500, 46,300 and 35,400, respectively. In unincorporated communities, the Town of Discovery Bay (TODB) had the highest population (about 13,400) and the other three communities had a combined population of about 5,000. Historical data show that the population of the Cities of Antioch, Brentwood and Oakley increased at a rapid rate (112 percent, 426 percent, and 800 percent, respectively, or 198 percent in their combined areas, from 1980 to 2000 (**Figure 4-2**). The growth rate has decreased since then but remained higher than the overall growth rate of Contra Costa County (49 percent in the three cities in the ECC Subbasin versus 22 percent in the County). The eastern region of the County in which the Subbasin is situated "is expected to be the fastest growing area of the County in the foreseeable future" (ECCC IRWMP, 2019). As the Cities reach the build-out population limits in 2040, growth is expected to continue but at a slower rate. This was the basis to apply the countywide growth rate, which is less than the pre-2040 growth rates of the area, to estimate the 2045 and 2050 population given in **Table 4-1**. The total population in the Subbasin is expected to increase to about 263,000 in 2040 and 273,000 in 2050, which correspond to increases of 50 percent and 56 percent compared to 2010 population **(Table 4-1**). For these same time periods, the countywide population has an expected growth rate of 27 percent (2040) and 32 percent (2050) relative to 2010 population (Department of Finance Population Projections, 2019).

4.3 Water Demands, Supplies and Utilization

4.3.1 Historic and Current Water Supplies

Annual water usage and sources of water supply from 1985 to 2019 by seven entities in the Subbasin are provided in **Tables 4.2 and Table 4-3. Table 4.2** lists annual metered groundwater extracted by water use sector (urban, industrial, and agricultural). Groundwater production by domestic well users (de minimis user) and small community systems are not metered but are estimated and described below.

Groundwater use by private agricultural wells and native vegetation are estimated in Section 4. **Table 4.3** lists annual metered surface water use for the seven entities by sector and individual surface water diverters with water rights permits. **Table 4-4** lists the total water use by source and water use sector from 1985 to 2019. Projected available supplies and water demand (2020 through 2050) for the seven entities are provided in **Table 4-5**. Below is a description of the seven retail and wholesale water suppliers that operate within the Subbasin, their water rights, and sources of water. Surface water diverted out of Old River for uses outside the ECC Subbasin (e.g., California Aqueduct and the Delta Mendota Canal) are not considered in this GSP.

Byron Bethany Irrigation District

The BBID service area extends beyond the ECC Subbasin boundaries, into the adjacent Tracy and Delta Mendota Subbasins. Byron and a portion of the Bethany Divisions of BBID are located within the ECC Subbasin. For purposes of this GSP, only the reported Byron Division supply will be used and the small portion of the Bethany Division that falls in the ECC Subbasin will not be estimated. The Byron and Bethany Divisions are served by the District's pre-1914 water rights of 50,000 AFY[2]. Water is obtained from the intake channel at the Harvey O. Banks Pumping Plant located between the Byron and Bethany Divisions and delivered to customers through distribution canals. During normal conditions, water is delivered for agricultural uses from March to November. During drought periods (e.g., 2013-2015) the water delivery period was extended depending on supply and demand conditions.

From 1997 to 2019, the pre-1914 surface water supply to the Byron Division ranged from about 7,000 AF (2017) to 28,000 AF (2009) and averaged about 14,500 AFY (**Table 4-3**). In 2015, during the drought, available surface water was not sufficient to meet water demands of the service area. Byron Division received two additional sources of water: about 2,000 AF purchased (transfer) water and, for the first time in its operational history, BBID obtained about 510 AF of groundwater (3 percent of total supplies) from private well owners in the Byron District. BBID does not maintain records on groundwater use for irrigation by private well owners in the District.

