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Developing Equitable and Effective Early Action Plans

The Cost of Interim Drinking Water Solutions and Public Outreach for Nitrate Contaminated Drinking Water

Analysis for Kings Basin, Kaweah Basin, Tule Basin, Turlock Basin, Modesto Basin, Chowchilla Basin and Tulare Lake Basin – San Joaquin Valley, CA

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Prepared for Community Water Center

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Executive Summary

Purpose

Nitrate contamination has resulted in significant impairment to groundwater relied upon for drinking water supplies throughout California's San Joaquin Valley. While long-term solutions needed to mitigate nitrate contaminated drinking water sources are under evaluation, the communities relying on a water source that is unsafe due to high nitrate concentrations must be provided an interim source of safe drinking water. **The specific focus for this effort has been on developing a cost estimate for interim drinking water solutions and associated public outreach and education for Management Zone Early Action Plans, as required by the Central Valley Basin Plan Amendments, for the following sub-basins of the San Joaquin Basin: Kings Basin, Kaweah Basin, Tule Basin, Turlock Basin, Modesto Basin, Chowchilla Basin and Tulare Lake Basin**.

This report provides an overview of the Public Water Systems (PWS) that are known to have high concentrations of nitrate based on data publicly available from the Safe Drinking Water Information System (SDWIS) federal reports data, water quality data available through the State Water Board's Division of Drinking Water (DDW), and the State Water Board's Human Right to Water (HR2W) data. Data on groundwater quality available through the Groundwater Ambient Monitoring and Assessment Program (GAMA) has also been analyzed to identify State Small Water Systems (SSWS) and private domestic wells that may be impacted by high concentrations of nitrate. With the data available, an alternatives analysis was conducted to determine the most appropriate interim drinking water supplies for each of the PWS nitrate levels known to exceed regulatory limits. A similar analysis was conducted for SSWS and private domestic wells in areas considered to be high-risk for excessive nitrate contamination based on GAMA data.

Due to the lack of reliable data for private domestic wells, the estimated number of people that need a safe interim drinking water source is difficult to fully determine without further surveys and on-the-ground investigation. For the purpose of this report, a conservative number of people who are likely impacted by unsafe drinking water due to contamination is provided in Table 0-1. These numbers are likely on the low end as only a percentage of the private domestic wells located in areas identified by GAMA as high-risk for nitrate have been included. Table 0-1 should be used as a starting point in the estimation of the number of people in each sub-basin that will require an interim drinking water supply, as private domestic wells and SSWSs that are located in areas not considered to be high-risk for nitrate may also produce water with nitrate exceeding health standards, and because a higher percentage of domestic wells in the high-risk areas may have nitrate contamination than what is estimated and put forward in this report.

Table 0-1 – Number of people by sub-basin impacted by unresolved nitrate contamination in drinking water.

	Chowchilla	Kaweah	Kings	Modesto	Tulare Lake	Tule	Turlock	Total
PWS	0	1,992	2,060	222	0	6,078	77	10,429
SSWS	0	75	55	25	0	75	161	391
Private Domestic Wells	218	1,422	2,917	384	86	528	1,445	7,000
Total Estimated Population Impacted by Sub-Basin	218	3,489	5,032	631	86	6,681	1,683	17,820

Interim Water Supply Solution Overview

The interim drinking water solutions considered in this study include delivered bottled water, point-of-use (POU) treatment[1], and water kiosks supplied by water from a PWS that is compliant with drinking water standards. The recommendations developed in this effort are based on available data and assumptions for the purposes of high-level cost estimation; no pilot, trials, or field studies have been conducted. It is critical to have the final determination of the optimal interim drinking water solution made on a case-by-case basis after coordinating closely with each community**. For instance, POU devices cannot be assumed to be effective in providing safe drinking water in all or even many cases, as there are numerous factors that may impede the devices from reliably producing water completely safe for human consumption.** As an example, a private domestic well contaminated with bacteria, 1,2,3-Trichloropropane (TCP), or arsenic would not be best served by a reverse osmosis (RO) POU device as these contaminants may pass through the device or may cause membrane fouling resulting in reduced treatment effectiveness. Additionally, extremely high levels of nitrate cannot be effectively removed to safe levels by POU devices. Therefore, the only way there can be any confidence that POU devices are providing safe drinking water is to have regular maintenance and to have water quality sampling done on a regular basis (at least quarterly). Water kiosks should also be carefully evaluated to determine suitability for each community**. There are a number of reasons why water kiosks may not adequately serve the communities needing safe drinking water. For instance, many of the people who are most in need of an interim drinking water supply are often economically disadvantaged and may experience further economic strain if they need to drive a long distance to a water kiosk on a regular basis to retrieve water.**

Factors that were considered in the interim drinking water alternatives analysis for PWS, SSWS and private domestic wells included:

- Demographics of the community that may impact ability to lift heavy water bottles such as age and disability
- Water quality factors that may impact effectiveness of POU devices
- Community economic status
- Proximity to a PWS compliant with drinking standards that could accommodate a kiosk
- The expected duration that interim water supplies will be required before permanent drinking water solutions are implemented. **Interim solutions, such as kiosks and POUs, which have high upfront capital costs do not provide a good return on investment if the expected duration of use is five years or less, as compared to delivered bottled water**.

Given the complexities of safely providing interim drinking water solutions, Management Zones should strongly consider contracting with technical assistance providers and Community Based Organizations to facilitate the provision (including necessary ongoing maintenance) of interim drinking water solutions.

Summary of Data and Methodology Used in Evaluation

Water quality data submitted to DDW and SDWIS by public water systems was used to identify the systems needing an interim drinking water supply due to unresolved nitrate violations. Accessibility to this data facilitated a more comprehensive interim drinking water supply alternatives analysis for the PWSs included in this evaluation. Consequently, the interim water solution recommendations for each PWS are provided with a more detailed explanation as to why various solutions would be more suitable than others.

Unlike PWSs, SSWSs are not required to submit water quality monitoring data to the State and therefore the data needed to conduct a more detailed analysis was not available. To pinpoint the SSWSs likely to require an interim drinking water supply, the research team mapped all known SSWSs into GIS over the GAMA data to identify the

[1] Point-of-entry (POE) cost analysis was not included in this report.

water systems located in areas known to have groundwater with nitrate near or above the maximum contaminant level (MCL) of 10 mg/L. The same approach was used for a small number of water systems that have a public water system ID (PWSID) but lack publicly available water quality data.

As previously mentioned, understanding the extent of private domestic well nitrate contamination is challenging due to a lack of available data. The exact location of the wells recorded within the state is not readily available. The data that is available only provides the number of private domestic wells in a square mile. A field survey will be necessary to verify if the wells included in the square mile count are currently in use for drinking water provision**. As water quality data for private domestic wells in the San Joaquin Valley is also sparse, an extensive effort will be required to sample and analyze water from wells used for drinking water provision to verify if the water is safe for consumption.** In order to develop high-level cost estimates for interim drinking water supplies and public outreach and education, the research team utilized GIS to map the well count data over GAMA data to estimate the number of private domestic wells located in areas considered to be high-risk for nitrate contamination. The cost estimates related to private domestic wells for interim drinking supplies and public outreach and education are conservative and should only be used for early-stage budgetary planning. **There may be more wells impacted by nitrate that have not included in this study. The true extent of nitrate impairment in private domestic wells will likely not be known until an extensive water quality study is conducted in each sub-basin.**

Outreach and Education Cost Development

Outreach and education costs were developed with the cooperation of Self-Help Enterprises (SHE). Considerations that have been factored into the estimated cost for outreach and education include:

- Time and materials for printed education media
- Translation services
- Staff time for in-person outreach (public meetings, phone contact, virtual meetings, etc.)
- Data management
- Travel expenses
- Miscellaneous expenses (postage, advertising, rentals, etc.)
- Water quality testing (domestic wells)

Outreach and education expenses are expected to be the highest in the first year when materials are developed, initial contact is made with communities, and information is gathered that may impact the suitability of various interim drinking water options. Outreach to private domestic wells in the first year will likely require substantial resources as contact information for private domestic well owners and well water quality is not readily accessible. Furthermore, water quality information will need to be gathered through sampling and analysis to establish if nitrate or other contaminants are present in the water produced by private domestic wells and the wells used by SSWSs. While the greatest effort will occur at the start of a public outreach and education program, it is critical that contact with nitrate impacted communities continues until permanent safe drinking water solutions are provided.

Community based organizations (CBOs) like Community Water Center and Leadership Counsel for Justice and Accountability, in addition to SHE, have particular expertise at reaching the most impacted communities. CBOs like these organizations also have unique outreach and engagement strategies and capacities above and beyond those identified in this report, and have developed safe strategies to continue public engagement and outreach to vulnerable communities even during the pandemic. These strategies include contactless pamphlet and material drops, digital outreach strategies utilizing texting and social media, phone calls, culturally competent outreach for well testing and facilitating implementation of short and long-term drinking water solutions, and more. These costs were not included in this report's cost estimates. **Management Zones should partner with CBOs to successfully conduct outreach and engagement strategies to the most impacted residents.**

Summary of Estimated Cost for Interim Water Supplies and Public Outreach and Education

Based on the interim water supply recommendations, high-level cost to implement and maintain identified interim solutions were developed for each of the sub-basins. The cost factors that were used for each of the interim water supply solutions considered in this study were developed using available literature and information provided by technical assistance organizations that have facilitated public outreach for nitrate impacted communities, as well as the delivery of POUs and bottled water

The cost estimates developed in this effort are intended to provide Management Zones a *high-level* approximation of the funding that is needed for interim drinking water supplies and public outreach and education. The final costs will ultimately depend on a number of factors and should involve coordination with the State and stakeholders in impacted communities to determine the interim drinking water solutions that will best meet the needs of each community.

A summary of the cost estimates for each sub-basin is provided in Table 0-2. Note that "Year 1- Total Outreach Cost" includes water quality analysis (aka, well sampling) for SSWSs and domestic wells. It is also important to note that cost estimates provided in Table 0-2 only include the cost of nitrate analysis that is needed to identify nitrate impacted private domestic wells and to verify POU effectiveness in removing nitrate. Analysis of additional water quality parameters will be necessary, in particular for private domestic wells, if POU treatment is considered. In addition to nitrate, groundwater in various area of the San Joaquin Valley has been found to have contaminants such as bacteria, arsenic, perchlorate, 1,2,3-trichloropropane, uranium, and other constituents that can impact human health and the effectiveness of POU treatment. An estimate of the cost of additional water quality analysis needed to fully assess the safety of water produced by private domestic wells in each sub-basin is provided Table 0-3. These costs are provided separately as funding for multiple parameter water quality analysis may be shared with other funding programs, such as the Safe and Affordable Funding for Equity and Resilience (SAFER) program.

Table 0-2 - Summary of costs for interim water supplies and public outreach for all sub-basins (values rounded to the nearest 100)

	Chowchilla	Kaweah	Kings	Modesto	Tulare Lake	Tule	Turlock
Year 1 - Total Cost for all Interim Water Supplies	$83,300	$901,200	$1,518,000	$271,100	$26,700	$2,043,600	$703,500
Annual Total Cost for Interim Water Supplies Beyond the First Year	$43,800	$427,800	$771,000	$138,600	$26,700	$1,792,000	$296,600
Year 1 - Total Outreach Cost (includes water quality analysis - nitrate only)	$67,200	$561,300	$1,494,300	$223,700	$45,200	$665,900	$730,200
Annual On-Going Outreach Cost	$2,900	$43,600	$75,300	$11,100	$2,000	$109,400	$32,300

Table 0-3 – Estimated cost of multiple parameter water quality analysis for private domestic well by sub-basin (values rounded to the nearest 100)

	Chowchilla	Kaweah	Kings	Modesto	Tulare Lake	Tule	Turlock
Total number of wells in areas high-risk for nitrate based on GAMA data	98	1077	2110	310	66	413	1062
Cost of multiple parameter water quality anaysis including: inorganic, physical, general mineral, TCP (low level), VOC, HPC, and IDEXX Quanti-Tray = **$695/well**	**$ 68,100**	**$ 748,500**	**$ 1,466,500**	**$ 215,500**	**$ 45,900**	**$ 287,000**	**$ 738,100**

Cost Estimating Calculator

As more information is developed in the future, stakeholders such as Management Zones, DDW, or non-governmental organizations (NGOs) may want to adjust some variables and scenarios that impact the costs of interim water supplies, as well as public outreach and education. For this reason, a calculator tool has been developed as a part of this project. The calculator tool incorporates the available data for PWSs, as well as the data used to identify the number of potentially nitrate impaired SSWS and private domestic wells in each of the sub-basins evaluated in this study. Calculator users are able to modify various inputs, such as the cost estimation of the various interim water supply solutions, or the percentage applied for each interim water supply alternative as part of the total solution for each sub-basin.

1. Purpose

Nitrate contamination has resulted in significant impairment to groundwater relied upon for drinking water supplies throughout California's San Joaquin Valley. While long-term solutions needed to mitigate nitrate contaminated drinking water sources are being evaluated, the communities relying on a water source that is unsafe due to high nitrate concentrations must be provided with an interim source of safe drinking water. The specific focus for this effort has been on developing a cost estimate for interim drinking water solutions and associated public outreach and education for several Management Zone Early Action Plans, as required by the Central Valley Basin Plan Amendments for the following sub-basins in the San Joaquin Valley Basin: Kings Basin, Kaweah Basin, Tule Basin, Turlock Basin, Modesto Basin, Chowchilla Basin and Tulare Lake Basin.

This paper provides an overview of the alternatives analysis that was conducted to provide recommendations for appropriate interim water supplies for Public Water Systems (PWS) and State Small Water Systems (SSWS) that are known to have nitrate concentrations in excess of regulatory limits. An alternatives analysis was also conducted for private domestic wells that are in areas known to have nitrate concentrations in excess of the Maximum Contaminant Level (MCL) of 10 mg/L (as N). Based on the alternatives analysis, interim water supply solutions are recommended for each PWS individually. As there is less data available for SSWS and private domestic wells, interim water supply recommendations have been made collectively for each sub-basin. The interim water supply solutions considered for this effort includes bottled water, Point of Use (POU) reverse osmosis treatment and water kiosks supplied by water from a PWS that is compliant with drinking water standards.

Based on the interim water supply recommendations, the high-level cost to implement and maintain the interim solutions were developed for each of the sub-basins. The estimated cost for public outreach and education have also been developed for each sub-basin as a part of this effort. The cost estimates developed in this effort are intended to provide Management Zones a *high-level* approximation of the funding that is needed for interim drinking water supplies and public outreach and education. The final costs will ultimately depend on a number of factors, including further domestic well and SWSS sampling, and should involve close coordination with the State and stakeholders in impacted communities to determine the interim drinking water solutions that will best meet the needs of each community.

2. Methodology Used to Identify Nitrate Impaired Drinking Water Systems and Domestic Wells

The database used to identify nitrate impacted PWS, SSWS and domestic wells houses all relevant data for the project, including information required for and generated by the GIS and cost evaluation efforts. The database is a PostgreSQL (Postgres) database managed using pgAdmin, an open-source administration and development platform for Postgres. The open-source software R for statistical computing is used as needed for data analysis and formatting data tables ahead of uploading to the PostgreSQL database. The following sources have been incorporated into the database:

- Safe Drinking Water Information System (SDWIS) federal reports data (EPA, SDWIS Federal Reporting Services System, 2020)
- State Water Board's Division of Drinking Water, water quality data (SWRCB , 2020)
- Water system economic status from the GIS analysis
- HR2W data (SWRCB, 2020)
- Groundwater Ambient Monitoring and Assessment (GAMA) Program Groundwater Information System (SWRCB, 2020)

- Selected information from the electronic annual reports[2] and information from a few select sanitary surveys[3]

To incorporate small systems, multiple small system datasets have been mined, merged and joined with the California Water System Service Area dataset. As needed, the small systems have been located in GIS using the Groundwater Ambient Monitoring and Assessment (GAMA) Program Groundwater Information System's Groundwater Well Locations dataset based on water system identification, or reverse geocoded to addresses provided from the raw sources. State small water system locational data from a recent RCAC project was also incorporated. Data was not available for all counties, and the data was provided in a variety of formats. More information on the RCAC project can be found on page 23.

The GAMA Needs Analysis Tool[1] was developed by the Division of Water Quality Groundwater Ambient Monitoring and Assessment Unit of the State Water Resources Control Board to identify at-risk domestic wells and state small water systems. The dataset includes the domestic well count in one square mile sections by Public Land Survey System (PLSS) sections from Department of Water Resources Online System of Well Completion Reports. Water quality information for nitrate, arsenic, hexavalent chromium, uranium, 1,2,3 trichloropropane (123-TCP), and perchlorate was downloaded from the GAMA tool to assess the incidence of these contaminants individually and as co-contaminants.

Also, as a part of this effort, the GAMA data on groundwater quality was compared with the water quality model that was developed by Luhdorff and Scalmanini Consulting Engineers (LSCE) in 2016 for the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) to ensure that there are not major discrepancies between the two models. A summary of this evaluation is provided in Appendix A.

Census data has also been incorporated into the database to provide insights on critical community considerations that may impact the selection of appropriate interim drinking water solutions and the implementation of an appropriate public outreach and education program. The following census categories are utilized for this effort: Median Household Income to determine Disadvantaged Community (DAC) and Severely Disadvantaged Community (SDAC) status, age 65+, disability, transportation modes, and ability to speak and understand English.

3. Factors Considered in the Evaluation of Appropriate Interim Drinking Water Solutions

A number of considerations that have been evaluated to determine the appropriate interim water solution(s) that should be applied to each water system and to private domestic wells in each sub-basin. The capital and operational costs of the interim solutions are an important factor for consideration when evaluating interim water supply options. That said, other critical factors that will impact the viability and effectiveness of the various interim water solutions have been considered in this evaluation. The solutions considered include POU treatment, delivered bottled water, and water kiosks supplied by water from a PWS that is compliant with drinking water standards. The following factors have been considered in the evaluation of the interim water solutions:

Point-of-Use Treatment

- Water quality can impact the effectiveness of POU treatment devices. POU treatment cannot be guaranteed to remove nitrate at extremely high concentrations as POU Reverse Osmosis (RO) treatment will typically remove only 80% of nitrate. The removal rate can be further impaired by other contaminants often found in water sources including iron, manganese, hardness, silica and bacteria.

[2] Provided by the Board

[3] Provided by the Board

- Other contaminants, such as 1,2,3-tricholopropane (TCP), may not be effectively removed by a POU device, thereby resulting in consumers feeling a false sense of safety about the water produced.
- Regular POU maintenance is required to ensure proper operation. Homeowners or renters must be willing to participate in on-going POU maintenance.
- Water quality must be monitored frequently (at least quarterly) after a POU is installed to ensure that the device is effectively removing nitrate and other contaminants to a safe level. It is essential that water quality monitoring include parameters beyond nitrate as the occurrence of co-contaminants, such as TCP, arsenic, or coliform bacteria, may not be effectively removed and if not included in regular monitoring could cause water users to have a false sense of safety.
- Plumbing configuration or age of homes or buildings may prevent installation of POU treatment devices.
- If a POU device fails, a plan must be in place to immediately provide that home with a backup source of interim safe water, for example delivered bottled water.

