

**INDIVIDUAL HOUSEHOLDS PILOT  
DISADVANTAGED COMMUNITY WATER STUDY  
FOR THE TULARE LAKE BASIN**

GRANT AGREEMENT NUMBER: 4600009132  
SAFE DRINKING WATER, WATER QUALITY AND SUPPLY, FLOOD CONTROL,  
RIVER AND COASTAL PROTECTION BOND ACT OF 2006 (PROPOSITION 84)

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***Prepared for:***

*Department of Water Resources*

*In Care of:  
County of Tulare*

***Prepared by:***

**KELLER/WEGLEY  
CONSULTING ENGINEERS**

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## ABBREVIATIONS

ACS .....	American Community Survey
AF .....	Acre-Feet
APWA .....	American Public Works Association
AWWA .....	American Water Works Association
BOD .....	Biochemical Oxygen Demand
CDBG .....	Community Development Block Grant
CDPH.....	California Department of Public Health
CEQA.....	California Environmental Quality Act
CFCC.....	California Financing Coordinating Committee
CFS.....	Cubic Feet per Second
CPUC.....	California Public Utilities Commission
CRWA.....	California Rural Water Association
CSA .....	County Service Area
CSD .....	Community Services District
CVP .....	Central Valley Project
CWD .....	County Water District

CWS .....	Community Water System
CWSRF.....	State Revolving Fund (Clean Water)
DAC .....	Disadvantaged Community
DBCP.....	Dibromochloropropane
DBP(s) .....	Disinfection By-Product(s)
DBPR.....	Disinfection Byproduct Rule
DWR .....	Department of Water Resources
DWSAP.....	Drinking Water Source Assessment & Protection
EPA.....	United States Environmental Protection Agency
FBR.....	Filter Backwash Rule
FEMA.....	Federal Emergency Management Agency
FRF .....	Fresno Regional Foundation
GIS.....	Geographic Information Systems
IE .....	Interim Enhanced; LT1-Long Term 1; LT2-Long Term 2
IRWM.....	Integrated Regional Water Management
IRWMA .....	Integrated Regional Water Management Authority
JPA .....	Joint Powers Authority
KBWA .....	Kings Basin Water Authority
LAFCo.....	Local Agency Formation Commission
LCR.....	Lead and Copper Rule
LPA.....	Local Primacy Agency
O&M.....	Operation and Maintenance
MCL .....	Maximum Contaminant Level
MHI .....	Median Household Income
MHP .....	Mobile Home Park
MOU .....	Memorandum of Understanding
MSR.....	Municipal Service Review
MWC.....	Mutual Water Company
NCWS.....	Non-Community Water System
NTNC.....	Non-Transient Non-Community Water System
PPB.....	Parts per Billion
PPM .....	Parts per Million

PPSAG or PSAG .....	Pilot Project Stakeholder Advisory Group
PUC .....	Public Utilities Commission
PUD .....	Public Utility District
PWS.....	Public Water System
RCAC.....	Rural Community Assistance Corporation
RMA.....	Resource Management Agency
RUS .....	Rural Utilities Service
RWQCB .....	Regional Water Quality Control Board
SB .....	Senate Bill
SDAC.....	Severely Disadvantaged Community
SDWA.....	Safe Drinking Water Act
SMD.....	Sewer Maintenance District
SOAC.....	Stakeholder Oversight Advisory Committee
SRF or SDWSRF.....	State Revolving Fund (Safe Drinking Water)
SSWS .....	State Small Water System
SWP.....	State Water Project
SWRCB .....	State Water Resources Control Board
SWS.....	Small Water System
SWTR .....	Surface Water Treatment Rule
TCP.....	1,2,3-Trichloropropane
THM(s).....	Trihalomethane(s)
TLB .....	Tulare Lake Basin
TMF .....	Technical Managerial & Financial
TNC .....	Transient Non-Community Water System
TSS.....	Total Suspended Solids
USDA.....	United States Department of Agriculture
USGS.....	United States Geological Survey
WC.....	California Water Code
WD.....	Water District
WDR.....	Waste Discharge Requirements
WWD .....	Water Works District
ZOB .....	Zone of Benefit

## EXECUTIVE SUMMARY

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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. **An individual household may be represented by homeowner or renter.** 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. Wastewater treatment and disposal regulations now apply to new on-site wastewater treatment and disposal systems. Numerous water quality and wastewater problems have been encountered in rural areas populated by individual households.

The Study has been prepared to assist in directing the individual person(s), **such as the homeowner or renter associated with a 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

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# 1 INTRODUCTION

## 1.1 Individual Households

Throughout Tulare Lake Basin Study Area, 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 supply well. In general, individual households also use private, on-site wastewater treatment systems such as septic tanks and leach line systems. **Figure 1-1 illustrates the systems associated with an individual household. In this Study, an individual household may be represented by either the homeowner/landowner or the renter.**

**The homeowner is the person (or persons) with the main legal authority over the house (and property). The homeowner may or may not live in the individual household. The homeowner can make decisions regarding the household independently.**

**The renter is a person (or persons) that uses an individual household under a legal agreement with the homeowner. In general, a renter does not have authority to make decisions regarding the household. The renter must work with the homeowner (landlord) to make changes at a house.**

Problems associated with the individual water and wastewater systems, in all respects, are the responsibility of the party associated with the individual household. **If the individual household is a renter, additional communication and cooperation with the homeowner (landlord) becomes necessary to address water and/or wastewater system problems.**

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### 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. In the Tulare Lake Basin Study area, small system oversight varies by county. Fresno and Kern Counties have CDPH oversight. Tulare and Kings Counties have County oversight (groundwater supplied systems) or CDPH oversight (surface water supplied systems). 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).

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

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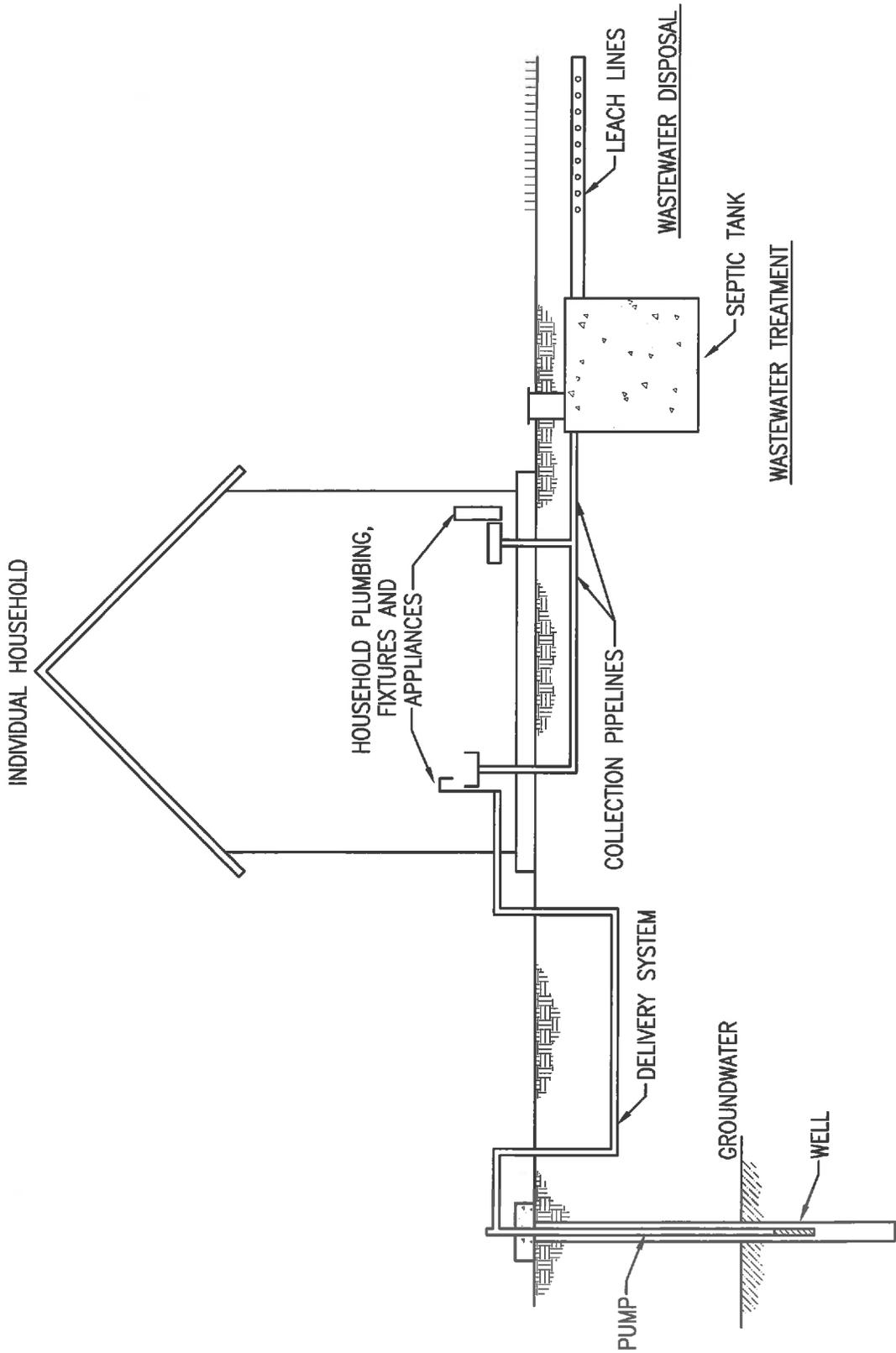
maintenance of individual wastewater treatment and disposal systems. The policy became effective in May, 2013.

### 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.



**OVERVIEW OF SYSTEMS ASSOCIATED WITH AN INDIVIDUAL HOUSEHOLD**

## SECTION TWO

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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: 1) water quality, 2) water quantity and its delivery and 3) 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 that those water quality problems 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 1,2,3-TCP, 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.

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Within the Study Area, Arsenic and Nitrate contamination of the groundwater supply represent the most commonly identified water quality problems based upon compiled data associated with community water systems (Table 2-3). Other commonly detected contaminants include DBCP and Uranium. Additionally, previous and ongoing efforts regarding water supplies further develop the extent of water quality problems within the Stud area and these efforts include:

1. Regulatory programs such as: Central Valley Salinity and Long Term Sustainability (CV-SALTS) and Groundwater Ambient Monitoring Assessment (GAMA) program;
2. Legislative programs such as the Integrated Regional Watershed Management Program (IRWMP);
3. Academic studies such as the Groundwater Nitrate Project (Report for the State Water Resources Control Board Report to the Legislature), January 2012;
4. Local consulting engineering experience including water district engineers and hydrogeologists; and
5. Outreach by community-based organizations such as Community Water Center, Rural Community Assistance Corporation and Self-Help Enterprises.

### 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. In general, these conditions are revealed to (or by) community-based organizations or to water supply services providers – such as plumbers or well contractors. Although water quantity and/or delivery problems

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are known to occur, the extent of the problem within the study area has not been established.

### 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, such as County health departments (See Section 6) or utility districts, community-based organizations and professional services such as septic tank installation and/or maintenance contractors have established that individual households experience wastewater treatment and disposal problems utilizing on-site systems. County health departments within the Study Area have undertaken community sewer system projects in the past to alleviate problems with individual wastewater 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

## Notes:

1. Source of data: 2011 Annual Compliance Report, CDPH (Table 1).  
Violations associated with community water systems (regulated by CDPH).
2. MCL – Maximum Contaminant Level; TT-Treatment Technique
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**  
**WATER/WASTEWATER STUDY**

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

**Notes:**

1. Source of Data: 2011 Annual Compliance Report, CDPH.
2. Violations associated with community water systems (regulated by CDPH).
3. Data not contained in referenced report.

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### 3 DESCRIPTION OF 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. **Figure 2-1 shows an overview of the types of solutions. 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 information 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:

These solutions address the condition of a well. Specific details regarding each solution can be found in Appendix B, Section B.1 – Well Improvements.

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

2) Water Quality Solutions:

These solutions address the water quality of the well water. Specific details regarding each solution can be found in Appendix B, Section B.2 – Water Quality.

- 1) Address Causative Factors such as a well without a sanitary seal, or a septic system too close to a well;
- 2) Point-of-Use (POU) Treatment Device;
- 3) Point-of-Entry (POE) Treatment Device; or
- 4) New Water Supply, such as a new well or bottled water supply.

3) Community Based Solutions:

These solutions address either well conditions or well water quality for a well that is shared between individual households. In general, these solutions are identical to the solutions established for a private (individual) well. Specific details regarding these solutions can be found in Appendix B, Section B.3 – Community – Based Water Source Solutions.

- 1) Water Well Improvements (for a shared well);
- 2) Well Head Treatment (for a shared well);
- 3) New Community Water Source, such as a new well; or
- 4) Alternative Water Source, such as bottled water supplies.

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 (NO <sub>3</sub> )	Fecal Coliform	Arsenic (As)	DBCP	Chlorine
			1,2,3-TCP	
			MTBE	
	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:

These solutions address conditions of the well that affect the delivery of water from the well. Specific details regarding each solution can be found in Appendix B, Section B-1, Well Improvement Solutions.

- 1) Repairs, such as pump or casing repairs;
- 2) Modifications, such as lowering a pump or drilling a deeper well; or
- 3) New Well.

2) Household Improvements:

These solutions address water quantity problems that result from existing plumbing conditions. Specific details regarding these solutions can be found in Appendix B, Section B-4, Household Improvement Solutions.

- 1) Plumbing Improvements, such as piping or fixture replacement.

3) Water Delivery Improvements:

These solutions address problems that address inadequate delivery of water to the household. Specific details regarding these solutions can be found in Appendix B, Section B-5, Water Delivery Improvement Solutions.

- 1) Well Improvements, such as a pump or motor replacement;
- 2) Water Delivery System Improvements (Distribution and storage); or
- 3) Water Demand Considerations, such as the use of water efficient fixtures or appliances.

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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:

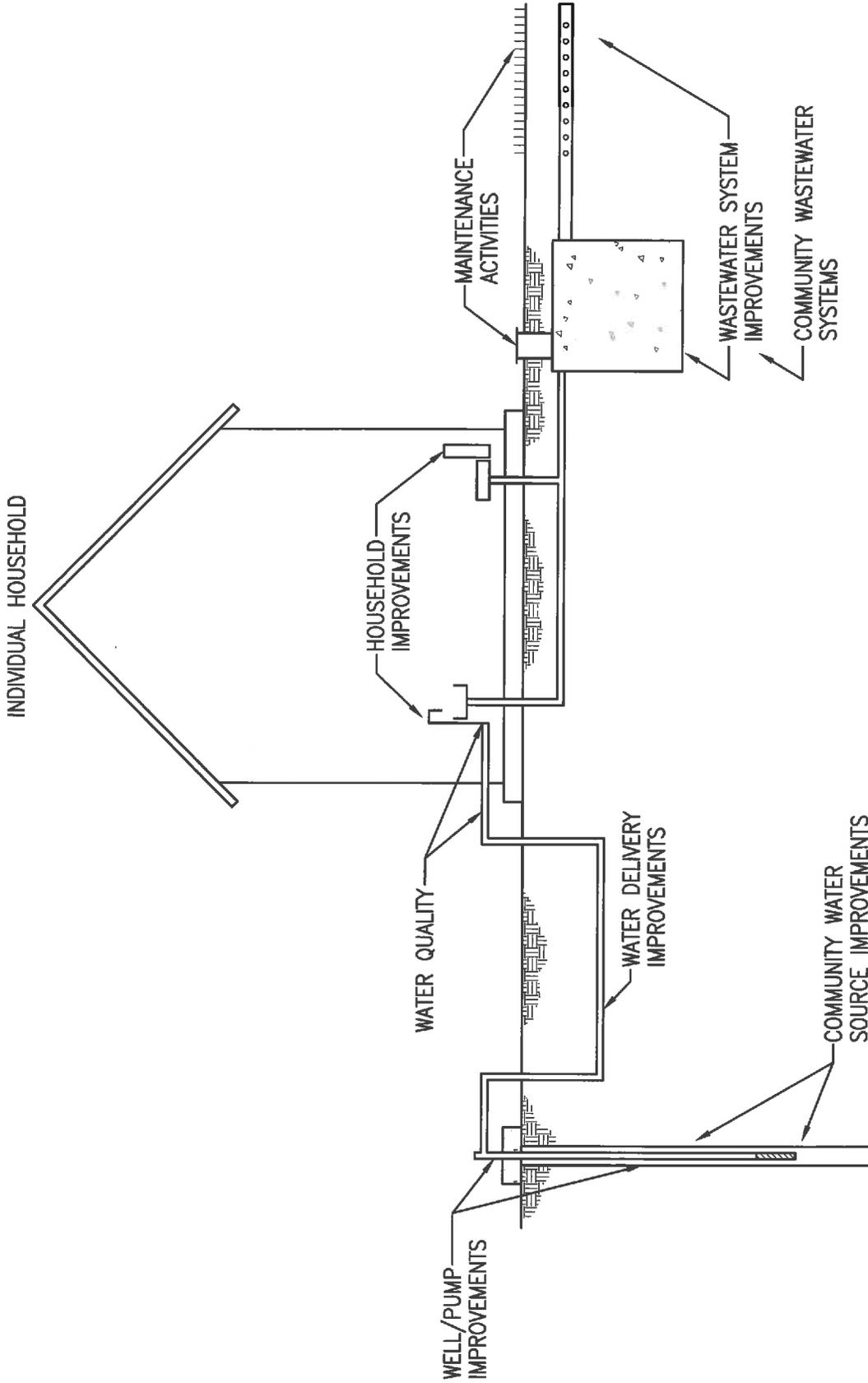
These solutions address conditions associated with a septic tank and leach field wastewater treatment system. Specific details regarding each solution can be found in Appendix B, Section B.6, Individual Wastewater System Improvements.

- 1) Repairs to existing treatment (Septic tank) system;
- 2) Repairs to existing disposal (leach field) system;
- 3) Enhancements to existing treatment/disposal systems, such as septic tank baffles;
- 4) Expansion/Upgrades to existing system elements, such as additional leach lines;
- 5) New treatment (septic tank) system;
- 6) New disposal (leach field) system; or
- 7) Community-based treatment and disposal system.

