# Attachment 2

# Project Justification

## Greater Monterey County IRWM Region

*"Addressing an Urgent Water Supply Need for a Disadvantaged Community in the Greater Monterey County IRWM Region"*

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# Project Summary Table

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| IR.2 | Stormwater capture, storage, clean-up, treatment, and management | |
| IR.3 | Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands | |
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## Project Description – Project #1: Castroville Water Supply and Water Conservation

**Implementing Agency:** Castroville Community Services District

**Brief Project Description:** Construct water supply system from deep aquifer, initiate water conservation program to address imminent threat of seawater intrusion for DAC and improve long-term drought preparedness.

**Need for Project:** The community of Castroville draws 100% of its water supply from the 400 Foot Aquifer of the Pressure sub-basin of the Salinas Valley Groundwater Basin. Groundwater levels in the 400 Foot Aquifer have dropped to more than 100 feet below mean sea level as of July 2015 at static conditions. During the operation of the water well, water levels drop to more than 190 feet below mean sea level. This dramatic drop combined with the close proximity to the Pacific Ocean (less than 4 miles) and close proximity to existing seawater intrusion (less than ¼ mile) has raised significant alarm that the existing water supply system to Castroville is imminently threatened with an unacceptable standard of high salinity water. Castroville's water supply is likely to be contaminated within the year.

The community of Castroville is primarily persons of Hispanic origin (over 90% according to 2010 US Census) who work in the agriculture industry; unemployment rate is over 16% and the high school education rate is just 42%.[1] Forty-four percent (44%) of the area of Castroville is designated as a disadvantaged community (DAC) according to 2009-2013 ACS, though review of the block groups leads CSD staff to believe that a manual survey would result in a much higher percentage DAC than reflected in the ACS data (this application timeline did not allow for the correction of that data through manual survey). Castroville is a poor community, and its community members cannot afford to pay the increased rates necessary to construct the appropriate water system improvements that are required to avoid seawater intrusion.

**Expanded Project Description:** Castroville CSD has four wells (previous wells were abandoned prior to 2000 due to seawater intrusion). Three of those wells draw water from the 400 Foot Aquifer, and currently produce the community's entire water supply (803 AF in 2014). In 2014, Well #2 produced 281 AF, Well #3 produced 122 AF, and Well #4 produced 400 AF.[2] The fourth well, Well #5, was constructed in 2007 in the 1400 Foot (Deep) Aquifer in order to respond to the threat of seawater intrusion. The 1400 Foot Aquifer shows no evidence of, nor vulnerability to, seawater intrusion, and offers an ample supply of water (the aquifer is estimated to contain approximately 4.6 million AF of fresh water, with an estimated recharge rate of 65,500 AFY).[3] However, Well #5 is not yet operable, pending the receipt of grant funds for arsenic treatment. When Well #5 becomes operable, it will produce 750-800 gpm and will replace Well #2. This, however, will address only part of the community's water supply need. A second deep well is needed to replace Wells #3 and #4. Note that Well #3 has already seen significant seawater intrusion. This was addressed by installing a sleeve, which reduced chloride levels; however, due to drought, chloride levels have been trending rapidly upward, and are currently at about 400 mg/L (seawater intrusion is defined at a level of 500 mg/L).[4]

Another need the community faces is the need for additional water storage for purposes of fire protection, drought preparedness, and other emergencies. The CSD recently received a letter from the Fire Chief of the North County Fire Protection District (dated July 31, 2015) requesting that the CSD system be upgraded to ensure at least 500,000 gallons of storage for firefighting use. CSD's two existing storage tanks have a combined capacity of 1.1 million gallons; with average daily use of about 800,000 gallons, this leaves about 300,000 gallons of additional storage, short of the 500,000 gallons needed for fire protection.

The project will address these needs by: (a) drilling a new water well in the Deep Aquifer (Well #6), which will produce at 1200 gpm and will supply the community of Castroville with 500 AFY of potable water; (b) installing water filtration for arsenic and other contaminants as required by drinking standards; (c) installing a 600,000-gallon water holding tank; and (d) implementing water conservation activities to reduce water consumption and raise community awareness, including workshops to educate consumers on how to reduce water consumption, and a rebate program for installation of water efficient devices.

**Project Benefits:** The project will provide immediate regional drought preparedness and water supply resiliency. The new deep well (plus water treatment system) will provide Castroville with a steady long-term supply of drinking water (500 AFY) while slowing the rate of seawater intrusion in the 400 Foot Aquifer, making that water available for other uses in the region (primarily agriculture). The 600,000-gallon storage tank will address the community's water storage deficit for fire protection. Finally, water conservation activities and water efficiency devices are expected to reduce water use by 17.3 AFY, and will help raise community awareness. The project will provide this DAC with potable, affordable (assuming the grant is awarded) and accessible water for human consumption, cooking, and sanitary purposes, as well as for firefighting and other emergency uses – addressing the community's urgent water supply needs and fully achieving the intent of the Human Right to Water Policy.

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[1] City-Data.com: http://www.city-data.com/city/Castroville-California.html

[2] Groundwater Extraction Report to Monterey County Water Resources Agency, dated January 2, 2015.

[3] Thorup, R.R. 1983, Hydrogeologic report on the Deep Aquifer, Salinas Valley, Monterey County, California: unpublished report to Monterey County Board of Supervisors, 40 p. Cited in Feeney, M.B. and L.I. Rosenberg, Technical Memorandum to WRIME, Inc., March 31, 2003, p. 4.

[4] According to J. Eric Tynan, in personal communication to Susan Robinson, July 31, 2015.

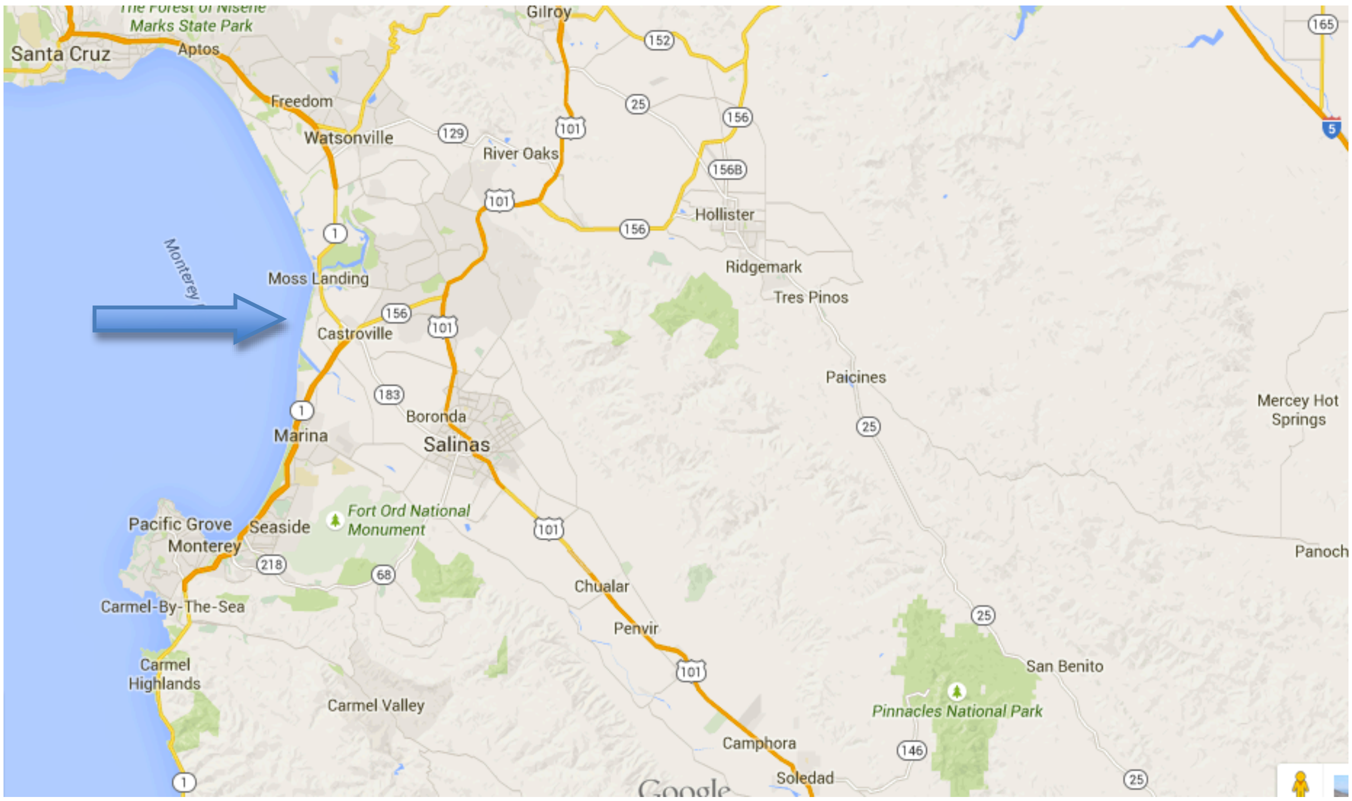
## Figure 1: Regional Map


This map shows the approximate location of the Castroville Water Supply and Water Conservation Project in context of the Greater Monterey County IRWM Region.

