SURVEY REPORT

ON

GROUNDWATER CONDITIONS

February 2021

ALAMEDA COUNTY WATER DISTRICT

Fremont, California
February 11, 2021

Mr. Aziz Akbari, President
Board of Directors
Alameda County Water District
43885 South Grimmer Boulevard
Fremont, California 94538

Dear Mr. Akbari:

Subject: Survey Report on Groundwater Conditions, February 2021

Submitted herewith is the Survey Report on Groundwater Conditions, as requested by the Board on November 12, 2020. It presents information on groundwater conditions together with estimates of FY 2021/22 costs of replenishing and maintaining the groundwater basin. This report is a prerequisite to consideration by the Board of the increase to the rate of replenishment assessment for FY 2021/22, under provisions of Chapter 1942, Statutes of 1961. It provides all the data required pursuant to Section 7 of this statute.

Staff is recommending a 3% increase in the replenishment assessment rate for production for purposes other than agricultural and municipal recreation to generate sufficient revenue to help pay necessary costs to ensure the supply and quality of groundwater in the basin. Shinn Pond fish screens and Rubber Dam 1 fish ladder and equipment modifications are among the capital projects currently underway to repair aging water diversion and recharge facilities and render them in compliance with the Endangered Species Act. Other recharge and diversion facility projects that will need to proceed over the next five years include Vallecitos Channel betterments and Kaiser Pit rehabilitation. Although ACWD has received significant grant funding for some of the projects identified above, an increase in the replenishment assessment rate is necessary to help pay for these projects in addition to operational costs. The recommendation for the rate of replenishment assessment has also taken into account investment in the evaluation and possible participation in select regional water infrastructure projects, such as the Los Vaqueros Reservoir Expansion, which have been identified for their potential value in the District’s strategy to ensure long-term availability of imported water supplies for the groundwater basin.

Sincerely,

[Signature]

Robert Shaver
General Manager
PROFESSIONAL CERTIFICATION

The 2021 Survey Report on Groundwater Conditions was prepared by Mikel Halliwell, Groundwater Resources Engineer, under the direction of Michelle Myers, Groundwater Resources Manager, and Laura Hidas, Manager of Water Resources. The information and other content in this report, including quantities provided in the tables, text, and figures, were developed with a level of effort and methods considered adequate for the purpose of this report’s creation; that is, to provide a reasonable basis for the Board of Directors of Alameda County Water District to determine the need for, and rate of, replenishment assessment for the coming fiscal year, pursuant to the requirements of the Replenishment Assessment Act of the Alameda County Water District.

Mikel S. Halliwell, P.E.
Groundwater Resources Engineer

February 5, 2021
Date
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Plate 12 ACWD Water Supply/Demand Inventory, FY 2020/21 (Forecast)

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INTRODUCTION

On November 12, 2020, the Board of Directors (Board) of the Alameda County Water District (District) ordered the preparation of a Survey Report on Groundwater Conditions. The purpose of the report is to provide information on the Niles Cone Groundwater Basin (Niles Cone) in accordance with Section 7, Chapter 1942, Statutes of 1961, referred to as the Replenishment Assessment Act of the Alameda County Water District (Replenishment Assessment Act).

The report contains the results of an annual study which: 1) estimates the total amount of groundwater production for the coming year; 2) estimates the total amount of groundwater recharge required; 3) determines the extent of any salinity intrusion into the groundwater basin; and 4) analyzes the effects of production and recharge on groundwater levels within the basin. The study reflects actual pumping and recharge from July 2019 through November 2020, and projected values for the remainder of FY 2020/21 and the entirety of FY 2021/22. The projections are based on a scenario of realization of subnormal rainfall in Calendar Year (CY) 2021 and median rainfall in CY 2022.

In addition, the report recommends the amount of supplemental water to be purchased in order to maintain basin water levels, and summarizes the cost of the District's groundwater program including the estimated cost of the recommended supplemental supply. The amount of these costs is the basis for the determination by the Board of the need for, and the rate of, a replenishment assessment for FY 2021/22.

The Replenishment Assessment Act requires the Board to perform certain actions prior to specific dates in the process of setting a replenishment assessment rate for the coming fiscal year. In addition, a proposal to increase the replenishment assessment rate is subject to the Proposition 218 notification requirement. Listed below are the required actions for raising funds by replenishment assessment in FY 2021/22:

<table>
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<th>REQUIRED ACTIONS</th>
<th>TENTATIVE DATE</th>
<th>LATEST DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Order an Engineering Survey and Report.</td>
<td>Completed on Nov. 12, 2020</td>
<td></td>
</tr>
<tr>
<td>2. To comply with the Sustainable Groundwater Management Act, mail written notices of scheduled Board actions on replenishment assessment to interested parties.</td>
<td>Completed on Jan. 22, 2021</td>
<td></td>
</tr>
<tr>
<td>3. Declare whether water funds will be raised by (a) a water charge, (b) by a replenishment assessment, or (c) a combination of both.</td>
<td>Feb. 11, 2021 Mar. 9, 2021</td>
<td></td>
</tr>
<tr>
<td>4. To comply with Proposition 218, mail written notices of the proposed increase in the replenishment assessment rate to well owners or operators that would be subject to the new rate.</td>
<td>Feb. 12, 2021 Feb. 22, 2021</td>
<td></td>
</tr>
<tr>
<td>8. Make formal findings on groundwater conditions and costs, and rate of replenishment assessment.</td>
<td>Apr. 13, 2021 May 11, 2021</td>
<td></td>
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CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. The water level in the Newark Aquifer has remained above sea level (the local mean level of San Francisco Bay). The aquifer was not overdrawn and there is no indication that saltwater entered the basin between Fall of 2019 and Fall of 2020.

2. The estimated volume of supplemental water needed for the replenishment of groundwater supplies in FY 2021/22 is 3,200 acre-feet.

3. Funds will be required in FY 2021/22 to pay capital and operating costs that benefit the groundwater basin, including State Water Project and Semitropic Water Storage District contract costs.

4. The estimate of the District's groundwater program costs for FY 2021/22 is summarized below:

<table>
<thead>
<tr>
<th>Category</th>
<th>Existing</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural and Municipal</td>
<td>8/acre-foot</td>
<td>8/acre-foot</td>
</tr>
<tr>
<td>Recreation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Other Purposes</td>
<td>485/acre-foot</td>
<td>500/acre-foot</td>
</tr>
</tbody>
</table>

Recommendations

1. In FY 2021/22, the District should purchase and/or take delivery of supplemental water from the State Water Project, Lake Del Valle, the Semitropic Water Storage District, and/or through other sources, such as the Dry Year Transfer Program, as they become available.

