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TULARE LAKE BASIN DISADVANTAGED COMMUNITY
WATER/WASTEWATER STUDY

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EXECUTIVE SUMMARY

The individual household, for purposes of this Individual Households Solutions Pilot Study (Study), is a single household that utilizes a privately owned, individual groundwater well to satisfy its water supply demands. An individual household may also use an on-site wastewater treatment system, such as a septic tank and leach line system. In general, individual households are not subject to drinking water quality regulations. Until May, 2013, individual households were not subject to wastewater treatment and disposal regulations, however, they now apply to new on-site wastewater treatment and disposal systems. Numerous water quality and wastewater problems have been established, however, in rural areas populated by individual households.

The Study has been prepared to assist in directing the individual person(s) associated with an household to potential solutions to identified water quality and/or wastewater problems. This Pilot Study Report is intended to provide guidance to the individual household in the process of selecting potential solutions to water quality and/or wastewater treatment and disposal problems. This Pilot Study Report establishes guidance utilizing questions and responses to direct the individual household to specific solutions. Categorical solutions to water quality and/or wastewater problems have been summarized for consideration by the person(s) associated with an individual household.

SECTION ONE

1 INTRODUCTION

1.1 Individual Households

Throughout Tulare County, homes exist in rural areas where community-based domestic water and wastewater utility services do not exist. Domestic water and wastewater systems serving individual households result. An individual household, for purposes of this Study, is a single family residence that uses a private, individual groundwater extraction well. In general, individual households also use private, on-site wastewater treatment systems such as septic tanks and leach line systems. Problems associated with the individual water and wastewater systems, in all respects, are the responsibility of the party associated with the individual household.

1.2 Drinking Water Regulations

The California Department of Public Health (CDPH) Drinking Water Program regulates and monitors all public water systems. Title 22 of the California Code of Regulations defines a public water system as a water system having 15 or more service connections, or 25 or more users for 60 or more days per year. State small water systems provide water to at least five (5), but less than 15 service connections. State small water systems are most always regulated by local health departments. Systems with fewer than five (5) connections may or may not be regulated, depending on the number of residents and length of exposure to the water supply. Individual households that are not connected to a water system are not subject to public water system regulations. Table 1-1 presents a tabular summary of this information.

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TABLE 1-1.

SUMMARY OF DIFFERENT WATER SYSTEM TYPES
INDIVIDUAL HOUSEHOLDS PILOT STUDY
TULARE LAKE BASIN DISADVANTAGED COMMUNITY
WATER/WASTEWATER STUDY

Type of Water System	Number of Connections	Water Supply Usage Time	Regulated Status
Public Water System	15+	60+ days per year	Yes, by CDPH or local agency
State Small System	5-14	No Standard	Yes, by local health departments
Individual Household	1, but may be As many as 4	No Standard	No

1.3 Wastewater Regulations

The State Water Resources Control Board (SWRCB) and the Central Valley Regional Water Quality Control Board (RWQCB) regulate discharges from wastewater treatment and disposal systems under general waste discharge requirements (WDRs). Small, domestic systems having a maximum daily flow of 20,000 gallons per day or less that discharge to land are covered under general WDRs for small systems (WQO No. 97-10-DWQ).

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Water Quality Order No. 97-10-DWQ does not apply to individual systems. On June 19, 2012, the SWRCB adopted its On-site Wastewater Treatment Systems Policy that established requirements for siting, design, operation and maintenance of individual wastewater treatment and disposal systems. The policy became effective in May, 2013.

1.4 Problem Description

Unlike community-based water and wastewater systems, individual households are not subject to drinking water and wastewater regulations. It is established, however, through sources such as neighboring public water systems, community organizations, academic studies and individual homeowners that individual households and rural subdivisions experience water quality, water supply and wastewater treatment and disposal problems that would fail to satisfy regulatory requirements. Since these individual systems are not part of a community-based water and/or wastewater system, a knowledge base of and access to potential solutions does not typically exist, especially for individual households in disadvantaged community areas.