# Project Maps: Castroville Water Supply and Water Conservation Project

The maps below show the geographic location of the project, which is located in Castroville, Monterey County, and the proposed construction site area. Note that disadvantaged communities in the project area are shown on the DAC map included in Attachment 7, and the groundwater resources affected by this project (400 Foot Aquifer of the Pressure sub-basin of the Salinas Valley Groundwater Basin) is shown on the CASGEM map in Attachment 1.

## Figure 2: Geographic Location of Project




The Castroville Water Supply and Water Conservation Project is located in the community of Castroville, which is located in Monterey County, approximately 10 miles northwest of the City of Salinas.

## Figure 3: Project Facilities and Construction Site


This map shows location of new deep water supply well (well #6) and new storage tank, as well as the project monitoring location.


This map shows the broader project area, including existing well #4 that is under imminent threat of seawater intrusion.

## Project Physical Benefits

The following tables show the primary and secondary physical benefits that would result from three of the four components of the proposed project, as indicated by project components (a), (c), and (d) below:

(a) Install deep well (Well #6)
(c) Install 600,000-gallon storage tank
(d) Implement water conservation and efficiency activities

The fourth component, (b) Install water filtration system, will result in improved water quality in the new water supply source in terms of arsenic removal and removal of other undesirable constituents. These benefits are not shown in Table 5, but are explained further in the "Technical Analysis of Physical Benefits Claimed" section.

### Table 5 – Primary Benefit

| **Table 5 – Annual Project Physical Benefits** | | | |
|---|---|---|---|
| **Project Name: Castroville Water Supply and Water Conservation Project**<br>**Type of Benefit Claimed: Improved Water Supply Security, Efficiency, and Reliability (primary benefit)**<br>**Units of the Benefit Claimed: Acre Feet/Year (AFY) of Water, and Million Gallons (MG) of Water**<br>**Anticipated Useful Life of Project (years): 40 years** | | | |
| **(a)** | **(b)** | **(c)** | **(d)** |
| | **Physical Benefits** | | |
| **Year** | **Without Project** | **With Project** | **Change Resulting from Project** |
| **2016** | a) 300 AFY<br>c) 1.1 MG<br>d) 0 AFY | a) 400 AFY<br>c) 1.7 MG<br>d) 17.3 AFY | a) 100 AFY water produced<br>c) 600,000-gallons of additional water storage capacity for fire protection, drought preparedness, and other emergency uses<br>d) 17.3 AFY water saved from water conservation and efficiency activities |
| **2017** | a) 300 AFY<br>c) 1.1 MG<br>d) 0 AFY | a) 800 AFY<br>c) 1.7 MG<br>d) 17.3 AFY | a) 500 AFY water produced<br>c) 600,000-gallons of additional water storage capacity for fire protection, drought preparedness, and other emergency uses<br>d) 17.3 AFY water saved from water conservation and efficiency activities |
| **2018 – 2056** | a) 300 AFY<br>c) 1.1 MG<br>d) 0 AFY | a) 800 AFY<br>c) 1.7 MG<br>d) 17.3 AFY | a) 500 AFY water produced<br>c) 600,000-gallons of additional water storage capacity for fire protection, drought preparedness, and other emergency uses<br>d) 17.3 AFY water saved from water conservation and efficiency activities |
| **Comments:**<br>(a) <u>Install Deep Well (Well #6):</u> The "Without Project" condition assumes that Well #5 (deep well) has begun operation, and that it produces 300 AFY (to replace Well #2). It also assumes that Wells #2, #3, and #4 have been contaminated by seawater intrusion and are no longer useable. The community currently requires about 800 AFY. The "Without Project" conditions would therefore result in a deficit of about 500 AFY of drinking water for the community. The proposed project will make up that deficit. In year 1 (2016), the project will result in partial benefits (100 AFY) since the new well will only be operable after construction is completed, in the latter part of the year. Full benefits (500 AFY) will accrue as of 2017. The new well is expected to have the capacity to produce as much water as the community needs over the next 40 years,[5] but a conservative estimate assumes the community's current rate of demand (about 800 AFY total).<br>(c) <u>Install 600,000-gallon Storage Tank:</u> The "Without Project" condition describes the existing storage capacity, which | | | |

[5] According to Castroville CSD General Manager J. Eric Tynan, in personal communication with Susan Robinson, Program Director for Greater Monterey County IRWM Region, August 3, 2015.

includes two tanks, one 420,000 gallons and the other 680,000 gallons (total storage capacity of 1.1 million gallons). The new storage tank will add 600,000-gallons of potential storage. Our goal is to ensure that there is *at least* enough water storage capacity to meet firefighting needs, which is 500,000 gallons of storage beyond the average daily use.[6] Since the community has a current storage capacity of 1.1 million gallons, and has a daily average use of 800,000 gallons of water, that leaves 300,000 gallons available for firefighting, drought preparedness, or other emergencies – which is short 200,000 gallons (at minimum). The new storage tank will accommodate up to 600,000-gallons of water, allowing for firefighting protection plus additional storage for drought preparedness and other emergency needs.

(d) Implement Water Conservation and Efficiency Activities: The "Without Project" condition assumes a baseline of "no water conserved" for the purposes of calculating physical benefits. Calculations for determining the amount of water saved from proposed water conservation activities, and the sources for this information, are as follows:

| Water Conservation Activity | Calculations | Total AFY |
|---|---|---|
| Laundry to Landscape[7] | 200 households x 5 loads laundry/week x 40.6 gallons/load x 52 weeks = 2,111,200 gallons/year | 6.48 AFY |
| Rain collection barrels[8] | 200 households x 55 gallon barrel x 12 refills/year[9] = 132,000 gallons/year | 0.41 AFY |
| Rain collection cisterns: Residential (2500 gallon)[10] | 15 households x 500 avg. sq ft catchment area x 12.83"/year of rain x 0.623 gal/inch/sq ft x 0.9 safety factor = 53,953 gallons potential catchment | 0.17 AFY |
| Rain collection cisterns: Commercial/institutional | 5 commercial/institutional x 3,800 avg. sq ft catchment area x 12.83"/year of rain x 0.623 gal/inch/sq ft x 0.9 safety factor = 136,682 gallons potential catchment | 0.42 AFY |
| Turf replacement[11] | 10 households or commercial/institutional: 100,000 turf sq ft (estimated total amount) x 32 gallons saved/sq ft = 3,200,000 gallons | 9.82 AFY |
| **TOTAL** | | **17.3 AFY** |

[6] Letter to J. Eric Tynan, General Manager of Castroville CSD, from Fire Chief Chris W. Orman, North County Fire Protection District, dated July 31, 2015.
[7] Average household laundry water use and average number of loads per week is based on: Water Conservation Measurement Metrics Guidance Report, Jan. 2010, AWWA. Dziegieleski and Kiefer. Page 31.
[8] Rain barrel typical use based on: Rainwater Harvesting Program Final Report, January 2012, Great Ecology and Santa Monica Bay Restoration Commission.
[9] Calculated based on average rainfall of 12.83" for Salinas region from: NOAA Hydrology-Meteorology Data Report Part 4. Accessed 8/3/15 Annual Normal Rainfall Greater Salinas Area, www.CNRFC.NOAA.gov/index.php.
[10] Rainwater collection cistern - collection and use calculations from Ecology Action, email to Karen Nilsen, Nilsen & Assoc., dated 8/3/2015.
[11] Calculations based on: Lawns and Water Demand in California, *Economic Policy*, Vol. 2 Number 2 July 2006, Hanak and Davis, p. 16, Turf Replacement Water Savings.