2. The District should levy a Replenishment Assessment to recover a portion of its groundwater program costs in FY 2021/22.
GROUNDWATER BASIN CONDITIONS

Background

The ACWD Groundwater Statutory Service Area, approximately 107 square miles (68,600 acres), is shown on Plate 1. Table 1 is a tabulation of 2017 land use, and Figure 1 illustrates 2017 land use in pie chart format. The categories in Table 1 and Figure 1 were established with consideration of hydrologic characteristics as well as potential water use. The “Salt Ponds and Marsh” category generally refers to the surface water and marsh system (salt ponds, levees, sloughs, small flood control channels, and marshes) extending from the westerly edge of urban development to the coastline of San Francisco Bay. However, the Alameda Creek Flood Control Channel and re-channelized Alameda Creek, which run through salt pond and marsh areas, are included under “Non-Developed.” “Non-Developed” also includes idle land; the natural, wooded portion of Fremont Central Park; Tule Pond; Old Alameda Creek; and the ‘natural’ parts of the Quarry Lake areas. Buildings, paved parking, and lawns within the Quarry Lakes Recreational Area, the Coyote Hills, and other non-city owned and operated parks comprise the non-municipal recreation component of “Irrigated Agricultural and Non-Municipal Recreation.” City parks, except the natural wooded area of Fremont Central Park, are categorized as part of “Municipal,” which also includes residential and retail/storefront-oriented commercial areas. The “Industrial” category refers to non-retail commercial lands such as industrial plants, warehouse areas, and business parks.

TABLE 1

LAND USE IN ACWD GROUNDWATER STATUTORY SERVICE AREA, 2017

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Thousands of Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal (e.g., residential and commercial)</td>
<td>24.4</td>
</tr>
<tr>
<td>Industrial</td>
<td>8.4</td>
</tr>
<tr>
<td>Irrigated Agricultural and Non-Municipal Recreation</td>
<td>0.5</td>
</tr>
<tr>
<td>Non-Developed</td>
<td>9.5</td>
</tr>
<tr>
<td>Salt Ponds and Marsh</td>
<td>25.8</td>
</tr>
<tr>
<td>TOTAL</td>
<td>68.6</td>
</tr>
</tbody>
</table>

The Niles Cone Groundwater Basin, as described by the State of California Department of Water Resources (DWR), exists almost exclusively within the District’s boundaries. However, certain aquifer layers of the Niles Cone appear to extend substantially beyond this boundary. The Newark Aquifer and Centerville-Fremont Aquifers, according to DWR (Plate 2), continue westward all the way to the San Francisco Bay Peninsula. In addition, there is evidence that the Deep Aquifer is hydraulically connected to the adjacent East Bay Plain Groundwater Basin to the north, albeit with some impedance.* The amount of groundwater production from the basin west of San Francisco Bay is quite small and is neglected for the purposes of this report. The portion of the Newark Aquifer under the bay provides the means of transporting saline water to the groundwater basin underlying the District.

*Luhdorf and Scalmanini Consulting Engineers. 2003. East Bay Plain Aquifer Test Project, South East Bay Plain and Niles Cone Ground-Water Basins.
FIGURE 1
LAND USE IN ACWD GROUNDWATER STATUTORY SERVICE AREA
2017

- INDUSTRIAL: 12.2%
- MUNICIPAL (e.g., resid. & comm.): 35.6%
- NON-DEVELOPED: 13.9%
- IRR. AG. & NON - MUNI. REC.: 0.7%
- SALT PONDS & MARSH: 37.6%
The groundwater basin is divided on the east side of the District by the Hayward Fault. The fault is a relatively impermeable barrier that impedes the flow of water, hence dividing the overall basin into two sub-basins: the Above Hayward Fault (AHF) and Below Hayward Fault (BHF) sub-basins located east and west, respectively, of the Hayward Fault. The AHF Sub-basin is smaller than the BHF Sub-basin. In FY 2019/20, 30% of the groundwater produced from the Niles Cone was pumped from the AHF Sub-basin, whereas 70% was pumped from the BHF Sub-basin.

The BHF Sub-basin is composed of a forebay and three primary aquifers as shown on Plate 2. If the water levels in the Newark Aquifer are below sea level, saline water will flow from the bay and salt evaporation ponds into the Newark Aquifer, then easterly toward the forebay area. Then, following the flow of water caused by pumping, the saline water may move down into the lower levels of the forebay and into the Centerville-Fremont and Deep Aquifers. Saline water can also be transmitted from the upper aquifers to the lower aquifers through natural weaknesses in the aquitards that separate the aquifers, and through defective wells. The saltwater intrusion results when groundwater levels in the Newark Aquifer are below sea level due to an overdraft of the basin. The Newark Aquifer water levels are presently above sea level and are forecast to remain above sea level through June 2021. A graph of historical groundwater levels in the forebay area of the Newark Aquifer is presented on Plate 3.

Production of Groundwater

The “production” of groundwater is defined in the Replenishment Assessment Act as the extraction of groundwater by pumping or any other method from shafts, tunnels, wells, excavations, or other sources of groundwater for domestic, irrigation, industrial, or other beneficial uses. Most pumping from the basin is classified as production.

Table 2 lists the various components of groundwater pumping for FY 2019/20 (actual), FY 2020/21 (forecast), and FY 2021/22 (forecast). Most of the FY 2019/20 groundwater production figures in the table were obtained from well meter readings. A small amount of unmetered groundwater production was estimated. Similarly, production figures for the first five months of FY 2020/21 were obtained mostly from well meter readings. The production of groundwater for the remaining seven months of FY 2020/21 and the entirety of FY 2021/22 was based on an analysis of historical trends, and information provided in planning documents and by well owners/operators.

Production is broken down by usage category and by sub-basin (Above Hayward Fault and Below Hayward Fault). Groundwater supplied to ACWD’s distribution system comprises the “Municipal” category of production, and includes water pumped from ACWD’s two wellfields, and water delivered to the Newark Desalination Facility from certain Aquifer Reclamation Program (ARP) wells. ARP water not diverted to the Newark Desalination Facility (i.e., ARP water discharged to flood control channels) is accounted for in Table 2 under “Aquifer Reclamation,” a category of pumping that is not production.
### TABLE 2

**PRODUCTION OF GROUNDWATER**  
(in thousands of acre-feet)**

<table>
<thead>
<tr>
<th></th>
<th>FY 2019/20 Actual</th>
<th>FY 2020/21 Forecast</th>
<th>FY 2021/22 Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ABOVE HAYWARD FAULT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal*</td>
<td>5.9</td>
<td>6.4</td>
<td>6.3</td>
</tr>
<tr>
<td>Industrial</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Non-Municipal Recreation</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
</tr>
<tr>
<td>Agricultural</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Municipal Recreation</td>
<td>0.3</td>
<td>0.2</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>6.3</td>
<td>6.7</td>
<td>6.8</td>
</tr>
<tr>
<td><strong>BELOW HAYWARD FAULT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal*</td>
<td>13.8</td>
<td>12.8</td>
<td>12.9</td>
</tr>
<tr>
<td>Industrial</td>
<td>0.9</td>
<td>1.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Non-Municipal Recreation</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Agricultural</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Municipal Recreation</td>
<td>0.1</td>
<td>0.0</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>15.0</td>
<td>14.0</td>
<td>14.1</td>
</tr>
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**TOTAL PRODUCTION BY USE**