1.5 Purpose of this Report

This Pilot Study Report (Report) describes an array of water quality, water supply and wastewater treatment and disposal problems associated with individual household systems and provides guidance to an individual homeowner or renter in selecting potential solutions. This Report also provides general information regarding specific solutions that may be appropriate. Although this Report focuses on individual households, the guidance and information within this Report can be utilized to address conditions associated with water systems and/or rural subdivisions that have up to 15 or possibly more connections.

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2 DESCRIPTION OF PROBLEMS

2.1 General

The purpose of this Pilot Study is to address water and wastewater related problems experienced by a person(s) associated with individual households in rural, unincorporated areas in the Study Area. This Pilot Study may also be considered as a tool when addressing rural subdivisions or clusters of individual households that experience common water and/or wastewater problems.

Specific problems associated with these groups are difficult to establish due to limited regulatory oversight. A person(s) associated with individual households is not required to monitor and report water quality or wastewater discharges. Unregulated (non-permitted) systems serving up to four (4) individual households present the same situation. Problem identification can originate from voluntary individual household reports, community organization advocacy, academic studies and professional services experience.

Based upon these considerations, several problems that effect individual households have been identified. The problems can be categorized into three (3) areas: water quality, water quantity and its delivery and wastewater treatment and disposal. Table 2-1 summarizes the types of specific problems that have been established or considered in this Pilot Study.

2.2.1 Water Quality

Water quality problems that affect permitted systems also affect small, unincorporated rural communities through their respective community water systems. It can be reasonably assumed to similarly affect rural individual households.

Water quality problems can be divided into five (5) general categories:

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- 1) Bacteriological – problems associated with microorganisms such as Fecal Coliform or E. Coli;
- 2) Nutrients – problems associated with Nitrates or other nutrients such as phosphorus;
- 3) Inorganics – problems associated with constituents such as Arsenic, Copper or Hexavalent Chromium;
- 4) Organics – problems associated with constituents such as DBCP, Perchlorate and pesticides; and
- 5) General Water Quality – problems associated with constituents not specifically categorized.

In general, constituents that cause water quality problems have state or federal primary drinking water standards.

Table 2-2 summarizes water quality violations compiled by the California Department of Public Health (CDPH) associated with regulated (community) water systems and reported in its 2011 Annual Compliance Report. As shown in Table 2-2, inorganic constituents such as Arsenic, Nitrates and bacteriological contamination (Total Coliform Rule violations) represent the most common water quality problem state-wide. Table 2-3 summarizes the 2011 violations for Fresno, Kern, Kings and Tulare Counties.

TABLE 2-1
PROBLEM CATEGORIES
INDIVIDUAL HOUSEHOLDS PILOT STUDY
TULARE LAKE BASIN DISADVANTAGED COMMUNITIES
WATER/WASTEWATER STUDY

Problem Category	Specific Problem Sub-Category	Example(s)
WATER QUALITY		
	Bacteriological	<p>Water supply and/or wastewater treatment deficiencies resulting in documented waterborne disease outbreaks.</p> <p>Water supply and/or wastewater treatment deficiencies producing a contaminated water source that results in Total, E. Coli or Fecal Coliform MCL violations.</p> <p>Other Total Coliform Rule violations not associated with the source water (example – contamination residing in plumbing fixtures).</p>
	Nutrients	Water supplied exceeds state or federal primary drinking water standard MCL (example – Nitrates).
	Inorganics	Water supplied exceeds state or federal primary drinking water standard MCL. Some examples include arsenic, hexavalent chromium and lead.
	Organics	Water supplied exceeds state or federal primary drinking water standard MCL. Some examples include DCBP (dichlorinated byphenols), pechlorate and TCE (trichloroethylene).
	General Water Quality	Water supplied exceeds state or federal primary drinking water standard MCL. Water supplied that exceeds state or federal secondary drinking water standards or other established chemical constituent notification level (examples – iron and manganese).