City of Antioch

The City of Antioch relies entirely on surface water for water supply. Antioch purchases raw water from CCWD and pumps water from the Sacramento-San Joaquin Delta when the chloride concentration is not over 250 milligrams per liter (mg/L). The current agreement between Antioch and CCWD is for a peak supply of 40,000 AFY (WYA, 2015). Antioch's water right to obtain water from the Delta for beneficial use does not specify a limitation, but the withdrawal rate is currently constrained to about 18,000 AFY by pumping and conveyance systems. Raw water from both sources can be directly pumped to Antioch's Water Treatment Plant (WTP) or into a municipal reservoir (Antioch Reservoir, **Figure 2-4**) for storage. The municipal reservoir has a capacity of 736 AF and is used to maintain a reliable supply to the WTP

[2] Ch2M, 2017: "The District asserts claims under this pre-1914 water right for reasonable and beneficial use of 60,000 AF. In exchange for operational certainty, the District has agreed to limit their annual diversion from the Delta to 50,000 AF through their Agreement with DWR"

when the ability to pump from the Delta is limited due to water quality. The maximum capacity of the WTP is over 40,000 AFY.

From 1997 to 2019, surface water supplies for the entire City of Antioch ranged from around 14,000 AFY (2015 to 2017) to 19,000 AFY to 21,000 AFY (2001 to 2008). However, 26 percent of Antioch falls outside the ECC Subbasin. To account for this, the total Antioch supply is adjusted in **Table 4-3** to remove the estimated 26 percent delivered to the portion of the city that falls outside the Subbasin. The adjusted surface water supply for the Subbasin ranges from around 10,000 AFY to 11,500 AFY (2015 to 2019) and 14,000 AFY to 16,000 AFY (2001 to 2008). The reduction in demand in recent years (2015 to 2019) is due to changes in customer water use patterns since the recent drought. As a result, projected demands are expected to decrease due to conservation and continuation of the drought-influenced water use patterns through 2040. Antioch's projected total water demand (**Table 4-4**) is expected to increase to about 13,500 AFY in 2050 with 12,000 AFY derived from surface water and 1,500 AFY from recycled water. Since 2011, the City has purchased recycled water from Delta Diablo for landscape irrigation, which currently accounts for about 0.25 percent of the City's total water usage.

The City of Brentwood

The City of Brentwood (COB or Brentwood) uses three sources of water to meet demand: surface water, groundwater, and recycled water. In 1999, Brentwood entered into an agreement with ECCID to obtain up to 14,800 AFY of raw surface water that is pumped from the Delta. COB purchases this water from both ECCID and CCWD. The majority of water purchased directly from ECCID is transported from the Rock Slough intake through the Contra Costa Canal to the City of Brentwood Water Treatment Plant (COBWTP). The COBWTP was constructed in 2008 jointly by the City and CCWD. The current capacity of the COBWTP is 14,600 AFY, but it can be increased to 36,000 AFY to meet future water demand. In addition, raw surface water used for landscape irrigation is purchased from ECCID and transported through their Main Canal. A portion of this ECCID entitlement is treated at the Randall-Bold Water Treatment Plant (RBWTP) and purchased from CCWD[3]. In 2004, COB purchased a permanent capacity of around 6,500 AFY at the RBWTP (East Contra Costa County Water and Wastewater MSR, 2007) and expects to maintain this capacity in the future. Historically, surface water purchased by COB from both ECCID and CCWD has increased from a low in 1994 to 1999 (less than 1,000 AFY) to the higher range in 2007 to 2019 (6,300 AFY to 9,600 AFY). Future surface water supply (to 2050) is expected to not exceed the current allocation of 14,800 AFY.

As of 2015, the City has seven active groundwater production wells within its service area. In 2018 and 2019, groundwater was extracted from five and four wells, respectively. Capacity of the active wells in 2015 was over 7,000 AFY (COB 2015 UWMP). From 1998 to 2019, COB pumped between 1,300 AFY (2016) to 5,800 AFY (2006). On an annual basis, contribution of groundwater has decreased in relation to the total city demand over the last 25 years. COB groundwater supply percentage was the highest from 1994 to 1999 with 80 percent to 90 percent (2,000 AFY to 4,000 AFY). From 2000 to 2006, 50

[3] Even though this water is purchased from CCWD it is included as part of the total 14,800 AFY agreement with ECCID; it is not CVP water.

percent to 70 percent (3,600 AFY to 5,800) of COB water supply was from groundwater. In the last 13 years groundwater supply decreased to 15 percent and 25 percent (1,300 AFY to 3,000 AFY) in normal years and from 30 percent to about 40 percent (4,000 AFY to 5,000 AFY) in drought years (2007 to 2009 and 2013 and 2014) as a result of the greater use of surface water sources. Future City pumpage is expected to not exceed 5,600 AFY through 2050 (**Table 4-4**).

