TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

4.7 PUBLIC HEALTH AND SAFETY

This section discusses the Project's potential to expose the public to chemicals, radionuclides, pathogenic viruses, bacteria or other disease organisms, potential to expose worker or the public to hazards from a know hazardous waste site, potential release of hazardous materials, safety hazards, flooding hazards, and disease vectors. To allow evaluation of these impacts, existing drinking water supplies are characterized, and regulations for water reclamation and wastewater discharge are presented. Reclaimed water quality is evaluated and potential pathways for public exposure to contaminants are described. Information on known hazardous waste sites in the Project area and hazardous materials storage and use at the Laguna Plant is summarized. Policies and regulations regarding construction hazards, flooding hazards and vector control are presented.

IMPACTS EVALUATED IN OTHER SECTIONS

The following items are related to Public Health and Safety but are evaluated in other sections of this document.

- Geologic and Flooding Hazards. These are discussed in Section 4.3, Geology, Soils, and Seismicity, and Section 4.4, Surface Water Hydrology, respectively.
- Water Quality Issues Regarding Groundwater and Surface Water. These issues are evaluated in Section 4.5, Groundwater, and Section 4.6, Surface Water Quality.
- Emergency Response Plans. Section 4.11, Transportation, discusses and evaluates impacts of the project required lane closures upon emergency services.
- Inundation from Dam Failure. Section 4.19, discusses the potential inundation areas from a dam failure.

AFFECTED ENVIRONMENT (SETTING)

Water Use, Reuse, and Discharge

The Project alternatives propose to release reclaimed water to the environment via four primary mechanisms, reuse for agricultural irrigation, reuse for urban irrigation, discharge to the Russian River or Laguna de Santa Rosa, and injection into the geysers steamfield. These release mechanisms provide several potential pathways (inhalation, dermal contact, and ingestion) via which humans may be exposed to reclaimed water. The affected environment for drinking water supplies, water reuse and reclamation, and wastewater discharge and the regulations which govern them are discussed below, followed by a summary of the findings of a human health risk assessment that evaluates potential exposure to reclaimed water via the Project alternatives (Parsons Engineering Science, Inc. 1995).

Drinking Water Supplies

The quality of drinking water within the Project area, and for most Californians, is regulated under the California Safe Drinking Water Act (California Health & Safety Code, Section 4010 *et seq.*) and the California Domestic Water Quality and Monitoring Regulations (Title 22, California Code of Regulations, Sections 64401 *et seq.*). These State laws and regulations are at least as stringent as Federal drinking water laws and regulations and California has been authorized by the U.S. Environmental Protection Agency (EPA) to operate its own drinking water program. The California Department of Health Services, Office of Drinking Water is responsible for enforcing the State's drinking water program.

The California Safe Drinking Water Act defines two general types of water delivery systems: Public Water Systems (there are subdivisions within this category) and State Small Water Systems (Table 4.7-1). Public Water Systems must meet the requirements of the Safe Drinking Water Act whereas the State Small Water Systems are excluded from the provisions of the Act (California Health and Safety Code §4010.8) as are private wells and systems with less than five service connections. Separate regulations have been adopted by California to cover Public Water Systems (Title 22, California Code of Regulations §64401 *et seq.*) and State Small Water Systems (Title 22, California Code of Regulations §64201 *et seq.*). Public Water Systems in Sonoma County are regulated by the California Department of Health Services, Office of Drinking Water. State Small Water Systems in Sonoma County are regulated by the Sonoma County Environmental Health Department.

Table 4.7-1

Regulation of Water Delivery Systems

Type of System	Definition	Oversight Agency
Public Water System	System that provides piped water to the public for human consumption which serves at least 15 connections or 25 individuals daily at least 60 days per year. Public Water Systems are classified as Community, Transient, Non-community, and Non-transient Water Systems.	Department of Health Services
State Small Water System	System that provides piped water to the public for human consumption which serves at least five, but not more than 14, service connections and does not regularly serve more than 25 individuals daily for more than 60 days per year.	Sonoma County Environmental Health Department

Source: California Code of Regulations

Both federal and state regulations contain primary and secondary drinking water standards (called maximum contaminant levels or MCLs) for the maximum permissible concentrations of organic and inorganic chemicals and for radionuclides in domestic water supplies delivered by a Public Water System. State MCLs are required to be at least as stringent as federal MCLs (California Health and Safety Code §4023.1). The MCLs were set to be protective of human health, taking water treatment technology and cost into account. Public Water Systems must have a regular program for monitoring the concentrations of these chemicals and radionuclides. If an MCL is exceeded by a Public Water System, the system must report these results to the State, notify the public, and take action to bring the level of that contaminant to or below its MCL.

The largest Public Water Systems in the Project area are the Sonoma County Water Agency and the municipal systems operated by Santa Rosa, Petaluma, Cotati, Sebastopol, and Rohnert Park. Sonoma State University operates a water system east of Rohnert Park. There are also numerous smaller systems operated by private companies that supply individual businesses or developments (e.g., restaurants, vineyards, apartment complexes, trailer parks). The systems in the study area rely primarily upon the Russian River or groundwater as the source of water. Santa Rosa and Petaluma receive most of their water from the Sonoma County Water Agency, which relies on intakes on the Russian River, while the remaining communities receive all or most of their water from groundwater (Rohnert Park and Cotati receive some water, about 20 percent or less of their total, from the Sonoma County Water Agency). The Sonoma County Water Agency estimates that it supplies drinking water to approximately 500,000 people in Sonoma and Marin Counties. The cities of Santa Rosa and Petaluma reportedly have approximately 43,000 and 15,000 metered users, respectively. The cities of Cotati, Sebastopol, and Rohnert Park have about 3,000 (or less) users each.

The drinking water supplied to residents of Santa Rosa, Petaluma, Cotati, Sebastopol, and Rohnert Park is tested each year to ensure that high quality drinking water is maintained. Drinking water for these public water systems was at or below MCLs in 1994 (City of Santa Rosa Utilities Department 1994; City of Petaluma 1994; City of Cotati 1994; City of Sebastopol Department of Public Works 1994; City of Rohnert Park 1994; Sonoma County Water Agency 1994). Only a few chemical, biological, and radiological constituents have been detected in the drinking water of these communities (Table 4.7-2). Detected constituents were primarily inorganic chemicals (e.g., arsenic, fluoride, lead, and nitrate) and trihalomethanes. Chlordane was detected in one sample collected in Sebastopol. Radionuclides, reported as gross alpha and gross beta radiation, were present at low levels in some systems. Coliform bacteria were reported in a few samples collected from the Sonoma County Water Agency drinking water sources along the Russian River and at several distribution points monitored by the City of Santa Rosa. However, fewer than 5% of the samples were found to contain coliform bacteria, a level which meets the MCL.