<table>
<thead>
<tr>
<th></th>
<th>FY 2019/20 Actual</th>
<th>FY 2020/21 Forecast</th>
<th>FY 2021/22 Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal*</td>
<td>19.7</td>
<td>19.2</td>
<td>19.2</td>
</tr>
<tr>
<td>Industrial</td>
<td>1.0</td>
<td>1.1</td>
<td>1.0</td>
</tr>
<tr>
<td>Non-Municipal Recreation</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Agricultural</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Municipal Recreation</td>
<td>0.4</td>
<td>0.2</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>TOTAL PRODUCTION</strong></td>
<td>21.3</td>
<td>20.7</td>
<td>20.9</td>
</tr>
</tbody>
</table>

Aquifer Reclamation*  | 0.3               | 0.0                 | 0.0                 |
| Other Reported Pumping | 0.1            | 0.1                 | 0.0                 |

**TOTAL REPORTED PUMPING** | **21.7** | **20.8** | **20.9** |

* The discussion on Page 5 describes how the amounts for these categories have been calculated.

** Categories with quantities of “0.0” may have had measurable amounts of pumping below 50 acre-feet but are reported as 0.0 due to rounding.
The purpose of ACWD's ARP is to restore water quality in certain sections of the basin in which groundwater became brackish due to intrusion of saltwater from San Francisco Bay. This saltwater intrusion occurred as a result of high-volume pumping during the 1920's through the early 1960's without adequate recharge for replenishment of the basin. The ARP involves extracting brackish groundwater, with the objective of improving the quality of groundwater in the basin as recharge water replaces the pumped brackish groundwater. ARP pumping also prevents the plume of brackish water in the Centerville-Fremont Aquifer from further migrating inland toward ACWD's Mowry Wellfield.

Prior to 2003, all pumped ARP water was discharged to San Francisco Bay. Construction of the Phase 1 Newark Desalination Facility subsequently enabled conversion of a portion of this discharge to potable use. The portion for potable use has increased since the Phase 2 expansion of the Newark Desalination Facility in 2010.

“Other Reported Pumping,” the final category listed in Table 2, is extraction of groundwater quantified and reported to ACWD, but is neither production nor “Aquifer Reclamation.” This category may include dewatering of trenches and excavations during construction of subsurface utilities.

“Total Reported Pumping” is the sum of “Total Production,” “Aquifer Reclamation,” and “Other Reported Pumping.” A certain amount of groundwater pumped from the basin is not reported to ACWD, and hence, is not included in Table 2. Unreported pumping is of one of several potential loss mechanisms for which the District attempts to estimate through the calculation of “Other Extractions and Outflow” (see “Annual Overdraft”).

Figure 2 provides graphs of historical groundwater pumping from FY 1969/70 through FY 2019/20. The terms “AHF Production” and “BHF Production” in the legend correspond to the subtotaled production of the Above Hayward Fault and Below Hayward Fault, respectively, in Table 2. Similarly, “Aquifer Reclamation,” “Other Reported Pumping,” and “Total Reported Pumping” refer to the same-named categories in Table 2.

As indicated in Figure 3, 38% of ACWD’s distribution system supply in FY 2019/20 was supplied by groundwater, with 18% and 20% supplied by the wellfields and the Newark Desalination Facility, respectively. In FY 2020/21, the groundwater share is expected to be 36%, with 17% from the wellfields and 19% from the Newark Desalination Facility. In FY 2021/22, it is anticipated that the wellfields will contribute 17%, and the Newark Desalination Facility 20%, to provide an estimated groundwater share of 37% toward the distribution system supply.
FIGURE 2
HISTORICAL GROUNDWATER PUMPING IN ACWD GROUNDWATER STATUTORY SERVICE AREA*
(ACTUAL THROUGH FY 2019/20)

*Includes private pumping.
FIGURE 3 - ACWD DISTRIBUTION SYSTEM SOURCE OF SUPPLY

FY 2019/20 (ACTUAL)

- WELLFIELDS: 7,900 AF (18%)
- DIRECT S.F. WATER: 900 AF (2%)
- BLENDED S.F. WATER: 7,900 AF (18%)
- WTP NO. 2: 18,100 AF (42%)

FY 2020/21 (FORECAST)

- WELLFIELDS: 7,400 AF (17%)
- DIRECT S.F. WATER: 600 AF (1%)
- BLENDED S.F. WATER: 8,300 AF (19%)
- WTP NO. 2: 19,700 AF (45%)

FY 2021/22 (FORECAST)

- WELLFIELDS: 7,400 AF (17%)
- DIRECT S.F. WATER: 600 AF (1%)
- BLENDED S.F. WATER: 8,300 AF (19%)
- WTP NO. 2: 18,800 AF (43%)
Replenishment Assessment Meters

The establishment of the replenishment assessment required that meters be installed on all active wells in the District. This requirement can, however, be deferred by the Board on a year-to-year basis if it is justified. The Board chose to install the necessary water meters on most wells in FY 1970/71 and FY 1971/72. Additional meters have been installed as necessary for new or reactivated wells.

Of the 47 non-ACWD-owned wells with active accounts in the replenishment assessment program, all are currently equipped with meters. All active ACWD production and ARP wells are equipped with meters, except Nursery Well and Lowry Well, which are operated infrequently or on a standby basis. The amounts of pumping from these unequipped wells are based on estimates instead of actual meter readings. The cost of metering Lowry Well and Nursery Well would likely not be returned during their remaining active years. To allow for the use of non-metered wells, Section 20 of the Replenishment Assessment Act requires that the Board adopt a resolution extending the date when all water producing facilities are required to be metered. The price of water metering devices or other circumstances can be the basis for the Board’s determination. Last year, the Board extended the deadline for metering non-metered wells to March 9, 2021.

Wells with discharge lines not greater than two inches in diameter and providing groundwater for domestic use or for irrigation on less than one acre of land can be excused from the meter requirement, and charged a flat rate established by the Board. The Board would be required to pass a resolution to that effect at the time they fix the general replenishment assessment rate. The Board did not levy a flat rate assessment on these wells for FY 2020/21.

Annual Overdraft

The annual overdraft, as defined in the Replenishment Assessment Act, means the amount, as determined by the Board, by which the quantity of groundwater removed by any natural or artificial means from the groundwater supplies within the District during the water year exceeds the quantity of non-saline water replaced therein by the replenishment of such groundwater supplies in the water year by any natural or artificial means other than replenishment under provisions of the Act. Effectively, the annual overdraft is the difference between the amount of pumping of groundwater from the basin and the amount of water recharged from local water supplies for the fiscal year.

The net local water recharged to the groundwater basin is composed of the portion of applied water (e.g., irrigation) and rainfall that percolates to the groundwater basin, plus the portion of watershed runoff impounded at the recharge facilities, less evaporation of such impounded water, and less saline and other outflows from the basin (discussed in more detail following Table 3). Part of the local recharge from precipitation and applied water may percolate into the brackish water in the Newark Aquifer. While part of this water is not usable directly due to degradation from mixing with saline water, it does contribute to the volume of water in the basin.