Bottled Water

- 5-gallon water bottles may be too heavy for certain populations such as elderly or disabled.
- Bottled water will require regular delivery schedules and programs should have a plan for how to provide bottled water to a household that may run out of water prior to the next delivery.

Kiosks

- Nitrate impaired PWSs, SSWSs, and domestic wells must fall within a 10-mile radius of a public water system that is compliant with water quality standards that would allow for a kiosk connection. The 10-mile radius does not account for actual overland mileage to and from kiosks.
- Demographic factors such as populations over the age of 65, or populations that are disabled must be considered, as people falling in these categories may not be able to access kiosks or lift and carry heavy bottles of water after filling at a kiosk.
- DAC and SDAC communities may not be able to access kiosks due to a lack of transportation or transportation costs associated with driving to kiosk locations.
- Kiosks must get approval for connection from compliant water systems. Approval from other local governing entities may be required.
- Businesses and community organizations may not have staff or volunteers available to pick-up water from kiosk locations, or the volume of water needed for those entities may make kiosk pickup infeasible.

The final decision of which interim water supply solution is most appropriate for water systems and individual households should be made after additional information is collected from drinking water users in the community. Implementing an effective public outreach and education program, with a particular focus on the most impacted community residents, prior to the final determination of interim drinking water solution(s) is absolutely critical.

4. Interim Drinking Water Supply Solution Alternatives Analysis for Nitrate Impaired Public Water Systems (PWS)

A public water system is defined by the Environmental Protection Agency (EPA) as one that provides water for consumption through pipes or other constructed conveyances to at least 15 service connections or serves an average of at least 25 people for at least 60 days a year. Such systems may be either publicly or privately owned and are further divided into the following classifications:

- Community Water System (CWS): A public water system that supplies water to the same population year-round.

- Non-Transient Non-Community Water System (NTNCWS): A public water system that regularly supplies water to at least 25 of the same people at least six months per year. Some examples are schools, factories, office buildings, and hospitals which have their own water systems.
- Transient Non-Community Water System (TNCWS): A public water system that provides water in a place such as a gas station or campground where people do not remain for long periods of time.

The data for this evaluation was narrowed to include only the systems that have unresolved Safe Drinking Water Information System (SDWIS) violations for nitrate and/or have been identified on California's Human Right to Water list for nitrate that exceeds the maximum contaminant level (MCL) of 10 mg/L (as N). Systems that are on the Human Right to Water list but have recently returned to compliance due to physical consolidation with another water system or implementation of new treatment are not included (City of Turlock and Sierra View Jr Academy for example). Additionally, not all businesses with SDWIS violations have been included. Only businesses or public organizations which provide service to the general public, such as markets, schools, and churches, have been included. Table 4-1 provides a listing of the PWS in each basin that meet the above stated criteria.

Table 4-1 - All Public Water Systems with on-going nitrate violations based on 2020 data utilized for this report

Subbasin	System ID	System Name	PWS Type	Population Served	Connections	SDWIS Violation	HR2W List
KAWEAH	CA5400709	SEQUOIA UNION SCHOOL	NTNC	400	1	Yes	Yes
KAWEAH	CA5400795	WAUKENA ELEMENTARY SCHOOL	NTNC	245	5	Yes	Yes
KAWEAH	CA5402030	WAUKENA MARKET	TNC	100	1	Yes	No
KAWEAH	CA5403122	P C FOOD MART	TNC	500	1	Yes	No
KAWEAH	CA5400616	LEMON COVE WATER CO	CWS	109	50	Yes	Yes
KAWEAH	CA5410007	LSID - TONYVILLE	CWS	500	50	Yes	Yes
KAWEAH	CA5400682	PLAINVIEW MWC - CENTRAL WATER	CWS	138	42	Yes	Yes
KINGS	CA1000057	DEL ORO WATER CO - METROPOLITAN DISTRICT	CWS	99	28	Yes	Yes
KINGS	CA5402043	MONSON MARKET	TNCS	30	2	Yes	No
KINGS	CA5400636	OROSI HIGH SCHOOL	NTNC	1200	14	Yes	Yes
KINGS	CA5401003	EAST OROSI CSD	CWC	700	106	Yes	Yes
KINGS	CA5402047	GLEANINGS FOR THE HUNGRY	CWS	31	12	Yes	Yes

Subbasin	System ID	System Name	PWS Type	Population Served	Connections	SDWIS Violation	HR2W List
MODESTO	CA5000295	SHILOH SCHOOL DISTRICT	NTNC	105	7	Yes	Yes
MODESTO	CA5000426	LIBERTY BAPTIST CHURCH	TNC	65	2	Yes	No
MODESTO	CA5000435	BLOOMINGCAMP WATER SYSTEM	TNC	50	12	Yes	No
TULE	CA5400558	SAUCELITO ELEM SCHOOL	NTNC	98	3	Yes	Yes
TULE	CA5400666	DEL ORO GRANDVIEW GARDENS	CWS	347	119	Yes	Yes
TULE	CA5400735	RODRIGUEZ LABOR CAMP	CWS	110	35	Yes	Yes
TULE	CA5400964	SIERRA VISTA ASSN	CWS	44	13	Yes	Yes
TULE	CA5403039	TEA POT DOME WATER CO	TNCS	40	4	Yes	No
TULE	CA5410014	TIPTON COMMUNITY SERVICES DIST	CWS	1792	600	Yes	Yes
TULE	CA5400994	HOPE ELEMENTARY SCHOOL	NTNC	275	1	Yes	Yes
TULE	CA5410024	RICHGROVE COMMUNITY SERVICES DISTRICT	CWS	3400	524		Yes
TURLOCK	CA5000402	OUR LADY OF ASSUMPTION CHURCH	TNCS	26	1	Yes	No
TURLOCK	CA5000462	BEST WESTERN-ORCHARD INN	TNCS	26	1	Yes	No
TURLOCK	CA5000525	OASIS MARKET	TNCS	25	1	Yes	No

4.1 Public Water System Interim Water Solution Analysis by Basin

To gain a further understanding of the conditions within each PWS that may impact the appropriate selection of an interim water supply the PWSs listed in Table 4.1 have been further broken down by sub-basin to analyze:

- Proximity to a compliant PWS where a kiosk could be located (Figure 4-1.)
- Basin demographics such as population per household, percent of population age 65+, percent population disabled, percent DAC and SDAC.

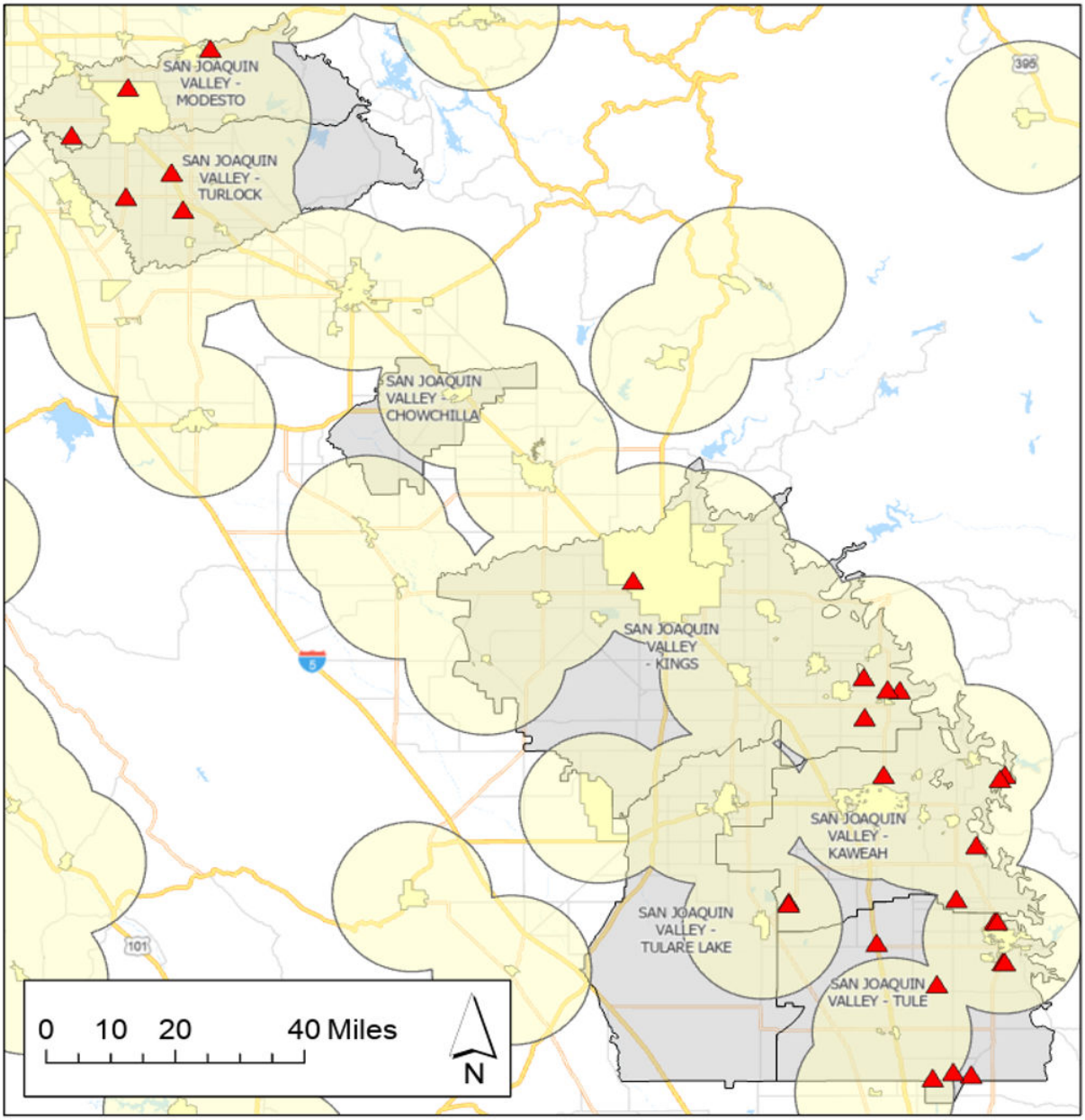

Figure 4-1 - Non-compliant public water system locations (triangles) and proximity to a potential kiosk location. The yellow circles indicate a 10-mile radius from around an area where a kiosk could be connected to a compliant public water system.

4.1.1 Chowchilla Sub-Basin

There are no PWSs in the Chowchilla Sub-Basin with unresolved violations for nitrate at the time of this report being published.

4.1.2 Kaweah Sub-Basin

There are seven (7) PWSs in Kaweah Sub-Basin that either have a SDWIS nitrate violation or are on the HR2W list for nitrate contamination at the time of this report being published. Table 4-2 provides water quality and census related data by PWS. Water quality violations for contaminants other than nitrate are included if known.

Table 4-2 - Water quality and census data for nitrate impacted Public Water Systems in the Kaweah Sub-Basin based on 2020 data utilized for this report

System Name	Nitrate Max MG/L	Other Water Quality Violations	% Age 65 +	% Disabled	% DAC	% SDAC
SEQUOIA UNION SCHOOL	15	No	16	1	0	0
WAUKENA ELEMENTARY SCHOOL	17.85	No	7	8	100	0
WAUKENA MARKET	21.46	No	7	8	100	0
P C FOOD MARKET	18.4	No	6	11	100	0
LEMON COVE WATER CO	18.1	No	21	12	0	0
LSID – TONYVILLE*	15	Arsenic and perchlorate	15	12	100	0
PLAINVIEW MWC – CENTRAL WATER	15.5	No	13	13	0	100

*Note that the LSID – Tonyville system is a participant in a Proposition 50 funded nitrate treatment project, and strongbase anion exchange treatment for nitrate, arsenic, and perchlorate removal is scheduled for installation in 2021.

4.1.2.1 Evaluation of Interim Water Supply Options for PWSs in Kaweah Sub-Basin

POU Treatment

- The following water quality issues for each system may contribute to poor POU performance:
  - All systems except for Plainview MWC – Central Water have hardness over 7 grains which may lead to increased membrane fouling for POUs using RO.
  - Plainview MWC – Central Water and LSID – Tonyville both have iron concentrations that may lead to increased membrane fouling for POUs using RO.
  - The LSID – Tonyville system also has had arsenic and perchlorate violations which would need to be considered prior to implementing POUs.

Bottled Water

- Bottled water has been used as an interim water supply in some schools in California, however it may not be an appropriate solution for schools and businesses that provide cooked meal service to large populations.
- All of the PWS considered have populations either over 65 years of age and/or disabled, thereby posing a potential problem to heavy water bottles if assistance is not available.

Kiosks

All of the PWS in the Kaweah Sub-Basin are within a 10-mile radius of a compliant PWS where a kiosk could be located. There are however several factors that preclude the use of kiosks as an optimal solution:

- Two of the PWS are schools. The use of kiosks in these cases would not be practical as the amount of water required for the populations served would require frequent trips to and from a kiosk location by staff paid for by the school, thereby putting an undue financial and human resource constraint on the school and population that is served by the school. Furthermore, Waukena Elementary School in an area where the population is 100% DAC. There was no DAC or SDAC information available for the other school.

- Two of the PWS are markets that serve the general public. The use of kiosks in these cases would not be practical as the amount of water required for the populations served would require frequent trips to and from a kiosk location by staff paid for by the businesses, thereby putting an undue financial and human resource constraint on business owners in an area that is considered 100% DAC.
- All of the PWS considered have populations either over 65 years of age and/or disabled, thereby posing a potential problem with accessibility to kiosks and the ability to lift and transport heavy water bottles.

4.1.2.2 Alternatives Analysis of Interim Water Solution Analysis by PWS in Kaweah Sub-Basin

Given the above considerations, the following interim water solutions are recommended:

1. **Schools:** POU treatment is recommended to provide adequate on demand water for cooking purposes. Bottled water should be provided for student and staff drinking water.
2. **Markets:** A POU is recommended in kitchens for cooking. Bottled water should be provided for staff and customer drinking water.
3. **Lemon Cove Water Co (aka. Lemon Cove Sanitary District):** At least 20% of the population in the water system is age 65 or older and 12% of the population has reported a disability. There are approximately 105 people served by 50 connections, averaging roughly 2 people per household and there is no DAC or SDAC data available for this system.
    - Kiosk water should not be considered as a 100% solution due to demographic factors.
    - Either bottled water or POU treatment should be made available to at least 25% of the connections to accommodate people who are not able to access kiosks.
4. **LSID – Tonyville:** At least 15% of the population in the water system is age 65 or older and 12% of the population has reported a disability. There are approximately 500 people served by 50 connections, averaging roughly 10 people per connection. The system is considered to have a population that is 100% DAC. It should be noted that upgraded treatment is planned for installation in the Tonyville system in 2021 and therefore an interim drinking water source may not be required. It has been included in this analysis however, as the treatment has not been installed.
    - Kiosk water should not be considered as a 100% solution due to demographic factors and DAC status.
    - POU treatment may not be appropriate due to water quality conditions such as high concentrations of iron and hardness that may impact the performance of the units. Reduced POU performance due to membrane fouling may result in inadequate removal of nitrate and arsenic to levels consistently below the MCL.
    - Bottled water should be provided to at least 30% of the connections to accommodate people who are not able to access kiosks.
5. **Plainview MWC – Central Water:** At least 13% of the population in the water system is age 65 or older and 13% of the population has reported a disability. There are approximately 138 people served by 42 connections, averaging roughly 3.3 people per connection. The system is considered to have a population that is 100% SDAC.
    - POU treatment may not be appropriate due to water quality conditions such as high concentrations of iron and hardness that may impact the performance of the units. Reduced POU performance due to membrane fouling may result in inadequate removal of nitrate, perchlorate, and arsenic to levels consistently below the MCL.
    - Due to SDAC status, bottled water should be provided to 50% - 100% to reduce the financial burden of travel to and from a kiosk to retrieve water.
    - Kiosk water should not be considered as a 100% solution due to demographic factors and SDAC status.

- Kiosk water should only be considered if the kiosk can be located within a very short drive from the community due the financial burden placed on the SDAC community if required to transport water from kiosks regularly.

4.1.2.3 Recommended Interim Water Solution by PWS in Kaweah Sub-Basin

Table 4-3 provides the recommended interim water solutions by percentage for each PWS in the Kaweah Sub-Basin.

Table 4-3 - Interim water solution recommendations by public water system in Kaweah Sub-Basin based on 2020 data utilized for this report

Recommended Interim Water Supply Solution by PWS				
System Name	**% Kiosk**	**% POU**	**# of POUs**	**% Bottled Water**
SEQUOIA UNION SCHOOL	0%	10%	1	90%
WAUKENA ELEMENTARY SCHOOL	0%	10%	1	90%
WAUKENA MARKET	0%	10%	1	90%
P C FOOD MARKET	0%	10%	1	90%
LEMON COVE WATER CO	75%	10%	5	15%
LSID – TONYVILLE	75%	0%	0	25%
PLAINVIEW MWC – CENTRAL WATER	50%	0%	0	50%

4.1.3 Kings Sub-Basin

There are five (5) PWSs in Kings Sub-Basin that either have an on-going SDWIS nitrate violation and/or are on the HR2W list for nitrate contamination at the time of this report being published. Table 4-4 provides water quality and census related data by PWS.

Table 4-4- Water quality and census data for nitrate impacted Public Water Systems in the Kings Sub-Basin based on 2020 data utilized for this report

System Name	Nitrate Max MG/L	Other Water Quality Violations	% Age 65 +	% Disabled	% DAC	% SDAC
DEL ORO WATER CO - METROPOLITAN DISTRICT	12	No	10	17	0	100
MONSON MARKET	18.47	No	14	12	100	0
OROSI HIGH SCHOOL	20.29	Arsenic	7	7	0	100
EAST OROSI CSD	14.38	TCP	12	11	0	100
GLEANINGS FOR THE HUNGRY	25.97	No	11	11	0	100

4.1.3.1 Evaluation of Interim Water Supply Options for PWSs in Kings Sub-Basin

POU Treatment

- High hardness that can lead to increased RO membrane fouling as well as other contaminants such as manganese may be present at all of the locations which can lead to accelerated RO membrane fouling. RO may be appropriate for all of the systems; however, a pilot which includes water quality testing will need to validate effectiveness in removing contaminants of concern.

Bottled Water

- Bottled water may not appropriate as a 100% solution for Monson Market, Orosi High School and Gleanings for the Hungry which provides cooked meal service to large populations.
- Del Oro Water Company and East Orosi CSD have a portion of the population that is either over 65 years of age and/or disabled, thereby posing a potential problem to heavy water bottles if assistance is not available.