Recycled water provided by the City's wastewater treatment plant has been used for landscape irrigation and industrial purposes. Recycled water has accounted for less than 1 percent to 5 percent of the total water supply of the City since 2005 when recycled water became available. Projected buildout recycled water demand for 2040 was estimated at 1,500 AFY (COB 2015).

Contra Costa Water District

CCWD is a regional water supplier to entities within and outside the Subbasin. It has a contract with the United States Bureau of Reclamation (USBR) for 195,000 AF per year through February 2045 (CDM Smith, 2016). The Sacramento-San Joaquin Delta (Delta) is the primary source of water and CCWD receives this water from the Central Valley Project (CVP). CCWD also obtains water through Delta surplus water right, Mallard Slough water rights and transfers from ECCID, as well as uses recycled water and a minor amount of local groundwater (CCWD, 2016). Currently CCWD withdraws only about 67 percent of its annual allocation of 195,000 AF from the Delta (WAY, 2016).

CCWD serves both as a retail and wholesale water supplier to the northern, eastern, and central parts of Contra Costa County but only CCWD surface water supplies for the ECC Subbasin will be discussed here. In the ECC Subbasin area, CCWD is a wholesale supplier of treated and raw water to the Cities of Antioch and Diablo Water District (DWD). CCWD also diverts and conveys ECCID surface water for the City of Brentwood. CCWD water supplied to these three entities is listed in **Table 4-3** under the entity name. Water supplied to these entities is pumped from Rock Slough, Old River, and Victoria Canal (Middle River) intakes located in the Sacramento-San Joaquin Delta (Delta) and, in most cases, is treated at the RBWTP. The RBWTP is jointly owned by CCWD and DWD and operated by CCWD. Water pumped from Old River and Victoria Canal intakes can be stored in the Los Vaqueros Reservoir, which has a 160,000 AF capacity. Water from the reservoir is treated at the RBWTP when direct supplies from the Delta are limited due to poor water quality. In addition, CCWD supplies agricultural water (**Table 4-3**) to the Antioch area inside the ECC Subbasin. These agricultural water supplies within the Subbasin (Antioch area) have ranged from 60-100 AFY (1994-2001) to 2-5 AFY (2015-2019). Future demands may decrease further depending on the conversion of agricultural lands to urban.

Diablo Water District

DWD supplies water to the City of Oakley, the Town of Knightsen, and some areas of Bethel Island. DWD uses two sources of water to meet demand (CDM Smith, 2020), the primary source is surface water with additional supply from groundwater (10-20 percent, 2007 to 2019). Surface water is purchased from CCWD, supplied from the Contra Costa Canal and the Los Vaqueros Project, and treated at the RBWTP. DWD's current capacity of the RBWTP is 8,400 AFY but this can be increased to 16,800

AFY per agreement with CCWD. DWD purchases CVP water from CCWD which has a contract with the US Bureau of Reclamation (USBR) for 195,000 AFY through February 2045. From 1994 to 2019 total water supply ranged from around 3,000 AFY (2001) to about 6,400 AFY (2007 and 2008). DWD's surface water supply has ranged from 3,100 AFY (2001) to 5,500 AFY (2007) (**Table 4-3**) and groundwater supply has ranged from a low of 0 AFY (2001-2005) to a high of 1,300 AFY (2011) (**Table 4-2**). From 2012 to 2019, groundwater supply has averaged about 800 AFY. Future demand is dependent on rate of DWD's growth and consumer conservation but is expected to be about 14,000 AFY in 2040 with 80 percent met by surface water and 20 percent met by groundwater (**Table 4-4**). DWD is proposing the installation of two new groundwater production wells in the vicinity of the Glen Park well (south-central portion of the District) in the next 10 to 20 years.