TABLE 2-1
PROBLEM CATEGORIES
INDIVIDUAL HOUSEHOLDS PILOT STUDY
TULARE LAKE BASIN DISADVANTAGED COMMUNITIES
WATER/WASTEWATER STUDY

Problem Category	Specific Problem Sub-Category	Example(s)
SOURCE WATER QUANTITY AND/OR DELIVERY		
	Household Plumbing Deficiencies	Plumbing that does not meet Uniform Plumbing Code standards. Improvements may also address water quality problems.
	Individual Water Well Deficiencies	Problems with water well may affect drinking water quality. For example, Uniform Plumbing Code standards violations could result in wastewater from an onsite treatment system entering water supply (example – lack of a sanitary seal on the well).
	Water Delivery Deficiencies	Delivery systems that do not meet Uniform Plumbing Code standards. Example: Well does not meet household demands.
WASTEWATER TREATMENT AND DISPOSAL		
	Wastewater Treatment and Disposal System Deficiencies	Problems may affect drinking water supply (example – a domestic water well). Addressing this problem could range from repairs to existing system to outright replacement.
	Lack of Maintenance Activities	Conditions may result from a lack of knowledge or education regarding onsite treatment systems or an inability to fund required practices (example – affordability of maintenance).
	Community-wide Wastewater Improvement Needs	For areas that: 1) already use a community-based wastewater treatment system; or 2) experience common wastewater treatment and disposal problems among multiple households.

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Within the Study Area, Nitrate contamination of the groundwater supply represents the most commonly identified water quality problems based upon professional experience, community organization outreach and academic studies. Other commonly detected contaminants include Arsenic and DBCP.

2.3 Water Quantity and Delivery

Individual households may experience water quantity and/or delivery problems resulting from plumbing or well deficiencies. Older households may be particularly affected.

2.4 Wastewater Treatment and Disposal

In the rural setting, a person(s) associated with an individual household does not have access to community-based wastewater treatment and disposal. Individual households utilize on-site wastewater treatment and disposal systems such as septic tanks and leach fields. Study Area-wide experience with wastewater systems by local agencies, community organizations and professional services have established that individual households experience wastewater treatment and disposal problems utilizing on-site systems. Deficiencies include infiltration through damaged wells and undersized or inadequate household plumbing. Problems include poorly performing leach fields, inadequate spacing between a well and the leach field and older, deteriorating on-site systems. These problems generate water quality impacts and subsequent health consequences associated with bacteriological contamination.

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TABLE 2-2
NUMBER OF VIOLATIONS STATEWIDE (1)
INDIVIDUAL HOUSEHOLDS PILOT STUDY
TULARE LAKE BASIN DISADVANTAGED COMMUNITY
WATER/WASTEWATER STUDY

Category	Number of Violations		
	2009	2010	2011
	MCL/TT(2)	MCL/TT(2)	MCL/TT(2)
Inorganic contaminants	737	825	936
Synthetic organic contaminants	13	10	14
Volatile organic contaminants	4	0	0
Radionuclide contaminants	45	41	55
Total coliform rule	656	635	569
Disinfectant and disinfection byproducts rule (DBPR)(3)	219	188	162
Surface water treatment rules (SWTR, IESWTR, LT1SWTR, LT2SWTR and FBR)(3)	72	150	128
Lead and copper rule (LCR)(3)	1	6	5

Note:

1. Source of data: 2011 Annual Compliance Report, CDPH (Table 1).
2. MCL – Maximum Contaminant Level; TT-Treatment Technique

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3. Abbreviations:

DBPR - Disinfection Byproduct Rule

SWTR - Surface Water Treatment Rule.

IE - Interim Enhanced; LT1 – Long Term 1; LT2 – Long Term 2.

FBR - Filter Backwash Rule.

LCR - Lead and Copper Rule.