## Table 5 – Secondary Benefit

| Table 5 – Annual Project Physical Benefits | | | |
|---|---|---|---|
| **Project Name: Castroville Water Supply and Water Conservation Project**<br>**Type of Benefit Claimed: Improved Water Quality (secondary benefit)**<br>**Units of the Benefit Claimed: mg/L chlorides; AFY (reduced pumping in seawater-intruded basin)**<br>**Anticipated Useful Life of Project (years): 40 years** | | | |
| **(a)** | **(b)** | **(c)** | **(d)** |
| | **Physical Benefits** | | |
| **Year** | **Without Project** | **With Project** | **Change Resulting from Project** |
| **2016** | a) 500+ mg/L<br>a) 500 AFY | a) 137 mg/L<br>a) 400 AFY | a) Estimated reduction of 363 mg/L chlorides in water supply<br>a) Reduced pumping of 100 AFY on 400 Foot Aquifer, resulting in reduced seawater intrusion |
| **2017** | a) 500+ mg/L<br>a) 500 AFY | a) 137 mg/L<br>a) 0 AFY | a) Estimated reduction of 363 mg/L chlorides in water supply<br>a) Reduced pumping of 500 AFY on 400 Foot Aquifer, resulting in reduced seawater intrusion |
| **2018 - 2056** | a) 500+ mg/L<br>a) 500 AFY | a) 137 mg/L<br>a) 0 AFY | a) Estimated reduction of 363 mg/L in water supply<br>a) Reduced pumping of 500 AFY on 400 Foot Aquifer, resulting in reduced seawater intrusion |

**Comments:**

(a) Install Deep Well (Well #6): The first water quality benefit is a reduction in chlorides in the new water supply (to meet secondary drinking water standards), relative to the water supply that would exist in "Without Project" conditions. The "Without Project" condition assumes it is late 2016 and seawater has contaminated Castroville's wells in the 400 Foot Aquifer (Wells #2, #3, and #4). We therefore assign a value of at least 500 mg/L, the defining level for seawater intrusion given by MCWRA (see Figure 4), for Wells #2, #3, and #4. We estimate that the new deep well (Well #6) will have a chloride concentration approximate to that of Well #5, which draws from the same 1400 Foot (Deep) Aquifer, and which according to a monitoring report dated June 22, 2015 by Monterey Bay Analytical Services, has a chloride concentration of 137 mg/L. This is well below the secondary MCL of 250 mg/L. Therefore, we calculated a reduction in chlorides from the "Without Project" situation of a seawater-intruded contaminated water supply, to a new water supply source in the Deep Aquifer that will approximate the low level of chlorides found in Well #5. Note: While 137 mg/L is about what we expect for the level of chlorides in Well #6, anything below 250 mg/L (secondary MCL standard for drinking water) will be considered acceptable.

(a) Install Deep Well (Well #6): The "Without Project" estimate reflects the approximate amount of water that is currently being drawn from Wells #3 and #4 in the 400 Foot Aquifer (actual amount in 2014: 522 AFY). The new Well #6 will replace Wells #3 and #4, producing about 500 AFY. Once the new well is online, it will draw about 500 AFY from the 1400 Foot (Deep) Aquifer, replacing the same amount of water currently being drawn from the 400 Foot Aquifer. Since seawater intrusion is caused primarily by over-pumping,[12] and since the seawater intrusion front is assumed to be advancing on account of the drought,[13] the "With Project" condition shows a slowing rate of seawater advancement that is proportionate to a reduction of 100 AFY in pumping in the first year (partial benefits, after construction of the well) and of 500 AFY for each year in the remaining lifespan of the project. A reduction in seawater intrusion will benefit other groundwater users of the 400 Foot Aquifer (primarily agriculture).

[12] California Water Foundation. 2014. Central Coast Groundwater: Seawater Intrusion and Other Issues. August 4, 2014. p. 1.
[13] Thorup 1983, p. 4.

# Technical Analysis of Physical Benefits Claimed

### 1. Need for the project

**Background:** Seawater intrusion (defined by the Monterey County Water Resources Agency [MCWRA] as 500 mg/L chlorides) has been advancing in the Pressure sub-basin of the Salinas Valley Groundwater Basin since the 1930s. Seawater intrusion was first observed in a few wells in the Castroville area in 1932.[14] By the 1940s, many agricultural wells in the Castroville area had to be abandoned. The Castroville Community Service District's wells in the shallower 180 Foot Aquifer of the Pressure sub-basin were abandoned prior to 2000 due to seawater intrusion. All of Castroville CSD's remaining wells (with the exception of Well #5, which is not yet operable) draw from the 400 Foot Aquifer of the Pressure sub-basin.

Seawater intrusion in the 400 Foot Aquifer of the Pressure sub-basin was first detected in the mid-1950s. MCWRA has put in place a "suite of projects" to combat seawater intrusion, from 1957 to 2010. The last project implemented (2010) was the Salinas Valley Water Project. This project replaces groundwater pumping with delivered surface water, allowing more groundwater to remain in the aquifer, opposing the seawater pressure, thus reducing intrusion. The "suite of projects" has been successfully working to slow or halt seawater intrusion. MCWRA's seawater intrusion data from 2011 and 2013 (years with the Salinas Valley Water Project online) indicate no movement in the seawater intrusion front, though new data (2014/2015) related to seawater intrusion has not yet been obtained. In these last two years, due to drought, there has not been enough water in the reservoir to make deliveries to the Salinas River Diversion Facility, and according to MCWRA Deputy General Manager, it is likely that the 2015 map will show seawater intrusion advancing.[15]

MCWRA monitors the position of the seawater intrusion front for both the Pressure 180 Foot and Pressure 400 Foot aquifers. The advancement of seawater in the 400 Foot Aquifer is illustrated in Figure 4 below. The intrusion front in the 180 Foot Aquifer has moved past Castroville CSD's east boundary, and the intrusion front in the 400 Foot Aquifer is mapped on the western boundary of the district. The seawater intrusion front edge in the 400 Foot Aquifer is less than ¼ mile away from Castroville CSD's three operable wells.

According to the proposed project's Basis of Design report, if current drought conditions continue, the rate of intrusion will accelerate.[16] Moreover, a study commissioned by MCWRA in January 2015 indicates that the seawater intrusion front may continue to advance even when drought conditions end: "Groundwater elevations well below the protective elevations indicate that the P-400 [400 Foot] Aquifer continues to be susceptible to seawater intrusion, particularly if the current drought conditions continue into the coming years. Based on the observed time lag (latency) between the end of the historic drought (WY 1984) and the end of the resulting increase in chloride concentrations (about 1999), …the 2013 chloride levels reported for coastal wells could show upward concentration trends over the coming years as the seawater intrusion front advances, even if wetter climate conditions return."[17]

Recent water elevation readings for Castroville CSD's three existing wells indicate that groundwater levels in the 400 Foot Aquifer have dropped to more than 100 feet below mean sea level as of July 2015 at static conditions. During the operation of CSD's water wells, water levels drop to more than 190 feet below mean sea level. This dramatic drop combined with the close proximity to the Pacific Ocean (less than 4 miles) and close proximity to the seawater intrusion front edge has raised significant alarm. Castroville CSD General Manager Eric Tynan predicts that the community's water supply is likely to be contaminated by seawater within the year.

Furthermore, the sodium to chloride (Na/Cl) ratio in groundwater indicates that numerous wells on the landward side of the mapped seawater intrusion front (in Figure 4) have likely been affected by seawater intrusion, even though the chloride concentration has not increased to the 500 mg/L level used by MCWRA to delineate seawater intrusion. "Lowered Na/Cl ratios (relative to background water quality), an indicator of seawater mixing into a freshwater aquifer, are present in wells screened in the 400 Foot Aquifer several miles landward of the mapped seawater intrusion extent."[18] In other words, it is possible that the community's wells are already impacted. The community of Castroville is in urgent need of water system improvements to forestall the possibility of running out of water in the very near future.

Note that, due to the urgency of the situation, the Castroville CSD has declared a "Level 2 Water Supply Shortage condition" ("Stage 2" of three stages) and has issued mandatory water conservation requirements, including issuing fines for watering on days

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[14] California Department of Water Resources (DWR). 1946. Bulletin 52: Salinas Basin Investigation. Sacramento, CA.