The component amounts of net local recharge for FY 2019/20 (actual), FY 2020/21 (forecast), and FY 2021/22 (forecast) are listed in Table 3. The values for FY 2020/21 reflect actual conditions experienced through November 2020. Anticipated local recharge through the remainder of FY 2020/21 and the entirety of FY 2021/22 has been estimated based on an assumption of subnormal rainfall for December 2020 through December 2021, followed by normal (median) rainfall for January 2022 through June 2022.

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1 At the time this report was prepared, electrical hookup for one newly installed meter was pending.
TABLE 3
ANNUAL OVERDRAFT
(In Thousands of Acre-Feet)

<table>
<thead>
<tr>
<th></th>
<th>FY 2019/20 Actual*</th>
<th>FY 2020/21 Forecast**</th>
<th>FY 2021/22 Forecast**</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL REPORTED PUMPING (Table 2)</td>
<td>21.7</td>
<td>20.8</td>
<td>20.9</td>
</tr>
<tr>
<td>LOCAL RECHARGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Runoff to the recharge facilities</td>
<td>16.3</td>
<td>13.3</td>
<td>18.7</td>
</tr>
<tr>
<td>Infiltration from direct rain and applied water, and other</td>
<td>6.2</td>
<td>5.5</td>
<td>8.9</td>
</tr>
<tr>
<td>(less) Evaporation at the recharge facilities</td>
<td>-1.4</td>
<td>-1.4</td>
<td>-1.4</td>
</tr>
<tr>
<td>(less) Saline water outflow†</td>
<td>-6.3</td>
<td>-5.4</td>
<td>-5.4</td>
</tr>
<tr>
<td>(less) Other extractions and outflow</td>
<td>-0.3</td>
<td>-0.0</td>
<td>-0.2</td>
</tr>
<tr>
<td>TOTAL NET LOCAL RECHARGE</td>
<td>14.5</td>
<td>12.0</td>
<td>20.6</td>
</tr>
<tr>
<td>ANNUAL OVERDRAFT</td>
<td>7.2</td>
<td>8.8</td>
<td>0.3</td>
</tr>
</tbody>
</table>

* Based on actual historical conditions, but the true values of recharge in FY 2019/20 may deviate from the amounts listed in this table due to limitations in accuracy of measurements, model calculations, and other estimating methods.

** Values reflect conditions actually experienced through November 2020, and anticipated local recharge through the remainder of FY 2020/21 and the entirety of FY 2021/22. Anticipated local recharge has been estimated based on projected subnormal amounts of rainfall through December 31, 2021, and median rainfall between January 1, 2022 and July 30, 2022.

† This value mainly reflects saline outflow to San Francisco Bay but also may include non-saline boundary flow between the Niles Cone Groundwater Basin and the East Bay Plain Groundwater Basin.

The District’s groundwater model, besides predicting future piezometric head in response to forecasted rainfall, pumping, and managed (Quarry Lakes) recharge, calculates the amounts of percolation from direct rain, percolation from applied water, saline water outflow, and other outflow and extractions listed in Table 3. Such quantities cannot easily be measured or estimated by more direct methods. Accordingly, values for these forms of recharge, including ‘actual’ values for FY 2019/20, are subject to uncertainty as a consequence of the limitations in the model and the accuracy of its input parameters.

When the piezometric head of the Newark Aquifer forebay approaches an elevation of 20 feet (National Geodetic Vertical Datum of 1929), the rate of rise in piezometric head appears to slow in response to additional recharge. Although the specific cause(s) of this phenomenon is not known precisely, ACWD has mathematically represented it as a discharge, labeled “Other Extractions and Outflow”, in the calculation of annual overdraft (Table 3) and water supply/demand inventory (Plates 11-13). However, the actual causes likely include miscellaneous, unrecorded pumping or other extractions from the basin; and may include possible overestimates of channel percolation, or model limitations that could lead to under-calculated saline outflow or overestimates of rainfall/applied water percolation.
Change in Piezometric Heads

In this report, each piezometric head value is presented as the actual elevation of the water level in the well in which it was measured, and accordingly, is expected to equate (approximately) to the level of the free water surface in the aquifer if the well is not in a pressure aquifer.

Movement of water within an aquifer is in the direction of decreasing piezometric heads (in certain cases, precise calculations of flow direction may require consideration of not only water levels but also water density). Prior to 1972, the Newark Aquifer groundwater levels decreased in the landward direction toward the basin forebay (as shown on Plate 2). This caused landward movement of saline water toward the forebay area. The piezometric heads in the lower aquifers were lower than those of the Newark Aquifer, and the aquitards separating the aquifers are thin in the forebay. As a result, saline water in the forebay area migrated downward from the Newark Aquifer and into the lower aquifers. A combination of recharge and pumping may have caused saline water in these lower aquifers to disperse and spread to areas outside the forebay.

Quantitative elevations of well levels (piezometric heads) on Plate 4, and elsewhere in this report, are given in reference to the National Geodetic Vertical Datum of 1929 (“NGVD 1929” or “1929 vertical datum”). For example, an elevation of 10.0 means 10.0 feet above the 1929 vertical datum. In Survey Reports prepared prior to 2018, elevations were reported in terms of “mean sea level” (MSL), with zero feet MSL taken to be the 1929 vertical datum. Therefore, numerical values of elevations in this Survey Report are comparable to those previous Survey Reports. In order to avoid confusion as to how high groundwater levels are relative to contemporary local mean sea level (San Francisco Bay proximal to the Niles Cone Groundwater Basin), this report refrains from use of “MSL”. The local mean level of San Francisco Bay was last determined to be 0.6 feet higher than the 1929 vertical datum per available tidal station data. Accordingly, in this report, only groundwater levels higher than Elevation 0.6 feet are considered “above sea level.” Consistent with global sea level trends, the difference between local mean sea level (San Francisco Bay) and Elevation 0 feet NGVD 1929 is likely to increase in future years.

During FY 2019/20, the piezometric heads of groundwater contained within the pressure level areas of the Newark Aquifer were above sea level. The water levels in the Centerville-Fremont Aquifer indicator well were mostly above sea level in July 2019, and between April 2020 through June 2020, but were below sea level during other times of the fiscal year. The levels in the Deep Aquifer indicator well on Plate 4 were below sea level over the entire fiscal year. The changes in piezometric heads from the beginning to the end of the fiscal year were, approximately, a three-foot decrease in the Newark Aquifer, a decrease of one foot in the Centerville-Fremont Aquifer, and a decrease of less than one foot in the Deep Aquifer. The level in the Newark Aquifer forebay indicator well varied between Elevation 11 feet and 18 feet during the fiscal year. Since the piezometric heads of the Newark Aquifer remained above sea level, some of the saltwater in the Newark Aquifer should have been repulsed back toward San Francisco Bay.