Kiosks

All of the PWS in the Kings Sub-Basin are within a 10-mile radius of a compliant PWS where a kiosk could be located. There are however several factors that preclude the use of kiosks as a 100% option:

- Monson Market is both a restaurant and a marketplace. The use of kiosks in this case would not be practical as the amount of water required for the populations served would require multiple frequent trips to and from a kiosk location by staff, thereby putting an undue financial and human resource constraint on the organization. Census data for this area shows that Monson Market in an area that is 100% DAC.
- Del Oro Water Company Metropolitan District is in an area that is 100% SDAC. Unless a kiosk is located within a very short distance to the system transportation costs to get to kiosks may cause an undue financial burden on the population.
- Orosi High School is in an area that is 100% SDAC. Kiosk water service would not be practical to serve students and faculty.
- East Orosi CSD is in an area that is 100% SDAC. Unless a kiosk is located within a very short distance to the system, transportation costs to get to kiosks may cause an undue financial burden on the population.
- Gleanings for the Hungry is in an area that is 100% SDAC. This non-profit organization cooks and provides food to the hungry in the area. Kiosk water would not be appropriate due to the strain on human resources to frequently retrieve water for cooking and drinking water.
- All of the PWS considered have populations either over 65 years of age and/or disabled, thereby posing a potential problem with accessibility to kiosks and the ability to lift and transport heavy water bottles.

Alternatives Analysis of Interim Water Solution Analysis by PWS

Given the above considerations, the following interim water solutions are recommended:

1. **Del Oro Water Company – Metropolitan District:** As this system appears to be located near the City of Fresno Water Service area, a kiosk could possibly be installed nearby. A kiosk could be considered as a potential solution for a portion of the connections. Demographic and SDAC factors however indicate that either bottled water or POU treatment is considered as a partial solution.
2. **Monson Market:** Either POU treatment or bottled water is recommended for the market.
3. **Orosi High School:** The East Orosi community is currently working toward consolidating with the Orosi Public Utilities District under direction by the State Water Board. Until the consolidation is complete a combination of bottled water and POU will be appropriate to provide water for both cooking and drinking water.
4. **East Orosi CSD:** The East Orosi community is currently working toward consolidating with the Orosi Public Utilities District (OPUD) under direction by the State Water Board. Until consolidation is complete a combination of bottled water and POU will be appropriate. A kiosk served by the OPUD in conjunction

with bottled water and/or POU may also be appropriate even after consolidation occurs, as it is likely that not all impaired domestic wells in the area will be served through the consolidation. To determine which solution is most appropriate, evaluating the length of time that interim water supplies will be needed until the consolidation occurs should be evaluated. If the consolidation is expected to occur within less than five years, bottled water is likely the most cost-effective means of providing interim water supplies as there are no upfront capital costs for kiosks or POU devices. An evaluation should also be conducted to determine the number of impacted domestic wells in the area that will not be served through the consolidation.

5. **Gleanings for the Hungry:** POU treatment should be considered in kitchens for cooking purposes. Bottled water should be provided for staff, volunteers, and the general public.

4.1.3.2 Recommended Interim Water Solution by PWS in Kings Sub-Basin

Table 4-5 provides the recommended interim water solutions by percentage for each PWS in the Kings Sub-Basin.

Table 4-5 - Interim water solution recommendations by public water system in Kings Sub-Basin based on 2020 data utilized for this report

Recommended Interim Water Supply Solution by PWS				
System Name	**% Kiosk**	**% POU**	**# of POUs**	**% Bottled Water**
DEL ORO WATER CO - METROPOLITAN DISTRICT	70%	0%	0	30%
MONSON MARKET	0%	10%	1	90%
OROSI HIGH SCHOOL	0%	10%	1	90%
EAST OROSI CSD	0%	0%	0	100%
GLEANINGS FOR THE HUNGRY	0%	10%	1	90%

4.1.4 Modesto Sub-Basin

There are three (3) PWSs in Modesto Sub-Basin that either have an on-going SDWIS nitrate violation and/or are on the HR2W list for nitrate contamination based on 2020 data utilized for this report. Table 4-6 provides water quality and census related data by PWS.

Table 4-6 - Water quality and census data for nitrate impacted Public Water Systems in the Modesto Sub-Basin based on 2020 data utilized for this report

System Name	Nitrate Max MG/L	Other Water Quality Violations	% Age 65 +	% Disabled	% DAC	% SDAC
SHILOH SCHOOL DISTRICT	17.4	No	15	13	0	0
LIBERTY BAPTIST CHURCH	14.8	No	17	15	100	0
BLOOMINGCAMP WATER SYSTEM	23.9	No	17	14	100	0

4.1.4.1 Evaluation of Interim Water Supply Options for PWSs in the Modesto Sub-Basin

POU Treatment

- Two of the systems have high hardness which can lead to increased RO membrane fouling. There is no available hardness or additional water quality information for Liberty Baptist Church.

Bottled Water

- Bottled water may not be an appropriate 100% solution for a school that provides cooked meal service to large populations.
- All of the PWS considered have populations either over 65 years of age and/or disabled. People in this category may not be able to lift heavy water bottles if assistance is not available.

Kiosks

All of the PWS in the Modesto Sub-Basin are within a 10-mile radius of a compliant PWS where a kiosk could be located. There are however factors within the basin that preclude the use of kiosks as a 100% option:

- One PWS is a school and the other is a church. The use of kiosks in these cases would not be practical as the amount of water required for the populations served would require multiple frequent trips to and from a kiosk location by staff paid for by the school or church, thereby putting an undue financial and human resource constraint on the organization. There is no DAC or SDAC information available for these organizations.
- All of the PWS considered have populations either over 65 years of age and/or disabled, thereby posing a potential problem with accessibility to kiosks and the ability to lift and transport heavy water bottles.

4.1.4.2 Alternatives Analysis of Interim Water Solution Analysis by PWS in Modesto Sub-Basin

Given the above considerations, the following interim water solutions are recommended:

1. **Shiloh School District:** POU treatment should be provided for cooking purposes. Bottled water should be provided for staff and students.
2. **Liberty Baptist Church:** Bottled water is recommended.
3. **Bloomingcamp Water System:** At least 17% of the population in the water system is age 65 or older and 14% of the population has reported a disability. There are approximately 50 people served by 12 connections, averaging roughly 4.6 people per connection. There is no DAC or SDAC data available for this system.
    a. Either bottled water or POU treatment should be made available. Bottled water is likely the least expensive option if an interim solution is expected to be needed less than five years.

4.1.4.3 Recommended Interim Water Solution by PWS in Modesto Sub-Basin

Table 4-7 provides the recommended interim water solutions by percentage for each PWS in the Modesto Sub-Basin.

Table 4-7 - Interim water solution recommendations by public water system in Modesto Sub-Basin based on 2020 data utilized for this report

Recommended Interim Water Supply Solution by PWS				
System Name	**% Kiosk**	**% POU**	**# of POUs**	**% Bottled Water**
SHILOH SCHOOL DISTRICT	0%	10%	1	90%
LIBERTY BAPTIST CHURCH	0%	0%	0	100%
BLOOMINGCAMP WATER SYSTEM	0%	0%	0	100%

4.1.5 Tulare Lake Sub-Basin

There are no PWS in the Tulare Lake Sub-Basin with unresolved violations for nitrate based on 2020 data utilized for this report.

4.1.6 Tule Sub-Basin

There are eight (8) PWSs in Tule Sub-Basin that either have an on-going SDWIS nitrate violation and/or are on the HR2W list for nitrate contamination based on 2020 data utilized for this report. Table 4-8 Provides water quality and census related data by PWS. Water quality violations for contaminants other than nitrate are included if known.

Table 4-8 - Water quality and census data for nitrate impacted Public Water Systems in the Tule Sub-Basin based on 2020 data utilized for this report

System Name	Nitrate Max MG/L	Other Water Quality Violations	% Age 65 +	% Disability	% DAC	% SDAC
SAUCELITO ELEM SCHOOL	14.23	TCP	8%	10%	0%	100%
RODRIGUEZ LABOR CAMP	33.89	TCP	8%	10%	100%	0%
SIERRA VISTA ASSN	16.5	TCP	8%	10%	100%	0%
TEA POT DOME WATER CO	17.1	No	16%	14%	100%	0%
TIPTON COMMUNITY SERVICES DIST	21	Arsenic	6%	8%	6%	94%
DEL ORO GRANDVIEW GARDENS	54.22	No	10%	9%	*	*
HOPE ELEMENTARY SCHOOL	12.3	No	16%	14%	100%	0%
RICHGROVE COMMUNITY SERVICES DISTRICT	13	TCP	8%	8%	33%	67%

*MIH Survey data shows DAC/SCAC status

4.1.6.1 Evaluation of Interim Water Supply Options for PWSs in Tule Sub-Basin

POU Treatment

- Water quality issues that may reduce the effectiveness of POU treatment:
  - Saucelito Elementary School, Sierra Vista Association, and Tea Pot D ome Water Company all have high hardness that could lead to increased RO membrane fouling.
  - Saucelito Elementary School, Rodriguez Labor Camp, and Sierra Vista Association and Richgrove Community Service District all have TCP over the state MCL. POUs used to treat nitrate may not be effective in treating TCP and therefore could result in a false sense of safety to consumers who

believe that the device is removing all contaminants of concern. Additionally, POU treatment is not acceptable for TCP because it does not address the health risk associated with inhalation.
    - Tipton Community Services District has had arsenic violations. Further evaluation would be required to determine if a POU would provide adequate treatment for both nitrate and arsenic.

Bottled Water

- Bottled water may not be an appropriate solution for a Saucelito Elementary School which provides cooked meal service to large populations.
- All of the PWS considered have a portion of the population that is either over 65 years of age and/or disabled, thereby posing a potential problem to heavy water bottles if assistance is not available.

Kiosks

Five of the eight PWS in the Tule Sub-Basin are within a 10-mile radius of a compliant PWS where a kiosk could be located. There are however several factors that preclude the use of kiosks as a 100% option:

- One of the PWS is a school. The use of kiosks in these cases would not be practical as the amount of water required for the populations served would require multiple frequent trips to and from a kiosk location by staff paid for by the school, thereby putting an undue financial and human resource constraint on the school and population that is served by the school. Furthermore, Saucelito Elementary School is considered to be in an area where the population is 100% SDAC.
- All of the PWSs are considered to be DAC or SDAC. Unless a kiosk is located within a very short distance to the water system, transportation costs to and from a kiosk may cause an undue financial burden on the population.
- Tipton Community Services District is outside of a 10-mile radius to a potential location for a kiosk.
- The Richgrove Community Service District is outside of the 10-mile radius of water systems that are meeting water quality standards.
- All of the PWS considered have a portion of the population that is either over 65 years of age and/or disabled, thereby posing a potential problem with accessibility to kiosks and the ability to lift and transport heavy water bottles.

4.1.6.2 Alternatives Analysis of Interim Water Solutions by PWS in Tule Sub-Basin

Given the above considerations, the following interim water solutions are recommended:

1. **Saucelito Elementary School:** Bottled water is recommended for this location due to co-contamination of TCP. Point-of-Entry treatment could be installed to treat for TCP, along with POU treatment for nitrate, however this combination is not one of the interim water solutions evaluated as a part of this effort.
2. **Rodriguez Labor Camp:** This PWS is on the outer edges of a 10-mile radius to an area where a kiosk could be located and therefore could possibly obtain some water from kiosks, however it is considered to be 100% DAC and therefore transportation costs to and from kiosks could result in undue financial burden to the disadvantaged population. Bottled water is recommended as POUs may not adequately address TCP contamination. This system is currently receiving bottled water through a Tulare County program.
3. **Sierra Vista Association:** This PWS is within the 10-mile radius of an area where a kiosk could be installed. Due to demographic factors and 100% DAC status kiosks should not be considered a 100% solution. A combination of kiosk and bottled water is recommended as POUs may not adequately address TCP contamination.
4. **Tea Pot Dome Water Company:** This PWS is located near the Porterville water service area and therefore could have a kiosk located nearby. There is however a small percentage of the population that may not be able to lift heavy water bottles and therefore should receive either bottled water or POUs.

5. **Tipton Community Services District:** This PWS is outside of a 10-mile radius of a potential location for a kiosk. Bottled water is recommended. POUs could be evaluated for usage to determine suitability in removing both nitrate and arsenic.
6. **Del Oro Grandview Gardens:** This PWS is located near the Porterville water service area and therefore could have a kiosk located nearby. There is however a small percentage of the population that may not be able to transport heavy water bottles and therefore should receive either bottled water or POUs.
7. **Hope Elementary School:** A combination of POU and bottled water is recommended for this school. A POU device would be useful for cooking. Bottled water can be used for drinking water to students and faculty. Hope Elementary School is currently receiving bottled water through a Tulare County program.
8. **Richgrove Community Services District:** This system is outside of a 10-mile radius from a PWS that is compliant, therefore for the purpose of this evaluation, a kiosk is not considered a solution. A kiosk that has treatment installed to manage all contaminants of concern could be located within the water system, however the costs for treatment of such a kiosk would need to be evaluated in a separate effort. As TCP has also been detected above the MCL, RO POUs may not be effective in removing all contaminants of concern. Pilot testing POUs on this system is recommended to evaluate effectiveness. Based on the current data and information available, bottled water is recommended for this system. Some residents in this system are currently receiving bottled water through a Tulare County program.

4.1.6.3 Recommended Interim Water Solution by PWS in Tule Sub-Basin

Table 4-9 provides the recommended interim water solutions by percentage for each PWS in the Tule Sub-Basin.

Table 4-9 - Interim water solution recommendations by public water system in Tule Sub-Basin

Recommended Interim Water Supply Solution by PWS in Tule Sub-Basin				
System Name	**% Kiosk**	**% POU**	**# of POUs**	**% Bottled Water**
SAUCELITO ELEM SCHOOL	0%	0%	0	100%
RODRIGUEZ LABOR CAMP	0%	0%	0	100%
SIERRA VISTA ASSN	75%	0%	0	25%
TEA POT DOME WATER CO	75%	0%	0	25%
TIPTON COMMUNITY SERVICES DIST	0%	0%	0	100%
DEL ORO GRANDVIEW GARDENS	75%	10%	12	15%
HOPE ELEMENTARY SCHOOL	0%	0%	0	100%
RICHGROVE COMMUNITY SERVICES DISTRICT	0%	0%	0	100%

4.1.7 Turlock Sub-Basin

There are three (3) PWSs in Turlock Sub-Basin that either have an on-going SDWIS nitrate violation and/or are on the HR2W list for nitrate contamination based on 2020 data utilized for this report. Table 4-10 provides water quality and census related data by PWS.

Table 4-10 - Water quality and census data for nitrate impacted Public Water Systems in the Turlock Sub-Basin based on 2020 data utilized for this report

System Name	Nitrate Max MG/L	Other Water Quality Violations	% Age 65 +	% Disability	% DAC	% SDAC
OUR LADY OF ASSUMPTION CHURCH	15.4	No	11%	16%	0%	0%
BEST WESTERN-ORCHARD INN	33	No	21%	21%	0%	0%
OASIS MARKET	12	No	21%	21%	100%	0%

4.1.7.1 Evaluation of Interim Water Supply Options for PWSs in Turlock Sub-Basin

POU Treatment

- There are no water quality issues known that would preclude the use of POUs for any of the three PWSs based on 2020 data utilized for this report.

Bottled Water

- Bottled water service would not adequately serve the Best Western Orchard Inn due to the number of guest rooms.

Kiosks

All three of PWSs in the Turlock Sub-Basin are within a 10-mile radius of a compliant PWS where a kiosk could be located. There are however several factors that preclude the use of kiosks as a 100% option:

- One of the PWS is a church which may preclude it from having enough staffing or volunteers to reliably pick-up and transport water from a kiosk.
- The Best Western Orchard Inn cannot be adequately served by a kiosk due to the number of rooms that would require individual water service for guests.
- The Oasis Mart is a gas station and store. Staff would be required to pick-up water from a kiosk and transport it to the store, thereby placing the cost of water service on the owner of the business.

4.1.7.2 Alternatives Analysis of Interim Water Solutions by PWS in Turlock Sub-Basin

Given the above considerations, the following interim water solutions are recommended:

1. **Our Lady of Assumption Church:** Bottled water is recommended.
2. **Best Western Orchard Inn:** A point of entry (POE) device would be most suitable for this location as there are 71 guest rooms, a conference room, and an area where meals are served. As POEs cost analysis is not a part of this project, POUs are recommended, however it should be noted that a cost analysis should be done to determine whether POUs or a POE would be most cost effective.
3. **Oasis Market:** Bottled water is recommended.

Recommended Interim Water Solution by PWS

Table 4-11 provides the recommended interim water solutions by percentage for each PWS in the Turlock Sub-Basin.

Table 4-11 - Interim water solution recommendations by public water system in Turlock Sub-Basin

Recommended Interim Water Supply Solution by PWS				
System Name	**% Kiosk**	**% POU**	**# of POUs**	**% Bottled Water**
OUR LADY OF ASSUMPTION CHURCH	0%	0%	0	100%
BEST WESTERN-ORCHARD INN	0%	100%	73	0%
OASIS MARKET	0%	0%	0	100%

4.2 Human Right to Water Systems That Mapped Outside the Sub-Basins

This section clarifies why some water systems on the Human Right to Water list are not included in this project. The Mammoth Pool Mobile Home Park water system is in Madera County, but did not map into any hydrologic basin. The three water systems in Tulare County that did not map into a hydrologic basin are shown in Figure 4-2.

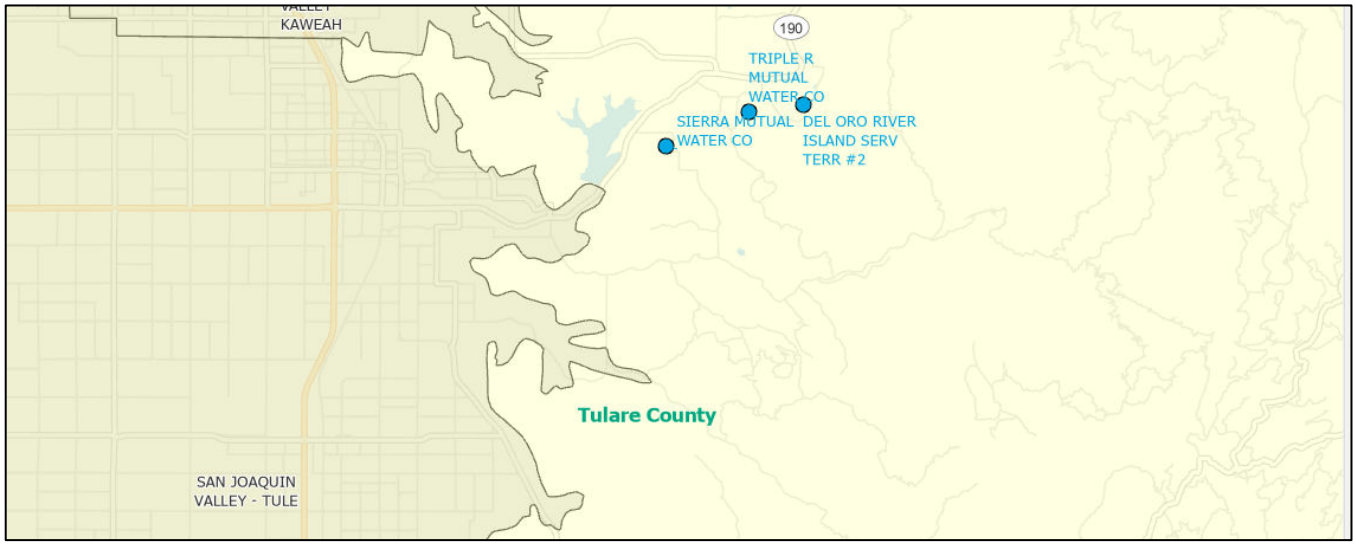

Figure 4-2- Systems that did not map into a hydrologic basin

5. Interim Drinking Water Supply Solution Alternatives Analysis for Nitrate Impaired Small State Water Systems (SSWS) and PWSs Lacking Available Nitrate Data

There are State Small Water Systems (SSWS) and some water systems with a public water system identification number (PWSID) in the sub-basins considered in this study which do not have available water quality data for nitrate or other constituents. Water quality data for SSWSs are typically managed by the counties where the SSWS is located, so the data may be available upon request from the counties. In many cases county water quality data for SSWSs may be managed in a paper, rather than digital, system.