[15] Personal communication from MCWRA Deputy General Manager Robert Johnson to Susan Robinson, Program Coordinator for Greater Monterey County IRWM Region, email dated August 3, 2015.

[16] Feeney, M. B. 2015. Proposed New Deep Aquifer Well – Castroville Well N. 6 – Siting/Basis of Design. July 20, 2015.

[17] Brown and Caldwell. 2015. "State of the Salinas Groundwater Basin. Section 5.2.2.

[18] Ibid. p. 5-8.

that are not permitted and fines for washing vehicles, limits on filling pools/spas, and requirement to fix leaks and malfunctions.[19] If the situation deteriorates the CSD is poised to mandate "Stage 3" restrictions.

**Need for New Deep Well:** Castroville CSD currently has four wells. Three of those wells draw water from the 400 Foot Aquifer, and produce the community's entire water supply (803 AF in 2014). In 2014, Well #2 produced 281 AF, Well #3 produced 122 AF, and Well #4 produced 400 AF.[20] The fourth well, Well #5, was constructed in 2007 in the 1400 Foot (Deep) Aquifer in order to respond to the threat of seawater intrusion. The 1400 Foot Aquifer shows no evidence of, nor vulnerability to, seawater intrusion, and offers an ample supply of water (the aquifer is estimated to contain approximately 4.6 million AF of fresh water, with an estimated recharge rate of 65,500 AFY).[21] However, Well #5 is not yet operable, pending the receipt of grant funds for arsenic treatment. When Well #5 becomes operable, it will produce 750-800 gpm and will replace Well #2. This, however, will address only part of the community's water supply need. A second deep well is needed to replace Wells #3 and #4. Note that Well #3 has already seen significant seawater intrusion. This was addressed by installing a sleeve, which reduced chloride levels; however, due to drought, chloride levels have been trending rapidly upward in Well #3, and are currently close to 400 mg/L[22] (the latest data, as of 8/3/15, shows 388 mg/L chlorides; seawater intrusion is defined at a level of 500 mg/L).

**Need for Water Treatment System:** The actual amount of arsenic present in the proposed new deep well is unknown, and will not be known until the well is dug and tested. A June 22, 2015 water sample from Well #5, which draws from the same 1400 Foot Aquifer, indicated arsenic levels of 22 ug/L (the MCL is 10ug/L, or 0.01 ppm).[23] Other samples from wells nearby have shown arsenic levels well below the MCL.[24] If arsenic levels higher than the MCL are found in the new well, a water treatment system will be installed to remove the arsenic down to about 5 ug/L. The sample from a neighboring well also indicates that the water is 85 degrees Fahrenheit and is at the odor threshold of 3 (MCL is 3), color is 15 (MCL is 15), and 483 mg/L of dissolved solids (MCL is 500). This indicates that the new well may require additional water treatment measures, even if the arsenic levels are below the MCL. It is important to note that arsenic and these other water quality attributes are readily treatable; seawater intrusion is not so readily treatable. Desalination is the only way to treat salty or brackish water, and that option is much more expensive than a low-income community such as Castroville can afford.

**Need for Additional Water Storage Capacity:** Another need the community faces is the need for additional water storage for purposes of fire protection, drought supply, and other emergency uses. The CSD recently received a letter from the Fire Chief of the North County Fire Protection District (dated July 31, 2015) requesting that the CSD system be upgraded to ensure at least 500,000 gallons of storage for firefighting protection. CSD's two existing storage tanks have a combined capacity of 1.1 million gallons; with average daily use of about 800,000 gallons, this leaves about 300,000 gallons of supplemental storage, 200,000 gallons short of the 500,000 gallons needed for fire protection. The CSD General Manager recalls a major fire at a Castroville packing plant in 1999, in which all of the CSD's water storage tanks were drained before the fire was controlled; there was simply not enough water to address the fire. The Fire Chief and CSD General Manager would like to prevent that situation from occurring again.[25]

**Need for Water Conservation/Efficiency Program:** Castroville CSD has offered various incentives to encourage its customers to conserve water, including low-flow toilet rebates and soil moisture meters. The CSD General Manager reports that water conservation measures, along with "Stage 2" restrictions, have resulted in an impressive 49 gallons/day per capita use.[26] However, given the urgency of the situation and the community's collective desire to avoid "Stage 3," the General Manager is confident that customers will respond to educational opportunities and additional incentives to conserve water.

**Need for Funding Assistance:** The community of Castroville is comprised primarily persons of Hispanic origin (over 90% according to 2010 US Census) who work in the agriculture industry; unemployment rate is over 16% and the high school education rate is just 42%.[27] Forty-four percent (44%) of the area of Castroville is designated as a disadvantaged community (DAC) according to 2009-2013 ACS, though review of the block groups leads CSD staff to believe that a manual survey would result in a much higher percentage DAC than reflected in the ACS data (this application timeline did not allow for the correction of that data through manual survey). Castroville is a poor community, and community members cannot afford to pay the

[19] Ordinance No. 2014-65, An Emergency Ordinance of the Castroville Community Services District: (1) Permanent Voluntary Water Saving Measures, and (2) Temporary Water Conservation Standards.
[20] Groundwater Extraction Report to Monterey County Water Resources Agency, dated January 2, 2015.
[21] Thorup 1983, p. 4.
[22] Monitoring report of Well #3, data spanning February 2001 – August 3, 2015, showing TDS and chlorides.
[23] Monterey Bay Analytical Services, June 22, 2015, for Castroville Community Services District.
[24] Monterey Bay Analytical Services, May 27, 2011, for Marina Coast Water District. Well #34 showed arsenic levels of 6 ug/L.
[25] Personal communication (phone conversation) between J. Eric Tynan and Susan Robinson, August 3, 2015.
[26] The per capita estimate was calculated as follows: According to p. 2 of the 2015 Urban Water Conservation Plan report to SWRCB, a single family residence (SFR) in Castroville used .22 AFY. So .22 AFY = 71,687 gal/yr, divided by 365 days = 196 gal/day/4 ppl/SFR = 49 gpd/capita.
[27] City-Data.com: http://www.city-data.com/city/Castroville-California.html

increased rates necessary to construct the appropriate water system improvements that are required to avoid seawater intrusion and to be adequately prepared for fire, drought, and other emergency situations. The CSD General Manager has initiated the Proposition 218 process, with a plan to raise water rates 10% per year over the next five years if IRWM grant funding is not obtained. This would result in a more than 60% increase in customers' water bills by year 5. The community members of this DAC are ill equipped to pay these rates.

**How the Project Will Address these Needs:** The project will address the community's needs through the following four components:

*a) Install Deep Well (Well #6):* Drill a new water well in the 1400 Foot (Deep) Aquifer. The new well, Well #6, will produce at 1200 gpm and will provide Castroville with a steady long-term supply of drinking water (500 AFY) while slowing the rate of seawater intrusion in the 400 Foot Aquifer, making that water available for other uses in the region (primarily agriculture). Well #6 will replace the existing Wells #3 and #4. The project will supply the community of Castroville with potable, affordable (assuming the grant is awarded) and accessible water for human consumption, cooking, and sanitary purposes.

*b) Install Water Treatment System:* Install a water treatment system to remove arsenic and other undesirable elements as required by potable drinking standards.