2) Individual Wastewater System Maintenance Activities:

These solutions address improvements to routine maintenance activities associated with septic tank and leach fields. Specific information regarding each solution can be found in Appendix B, Section B.7-Individual Wastewater System Maintenance Activities.

- 1) Implement/follow proper individual system use limitations, such as clothes washer connections;



**OVERVIEW OF SOLUTIONS  
FOR INDIVIDUAL HOUSEHOLDS**

## SECTION FOUR

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### 4 FINDING A SOLUTION

#### 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 2 presented an overview of water and wastewater problems experienced by individual households within the Tulare Lake Basin Study area.**

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.

**Addressing the identified problem** 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. **Proceeding with** of the selected solution remains the responsibility of the individual homeowner.

#### 4.2 Solution Charts and Solution Sets

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

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

### 4.3 Cost Considerations

Specific costs for each solution have not been provided due to the broad, undefined nature of the potential problems under consideration. **Costs will vary widely through the Tulare Lake Basin depending on the location of the individual household. For example, solutions considered for foothill regions will have significantly different costs compared to solutions along the valley floor. Specific costs associated with identified solutions can be obtained by the individual household.** These solutions and costs will reflect the specific conditions associated with the problem(s).

**Relative costs have been generated and are included with the solution sets.** 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 (MHI) of Fresno, Kern, Kings and Tulare Counties as compiled by the American Community Survey (2006-2010). **The dollar range describing the relative cost, such as “low” or “high” represents a percentage range (0.5 percent to 5 percent) of the average MHI adjusted downward by disadvantaged community definitions. The low end of the dollar range uses the severely disadvantaged definition represented by incomes that**

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are 60 percent of the MHI. The upper end of the dollar range uses the disadvantaged definition estimate by incomes that are 80 percent of the MHI.

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

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<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

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The cost scale approximates the affordability considerations associated with identified solutions for disadvantaged communities. **The cost scale applies to both up-front/one-time costs and ongoing/annual costs. Upfront costs include purchase cost and installation costs. Ongoing costs include costs for regular maintenance to ensure the equipment operates properly.**

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. **An example demonstrating the comparison of costs is presented in Section 5.**

## SECTION FOUR

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

One example of local agency funding exists through the Clean Water State Revolving Fund (CWSRF). Local agencies apply for funds for use in mini-loan programs to assist individual households with compliance with the new onsite wastewater system policy (reference Section 1). This approach has significant disadvantages, including loan costs passed on to the household and the local agency must apply and be awarded funds for distribution. The CWSRF program is a highly competitive funding program and local agencies may not be awarded funding.

Although funding programs exist for small community or private water systems, similar opportunities for funding do not exist for the individual household. Funding programs become available when multiple households come together for community-based solutions.

## SECTION FOUR

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### 4.5 Obstacles

Numerous obstacles exist for implementing solutions for individual households, including financial, **ownership**, regulatory and governance considerations. These obstacles may prevent an otherwise responsible individual 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 **throughout the Tulare Lake Basin Study area** satisfy the income criteria for a household within a **disadvantaged community (DAC) or** 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 cases, assistance comes in the form of donated equipment and supplies. These types of programs are limited and, further, may be geographically focused on specific areas.

#### 4.5.2 Ownership

**The individual household may not be owned by its occupants. In these cases, the renters must work with the homeowners (landlords) to pursue and implement solutions. Homeowners may be unable or unwilling to pursue solutions on the renter's behalf resulting from financial or legal constraints. Solutions completed by the renter may be prevented by similar financial, legal or ownership considerations.**

## SECTION FOUR

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### 4.5.3 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 that supply treatment devices. Consequently, the quantity and types of equipment may be limited for a potential solution. Fewer options available to the individual household typically result in increased costs.

### 4.5.4 Governance

Governance or other organizational considerations can also prevent the implementation of potential solutions. A 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.

### 4.5.5 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. **Subsequently, the individual must determine solutions for which he may not have the necessary experience or expertise.** In these cases, community-based organizations, or manufacturers, may provide suitable alternatives, if available. **Section 5 demonstrates the typical process used to identify a potential solution and its associated considerations.**

### 4.6 Getting Started

**Understanding the conditions regarding the water and wastewater systems associated with the individual household represents the first step to**

## SECTION FOUR

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effectively using this Pilot Study Report. Many individual households will need assistance in finding solutions to water and wastewater problems. Some individual households will know what solution they wish to pursue. Other individual households will need to determine the presence of water or wastewater problems before pursuing a solution. Table 4-2 summarizes actions and/or activities that can be undertaken to determine the existence of a water or wastewater problem.

Figure 4-1 presents an overview of the first step(s) that need to be taken by an individual household.

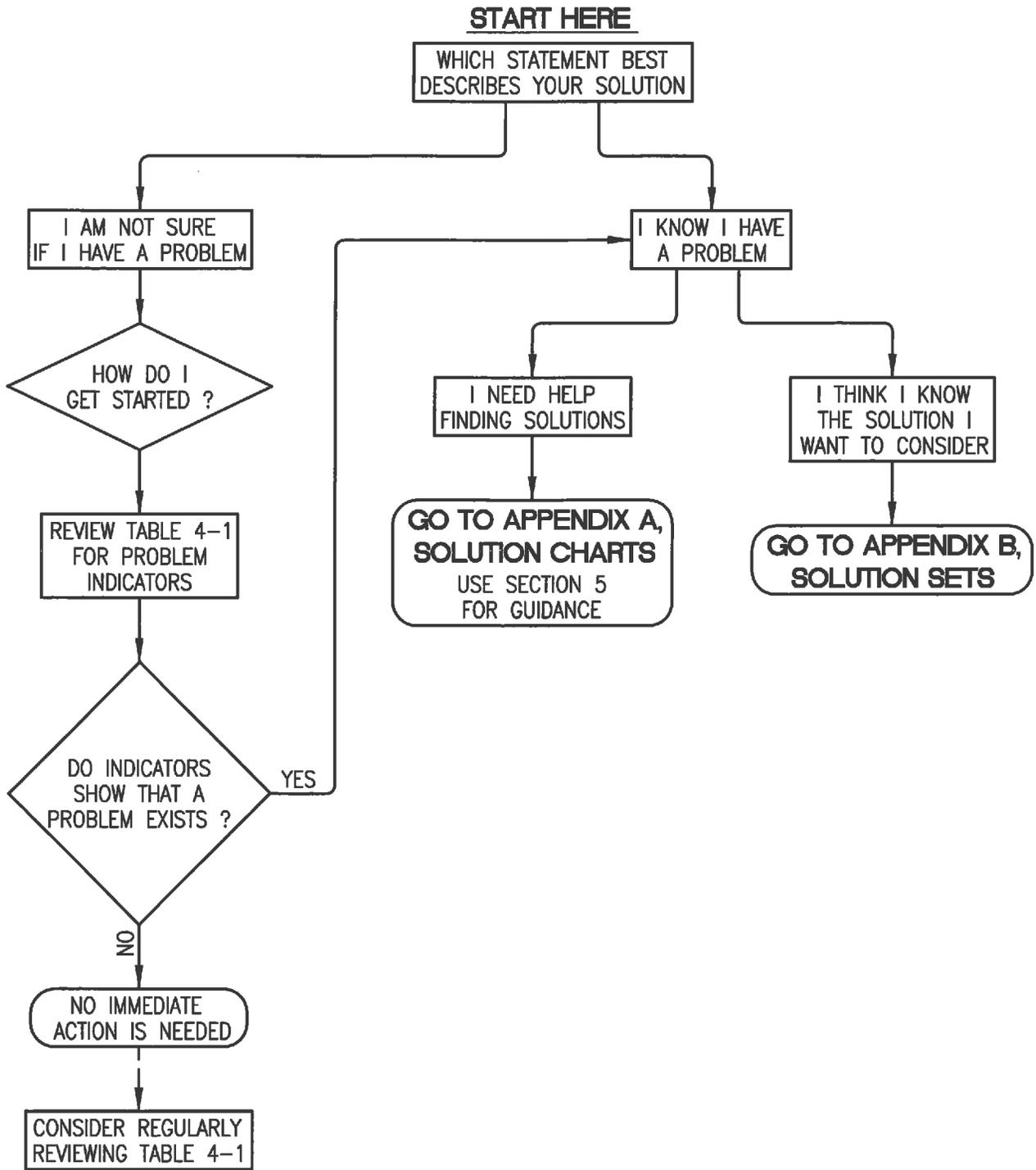
To get started, the individual household must be able to describe their situation as:

1. Knowing they have a problem; or
2. Unsure if a problem exists.

If a water or wastewater problem is known, the individual household needs to establish if:

1. They need help finding solutions; or
2. They know the solution they wish to use.

The use of Figure 4-1 will help the individual household determine which sections of the Pilot Study Report to review.



**GETTING STARTED**  
**INDIVIDUAL HOUSEHOLD PILOT STUDY**  
**TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY**

## SECTION FIVE

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# 5 TUTORIAL - USING THE SOLUTION CHARTS AND SOLUTION SETS

## 5.1 Introduction

This tutorial has been prepared to demonstrate to the party associated with the individual household (homeowner) how to use the solution charts and solution sets to identify and select potential solutions to water and wastewater problems. The solution charts present a series of questions that lead the homeowner to potential solutions. The solution sets provide general information and considerations that help the homeowner to select solutions.

## 5.2 Solution Charts

There are four (4) solution chart series that are available to the homeowner. The solution charts are located for the homeowner's use in Appendix A.

The homeowner starts the process with Solution Chart No. 1 – Initial Classification. In order to be able to use Solution Chart No. 1, the individual must have previously identified the problem (or problems) that needs to be addressed. The homeowner responds to the question(s) presented by Solution Chart No. 1 which will subsequently direct the homeowner to a specific solution chart.

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The individual responds to each question presented in the specific solution chart series (examples: Series 2A – Nutrients, or Series 3 – Water Supply and Delivery, etc.). The responses to the questions will direct the individual to appropriate solution sets presented in Appendix B for consideration.

### 5.3 Solution Sets

Each solution chart includes steps where the individual must identify and compare potential solutions that may address the problem(s) experienced by the individual household.

Elements of each solution that must be considered include:

- Construction cost;
- Ability to operate and maintain;
- Costs to operate and maintain;
- Practical nature;
- Advantages; and
- Disadvantages.

Under many conditions, a single solution may be identified to address the problem. In some cases, however, the person(s) associated with the individual household will need to choose between equally viable solutions. Furthermore,

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the possibility exists that a solution may not be feasible for a number of reasons, such as total cost or operational characteristics.

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### 5.4 Example

The following example has been prepared to demonstrate the use of the solution charts and solution sets. The example walks through each question presented by the solution chart and reviews the considerations associated with the potential solution.

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### Start Here

Mr. Jones owns a home in the rural area of Eastern Tulare County. He bought the home about 15 years ago. The home is surrounded by agricultural fields and orchards.

One day, his neighbor who lives down the road one-half of a mile tells Mr. Jones that his well water consistently exceeds the drinking water limit for nitrates. Since Mr. Jones has never tested his well water for nitrates, the neighbor suggests that Mr. Jones test his well water.

The neighbor indicates that Mr. Jones can contact the County Health Department for further assistance, or can contact a water testing laboratory directly. Mr. Jones finds a laboratory and has his well water tested. The results indicate that Mr. Jones' water has a nitrate level of 75 mg/L. The nitrates in Mr. Jones' water exceed the drinking water standard of 45 mg/L.

Mr. Jones needs to address the high nitrates in his drinking water. He proceeds to Solution Chart No. 1- Initial Classification.

**SECTION FIVE**

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**Solution Chart No. 1 – Initial Classification**

**Question: Do you live in a rural residential subdivision having more than 15 dwellings?**

**Response: No.**

**Reason: Mr. Jones lives in a rural area. His nearest neighbors are approximately one-half mile away.**

**Next Step: Mr. Jones proceeds to the next question on Solution Chart No. 1.**

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## SECTION FIVE

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### **Solution Chart No. 1 – Initial Classification**

**Question:** Does household experience a domestic water quality issue?

**Response:** Yes.

**Reason:** Water testing has established that the water has high nitrates.

In most cases, follow-up testing should be conducted to confirm the initial test results. Nearby test results or historical experience with water quality of the area may serve, however, to support the initial test results.

**Next Step:** Mr. Jones goes to Solution Chart No. 2 – Water Quality Solutions

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**Notes:** Mr. Jones wants to address a water quality problem associated with nitrates. If Mr. Jones experienced problems with his well pump or wastewater disposal system (septic system), Mr. Jones could continue with additional questions on Solution Chart No. 1.

**SECTION FIVE**

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**Solution Chart Series No. 2 – Water Quality Solutions**

This solution chart is specifically prepared to identify and direct the homeowner to the appropriate water quality solution chart. Mr. Jones will use this chart to direct him to the proper solution chart to address his nitrate problem.

**Question: Does water quality exceed a maximum contaminant level (MCL) or the drinking water standard?**

**Response:** Yes.

**Reason:** The MCL for nitrates is 45 mg/L. Mr. Jones' water test shows 75 mg/L nitrates, which is higher than the MCL.

**Next Step:** Mr. Jones is not familiar with water quality. He needs to describe the water quality issue. Using Table 3-2 – Water Quality Constituent Categories, Mr. Jones finds that nitrates fall in the "Nutrient" category.

Mr. Jones goes to Solution Chart 2A – Nutrients.

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**Notes:** Mr. Jones' water quality testing did not identify any other water quality constituents of concern.

If another contaminant, however, was identified, Mr. Jones would return to this solution chart after finding solutions for nitrates.

Mr. Jones would repeat this process and consider the solutions for each water quality contaminant so that he could develop a combined solution.

**SECTION FIVE**

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**Solution Chart Series 2A – Nutrients**

This solution chart is prepared to guide the homeowner through a series of questions to help the homeowner identify potential solutions for water quality problems. The questions are listed in Appendix A.

Mr. Jones will use these questions to identify his options for his high nitrate problem.

**Question No. 1: Is an individual water well (or other source) used?**

Response: Yes.

Reason: Mr. Jones lives in a rural area. The nearest town with a water system is approximately five (5) miles away. Mr. Jones' property has a well that provides water to his home. The well was constructed by the previous homeowner.

Next Step: Mr. Jones goes to Question No. 2.

**SECTION FIVE**

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**Solution Chart Series 2A – Nutrients**

**Question No. 2: Are design and installation features of the water well system known?**

**Response:** No.

**Reason:** Mr. Jones has lived in the house for 15 years. Although he may have been given information about the well when he purchased the house, he has since lost or misplaced it. The only information he has is depth to water information provided by the pump maintenance company that he uses to annually service the pump.

**Next Step:** Mr. Jones needs to establish the features of his well. He contacts a local well drilling contractor for assistance. He learns that his well is in good condition with good sanitary seal. Mr. Jones goes to Question No. 3.

**SECTION FIVE**

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**Solution Chart Series 2A – Nutrients**

**Question No. 3: Are the water well features considered acceptable – do the features comply with standards?**

**Response:** Yes.

**Reason:** The well inspection completed for Mr. Jones did not identify any problems with Mr. Jones' well. The well had a sanitary seal in place and other features met standards.

**Next Step:** Mr. Jones goes to Question No. 4.

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**Notes:** If the well inspection had identified a problem with Mr. Jones' well, Mr. Jones would need to consider well improvement solutions that are identified in Appendix B.1 – Well Improvements.

Any potential solution would be considered in Comparison Step No. 10.

**SECTION FIVE**

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**Solution Chart Series 2A – Nutrients****Question No. 4: Has the on-site wastewater system been evaluated?**

**Response:** Yes.

**Reason:** During the well inspection, Mr. Jones established that his septic system and well were separated by over 200 feet. Mr. Jones has never had problems with his septic system and routinely cleans and pumps his system out. His leach field never floods.

**Next Step:** Mr. Jones goes to Question No. 5.

---

**Notes:** If Mr. Jones had answered “no” to Question No. 4, he would need to complete an evaluation of his septic system by following steps of Solution Chart No. 4 – Wastewater Solutions. This chart reviews consideration with construction, operation and maintenance of septic systems.

Septic systems can represent a source of nutrients in the well water; therefore, solutions that address problems with septic systems can address nutrients in well water.

**SECTION FIVE**

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**Solution Chart Series 2A – Nutrients**

**Question No. 5: Does on-site wastewater system represent the primary source of the contaminants (nitrates)?**

**Response:** No.

**Reason:** No evidence exists to suggest that Mr. Jones septic system is the cause of the nitrates. His septic system is operating properly. His water well is adequately separated from the septic system. There is no other water quality data, such as coliform results, to suggest wastewater contamination of the well.

**Next Step:** Mr. Jones proceeds to Question No. 6.

---

**Notes:** If Mr. Jones' septic system represented the primary source of the nitrates, he would need to go to Solution Chart No. 4 – Wastewater Solutions to look at potential solutions for his septic system.

**SECTION FIVE**

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**Solution Chart Series 2A – Nutrients**

**Question No. 6: Is the system subject to outside influences that are external to the residence/property?**

Response: Yes.

Reason: Mr. Jones lives in an area that has been farmed for decades. It is likely that fertilizers have been applied on the land surrounding his home for a long time.

Next Step: Mr. Jones goes to Question No. 9.

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**SECTION FIVE**

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**Solution Chart Series 2A – Nutrients**

**Question No. 9: Is water quality problem shared by adjacent water wells and residences?**

**Response:** Yes.

**Reason:** Mr. Jones' neighbor previously shared his nitrate problem with his own well. Mr. Jones' conversation with other neighbors reveals the same nitrate problems in well water.

**Next Step:** Consider community-based water quality solutions.  
Mr. Jones goes to Solution Set B3-Community-based Water Solutions to identify potential solutions.

**SECTION FIVE**

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**Solution Chart Series 2A – Nutrients****Solution Set B3 – Community-Based Water Source Solutions**

Action: Identify potential solutions.