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TABLE 2-3
SUMMARY OF VIOLATIONS (2011)(1)
INDIVIDUAL HOUSEHOLDS PILOT STUDY
TULARE LAKE BASIN DISADVANTAGED COMMUNITY
WATERWASTEWATER STUDY

Category - Parameter	COUNTY			
	Kern	Kings	Fresno	Tulare
Inorganic Contaminants				
Arsenic	150	34	40	72
Nitrates	33	(2)	30	106
Fluoride (Natural)	1	-	-	-
Synthetic Organic Compounds				
DBCP	-	-	6	-
Disinfection By-Products				
TTHM	3	5	69	4
HAA5	3	(2)	2	9
Surface Water Treatment	-	-	38	-
Radiological				
Uranium	1	-	17	-
Total Coliform Rule	10	9	53	(2)

Notes:

1. Source of Data: 2011 Annual Compliance Report, CDPH.
2. Data not contained in referenced report.

SECTION THREE

3 SOLUTIONS

3.1 General

Section 2 established that the problems facing individual households can be principally categorized into three (3) areas: water quality, water quantity and delivery and wastewater treatment and disposal. Multiple solutions exist for each problem category. This section provides a summary of the solutions sets available for the individual household to address these problems. These solutions may also be applicable to small clusters of households or rural subdivisions that experience common problems. Identifying potential solutions for implementation is discussed in Appendix A – Solution Charts. General details regarding each solution set can be found in Appendix B – Solution Sets.

3.2 Water Quality Solutions

Table 3-1 lists the potential solutions that may address water quality related problems. Solutions range from individual directed improvements, to community oriented approaches. Well improvement solutions target problems that are associated with a domestic water well. An assessment of the well's design and operational features will be needed.

Water quality solutions address problems specific to the constituents detected in the water source. These solutions may include other referenced solutions such as well improvements or wastewater improvements. For this Pilot Study, water quality solutions have been grouped into five (5) constituent categories: bacteriological, inorganic, nutrients, organics and general (other) water quality. Table 3-2 summarizes the most common water quality constituents which are given consideration.

TABLE 3-1
POTENTIAL WATER QUALITY SOLUTIONS
INDIVIDUAL HOUSEHOLDS PILOT STUDY
TULARE LAKE BASIN DISADVANTAGED COMMUNITY
WATER/WASTEWATER STUDY

1) Well Improvement Solutions:

- 1) Disinfection;
- 2) Repairs;
- 3) Modifications; or
- 4) New Well.

2) Water Quality Solutions:

- 1) Address Causative Factors;
- 2) Point-of-Use (POU) Device;
- 3) Point-of-Entry (POE) Device; or
- 4) New Water Supply.

3) Community Based Solutions:

- 1) Water Well Improvements (for a shared well);
- 2) Well Head Treatment (for a shared well);
- 3) New Community Water Source; or
- 4) Alternative Water Source.

TABLE 3-2
WATER QUALITY CONSTITUENT CATEGORIES (1)(2)
INDIVIDUAL HOUSEHOLDS PILOT STUDY
TULARE LAKE BASIN DISADVANTAGED COMMUNITY
WATER/WASTEWATER STUDY

NUTRIENTS	BACTERIOLOGICAL	INORGANICS	ORGANICS	GENERAL
Nitrates (NO₃)	Fecal Coliform	Arsenic (As)	MTBE	Chlorine
	E. Coli	Copper (Cu)	Perchlorate	Fluoride
	Giardia	Lead (Pb)	Volatile Organic Compounds -Pesticides -Herbicides	Radium 226
	Cryptosporidium	Hexavalent Chromium(Cr)	Disinfection By-Products	Hardness
	Bacteria			Uranium
	Viruses			

NOTES:

- (1) This table presents the most commonly identified parameters associated with water quality problems. It is not intended to be a comprehensive list of all problems.
- (2) If a constituent is not listed on this table, please consult with your analytical testing laboratory or county health department to identify the most appropriate category for the constituent in question.