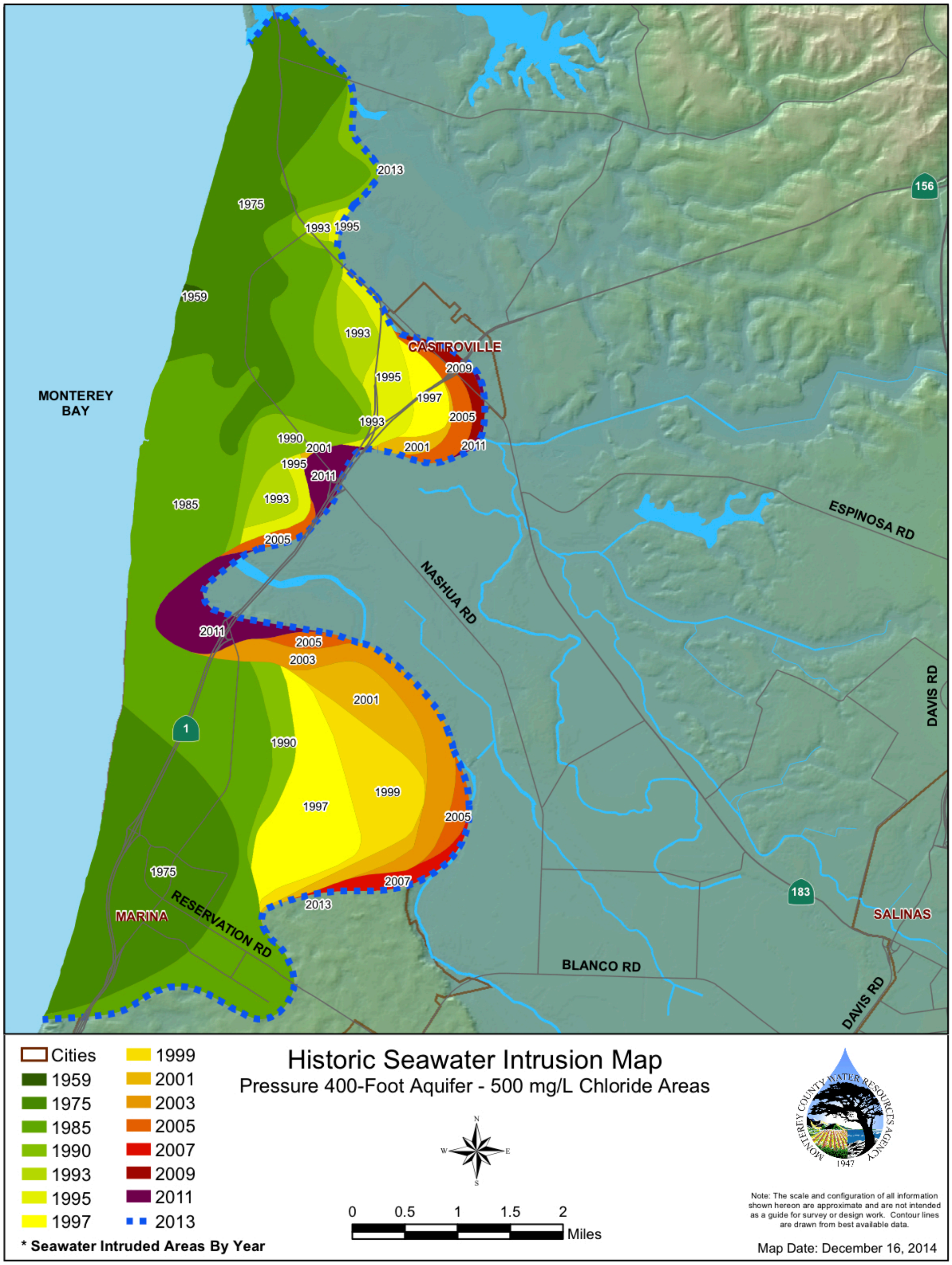
*c) Install 600,000-gallon Storage Tank:* Install a 600,000-gallon water storage tank to address the community's 200,000-gallon water storage deficit for fire protection, and to provide additional storage for drought preparedness and other emergency uses. The storage tank will also allow the cooling of the water from the 85-degree temperature to an ambient temperature, before delivery to residents. The water storage tank will be installed immediately adjacent to the new well.

*d) Implement Water Conservation Activities:* Implement water conservation activities to include a program of workshops and trainings to educate consumers on reducing water consumption, and a rebate program for installation of water saving devices, including "Laundry to Landscape" kits, rain barrels, and rainwater collection cisterns, as well as turf replacement. Water conservation activities are expected to reduce water use and groundwater pumping by 17.3 AFY, and will help raise community awareness.

The project will provide immediate regional drought preparedness and water supply resiliency. The new well (plus water treatment system) will provide the community of Castroville with a steady long-term supply of drinking water (500 AFY) while slowing the rate of seawater intrusion in the 400 Foot Aquifer, making that water available for other uses in the region (primarily agriculture). The project will enable more efficient management of the aquifer, removing competition between municipal and agricultural users at the same groundwater source. The 600,000-gallon storage tank will address the community's water storage deficit for firefighting protection, and provide water storage capacity for drought preparedness and other emergency uses. Finally, water conservation activities are expected to reduce water use by 17.3 AFY, and will help raise community awareness.

The project will provide this DAC with potable, affordable (assuming the grant is awarded) and accessible water for human consumption, cooking, and sanitary purposes – addressing the community's urgent water supply needs and fully achieving the intent of the Human Right to Water Policy.

## Figure 4: Seawater Intrusion Trends – 400 Foot Aquifer




This map illustrates seawater intrusion trends in the 400 Foot Aquifer through 2013. The community of Castroville lies on the front line of seawater intrusion – approximately ¼ mile from the leading edge.

**2. Estimate of without-project conditions:** If the project is not funded, and no additional action is taken, the following scenario would most likely ensue: Within approximately one year from now, seawater intrusion will have impacted the community's three wells in the 400 Foot Aquifer (Wells #2, #3, and #4). Those wells will be unusable for drinking and cooking purposes. By then, grant funding (from Round 1 of the IRWM Implementation Round) will have been received to enable construction of the arsenic filtration system for Well #5, the well that was constructed by Castroville CSD in 2007 in the 1400 Foot (Deep) Aquifer. We assume that Well #5 will be operable and providing approximately 300 AFY potable water, producing at 750-800 gpm, and storing water in an existing 420,000-gallon storage tank, which is located adjacent to the well. The community currently uses about 800 AF of water annually, and 800,000 gallons/day. The total production from Well #5 and the available storage will fall far short of the community's daily and annual water needs. (Note: because of the distant location of the second storage tank, which holds 680,000 gallons, it would be logistically difficult, costly, and extremely inefficient to move and store water from Well #5 in that second storage tank.) The community will have a deficit of approximately 800 AFY – 300 AFY = 500 AFY.

Castroville CSD staff have considered several alternatives to address this need. The first and by far best option is to implement this project, supported with IRWM grant funding. If IRWM grant funding is not forthcoming, in the short term the CSD would most likely need to bring in bottled water for drinking and cooking purposes, in order to address the water supply deficit. The CSD would also mandate strict water conservation ("Stage 3"), including a prohibition on all outdoor water use, no car washing, and no new connections to the system. Having bottled water delivered to its 7,000 customers for drinking and cooking purposes would be costly, and would only be suitable as a short-term solution; in this scenario, the CSD would deliver seawater-intruded well water to its customers for all uses besides drinking and cooking, and therefore the bottled water costs would be additional to baseline operations and maintenance (O&M) costs. CSD staff estimate that it would cost an additional $3.1 million/year for bottled water to be delivered to its 7,000 customers (for cooking and drinking only).[28] This cost would be transferred to the community of Castroville water users, most of whom would be unable to pay for it.

Long-term alternatives include the following:

1) To implement the "bare minimum" components of this project – which would include drilling the new deep well, and installing a water filtration system – with project costs paid by the consumers. The CSD would mandate strict water conservation ("Stage 3"), but would not be able to afford to offer incentive programs, such as rebates.
2) To import water from another source. In order to not exacerbate other drought-impacted communities, the likely solution would be to obtain water from a desalination plant. The nearby city of Sand City built a desalination plant in 2010 in partnership with California American Water Company, but its production of 300 AFY is not sufficient to offer purchase. Several desalination plants in the Monterey Bay region currently are in the early stages of concept to test wells. The most advanced project in the pipeline of projects is the Monterey Supply project, estimated at $328 million (State of California Division of Ratepayer Advocates) to produce 9,750 AFY of water. If Castroville CSD were to pay for the Monterey Supply Project water, then it is reasonable to expect that the District would pay the fair share of the capital cost, plus the ongoing O&M plus the cost to deliver the water from the facility to Castroville. The ratio of water needed from the Monterey Supply Project would be the ratio of AF of water needed for Castroville divided by the amount of water the Monterey Supply Project produces: 500 AFY/9,750 AFY. This ratio is then multiplied by the total capital cost of the Monterey Supply Project: capital cost x ratio = equivalent alternative = 500/9750 x $328 million = $16.8 million. The cost of transportation would be added along with the cost of O&M, which in itself would be very extensive.
3) Desalination of the seawater-impacted, briny water in CSD's existing wells in the 400 Foot Aquifer. The cost of constructing a desalination facility would be astronomical for a small low-income community such as Castroville. As noted above, the nearby city of Sand City recently installed a desalination plant to provide 300 AFY at a cost of $14 million dollars.[29] But even setting aside the construction costs, the O&M costs alone would make this alternative infeasible. CSD staff estimate that O&M costs for desalination would be roughly $2,500-$3,000/AF.[30] This is compared to current costs, which are on average $100/AF (in winter: $95-$98/AF; in summer: $113/AF).