Mr. Jones reviews Solution Set B-3 for potential solutions to his nitrate problem. The solutions presented in B-3, however, specifically address water quality problems for rural subdivisions that share a common well. There is no potential to develop a shared well because the distance between the neighbors is too great. This condition rules out Solutions B.3.1 (Well Improvements) and B.3.2 (New Water Source). Connecting to the water system of the nearby community (also known as consolidation) is not realistic, since it is five miles to town. Subsequently, Solution B.3.3 (Alternative Water Source) is also not possible.

**Question: Is a community solution feasible?**

Response: No. Mr. Jones concludes that potential community based water quality solutions do not exist.

Next Step: Mr. Jones goes to Consideration Step No. 7.

**SECTION FIVE**

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**Solution Chart Series 2A – Nutrients****Consideration Step No. 7 - Consider Individual Solutions**

Action: Identify Potential Solutions.

Mr. Jones goes to Solution Set B2-Water Quality Solutions to identify potential solutions. Mr. Jones reviews Solution Set B2 for potential solutions that address his nitrate problem. Three (3) types of solutions exist: existing source options, treatment options and new source options.

**Existing Source Options**

Mr. Jones reviews the information associated with existing sources. These solutions address well construction and wastewater system improvements. Since Mr. Jones' well and wastewater system are not associated with the nitrate problem, these solutions do not apply to Mr. Jones' situation. Refer to Question Nos. 3, 4 and 5.

**Treatment Options**

Mr. Jones reviews the information associated with the treatment options. Both Point of Use (POU) and Point of Entry (POE) appear realistic solutions. Mr. Jones researches potential treatment units through web sites and phone calls to suppliers. He collects purchase and installation costs. Mr. Jones finds out the yearly cost to operate the units he is considering. Mr. Jones summarized his information in the following table.

**SECTION FIVE**

Type of Unit	Manufacturer /Supplier	Type	Purchase Cost	Installation Cost	Yearly Costs	Notes
POU	Brand A	Ion Exchange (IX)	\$150	\$100	\$200	Change cartridge 4 times/year
POU	Brand B	IX	\$220	\$75	\$150	Change cartridge 5 times/year
POU	Brand C	Reverse Osmosis (RO)	\$200	\$100	\$200	Cartridge change out once per year; RO unit – every 3 years
POE	Brand D	IX	\$1500	\$300	\$300	Size is flow dependent
POE	Brand E	RO	\$2000	\$300	\$300	Size is dependent on flow

Note: Costs shown above are for example purposes only. The costs do not represent actual costs.

Mr. Jones reviews the information he has collected. Based upon his current finances, he cannot afford a POE device, so he settles for a POU device due to a lower annual cost. Ion exchange (IX) also offers advantages to Mr. Jones for his situation.

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### New Source Options

Mr. Jones also reviews the information regarding new water sources. A bottled water supply provides similar considerations to a POU device – water is available for drinking water purposes only. Mr. Jones can have water delivered to his home or go purchase it at a distribution center in the nearby town. Mr. Jones collects monthly costs for delivery and also considers his transportation costs for picking the water up in town. Mr. Jones decides that he does not want to drive to town for water, since he may not be strong enough to handle the large bottles. He chooses a bottled water delivery option for further consideration.

Mr. Jones also considers other options for a new water source. He considers a new well, however, a new well will likely not produce water low in nitrates since his neighbors also experience high nitrates. A new well will be very expensive when compared to other options. Mr. Jones also concludes that a tie-in to a community system or new multi-household system is not practical since his house is a long way from other residences or the town.

**Findings:** After working through Solution Set B2, Mr. Jones has identified the following potential solutions to his nitrate problem:

- 1) POU device; and
- 2) Bottled water delivery.

**Next Step:** Mr. Jones goes to Comparison Step No. 10.

**SECTION FIVE**

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**Solution Chart Series 2A – Nutrients**

**Comparison Step No. 10 – Compare Identified Solutions**

Action: Collect information gathered regarding potential solutions.

Mr. Jones reviews the information and findings he has collected as he has worked through the solution series. He is ready to compare all of his identified potential solutions.

First, Mr. Jones knows that there are no solutions applicable regarding his water well (Question No. 3).

Second, two solutions exist for Mr. Jones that could be used at his household: a POU device or bottled water delivery (Consideration Step No. 7).

Finally, although community-based solutions exist, the solutions are not practical for Mr. Jones at this time (Question No. 9).

The following table summarizes the potential solutions considered by Mr. Jones.

POTENTIAL SOLUTIONS		
Well Improvement Solutions (Question 3)	Individual Water Source Solutions (Consideration Step No. 7)	Community Based Water Source Solutions (Question 9)
None	POU Unit (IX) Bottled Water Delivery	None

**SECTION FIVE**

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Mr. Jones gathers all of the information he has collected regarding each potential solution. His information is shown in the following table.

<u>Potential Solution</u>	<u>Advantages</u>	<u>Disadvantages</u>	<u>Initial Cost</u>	<u>Ongoing Costs</u>
POU Unit (IX)	Undersink Installation  Use as much water as needed	Equipment to maintain (plumbing, etc.)  Cartridge changeouts	\$300	\$150/year
Bottled Water Delivery	No equipment maintenance	Extra Equipment (dispenser)  Water supply could be limited between deliveries	-	\$360/year

Note: Information listed above is for example purposes only. The user of this document will need to generate this information.

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**Question: Can a solution be selected and implemented?**

**Response:** Yes.

**Reason:** Mr. Jones reviews his finances. He has a limited income, but does have some money set aside for home improvements. He decides he can afford about \$20 per month for water treatment. Consequently, a water treatment solution appears possible. Mr. Jones selects to install a IX POU unit.

**Next Steps:** After installing the POU unit, Mr. Jones will need to have water quality tests completed during the following year to determine his selected solution's effectiveness. If the water test results show that nitrate levels remain below the drinking water standard, Mr. Jones does not need to continue with any other activities.

If test results again show high nitrate levels, Mr. Jones will need to re-evaluate potential solutions by completing the solution charts with new considerations. This may require the use of water quality professionals, community assistance organizations, and further work with manufacturers and suppliers.

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**Financial Considerations:**

Mr. Jones' financial capabilities affect the possibility of many alternatives. If Mr. Jones did not have the ability to pay any monthly costs, neither solution would be possible and Mr. Jones would be without a solution to his nitrate problem. If Mr. Jones had more financial resources, he may elect to choose a bottle water delivery solution to eliminate any POU ownership hassles, or choose to install a POE unit to treat all water that is used in his house.

## SECTION SIX

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### 6 RESOURCES

This section provides a list of resources available to the person associated with an individual household. The listed resources provide initial starting points for the individual that will direct him/her to additional resources.

#### 6.1 Local Agencies

- A. County of Fresno Department of Public Health  
Environmental Health/Water Surveillance Program  
1221 Fulton Mall, Third Floor  
Fresno, CA 93775  
(559) 600-3357  
[www.co.fresno.ca.us](http://www.co.fresno.ca.us)
- B. County of Kern Environmental Health Division  
2700 M Street, Suite 300  
Bakersfield, CA 93301  
(661) 862-8740  
[www.co.kern.ca.us/eh/](http://www.co.kern.ca.us/eh/)
- C. County of Kings Environmental Health Services Division  
330 Campus Drive  
Hanford, CA 93230  
(559) 852-2617  
[www.countyofkings.com/ehs/](http://www.countyofkings.com/ehs/)
- D. County of Tulare Environmental Health Services Division  
5957 S. Mooney Blvd.  
Visalia, CA 93277  
(559) 624-7400  
[www.tchhsa.org](http://www.tchhsa.org)

## SECTION SIX

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### 6.2 State Agencies

- A. California Department of Public Health  
Drinking Water Program  
(Fresno/Kings/Tulare Counties)  
265 W. Bullard Ave., Suite 101  
Fresno, CA 93704  
(559) 447-3300
- B. California Department of Public Health  
Drinking Water Program  
(Kern County)  
2925 Commerce Dr., Suite 120  
Bakersfield, CA 93309  
(661) 335-7315

Note: The California Department of Public Health (Department) does not regulate individual households. The Department, however, certifies Point-of-Use (POU) and Point-of-Entry (POE) devices.

[www.cdph.ca.gov/certlic/device/pages/watertreatmentdevices.aspx](http://www.cdph.ca.gov/certlic/device/pages/watertreatmentdevices.aspx)

### 6.3 Internet (Web-based) Resources

- A. California Department of Water Resources
- Groundwater well standards: [www.water.ca.gov/groundwater/well\\_info\\_and\\_other/](http://www.water.ca.gov/groundwater/well_info_and_other/)
- B. National Environmental Services Center
- Septic Systems: [www.nesc.wvu.edu/subpages/septic.cfm](http://www.nesc.wvu.edu/subpages/septic.cfm)
  - Wells: [www.nesc.wvu.edu/subpages/wells.cfm](http://www.nesc.wvu.edu/subpages/wells.cfm)
- C. United States Environmental Protection Agency (EPA)
- Private Drinking Water Wells: [www.water.epa.gov/drink/info/well/](http://www.water.epa.gov/drink/info/well/)
  - Septic Systems: [www.water.epa.gov/infrastructure/septic](http://www.water.epa.gov/infrastructure/septic)

Note: The list of internet resources is not intended to be comprehensive. The list represents a starting point for useful information.

**SECTION SIX**

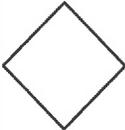
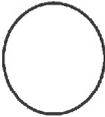
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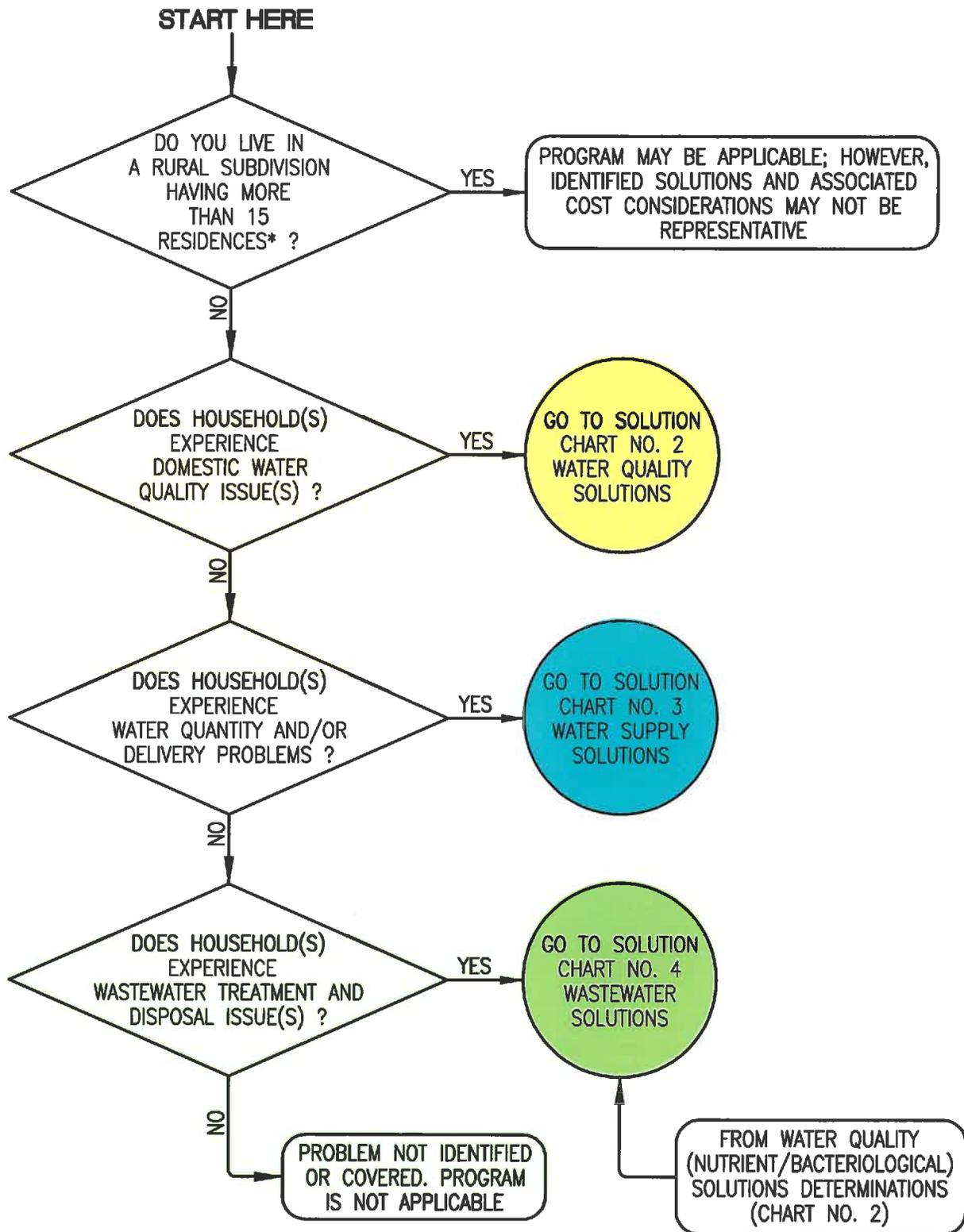
**6.4 Water Testing Laboratories**

- A. **BC Laboratories, Inc.**  
4100 Atlas Court  
Bakersfield, CA 93308  
(661) 327-4911  
(800) 878-4911  
[www.bclabs.com](http://www.bclabs.com)
  
- B. **BSK Laboratories**  
550 W. Locust Avenue  
Fresno, CA 93650  
(559) 497-2880  
[www.bskassociates.com](http://www.bskassociates.com)
  
- C. **FGL Environmental Laboratories**  
9415 W. Goshen Avenue  
Visalia, CA 93291  
(559) 734-9473  
[www.fglinc.com](http://www.fglinc.com)
  
- D. **Moore Twining Associates, Inc.**  
2527 Fresno Street  
Fresno, CA 93721  
(559) 268-7021  
(800) 268-7021  
[www.mooretwining.com](http://www.mooretwining.com)

**Note:** The list of laboratories is not intended to be comprehensive. The list provides the individual with a starting point. Additional laboratories may be available.

### Legend – Symbols (Type of Action)

Flowchart Symbol	Name	Description	Notes
	Process	An operation or action step.	
	Terminator	A start or stop point in a process.	
	Decision	A question or branch in the process.	
	Connector	A jump from one point to another.	For example, a jump from one tree to another.
	Extract (Measurement, Finished Goods)	Extract (split processes) or more commonly – a measurement or finished goods	For example, an offer or acceptance of funds.
	Callout	Used to add comments to a flowchart.	
	Flow Line	Indicates the direction of flow for materials and/or information	



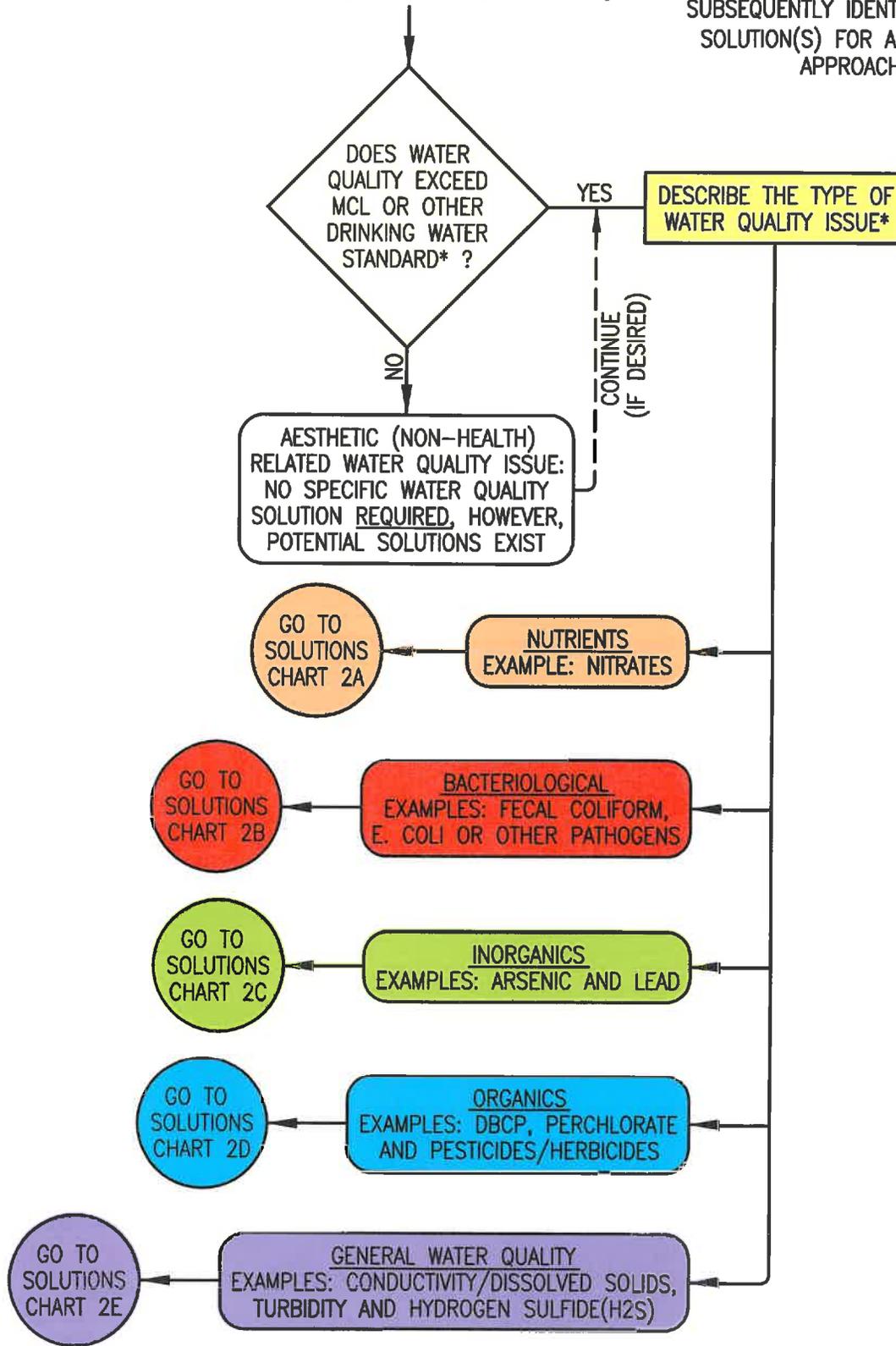
\*THIS PROGRAM IS SPECIFICALLY DESIGNED FOR INDIVIDUAL HOUSEHOLDS OR GROUPS OF HOUSEHOLDS CONSISTING OF 15 RESIDENCES OR LESS