Table 4.7-2

Detected Contaminants in Municipal Drinking Water Supplies (1994)

				Sonoma County Water Agency Intakes		Santa Rosa Water Sample Station				Sebastopol			
Constituent	**Units**	**State MCL**	**Federal MCL**	**Wohler**	**Mirabel**	**046**	**001**	**Petaluma**	**Rohnert Park**	**Well 2**	**Well 4**	**Well 6**	**Cotati**
INORGANICS													
Aluminum	mg/L	1	N/A	ND	0.3	ND	ND	0.3	ND	ND	ND	ND	ND
Arsenic	mg/L	0.05	0.05	ND	ND	ND	0.0064	ND	0.0026	0.01	0.01	0.026	ND
Barium	mg/L	1	2	0.36	0.11	0.11	ND	0.1	0.04	ND	ND	ND	0.11
Fluoride	mg/L	N/A	4	0.1	0.1	0.19	ND	ND	0.1	ND	ND	ND	0.16
Lead	mg/L	0.015[(1)]	0.015[(1)]	ND	ND	ND	ND	ND	0.009	ND	ND	ND	ND
Nitrate as nitrogen	mg/L	10	10	ND	ND	0.65	ND	ND	1.5	0.7	2.0	0.6	0.10-0.43
ORGANICS													
Volatiles													
Trihalomethanes	mg/L	0.1	0.1	NR	NR	0.01	0.01	0.013	0.0085	ND	ND	0.0024	0.00052
Non-Volatiles													
Chlordane	mg/L	0.0001	0.002	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	NR
MICROBIOLOGY													
Total Coliform Bacteria	% positive samples	<5%	<5%	0%	Present in 3 samples	0.22%	0.22%	ND	0%	0%	0%	0%	0%

Table 4.7-2

Detected Contaminants in Municipal Drinking Water Supplies (1994)

				Sonoma County Water Agency Intakes		Santa Rosa Water Sample Station				Sebastopol			
Constituent	**Units**	**State MCL**	**Federal MCL**	**Wohler**	**Mirabel**	**046**	**001**	**Petaluma**	**Rohnert Park**	**Well 2**	**Well 4**	**Well 6**	**Cotati**
SECONDARY STANDARDS													
Chloride	mg/L	N/A	250	7.3	5.3	5	4.5	5.3	19.9	12	18	13	46
Iron	mg/L	N/A	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Manganese	mg/L	N/A	0.05	ND	ND	ND	ND	ND	0.005	ND	ND	ND	0.035
Sulfate	mg/L	N/A	250	13	13	12	12	13	11.6	20	9.8	19	11
Total Dissolved Solids	mg/L	N/A	500	130	140	180	160	140	277	250	250	230	260
Zinc	mg/L	N/A	5	0.21	ND	ND	0.059	ND	0.012	ND	ND	ND	ND
RADIOACTIVITY													
Gross Alpha	pCi/L	N/A	15	0.8	0.7	1.3	ND	0.7	0.2	ND	ND	ND	NR
Gross Beta	pCi/L	N/A	50	NR	NR	2.9	1.7	NR	NR	NR	NR	NR	NR

Source: City of Cotati, 1994; City of Petaluma, 1994, City of Rohnert Park, 1994, City of Santa Rosa Utilities Department, 1994, City of Sebastopol Public Works Department 1994, Sonoma County Water Agency, 1994

Notes:
N/A = Not available
NR = Not Reported
ND = Not detected at or above the reporting limit
mg/L = milligrams per liter or parts per million
µmhos/cm = Micromhos per centimeter
pCi/L = picoCuries per liter
NTUs = Nephelometric Turbidity Units
MPN/100mL = Most Probable Number per 100 milliliters
(1) Action level.

The North Coast and San Francisco Bay Regional Water Quality Control Boards have developed Water Quality Control Plans (Basin Plans) to protect surface and groundwater within the Project area. The Basin Plans identify water for domestic use (including drinking water supply) by community, military, or individual water supply systems as a protected beneficial use. The principal issues involving municipal water supply quality are protection of public health, aesthetic acceptability of the water, and the economic impacts associated with treatment or quality-related damages.

Health considerations include direct disease transmission by biological agents (e.g., typhoid fever or cholera), toxic effects (e.g., methemoglobinemia or "blue babies" caused by nitrate or nitrite), and increased susceptibility to disease (e.g., increased risk of cancer from exposure to halogenated organic compounds). Aesthetic considerations include unpleasant odors or taste, turbidity, color, and excessive hardness. Published water quality objectives (e.g., MCLs as discussed above) give limits for known health-related constituents and most properties (e.g., odor, color, taste) affecting public acceptance and are the basis for the numerical water quality criteria identified in the Basin Plans.

The water quality objectives for groundwater consist of both narrative and numerical objectives and apply to all groundwaters, not just at a wellhead or at a point of consumption. The maintenance of existing high quality of groundwater (i.e., background) is the primary narrative groundwater objective. In addition, the Basin Plans specify that groundwater with a beneficial use of municipal and domestic supply shall not contain concentrations of bacteria, chemical constituents, radioactivity, or substances producing taste and odor in excess of human health objectives, as identified by the EPA and the California Department of Health Services, unless naturally occurring background concentrations are greater. Quantitative objectives include (1) the median of the MPN (most probable number) of coliform organisms over any seven-day period shall be less than 1.1 MPN/100 mL and (2) groundwaters shall be maintained free of organic and inorganic chemical constituents in concentrations that adversely affect beneficial uses. At a minimum, they shall not contain concentrations of chemical constituents or radionuclides in excess of the state or federal MCLs or secondary MCLs, whichever is less.

Water Reclamation and Reuse

Untreated wastewater potentially contains pathogenic organisms (i.e., bacteria, viruses, and parasites) that must be removed to allow safe use of reclaimed water. The potential for pathogenic contamination of reclaimed water is expressed as the number (measured by the Most Probable Number [MPN]) of coliform bacteria present in water sources. Coliform bacteria are "indicator organisms" whose presence is evidence that pollution (associated with fecal contamination from humans or other warm-blooded animals) has occurred. Indicator organisms may be accompanied by pathogens, but do not necessarily cause disease themselves. Indicators have the following general characteristics: they are absent from unpolluted waters; are present in greater numbers than pathogenic organisms; have greater survival time than pathogens; and their detection is generally more reliable and less time-consuming.

To ensure an appropriate level of treatment for protection of public health from pathogenic organisms, the California Department of Health Services has established treatment requirements for a variety of reclaimed water uses (Title 22, California Code of Regulations, §60301 *et seq.*). These conventional and widely practiced water and wastewater treatment processes are believed to be capable of reducing pathogenic constituents to acceptable levels. The California Department of Health Services has proposed changes to these existing regulations and submitted these changes for public review and comment. These revisions have not been adopted, but are currently being used as guidance by regulatory agencies, such as the Regional Water Quality Control Boards (Regional Boards) (Hulquist 1996).

Current Title 22 criteria for reclaimed water are intended to prevent transmission of disease by any of the possible mechanisms: skin contact; ingestion; or inhalation of infectious agents in water or by direct contact with a contaminated object. Reclaimed water must be treated to an appropriate level to protect surface water and to prevent transmission of pathogens through aerosols (small particles of water suspended in air) from spray irrigation. The level of treatment, required in the proposed revision to Title 22, varies with the ultimate use of the reclaimed water but at minimum, wastewater must receive secondary treatment prior to use as reclaimed water (Table 4.7-3). The most stringent criteria require secondary treatment plus advanced treatment processes of coagulation, clarification, filtration, and disinfection. The level of disinfection required depends upon the ultimate use of the water, but the most restrictive requirement (for nonrestricted recreational impoundments and spray irrigation) is a median coliform level that does not exceed 2.2 MPN/100 mL and a maximum coliform level that does not exceed 23 MPN/100 mL more than once in a 30-day period. Filtration must reduce turbidity to 2 turbidity units or less. Basin Plan water quality objectives for nonrestricted recreational impoundments are less stringent. Median coliform bacterial levels cannot exceed 240 MPN/100 mL, and no sample can exceed 10,000 MPN/100mL.