To pay for *any* of these long-term alternatives, the CSD would need to sharply raise customer water rates. Castroville CSD has just initiated the Proposition 218 process in the event that IRWM grant funds are not received. The CSD would increase customer

[28] This cost was calculated as follows: Staff at Pure Water Bottling Company in Castroville, CA estimate that each 4-person household uses on average about 30 gallons per week (phone call to Pure Water on August 4, 2015). This is consistent with EPA standard of 1 gallon per person per day ("Planning for an Emergency Drinking Water Supply," prepared for U.S. Environmental Protection Agency's National Homeland Security Research Center by American Water Works Association and CDM. June 2011. p. 7). Cost for 1 hh/year for Pure Water bottled water: $5.75 (per 5-gal bottle) x 6 bottles/week x 52 weeks = $1,794/hh/yr plus $21/year delivery cost per hh = $1,815/hh/year. Multiply by 1750 hh's in Castroville (assuming population of 7,000/4) = $3,176,250 year.

[29] Roach, J. 2014. "Parched California Pours Mega-Millions into Desalination Tech," NBC News website article, February 17, 2014. http://www.nbcnews.com/storyline/california-drought/parched-california-pours-mega-millions-desalination-tech-n28066

[30] Ibid. (Based on J. Roach 2014 article.)

water rates 10% per year for five years, resulting in more than a 60% increase by year 5. This would represent just the start of water rate increases; the CSD would need to re-evaluate a payment plan after the first five years.

As established in Attachment 7, the community of Castroville is 44% DAC according to 2009-2013 ACS (and likely much higher, to be determined in the near future by MHI survey). The community is primarily persons of Hispanic origin (over 90% according to 2010 US Census) who work in the agriculture industry; unemployment rate is over 16% and the high school education rate is just 42%.[31] Castroville is a poor community, and some (if not most) of the community members will simply be unable to afford to pay the increased rates. Some, if not many, community members may be forced to relocate.

**3. Methods used to estimate physical benefits:** The following describes the methodology used to estimate physical benefits.

Physical benefit #1: Improved Water Supply Security, Efficiency, and Reliability (primary benefit):

The primary physical benefit will accrue from three of the four components of the proposed project: (a) Install Deep Well (Well #6); (c) Install 600,000-gallon Storage Tank; and (d) Implement Water Conservation Activities. The methods used to estimate physical benefits are described for each of these components below.

(a) Install Deep Well (Well #6): This project component will result in a physical benefit of *500 AFY water produced*. The "Without Project" condition assumes that Well #5 (deep well) has begun operation, and that it produces about 300 AFY (to replace Well #2). It also assumes that Wells #3 and #4 have been contaminated by seawater intrusion and are no longer operable. The community currently requires about 800 AFY. The "Without Project" conditions would therefore result in a deficit of about 500 AFY of drinking water for the community. The proposed project will make up that deficit. In year 1 (2016), the project will result in partial benefits (100 AFY) since the new well will only be operable after construction is completed, in the latter part of the year. Full benefits (500 AFY) will accrue as of 2017, and will continue for the life of the project (assumed to be 40 years). The new well is expected to be able to produce as much water as the community requires over the next 40 years; the 500 AFY estimate has been used as a conservative estimate, assuming the community's current rate of demand (about 800 AFY total) and not taking into account potential population growth.

(c) Install 600,000-gallon Storage Tank: This project component will result in a physical benefit of *600,000-gallons of additional water storage capacity for fire protection, drought preparedness, and other emergency uses*. The "Without Project" condition describes the existing storage capacity, which includes two tanks, one 420,000 gallons and the other 680,000 gallons (total storage capacity of 1.1 million gallons). The new storage tank will add 600,000-gallons of potential storage. Our goal is to ensure *at least* enough water storage to meet firefighting needs, which is 500,000 gallons beyond what is required for daily water use.[32] Since the community has a current storage capacity of 1.1 million gallons, and has a daily average use of 800,000 gallons of water, that leaves 300,000 gallons available for firefighting, drought preparedness, or other emergency uses – which is short 200,000 gallons. The new storage tank will accommodate up to 600,000 additional gallons of water. The project will ensure that at least 200,000 additional gallons of water is stored at any one time to meet firefighting needs, and will have additional capacity available to meet drought and other emergency needs.

(e) Implement Water Conservation Activities: This project component will result in a physical benefit of *17.3 AFY water saved from conservation and efficiency activities*. The "Without Project" condition assumes a baseline of "no water conserved" for the purposes of calculating physical benefits, though in actuality the community of Castroville actively participates in water conservation activities (the current rate of per capita water use is just 49 gallons per day,[33] compared with the average California per capita water use of 97.7 gallons/day, as of June 15, 2015[34]). Calculations for determining the amount of water saved from proposed water conservation activities, and the sources for this information, are as follows:

[31] City-Data.com: http://www.city-data.com/city/Castroville-California.html

[32] Letter to J. Eric Tynan, General Manager of Castroville CSD, from Fire Chief Chris W. Orman, North County Fire Protection District, dated July 31, 2015.

[33] The per capita estimate was calculated as follows: According to p. 2 of the 2015 Urban Water Conservation Plan report to SWRCB, a single family residence (SFR) in Castroville used .22 AFY. So .22 AFY = 71,687 gal/yr, divided by 365 days = 196 gal/day/4 ppl/SFR = 49 gpd/capita.

[34] State Water Resources Control Board. 2015. June 2015 Statewide Conservation Data. Media release, dated July 30, 2015. http://www.waterboards.ca.gov/waterrights/water_issues/programs/drought/docs/fs073015_june_by_the_numbers.pdf

| Water Conservation Activity | Calculations | Total AFY |
|---|---|---|
| Laundry to Landscape kits | 200 households x 5 loads laundry/week x 40.6 gallons/load x 52 weeks = 2,111,200 gallons/year | 6.48 AFY |
| Rain barrels | 200 households x 55 gallon barrel x 12 refills/year = 132,000 gallons/year | 0.41 AFY |
| Rainwater collection cisterns: Residential | 15 households x 500 avg. sq ft catchment area x 12.83"/year of rain x 0.623 gal/inch/sq ft x 0.9 safety factor = 53,953 gallons potential catchment | 0.17 AFY |
| Rainwater collection cisterns: Commercial/institutional | 5 commercial/institutional x 3,800 avg. sq ft catchment area x 12.83"/year of rain x 0.623 gal/inch/sq ft x 0.9 safety factor = 136,682 gallons potential catchment | 0.42 AFY |
| Turf replacement | 10 households or commercial/institutional: 100,000 turf sq ft (estimated total amount) x 32 gallons saved/sq ft = 3,200,000 gallons | 9.82 AFY |
| **TOTAL** | | **17.3 AFY** |

NOTES:

- Laundry to Landscape kits: Source for calculating average household laundry water use and average number of loads per week: Water Conservation Measurement Metrics Guidance Report, Jan. 2010, AWWA. Dziegieleski and Kiefer. Page 31.
- Rain barrels: Source for rain barrel typical use: Rainwater Harvesting Program Final Report, January 2012, Great Ecology and Santa Monica Bay Restoration Commission.
- Rainwater collection cisterns: Collection and use calculations from Ecology Action, email to Karen Nilsen, Nilsen & Assoc., dated 8/3/2015.
- Calculations for the volume of water contained in rain barrels and cisterns plus typical number of refills in one year came from sources above, based on average rainfall of 12.83" for Salinas region (source: NOAA Hydrology-Meteorology Data Report Part 4. Accessed 8/3/15 Annual Normal Rainfall Greater Salinas Area, www.CNRFC.NOAA.gov/index.php).
- Turf replacement: Calculations based on: Lawns and Water Demand in California, *Economic Policy*, Vol. 2 Number 2 July 2006, Hanak and Davis, p. 16, Turf Replacement Water Savings.