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3.3 Water Quantity and Delivery Solutions

Table 3-3 presents potential solutions for water quantity and delivery problems. These solutions are designed to address problems associated with inadequate supply, such as pumping or plumbing deficiencies. Well improvements represent a common solution set to both water quality and quantity problems.

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TABLE 3-3
POTENTIAL WATER QUANTITY AND DELIVERY SOLUTIONS
INDIVIDUAL HOUSEHOLDS PILOT STUDY
TULARE LAKE BASIN DISADVANTAGED COMMUNITY
WATER/WASTEWATER STUDY

1) Well Improvements Solutions:

- 1) Repairs;**
- 2) Modifications; or**
- 3) New Well.**

2) Household Improvements:

- 1) Plumbing Improvements.**

3) Water Delivery Improvements:

- 1) Well Improvements;**
- 2) Water Demand Considerations; or**
- 3) Water Delivery System Improvements (Distribution and storage).**

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3.4 Wastewater Treatment and Disposal Solutions

For the purposes of this Pilot Study, individual households are assumed to use compliant on-site wastewater treatment systems, such as septic tank and leach field systems. Some rural household clusters may utilize a shared on-site wastewater system. Table 3-4 lists the potential solutions associated with wastewater treatment and disposal problems that may be experienced by on-site systems. Three (3) primary solution sets exist: Individual system improvements, maintenance-based solutions and community based system improvements. These solution sets may also address water quality problems associated with bacteriological or nutrient related problems as a supplemental benefit.

TABLE 3-4
POTENTIAL WASTEWATER TREATMENT AND DISPOSAL SOLUTIONS
INDIVIDUAL HOUSEHOLDS PILOT STUDY
TULARE LAKE BASIN DISADVANTAGED COMMUNITY
WATER/WASTEWATER STUDY

- 1) Individual Wastewater System Improvements:
 - 1) Repairs to existing treatment system;
 - 2) Repairs to existing disposal system;
 - 3) Enhancements to existing treatment/disposal systems;
 - 4) Expansion/Upgrades to existing system elements;
 - 5) New treatment system;
 - 6) New disposal system; or
 - 7) Community-based treatment and disposal system.

- 2) Individual Wastewater System Maintenance Activities:
 - 1) Implement/follow proper individual system use limitations;
 - 2) Implement/follow proper maintenance practices;
 - 3) Increase maintenance practice frequency; or
 - 4) Implement community-based maintenance activities (cost sharing).

- 3) Community-based Wastewater Systems:
 - 1) Existing wastewater system improvements;
 - 2) New community wastewater system; or
 - 3) Alternatives to community-based systems.

SECTION FOUR

4 IMPLEMENTATION

4.1 General

Methods to identify domestic water and wastewater problems and an overview of potential solutions for individual households represents the overall purpose of this Pilot Study. Section 3 summarized the potential solution sets available to the individual household to address water and/or wastewater problems. To assist individual households in identifying the most appropriate solution, this Pilot Study Report provides a self-guided series of questions as charts to direct the individual household occupant to potential solutions. The solution charts and associated questions are presented in Appendix A. Table A-1 summarizes the solution charts. The solution sets are presented in Appendix B.

Implementation begins with the identification and selection of a potential solution by the individual homeowner. A homeowner can utilize professional or trade-based services for assistance, if desired. Implementation of the selected solution remains the responsibility of the individual homeowner.

4.2 Solution Charts

The use of the solution charts and solution sets begins with the identification of the problem (or problems) that affect the individual household's water or wastewater system. Once a problem has been identified, the person(s) associated with the individual household uses the solution charts compiled in Appendix A to determine potential solutions for consideration. The solution charts are organized by the type of water or wastewater problem. The solution charts consist of a series of questions that guide the user through considerations leading to solutions.

Solutions represent improvements to address the water quality problem through repairs, modifications or new features such as equipment or facilities, as is the case with a new well. Solutions also result from new or additional operation

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and maintenance activities for existing water and/or wastewater systems. The solution sets present information for the person(s) associated with the consideration individual household regarding specific solutions. Information provided includes costs, advantages, disadvantages and miscellaneous considerations specific to the solution.