Under the scenario of pumping (Table 2) and recharge (Tables 3 and 4) considered for this report, the water level in the Newark Aquifer forebay indicator well (4S/1W-29A06 on Plate 4) is anticipated to be at Elevation 13 feet in June 2021 and 15 feet in June 2022. The well levels in the Centerville-Fremont and Deep Aquifers are expected to range from slightly below to slightly above Elevation 0 feet for the remainder of the current water year.

The AHF Sub-basin, situated between the Hayward Fault and the hills, accommodates higher...

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2 NGVD 1929 was established as a sea level-based datum.
groundwater levels than those in the BHF Sub-basin (Newark, Centerville-Fremont and Deep Aquifers). With reference to the hydrograph of well 4S/1W-27D08 on Plate 4, levels within the AHF were in the higher part of their operating range in FY 2019/20, despite a six-foot decrease between the beginning and end of the fiscal year.

Extent of Salinity Intrusion

As discussed above under the heading of “Change in Piezometric Heads,” the overdraft condition that had existed within the groundwater basin prior to the mid-1970s caused saltwater intrusion to occur in the BHF Sub-basin. Enhancement of ACWD’s artificial recharge operation and importation of supplemental water have helped to reverse this condition.

Portions of aquifers that contain water with a chloride concentration greater than 250 parts per million (ppm) are considered to remain degraded by legacy saltwater intrusion. Plates 8 through 10, which were obtained from the District’s 2020 Groundwater Monitoring Report (Groundwater Monitoring Report), indicate the location of the 250 ppm line (isochlor) in the Newark Aquifer, Centerville-Fremont Aquifer, and Deep Aquifer in the fall of 2020. Each plate also includes the corresponding 250 ppm isochlor line for 1962-the year when supplemental water from the State Water Project was first purchased and groundwater levels began to rebound. These plates aim to illustrate the difference between the two time periods with respect to the 250 ppm contour line.

According to the Groundwater Monitoring Report, all wells monitored above the Hayward Fault had chloride concentrations below 250 ppm in the fall of 2020. A comparison of Fall 2020 chloride maps to those of Fall 2019 indicate no significant changes, although fluctuations in chloride concentrations in three Deep Aquifer wells located near the central portion of the basin (within the vicinity of Dyer Street, Fremont Boulevard, and Lowry Road) induced modest changes in the interpolated position of the Deep Aquifer 250 ppm chloride contour.

Accumulated Overdraft

The accumulated overdraft is defined in the Replenishment Assessment Act as the amount of water necessary to be replaced in the groundwater basin to prevent the landward movement of bay water into the fresh groundwater basin. This applies only to the BHF Sub-basin. Therefore, for this report, the accumulated overdraft is assumed to be the volume of water required to raise the water levels in the Newark Aquifer to the local mean level of San Francisco Bay.

The accumulated overdraft of the basin has been eliminated since early 1972, as indicated on Plate 3. The water levels in the Newark Aquifer are expected to remain above sea level through FY 2020/21 and for the entire FY 2021/22, based on projections of pumping (Table 2) and local recharge (Table 3). Accordingly, no accumulated overdraft is expected in June 2021.

**AMOUNT AND AVAILABILITY OF SUPPLEMENTAL WATER SUPPLIES**

Supplemental Water Supplies Available to the District

The District obtains supplemental water for groundwater replenishment from the California State Water Project (SWP), ACWD's share of the local conservation storage in Del Valle Reservoir, ACWD’s banked storage at the Semitropic Water Storage District (SWSD), and other sources. ‘Withdrawal’ of banked water is actually accomplished through an exchange, whereby ACWD receives SWP water that would otherwise be allocated to the SWSD, or to other State Water Contractors that, in turn, can be compensated through deliveries from the SWSD. When advantageous, ACWD replenishes its banked water supply through diversion of a portion of its state water allocation to SWSD in lieu of direct delivery to ACWD. The terms of the water banking
agreements between ACWD and SWSD include a 10% evaporation and aquifer loss; hence, 90% of ACWD’s transfers of SWP water to SWSD (i.e., 90% of the amounts indicated in Plates 11 to 13) is credited to ACWD’s balance of banked water.

The amount of water that can be withdrawn from the SWSD in any given year, and the timing of withdrawals, is subject to limitations. To improve flexibility, some SWSD water, when available, may be withdrawn and directed to an intermediate storage facility, such as San Luis Reservoir (SLR), in exchange for water to be delivered to ACWD at a more advantageous time (see Plates 11 through 13). In addition, water may be obtained from other sources, such as in FY 2020/21 when ACWD obtained some of its imported supply from through the State Water Contractors’ Dry Year Transfer Program (DYTP).

Table 4 indicates the amounts of supplemental water received at ACWD for groundwater replenishment from each of the aforementioned sources in FY 2019/20 and the amounts that are anticipated to be received in FY 2020/21 and FY 2021/22. ACWD experienced subnormal rainfall, and hence reduced local recharge, in CY 2020, and has planned for continuation of such conditions through CY 2021. The anticipated amounts of supplemental water will help maintain groundwater levels within acceptable ranges through the end of FY 2021/22. Water obtained through the DYTP is listed under the category “Other” in Table 4 and Plates 11 to 13.

**TABLE 4**

SUPPLEMENTAL WATER SUPPLIES
(In Thousands of Acre-Feet)*

<table>
<thead>
<tr>
<th>Source</th>
<th>FY 2019/20</th>
<th>FY 2020/21**</th>
<th>FY 2021/22**</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Water Project (SWP)</td>
<td>1.0</td>
<td>2.4</td>
<td>1.2</td>
</tr>
<tr>
<td>Del Valle Reservoir</td>
<td>0.1</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>SWSD (without intermediate storage)</td>
<td>1.2</td>
<td>2.8</td>
<td>1.7</td>
</tr>
<tr>
<td>SWSD via SLR</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Other</td>
<td>0.0</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>TOTAL FOR YEAR</strong></td>
<td>2.3</td>
<td>5.6</td>
<td>3.2</td>
</tr>
</tbody>
</table>

* Values reflect only amounts delivered, or projected to be delivered, to ACWD for groundwater recharge within the fiscal years indicated. This table does not include values for the supply to ACWD’s active surface water treatment plant (Treatment Plant No. 2) and diversions of state water to the SWSD, and from SWSD to SLR, for future ACWD use. However, values for these entities appear on Plates 11 through 13.

** Assuming values of pumping in Table 2 and natural recharge in Table 3.

External Water Transfer for Future Use

As indicated on Plate 11, 12 and 13, ACWD made deposits of SWP water at SWSD in FY 2019/20 and anticipates additional deposits in FY 2021/22. Deposits totaling to 7,100 acre-feet in FY 2019/20 occurred in CY 2019 when SWP water was available for water banking. No deposit at SWSD is expected in FY 2020/21. Deposits totaling to 3,900 acre-feet would be made in the winter months of CY 2022, assuming resumption of a normal rainfall pattern (and availability of SWP water for deposit) at that time.
When SWSD water is eventually withdrawn for use at ACWD, whether directly or via SLR, it is expected that the groundwater basin will receive approximately 30% of this (SWSD) water or equivalent import water. The component for groundwater recharge (30%) is expected to be realized as a long-term average, not necessarily in any individual year that banked water is withdrawn. Plates 11, 12, and 13 indicate the amount withdrawn from SWSD directly to ACWD in FY 2019/20 (actual), and anticipated amounts to be withdrawn in FY 2020/21 and FY 2021/22, including the component routed or planned for groundwater replenishment consistent with Table 4. Plates 12 and 13 also indicate the amount of expected transfer from SWSD to SLR in FY 2020/21 and FY 2021/22.