Reclaimed water from the existing Subregional System meets requirements for unrestricted use and is used in accordance with Title 22 regulations. Uses approved by Title 22 specifically include irrigation of food crops, parks and playgrounds, school yards, residential landscaping, unrestricted access golf courses, pasture for animals producing milk for human consumption, and a variety of other uses. Use of reclaimed water is not allowed within a food-handling facility, so it is assumed that reclaimed water could not be used within a milking area (e.g. for cleaning udders). However, the use of reclaimed water for livestock watering is not prohibited.

Table 4.7-3

Categories of Reclaimed Water Usage

General Use Category	Definition	Disinfection Criteria
Spray Irrigation	The application of reclaimed water to crops by spraying it from orifices in piping.	Water shall be adequately disinfected, oxidized, coagulated, clarified, and filtered wastewater. Coliform not to exceed 2.2 MPN per 100 mL (based on the last 7 days for which analyses have been completed) at some point in the treatment process and the total number of coliform not to exceed 23 per 100 mL in more than one sample within a 30-day period.
Nonrestricted Recreational Impoundment	A body of reclaimed water in which no limitations are imposed on body-contact water sport activities.	
Surface Irrigation	The application of reclaimed water by means other than spraying such that contact between the edible portion of any food crop and reclaimed water is prevented.	Water shall be adequately disinfected and oxidized. Coliform not to exceed 2.2 MPN per 100 mL (based on the last 7 days for which analyses have been completed) at some point in the treatment process.
Restricted Recreational Impoundment	A body of reclaimed water in which recreation is limited to fishing, boating, and other non-body-contact water recreational activities.	
Landscape Impoundment	A body of reclaimed water which is used for aesthetic enjoyment or which otherwise serves a function not intended to include public contact.	Water shall be adequately disinfected and oxidized. Coliform not to exceed 23 MPN per 100 mL (based on the last 7 days for which analyses have been completed) at some point in the treatment process.
Groundwater Recharge	Reclaimed water used for recharge of domestic water supply aquifers by surface spreading.	Water shall be of a quality that is protective of public health. The California DHS will make recommendations to the RWQCB based on relevant aspects of each project, including treatment provided; effluent quality and quantity; spreading area operations; soil characteristics; hydrogeology; residence time; and distance to withdrawal.

Source: California Code of Regulations

Reclaimed Water Discharge

Reclaimed water discharges to surface waters (rivers, lakes and streams) are regulated under the Federal Clean Water Act and in California under the Porter-Cologne Water Quality Control Act (Porter-Cologne Act, California Water Code §13000 *et seq.*). The Porter-Cologne Act also addresses reclaimed water discharges that may affect groundwater quality. The Clean Water Act's broad objective is to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." To meet this objective, the U.S. EPA has set up a system of permitting and licensing, the National Pollutant Discharge Elimination System (NPDES), to monitor and control reclaimed water discharges. In the study area, this system is administered by the State Water Resources Control Board (SWRCB) and the North Coast and San Francisco Bay Regional Water Quality Control Boards, which are part of the California EPA. Currently, the Laguna Plant releases reclaimed water into the Laguna de Santa Rosa during the winter months (1st October through 4th May) once the flow in the Russian River exceeds 1,000 cfs. These discharges are limited to one percent of the Russian River flow (with five percent allowed only by direct authorization by the North Coast Regional Board), but sometimes represent a much higher proportion of flow in the Laguna.

Publicly Owned Treatment Works (POTWs), such as the Laguna Plant, operate under the NPDES and must have an NPDES permit to discharge reclaimed water. The permit sets discharge requirements and specifies what chemicals the POTW must monitor. Because the Laguna Plant has a daily flow of more than five million gallons it is required to establish an industrial pretreatment program to control industrial discharges into the sewer system. The standards were established to prevent discharges that would interfere with the POTW's treatment equipment or operations or endanger personnel and to prevent discharges that could not be adequately treated before discharge by the POTW. The Laguna Plant’s pretreatment program and other programs that have been developed to minimize the introduction of chemicals into the Laguna Plant are discussed in the Description of Existing System and Alternatives, Section 3.2. Industrial dischargers must pretreat their wastewater to standards set by the EPA and the State Water Resources Control Board.

Human Exposure to Reclaimed Water

The potential health impacts presented by the proposed release mechanisms (urban and agriculture irrigation, discharge to the Russian River or Laguna, and geysers injection) depend upon the concentrations of the chemical and biological constituents in the water and the pathways (inhalation, dermal contact, ingestion) via which individuals are exposed. The potential health impacts are evaluated in a human health risk assessment that has been prepared for the Project alternatives, (Parsons Engineering Science, Inc. 1996). This section summarizes the findings of that assessment.

Wastewater that arrives at the Laguna Plant is a mixture of domestic and municipal/ household wastes and industrial wastes that have received pretreatment. This wastewater contains both chemical (organic and inorganic) and biological (bacteria, viruses, and

parasites) constituents that must be removed to allow safe reuse or discharge of the water. The primary, secondary, and tertiary treatment processes at the Laguna Plant are capable of greatly reducing the chemical and biological constituents in the wastewater as it passes sequentially through these treatment processes. Water that is released from the Laguna Plant historically has contained low concentrations of chemical and biological constituents.

Chemical Constituents

About 30 inorganic and 200 organic chemicals have been analyzed in the Laguna Plant's undiluted effluent at least once between 1988 and 1995 (Merritt Smith Consulting 1996). Of these, 23 inorganic and 26 organic chemicals have been reported at or above their analytical detection limits in at least one sample (Table 4.6-1).

Nitrate and Nitrite

Of the reported chemicals in undiluted effluent, only nitrate and nitrite have occurred regularly (>90% of samples) and have both maximum and mean concentrations which exceed State and Federal drinking water standards and the human health criteria for noncarcinogenic health effects (Parsons Engineering Science, Inc. 1996). The primary health effect of elevated levels of nitrate and nitrite in drinking water is the induction of methemoglobinemia in infants (blue-baby syndrome). The drinking water standard and the health criteria are derived from human epidemiological studies that have reported health effects only at nitrate concentrations which exceed 10 mg/L nitrate (as nitrogen) in water. A small number of cases of methemoglobinemia has been reported in epidemiological studies for water containing 11 to 20 mg/L nitrate (as nitrogen) (coliform-contaminated well water may have been a complicating factor in these cases) although clinical studies have reported no clinical signs of methemoglobinemia for infants who received water containing up to 34.5 mg/L nitrate-nitrogen. The 10 mg/L drinking standard is therefore believed to be fully protective of human health.

Nitrate is found in municipal drinking water supplies within the Project area at concentrations of 2.0 mg/L nitrate (as nitrogen) or less (Table 4.7-2). Nitrate concentrations in groundwater within the Project area vary from non-detect up to a reported 72 mg/L in the Stemple Creek area near the Two Rock reservoir site and 12 mg/L near the Lakeville reservoir site (refer to Section 4.5, Groundwater).

Trihalomethanes

Chloroform and bromodichloromethane have been reported regularly (100% and 95% of samples, respectively) in the Laguna Plant's undiluted effluent. These two chemicals, along with dibromochloromethane, (which has been detected infrequently in less than 20% of samples) and bromoform (which has not been detected), are often referred to collectively as trihalomethanes. Trihalomethanes

are by-products of disinfection that form when water containing naturally-occurring organic matter is chlorinated to inactivate disease-causing microorganisms. Disinfection by-products are also commonly found in municipal drinking water systems when chlorine is used to disinfect during water treatment and to provide a residual chlorine level that will prevent microbiological growth in water pipelines. The average, combined concentration of trihalomethanes (0.0129 mg/L) in the Laguna Plant's effluent is similar to that found in the drinking water supplies of Santa Rosa, Petaluma and Rohnert Park (Table 4.7-2).