4.3 Cost Considerations

Relative costs have been generated and are included with the solution sets. Specific costs have not been provided due to the broad, undefined nature of the potential problems under consideration. Specific costs can be obtained when solutions are clearly identified that reflect the specific conditions associated with the problem(s).

For comparison purposes, this Pilot Study has established a relative cost scale. The cost scale is summarized in Table 4-1. The cost scale is based upon the average Median Household Income of Fresno, Kern, Kings and Tulare Counties as compiled by the American Community Survey (2006-2010). The cost range represents a percentage range (0.5 percent to 5 percent) of the average MHI adjusted downward by disadvantaged community definitions such as 60 percent MHI-severely disadvantaged; 80 percent of MHI – disadvantaged.

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TABLE 4-1
COST SCALE
INDIVIDUAL HOUSEHOLD PILOT STUDY
TULARE LAKE BASIN DISADVANTAGED COMMUNITY
WATER/WASTEWATER STUDY

<u>COST</u>	<u>DOLLAR RANGE</u>
Very Low	Less than \$200
Low	\$200 to \$500
Moderate	\$500 to \$1,300
High	\$1,300 to \$2,000
Very High	Greater than \$2,000

The cost scale approximates the affordability considerations associated with identified solutions for disadvantaged communities. The cost scale is intended for the person(s) associated with the individual household to use when considering various solutions. Each individual household, however, will need to review its financial situation to determine the actual affordability of a solution which is under consideration.

The evaluation of costs represents a consideration where the use of professional services may be warranted. Trade-based organizations, community-

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based organizations and manufacturers may also be available to assist the individual household.

4.4 Funding Opportunities

Funding opportunities are limited in the area of assistance to the parties associated with individual households. In general, funding programs are designed to serve community-based systems, in which a governance structure exists for disbursement of funds and repayment of funds, if necessary.

Funding opportunities for improvements related to individual households may be available through special funding programs offered at the county level or through community-based organizations, as well as philanthropic groups. Equipment manufacturers may also offer price incentives or discounts that would reduce solution costs.

4.5 Obstacles

Numerous obstacles exist for implementing solutions for individual households, including financial, regulatory and governance considerations. These obstacles may prevent an otherwise individual responsible from pursuing solutions and subsequent implementation.

4.5.1 Financial

Financial obstacles represent the primary obstacle to solution implementation. In general, the individual household units under consideration in this Pilot Study satisfy the criteria for a household within a severely disadvantaged community (SDAC). This situation translates to the individual household owner/occupant not having sufficient financial capability to pursue a solution and/or maintain its viability and use. Additionally, current funding programs typically facilitate projects for community water systems, not individual households, subsequently preventing access to potential sources of grant funds. Charitable outreach programs represent the primary source of funds, or in most

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cases, assistance comes in the form of donated equipment and supplies. These types of programs are limited and, further, may be geographically limited.

4.5.2 Regulatory

At times, regulatory requirements inadvertently place obstacles in the pathway to potential solutions. For example, CDPH requires that all water treatment devices be certified prior to sale. Cost of state certification by the manufacturer is substantial and can reduce the number of potential equipment manufacturers. Consequently, the quantity and types of equipment may be limited for a potential solution. Fewer options available to the individual household typically results in increased cost considerations.

4.5.3 Governance

Governance or other organizational considerations can also prevent the implementation of potential solutions. An person associated with an individual household may be reluctant to join a rural neighborhood association due to a variety of reasons, including lack of independence, lack of perceived benefit and legal considerations.

4.5.4 Access to Expertise

An additional obstacle for the individual household can be the complexity of the potential solutions to address the problem. Permitted water systems typically utilize professional services to identify the most appropriate and cost effective solutions. The use of professional services may not be readily available to the individual. In these cases, community-based organizations, or manufacturers, may provide suitable alternatives, if available.