Comprehensive Water Supply/Demand Inventory

The water supply/demand inventory for ACWD in FY 2019/20, FY 2020/21, and FY 2021/22 is illustrated in flow chart format on Plates 11, 12, and 13, respectively. These plates depict not only groundwater basin inflows and outflows listed in Tables 2, 3, and 4, but also the supply to Treatment Plant No. 2, inputs of San Francisco Public Utilities Commission water to the distribution system, and external transfers. As noted under “Supplemental Water Supplies Available to the District”, external transfers include deposits of banked water (SWP to SWSD) and withdrawals of banked water for holding at intermediate storage facilities (e.g., SWSD to SLR) pending delivery to ACWD.

As indicated at the bottom of Plate 11, a net decrease in storage in the groundwater basin was realized in FY 2019/20. This was due to a decrease in local recharge associated with subnormal rainfall over the fiscal year. However, with imports of supplemental water for groundwater recharge, groundwater levels remained within normal operating ranges.

GROUNDWATER COSTS AND FUNDING

Estimated Groundwater Costs

In FY 2021/22, the District's groundwater program activities will require funds to pay for: 1) variable cost of supplemental water, either delivered directly to ACWD for groundwater replenishment or external transfers for future groundwater replenishment; 2) fixed SWP and SWSD contract costs for supplemental water; 3) capital costs of the District's groundwater recharge facilities; and 4) the District's operation, maintenance, and engineering activities associated with groundwater replenishment and basin management. The estimated cost of the District's groundwater program is shown by major function in Table 5 for FY 2021/22. The amounts on Table 5 reflect costs for only those items in the General Fund, or the portion of such items, which are expected to benefit all users of the groundwater basin. Hence, costs attributed to the distribution system, including (but not limited to) operation of wells and treatment plants to supply the distribution system, are not reflected in Table 5. Individual cost items in the General Fund are reviewed each year for their relevance to the supply and maintenance of the groundwater basin. Administration and General costs support all of the District’s operations commonly. Through a detailed evaluation, it is estimated that 15% of the total District Administrative and General costs in FY 2021/22 will support the supply and maintenance of the groundwater basin.

Estimated Cost of FY 2021/22 Supplemental Water Supply

The cost of supplemental water for groundwater replenishment in FY 2021/22 is expected to be incurred through ACWD’s State Water Project (SWP) contract with the Department of Water Resources, water banking agreements with the Semitropic Water Storage District (SWSD), and a purchase from the State Water Contractors Association through the DYTP.
## TABLE 5
ESTIMATED GROUNDWATER COSTS*
FY 2021/22

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost $</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FIXED OR CAPITAL COSTS</strong></td>
<td></td>
</tr>
<tr>
<td>State Water Project Fixed (Groundwater portion)</td>
<td>6,248,000</td>
</tr>
<tr>
<td>Water Banking Fixed (Groundwater portion)</td>
<td>332,000</td>
</tr>
<tr>
<td>Delta Conveyance (Groundwater portion)</td>
<td>265,000</td>
</tr>
<tr>
<td>Program Planning &amp; Environmental Documentation</td>
<td>5,000</td>
</tr>
<tr>
<td>Groundwater Supply Facilities Improv/Equip Replacements</td>
<td>41,000</td>
</tr>
<tr>
<td>Removal of Nichols and Bunting Houses</td>
<td>64,000</td>
</tr>
<tr>
<td>Interfacility Electrical and Control</td>
<td>129,000</td>
</tr>
<tr>
<td>Administrative Capital</td>
<td>139,000</td>
</tr>
<tr>
<td>Bunting Pumping Plant Decommissioning</td>
<td>412,000</td>
</tr>
<tr>
<td>Rubber Dam No. 1 - Fabric Replacement, and Control Building &amp; Equipment Modifications</td>
<td>593,000</td>
</tr>
<tr>
<td>Los Vaqueros Reservoir Expansion Project (Groundwater portion)</td>
<td>762,000</td>
</tr>
<tr>
<td>Vallecitos Channel Betterments</td>
<td>1,372,000</td>
</tr>
<tr>
<td>Shinn Pond Fish Screen</td>
<td>6,167,000</td>
</tr>
<tr>
<td>Rubber Dam 1 - Fish Ladder</td>
<td>8,044,000</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>$ 24,573,000</strong></td>
</tr>
<tr>
<td><strong>EXPENSES</strong></td>
<td></td>
</tr>
<tr>
<td>State Water Project Variable (Groundwater portion)</td>
<td>191,000</td>
</tr>
<tr>
<td>Water Banking Variable (Groundwater portion)</td>
<td>320,000</td>
</tr>
<tr>
<td>Purchased Water-Other (Dry Year Transfer Program)</td>
<td>67,000</td>
</tr>
<tr>
<td>Pits and Creek Maintenance and Diversion Pumping</td>
<td>1,390,000</td>
</tr>
<tr>
<td>Supervision, Labor and Expense</td>
<td></td>
</tr>
<tr>
<td>1. Management of groundwater basin</td>
<td>1,262,000</td>
</tr>
<tr>
<td>2. Management of watershed and recharge facilities</td>
<td>943,000</td>
</tr>
<tr>
<td>3. Monitoring and analysis of groundwater</td>
<td>445,000</td>
</tr>
<tr>
<td>4. Monitoring and analysis of creek and pit water</td>
<td>545,000</td>
</tr>
<tr>
<td>5. Well Ordinance administration**</td>
<td>1,052,000</td>
</tr>
<tr>
<td>6. Water resources planning</td>
<td>969,000</td>
</tr>
<tr>
<td>7. Groundwater Protection Program</td>
<td>562,000</td>
</tr>
<tr>
<td>8. Local Oversight Program (LUFT/SCP sites)</td>
<td>507,000</td>
</tr>
<tr>
<td>Aquifer Reclamation Program **</td>
<td>85,000</td>
</tr>
<tr>
<td>Replenishment Assessment and Meter Maintenance</td>
<td>14,000</td>
</tr>
<tr>
<td>Administrative and General Expense (Groundwater portion)</td>
<td>3,442,000</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>$ 11,794,000</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 36,367,000</strong></td>
</tr>
</tbody>
</table>

* Includes only the non-growth component of costs associated with the management and replenishment of the groundwater basin. Growth and distribution system-related costs are not included herein. Capital costs other than State Water Project and water banking fixed costs are based on cost estimates for projects in ACWD's 25-Year Capital Improvement Program.