The historic concentrations of trihalomethanes in the undiluted effluent do not exceed the state or federal drinking water standard (0.100 mg/L). The average concentration in the undiluted Laguna Plant effluent represents an average excess cancer risk of between about one in one hundred thousand (1×10^{-5}) and one in a million (1×10^{-6}). This level of risk is within the acceptable cancer risk range (1×10^{-4} to 1×10^{-6}), which the EPA considers to be protective of human health when setting drinking water standards (U.S. EPA 1994).

Hormone Mimics/Disrupters

Recent scientific publications have suggested that some chemicals (sometimes described collectively as environmental estrogens, hormone mimics/disrupters, or environmental hormones) may be responsible for observed declines in the reproductive success and sexual development of wildlife and similar adverse health effects in humans (Parsons Engineering Science, Inc. 1995). Researchers have proposed that these chemicals may induce their effects by disrupting the metabolism or effects of the natural sex hormones of both males and females. Many of the chemicals that have been identified as potential hormone mimics or disrupters are chlorine-based chemicals such as dioxins, DDT, chlordane, lindane or polychlorinated biphenyls (PCBs), although non-chlorine chemicals (detergents, synthetic estrogens, and some metals) have been identified as well.

Several of the potential hormone mimics or disrupters have been reported at low concentrations in the undiluted effluent from the Laguna Plant. The reported chemicals include five pesticides (aldicarb, aldrin, endosulfan, lindane, and heptachlor), three phthalates (di-n-butyl phthalate, bis (2-ethylhexyl) phthalate, and diethyl phthalate), and three metals (cadmium, lead, and mercury). Generally, they have occurred infrequently (frequencies ranged from 1 of 91 samples to 2 of 4 samples) and at concentrations close to the detection limits of the analytical method (Table 4.6-1).

Because scientific research into this phenomenon is relatively recent, the EPA and other regulatory agencies have not developed new standards or adjusted existing standards to address the reproductive effects of these chemicals at low concentrations. Therefore, it is not currently possible, using existing standards and/or regulatory agency risk assessment methodology, to evaluate the

environmental hormone effects of these chemicals at the low concentrations reported in the Laguna Plant effluent.

Biological Constituents

Total coliform bacteria, heterotrophic bacteria, *Salmonella*, *Shigella*, *Legionella*, *Giardia*, *Cryptosporidium*, and enteric viruses were analyzed in samples collected from the Laguna Plant effluent and the Russian River (above the confluence with Mark West Creek) as part of this study in 1994. In addition, data for total coliform bacteria were obtained from the Laguna Plant's waste discharge permit records from 1991 to 1994.

Salmonella, *Shigella*, *Legionella*, and enteric viruses were not detected in any samples (Table 4.7-4). During the 1994 sampling event, total coliform bacteria were detected in one effluent sample (2 MPN/100 mL) and all four of the Russian River samples (23 to 240 MPN/100 mL). Individual samples recorded in the Laguna Plant's historical data contained coliform bacteria counts as high as 170 MPN/100 mL for one daily sample, but the monthly mean concentrations never exceeded 2 MPN/100 mL. *Giardia* cysts were detected only in the effluent during the late 1994 sampling event, although they have previously been detected in the Russian River (CH2M Hill 1993). *Cryptosporidium* oocysts were detected only in the Russian River.

Hazardous Materials/Waste

Releases of hazardous materials/wastes have the potential to adversely affect public health if they are encountered unexpectedly during the construction phase of the Project or if they impact Project elements during the Project lifetime. At the Federal level, the storage and handling of hazardous substances is regulated under the Resource Conservation and Recovery Act, which follows hazardous substances from "cradle to grave" and regulates hazardous waste generators; transporters; and treatment, storage, and disposal facilities. California has been authorized by the EPA to administer its own Resource Conservation and Recovery Act program. The cleanup of sites contaminated by releases of hazardous substances is regulated by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 which was amended by the Superfund Amendment and Reauthorization Act of 1986.

Known hazardous waste release sites are subject to oversight by federal, state, and/or local agencies. Information about these sites, such as the site address, responsible party, types of contaminants and status of cleanup, is maintained in government agency files and databases. The agencies with potential oversight at sites in Sonoma County include the EPA; the Department of Toxic Substances Control within the California EPA; the North Coast and San Francisco Bay Regional Water Quality Control Boards; the Sonoma County Public Health Department, Environmental Health Services; and the local city and county fire departments.

Table 4.7-4

Historical Biological Constituents in the Laguna Plant Effluent and Russian River (1994)

Sample Type	Date	Total Coliform	Legionella	Salmonella	Shigella	Heterotrophic Bacteria	Giardia lamblia	Cryptosporidium	Enteric Virus
		MPN/100 mL				(CFU/1 mL)	(Cysts/100 L)	(Oocysts/100 L)	(PFU/Volume)
Fresh Effluent	27 Oct 94	< 2	ND	ND	ND	8	0	0	NA
Fresh Effluent	8 Nov 94	< 2	ND	ND	ND	21	0	0	NA
Fresh Effluent	30 Nov 94	2	ND	ND	ND	20	5.1	0	NA
Fresh Effluent	14 Dec 94	< 2	ND	ND	ND	18	13.8	0	< 1 / 129 L
Russian River	27 Oct 94	23	ND	ND	ND	166	NA	NA	0 / 22 L
Russian River	8 Nov 94	240	ND	ND	ND	31	0	2.7	NA
Russian River	30 Nov 94	30	ND	ND	ND	110	0	0	0 / 153 L
Russian River	14 Dec 94	220	ND	ND	ND	610	0	0.4	NA

Source: Parsons Engineering Science, Inc., *Human Health Risks from Chemical and Biological Components of Reclaimed Water* 1995

Notes:

MPN = most probable number
CFU = colony forming units
ND = not detected
PFU = plaque forming units
NA = not analyzed
< indicates the detection limit

Summary of Regulatory Agency Databases and List Review

The potential for encountering existing contamination from historical hazardous materials/waste releases can be evaluated by reviewing lists and databases compiled by regulatory agencies with oversight within the Project area. For purposes of this study the study area is defined as sites within a 1,000-foot wide corridor along the pipeline alignments and around pump station and reservoir sites (500 feet on a side) for state, local and most national listings and a one-mile wide corridor for sites on the National Priority List (also known as Superfund sites). A database search was conducted to identify sites that are included on fourteen different State and Federal regulatory agency databases (Environmental Risk Information & Imaging Services 1995). The environmental databases and lists, which are current to the listed date and were included in the search are found in Table 4.7-5. A total of 196 sites appeared on the regulatory agencies lists. The locations of these sites with respect to project elements are shown on Figures 4.7-1 and 4.7-2.