The SSWS used in this study were identified through the RCAC data for 49 counties provided to the University of California – Los Angeles (UCLA) for the State-Wide Needs Assessment that is currently underway to estimate the cost of short and long-term solutions for systems on the HR2W list. In addition to lacking water quality data, many

of the systems in the RCAC dataset lacked information on population served and/or number of service connections. For the purpose of this evaluation only the SSWSs which are likely to serve the general public or have continuous residence and are located in areas at high-risk for nitrate contamination based on GAMA data have been included. Additionally, there are five water systems with a PWSID which lack water quality data and are located in areas identified by GAMA data as high-risk for nitrate exceeding health standards. Both the SSWSs and waters systems with a PWSID but lacking nitrate data are included in this section as in both cases there is no publicly available water quality data and therefore the analysis is based on GAMA data. **Because data and information are limited, there may be additional SSWSs and water systems lacking nitrate data with a PWSID that may require an interim drinking water solution.**

In the past, all California water systems were screened based on population and connections, classifying any system with a population less than 26 people and less than 15 connections as SSWS, regardless of PWSID. Screening for SSWS was subsequently modified to classify only systems without a PWSID and providing piped water to the public for human consumption that serves at least 5 but not more than 14 service connections and does not regularly serve drinking water to more than an average of 25 individuals for more than 60 days out of the year.

Several figures and tables in this section use a color code from the GAMA water quality GIS layer. Table 5-1 explains what each color represents.

Table 5-1. Nitrate grade for SSWS and Domestic Wells.

Color	Definition
4-6	Recent MCL exceedances or average detection is over the MCL
3	No recent MCL exceedances, and the average detection is between 80 and 100% of the MCL (0.8 to 1.0)
2	No recent MCL exceedances, and the average detection is between 50 and 80% of the MCL (0.5 to 0.8)
1	No recent MCL exceedances, and the average detection is less than 50% of the MCL (<0.5)

There is less available data and information about SSWS and therefore the analysis to determine the most appropriate interim water solutions is more challenging as a desktop exercise. The analysis is based on the basic data available which includes estimated proximity to areas with known groundwater nitrate contamination, data that is available regarding nitrate MCL violations, and proximity to a compliant PWS that could accommodate kiosks. Additionally, based on system names, subjective determinations were made with respect to the appropriateness of kiosk, POU treatment, and bottled water. As previously mentioned, only the SSWSs suspected to serve water to the general public or to have continuous residence are included in the evaluation. Some SSWSs appearing to be private businesses with a small number of employees are not included in the analysis. Table 5-2 provides an overview of the systems and available data that have nitrate concentrations that are in Grades 4-6 (red) wherein nitrate has been found in concentrations that reach or exceed the nitrate MCL of 10 mg/L.

Table 5-2 - State Small Water Systems with potential nitrate violations

State Small Water System Information				
Subbasin	**System Name**	**Population Served**	**Connections**	**NO3 Grade**
KAWEAH	HARLIEN'S RENTALS	25	13	5
KAWEAH	GONZALEZ WS	25	2	5
KINGS	DE GROOT & SON DAIRY	25	8	5
MODESTO	CARDOZA WATER SYSTEM	25	5	4
TURLOCK	STARN, R.C. & SONS	25	13	5
TURLOCK	SHILO RIVER RESORT	25	2	4
TURLOCK	HOUSEBOAT MINI MART	25	1	5

The water systems with a PWSID that do not have publicly available nitrate data for the last 10 years and fall into areas that in GAMA are considered a grade 4 or higher are included in Table 5-3.

Table 5-3 – Water systems with a PWSID, however do not have available water quality data

Water Systems with PWSID and No Available Nitrate Data						
Subbasin	**System ID**	**System Name**	**PWS Type**	**Population Served**	**Connections**	**NO3 Grade**
KAWEAH	CA5403069	FRANZIA-TULARE WINERY	TNC	25	13	5
KINGS	CA1000628	MELKONIAN BROTHERS FRUIT STAND	TNC	30	2	5
TULE	CA401065	FRANCHER CREEK PACKING INC	NTNC	75	4	5
TURLOCK	CA5000570	INTERSTATE TRUCK CENTER VALLEY PETERBILT	NTNC	25	2	5
TURLOCK	CA5000601	BEST RV CENTER	NTNC	61	4	5

5.1 Interim Water Supply Solutions Alternatives Analysis for SSWSs and PWSs without nitrate data

While nearly all of the SSWS and PWSs that are included in the evaluation based on GAMA data are located in areas within a 10-mile radius of a compliant PWS where a kiosk could be located (Figure 5-1), the majority of the SSWS and PWS without nitrate data appear to be businesses, which presents challenges for business owners or organizations to transport water from kiosks on a regular basis. In many cases bottled water will likely be the most suitable, however there may be some instances where POU devices will be more appropriate. Determining which alternative is best will require coordination with individual water systems and conducting water quality sampling to establish if POU devices will provide sufficient nitrate and co-contaminant removal. For the purpose of this cost development effort, the SSWS in each basin will be assumed to have an even split between POUs and bottled water service.

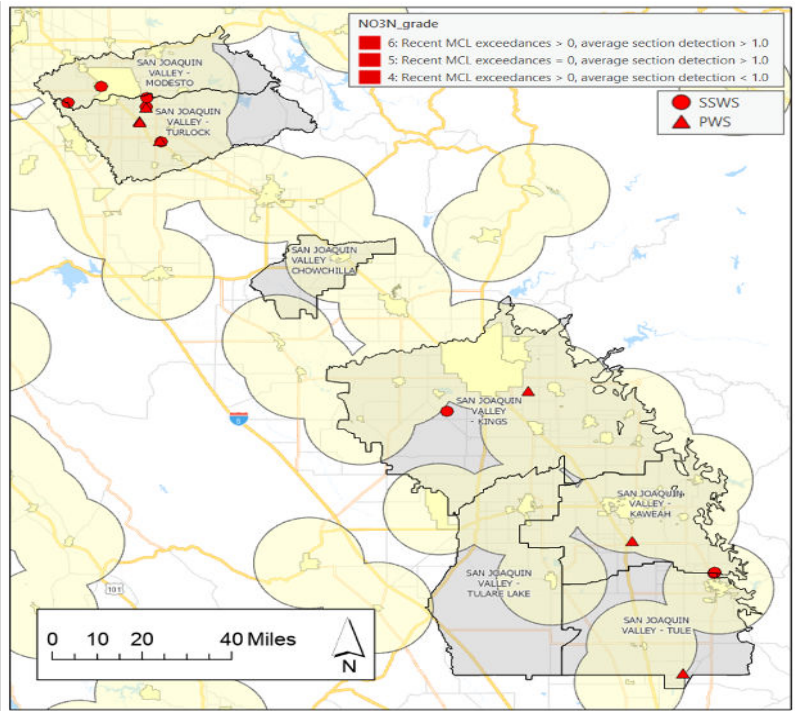

Figure 5-1 - SSWS and water systems lacking water nitrate data with a PWSID location within 10-mile radius of a PWS where a kiosk could potentially be located.

Interim Drinking Water Supply Recommendation for SSWSs and Water Systems with PWSID that Lack Water Quality Data (all applicable sub-basins)

- 50% POU
- 50% Bottled Water

6. Interim Drinking Water Supply Solution Alternatives Analysis for Domestic Wells at High-Risk for Nitrate Contamination

There is limited data available to estimate the number and exact location of nitrate impacted private domestic wells. As previously mentioned, the number of wells used in this study is based on the known number of well applications registered in a 1-mile cubic area. The well count does not provide exact location within the 1-mile area or identify if the well is actively used as a drinking water supply, used for irrigation only, or has been abandoned or destroyed. Specific water quality information is also not available for domestic wells, so the potential number of domestic wells that may be impacted by nitrate contamination is derived by analyzing GAMA data with the well count data overlaid. This data analysis method provides the number of wells that fall inside the areas designated in GAMA as being at high-risk for high concentrations of nitrate (Figure 6-1). It should be noted that the data used to determine the number of wells are a count of wells labelled with 'domestic' in the OSWCR (based on well completion reports). The GAMA methodology models domestic well water quality based on what would be found in the shallow aquifer to be more indicative of the water quality expected at domestic well depths.

Table 6-1 provides a total count of the number of wells that may be in each category. For the purpose of this evaluation, only wells that are modeled to fall into Category 4 or higher (red) nitrate zones (nitrate concentrations at or above the MCL) have been included.

Table 6-1 - Domestic well count by potential categorical potential for nitrate contamination.

Sub-Basin	1	2	3	4 - 6
CHOWCHILLA	246	235	44	98
KAWEAH	1759	970	259	1077
KINGS	8012	5777	1384	2110
MODESTO	1805	842	76	317
TULARE LAKE	1759	67		66
TULE	452	534	89	413
TURLOCK	1901	1294	358	1062

There is no way to verify if the wells that have been counted in areas at high-risk for having high nitrate concentrations are producing water that exceeds the MCL without water quality testing at each location. Similarly, there is no way to verify if wells that have *not* been counted in areas deemed at high-risk for having high nitrate concentrations are producing water that exceeds the MCL without water quality testing at each location. To better quantify the probable percentage of the domestic wells located in areas of high nitrate concentrations, an estimate of 40% of the total number of wells in impacted areas will be used to calculate interim water supply cost estimation. This estimate is based on a 2016 report from the California Water Board titled Groundwater Ambient Monitoring and Assessment (GAMA): Domestic Well Project Groundwater Quality Data Report Tulare County Focus Area (California Water Boards, 2016). The report was developed after Water Board staff sampled 181 wells located in Tulare County to gain a better understanding of the number of wells with contaminants exceeding health standards. Through this effort, 8 of the 181 wells tested were found to have no detectable nitrate, while 173 wells were found to have nitrate detection at concentrations ranging from 0.11 to 54 mg/L (as N). Nitrate was detected above the MCL of 10 mg/L in 72 wells, which is approximately 40% of the total wells tested. **Some of the wells in the study found to have high nitrate levels occurred in areas that are not considered to be at high risk for nitrate based on GAMA data. With that in mind, the estimations of potentially impacted wells used for the purposes of this evaluation may underestimate the actual number of wells that have high nitrate levels. To ensure that all private domestic wells with nitrate levels exceeding health standards are identified, outreach and well sampling to all domestic wells in both areas that are considered at high risk as well as in areas that are not considered to be high-risk is highly recommended.** Figure 6-2, which is provided in the Water Board report, indicates the location of the wells that were sampled and the associated nitrate concentrations.

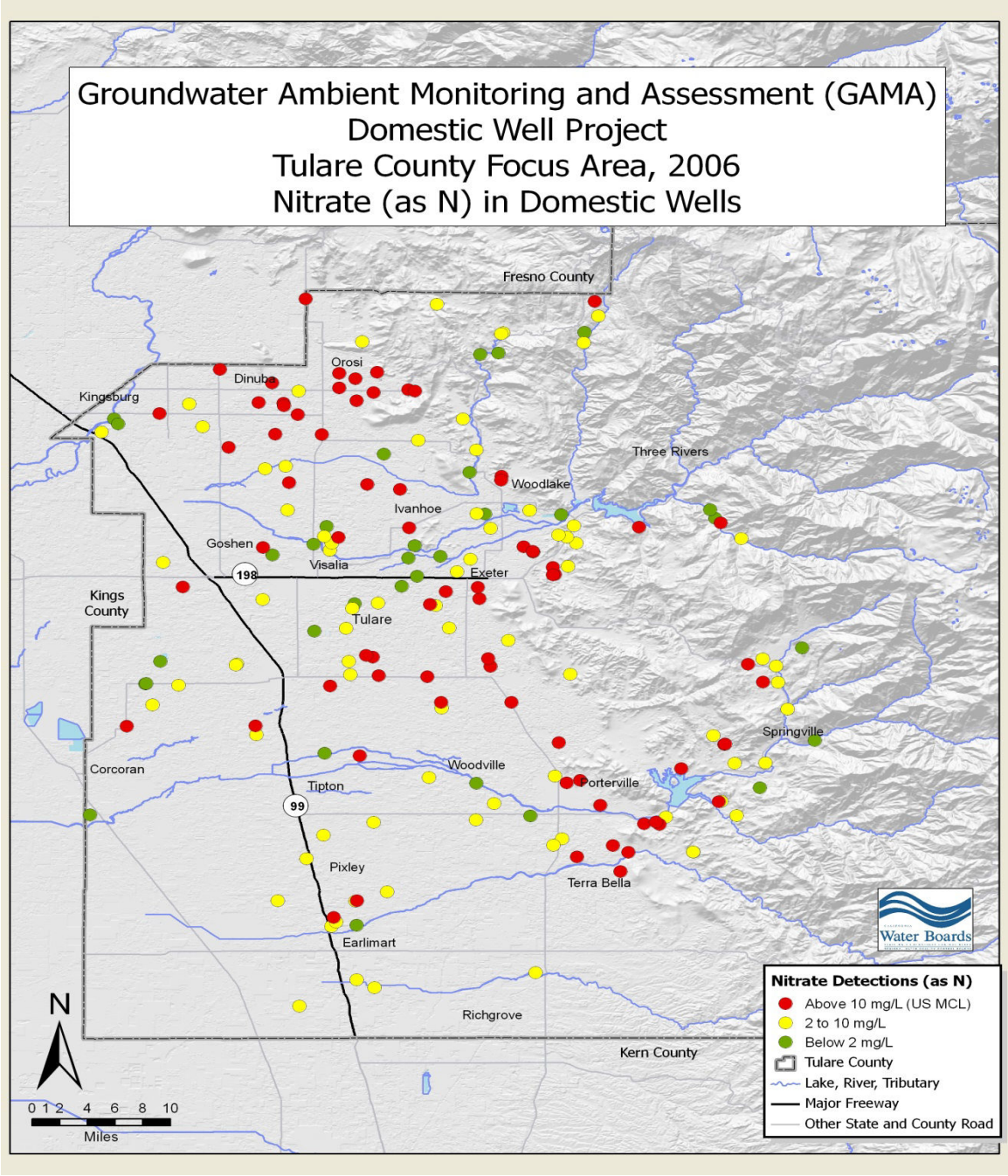

Figure 6-2 - Location of wells sampled with high nitrate concentrations (California Water Boards, 2016)

In addition to nitrate contamination, groundwater in certain areas of the San Joaquin Valley is also at high-risk of having the following contaminants at concentrations higher than the MCL:

- Arsenic
- Perchlorate
- 1,2,3-Trichloropropane
- Uranium

Figure 6-3 depicts the locations where each of these contaminants have been found in concentrations of a Grade 4 or higher (which means concentrations that may be at or above the MCL). The potential of co-contamination (nitrate plus other contaminants) is important to recognize when conducting an interim drinking water solution alternatives analysis, as the areas with a high likelihood of co-contamination may not be best suited for POUs which may not adequately treat all contaminants of concern.

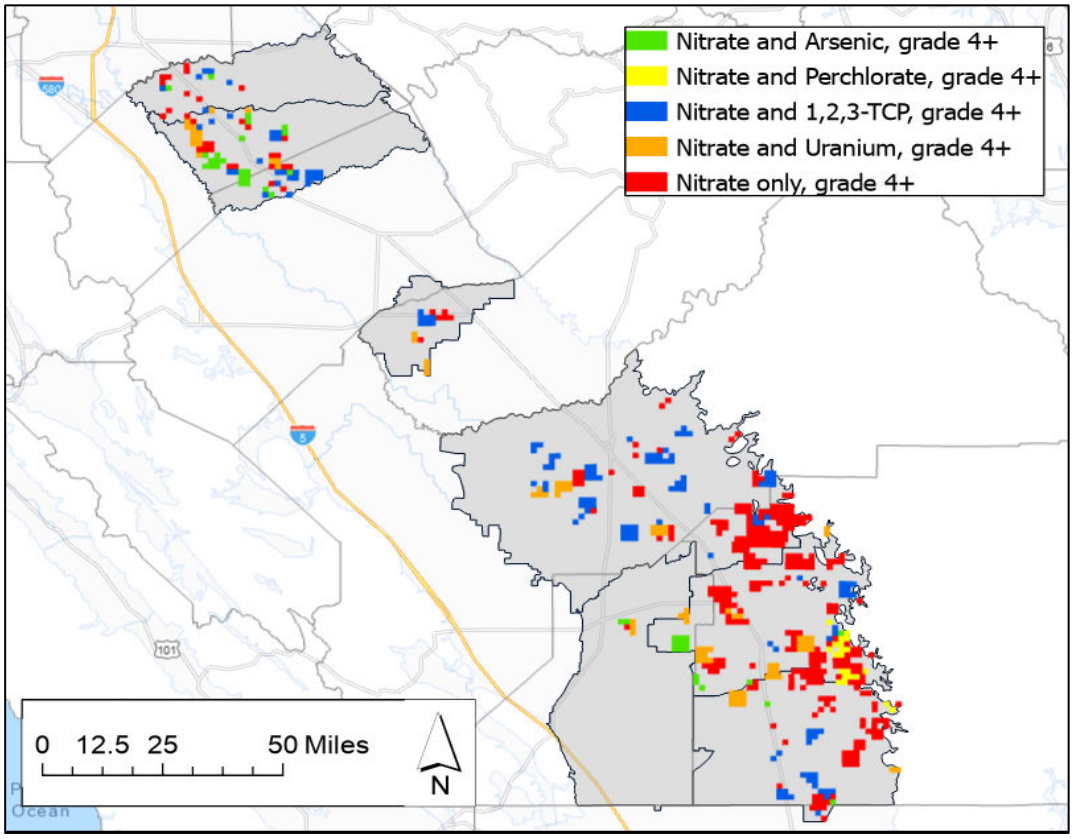

Figure 6-3- Locations of co-contamination (grade 4 or higher)

6.1 Factors Considered in the Evaluation of Appropriate Interim Drinking Water Solutions for Domestic Wells:

Similar to the alternatives analysis conducted for PWSs, the domestic well evaluation takes into consideration the following:

- Potential for high concentrations of other contaminants in addition to nitrate
- Community considerations based on census data averages for each sub-basin
- Interim drinking water solution cost
- Proximity to a compliant PWS where a kiosk could be located

The potential interim drinking water solutions that have been evaluated as a part of this effort for domestic wells impacted by high nitrate concentrations include kiosks supplied by water from a PWS that is compliant with drinking water standards, point-of-use devices, and home delivered bottled water. It is unlikely that any one of these solutions (particularly for kiosks and POU devices) will provide a 100% solution for any of the communities impacted by nitrate contamination. In addition to the financial cost of implementing potential solutions, other attributes such as managerial requirements/capabilities and social implications factors should be evaluated prior to the final determination of which solutions are best suited for each scenario. This paper only addresses financial

costs and social implications at a high level. The final determination of the proper interim solutions delivered should be based on information that can be collected from private domestic well owners and users through a public outreach effort.