Groundwater is currently pumped from two wells in Oakley, then conveyed to the Blending Facility, where it is treated and blended with treated surface water prior to distribution to customers. The Blending Facility is operated so that the distributed water does not exceed 280 mg/L total dissolved solids (TDS). During water shortages this may be relaxed by DWD to 500 mg/L (TDS). Groundwater is supplied year-round because it can be provided at a lower cost than surface water.

DWD does not use recycled water for any beneficial use. Ironhouse Sanitary District (ISD) owns and operates the wastewater treatment system in DWD's service area and also includes Bethel Island, Jersey Island, and part of Holland Tract. In 2011, ISD completed construction of the Waste Recycling Facility producing tertiary-treated recycled water. The operating capacity is currently 4,800 AFY with an expansion capacity up to 7,600 AFY. The recycled water is currently applied on agricultural land owned by ISD (on Jersey Island), provided at fill stations, or discharged to the San Joaquin River

Other groundwater pumping in the DWD service area is described in the Oakley General Plan (City of Oakley, 2016 amended) that states that over 30 small water companies or service districts serving less than 5,000 people are located in the eastern portion of the District's sphere of influence (SOI). Also, within the District's SOI are residences with individual domestic wells, generally shallower than 200 feet, that are considered di minimis users for SGMA purposes. However, these wells will be considered as beneficial users and potentially impacted by other groundwater pumping as discussed further below. The Oakley General Plan has a policy (4.8.8) that encourages rural residences currently served by well water to connect to municipal water service when it becomes available. DWD assumes that the small water systems would be replaced by a system meeting DWD standards when DWD treated water service becomes available in these areas(CDM Smith, 2020).

East Contra Costa Irrigation District

The East Contra Costa Irrigation District (ECCID) is an independent special district established in 1926. The primary purpose of ECCID is to provide agricultural irrigation water to properties within the District boundaries. In addition, it provides raw water for treatment facilities in urban areas. ECCID's approximately 40 square mile service area includes the City of Brentwood, parts of the Cities of Antioch and Oakley, the unincorporated community of Knightsen, and unincorporated areas located south and east of Brentwood. Water is supplied primarily from surface water diverted from Indian Slough off Old

River but is also supplemented with groundwater. ECCID holds pre-1914 water rights for up to 50,000 AFY, that is not subject to delivery reduction during water shortages including regulatory-restricted and drought years.

Surface water provided for agricultural irrigation ranged from about 30,000 AFY to 34,000 AFY) between 1994 to 2000 to about 17,000 AFY in 2017 and 2018 (**Table 4-3**). The decrease reflects the conversion of agricultural lands to urban lands within ECCID's service area.

ECCID also operates nine groundwater wells (ECWMA, 2019) that generally pump between 300 to 800 AFY in normal years and increases to between 1000 to 4,000 AFY in drought years (2008, 2009, 2014, and 2015). As mentioned above, CCWD has an agreement with ECCID to provide groundwater to CCWD when there is a shortage of CVP water as represented in ECCID's drought year pumping.

ECCID provides surface water to Brentwood and CCWD through agreements described below. These annual surface water diversions for Brentwood and CCWD are tabulated under the Brentwood heading in **Table 4-3**.

- In 1999, Brentwood and ECCID entered into an agreement under which ECCID would provide up to 14,800 AFY of raw water each year. The water is available on Indian Slough, Rock Slough, or the intake on Old River to the Vaqueros Project. The City treats and distributes water to customers located within the City or ECCID boundaries.
- In 2000, CCWD and ECCID entered into an agreement in which ECCID provides up to 8,200 AFY surplus irrigation water to CCWD to serve municipal and industrial needs within the overlapping areas of the two agencies. Furthermore, ECCID may provide up to 4,000 AFY of groundwater to CCWD by exchange for the use within the CCWD service area when there is a shortage of CVP water.

In the future, ECCID anticipates some reduction in agricultural lands, however, these lands have been fallowed for many years so water demand by the agricultural core area is not expected to change and would remain at about 20,000 AFY. In the next 15 years, ECCID expects a 15 percent increase in urban non-potable landscape water deliveries for Brentwood that is fed through the ECCID main canal.