Typical sites include gas stations and other owners of underground storage tanks, solid waste landfills, businesses that use or store hazardous materials, and a variety of other operations that handle, generate, or store hazardous materials or hazardous wastes. Many sites appear on more than one database. Therefore, multiple listings must be considered when evaluating the number of releases, generators, handlers, and discharges of potentially hazardous substances or wastes. Review of the available regulatory agency databases revealed the following totals:

- 196 sites were identified within the Project area for the hazardous materials investigation;
- 19 sites were listed but had insufficient data to accurately plot their location in relation to the project alternatives, but were included in this study due to the potential for impact;
- 122 sites had registered or formerly registered underground storage tanks (UST, LUST and CORTESE lists);
- 72 sites have reported leaking underground storage tanks (LUST and CORTESE lists);
- 4 sites have been investigated or are under investigation by the EPA (CERCLIS database);
- 12 sites are active or inactive solid waste landfills or processing facilities of which two have reported a migration of hazardous waste (SWIS and SWAT databases);
- 65 sites were listed as generators or handlers of hazardous materials (HWIS and RCRIS databases);

Table 4.7-5

Environmental Data Bases and Lists

Data Base	Definition	Date
CALSITES	California Hazardous Waste Sites	May 1995
CERCLIS	Comprehensive Environmental Response Compensation and Liability Information System	May 1995
CORTESE	California Cortese List	September 1990
ERNS	Emergency Response Notification System	July 1994
FINDS	Facility Index System	March 1995
HWIS	California Hazardous Waste Information System	December 1993
LUST	California Leaking Underground Storage Tanks	January 1995
NFRAP	No Further Remedial Action Planned Sites	February 1995
NPL	National Priorities List	May 1995
RCRIS	Resource Conservation and Recovery Information System	November 1994
SWAT	California Solid Waste Assessment Test	June 1994
SWIS	California Solid Waste Information System	November 1994
TRI	Toxic Release Inventory	December 1992
UST	California Underground Storage Tanks	March 1994
WDS	California Waste Discharger System	February 1995

Source: Environmental Risk Information and Imagery Services , Environmental Database Search Summary Report 1995.

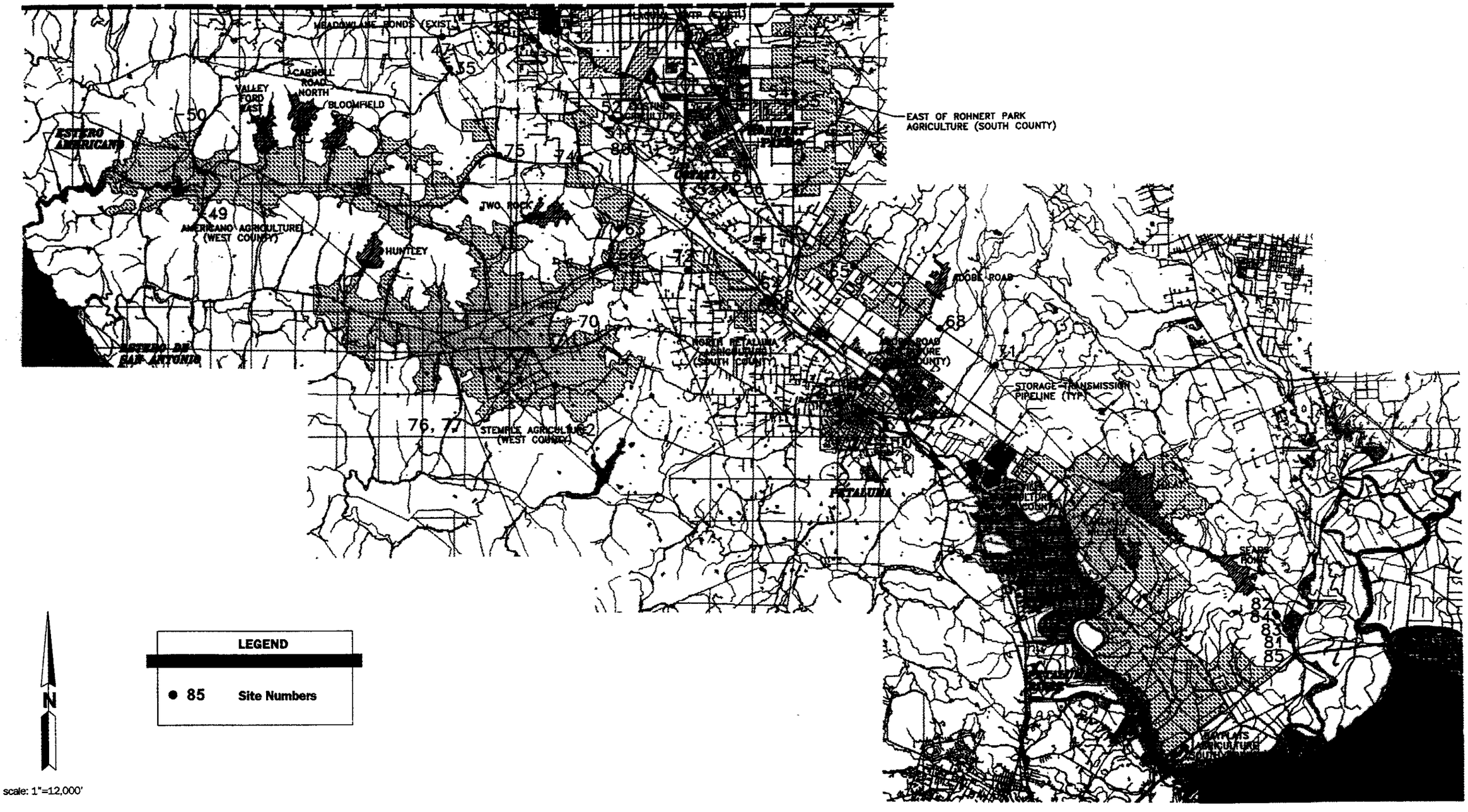
- 13 sites were listed as permitted to discharge wastewater or hazardous waste into either injection wells or surface water (WDS list);
- 2 sites have reported sudden and/or accidental release of hazardous substances into the environment (ERNS list); and
- No sites within one-half mile of the Project components appeared on the National Priorities List.

Each of the pipeline alignments was qualitatively evaluated for their potential to encounter soil and/or groundwater contamination during construction. The pipeline routes for the Discharge Alternatives do not have any reported releases or hazardous material handlers within 500 feet of the alignment and the probability of encountering environmental contamination during construction is considered low. The West County (16 sites), South County (17 sites), Sebastopol irrigation area (17 sites), and geysers (25 sites) pipeline routes have a moderate probability of encountering environmental contamination during construction based on the number of sites observed. The urban irrigation pipelines alignment has the highest probability of encountering environmental contamination, as a total of 86 sites are located within 500 feet of this route. Most sites listed in the regulatory agency databases are properties where a small to moderate volume of hazardous materials/wastes are used, stored, or generated and/or underground storage tank(s) containing petroleum hydrocarbons are present. These sites typically do not have widespread contamination except where the volume of the release is great and groundwater is shallow.

The location of pump stations with respect to contaminant release sites and hazardous material handlers are evaluated separately from the pipelines. Although the construction of pump stations would be slab on grade and most of the piping would be aboveground, surface and subsurface materials at these locations would be disturbed to some degree to accommodate installation or realignment of utilities and connections to the water pipelines. Six pump stations appear to be located within approximately 500 feet of hazardous materials/waste sites. Pump Stations WPBS-13 and WPBS-16 are located in the West County near Sites 49 and 75. Pump Station SBPS-7 is located near Site 55 in the South County. Pump Stations LBPS-1 and LBPS-2 are located near Sites 41 and 32 in the Sebastopol area. Pump Station PS-G2 is located near Site 4 along the geysers pipeline alignment. With the exception of Pump Station WPBS-16, the nearby hazardous materials/waste sites are underground storage tanks or leaking underground storage tank sites. Pump Station WPBS-16 is located near the Class III Sonoma County Landfill on Meacham Road.