Given the complexities of safely providing interim drinking water solutions, Management Zones should strongly consider contracting with technical assistance providers and Community Based Organizations to facilitate the provision (including necessary ongoing maintenance) of interim drinking water solutions.

6.2 Alternatives Analysis of Interim Water Supplies by Sub-Basin

6.2.1 Alternatives Analysis for Nitrate Impacted Domestic Wells in Chowchilla Sub-Basin

Chowchilla Sub-Basin High-Risk Domestic Well Count and Proximity to Potential Kiosk Location

There are 98 domestic wells in the Chowchilla Sub-Basin in areas at high-risk for nitrate concentrations above the MCL. All of the 98 wells fall within a 10-mile radius of a compliant PWS (Figure 6-4) that could potentially accommodate a kiosk. Use of kiosks should be complimented with more convenient options (like bottled water, or POU where deemed safe and with sufficient maintenance and sampling) for low-income families that may struggle to equitably access a kiosk.

Figure 6-4 – Wells located in areas at-risk in Chowchilla Sub-Basin for high nitrate are indicated by red blocks. Yellow circles indicate 10-mile radius from compliant PWS.

Co-contamination Risk

- 5 of the domestic wells are at high-risk for nitrate and uranium over the MCL.
- 28 of the domestic wells are at high-risk for nitrate and 1,2,3,-TCP over the MCL.

Demographic Information for Chowchilla Sub-Basin

- 12% of the population are 65 years or older
- 13% of the community are considered disabled
- 47% of the community are renters
- 20% of the community speaks English less than well
- 60% of the community are considered disadvantaged (DAC)
- 21% of the community are considered severely disadvantaged (SDAC)
- Average number of people per household = 5.6

Chowchilla Sub-Basin Alternatives Analysis Summary and Recommendation

30% of the domestic wells that are at high-risk for nitrate are also at high-risk for elevated concentrations of other contaminants of concern, which may impact the efficiency and effectiveness of POU treatment. None of the high-

risk domestic wells fall outside of an area where a kiosk could potentially be located, however least 13% of the population may not be able to lift and transport heavy bottles of water from a kiosk location due to disability, age or other factors. Additionally, there are no PWSs that have unresolved nitrate violations (see Section 4) or SSWSs (see Section 5) in the Chowchilla Sub-Basin that would benefit from a kiosk, so the cost to construct and operate kiosks to serve fewer than 50 domestic wells does not provide good return on investment.

Recommendation:

- POU treatment could serve as a 60% solution to domestic wells that do not have co-contamination or for populations unable to lift 5-gallon bottles of water. One POU per well is assumed for cost calculations.
- Bottled water could serve as a 40% solution to the population not able to be served by POUs or wells.

6.2.2 Alternatives Analysis for Kaweah Sub-Basin

Kaweah Sub-Basin High-Risk Domestic Well Count and Proximity to Potential Kiosk Location

There are 1,077 domestic wells in the Kaweah Sub-Basin in areas at high-risk for nitrate concentrations above the MCL. 28 of the high-risk domestic wells are located outside of a 10-mile radius of a compliant PWS (Figure 6-5) that could potentially accommodate a kiosk.

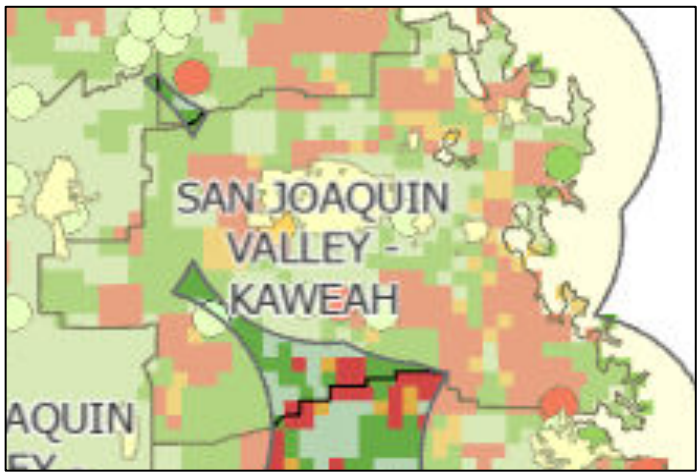

Figure 6-5 - Wells located in areas at-risk in Kaweah Sub-Basin for high nitrate are indicated by red blocks. Yellow circles indicate 10-mile radius from compliant PWS.

Co-contamination Risk

- 86 of the domestic wells are at high-risk for nitrate and uranium over the MCL.
- 136 of the domestic wells are at high-risk for nitrate and 1,2,3,-TCP over the MCL.
- 81 of the domestic wells are at high-risk for nitrate and perchlorate over the MCL.
- 52 of the domestic wells are at high-risk for nitrate and arsenic over the MCL.

Demographic Information for Kaweah Sub-Basin

- 12% of the population are 65 years or older
- 13% of the community are considered disabled
- 47% of the community are renters
- 20% of the community speaks English less than well
- 22% of the community are considered disadvantaged (DAC)
- 31% of the community are considered severely disadvantaged (SDAC)

- Average number of people per household = 3.3

Kaweah Sub-Basin Alternatives Analysis Summary and Recommendation

33% of the domestic wells that are at high-risk for nitrate are also at high-risk for elevated concentrations of other contaminants of concern, which may impact the efficiency and effectiveness of POU treatment. 3% of the high-risk domestic wells fall outside an area where a kiosk could potentially be located, and at least 13% of the population may not be able to lift and transport heavy bottles of water from a kiosk location due to disability, age or other factors. There are some PWS (see Section 4) in the Kaweah Sub-Basin that would benefit from kiosks, and the same kiosks could serve a portion of impacted domestic well users, although use of kiosks should be complimented with more convenient options (like bottled water, or POU where deemed safe and with sufficient maintenance and sampling) for low-income families that may struggle to equitably access a kiosk.

Recommendation:

- 3 kiosks are recommended as a solution for 50% of impacted domestic wells.
- POU treatment could serve as a 30% solution to domestic wells that do not have co-contamination, are outside of a kiosk boundary, or for populations unable to 5-gallon bottles of water. One POU per well is assumed for cost calculations.
- Bottled water could serve as a 20% solution to the population not able to be served by POUs or wells.

6.2.3 Alternatives Analysis for Kings Sub-Basin

Kings Sub-Basin High-Risk Domestic Well Count and Proximity to Potential Kiosk Location

There are 2,110 domestic wells in Kings Sub-Basin in areas at high-risk for nitrate concentrations above the MCL. 131 of the high-risk domestic wells are located outside of a 10-mile radius of a compliant PWS (Figure 6-6) that could potentially accommodate a kiosk.

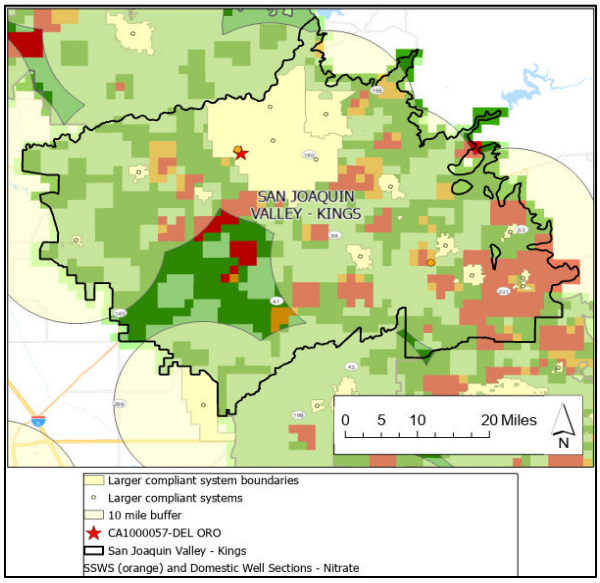

Figure 6-6 - Wells located in areas at-risk in Kings Sub-Basin for high nitrate are indicated by red blocks. Yellow circles indicate 10-mile radius from compliant PWS.

Co-contamination Risk

- 377 of the domestic wells are at high-risk for nitrate and uranium over the MCL.
- 854 of the domestic wells are at high-risk for nitrate and 1,2,3,-TCP over the MCL.

Demographic Information for Kings Sub-Basin

- 12% of the population are 65 years or older
- 13% of the community are considered disabled

- 47% of the community are renters
- 20% of the community speaks English less than well
- 27% of the community are considered disadvantaged (DAC)
- 32% of the community are considered severely disadvantaged (SDAC)
- Average number of people per household = 3.3

Kings Sub-Basin Alternatives Analysis Summary and Recommendation

58% of the domestic wells that are at high-risk for nitrate are also at high-risk for elevated concentrations of other contaminants of concern, which may impact the efficiency and effectiveness of POU treatment. 6% of the high-risk domestic wells fall outside an area where a kiosk could potentially be located, and at least 13% of the population may not be able to lift and transport heavy bottles of water from a kiosk location due to disability, age or other factors. There is one PWS (see Section 4.1.3) in the Kings Sub-Basin that would benefit from a kiosk, and the same kiosk could serve a portion of impacted domestic well users, although use of kiosks should be complimented with more convenient options (like bottled water, or POU where deemed safe and with sufficient maintenance and sampling) for low-income families that may struggle to equitably access a kiosk.

Recommendation:

- 4 kiosks are recommended as a solution for 50% of impacted domestic wells, although use of kiosks should be complimented with more convenient options (like bottled water, or POU where deemed safe and with sufficient maintenance and sampling) for low-income families that may struggle to equitably access a kiosk.
- POU treatment could serve as a 30% solution to domestic wells that do not have co-contamination, are outside of a kiosk boundary, or for populations unable to 5-gallon bottles of water. One POU per well is assumed for cost calculations.
- Bottled water could serve as a 20% solution to the population not able to be served by POUs or wells.

6.2.4 Alternatives Analysis for Modesto Sub-Basin

Modesto Sub-Basin High-Risk Domestic Well Count and Proximity to Potential Kiosk Location

There are 310 domestic wells in Modesto Sub-Basin located in areas at high-risk for nitrate concentrations above the MCL. None of the high-risk domestic wells are located outside of a 10-mile radius of a compliant PWS (Figure 6-7) that could potentially accommodate a kiosk.

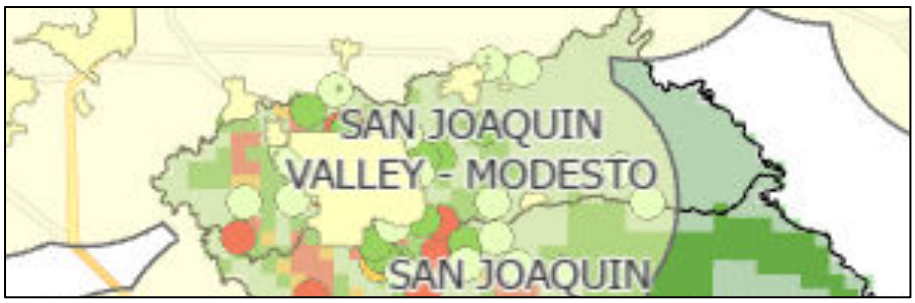

Figure 6-7 - Wells located in areas at-risk in Modesto Sub-Basin for high nitrate are indicated by red blocks. Yellow circles indicate 10-mile radius from compliant PWS.

Co-contamination Risk in Modesto Sub-Basin

- 3 of the domestic wells are at high-risk for nitrate and uranium over the MCL.
- 150 of the domestic wells are at high-risk for nitrate and 1,2,3-TCP over the MCL.
- 28 of the domestic wells are at high-risk for nitrate and arsenic over the MCL.

Demographic Information for Modesto Sub-Basin

- 12% of the population are 65 years or older
- 13% of the community are considered disabled
- 47% of the community are renters
- 20% of the community speaks English less than well
- 2% of the community are considered disadvantaged (DAC)
- 6% of the community are considered severely disadvantaged (SDAC)
- Average number of people per household = 3.1

Modesto Sub-Basin Alternatives Analysis Summary and Recommendation

58% of the domestic wells that are at high-risk for nitrate are also at high-risk for elevated concentrations of other contaminants of concern, which may impact the efficiency and effectiveness of POU treatment. None of the high-risk domestic wells fall outside an area where a kiosk could potentially be located, however at least 13% of the population may not be able to lift and transport heavy bottles of water from a kiosk location due to disability, age or other factors. Additionally, there are no impacted PWS (see Section 4.1.4) in the Modesto Sub-Basin that would benefit from a kiosk, so the cost to construct and operate kiosks to serve fewer than 300 domestic wells does not provide good return on investment.

Recommendation:

- POU treatment could serve as a 60% solution to domestic wells that do not have co-contamination or for populations unable to 5-gallon bottles of water. One POU per well is assumed for cost calculations.
- Bottled water could serve as a 40% solution to the population not able to be served by POUs or wells

6.2.5 Alternatives Analysis for Tulare Lake Sub-Basin

Tulare Lake Sub-Basin High-Risk Domestic Well Count and Proximity to Potential Kiosk Location

There are 66 domestic wells in Tulare Lake Sub-Basin located in areas at high-risk for nitrate concentrations above the MCL. None of the high-risk domestic wells are located outside of a 10-mile radius of a compliant PWS (Figure 6-8) that could potentially accommodate a kiosk.

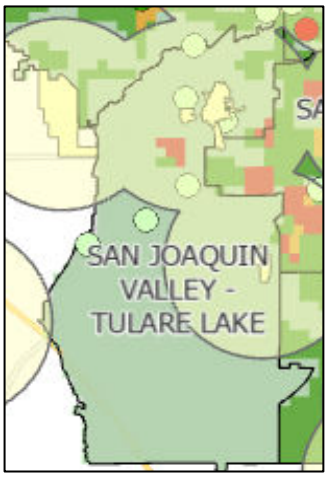

Figure 6-8 - Wells located in areas at-risk in Tulare Lake Sub-Basin for high nitrate are indicated by red blocks. Yellow circles indicate 10-mile radius from compliant PWS.

Co-contamination Risk in Tulare Lake Sub-Basin

- 43 of the domestic wells are at high-risk for nitrate and uranium over the MCL.
- 18 of the domestic wells are at high-risk for nitrate and arsenic over the MCL.

Demographic Information for Tulare Lake Sub-Basin

- 12% of the population are 65 years or older
- 13% of the community are considered disabled
- 47% of the community are renters
- 20% of the community speaks English less than well
- 69% of the community are considered disadvantaged (DAC)
- 4% of the community are considered severely disadvantaged (SDAC)
- Average number of people per household = 3.3

Tulare Lake Sub-Basin Alternatives Analysis Summary and Recommendation

92% of the domestic wells that are at high-risk for nitrate are also at high-risk for elevated concentrations of other contaminants of concern, which may impact the efficiency and effectiveness of POU treatment. While all of the high-risk domestic wells fall within an area where a kiosk could potentially be located, there are no PWSs that have unresolved nitrate violations (see Section 4) or SSWSs (see Section 6) in the Tulare Lake Sub-Basin that would benefit from a kiosk, so the cost to construct and operate kiosks to serve fewer than 50 domestic wells does not provide good return on investment.

Recommendation:

- Bottled water is recommended for 100% of the impacted domestic wells in the Tulare Lake Sub-Basin

6.2.6 Alternatives Analysis for Tule Sub-Basin

Tule Sub-Basin High-Risk Domestic Well Count and Proximity to Potential Kiosk Location

There are 413 domestic wells in Tule Sub-Basin located in areas at high-risk for nitrate concentrations above the MCL. 51 of the high-risk domestic wells are located outside of a 10-mile radius of a compliant PWS (Figure 6-9) that could potentially accommodate a kiosk.

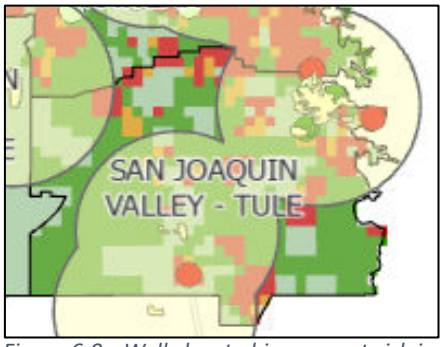

Figure 6-9 - Wells located in areas at-risk in Tule Sub-Basin for high nitrate are indicated by red blocks. Yellow circles indicate 10-mile radius from compliant PWS.

Co-contamination Risk in Tule Sub-Basin

- 25 of the domestic wells are at high-risk for nitrate and uranium over the MCL.
- 25 of the domestic wells are at high-risk for nitrate and 1,2,3-TCP over the MCL.
- 30 of the domestic wells are at high-risk for nitrate and perchlorate over the MCL.
- 4 of the domestic wells are at high-risk for nitrate and arsenic over the MCL.

Demographic Information for Tule Sub-Basin

- 12% of the population are 65 years or older
- 13% of the community are considered disabled
- 47% of the community are renters
- 20% of the community speaks English less than well
- 36% of the community are considered disadvantaged (DAC)
- 56% of the community are considered severely disadvantaged (SDAC)
- Average number of people per household = 3.2

Tule Sub-Basin Alternatives Analysis Summary and Recommendation

20% of the domestic wells that are at high-risk for nitrate are also at high-risk for co-contamination, which may impact the efficiency and effectiveness of POU treatment. 12% all of the high-risk domestic wells fall outside an area where a kiosk could potentially be located, which eliminates kiosks as a viable option for the population served by those wells. Additionally, at least 13% of the population may not be able to lift and transport heavy bottles of water from a kiosk location due to disability, age or other factors. If installed and properly located, kiosks could serve a percentage of both impacted PWS (see Section 4), as well as some of the domestic wells, although use of any kiosk should be complimented with more convenient options (like bottled water, or POU where deemed safe and with sufficient maintenance and sampling) for low-income families that may struggle to equitably access a kiosk.