The Town of Discovery Bay

TODB Community Services District operates the public water supply system of the Town. The TODB relies exclusively on groundwater. Raw water pumped from six groundwater wells are treated at two water treatment plants (Willow Lake WTP and Newport WTP) located in the area. The combined capacity of wells is approximately 16,000 AFY, while the combined capacity of the two water treatment plants is approximately 12,000 AFY. Groundwater pumped between 1994 varied from about 1,800 AFY in 1994 to over 4,000 AFY in the drought years of 2007 to 2009 (**Table 4-2**). The District operates two wastewater treatment facilities, but recycled water is not used for any beneficial purpose because it is not cost effective and all water demands can be sustainably met with groundwater. Projected demand is expected to reach about 6,200 AFY by 2040 that will be met entirely by groundwater (**Table 4-4**).

Small Water Systems and De Minimis Users

Additional groundwater is pumped in the Subbasin by small public water systems (PWS) and rural domestic (de minimis) wells that are not metered. In order to estimate groundwater pumped by the PWS, a variety of information was collected. In 2018, Contra Costa County Environmental Health reported 62 small public water systems (those with <200 connections) in the ECC Subbasin. This list was refined with duplicates removed leaving 51 PWS currently in the ECC Subbasin. These consisted of a variety of facilities including marinas, schools, churches, a golf course, restaurants, and mutual water companies. However, the County does not estimate total groundwater demand by these users. The California State Water Resources Control Board (Water Board) collects self-reported annual inventory information of public water systems. As per the most recent data available from the Water Board[4] (reporting year 2016, data set updated in October 2019), 26 small water systems owned by local governments or private parties exist within the ECC Subbasin. These water systems are designed to serve a population of more than 4,500. Reported data from 11 water systems show that about 83 AFY of water, entirely obtained from groundwater wells, has been distributed to a population of about 2,300 in 2016. Supply details of the other 15 water systems are not available. To account for these groundwater users, an estimate was assigned of about 500 AFY total water for the PWS. PWS locations and groundwater demand have been identified as a data gap and will be refined over the next five years.

DWR's well completion report database[5] lists about 975 domestic wells (de minimis user) in the ECC Subbasin (**Figure 2-6a**). This list was refined to remove any well installed over 30 years ago (assuming that a domestic well life span is 30 years) leaving about 620 domestic wells. It was assumed that the average domestic well pumps about 1[6] AFY; domestic wells in the ECC subbasin produce about 600 AFY. The number of domestic wells, their locations, and average water use has been identified as a data gap and will be refined over the next five years.

Individual Surface Water Diversions

Individual surface water diversions are made by those with water rights permits and are reported by the State Water Resources Control Board (SWRCB). **Table 4-3** lists the annual amount reported[7] as diverted

[4] https://data.ca.gov/dataset/drinking-water-public-water-system-annually-reported-water-production-and-delivery-information. Downloaded July 14, 2020.

[5] Downloaded May 2019.

[6] Estimate for domestic well pumpage: 100 gallons/day/person x 4 persons/household*365 days/year=about .5 AFY plus extra for irrigation= total for one domestic well annual pumpage 1 AFY.

[7] Monthly self-reported surface water diversions for the years 2008-2019 downloaded from: https://ciwqs.waterboards.ca.gov/ciwqs/ewrims/reportingDiversionDownloadPublicSetup.do. GIS files of Points of Diversion downloaded from: https://waterrightsmaps.waterboards.ca.gov/viewer/index.html?viewer=eWRIMS.eWRIMS_gvh#

by individual water rights holders in the ECC Subbasin and ranges in the last 10 year from between 114,000 AFY (2018) to 196,000 AFY (2013). California Water Code § 5101 requires individual surface water diversions made by those with water rights permits to report water diversion to the state on an annual basis. At present, there are 272 currently active "Application Numbers", each of which uniquely identifies a surface water diversion point and its owner, in the ECC Subbasin. However, the Electronic Water Rights Information Management System (eWRIMS) of the SWRCB does not contain diversion records of any of those Application Numbers until 2008. Diversion data of about 15% of Application Numbers are available for 2009, but that percentage is 68% for 2010, 79% for 2015 and 95% for 2019. **Appendix 1** lists the diversions by tract and subarea. The State Water Boards acknowledges that the data is uncertain possibly due to a mix of units (gallons vs acre-feet) and/or double reporting[8] and they are working to improve the reporting. For purposes of calculating total water use in the ECC Subbasin, these amounts are used and will be refined in the future.