Other Potential Sources of Contamination

Leaded gasolines have been used as vehicle fuels in the U.S. since the 1920s. Although lead has recently been removed from fuel formulations, leaded fuels are a recognized source of contamination in soils along roadways in urban areas (Madhaven et al. 1989). The proposed pipeline alignments intersect or parallel several freeways (State highways 112, 101, and 116) and other heavily trafficked routes. Surface and near-surface soils



LEGEND

● 85 Site Numbers

scale: 1"=12,000'

Source: Parsons Engineering Science

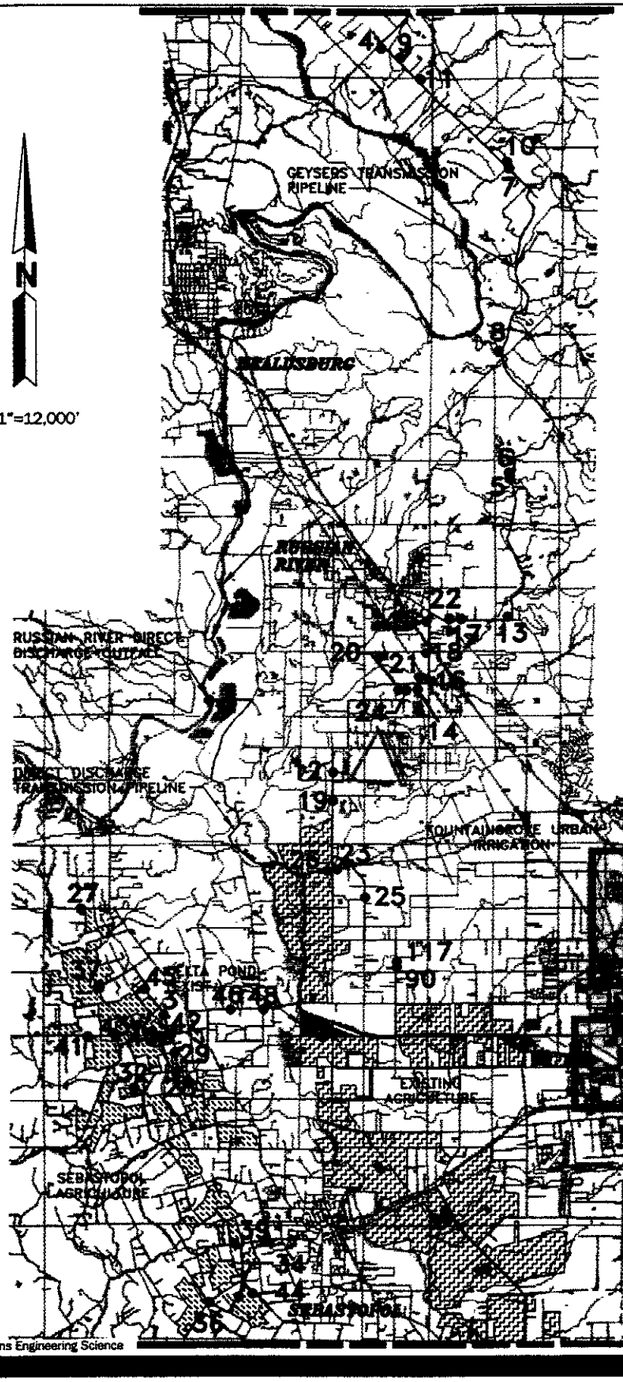
HARLAND BARTHOLOMEW & ASSOCIATES, INC.
PARSONS ENGINEERING SCIENCE, INC.
UNITS OF PARSONS INFRASTRUCTURE & TECHNOLOGY INC.
PARSONS

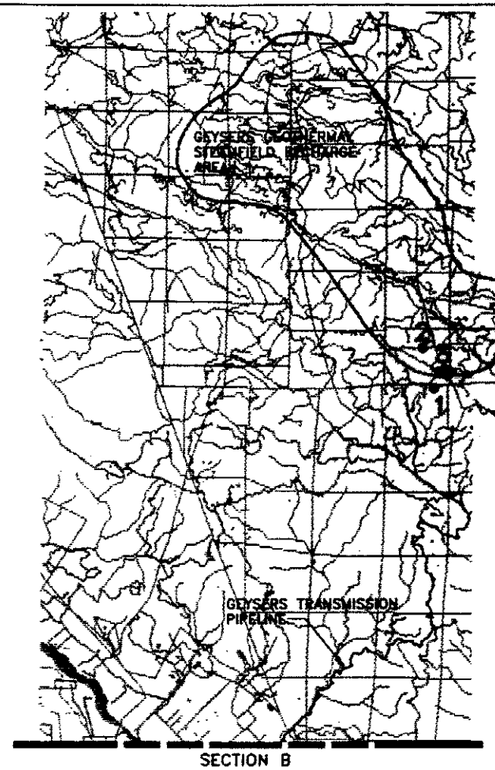
Santa Rosa Subregional Long-Term Wastewater Project

REPORTED HAZARDOUS MATERIALS/WASTE SITES SOUTHERN PROJECT AREA

Figure 4.7-1

This page left intentionally blank.