**SOLUTION CHART NO. 1 - INITIAL CLASSIFICATION  
INDIVIDUAL HOUSEHOLD PILOT STUDY**

**TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY**

**WATER QUALITY  
PROBLEM CLASSIFICATION  
(FROM SOLUTION CHART NO. 1)**

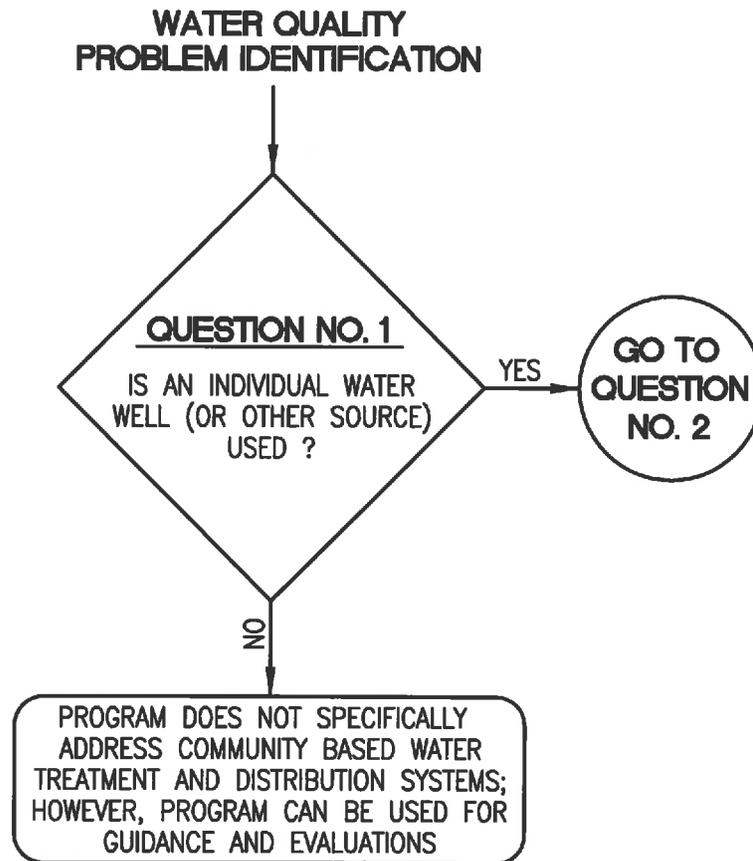
\*FOR MULTIPLE WATER QUALITY ISSUES,  
IDENTIFY SOLUTION(S) SEPARATELY.  
SUBSEQUENTLY IDENTIFY COMMON  
SOLUTION(S) FOR A COMBINED  
APPROACH.



**SOLUTION CHART NO. 2 - WATER QUALITY SOLUTIONS**

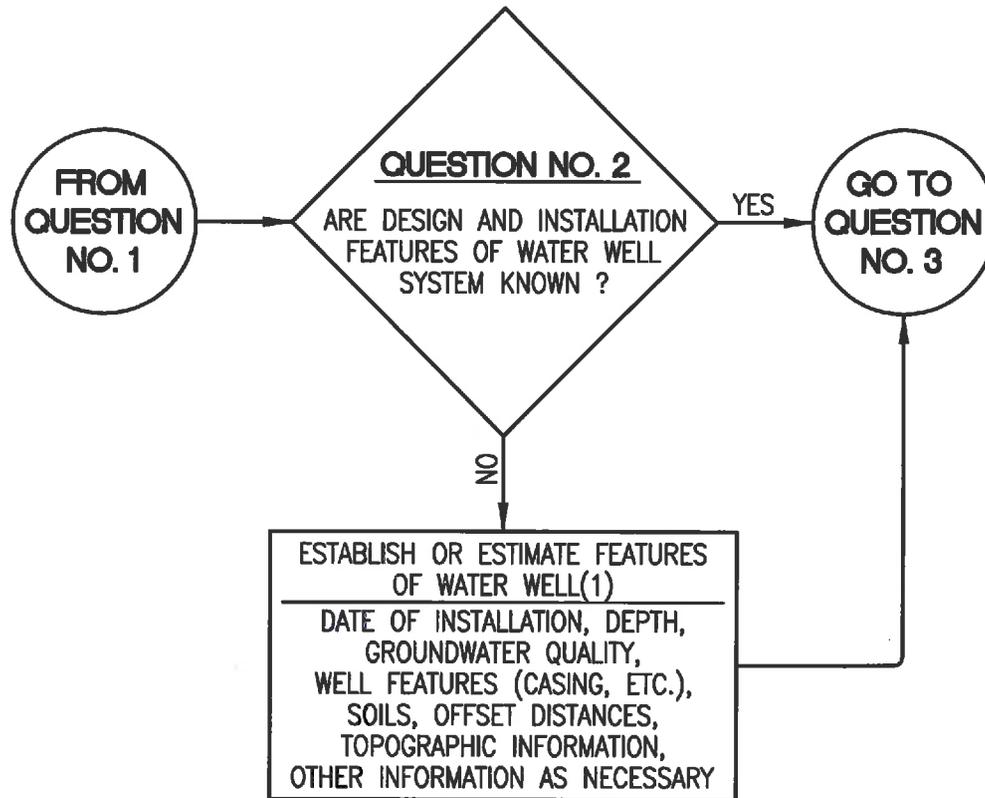
**INDIVIDUAL HOUSEHOLD PILOT STUDY**

**TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY**



QUESTION NO. 1

SOLUTION CHART NO. 2B - WATER QUALITY SOLUTIONS - BACTERIOLOGICAL  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY

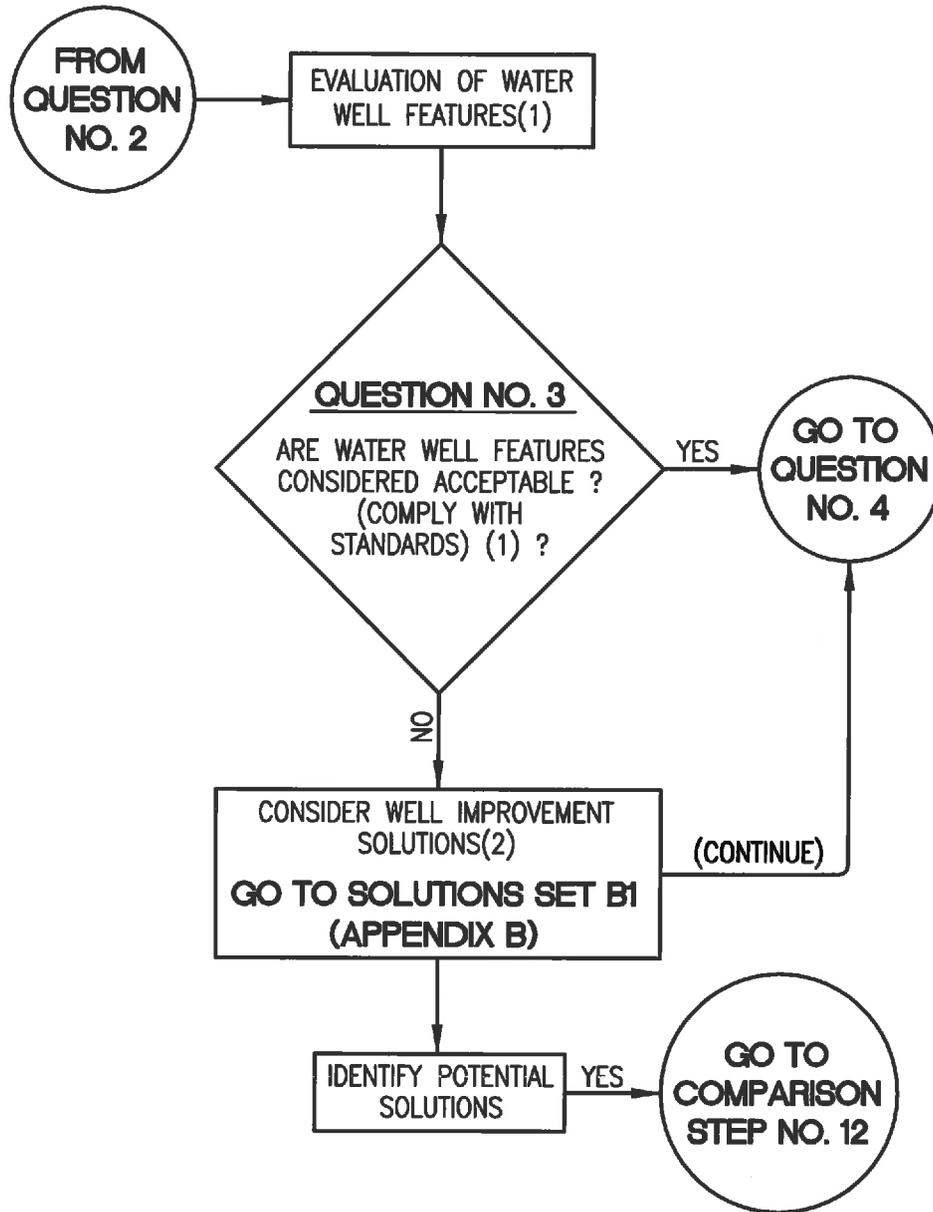


NOTE:

1. EVALUATION SHOULD BE CONDUCTED BY INDIVIDUAL WITH EXPERIENCE IN WATER WELL DESIGN AND INSTALLATION.

QUESTION NO. 2

SOLUTION CHART NO. 2B - WATER QUALITY SOLUTIONS - BACTERIOLOGICAL  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY

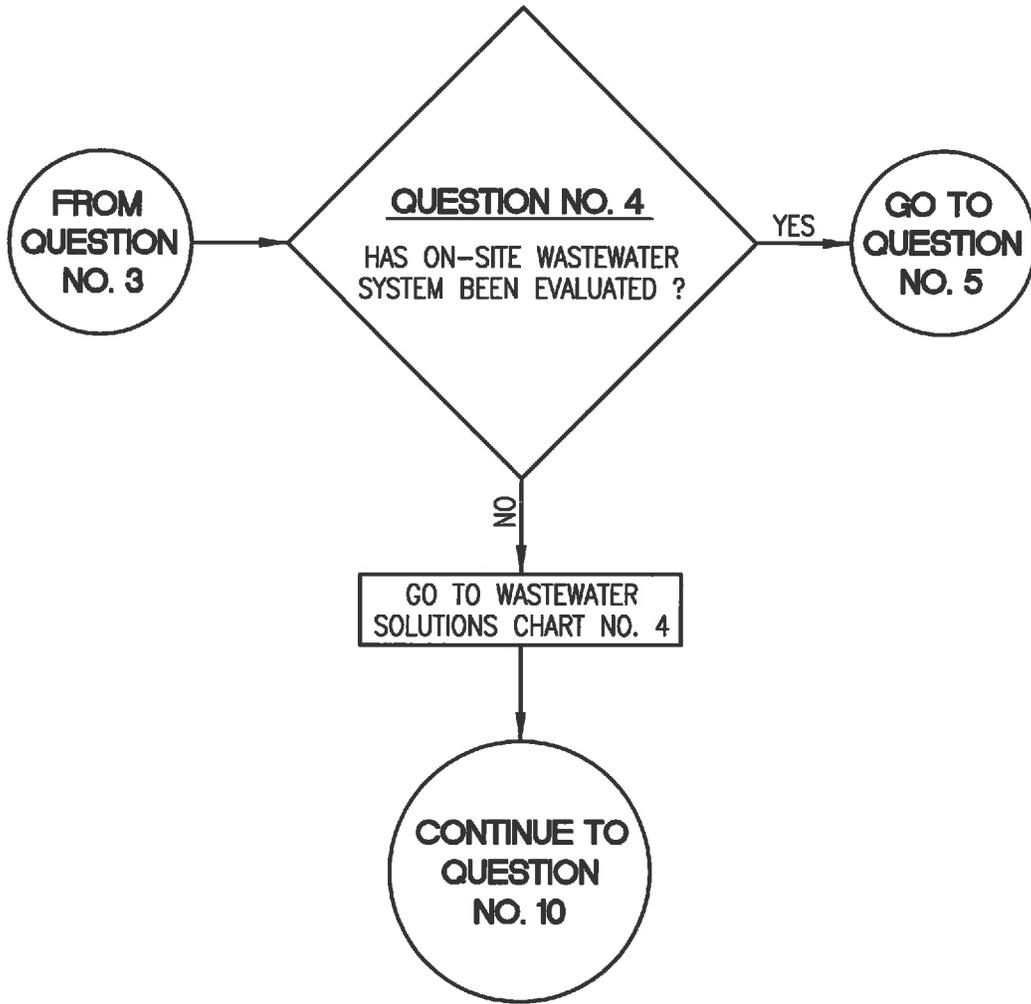


**NOTES:**

1. EVALUATION SHOULD BE CONDUCTED BY PROFESSIONAL WITH EXPERIENCE IN WATER WELL DESIGN, INSTALLATION AND REGULATORY REQUIREMENTS.
2. SOLUTIONS SHOULD BE EVALUATED AND ESTABLISHED BY PERSON(S) EXPERIENCED IN DRINKING WATER TREATMENT. EXAMPLES: DRINKING WATER TREATMENT CONSULTANTS, HEALTH DEPARTMENT REPRESENTATIVES AND WATER TREATMENT EQUIPMENT MANUFACTURERS.

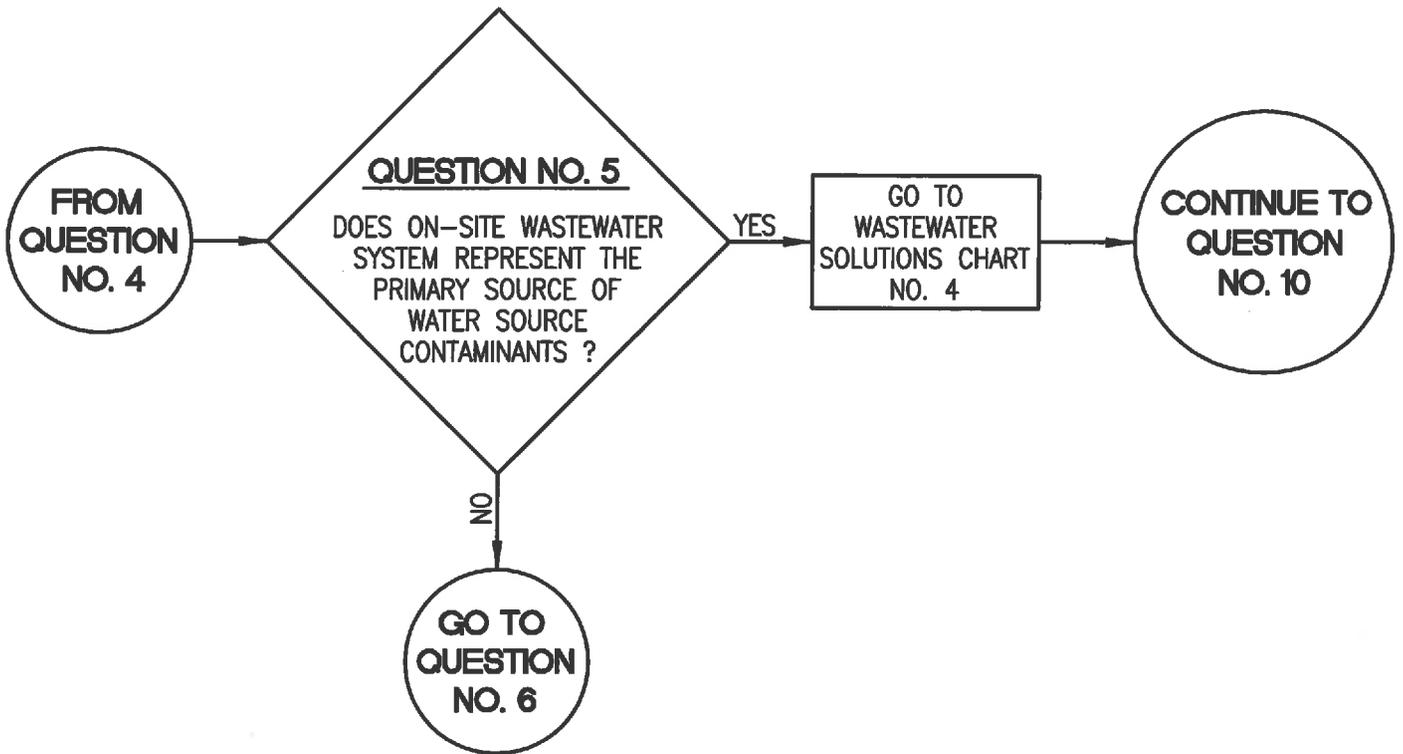
**QUESTION NO. 3**

**SOLUTION CHART NO. 2B - WATER QUALITY SOLUTIONS - BACTERIOLOGICAL  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY**