Physical benefit #2: Improved Water Quality (secondary benefit):

The secondary physical benefit will accrue from component (a) of the proposed project: *(a) Install Deep Well (Well #6)*. We estimate two water quality benefits from installing the new deep well: 1) reduction in chlorides in the community's water supply to a safe, potable level (i.e., below the secondary MCL drinking water standard of 250 mg/L); and 2) reduction in the advancement of seawater intrusion in the 400 Foot Aquifer, due to reduced pumping on the order of 500 AFY; this will result in higher water quality for other groundwater users of the 400 Foot Aquifer, primarily agricultural.

For the first water quality benefit, our methodology assumes that by 2016, CSD's existing wells in the 400 Foot Aquifer, Wells #2, #3, and #4, will have been impacted by seawater intrusion. We thus assume that the chloride level in those wells at that time is greater than 500 mg/L, which is the level at which MCWRA defines "seawater intrusion" (see Figure 4). We estimate that the new deep well (Well #6) will have a chloride concentration approximate to that of Well #5, which draws from the same 1400 Foot (Deep) Aquifer, and which according to a monitoring report dated June 22, 2015 by Monterey Bay Analytical Services, has a chloride concentration of 137 mg/L. This is well below the secondary MCL of 250 mg/L. Therefore, we calculate a reduction in chlorides in the community's water supply, from the "Without Project" scenario of a seawater-intruded contaminated water supply, to the "With Project" scenario of a new water supply source in the Deep Aquifer, of at least 363 mg/L (500 mg/L – 137 mg/L = 363 mg/L reduction). Note: While 137 mg/L is about what we expect for the level of chlorides in Well #6, anything below 250 mg/L (secondary MCL standard for drinking water) will be considered acceptable.

A second physical benefit would accrue by virtue of reduced pumping from the 400 Foot Aquifer. The new deep well would reduce groundwater pumping from the 400 Foot Aquifer by about 500 AFY (drawing instead from the 1400 Foot Aquifer). Since seawater intrusion is caused primarily by over-pumping,[35] and since the seawater intrusion front is assumed to be advancing on account of the drought,[36] the "With Project" condition shows a slowing rate of seawater advancement that is proportionate to a reduction of 100 AFY in pumping in the first year (partial benefits, after construction of the well) and of 500 AFY for each year in the remaining lifespan of the project. A reduction in seawater intrusion will benefit other groundwater users of the 400 Foot

[35] California Water Foundation 2014, p. 1.
[36] Thorup 1983, p. 4.

Aquifer (primarily agriculture) by helping to protect the quality of their water supply, and enabling them to use that water supply for a longer timeframe.

Note: The rate of seawater intrusion will change over the lifespan of this project; it will tend higher under conditions of drought, increased over-pumping, and sea level rise, and lower in wet years and with reduced pumping. A model for predicting the changes that groundwater extraction and/or sea level would cause for specified levels of groundwater salinization at strategic locations and times, has been developed by researchers at UC Santa Barbara;[37] it is beyond the technical abilities of this DAC, however, to run the model for a change of 500 AFY in groundwater extraction. We do know with certainty that over-pumping is the primary source of seawater intrusion.[38] Therefore, reducing groundwater pumping by 500 AFY in this aquifer will help slow the rate of seawater intrusion to at least some extent, increasing drought preparedness for the North County coastal area, which relies almost entirely on the 400 Foot Aquifer for its agricultural and drinking water supply.

The fourth project component, *(b) Install water filtration system*, will result in improved water quality in the new water supply source in terms of arsenic removal and removal of other undesirable constituents; these benefits, however, are not shown in Table 5. The actual amount of arsenic present in the new well (Well #6) is unknown, and will not be known until the well is dug and tested. However, recent monitoring results for Well #5, which draws from the same 1400 Foot (Deep) Aquifer, indicate arsenic levels of 22 ug/L in that water source,[39] while other wells drawing from the Deep Aquifer have found insignificant levels of arsenic.[40] If arsenic is found to be present in Well #6, the new water treatment system will remove it down to 5 ug/L (below the MCL of 10 ug/L, or 0.01 ppm).

**4. Identification of all new facilities, policies, and actions required to obtain the physical benefits:** The project includes the drilling of a new water well in the deep aquifer, installation of a 600,000-gallon water holding tank, chlorine generation equipment, electrical controls, instrumentation, fencing and water treatment system to remove arsenic and other undesirable elements as required by potable drinking standards. The project also includes the implementation of water conservation and water efficiency programs. These project components will need to be constructed and implemented in order to obtain physical benefits. No new policies will be required, though several permits will need to be prepared and approved (as described in the Work Plan) in order to implement the project and achieve physical benefits.

**5. Description of any potential adverse effects and mitigations:** The impacts of construction of the deep well and storage tank are expected to be minimal. There will be no traffic disruptions, or disruptions to water service. Dust and noise created in the course of construction activities are expected to be short-term and minimal (insignificant). Baker tanks will be used to manage mud that results from drilling. Any runoff from construction activities will be contained onsite.

**6. Description of whether the project effectively addresses long-term drought preparedness:** The project will provide immediate regional drought preparedness. The new well in the 1400 Foot (Deep) Aquifer will provide Castroville with a steady, ample, long-term supply of potable water, ensuring a new, secure source of water in the event of drought. The aquifer is estimated to contain approximately 4.6 million AF of fresh water, with an estimated recharge rate of 65,500 AFY.[41] Construction of the new well will also result in reduced groundwater pumping by 500 AFY in the 400 Foot Aquifer, thereby reducing the rate of seawater intrusion in that aquifer. This will provide improved drought preparedness not only for the community of Castroville but for the North County coastal region, which relies almost entirely on the 400 Foot Aquifer for its agricultural and drinking water supply.

The project will promote water conservation by implementing a program of workshops and trainings to educate consumers on reducing water consumption, and a rebate program for installation of water saving devices, including "Laundry to Landscape" kits, rain barrels, and rainwater collection cisterns. Water conservation activities will include turf replacement, improving landscape irrigation efficiencies. This component of the project is expected to produce long-term reduction of water use on the order of 17.3 AFY.

Finally, the project will enable more efficient groundwater basin management, removing competition between municipal and agricultural users at the same groundwater source, the 400 Foot Aquifer.

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[37] Lo´aiciga, H.A. T. J. Pingel, and E. S. Garcia. 2012. Sea Water Intrusion by Sea-Level Rise: Scenarios for the 21st Century. Ground Water, Vol. 50, No. 1. January-February 2012 (pp 37-47.

[38] Ibid.

[39] Monterey Bay Analytical Services, June 22, 2015, for Castroville Community Services District.

[40] Personal communication with Castroville CSD General Manager, email August 5, 2015.

[41] Thorup 1983, p. 4.

## Direct Water-Related Benefit to a DAC

The proposed project area encompasses a DAC. The CCSD supplies water to the community of Castroville, with a customer base of about 7,000 people. According to 2009-2013 ACS data, two out of the four block groups that comprise the CCSD service area – Block Groups 1 and 2 – qualify as DAC. With a combined population of 3,050 in Block Groups 1 and 2, out of a total service area population of 7,000, the project serves a 44% DAC area. Please see Attachment 7 for a more detailed description and map.

Seawater intrusion in the 400 Foot Aquifer poses an imminent threat to the community's water supply. Three out of the community's four existing water supply wells draw from the 400 Foot Aquifer (the fourth well, drawing from the Deep Aquifer, is not yet operable). The District's General Manager predicts, based on historical trends that have been accelerated due to drought, that seawater intrusion will impact the community's drinking water supply likely within the year. This low-income community cannot afford to construct a new well without funding support. Without such support, the District will need to raise water rates precipitously (potentially forcing some or many in the community to relocate), and will most likely need to truck in bottled water for its 7,000 customers as a short-term solution.

The proposed project addresses the problem of the community's impending water supply contamination by providing a new source of water from the 1400 Foot Aquifer that is not impacted, nor is likely to be impacted, by seawater intrusion. There is an ample supply of water in the 1400 Foot Aquifer, which will provide for the community's water supply needs long into the future. This will provide both improved drought preparedness and long-term water supply reliability.

The project meets the following definition of critical water supply/water quality need of a DAC: "Infrastructure renovations to a public water supply system necessary to assure continued reliability of the minimum quality and quantity of water." The project also addresses the Human Right to Water Policy by ensuring the provision of clean, affordable, and accessible water for human consumption, cooking, and sanitary purposes.