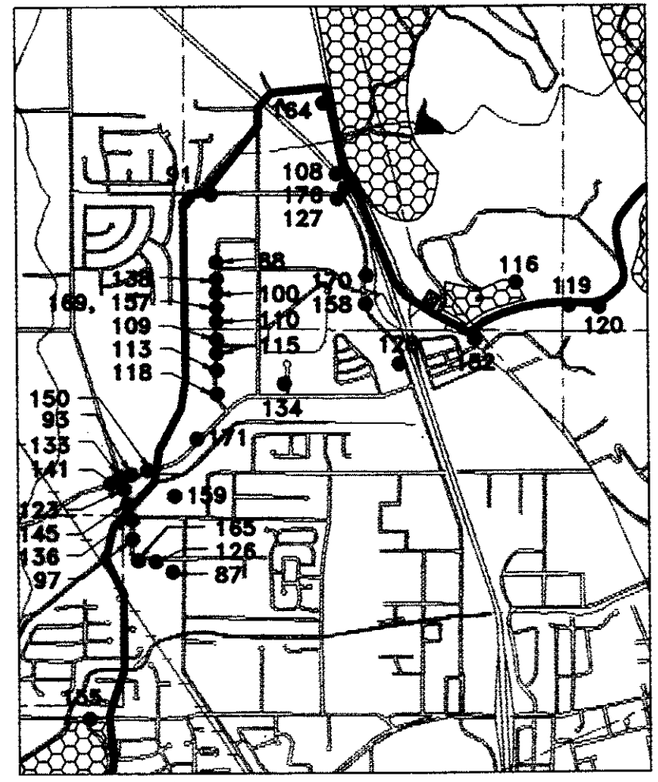


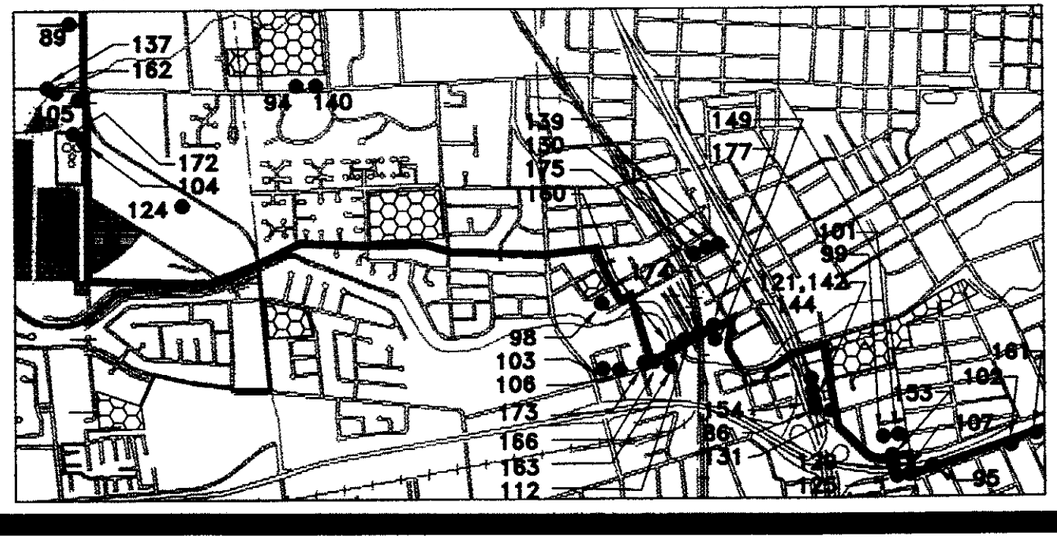


SECTION B

LEGEND

● 159 Site Numbers





Source: Parsons Engineering Science

HARLAND BARTHOLOMEW & ASSOCIATES, INC.
PARSONS ENGINEERING SCIENCE, INC.
UNITS OF PARSONS INFRASTRUCTURE & TECHNOLOGY INC.
PARSONS

Santa Rosa Subregional Long-Term Wastewater Project

REPORTED HAZARDOUS MATERIALS/WASTE SITES NORTHERN PROJECT AREA

Figure 4.7-2

This page left intentionally blank.

adjacent to these roadways have the potential to contain significant concentrations of lead (over 1,000 mg/kg) due to the deposition of lead compounds from vehicle exhausts.

Railroad rights-of-way are potential sources of environmental contamination because of undocumented spillage that may have occurred during the transport of chemicals. Pesticides, used to control plant growth or to preserve railroad ties, are another potential source of contamination along railroad rights-of-way. The West County, South County, urban irrigation, Russian River discharge, and Sebastopol irrigation pipeline alignments cross the Petaluma-Santa Rosa Railroad right-of-way. The South County, urban irrigation, and geysers pipeline alignments cross the Northwestern Pacific Railroad right-of-way.

Hazardous Materials Storage and Use

A variety of hazardous materials, including chlorine to disinfect wastewater, are currently used during operations at the Laguna Plant (City of Santa Rosa 1991). Additional hazardous materials, such as fuels, motor oils, paints, and compressed gases, would be used in construction. While these are commonly used materials, if handled improperly (fuels, for example, are flammable) they could endanger workers and the public.

State regulations require the operator of a business that uses hazardous materials to prepare a Hazardous Materials Management Plan (HMMP) to address the storage and handling of these materials and to be prepared to respond to the possible release of such materials. The plans are generally provided to fire departments to aid their response to emergencies at facilities which handle hazardous materials. HMMPs are intended to prevent or to mitigate damage from hazardous materials releases and therefore to minimize the safety and health hazards that these materials pose. The Laguna Plant has prepared separate HMMPs to address the storage and handling of hazardous materials during operation of the water reclamation plant and maintenance facilities. In addition, the reclamation plant has a Process Safety Plan that addresses the handling of chlorine (and other hazardous materials) during the daily operation of the plant.

The chlorine that is used for disinfection is stored in two, 40,000-pound bulk storage tanks at a pressure of 90 pounds per square inch (psi). At this pressure, chlorine is in a liquid state. Each tank is filled to a maximum level of 34,000 pounds, so the maximum amount of liquid chlorine that could be stored on site at any time would not exceed 68,000 pounds. The median daily chlorine use is about 3,000 pounds, with a range of 2,000 to 6,000 pounds per day. Use at this level requires new deliveries of liquid chlorine (by tank truck) about every twelve days.

From the storage tanks, liquid chlorine flows through pipes to evaporators where the liquid is vaporized to a gas. The gas flows under vacuum to chlorinators and then to metered injectors, which mix the chlorine with water just upstream of the contact tanks (or other processes that require chlorination). About 80% to 85% of the chlorine use is in the contact tanks and about 15% to 20% is in the headworks. Less than 2% is used for other processes.

The Laguna Plant has several safety features to prevent the release of chlorine gas to the atmosphere and to warn employees in the event that a release does occur. Chlorine detectors and alarms are installed near the chlorine storage tanks, the evaporators, and the chlorinators. In addition, the chlorination system has sensors to detect temperature, pressure, and water flow. Monitoring of these parameters is used to detect potential problems. Since the current system has been in use, there have been no releases of chlorine that would adversely affect public health.

Construction Hazards

Hazards associated with construction activities can affect the safety of both workers and the general public. The safety of workers is regulated by the California Occupational Safety and Health Administration, which receives its authority from Title 8 of the California Code of Regulations. These regulations also indirectly protect the general public by requiring construction managers to post warnings signs, to limit public access to construction areas, and to obtain permits for work considered to present a significant risk of injury (e.g., excavations greater than 5 feet into which a person is required to descend).

Where excavations or other Project activities would occur in public rights-of-way, an encroachment permit is required from the appropriate agency such as the California Department of Transportation for State highways, Departments of Public Works for roadways within cities, or the Sonoma County Department of Public Works or Office of Emergency Services for county roads (refer to Section 4.11, Transportation). These permits are designed to protect the public by providing a system of notification to providers of emergency or other important services of road closures. Compliance with these requirements would minimize the safety and health hazards associated with construction activities.

Flood Hazards

Flooding or inundation may occur when runoff from a watershed exceeds the capacity of the stream or river channel that drains the watershed or when water is released catastrophically from a dam failure. Impacts of the Project alternatives relative to flooding from excessive runoff are discussed in Surface Water Hydrology, Section 4.4. Risk of flooding as a result of dam failure is discussed in this Public Health and Safety section. Areas that would be inundated in the event of a dam break are evaluated in Section 4.19, Inundation from Dam Failure.

Vector Control

Mosquitoes are both pests and vectors of disease to humans and animals. Mosquito populations can increase rapidly, especially during the warmer summer months. Twenty-one species of mosquitoes are known to occur within the Project area. Several of these have the potential to breed and to reproduce as a result of the construction and operation of Project components (e.g., storage reservoirs and irrigation areas).

The California Health and Safety Code provides authority for mosquito abatement districts to advise and control mosquito production on private and public lands and to assess the land owner for the cost of that control. The districts also have the authority to hold hearings and assess civil penalties to abate nuisance and potential health threats to the general public (California Health and Safety Code, Sections 2270-2294). The Marin/Sonoma Mosquito Abatement District (Abatement District) and the Vector Biology and Control Branch of the California Department of Health Services are responsible for overseeing the mosquito prevention program within the Project area. The primary objective of the Abatement District is to suppress the mosquito population below the threshold level required for disease transmission or nuisance tolerance level.

The Abatement District has produced several documents addressing mosquitoes and other biting arthropods associated with wastewater reclamation or disposal projects. These documents provide project design criteria for mosquito prevention as well as guidelines for proper management of wastewater reclamation or disposal projects. The design criteria include minimizing the amount of over-irrigation, ponding, or tail water, thereby significantly reducing the need to treat these sites with pesticides and the subsequent need to provide the Abatement District with compensation for that control effort. These criteria are addressed in the Project design where new irrigated areas would be created (refer to the *Irrigation Management Guidelines*, Questa Engineering Corporation 1996).