Recommendation:

- 2 kiosks are recommended to serve as a 50% solution for impacted domestic wells, although use of kiosks should be complimented with more convenient options (like bottled water, or POU where deemed safe and with sufficient maintenance and sampling) for low-income families that may struggle to equitably access a kiosk.
- POU treatment could serve as a 30% solution to domestic wells that do not have co-contamination, are outside of a kiosk boundary, or for populations unable to lift 5-gallon bottles of water. One POU per well is assumed for cost calculations.
- Bottled water could serve as a 20% solution to the population not able to be served by POUs or wells.

6.2.7 Alternatives Analysis for Turlock Sub-Basin

Turlock Sub-Basin High-Risk Domestic Well Count and Proximity to Potential Kiosk Location

There are 1,062 domestic wells in Turlock Sub-Basin located in areas at high-risk for nitrate concentrations above the MCL. None of the high-risk domestic wells are located outside of a 10-mile radius of a compliant PWS (Figure 6-10) that could potentially accommodate a kiosk.

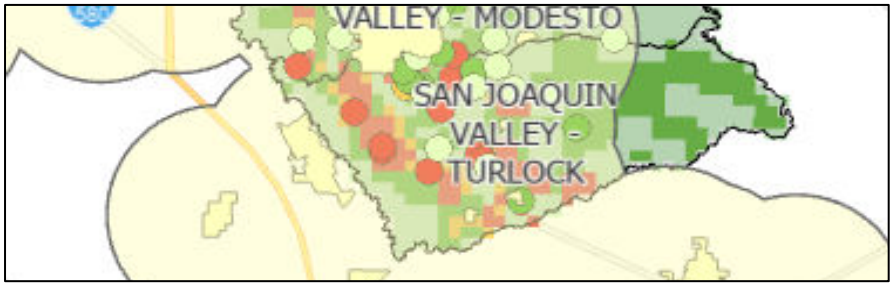

Figure 6-10 - Wells located in areas at-risk in Turlock Sub-Basin for high nitrate are indicated by red blocks. Yellow circles indicate 10-mile radius from compliant PWS.

Co-contamination Risk in Turlock Sub-Basin

- 216 of the domestic wells are at high-risk for nitrate and uranium over the MCL.
- 427 of the domestic wells are at high-risk for nitrate and 1,2,3-TCP over the MCL.
- 232 of the domestic wells are at high-risk for nitrate and arsenic over the MCL.

Demographic Information for Turlock Sub-Basin

- 12% of the population are 65 years or older
- 13% of the community are considered disabled
- 47% of the community are renters
- 20% of the community speaks English less than well
- 67% of the community are considered disadvantaged (DAC)
- 9% of the community are considered severely disadvantaged (SDAC)
- Average number of people per household = 3.4

Turlock Sub-Basin Alternatives Analysis Summary and Recommendation

82% of the domestic wells that are at high-risk for nitrate are also at high-risk for co-contamination, which may impact the efficiency and effectiveness of POU treatment. None of the high-risk domestic wells fall outside an area where a kiosk could potentially be located, however at least 13% of the population may not be able to lift and transport heavy bottles of water from a kiosk location due to disability, age or other factors. If installed and properly located, kiosks could serve a percentage of the impacted domestic wells, although any use of kiosks should be complimented with more convenient options (like bottled water, or POU where deemed safe and with sufficient maintenance and sampling) for low-income families that may struggle to equitably access a kiosk..

Recommendation:

- 2 kiosks are recommended as a solution for 50% of impacted domestic, although any use of kiosks should be complimented with more convenient options (like bottled water, or POU where deemed safe and with sufficient maintenance and sampling) for low-income families that may struggle to equitably access a kiosk.
- POU treatment could serve as a 15% solution to domestic wells that do not have co-contamination, are outside of a kiosk boundary, or for populations unable to lift 5-gallon bottles of water. One POU per well is assumed for cost calculations.
- Bottled water could serve as a 35% solution to the population not able to be served by POUs or wells.

6.3 Summary of Interim Drinking Water Supply Recommendation for Private Domestic Wells

The interim water supply recommendations for each sub-basin, as summarized in Table 6-2, have been used in the development of interim water supply costs which are provided in Section 9. The number of kiosks recommended for each sub-basin has primarily been based on the practicality of kiosk use by private domestic well users. The kiosks recommended for use by private domestic wells in Kaweah, Kings, Tule and Turlock Sub-Basins are the same kiosks that are recommended for use by PWS in Section 4. As stated repeatedly in this report, any usage of kiosks should be complimented with more convenient options (like bottled water, or POU where deemed safe and with sufficient maintenance and sampling) for low-income families that may struggle to equitably access a kiosk. It should not be assumed that nitrate is the only contaminant of concern, or that a POU will effectively remove nitrate or other contaminants to safe levels on a continuous basis. POU devices should be used only if regular maintenance (minimum twice per year) and water quality testing (minimum of once per quarter) can be carried out. Water quality sampling must be done on all private domestic wells prior to consideration for POU treatment and should include multiple parameters such as TDS, hardness, manganese, iron, bacteria, and regulated contaminants. Further, it should be expected that at least 26% of private domestic wells that are impacted by nitrate are also like to have coliform bacteria contamination based on the GAMA Domestic Well Project (SWRCB, 2020). The occurrence of coliform bacteria will greatly reduce POU effectiveness resulting in the potential for bacteria, nitrate and other contaminants to pass through the RO membranes. Additional recommendations for proper POU use are provided in Section 7.3.

Table 6-2 - Summary of recommended interim water supplies for private domestic wells by basin.

Basin	Recommended # of Kiosks	% Domestic Wells Served by Kiosks	% Domestic Wells Served by POU	% Domestic Wells Served by Bottled Water
Chowchilla	0	0%	60%	40%
Kaweah	3	50%	30%	20%
Kings	4	50%	30%	20%
Modesto	0	0%	60%	40%
Tulare Lake	0	0%	0%	100%
Tule	2	50%	30%	20%
Turlock	2	50%	15%	35%

7. Interim Water Supply Cost Development

7.1 Cost Estimation Level of Accuracy

The methodology described below corresponds with a Class 5 cost estimate as defined by AACE International. Class 5 cost estimates are considered appropriate for screening level efforts and have a level of accuracy ranging from -20% to -50% on the low end and +30% to +100% for an encompassing range of -50% to +100%. For the developed costs, the central tendency of the cost estimates will be shown; however, it is important the reader view each value with the accuracy range in mind. For example, if a cost of $100 is presented the corresponding range of anticipated costs is $50 to $200.

7.2 Kiosks Capital and Annual O&M Cost Assumptions and Other Considerations

Table 7-1 and Table 7-2 show a breakdown of the per location capital and O&M cost estimate used for kiosks (aka, vended water machines). This estimate is based on the cost information used to estimate kiosk installation and management costs in the Turlock Management Zone, as well as cost data from the Arvin Community Services District Vended Water Project and the Tecopa Water Vending Machine. The cost may vary widely depending on the locations where the kiosks are installed.

As previously mentioned, social factors should also be considered when determining if kiosks will provide an appropriate solution for various segments of each nitrate impacted community. For instance, the amount of time required to drive to a kiosk location will impact customers not only in the cost of fuel, but also the amount of time required to acquire water. Access to reliable transportation to access kiosk locations is another consideration. Other factors such as disability and age may impact an individual's ability to pick-up and move 5-gallon bottles of water. These considerations have been factored into the interim water supply recommendations provided in this paper.

Table 7-1 - Kiosk capital cost detail

Kiosk Capital Cost Detail	
Construction costs (includes project management, design, kiosk purchase and installation costs, submittal to DDW)	$50,000
Legal support	$6,000
Start-up costs	$6,000
Project Management (includes construction project management and identification of kiosk locations)	$9,000
Total	**$71,000**

Table 7-2 - Kiosk annual operations and maintenance cost detail

Kiosk Annual Operations and Maintenance Cost Detail	
Operations and Maintenance	$6,000
Data Management/Reporting to DDW	$6,000
Total	**$12,000**

7.3 Point-of-Use Capital and Annual O&M Cost Assumptions and Other Considerations

Table 7-3 and Table 7-4 show a breakdown of the per connection capital and O&M cost estimate used for reverse osmosis POUs[4].

A reverse osmosis POU is an appropriate device to reduce nitrate, however a POU cannot be guaranteed to work in all circumstances where nitrate contamination is a concern. POUs should not be assumed to be capable of effectively treating water with extremely high concentrations of nitrate. Additionally, water quality factors such as Total Dissolved Solids (TDS), chloride, alkalinity, bacteria and sulfate can reduce POU effectiveness due to membrane fouling, resulting in contaminant pass through. RO POU devices which are treating groundwater typically show a 70% nitrate removal rate and may only have a 30% recovery rate, meaning that 70% of the water passing through the POU goes to waste (Shams, 2010). High hardness, silica, and bacteria can reduce contaminant removal rates to below 70% and therefore it is critical that regular water quality monitoring is conducted (at least quarterly) which include multiple water quality parameters, in order to ensure that the water produced is safe for human consumption. Contaminants beyond nitrate may not be effectively removed by a POU. For instance, many of the sub-basins included in this report have been found to have 1,2,3 TCP in the groundwater, which may not be effectively removed by a POU, plus TCP exposure can occur during showering, and through inhalation, which would not be addressed by a POU used on a kitchen tap.

Low water pressure may also be another limiting factor for POUs, as the units may not be able to process water efficiently if water pressures are too low. Other considerations include the age of the property plumbing, as POUs may not be feasible for use on old or inaccessible plumbing. Finally, if a property is rented, both the owner and renter will need to provide permission to have POUs installed and regularly maintained which can add an additional layer of complexity (Self-Help Enterprises, 2020).

Prior to considering POUs as an interim drinking water solution, the recommendations developed by CWC and submitted to Monterey County (see Appendix B) regarding revisions to the currently suspended Ordinance 15.06 (Point-of-Use (POU) and Point-of-Entry (POE) Water Treatment Systems) should be implemented to ensure that the devices are appropriate on a case-by-case basis and so that drinking water users do not have a false sense of security that the device is removing all contaminants to a level of safety. **Only POUs that are state certified for the removal of nitrate should be used and should come equipped with a TDS performance indicator. Technical Assistance (TA) providers should be contracted to oversee the installation and maintenance of POUs to ensure proper operation and to provide users with on-going technical support.**

To ensure that POUs are an appropriate interim solution, a multiple parameter water quality analysis should be conducted, in-particular for private domestic wells where water quality is likely unknown. POUs should not be considered when water quality results indicate contaminates exceeding water quality standards are unlikely to be removed to safe levels by a POU. POUs should also not be considered if nitrates are higher than the POU device is certified to remove, and/or there are contaminants that are known to inhibit (e.g. clog, foul, etc) RO treatment – such as high hardness and total coliform bacteria.

If POUs are considered to likely provide adequate treatment based on device certification related to the existing water quality, it is still important to closely monitor installed POUs for the first three months of use, by conducting a minimum of monthly sampling to evaluate all contaminants of concern. This three-month pilot period will help to inform the effectiveness of the treatment device in removing nitrate and other regulated contaminants, as well as provide device performance indicators that can assist in developing

[4] Porse, Erik, 2019. Sacramento State Office of Water Programs. Unpublished. Also used in the interim solutions cost part of the State Water Board's Needs Assessment project completed by Gregory Pierce at UCLA. Corona added operator labor costs and analytical costs on an annual basis.

maintenance and water quality sampling schedules. Tables 7-3 and 7-4 includes the cost for nitrate analysis only, however it is critical that additional water quality parameters are included, such as TDS, hardness, inorganics, bacteria and other contaminants of concern. Estimated cost for analysis of additional water quality parameters are provided in Table 7-5. **Management Zones should work closely with counties and the state to ensure that proper water quality analysis is conducted and to coordinate with other funding programs that may provide assistance with water quality analysis costs extending beyond nitrate.** Following the three-month pilot, quarterly water quality sampling and analysis should be conducted to ensure adequate continued operation of the POU device. If POU devices are not effective in providing consistently safe drinking water, bottled water should be provided to the household or business.

Table 7-3 - POU capital cost detail (per connection)

Point of Use Capital Cost Detail (Per Connection)	
Estimated cost per unit (POU Filter, 1st year membrane replacement, TDS monitor, Flowmeter)	$1,200
Filter Installation and membrane replacement labor cost per unit ($100/hr)	$300
Analytical (nitrate analysis during 3-month pilot (sampling monthly) plus quarterly nitrate analysis after pilot. Assumes $30/sample x 6)	$180*
Labor for project management and sample collection (labor for coordination with user, filter procurement administration, data management, sub-contractor and laboratory coordination. Based on labor cost of $50/hour)	$920
Total	$2,600**

* Represents analytical cost for nitrate only. Reference Table 7-5 for the cost of additional analytics that should be conducted during the pilot period, and possibly on-going for the duration of POU use. The cost for analysis of other parameters could be shared with other funding programs, such as SAFER).
** Anticipated life of unit based on a 3.5 people per household is 10 years. If unit is expected to remain in use for greater than 10 years this cost will be occurred again.

Table 7-4 - POU annual operations and maintenance cost detail (per connection)

Point of Use Annual Operation and Maintenance Cost Detail (Per Connection)	
Membrane replacement 2x/year ($100/replacement x 2)*	$200
Labor for membrane replacement ($100/hour x 2)	$200
Analytical 4x/year (analysis for nitrate only=$30 x 4)**	$120
Labor for sampling and data management (1-hour labor/sampling event =$50 x 4)	$200
Total	$720

* Assumes membrane replacement twice per year
**Assumes quarterly sampling

Table 7-5 – Cost of additional potentially needed/required water quality analysis to ensure POU safety and effectiveness

Estimated Cost of Additional Water Quality Analysis Potentially Needed to Ensure POU Effectiveness	
General mineral, physical, inorganic (includes nitrate. Does not include MBAS or CN)	$275
TCP low level	$200
EPA 525 for Volatile Organic Chemicals	$150
IDEXX Quanti-Tray (quantifies coliforms, *E. coli*, enterococci, and *Pseudomonas aeruginosa*)	$30
Heterotrophic Plate Count (HPC)(48 hour method)	$40

7.4 Bottled Water Cost Assumptions and Other Considerations

Bottled water is assumed to be provided in reusable 5-gallon bottles. The amount of water required for drinking, cooking and hygiene is estimated to be 0.67 gallons per person per day for residential use and 0.25 gallons per person per week for businesses and public organizations such as schools (Pierce, 2019). Bottled water cost has been based on an average cost of $1.25 per gallon (Pierce, 2019). These costs included the average cost of administration, implementation and other delivery or equipment costs. For the purpose of this paper the costs for bottled water are not further developed into variables associated with water that is delivered to each home/business versus a central bottled water pick-up location. Social factors should however be accounted for when determining the appropriate selection between delivered and centralized distribution of water related to factors such as community ability to access a centralized distribution location based on distance and availability of transportation and the impacts that disabilities and age may play in an individual's ability to pick-up and move 5-gallon bottles of water. In some cases, 1-gallon water bottles may be more appropriate for people who are unable to lift anything heavy, such as the elderly or disabled.

8. Cost of Interim Water Solutions and Public Outreach and Education

People living in areas where water sources have high concentrations of untreated nitrate and other contaminants should receive information and guidance about the potential health risks posed by the contaminants, as well as guidance about what they can do to protect themselves and their family. Additionally, to ensure acceptance and needed participation in interim drinking water solution implementation, and to make sure any proposed interim solution sets actually meet each particular community's needs, communities living in areas impacted by poor drinking water quality should be involved at every step of the process of interim water solution selection.

The degree to which a population may be aware of the health risks associated with contaminated water will vary. Because of the nature of how groundwater moves within the earth, the threats posed by groundwater contamination can vary dramatically throughout a sub-basin and can even vary in neighboring wells. Furthermore, the effectiveness of communication and outreach tactics will also change from one individual to the next due to diversity in background, education, economic status, and personality. For this reason, there is no 'one size fits all' approach that will work for every community and every person needing to be reached by a public outreach and education program.

It should be noted that the approach required to establish outreach and education costs for domestic well users varies from the approach used for PWSs and SSWSs. This is due, in large part, to the fact that there is often limited available data with the exact location of domestic wells that have contaminants exceeding current MCLs. Additionally, private domestic wells may or may not be consolidated into an area where they are easy to establish and maintain contact once identified. For this reason, the cost for public outreach to private domestic well owners is shown separately.

The Purpose of Outreach and Education

Public outreach and education to communities served by a PWS, SSWS, and domestic wells may be used to:

- Inform people about health risks posed by contaminants that may be in their drinking water as well as what they can do to protect themselves or their families until permanent solutions are put in place to mitigate the risks.
- Inform people about the steps that are being taken to mitigate contamination to drinking water supplies and what they can do to be involved in those efforts.
- Gather information from households and businesses that may assist in interim water supply solution analysis and selection.

- Provide information to people about interim drinking water supply and treatment programs that they can participate in.
- Provide instruction and assistance on proper use and maintenance of POU treatment, if applicable.
- Establish public trust and acceptance of short and long-term solutions to mitigate contaminants in water supplies.

Outreach to Private Domestic Wells

As mentioned before, outreach to private domestic well owners and users will often have an additional layer of complexity. Establishing contact with domestic well owners can be time and labor intensive as there is no single data source that is reliable for obtaining contact information. Further, whereas PWSs have water quality data that demonstrates water quality challenges, there is typically no water quality data available for the majority of private domestic wells considered to be in areas at high-risk for contamination. Additionally, private well owners, even once contacted, may not be interested in receiving information and guidance about contaminants that may be present in their water. This can be due to a lack of understanding, distrust in the government or public organizations, a false sense of safety, or simply not having the time or interest in being bothered (Morris, Wilson, & Kelly, 2016). Given that these and other barriers may exist, consistent and persistent outreach efforts are important for gaining participation from private domestic well owners and users.

The outreach to private domestic wells requires not only pushing information out, but also gathering of information from well users. Private domestic wells will require water quality testing to confirm water contamination and to identify the contaminants present at concentrations exceeding regulatory limits. Water quality sampling of private domestic wells should be expected to require extensive time and labor resources. A report published in 2020 by Self-Help Enterprises (SHE) provides an overview of the challenges faced in a pilot program through WIC in Tulare County to assess nitrate contamination and provide interim drinking water supplies. One of the lessons learned is the importance of conducting home visits for water sampling, rather than requiring private domestic well users to pick-up sample bottles and return the water samples to a program coordinator (Self-Help Enterprises, 2020). This is due to the delayed or sometimes absent response from well owners in both picking-up sample kits as well as returning them for analysis.