** Reflects net cost after permit and lease revenue considered.
As detailed below, SWP and SWSD costs have fixed and variable components. For purposes of this report, fixed costs are generally recurring and independent of the amount of water transferred, whereas variable costs are calculated according to the amount of water transferred. The purchase of water through the Dry Year Transfer Program is expected to be a variable cost only.

**State Water Project**

As listed in Table 5, the share of the SWP fixed cost allocated to the groundwater basin in FY 2021/22 is estimated to be $6,248,000, and the groundwater share of the SWP variable cost is anticipated to be $191,000.

SWP variable cost are based on: 1) the amount of water imported from various sources for groundwater replenishment, as indicated on Table 4; 2) external transfers for future replenishment of the groundwater basin; e.g., deposits to SWSD and transfers from SWSD to SLR; and 3) applicable adjustments. The unit charge to deliver SWP water directly to ACWD is $66.62 in CY 2021 and is expected to be $66.77 in CY 2022. The groundwater basin variable cost includes the amount given by applying these unit charges to the volumes of water to be delivered to the groundwater basin.

However, the groundwater share of adjustments and external transfers is calculated according to a different formula. A discount of $25.34 per acre-foot is anticipated for water withdrawn from SWSD in CY 2021 (no SWSD water to ACWD is expected in CY 2022), as a credit for prior years’ SWP charges to deposit this same volume water at SWSD. The entire expected credit due to ACWD has been calculated by applying the $25.34 per acre-foot discount to the volume of water to be withdrawn from SWSD, including water withdrawn for the groundwater basin, Treatment Plant No. 2, and transfer to SLR. The groundwater share would be 30.1% of the entire credit, not necessarily the percentage of SWSD water delivered to the groundwater basin (versus Treatment Plant No. 2) in FY 2021/22. This manner of apportionment ensures that the groundwater is fully credited for its share of prior SWP variable costs to deposit water at SWSD.

Following withdrawals from SWSD in CY 2021, ACWD would initiate deposits in CY 2022 to restore its supply banked at SWSD. The unit SWP charge for deposit at SWSD in CY 2022 is anticipated to be $25.94 per acre-foot. As noted above, the groundwater basin share of the SWP cost for deposit to SWSD would be 30.1% (69.9% for the distribution system), in anticipation that the groundwater basin would use 30.1% of such water or equivalent import water at the time water is withdrawn from SWSD. As also noted, the SWP variable cost to deposit water at SWSD is expected to be credited back to ACWD at the time the water is withdrawn from SWSD.

A transfer of water from SWSD to SLR, anticipated in CY 2021, would incur a SWP variable cost of $17.59 per acre-foot ($18.33 per acre-foot if the transfer occurs in CY 2022). However, as stated above, ACWD would receive a credit of $25.34 for withdrawals from SWSD, including the transfer from SWSD to SLR. The share of the SWP variable cost (or net credit) allocated to the groundwater basin share for this transfer would be 30.1%, the same as deposits to SWSD.

Unit charges noted in this report are based on the current Department of Water Resources cost schedule (which is subject to revision). Invoices and payments are anticipated to lag actual deliveries by one month; therefore, the amount payable in FY 2021/22 would be for deliveries made between June 2021 and May 2022, not July 2021 through June 2022. Accordingly, variable costs in FY 2021/22 are based on water volumes that may somewhat differ from those indicated in Table 4 and Plate 13.

SWP fixed and variable costs to the groundwater basin are offset by SWP override tax revenue (see Table 6 on page 19).
Water Banking

The groundwater share of SWSD’s annual O&M fee, allocated as a fixed cost, is expected to be $332,000 in FY 2021/22 (30.1% of the total amount of $1,103,000) (see “Water Banking Fixed (Groundwater portion)” in Table 5). The SWSD variable cost of $320,000 in FY 2021/22 has been calculated by applying an anticipated unit charge of $132.25 per acre-foot to the volume of SWSD water to be delivered to the groundwater basin and payable in FY 2021/22 (withdrawals between June 2021 and May 2021), and 30.1% of the transfer from SWSD to SLR over this same period.

Other

As indicated in Table 4, supplemental water for groundwater replenishment in FY 2021/22 would include 300 acre-feet obtained through the DYTP. Such water would be delivered between July and December of 2021. A cost of $67,250 (rounded to $67,000 in Table 5) for FY 2021/22 has been calculated for purchase of this water based on the precise volume of 269 acre-feet (in lieu of the rounded 300 acre-feet), an estimated effective unit cost of $500 per acre-foot after carriage losses, and payment in two equal installments: an advance payment of $67,000 between January 2021 and June 2021 (to be paid in FY 2020/21), and the remainder (also $67,000) between July 2021 and December 2021 (the amount payable in FY 2021/22).

Groundwater Program Funding and Replenishment Assessment

In accordance with Section 7, Paragraph f, of the Replenishment Assessment Act, shown below is the rate of replenishment assessment required to be levied upon the production of groundwater to fund the estimated groundwater costs shown on Table 5 without consideration of other revenue sources.

<table>
<thead>
<tr>
<th>Water Use</th>
<th>Acre-Feet (from Table 2)</th>
<th>Rate /acre-foot</th>
<th>Funds $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural and Municipal Recreation</td>
<td>500</td>
<td>8.00 (a)</td>
<td>4,000</td>
</tr>
<tr>
<td>Other than Agricultural and Municipal Recreation</td>
<td>20,400</td>
<td>1,782.50 (b)</td>
<td>36,363,000</td>
</tr>
<tr>
<td><strong>Required Total (from Table 5)</strong></td>
<td></td>
<td></td>
<td>36,367,000</td>
</tr>
</tbody>
</table>

(a) Maximum rate fixed by AB 2052
(b) Computed to nearest 1¢

Historically, the District has used a combination of sources to fund groundwater costs. Table 6 shows the existing and proposed replenishment assessment rates and the corresponding amounts of the other currently utilized sources of groundwater program funds required for the total cost shown on Table 5. The recommended FY 2021/22 replenishment assessment rate (for production for purposes other than agricultural and municipal recreation) has been made with consideration that sources of revenue other than replenishment assessment will be available.
### TABLE 6
GROUNDWATER PROGRAM FUNDING AND REPLENISHMENT ASSESSMENT
FY 2021/22