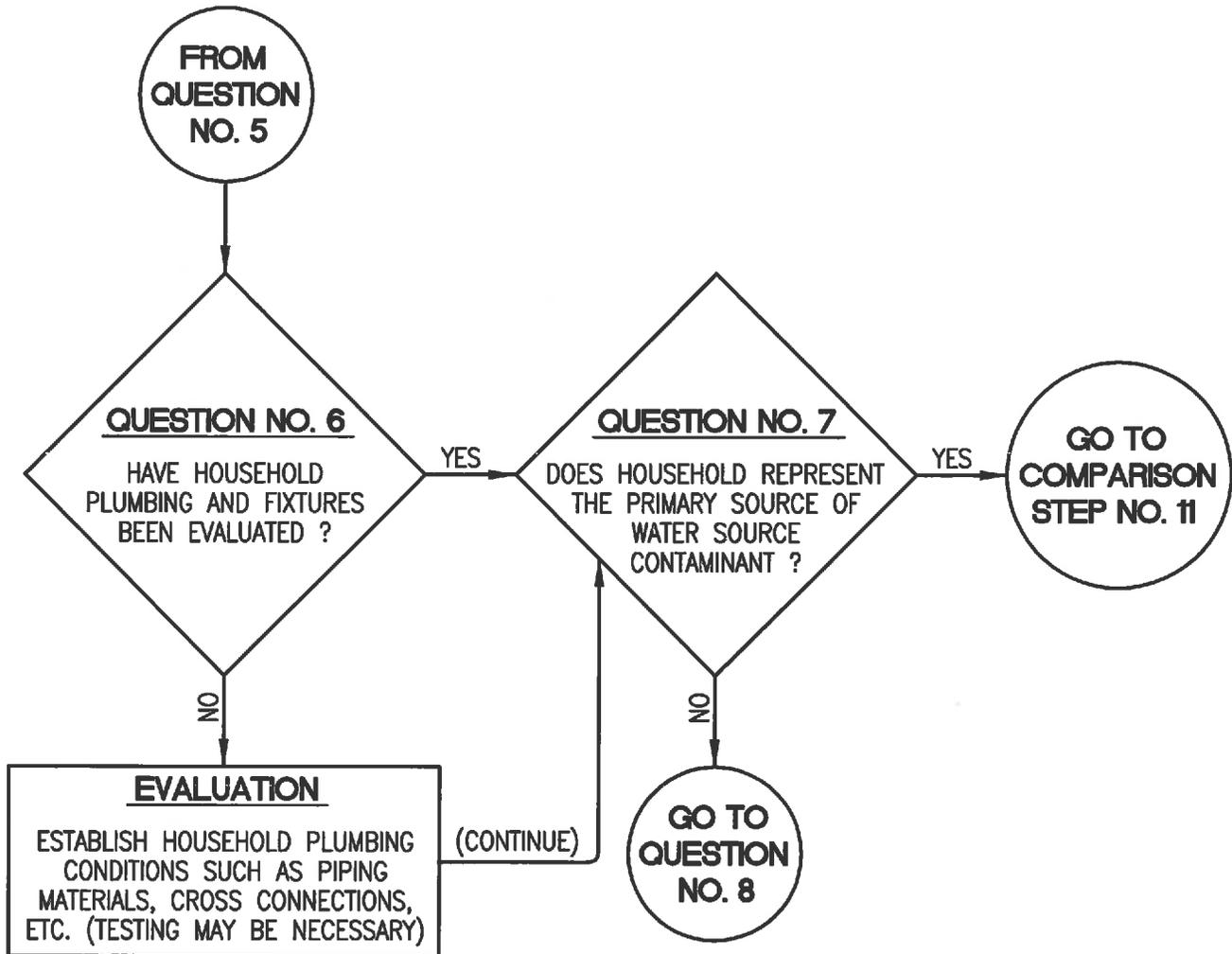
QUESTION NO. 4

SOLUTION CHART NO. 2B - WATER QUALITY SOLUTIONS - BACTERIOLOGICAL  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



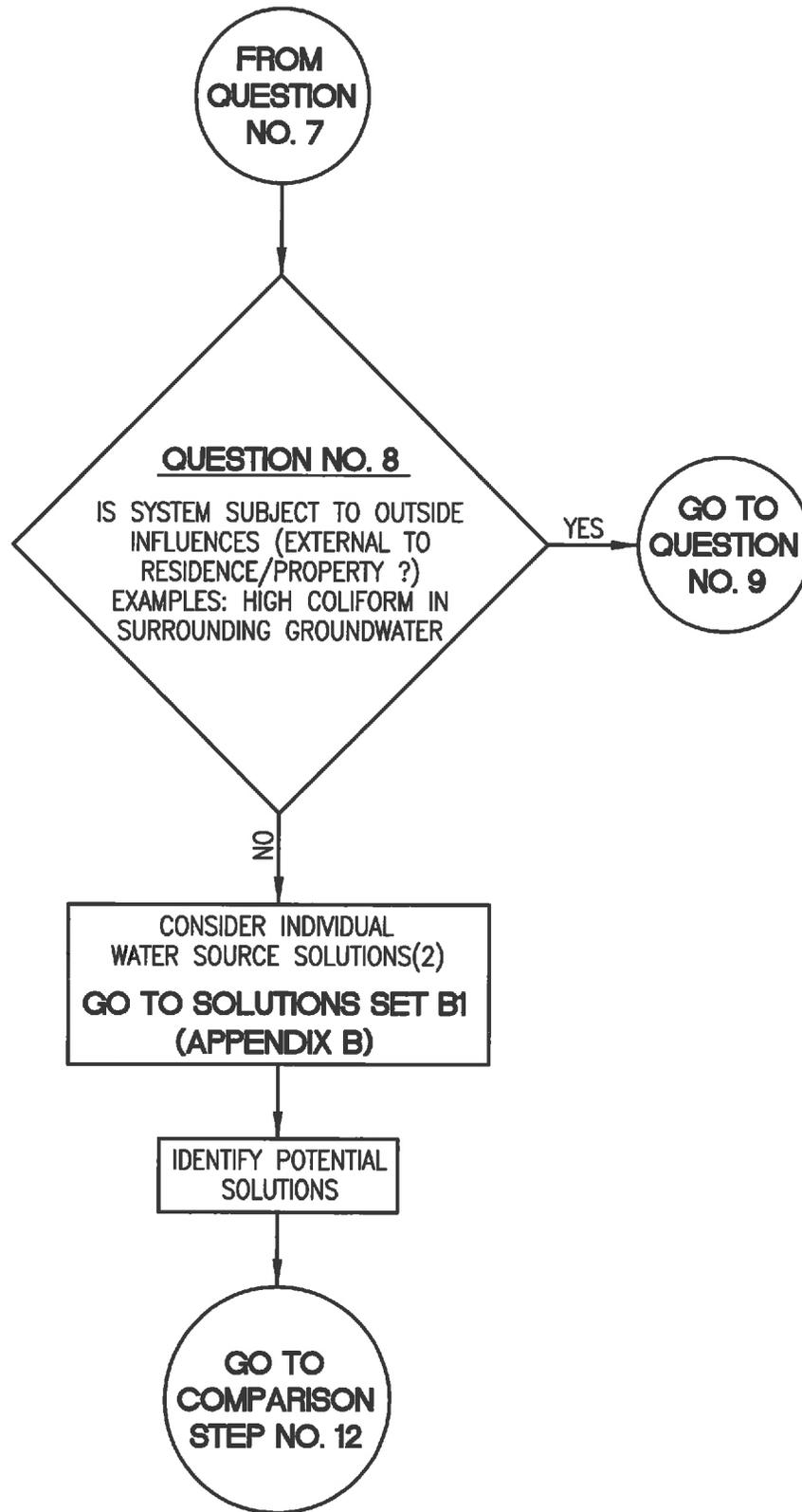
QUESTION NO. 5

SOLUTION CHART NO. 2B - WATER QUALITY SOLUTIONS - BACTERIOLOGICAL  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



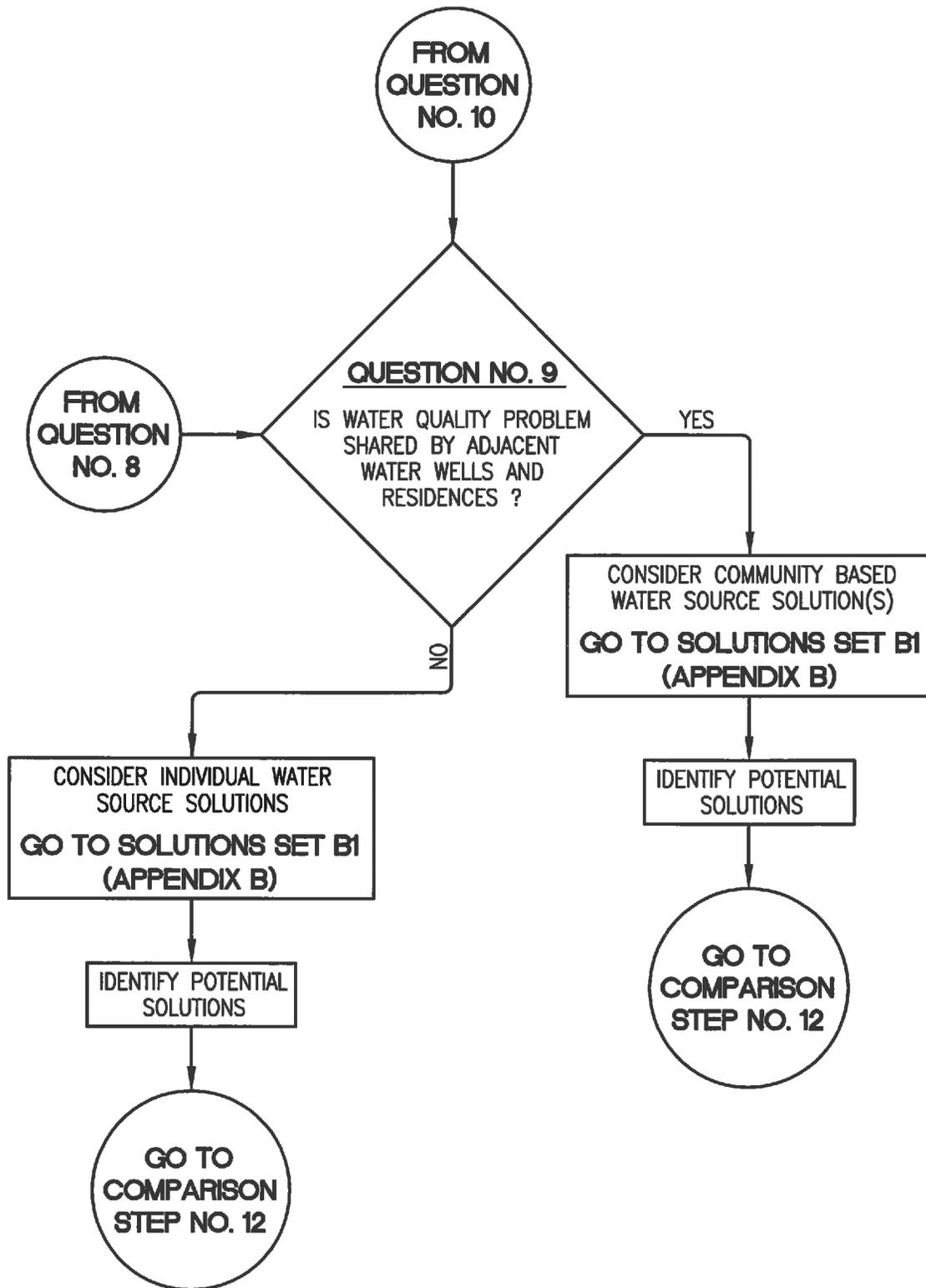
QUESTIONS NO. 6 AND NO. 7

SOLUTION CHART NO. 2B - WATER QUALITY SOLUTIONS - BACTERIOLOGICAL  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



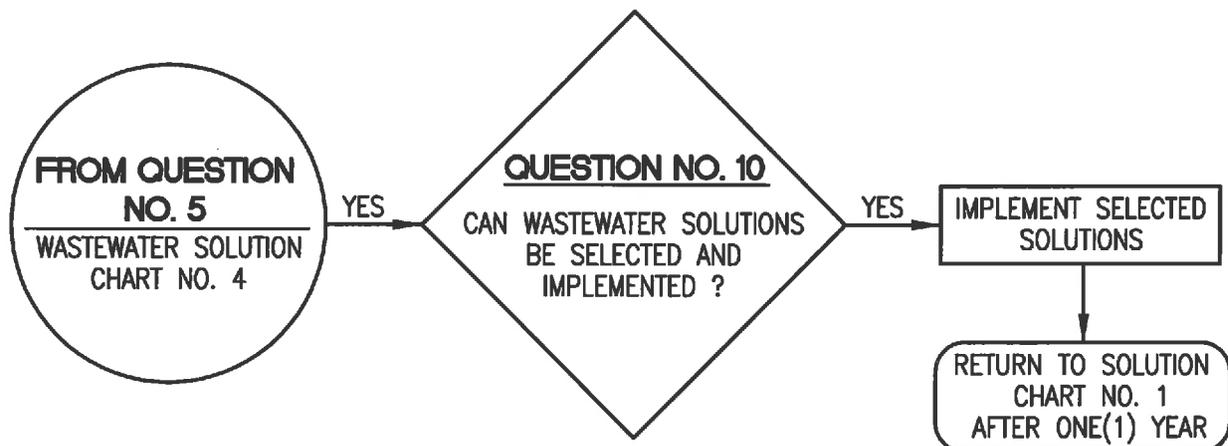
QUESTION NO. 8

SOLUTION CHART NO. 2B - WATER QUALITY SOLUTIONS - BACTERIOLOGICAL  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



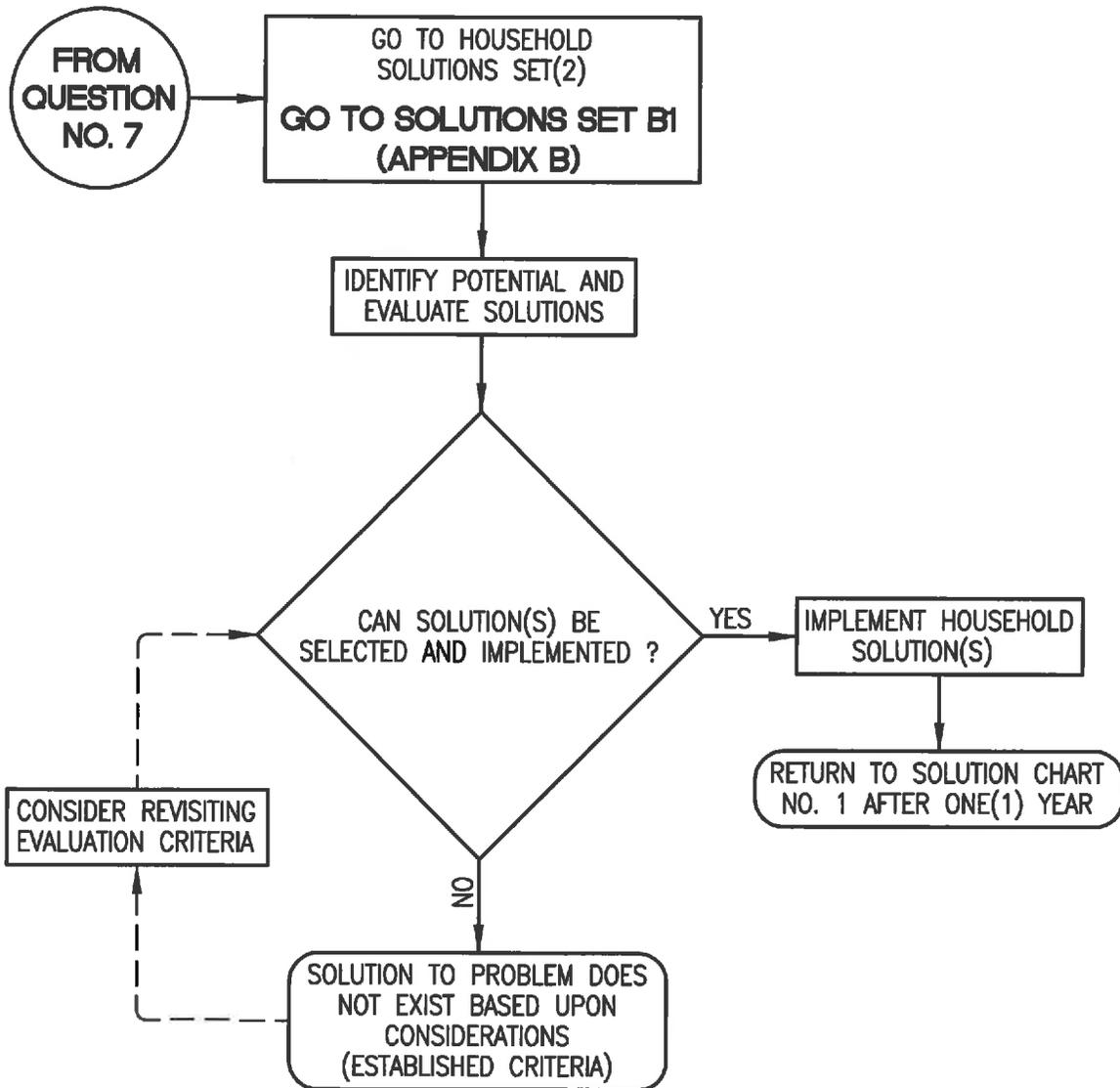
QUESTION NO. 9

SOLUTION CHART NO. 2B - WATER QUALITY SOLUTIONS - BACTERIOLOGICAL  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



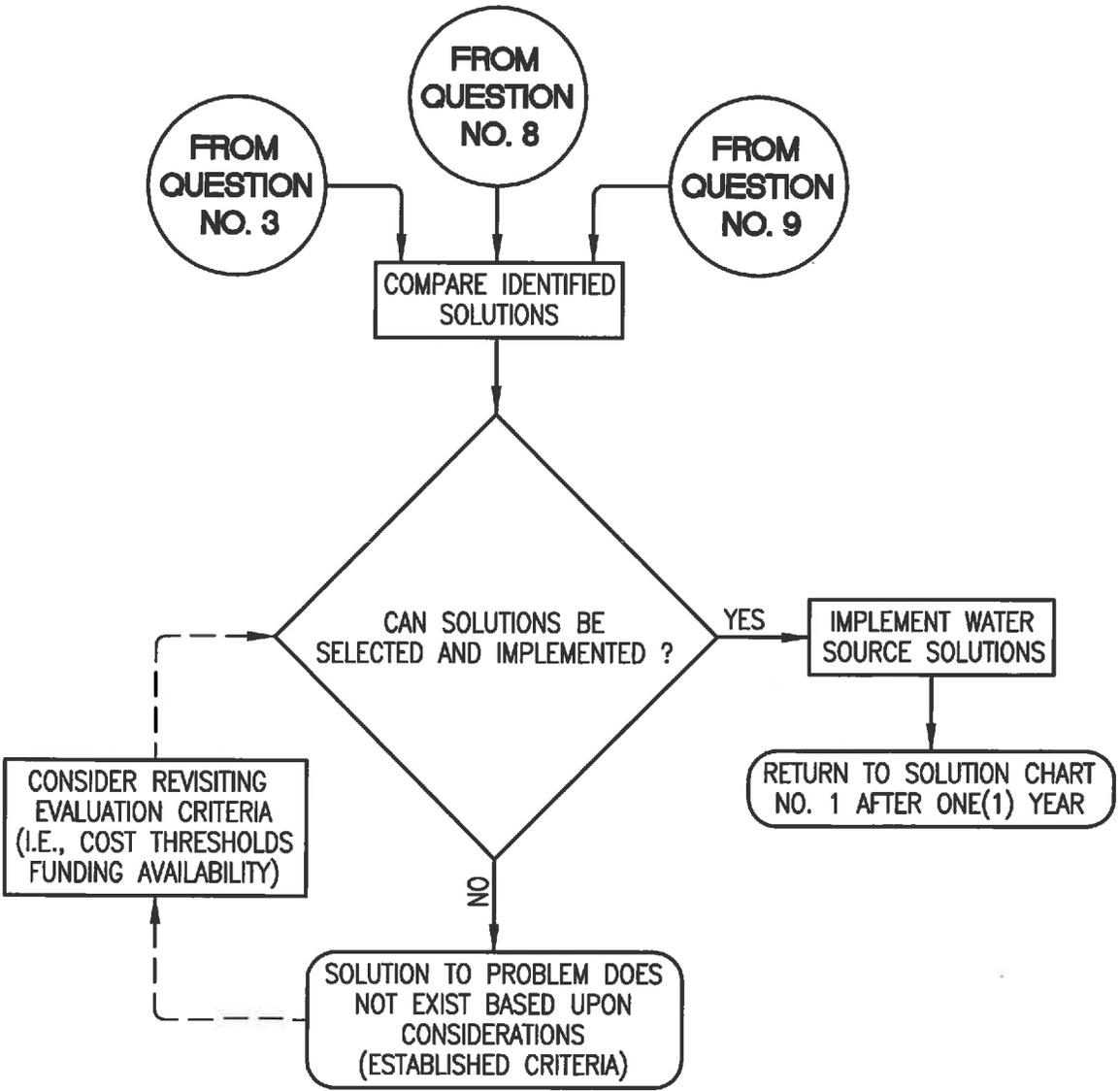
QUESTION NO. 10

SOLUTION CHART NO. 2B - WATER QUALITY SOLUTIONS - BACTERIOLOGICAL  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



COMPARISON STEP NO. 11

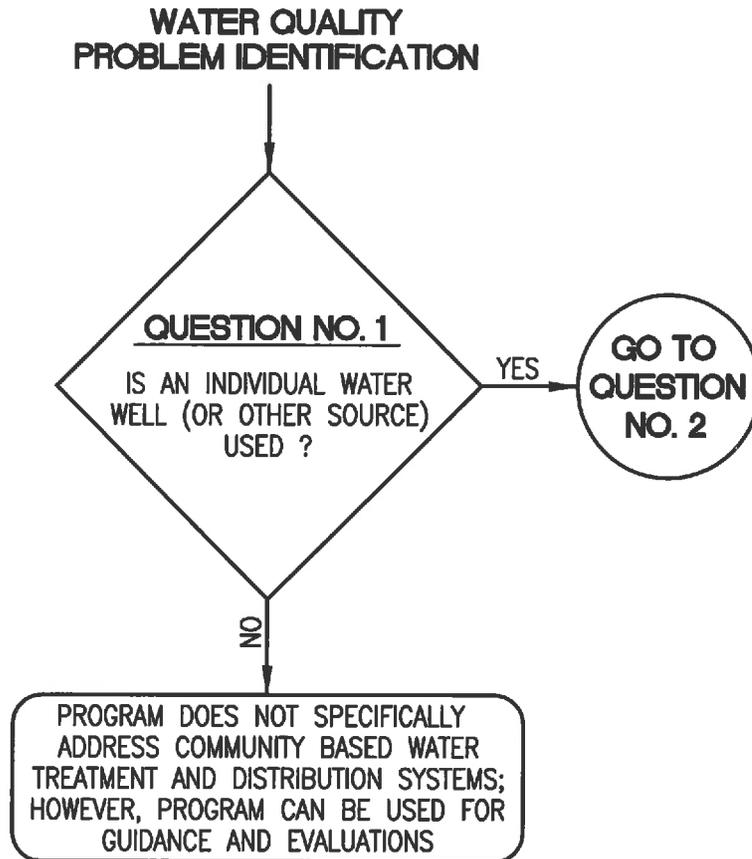
SOLUTION CHART NO. 2B - WATER QUALITY SOLUTIONS - BACTERIOLOGICAL  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



COMPARISON STEP NO. 12