As nitrate is not the only contaminant of concern for private domestic wells, it is critical that counties, the state and M anagement Z ones work closely together to coordinate water quality sampling and analysis, as well as public outreach and education. It should be expected that contaminants such as TCP, arsenic, bacteria, and other contaminants will be found in some of the wells analyzed, therefore the management zones and the state could possibly share the cost for interim water supplies and public outreach. With this in mind, cost for water quality analysis beyond just nitrate analysis has been split out and provided in Table 8-2 to provide an estimate of the potential cost to conduct cursory analysis of private domestic wells in the area that are considered to be high-risk for nitrate contamination based on GAMA data. **It should be noted that private domestic wells should have the water quality assessed throughout each sub-basin, regardless of whether or not they are located in areas considered to be at high-risk for nitrate, as it is possible that nitrate contamination exceeding the MCL can be found in even low-risk areas.**

Domestic well users require printed informational materials about water contamination and will also need information resources about the solutions that may be available to remedy water that may be unsafe due to contamination. If a POU device is determined to be a suitable solution for a domestic well once water quality information is obtained, information about proper use and maintenance of the treatment device will be necessary. Additionally, well users who install POUs should have access to technical assistance to help with troubleshooting and other questions (Regunathan, Lowry, Cotruvo, & Latimer, 2007).

CBOs like Community Water Center and Leadership Counsel for Justice and Accountability, in addition to SHE, have particular expertise at reaching the most impacted communities, including to predominantly Spanish

speaking domestic well communities. CBOs like these organizations also have unique outreach and engagement strategies and have developed safe strategies to continue public engagement and outreach to vulnerable communities even during the pandemic. **Management Zones should partner with CBOs to successfully conduct outreach and engagement strategies to the most impacted residents.**

Cost Estimate Development

The cost estimates for this effort have been developed with the assistance of SHE, which provided salary and other cost related data. Additionally, the expected hours required to conduct outreach and education provided in the Environmental Protection Agency's cost estimating tool for point-of-use treatment devices have also been incorporated in draft budget estimates (Regunathan, Lowry, Cotruvo, & Latimer, 2007). As with the other cost development efforts, the cost estimates developed here only provide a standardized cost on a per connection basis for budget planning purposes.

Outreach and education for the public in the first year are expected to be higher than in following years, as it is during this time that informational materials are created, data systems are developed, and initial contact is made with impacted communities both face-to-face and through a variety of printed and digital media. The first-year cost to establish contact with domestic wells is higher due to the time and labor resources needed to identify and reach impacted domestic well users. For this reason, the first-year public outreach and education costs for domestic wells has been developed separately from the cost of public outreach and education for PWS and SSWS. Table 8-1 provides the breakdown for estimated first-year cost for public outreach and education for PWS and SSWS on a per connection basis.

It should be noted that CBOs have unique outreach and engagement strategies and capacities above and beyond those identified in this section. These strategies include contactless pamphlet and material drops, digital outreach strategies utilizing texting and social media, phone calls, culturally competent outreach for well testing and facilitating implementation of short and long-term drinking water solutions, and more. These costs were not included in this report's cost estimates. CBOs can also leverage their already trusted relationships with impacted community members to help support equitable Early Action Plan development and implementation. Management Zones should partner with CBOs to successfully conduct outreach and engagement strategies to the most impacted residents.

Table 8-1 - Detailed estimated cost year 1 annual public outreach and education for PWS and SSWS

Estimated First Year Public Outreach and Education Costs for a Single PWS or SSWS Connection

	Total Hours or Units	Program Director *$57*	Administrative Analyst *$37*	Project Manager *$34*	Project Technician *$37*	Materials	Total Cost/Unit
Staff Time (hourly rate)							
Develop Materials	0.25				0.25		$9
Outreach efforts (meeting, phone calls, field work)	7.2	0.2		2	2		$153
Information management	2.75		0.25	0.25	0.25		$27
Education Materials							
Flyers	3					$2.00	$6
Meeting handouts	3					$1.50	$5
Billing mailer	2					$1.00	$2
Misc. (meeting venue rental, ads, etc.)	1					$10.00	$10
Travel							
Mileage (per mile)	50					$0.58	$29
Rental Car (per day)	1.8					$30.00	$54
						1st Year Cost for Outreach per Connection=	**$295**

Table 8-2 provides the breakdown for estimated first year costs for domestic wells on a per well basis. **The cost of water quality sampling and analysis is split out from the labor, materials and travel costs for general outreach and education as the initial water quality analysis for private domestic wells will likely require coordination with the state.**

Table 8-2 - Detailed estimated cost year 1 annual public outreach and education for private domestic wells

1st Year Cost for Domestic Well Public Outreach and Education

	Total Hours or Units	Program Director *$57*	Administrative Analyst *$37*	Project Manager *$34*	Project Technician *$37*	Materials	Total Cost/Unit
Staff Time							
Develop Materials	0.5				0.5		$19
Outreach efforts (meeting, phone calls, field work)	7.2	0.2		3	3		$224
Information management	2.75		2.25	0.25	1.25		$138
Education Materials							
Flyers	5					$2.00	$10
Meeting handouts	3					$1.50	$5
Billing mailer	2					$1.00	$2
Misc. (meeting venue rental, ads, etc.)	1					$10.00	$10
Travel							
Mileage (per mile)	75					$0.58	$44
Rental Car (per day)	1					$30.00	$30
Subtotal Outreach Labor, Materials & Travel							**$480**
Water Quality Analysis - nitrate only							
Labor: water quality sampling/data analysis			0.5		3		$111
Misc. (Bottles, reflective vests, etc.)	1					$20.00	$20
Travel							
Mileage (per mile)	50					$0.58	$29
Rental Car (per day)	0.5					$30.00	$15
Subtotal Well Sampling Analysis							**$175**
Laboratory services: water quality analysis - nitrate only	1					$30.00	**$30**
1st Year Cost for Outreach per Domestic Well for Outreach Labor, Materials, Travel and Water Quality Analysis (Nitrate Only)=							**$685**

Water Quality Analysis - Multiple Parameters							
General mineral, physical, inorganic (includes nitrate, does not include MBAS or CN)	1					$275.00	$275
TCP (low level)	1					$200.00	$200
EPA 525 for volatile organic chemicals (VOC)	1					$150.00	$150
Heterotrphic Plate Count (HPC)	1					$40.00	$40
IDEXX Quanti-Tray	1					$30.00	$30
Subtotal Water Quality Analysis - Multiple Parameters							**$695**
1st Year Cost for Outreach per Domestic Well for Outreach Labor, Materials, Travel and Water Quality Analysis - Multiple Parameters =							**$1,350**

It is critical for outreach and education programs to continue providing assistance and information beyond the first year to ensure that water system customers and domestic well users properly use and maintain POU treatment devices if used as a solution. It is to be expected that a percentage of the population in an impacted area will migrate in and out of the community. Individuals and families new to the community will need to be reached to provide information about water quality in their area, guidance for what they can do to minimize health related risks from contaminants that may be present in drinking water, as well as any information about POU treatment if applicable. Table 8-3 provides the detailed cost estimate for on-going (beyond year 1) public

outreach and education. The cost estimate can be applied per each connection in a PWS or SSWS, or for an individual well that has been verified to have contaminants that exceed regulatory limits.

Table 8-3 - Detailed estimated cost for on-going (beyond year 1) annual public outreach and education

On-Going Public Outreach and Education Cost Estimate for Domestic Wells, PWS, and SSWS

	Total Hours or Units	Program Director *$57*	Administrative Analyst *$37*	Project Manager *$34*	Project Technician *$37*	Materials	Total Cost/Unit
On-going outreach (labor hou	2			1	1		**$71**
Mailer/Flyer	2					$2.00	**$4**
						Total Annual Cost per Connection/Domestic Well=	**$75**

9. Estimated Cost of Interim Water Supplies and Public Outreach and Education by Basin

The cost estimate provided in this section is based on the interim water supply recommendations for individual PWS in each sub-basin (Section 4), the recommendation of 50% POUs and 50% bottled water for SSWS in each sub-basin (Section 5), and the recommendations for interim water supplies for private domestic wells in each sub-basin (Section 6).

9.1 Overview of Cost Factors Used to Develop Interim Water Supply Costs for Public Water Systems

The interim water supply costs for PWS in each basin have been based on the specific recommendations for each PWS in the sub-basins as detailed in Section 4. Table 9-1 provides a detailed summary of the cost related factors for PWS that have been used to develop costs for interim water supplies for each basin.

Table 9-1 - Summary of public water system interim water supply cost drivers used to develop costs for each basin

	Chowchilla	Kaweah	Kings	Modesto	Tulare Lake	Tule	Turlock
Number of Business or public organization connection	0	8	28	9	0	4	3
Population served by business or public organization connections	**0**	**1245**	**1261**	**172**	**0**	**373**	**77**
Number of Household connection	0	142	134	12	0	1295	0
Population served by household connections	0	747	799	50	0	5733	0
Kiosks							
Number of kiosks recommended for sub-basin	0	3	4	0	0	3	2
Number of connections to use kiosks	0	96	20	0	0	102	0
POU							
Number of connections to use POU	0	9	3	1	0	12	1
Number of POUs needed	0	9	3	1	0	12	73
Bottled Water							
Number household connections to use bottled water	0	36	114	12	0	1181	0
Household population to use bottled water	0	160	730	50	0	5375	0
Number of buinesses or public organizatins connections to use bottled water	0	4	27	8	0	4	2
Number of people served by buinesses or public organizations to use bottled water	0	1245	1135	160	0	373	51

9.2 Overview of Cost Factors Used to Develop Interim Water Supply Costs for Private Domestic Wells

The interim water supply costs for private domestic wells in each sub-basin have been based on the recommendations detailed in Section 6. Table 9-2 provides a detailed summary of the cost related factors for private domestic wells that have been used to develop costs for interim water supplies for each basin. As discussed in Section 6, it is assumed that not all of the domestic wells in areas considered high-risk for excessive nitrate concentrations will produce water with nitrate in excess of the MCL. Therefore, only 40% of the total number of domestic wells in high-risk areas will be assumed to require an interim water supply. As discussed previously, this number is likely an underestimation of the actual number of wells that have high nitrate levels. To ensure that all private domestic wells with nitrate levels exceeding health standards are identified, outreach

and well sampling to all domestic wells in both areas that are considered at high risk as well as in areas that are not considered to be high-risk is highly recommended.

Table 9-2 - Summary of domestic well interim water supply cost drivers used to develop costs for each basin

	Chowchilla	Kaweah	Kings	Modesto	Tulare Lake	Tule	Turlock
Avg. number of people/household	5.6	3.3	3.3	3.1	3.3	3.2	3.4
Total number of wells in sub-basin in high-risk area	98	1077	2110	310	66	413	1062
Estimated number of wells requiring interim drinking water (40% of total number of wells)	**39**	**431**	**844**	**124**	**26**	**165**	**425**
Kiosks							
Number of kiosks recommended for sub-basin	0	3	4	0	0	2	2
Percentage of estimated wells to use kiosks for interim solution	0	50%	50%	0%	0%	50%	50%
Number of estimated wells to use kiosks for interim solution	**0**	**215**	**422**	**0**	**0**	**83**	**212**
POU							
Percentage of wells to use POU for interim solution	60%	30%	30%	60%	0%	30%	15%
Number of wells to use POU for interim solution/number of POUs (assumes 1 POU per domestic well)	**24**	**129**	**253**	**74**	**0**	**50**	**64**
Bottled Water							
Percentage of wells to use bottled water for interim solution	40%	20%	20%	40%	100%	20%	35%
Number of estimated wells to use bottled water for interim solution	16	86	169	50	26	33	149
water (# of domestic wells requiring bottled water * avg. # people/household)	**88**	**284**	**557**	**154**	**87**	**106**	**506**

9.3 Total Cost for All Recommended Interim Water Supplies for All Basins

Table 9-3 provides a detailed overview of the calculation used to develop interim water supply costs for each basin.

Table 9-3 - Total cost by sub-basin for all recommended interim water supplies (values rounded to the nearest 100)

	Cost ($)	Chowchilla		Kaweah		Kings		Modesto		Tulare Lake		Tule		Turlock	
Kiosks															
# Kiosks		0		3		4		0		0		2		2	
		Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going
Kiosk Capital	$71,000	$0		$213,000		$284,000		$0		$0	$0	$142,000		$142,000	
Kiosk Annual O&M	$12,000	$0	$0	$36,000	$36,000	$48,000	$48,000	$0	$0	$0	$0	$24,000	$24,000	$24,000	$24,000
Domestic Wells															
POUs															
# POUs		24		129		253		74		0		50		64	
		Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going
POU Cost	$2,400	$56,400		$310,200		$607,700		$178,600		$0		$118,900		$152,900	
Annual Maintenance	$720		$16,900		$93,100		$182,300		$53,600		$0		$35,700		$45,900
Bottled Water															
Number of people to receive bottled water		88		284		557		154		87		106		506	
		Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going
Household Bottled Water Cost/Person/Year (assumes .67 gallons of water/person/day * $1.25/gallon of water)	$306	$26,900	$26,900	$87,000	$87,000	$170,500	$170,500	$47,100	$47,100	$26,700	$26,700	$32,400	$32,400	$154,700	$154,700
Public Water Systems															
POUs															
# POUs		0		9		15		1		0		12		73	
		Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going
POU Cost	$2,600	$0		$23,400		$39,000		$2,600		$0		$31,200		$189,800	
Annual Maintenance	$720		$0		$6,500		$10,800		$700		$0		$8,600		$52,600
Bottled Water															
Number of people to receive bottled water - households		0		160		730		50		0		5375		0	
Number of people to receive bottled water - business or public organization		0		1245		1135		160		0		373		51	
		Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going
Household Bottled Water Cost/Person/Year (assumes .67 gallons of water/person/day * $1.25/gallon of water)	$306	$0	$0	$48,900	$48,900	$223,200	$223,200	$15,300	$15,300	$0	$0	$1,643,100	$1,643,100	$0	$0
Business and Public Organization Bottled Water Cost/Person/Year (assumes .25 gallons of water/person/day * $1.25/gallon of water) - business or public organization	$114	$0	$0	$141,930	$141,930	$129,390	$129,390	$18,200	$18,200	$0	$0	$42,500	$42,500	$5,800	$5,800
State Small Water Systems & PWS w/o Nitrate Data															
POUs															
# POUs		0		14		5		3		0		2		11	
		Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going
POU Cost	$2,600	$0		$36,400		$13,000		$7,800		$0		$5,200		$28,600	
Annual Maintenance	$720		$0		$10,080		$3,600		$2,200		$0		$1,440		$7,900
Bottled Water															
Number of people to receive bottled water - business or public organization		0		38		28		13		0		38		50	
		Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going
Cost/Person/Year (assumes .25 gallons of water/person/day * $1.25/gallon of water) - business or public organization	$114	$0	$0	$4,332	$4,332	$3,200	$3,200	$1,500	$1,500	$0	$0	$4,300	$4,300	$5,700	$5,700
		Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going	Year 1	On-going
Total cost for all solutions (rounded to nearest 100)		**$83,300**	**$43,800**	**$901,200**	**$427,800**	**$1,518,000**	**$771,000**	**$271,100**	**$138,600**	**$26,700**	**$26,700**	**$2,043,600**	**$1,792,000**	**$703,500**	**$296,600**

9.4 Public Outreach and Education Cost Estimates for All Sub-Basins

The cost for public outreach and education were developed based on the cost estimations described in Section 8. The factors influencing total cost include the number of domestic wells or the number of connections in a PWS or SSWS that will be included in a public outreach and education program. It is assumed that 100% of all of the PWS and SSWS connections that were evaluated in this effort will be included in both the first year of public outreach and on-going years. It is not expected that 100% of all well owners, even if reached, will have interest or come forward to participate in the interim water supply program. On-going outreach to domestic wells is expected to fall to only 40% of the total number of wells identified in high-risk areas (see Section 6), as only the domestic wells which are confirmed to have nitrate over the MCL will require on-going contact. However, as discussed previously, this 40% estimation is a conservative assumption, utilizing existing imperfect data, of the number of domestic well owners that are actually impacted by high levels of nitrate contamination.

Table 9-4 provides the per sub-basin cost of public outreach and education separated out by PWS, SSWS, and domestic wells. The initial cost of domestic well sampling is further broken out, as some of this cost may be shared with state programs that are focused on contaminates beyond nitrate. See Table 8-2 on page 45 for the cost of domestic well sampling for several other non-nitrate contaminants that will also need to be tested for.

Table 9-4 - Cost of public outreach and education for PWS, SSWS and domestic wells in all sub-basins (values rounded to the nearest 100)

	Chowchilla	Kaweah	Kings	Modesto	Tulare Lake	Tule	Turlock	Total
Total # Domestic Wells	**98**	**1077**	**2110**	**317**	**66**	**413**	**1062**	**5143**
Water Quality Sampling and Analysis - Nitrate only	$20,100	$221,000	$432,900	$65,000	$13,500	$84,700	$217,900	**$1,055,100**
1st Year Outreach	$47,100	$517,100	$1,013,100	$152,200	$31,700	$198,300	$509,900	**$2,469,400**
Total cost of on-going outreach for 5 years (years 2-6) to 40% of domestic wells	$14,600	$160,800	$315,100	$47,300	$9,900	$61,700	$158,600	**$768,000**
Total cost over 6 years	**$81,800**	**$898,900**	**$1,761,100**	**$264,500**	**$55,100**	**$344,700**	**$886,400**	**$4,292,500**

	Chowchilla	Kaweah	Kings	Modesto	Tulare Lake	Tule	Turlock	Total
# PWS Connections	**0**	**150**	**162**	**21**	**0**	**1299**	**3**	**1635**
1st Year Outreach	$0	$44,200	$47,700	$6,200	$0	$382,600	$900	**$437,400**
On-Going Outreach (Years 2-6)	$0	$56,000	$60,500	$7,800	$0	$485,000	$1,100	**$554,400**
Total cost over 6 years	**$0**	**$100,200**	**$108,200**	**$14,000**	**$0**	**$867,600**	**$2,000**	**$991,800**

	Chowchilla	Kaweah	Kings	Modesto	Tulare Lake	Tule	Turlock	Total
# SSWS and PWS (w/o nitrate data)	**0**	**3**	**2**	**1**	**0**	**1**	**5**	**12**
1st Year Outreach	$0	$900	$600	$300	$0	$300	$1,500	**$2,700**
On-Going Outreach (Years 2-6)	$0	$1,100	$700	$400	$0	$400	$1,900	**$3,400**
Total cost over 6 years	**$0**	**$2,000**	**$1,300**	**$700**	**$0**	**$700**	**$3,400**	**$6,100**

Table 9-4 has cost calculated over a six-year period, which includes the first-year cost of setting up and implementing initial outreach and education efforts, plus five (5) years of on-going outreach. Table 9-5 provides simplified cost break down with only the cost of on-going outreach for a single year.