Summary

In the previous 10 years (2010 to 2019), the ECC Subbasin total metered and estimated water use (**Table 4-4**) has ranged from, 173,000 AFY (2018) to, 214,000 AFY (2013). Sources of water supplies during this same time frame included: surface water ranging from 165,000 AFY to 259,000 AFY (95 percent to 97 percent of total supply); groundwater supplies range from about 6,000 AFY to 11,000 AFY (3 percent to 5 percent of total supply); and recycled water supplies ranged from 50 AFY to 500 AFY (less than 1 percent of total supply).

4.3.2 Projected Water Demands and Supplies

Table 4-5 provides the projected water demand from 2020 to 2050 in five-year intervals within the service area of each supplier. Note that projections are for major water users and do not include unmetered di minimis users, PWS, or individual surface water diverters. Estimated demands and supplies for the 2020-2040 period were obtained from the following sources: 2015 Urban Water Management Plans of the water suppliers, Technical Memorandum of City of Antioch 2020 Existing and Projected Water Use, Diablo Water District 2020 Facilities Plan, and personal communication (ECCID and BBID). Water demands for 2045 and 2050 were estimated using the projected population for those years and 2040 per capita water demands given in UWMPs and other reports. Available supplies for the 2045 and 2050 were assumed to be equal to the supplies estimated for 2040 in UWMPs.

As mentioned above, population in the ECC Subbasin will be increasing and water demand in service areas of water suppliers are expected to stay the same or increase with the new development in the area. In comparison to reported water supplies in 2019, water demand in 2050 is projected to decrease by 7 percent in Antioch because of water conservation practices. Irrigation water demand of ECCID and BBID service area is expected to remain nearly unchanged during the projected period. Projected water demands for all other entities are expected to increase with population growth and other developments in the area. Within the same period, the increase of water demand will be about 70 percent in

[8] Michael George, Delta Watermaster, Delta Protection Commission meeting, September 17, 2020.

Brentwood, 120 percent in TODB, and 170 percent in DWD service area. The demand for water is expected to increase: for surface water from the 2019 amount[9] (50,000 AF) to the 2050 amount[10] (68,000 AF), for groundwater[11] from the 2019 pumped amount (10,000 AF) to the projected amount in 2050 (18,000 AF), and recycled water from the current 2019 amount (400 AF) to the projected 2050 amount (3,000 AF). In 2050, groundwater is expected to supply 20 percent (18,000 AFY) of the ECC Subbasin demand which is an increase of 8,000 AFY from 2019.

4.3.3 Water Availability and Reliability

Historically, 80 to 87 percent of annual water demand in the Subbasin was met with surface water (2000 – 2019 period). Availability of water from the Delta, the primary source of surface water, largely depends on water quality and water rights.

It has been reported that the water quality of the Delta has been degrading regardless of the measures taken to improve it (CCWD, 2015 UWMP). CCWD, one of the main water suppliers in the Subbasin, identified several contributing factors to deteriorating water quality in its 2015 UWMP.

- Changes in local and regional precipitation patterns can affect the timing and quantity of freshwater flow into the Delta. Lack of local precipitation and reduced flow from the upstream contribute to increased salinity levels in the Delta.
- Excessive pumping of Delta water and sea level rise can increase the salinity of the Delta water.
- Increased flows of wastewater, storm water and agricultural drainage to the Delta also degrade the water quality of Delta.