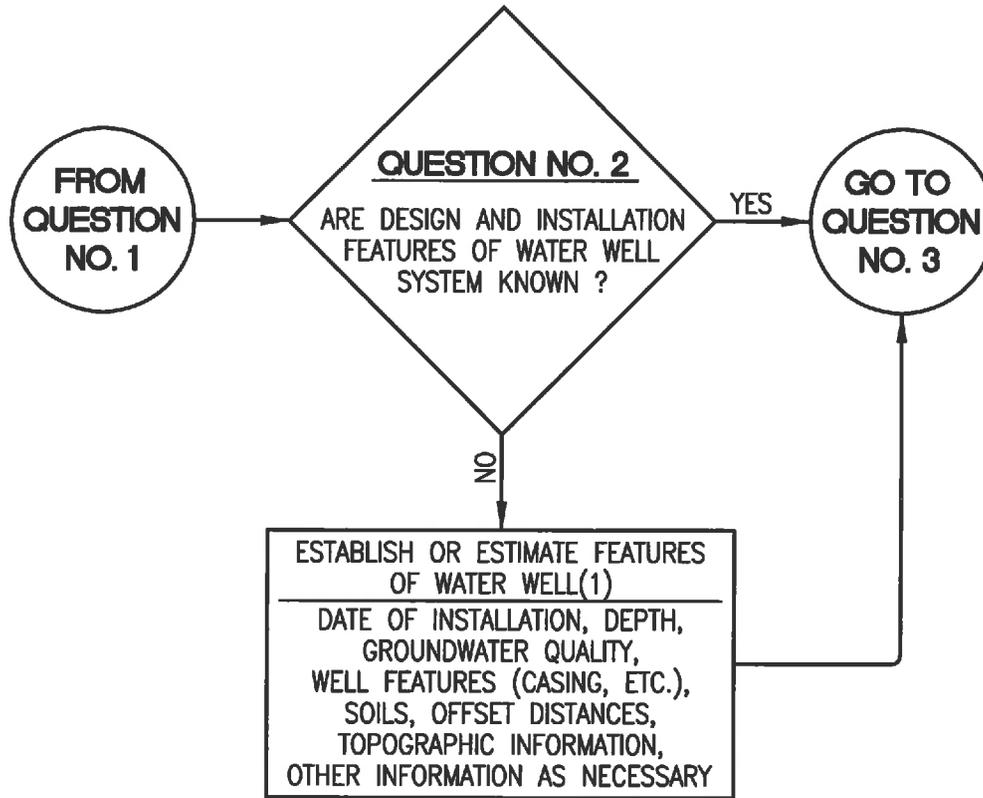
SOLUTION CHART NO. 2B - WATER QUALITY SOLUTIONS - BACTERIOLOGICAL  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY

L:\TODDC\12) BACTERIOLOGICAL-SOLUTION-CHART 2B.Dwg



QUESTION NO. 1

SOLUTION SERIES NO. 2C - WATER QUALITY SOLUTIONS - INORGANICS  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY

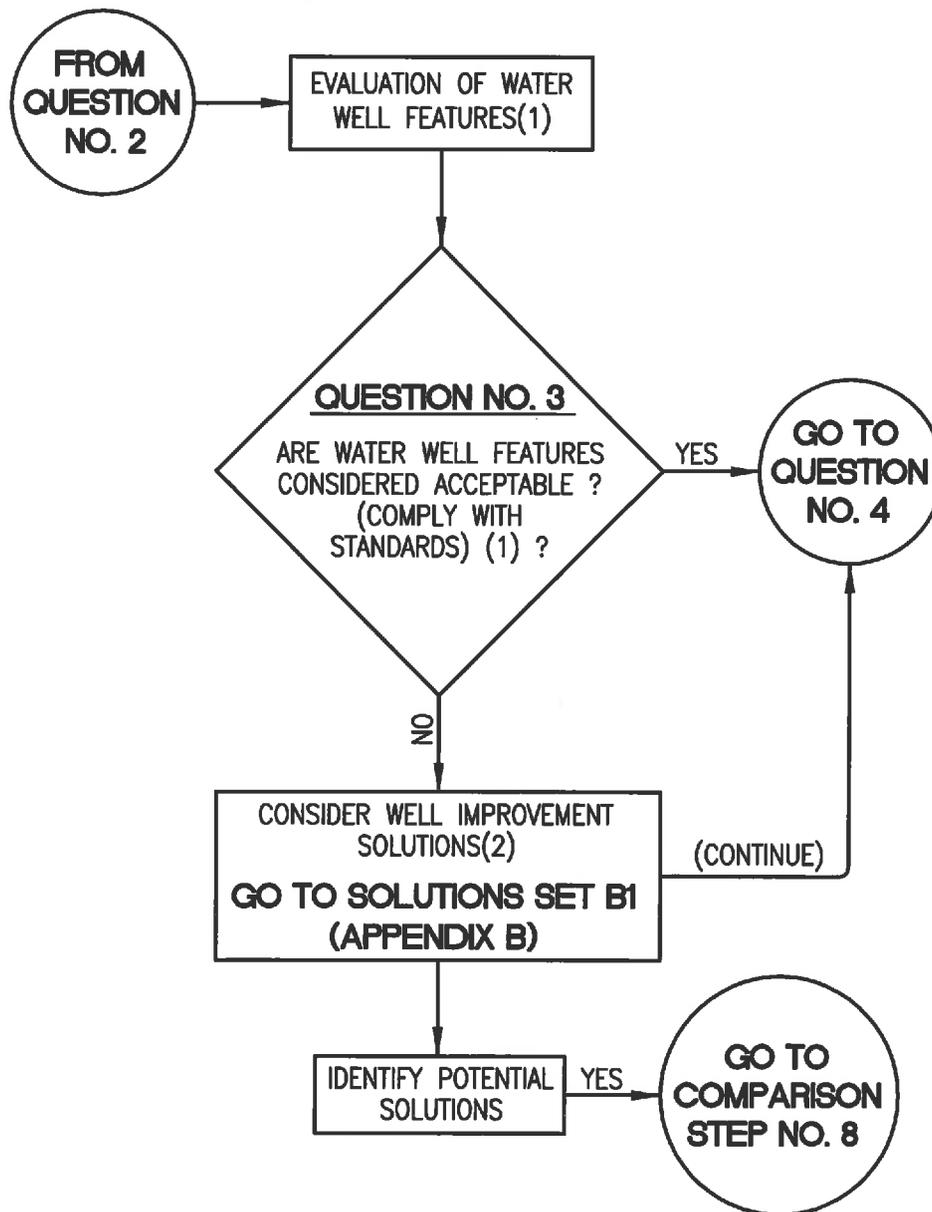


**NOTE:**

1. EVALUATION SHOULD BE CONDUCTED BY INDIVIDUAL WITH EXPERIENCE IN WATER WELL DESIGN AND INSTALLATION.

**QUESTION NO. 2**

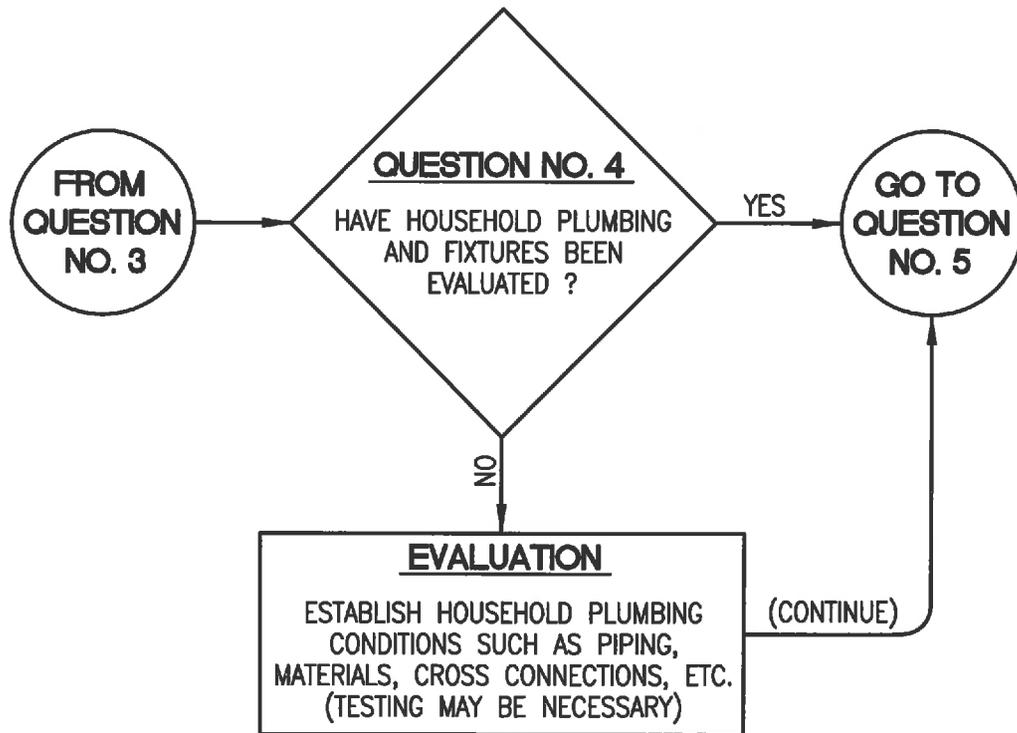
**SOLUTION SERIES NO. 2C - WATER QUALITY SOLUTIONS - INORGANICS**  
**INDIVIDUAL HOUSEHOLD PILOT STUDY**  
**TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY**

**NOTES:**

1. EVALUATION SHOULD BE CONDUCTED BY PROFESSIONAL WITH EXPERIENCE IN WATER WELL DESIGN, INSTALLATION AND REGULATORY REQUIREMENTS.
2. SOLUTIONS SHOULD BE EVALUATED AND ESTABLISHED BY PERSON(S) EXPERIENCED IN DRINKING WATER TREATMENT. EXAMPLES: DRINKING WATER TREATMENT CONSULTANTS, HEALTH DEPARTMENT REPRESENTATIVES AND WATER TREATMENT EQUIPMENT MANUFACTURERS.

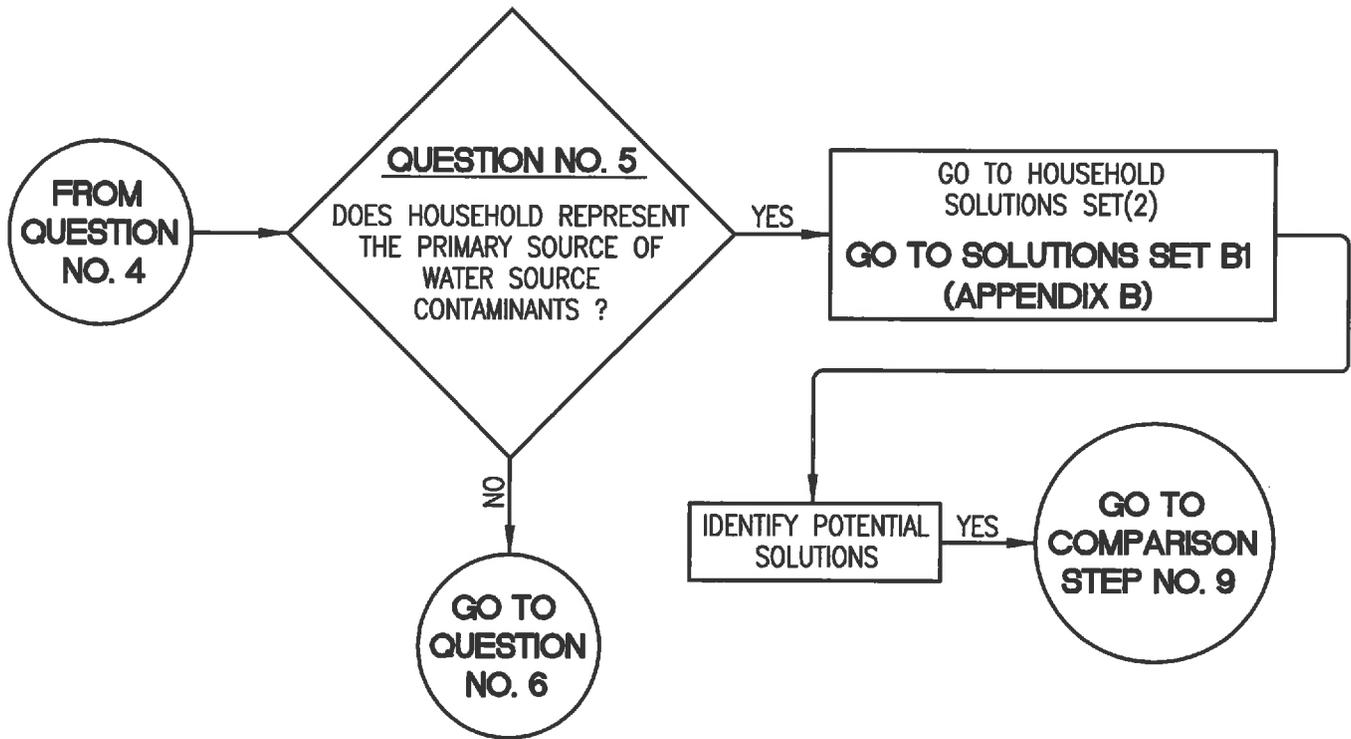
**QUESTION NO. 3**

**SOLUTION SERIES NO. 2C - WATER QUALITY SOLUTIONS - INORGANICS**  
**INDIVIDUAL HOUSEHOLD PILOT STUDY**  
**TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY**