## Project Performance Monitoring Plan

Castroville CSD will develop and submit a Project Performance Monitoring Plan as part of the Castroville Water Supply and Water Conservation Project. The Project Performance Monitoring Plan will include narrative summary of the specific accomplishments achieved during the quarterly cycle, problems encountered or anticipated, plans for resolving problems, and anticipated milestones to be achieved during the next quarter; and will include reporting to regulatory agencies as required, and ensuring that data is reported in accordance with the IRWM Plan approved for the Greater Monterey County for data sharing with appropriate State agencies. The Project Performance Monitoring Plan will also track the project's pace in meeting the benefits claimed in Table 5 through the following methods:

Primary Physical Benefit: Improved Water Supply Security, Efficiency, and Reliability

(a) *500 AFY of water produced:* The amount of water produced by the new deep well will be monitored via the well pump flow meter. This benefit will be measured on a daily basis upon completion of the project, and will be reported to MCWRA, SWRCB, and DWR on an annual basis following project completion. Since project construction will occur at the end of year 1, we will expect only 100 AFY to be produced from the new well in the first year. We expect production to equal at least 500 AFY in the remaining years of the project (years 2 – 40).

(c) *600,000-gallons of additional storage:* Castroville CSD will conduct an annual performance assessment of the 600,000-gallon storage tank throughout the lifespan of the project, beginning in year 1. The CSD will track average water storage volume in all three storage tanks combined, and report that data in quarterly progress reports to DWR. The goal is to ensure that the three tanks combined store enough water, at minimum, to meet daily consumption needs (800,000 gallon/day) plus an additional 500,000 gallons, at any one time for firefighting preparedness (at minimum) and for drought preparedness and other emergencies.

*(d) 17.3 AFY water saved from water conservation and efficiency activities:* The installation of water efficiency devices and the implementation of water conservation workshops/trainings will be tracked by the number of rebates offered and water efficiency devices installed, the total square footage of turf replaced, and by the number of workshops/trainings conducted and number of participants at each workshop. All water efficiency installations and water conservation workshops will have been completed by year 2 of the project. Monitoring for effectiveness will be accomplished by comparing the total metered usage in baseline year 2015 against a target reduction of 17.3 AFY by the end of year 3 of the project. All of this data will be reported in quarterly progress reports to DWR until project completion, and then annually through year 7 of the project (five years of reporting).

Secondary Physical Benefit: Improved Water Quality

(a) *Estimated reduction of 363 mg/L chlorides in water supply:* This benefit will be measured by regular water quality testing of the new well water source. Testing will occur on a quarterly basis and will measure the concentration of chlorides. Results will be reported to DWR in the final project report, and to the State Water Resources Control Board (SWRCB) and MCWRA in annual reports thereafter.

(a) *Reduced advancement of seawater intrusion proportionate to reduced pumping of 500 AFY:* MCWRA monitors the advancing location of the seawater intrusion front on an annual basis, but this measurement is not precise, given the variability of monitoring well locations. Researchers at UC Santa Barbara have developed a model for predicting the changes that groundwater extraction and/or sea level would cause for specified levels of groundwater salinization at strategic locations and times; however, it is beyond the technical capabilities of the Castroville DAC to run the model. Given these limitations, this benefit will be measured simply by how much water the new deep well produces on an annual basis from the 1400 Foot Aquifer, with the assumption that the advancement of seawater intrusion is reduced proportionate to that amount. The volume of water produced by the new well will be monitored via the well pump meter, measured on a daily basis, and reported following project completion on an annual basis to MCWRA, SWRCB, and DWR.

**Table 6 – Project Performance Monitoring Plan**

**Project: Castroville Water Supply Well #6**

| Proposed Physical Benefits | Targets | Measurement Tools and Methods |
|---|---|---|
| Improved water supply security, efficiency, and reliability | (a) 100 AFY water produced in year 1; 500 AFY water produced in years 2 – 40.<br>(c) 600,000-gallons of additional water storage capacity.<br>(d) 17.3 AFY water saved from water conservation and efficiency activities. | (a) Pump meter, tested daily and reported after project completion, on an annual basis, to MCWRA, SWRCB, and DWR.<br>(c) Annual performance testing of new tank; tracking of actual combined storage in all three tanks to ensure 1.3 M gallons of storage for all purposes. Report in project completion report to DWR.<br>(d) Track # of rebates/workshops, total square footage of turf replaced, # of participants. Measure amount of water saved by comparing the total metered usage in baseline year 2015 against a target reduction of 17.3 AFY by the end of year 3 of the project. Report results to DWR in quarterly progress reports until project completion and annually until the end of year 7 (five years of reporting). |
| Improved water quality | (a) Estimated reduction of 363 mg/L in water supply (expected target: about 137 mg/L chlorides in Well #6 water supply, though anything below 250 mg/L will be acceptable)<br>(a) Reduced pumping of 500 AFY on 400 Foot Aquifer | (a) Quarterly water sampling in Well #6, reporting to DWR in project completion report; thereafter, report monitoring results on annual basis to SWRCB and to MCWRA.<br>(a) Pump meter, tested daily and reported after project completion, on an annual basis, to MCWRA, SWRCB, and DWR. |

## Cost-Effectiveness Analysis

<table>
<tr><th colspan="2">Table 7 – Cost Effective Analysis<br>Project: Castroville Water Supply and Water Conservation Project</th></tr>
<tr><td>Question 1</td><td>Types of benefits provided as shown in Table 5: For the purposes of the Cost Effectiveness Analysis, we will focus on the following two benefits:<br>- 500 AFY potable water produced<br>- Estimated reduction of 363 mg/L chlorides in water supply vs. seawater-contaminated water (500+ mg/L)</td></tr>
<tr><td rowspan="3">Question 2</td><td>Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? Yes</td></tr>
<tr><td>If no, why? N/A</td></tr>
<tr><td>If yes, list the methods (including the proposed project) and estimated costs. See below.</td></tr>
<tr><td>Question 3</td><td>If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.<br>The project is the least cost alternative.</td></tr>
<tr><td colspan="2">Comments:<br><br>The Castroville Water Supply and Water Conservation Project has a present value cost of $5.7 million. Alternative methods that have been considered include the following:<br><br>1) Construct Desalination Plant: Present value cost: $14 million, minimum + O&M<br><br>The cost of constructing a desalination facility would be astronomical for a small low-income community such as Castroville. The nearby city of Sand City recently installed a desalination plant to provide 300 AFY at a cost of $14 million dollars.[42] But even setting aside the construction costs, the O&M costs alone would make this alternative infeasible. CSD staff estimate that O&M costs for desalination would be roughly $2,500-$3,000/AF.[43] This is compared to current costs, which are on average $100/AF (in winter: $95-$98/AF; in summer: $113/AF).<br><br>2) Purchase Imported Water: Present value cost: $16.8 million + cost of transportation + O&M<br><br>The Castroville CSD could purchase imported water to meet the need for 500 AFY of water. In order to not exacerbate other drought-impacted communities, the likely solution would be to obtain water from a desalination plant. Production at the newly constructed desalination plant in the nearby city of Sand City is not sufficient to offer purchase. Several desalination plants in the Monterey Bay region currently are in the early stages of concept to test wells. The most advanced project in the pipeline of projects is the Monterey Supply project, estimated at $328 million (State of California Division of Ratepayer Advocates) to produce 9,750 AFY of water. If Castroville CSD were to pay for the Monterey Supply Project water, then it is reasonable to expect that the District would pay the fair share of the capital cost, plus the ongoing O&M plus the cost to deliver the water from the facility to Castroville. Evaluation of the fair share of capital cost immediately makes this option a more expensive option. The ratio of water needed from the Monterey Supply Project would be the ratio of AF of water needed for Castroville divided by the amount of water the Monterey Supply Project produces: 500 AFY/9,750 AFY. This ratio is then multiplied by the total capital cost of the Monterey Supply Project: capital cost x ratio = equivalent alternative = 500/9750 x $328 million = $16.8 million. This ratio shows the cost to recover the share of the project cost. The District would pay a much greater expense for the water than the option of drilling a new water well and providing a water supply at $5.7 million. It should be noted that the cost of transportation would be added along with the cost of O&M, which would be extensive. In addition to the cost of transportation there is an undesirable effect of the increased greenhouse gas emissions necessary to transport the water, or the cost of infrastructure to build a pipeline between the desalination plant and the community of Castroville.</td></tr>
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[42] Roach 2014.
[43] Ibid. (Estimate based on Roach 2014 article.)