<table>
<thead>
<tr>
<th>Acre-Feet</th>
<th>Existing Revenue</th>
<th>Proposed Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$/AF</td>
<td>$</td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td>Funds</td>
</tr>
<tr>
<td></td>
<td>Rate</td>
<td>Funds</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Existing</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Replenishment Assessment Categories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Agricultural and Municipal Recreation</td>
<td>500</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>4,000</td>
<td>8</td>
</tr>
<tr>
<td>2. Municipal, Industrial and Non-Municipal</td>
<td>20,400</td>
<td>485</td>
</tr>
<tr>
<td>Recreation</td>
<td>9,894,000</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>10,200,000</td>
<td></td>
</tr>
</tbody>
</table>

| B. Ad Valorem Taxes                           |          |          |
| 1. Portion of 1% Tax                          | 7,360,000| 7,360,000|
| 2. State Water Project                        | 6,438,000| 6,438,000|

| C. Grants                                     | 10,622,000| 10,622,000|

**Total Groundwater Revenue** 34,318,000 34,624,000
**Total Groundwater Costs** 36,367,000 36,367,000
**Subtotal** (2,049,000) (1,743,000)
**Intra-Fund Transfer** 2,049,000 1,743,000
**Total** 0 0
A 3% increase in the replenishment assessment rate for production for purposes other than agricultural and municipal recreation is recommended to generate sufficient revenue to help pay necessary costs to ensure the supply and quality of groundwater in the basin. Shinn Pond fish screens and Rubber Dam 1 fish ladder and equipment modifications are among the capital projects currently underway to repair aging water diversion and recharge facilities and render them in compliance with the Endangered Species Act. Other recharge and diversion facility projects that will need to proceed over the next five years include Vallecitos Channel betterments and Kaiser Pit rehabilitation. Although ACWD has received significant grant funding for some of the projects identified above, an increase in the replenishment assessment rate is necessary to help pay for these projects in addition to operational costs. The recommendation for the rate of replenishment assessment has also taken into account investment in the evaluation and possible participation in select regional water infrastructure projects, such as the Los Vaqueros Reservoir Expansion, which have been identified for their potential value in the District’s strategy to ensure long-term availability of imported water supplies for the groundwater basin. The full list of expected capital and operational expenditures for the groundwater basin in FY 2021/22 is included in Table 5.

As indicated in Figure 4 (page 21), the replenishment assessment rates were not increased in FY 1998/99 to FY 2007/08.
FIGURE 4
REPLENISHMENT ASSESSMENT RATES

Water Use Other than Agricultural & Municipal Recreation
$500 (Proposed for FY 2021/22)

Agricultural & Municipal Recreation
$8
PLATE 1: LOCAL AGENCY BOUNDARIES

ACWD GROUNDWATER STATUTORY SERVICE AREA BOUNDARY

2016 APPROVED DWR BULLETIN-118 GROUNDWATER BASIN BOUNDARY

Hayward Detachment

EBMUD Bayside Groundwater Project Location

San Francisco Bay

San Leandro

San Lorenzo

Alameda Creek

Hayward Detachment

FREMONT

NEWARK

UNION CITY

Quarry Lakes Regional Recreational Area

EBMUD Bayside Groundwater Project Location

0 1 2 Miles
CONCEPTUAL DIAGRAM OF HISTORICAL INTRUSION OF SALTWATER INTO THE NILES CONE


PLATE 2
HISTORICAL WATER LEVELS IN THE NEWARK AQUIFER (FOREBAY AREA)

11.2 ft. recorded on Dec. 29, 2020
LEGEND

CY 2019

CY 2020

ALAMEDA COUNTY WATER DISTRICT
GROUNDWATER BASIN MONTHLY WELL LEVEL ELEVATIONS (feet, NGVD 1929)

TYPICAL INTERVALS OF OCCURRENCE OF BHF AQUIFERS BELOW GROUND SURFACE

NEWARK (UPPER) AQUIFER: 40’ to 140’
CENTERVILLE-FREMONT AQUIFERS: 180’ to 390’
DEEP AQUIFERS: 400’ and deeper
COMPARISON OF 250 ppm CHLORIDE CONTOURS IN THE NEWARK AQUIFER FALL - 1962 TO FALL - 2020

PLATE 8
LEGEND

- 1962 CONTOUR LINE
- 2020 CONTOUR LINE
- DECREASE
  FALL 1962 TO FALL 2020
- INCREASE
  FALL 1962 TO FALL 2019
- HAYWARD EMERGENCY WELLS
- ACWD GROUNDWATER STATUTORY SERVICE AREA BOUNDARY
- ARP WELL
- ACWD PRODUCTION WELLS

ALAMEDA COUNTY WATER DISTRICT
FREMONT, CALIFORNIA

COMPARISON OF 250 ppm CHLORIDE
CONTOURS IN THE CENTERVILLE - FREMONT AQUIFER
FALL - 1962 TO FALL - 2020
LEGEND

1962 CONTOUR LINE
2020 CONTOUR LINE
DECREASE
FALL 1962 TO FALL 2020
INCREASE
FALL 1962 TO FALL 2020
HAYWARD EMERGENCY WELLS
ACWD GROUNDWATER
STATUTORY SERVICE
AREA BOUNDARY
ARP WELL
ACWD PRODUCTION WELLS

ALAMEDA COUNTY WATER DISTRICT
FREMONT, CALIFORNIA
COMPARISON OF 250 ppm
CHLORIDE
CONTOURS IN THE
DEEP
AQUIFER
FALL - 1962 TO FALL - 2020

PLATE 10
ALAMEDA COUNTY WATER DISTRICT
WATER SUPPLY/DEMAND INVENTORY FY 2020/21 (FORECAST)
(1000’s OF ACRE-FEET)

SUPPLY

SWP

0.0

0.0

7.6

2.4

SWSD

2.8

0.5

10.3

0.0

Del Valle

0.0

0.3

1.0

Runoff

0.1

0.8

13.3

23.0

Recharge Area Facilities

17.5

20.8

Private Wells

1.6

11.8

ARP Wells

11.8

ACWD Wellfields

7.4

WTP #2

19.7

SF PUC

8.4

ACWD Distribution System

44.1

To S.F. Bay

Direct rain, applied water & other

1.4

5.5

EVAP.

Newark Desal. Facility

3.2

SLR

Other

0.1

0.0

0.3

1.0

11.8

Newark Aquifer Forebay Level at end of FY= 13 ft. (NGVD 1929)

Total Recharge

Less Pumping

Less Natural Saline Outflow

Less Other Extractions & Outflow

Basin Balance

23.0

-20.8

-5.4

-0.0

-3.2

NILES CONE GROUNDWATER BASIN
(1000’s of Acre-Feet)

Natural Saline Outflow

Other Extractions

& Outflow

5.4

0.0

Other Reported

0.1

Agric.

0.1

Muni.-Rec.

0.2

Non-Muni. Rec.

0.1

Industrial

1.1

ACWD Distribution System

44.1

To S.F. Bay

Direct rain, applied water & other

1.4

5.5

EVAP.

Newark Desal. Facility

3.2

SLR

Other

0.1

0.0

0.3

1.0

11.8

Newark Aquifer Forebay Level at end of FY= 13 ft. (NGVD 1929)

Total Recharge

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-5.4

-0.0

-3.2

NILES CONE GROUNDWATER BASIN
(1000’s of Acre-Feet)

Natural Saline Outflow

Other Extractions

& Outflow

5.4

0.0

Other Reported

0.1

Agric.

0.1

Muni.-Rec.

0.2

Non-Muni. Rec.

0.1

Industrial

1.1

ACWD Distribution System

44.1

To S.F. Bay

Direct rain, applied water & other

1.4

5.5

EVAP.