Table 9-5 - Outreach and education cost by sub-basin for first year cost (including domestic well sampling) and the single year cost for on-going outreach (values rounded to the nearest 100)

	Chowchilla	Kaweah	Kings	Modesto	Tulare Lake	Tule	Turlock
Total Year 1 Outreach Cost (includes water quality analysis - nitrate only)	$67,200	$561,300	$1,494,300	$223,700	$45,200	$665,900	$730,200
Annual On-Going Outreach Cost (per year after first year)	$2,900	$43,600	$75,300	$11,100	$2,000	$109,400	$32,300

9.5 Interim Water Supply and Public Outreach and Education Cost Estimating Tool

The CWC Interim Drinking Water Solutions Cost Calculator is an Excel workbook that helps calculate the costs associated with providing drinking water to water systems and private domestic well owners that have been impacted by high nitrate levels in their drinking water in the Central Valley of California. The tool allows users to consider the cost of drinking water solutions for seven high priority subbasins – Chowchilla, Kaweah, Kings, Modesto, Tulare Lake, Tule, and Turlock. The tool considers three potential interim drinking water solutions – delivery of bottled water, use of kiosks, and installation of point-of-use (POU) devices. The tool allows users to vary the percentage assigned to each type of solution in each basin, in order to represent the mix of solutions that might be used, and to calculate the associated total cost for each subbasin. The tool includes costs associated with public education and outreach in order to provide the drinking water solutions to systems or domestic well owners in need.

The tool builds up the total cost for each solution type by considering both the initial cost and the ongoing annual costs. Future annual costs are discounted to present value and added to initial costs in order to show total costs over the time period selected for the analysis. The default assumption in the tool is that interim drinking water solutions will be used for 5 years – after which time, permanent solutions will be provided. However, the tool allows users to adjust the assumption for the number of years to choose any analysis period up to 10 years.

The tool builds cost estimates for each drinking water solution, and associated education and outreach, from unit costs from published literature and experience by current providers of drinking water assistance. The tool user can change basic default assumptions about initial or annual cost for POU devices, kiosks, bottled water, and well testing or going costs for education and outreach. The cost estimating tool is not designed to incorporate the specific recommendations provided within this paper for individual PWSs due to the complexity of the individual input required.

Works Cited

Botts, J. (2020, February 27). *California's struggle to get food stamps to the hungry*. Retrieved from Cal Matters: https://calmatters.org/california-divide/2019/07/california-food-stamp-enrollment-rate-calfresh/

Brandy, M. (2015, July). *The WIC Program in California*. Retrieved from Public Policy Institute of California: https://www.ppic.org/publication/the-wic-program-in-california/#:~:text=California%20has%20the%20highest%20coverage,the%202014%20federal%20fiscal%20year.&text=Relatively%20fewer%20children%20participated%20in,and%20Orange%20(15.1%25)%20Counties.

California Water Boards. (2016). *Groundwater Ambient Monitoring and Assessment (GAMA): Domestic Well Project Groundwater Quality Data Report - Tulare County Focus Area.* California Water Boards.

EPA. (2019, December 5). *SDWIS Federal Reporting Services System*. Retrieved from Environmental Protection Agency: https://ofmpub.epa.gov/apex/sfdw/f?p=108:200:::NO:::

EPA. (2020). *This is a book.* Denver: AWWA.

Morris, L., Wilson, S., & Kelly, W. (2016). Methods of conducting effective outrach to private well owners - a literature review and model approach. *Journal of Water and Health*, 167-182.

Pierce, G. R. (2019). *Needs Assessment Element 3 Phase 2: Feasibility and Cost of Emergency and Interim Solutions.* Los Angeles: USCL Luskin Center.

Regunathan, R., Lowry, J., Cotruvo, J., & Latimer, G. (2007). *Cost Evaluation of Point-of-Use and Point-of-Entry Treatment Units for Small Systems: Cost Estimating Tool and Users Guide.* U.S. Environmental Protection Agency.

Self-Help Enterprises. (2020). *WIC Nitrate Drinking Water Testing & Interim Drinking Water Supply Project.* Self-Help Enterpises & Central Valley Salinity Coalition.

Shams, S. e. (2010). Assessing Ion Exchange and Reverse Osmosis for Nitrate Removal. *2010 OWWA/OMWA Joint Annual Conference and Trade Show.* OWWA/OMWA.

SWRCB (2020, January 28). GAMA Domestic Well Project Summary Results Commonly Observed Chemicals. Retrieved from https://www.waterboards.ca.gov/water_issues/programs/gama/docs/dwprjct_tstng_smmry.pdf

SWRCB (2019, October 28). *Human Right to Water Portal: Water System Drinking Water Data*. Retrieved from California Water Boards: https://www.waterboards.ca.gov/water_issues/programs/hr2w/

SWRCB (2020, March 17). *EDT Library and Water Quality Analysis Data and Download Page*. Retrieved from California Water Boards: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/EDTlibrary.html

Appendix A – Comparison of GAMA water quality model with the CV-SALTS model

For this project we used the GAMA Needs Analysis nitrate water quality model (2020)[5,6] for estimating the number of domestic wells and State Small Water Systems that may be affected by high nitrate. A previous nitrate water quality model was developed by Luhdorff and Scalmanini Consulting Engineers (LSCE) in 2016 for the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS)[7]. The associated GIS files were provided to Corona by LSCE on October 9, 2020. A preliminary comparison of the two nitrate water quality datasets has been performed and is illustrated below (Figure A-1); a quantitative spatial comparison of the number of domestic wells with high nitrate estimated by each of the models will require additional analysis and is currently being explored. The nitrate concentrations as modeled by the CV-SALTS 2016 method and the GAMA 2020 method can be seen in Figure 3. The visual comparison shows that the GAMA model results in fewer domestic wells that appear to be nitrate contaminated in comparison with the CV-SALTS model. The GAMA Needs Analysis methodology is documented in a whitepaper which includes comparison of the GAMA model with other such models, including the CV-SALTS model. The GAMA whitepaper points out that "the generally more extensive areas with nitrate > 10 mg/L indicated by the CV-SALTS analysis likely reflects that that analysis included water quality data from monitoring wells, which represent groundwater quality data from shallower depth intervals potentially closer to source areas.[5]" Ultimately, water quality samples from domestic wells will need to be collected to understand the magnitude of nitrate contamination.

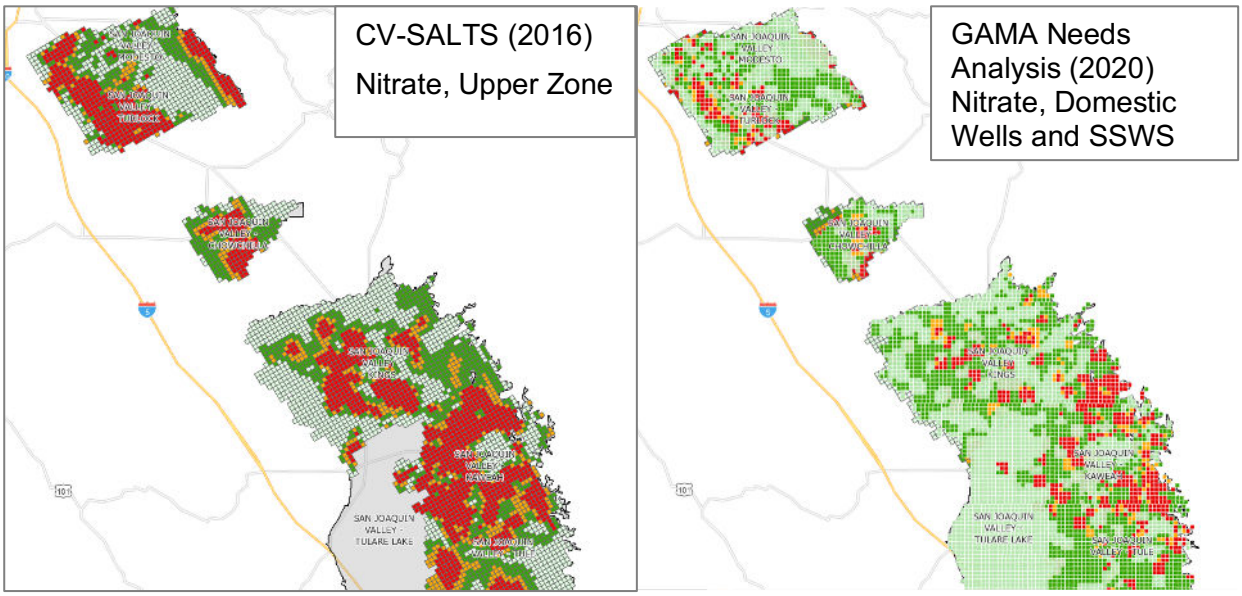

Figure A-1 - CV-SALTS nitrate model compared with the GAMA nitrate model.

[5] State Water Resources Control Board. (2020) Needs Analysis GAMA Tool. GAMA Groundwater Ambient Monitoring and Assessment Program.

[6] State Water Resources Control Board. (2020). Methodology to Estimate Groundwater Quality Accessed by Domestic Wells in California, Draft 2/14/2020. Division of Water Quality, Groundwater Ambient Monitoring and Assessment Unit.

[7] Luhdorff and Scalmanini Consulting Engineers and Larry Walker Associates, Inc., 2016. Central Valley Salinity Alternatives for Long Term Sustainability (CV- Salts) Region 5: Updated Groundwater Quality Analysis and High-Resolution Mapping for Central Valley Salt and Nitrate Management Plan.

Appendix B

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June 17, 2019

Monterey County Board of Supervisors
Environmental Health Bureau, County of Monterey
1270 Natividad Rd.
Salinas, CA 93906

Subject: Community Water Center Recommendations for Monterey County Point of Use / Point of Entry Ordinance for local and state small water systems

Dear Monterey County Board of Supervisors and Environmental Health Bureau staff:

We appreciate the opportunity to be part of the public process around the Point of Use / Point of Entry (POU/POE) Treatment Ordinance and look forward to continuing to work with Monterey County for a future where all have access to safe and affordable drinking water. We recommend that the proposed 18 month pilot focus on better understanding *under what conditions* and *at what cost* safe water can be delivered through POU/POE devices. We agree with Monterey County that POU/POE devices should be considered interim solutions only, while we all work together for long-term, reliable, safe and affordable drinking water solutions.

Based on our direct experience with POU/POE devices, we believe that the proposed POU/POE ordinance has the potential to create a false sense of security for residents, and place an unintended burden on tenants in Monterey County. Our concern is this ordinance may unintentionally expose people to unsafe water as the monitoring is infrequent (3-6 months between samples). The background provided in these comments together with our recommendations intend to limit the risk to public health during this pilot project.

CWC participation in the POU / POE ordinance development: Community Water Center staff attended two of the public workshops, participated in two (of the four) working group meetings all related to the ordinance in the Fall of 2018, met with staff from the Monterey County Environmental Health Bureau on April 24, 2019, and gave public comment at the April 30, 2019 Board of Supervisors meeting. We submit these written comments today to capture some of what we expressed during the working group meetings and subsequent conversations with Monterey County and Central Coast Regional Water Board staff.

CWC background working on POU implementation: Since 2006, Community Water Center has worked with local residents from more than 80 California communities to improve access to safe, clean, and affordable water. Community Water Center acts as a catalyst for community-1

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driven water solutions through organizing, education, and advocacy. We also have specific relevant experience related to Point of Use (POU) technology in California - including work on a State Water Board funded pilot project in Arvin, California which installed POU arsenic treatment systems in local schools, health clinics, and community parks. We also supported a local community group who installed POU nitrate treatment systems in households relying on private wells in northern Tulare County, and also conducted follow-up water quality monitoring of the devices.

Small water systems and private wells in Monterey County contain multiple contaminants, some at dangerous levels: In the past 6 months, CWC has connected community residents of small water systems and private wells in an area of Monterey County near the coast to the Central Coast Regional Water Board's free private well testing program and conducted follow up outreach. This testing revealed extremely high levels of nitrate, 123-TCP, and total dissolved solids which make it difficult to advise the use of POU and/or POE devices in this whole area for at least the following reasons: 1) 123-TCP exposure occurs through showering so POE is recommended for this contaminant, 2) there is no current state certified POU/POE device for 123-TCP, 3) nitrate levels in this area greatly exceed the maximum levels for residential treatment systems certified by the state of California, and 4) high TDS levels current result in the rapid clogging of treatment systems used by current residents in this area

State-wide regulatory requirements for *public water systems* make it more likely that Point-of Use treatment will result in safe effluent water quality at each household's kitchen tap than the proposed Monterey County ordinance, which applies to *state and local small water systems* with minimal requirements. The State of California's POU and POE Treatment - Permanent Regulations apply to *public water systems only,* which have many more regulatory requirements than state and local small water systems. For example, public water systems are required to monitor their source water for all Title 22 contaminants including 123-TCP, nitrate, and bacteria which have all been found in Monterey County. Public water systems are also required to have a state certified water system operator. State and local small water systems in Monterey County are shared wells that often do not have written agreements between owners, no water system manager or operator, and have very limited water quality data (beyond bacteria, nitrate or arsenic).

Recommendations

Specifically, we recommend that Monterey County require and/or implement the following during the proposed 18 month pilot program:

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Recommendation 1: Source Water Monitoring. Every state or local small water system should be required to monitor their source water for all contaminants required by drinking water regulations for public water systems as well as contaminants that are known to interfere with treatment.

The only way to ensure safe effluent water quality after POU/POE treatment is to first understand the source water quality (or influent water quality). The costs for requiring the same level of source water monitoring as public water systems can be offset if water systems choose to participate in the Central Coast Regional Water Quality Control Board's free well testing program and use the results to inform their POU/POE permit amendment.

The Monterey County Environmental Health Bureau only collects limited water quality data on bacteria, nitrate, and/or arsenic for state and local small water systems. Yet, it is known that other contaminants are present throughout the county. These other contaminants might result in lower than expected removal of nitrate or bacteria, or might themselves pose a threat to resident health. We request that Monterey County ensure compliance with California Code of Regulations *§64213 on Chemical Quality Monitoring* as well as its intent to inform source water monitoring protocols.

> *§64213. Chemical Quality Monitoring. (a) A water supplier operating a state small water system shall sample each source of supply prior to any treatment at least once...for fluoride, iron, manganese, chlorides, total dissolved solids, and the inorganic chemicals listed in table 64431-A, section 64431.*

Recommendation 2: Focus the pilot project on water systems with only one contaminant present that can be treated by a state-certified residential treatment device.[1]

As mentioned previously, recent testing of private wells and local small water systems in Monterey County through a free regional water board program has shown very high levels of multiple contaminants. We recommend that the county focus this pilot on water systems that meet all primary and secondary drinking water standards with the exception of one contaminant only (as demonstrated by the source water monitoring per prior recommendation.) POU/POE devices are not appropriate for drinking water sources with "microbial" contamination like bacteria. The presence of bacteria is an indication of other potential issues.

[1] State Water Resources Control Board (2019) Residential Water Treatment Devices. https://www.waterboards.ca.gov/drinking_water/certlic/device/watertreatmentdevices.html

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If nitrate is the only contaminant present, this would mean that the water system in the pilot would need to have influent nitrate as N below 24 mg/L, have not had a positive bacteria sample in the past year (assuming 12 months of monthly bacteria data), have low total dissolved solids, and meet the POU/POE pressure, temperature, and other limits of that particular device.

Recommendation 3: Require additional monitoring of the POU/POE devices during the pilot.

We recommend additional monitoring during the 18 month pilot to ensure each POU/POE device's continued functioning, and to better understand the cost and reliability of monitoring technologies and effluent sampling protocols (e.g., low cost TDS analyzers versus TDS analyzers built into the POU/POE device). It is our understanding that due to the acute public health risk of nitrate in water, Monterey County Environmental Health Bureau has previously required *daily nitrate sampling* in the permits for nitrate treatment systems for public water systems in the County. *The proposed ordinance would lessen this requirement to only one sample per year per treatment system or from daily monitoring to annual monitoring per treatment system*.

The monitoring requirements in the POU/POE ordinance mark a significant decrease in monitoring requirements for small water system treatment systems and a heightened risk to public health. We recommend that the pilot project use state-certified POU or POE devices with flow and/or inline monitors that are integrated into the device itself. For example, Culligan's AquaCleer Advanced Drinking Water System has an inline performance indicator built in that monitors for total dissolved solids. We also need to identify or develop POU/POE devices that have an automatic shutoff when they are no longer providing safe water (e.g. when some component fails or needs to be replaced).

Recommendation 4: Separately track monitoring and reporting violations (in addition to Maximum Contaminant Level violations).

We recommend that Monterey County Environmental Health Bureau maintain lists of different types of violations associated with the POU/POE pilot similar to what public water systems are already required to do since much of the monitoring and notifications of the POU/POE devices will be left to each small water system. What happens if a sample result shows a device is not working? What happens if follow-up sampling is not conducted? Or if a notification is not issued to all residents served by that water system? Or, if the issue is not corrected? If it is discovered that the POU/POE has been delivering unsafe water for up to three months (since the last sample or up to 6 months for a local small water system serving only two households), 4

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who is responsible for that public health burden? Ultimately, the pilot could help us better understand how many systems are meeting the monitoring and reporting requirements which are necessary to determine whether safe water is being provided.

Recommendation 5: Develop a POU/POE cost estimate that uses a professional service and that assigns costs to all requirements in the ordinance.

We recommend that the County develop a cost estimate that uses a professional service to install, monitor, and maintain POU/POE devices and includes the cost of every requirement of the ordinance. The cost of POU/POE treatment is not only the cost of the devices and replacement parts. Because most/all state and local small water systems do not have paid staff, operators, or managers, someone at the small water system will need to be in charge of implementing all requirements in the ordinance in order to ensure the delivery of safe water. Everything listed in the ordinance takes time – a true cost estimate should not assume a volunteer will complete tasks nor should it assume residents will have expertise needed. CWC's direct experience with POU systems has shown that leaks happen, monitoring devices stop working, and that some residents are not able to maintain POU systems on their own due to work schedules, limited plumbing experience, and/or physical limitations.

For example, the cost of the required quarterly monitoring of POU devices should be included - not only the cost of analyzing the samples, but the cost of collecting the samples, the cost of driving them to the lab for analysis, as well as the cost of notifying everyone served by the small water system of the results of the quarterly sampling. If waste from the POU/POE requires offsite disposal, then the cost for the time and mileage for driving the waste to the landfill or disposal site should also be included. Someone at the small water system will need to take the lead on preparing all necessary forms for the POU permit amendment and for managing the POU systems. This might include attending county workshops, developing an agreement between property owners of the shared water system (some of whom may live elsewhere), researching and choosing a POU/POE device, communication with residents served by system, emergency response, pilot testing, reporting, and more. The cost analysis could clarify what the County will be responsible for during this pilot project and what will be required of the small water system.

Summary

In conclusion, Community Water Center would like to make sure this ordinance maintains a focus on public health and that Monterey County dedicate resources to securing long-term safe drinking water solutions. The proposed POU/POE pilot project offers an opportunity to

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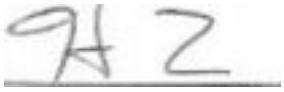
document the true costs of POU/POE and to better understand under what conditions POU/POE might provide safe drinking water as an interim measure.

We appreciate the opportunity to be involved in this ordinance and request to be part of future conversations about the implementation of the proposed POU/POE pilot project.

Sincerely,



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