Water quality of the Delta is generally evaluated using its chloride concentration. The secondary maximum contaminant level of chloride in drinking water is 250 mg/L. Historically, chloride concentration at Delta water intakes has fluctuated between 20 and 250 mg/L (DWD, 2015 UWMP), but periods where daily mean chloride concentration increased over 1,000 mg/L have been reported (CCWD, 2010). The Los Vaqueros reservoir (160,000 AF capacity) is used to store higher quality Delta water to blend with high salinity water pumped from the Delta during dry periods. Furthermore, the reservoir can provide emergency supply; a minimum of 70,000 AF in wet years and 44,000 AF in dry years (CCWD, 2015 UWMP). CCWD has proposed expanding the reservoir to 275,000 AF to improve supply reliability and water quality (CDM Smith, 2020).

Another critical factor that affects availability of CCWD CVP water from the Delta is regulatory actions imposed due to biological opinions associated with environmental protection. As per some biological opinions, quantity and timing of CVP and State Water Project water supplies used for urban or irrigation purposes may be limited when environmental supplies are prioritized. As a policy, CCWD plans to meet

[9] All 2019 amounts are from Table 4-3 for the ECC Subbasin only,
[10] 2050 amounts are from Table 4-4 and are for the entire ECC Subbasin.
[11] Note that groundwater totals from 2019 and projected 2050 include an estimated groundwater use for domestic wells and public water systems totally 4,000 AFY.

the entire demand in normal years and meet 85 percent of demand during drought periods. The unmet supply of 15 percent is to be managed with short-term demand management measures.

The City of Antioch, which entirely relies on surface water to meet its water demands, is expected to meet 100 percent of the projected water demands in normal years (COA, 2015 UWMP). During drought conditions, at least 85 percent of the 2040 projected demand will be met during the third year of a drought period. The deficiency of supplies will be managed with short-term water purchases and short-term water conservation programs during droughts.

Raw and treated water supplies that Brentwood receives may be affected by the limitations of availability of surface water. At present, groundwater quality of the City's active supply wells meets potable water quality requirements. Groundwater is pumped from the Tulare Formation from wells perforated from 200 to 500 ft deep. Relatively high total dissolved solids (TDS), nitrate and chloride concentrations have been reported in shallow groundwater, but water quality improves with the increasing depth. If necessary, in the future, groundwater will be mixed with surface water to preserve quality. Available supplies exceed the 2040 projected water demand even in the third year of a drought period (COB, 2015 UWMP).

DWD is capable of meeting 100 percent of 2040 projected water demand in normal years and until the first year of a drought period only with water received from CCWD RBWTP (CDM Smith, 2016). Surface water supplies from CCWD are expected to fulfil up to 94 percent and 85 percent of the 2040 projected demand in the second and third years of a drought period, respectively. The remaining demand will be met with groundwater supplies from the District's wells. DWD plans to increase the groundwater supply up to about 20 percent of the total supplies by 2030 (CDM Smith, 2020) and it is expected to remain at 20 percent through 2040. However, if sufficient amounts of groundwater are not available during drought periods, DWD will request additional water from CCWD, explore other local sources, and/or implement water conservation programs as needed.

TODB, which uses groundwater to meet its entire water demand, has been conducting a groundwater monitoring program since 1980s. The perforated interval of supply wells ranges from 250 to 350 ft bgs. Groundwater water level data indicate that groundwater pumping has been sustainable, even during the 2013 to 2015 drought period (TODB, 2015 UWMP). Groundwater quality from its supply wells meet all state of California primary drinking water standards. Manganese concentration exceeds the maximum limit specified in the secondary standards (0.005 mg/L); therefore, water is treated to remove excess manganese before distribution. Groundwater supplies can meet 100 percent of 2040 projected water demand during the third year of a drought period.

Both irrigation districts (BBID and ECCID) have pre-2014 rights which is projected to meet the Districts' water demands in 2050. To prepare for reliable water during droughts, BBID has executed an agreement with CCWD for an intertie between the Byron Division Canal 45 and the Old River Pipeline to allow storage of BBID water in the Los Vaqueros Reservoir for later use in the Byron Division and to facilitate water transfers with CCWD (Ch2M, 2017).

Available supplies for the BBID, Antioch, Brentwood, CCWD, DWD, ECCID, and TODB meet or exceed the projected water demand of 2050 in normal years.

4.4 References

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