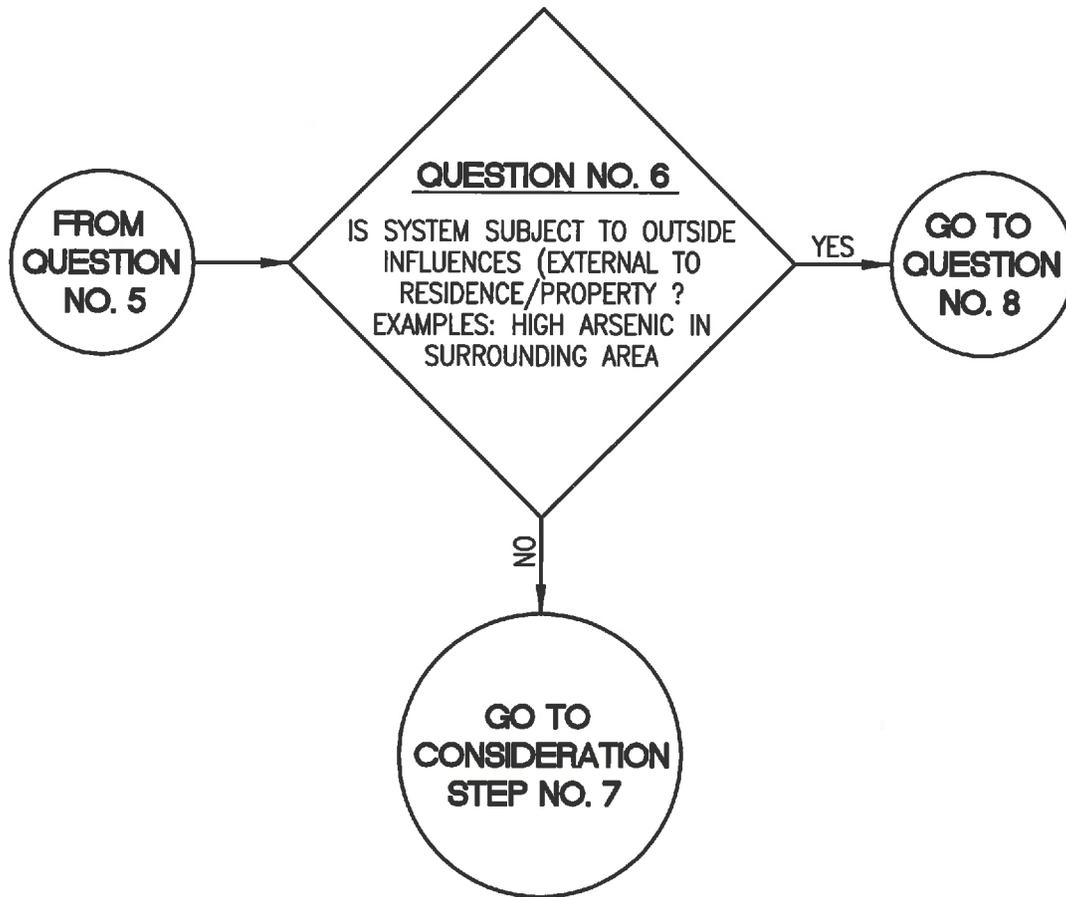
QUESTION NO. 4

SOLUTION SERIES NO. 2C - WATER QUALITY SOLUTIONS -INORGANICS  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



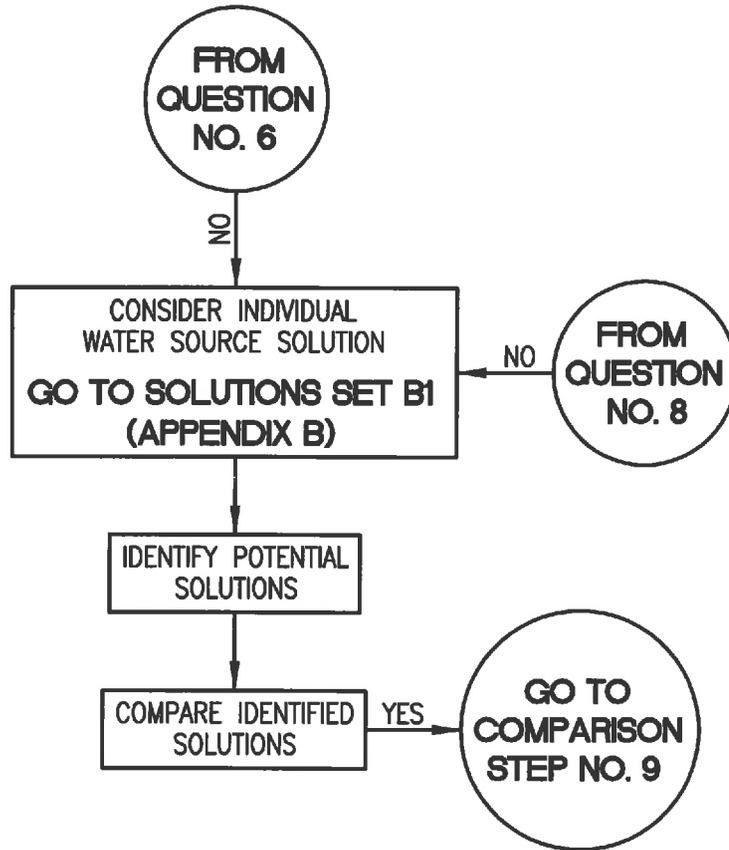
QUESTION NO. 5

SOLUTION SERIES NO. 2C - WATER QUALITY SOLUTIONS - INORGANICS  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



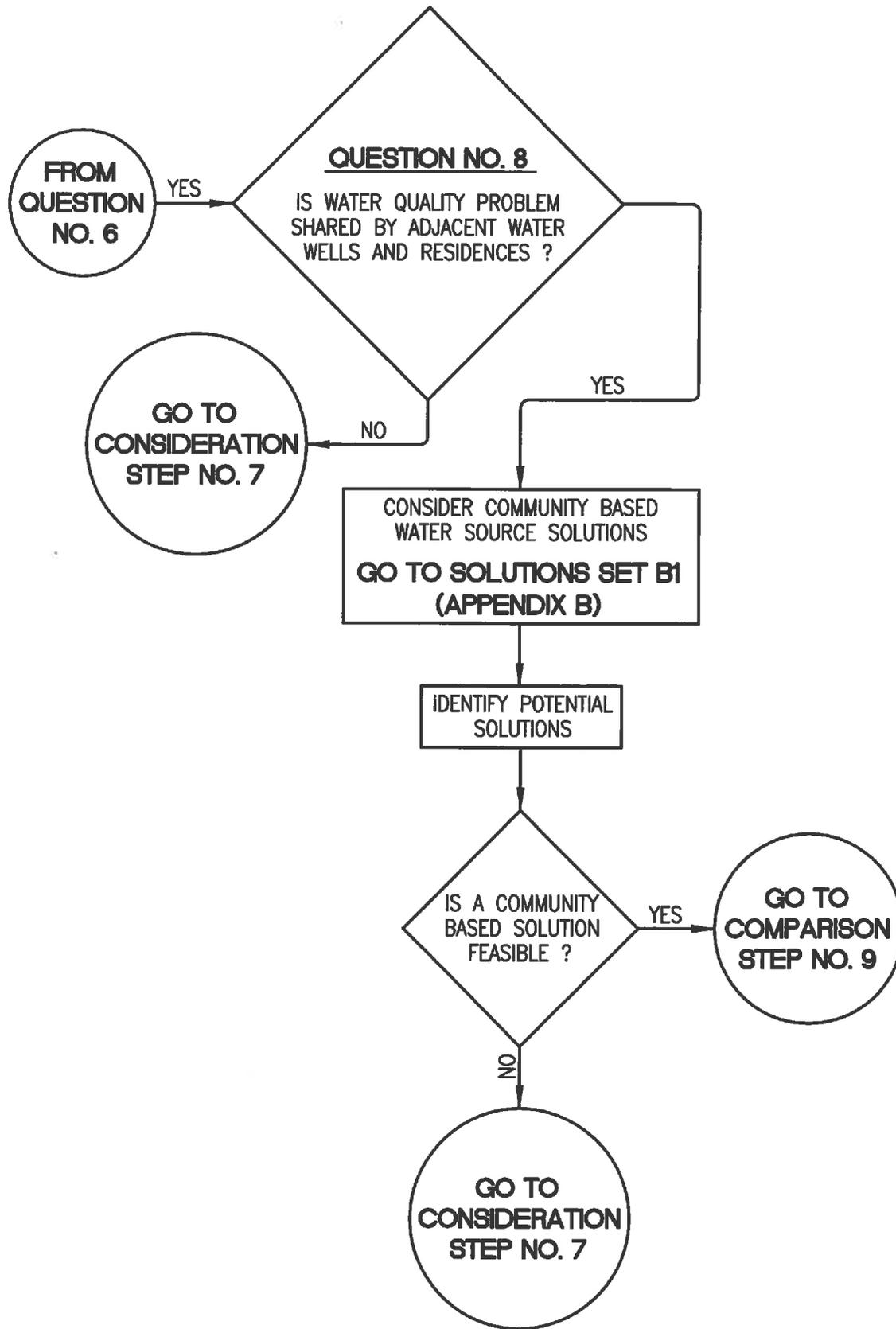
QUESTION NO. 6

SOLUTION SERIES NO. 2C - WATER QUALITY SOLUTIONS - INORGANICS  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



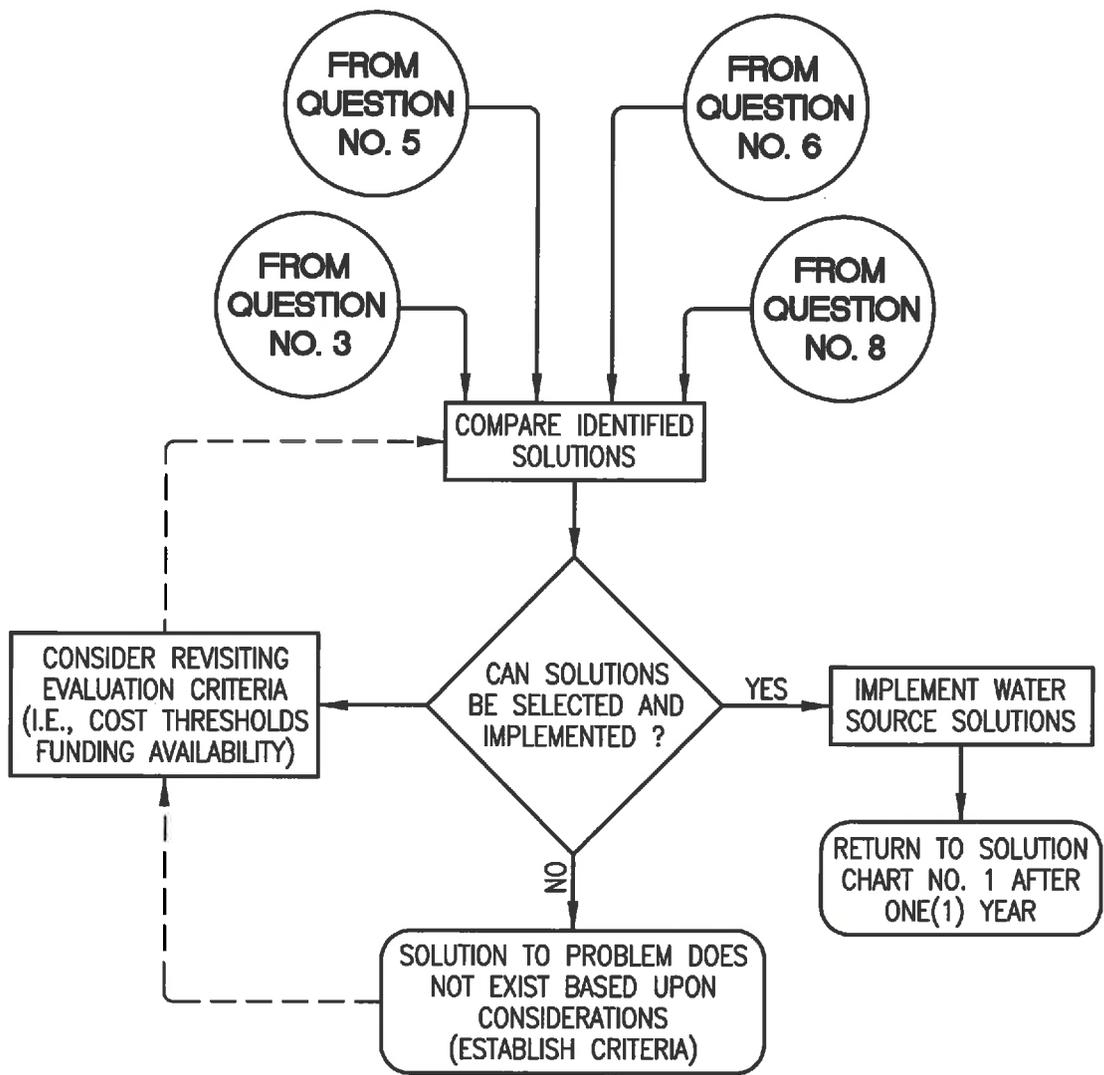
CONSIDERATION STEP NO. 7

SOLUTION SERIES NO. 2C - WATER QUALITY SOLUTIONS - INORGANICS  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



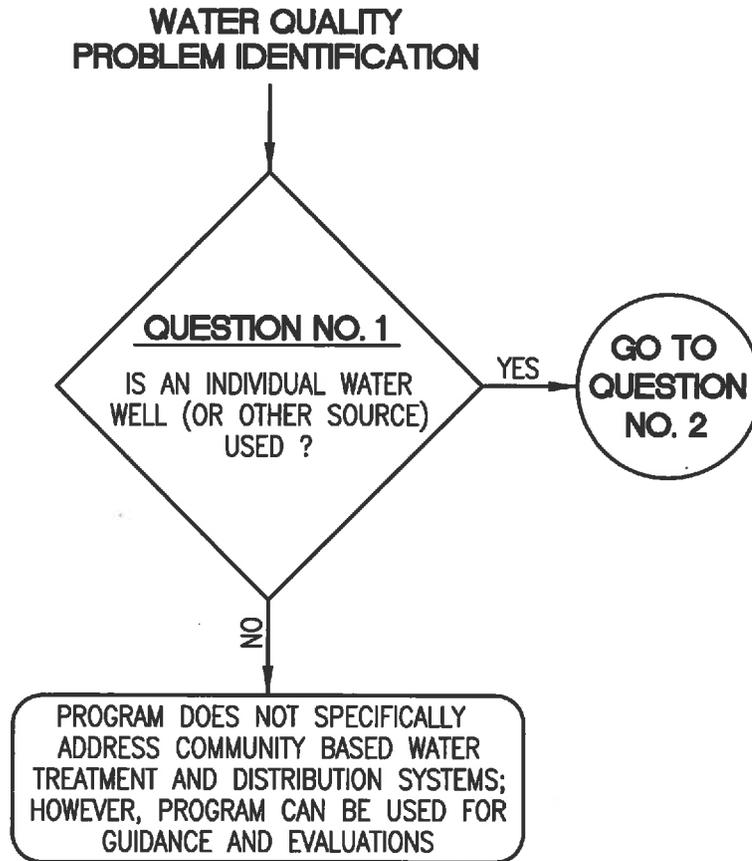
QUESTION NO. 8

SOLUTION SERIES NO. 2C - WATER QUALITY SOLUTIONS - INORGANICS  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



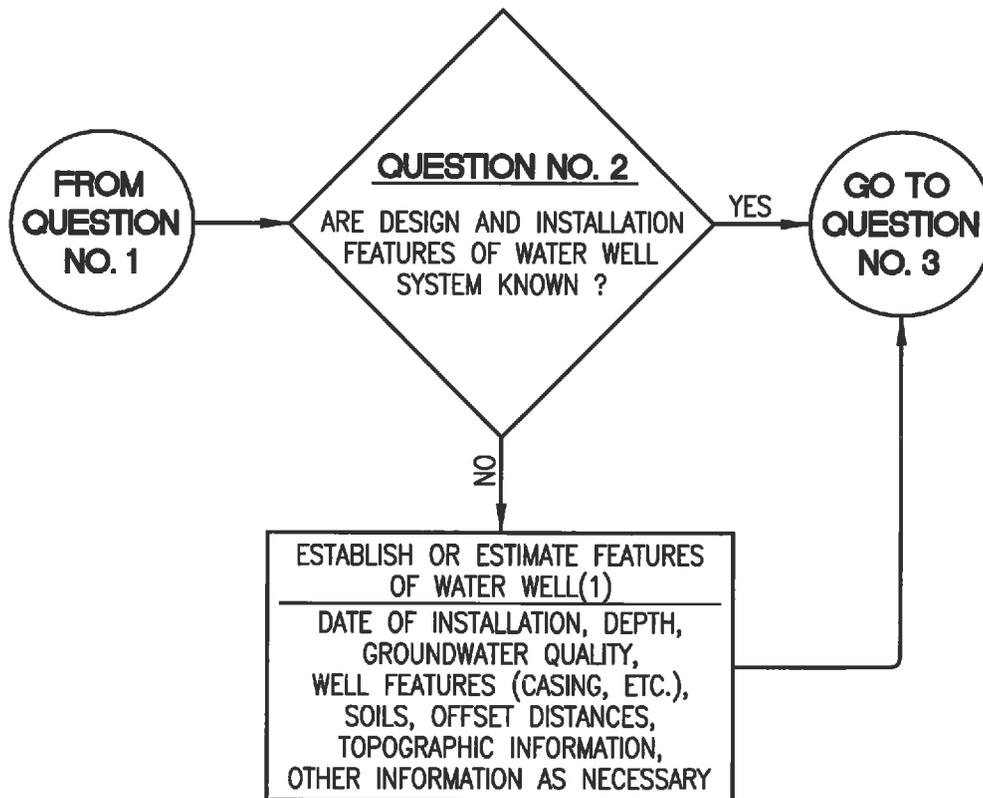
COMPARISON STEP NO. 9

SOLUTION SERIES NO. 2C - WATER QUALITY SOLUTIONS - INORGANICS  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



QUESTION NO. 1

SOLUTION CHART NO. 2D - WATER QUALITY SOLUTIONS - ORGANICS  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY

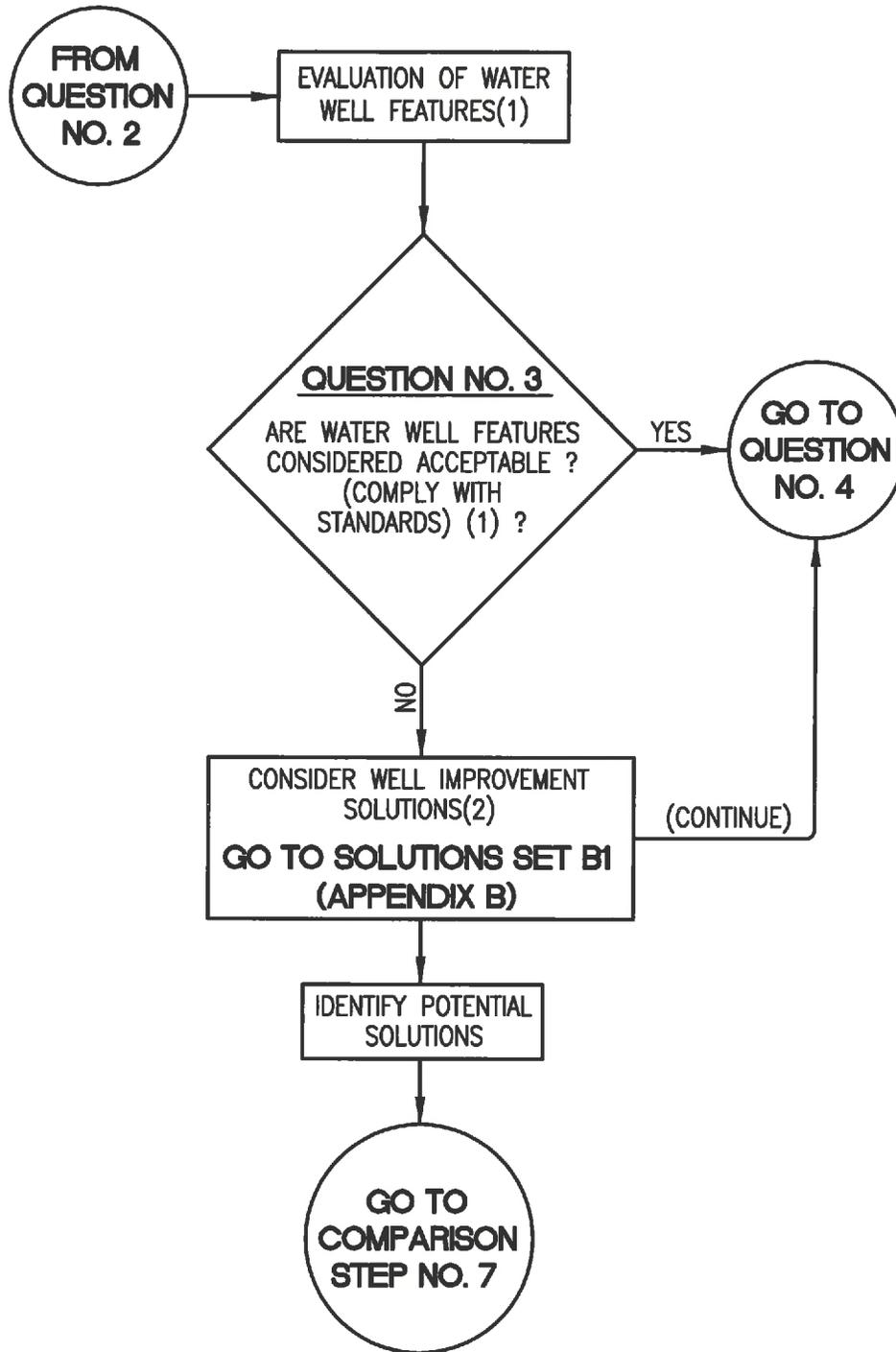


**NOTE:**

1. EVALUATION SHOULD BE CONDUCTED BY INDIVIDUAL WITH EXPERIENCE IN WATER WELL DESIGN AND INSTALLATION.

**QUESTION NO. 2**

**SOLUTION CHART NO. 2D - WATER QUALITY SOLUTIONS - ORGANICS**  
**INDIVIDUAL HOUSEHOLD PILOT STUDY**  
**TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY**



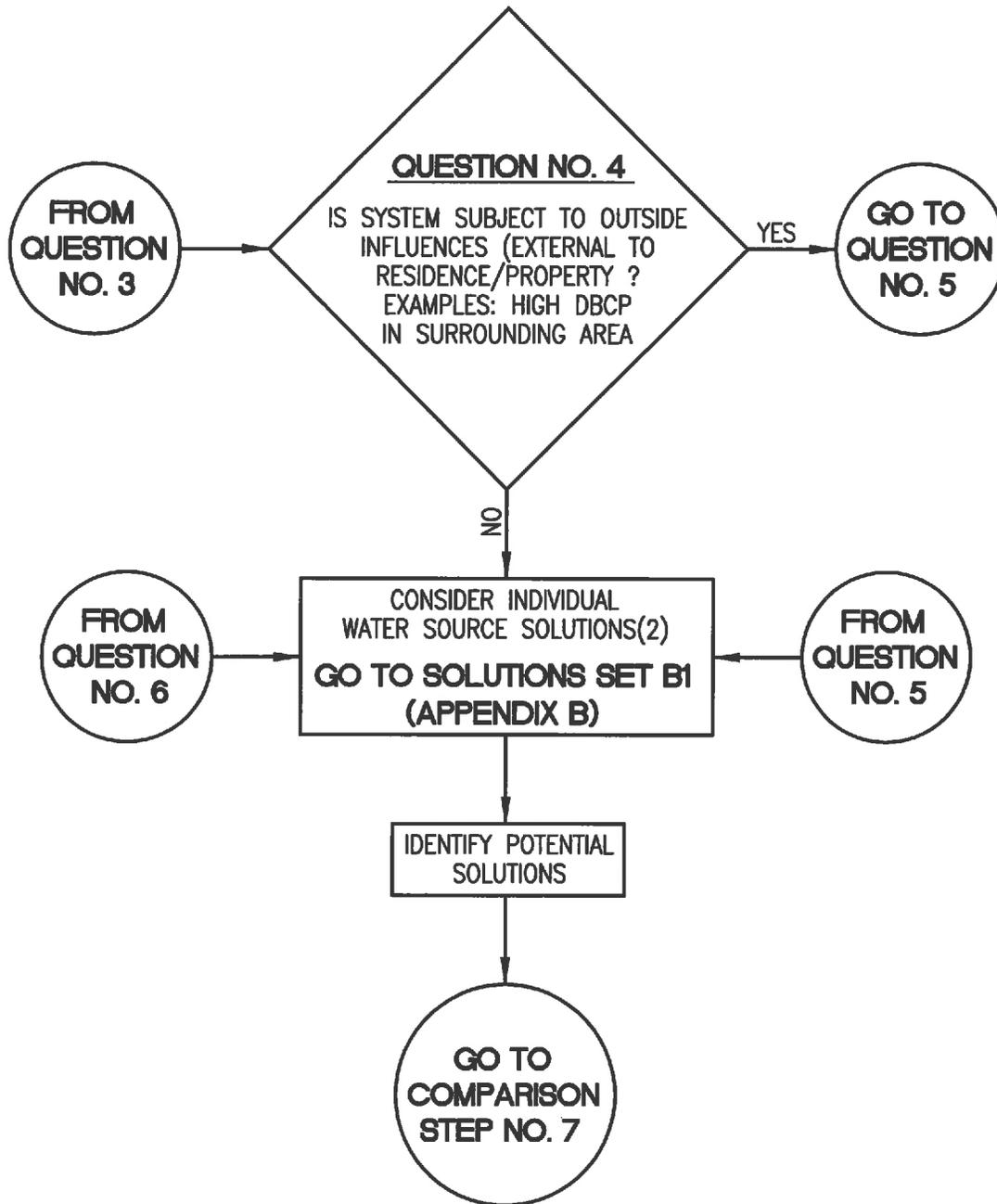
**NOTES:**

1. EVALUATION SHOULD BE CONDUCTED BY PROFESSIONAL WITH EXPERIENCE IN WATER WELL DESIGN, INSTALLATION AND REGULATORY REQUIREMENTS.
2. SOLUTIONS SHOULD BE EVALUATED AND ESTABLISHED BY PERSON(S) EXPERIENCED IN DRINKING WATER TREATMENT. EXAMPLES: DRINKING WATER TREATMENT CONSULTANTS, HEALTH DEPARTMENT REPRESENTATIVES AND WATER TREATMENT EQUIPMENT MANUFACTURERS.

**QUESTION NO. 3**

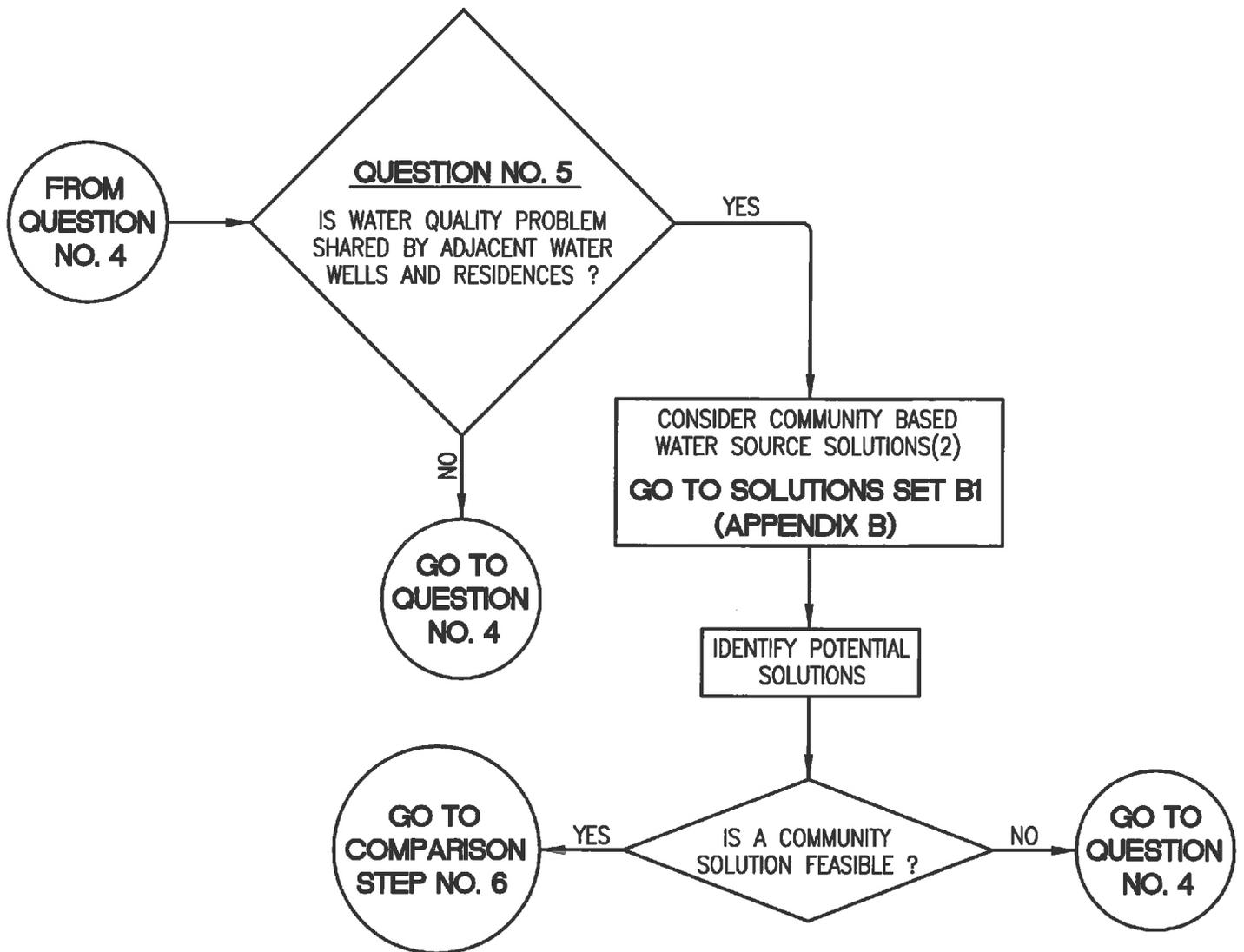
**SOLUTION CHART NO. 2D - WATER QUALITY SOLUTIONS - ORGANICS  
INDIVIDUAL HOUSEHOLD PILOT PROJECT**

**TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY**



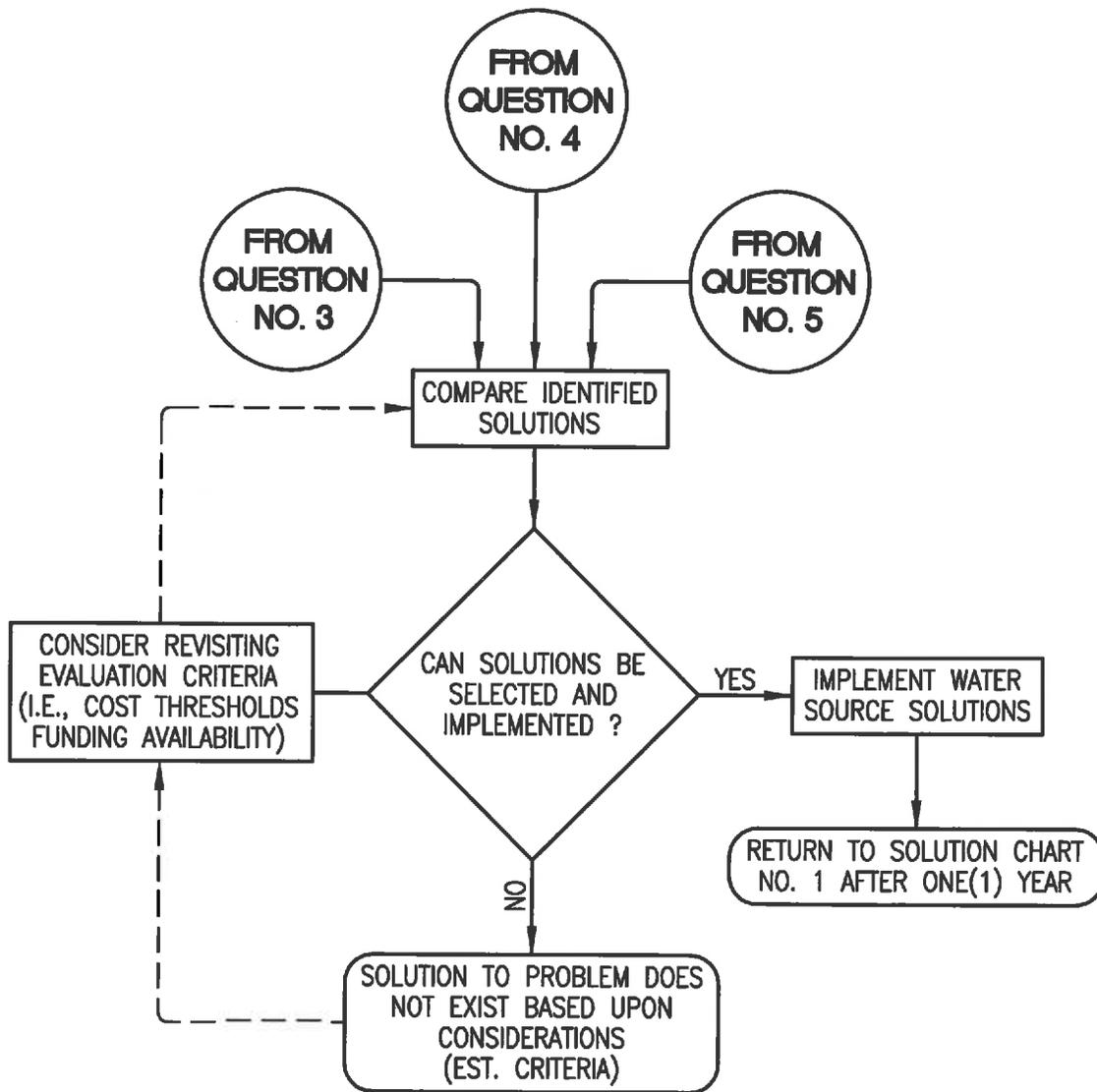
QUESTION NO. 4

SOLUTION CHART NO. 2D - WATER QUALITY SOLUTIONS - ORGANICS  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



QUESTION NO. 5

SOLUTION CHART NO. 2D - WATER QUALITY SOLUTIONS - ORGANICS  
INDIVIDUAL HOUSEHOLD PILOT STUDY  
TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY



COMPARISON STEP NO. 6

SOLUTION CHART NO. 2D - WATER QUALITY SOLUTIONS - ORGANICS  
INDIVIDUAL HOUSEHOLD PILOT STUDY

TULARE LAKE BASIN DISADVANTAGED COMMUNITY WATER/WASTEWATER STUDY