Public Health and Safety Goals, Objectives, and Policies

Table 4.7-6 identifies goals, objectives, and policies which provide guidance for development in relation to potable water supplies and exposure to hazardous materials or waste. The table also indicates which criteria in the Public Health and Safety Section are responsive to each set of policies.

Table 4.7-6

General Plan Goals, Objectives, and Policies - Public Health and Safety

Adopted Plan Document	Document Section	Document Numeric Reference	Policy	Relevant Evaluation Criteria[1]
Sonoma County General Plan	Resource Conservation Element	Goal RC-3	Assure an adequate long term supply of water for domestic use	1
Sonoma County General Plan	Public Safety Element	Goal PS-4 Objective PS-4.2	Prevent unnecessary exposure of people and property to risks from hazardous materials, and regulate their transport, storage and use to reduce risks to acceptable levels	1

Table 4.7-6

General Plan Goals, Objectives, and Policies - Public Health and Safety

Adopted Plan Document	Document Section	Document Numeric Reference	Policy	Relevant Evaluation Criteria[1]
Marin Countywide Plan	Environmental Quality Element	Policy EQ-3.3	Radioactive, chemical and biological health hazards to humans or wildlife shall not be created, and existing levels shall be reduced	1,2,3
Santa Rosa General Plan	Public Facilities and Services Element	Goal PSF-9	Utilize high quality water from the Sonoma County Water Agency aqueduct system as the primary water supply	1
Santa Rosa General Plan	Safety Element	Goal S-6 Objective S-6a	Use existing regulations to identity and eliminate or mitigate existing or potential dangers from hazardous materials	2,3
Petaluma General Plan	Community Health and Safety Element	Objective (r)	Insure safe drinking water for all Petalumans	1
Petaluma General Plan	Community Health and Safety Element	Objective (l)	The city shall use Sonoma County's Hazardous Waste Management Plan to minimize the dangers from transport treatment and storage of hazardous waste	2,3
Sebastopol General Plan	Safety Element	Policy 11	Protect the water quality obtained from City wells	1
Sebastopol General Plan	Safety Element	Goal 8 Policy 34 Policy 36	Reduce hazards of transportation, storage and disposal of hazardous waste	2,3
Rohnert Park General Plan	Safety Element	Objective 4 Principle 5 Principle 6	Protect the community's health, safety, welfare, natural resources and property through regulation of authorized use, elimination of unauthorized use, storage, transport and disposal of hazardous materials with specific focus on problem prevention	2,3

Table 4.7-6

General Plan Goals, Objectives, and Policies - Public Health and Safety

Adopted Plan Document	Document Section	Document Numeric Reference	Policy	Relevant Evaluation Criteria[1]
Cotati General Plan	Quality of Life Section	Objective 7.5	Protect citizens from dangers related to the movement, storage and manufacture of hazardous materials	2,3
Windsor General Plan	Public Health and Safety Element	Policy E.1 Policy E.1.1 Policy E.1.3	Minimize potential health effects from the use, storage and disposal of hazardous materials and waste	2,3

Source: Harland Bartholomew and Associates, Inc., 1995

1 The evaluation criteria are in Table 4.7-7.

EVALUATION CRITERIA WITH POINT OF SIGNIFICANCE

The evaluation criteria for Public Health and Safety are based on standards promulgated by the State of California and goals, objectives, and/or policies of regional and local governments and special districts (Table 4.7-7).

Table 4.7-7

Evaluation Criteria with Point of Significance - Public Health and Safety

Evaluation Criteria	As Measured by	Point of Significance	Justification
1. Will the Project expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms at concentrations detrimental to human health?	Concentration of constituents in reclaimed water. Concentration of pathogens in reclaimed water.	Exceedence of State or Federal drinking water standards or human health-based criteria at a domestic water source, or State Department of Health Services standards for reclaimed water.	California Drinking Water and Reclaimed Water Regulations

Table 4.7-7

Evaluation Criteria with Point of Significance - Public Health and Safety

Evaluation Criteria	As Measured by	Point of Significance	Justification
2. Will the Project expose workers or the public to hazards from a known hazardous waste site?	Ground disturbance near a hazardous waste site(s).	Less than 500 feet	CEQA guidelines; Resource Conservation and Recovery Act; Comprehensive Environmental Response Compensation and Liability Act
3. Will the Project increase potential exposure of the public to hazardous materials due to a chemical release?	Increase in use or storage of hazardous materials not in accordance with State and Federal hazardous materials or waste regulations.	Greater than 0 occurrences	California and Federal Hazardous Materials/Waste Regulations; Public Safety sections of local General Plans
4. Will the Project expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of accessible excavations (trenches, pits, or borings); or creation of an accessible open body of water?	Use of heavy machinery, vehicles or equipment; creation of excavations; or creation of an open body of water in public areas not in accordance with State construction safety regulations.	Greater than 0 occurrences	California Construction Safety Regulations (see text)
5. Will the Project expose the public to a flooding hazard?	Increased hazard due to construction not in accordance with state and federal regulations.	Greater than 0 houses and facilities affected	Public Safety sections of local General Plans
6. Will the Project increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?	Creation of mosquito habitat.	Greater than 0 acres of new mosquito habitat	Marin/Sonoma Mosquito Abatement District criteria for mosquito abatement

Source: Parsons Engineering Science, Inc. 1996

The evaluation criteria and points of significance were developed as discussed below.

Water Use, Reuse, and Discharge

The water use, reuse, and discharge evaluation criteria are based on numeric standards MCLs promulgated in the State of California's drinking water regulations and risk-based numbers calculated using formulae derived by the California Department of Toxic Substances Control. An MCL has been set for many organic and inorganic chemicals and for radionuclides in domestic water supplies delivered by Public Water Systems. Risk-based criteria are being used to evaluate chemicals for which an MCL has not been promulgated and to evaluate potential exposure to reclaimed water via pathways other than domestic water use.

For potential exposures other than domestic water use, the concentrations of chemicals and microorganisms in reclaimed water are evaluated in the context of California Department of Health Services standards governing water reclamation.

Chemicals and Radionuclides

Information about background water quality and quality of project-related inflows (direct discharge to the Russian River and storage reservoir "leakage") is used to estimate the Project impact on domestic water quality. Estimated water quality will be compared directly to MCLs (Table 4.7-8). If a Project alternative would cause the water quality at a domestic water intake to exceed an MCL, then the impact would be considered significant.

Some chemicals do not have a promulgated MCL but may potentially produce adverse human health effects and thus have significant effects. One purpose of the human health risk assessment is to identify such effects. Recent data are used to estimate the human health risk from exposure to reclaimed water via feasible exposure pathways in addition to domestic water consumption (e.g., consumption of fish, exposure to irrigation water, exposure during water recreation activities) unless the current and proposed treatment plant upgrades are expected to change effluent quality.

Environmental Estrogens

The current scientific literature suggests that a large number of the man-made, industrial, and agricultural chemicals that have been released into the environment over the past 50 years have the potential to disrupt the endocrine system of terrestrial and aquatic life. State and federal MCLs are available for many of these potential environmental estrogens, however, the MCLs are based on adverse health effects of these chemicals other than their potential estrogenic effects. The estrogenic effects of these chemicals may occur at higher or lower concentrations than the MCLs. It is therefore inappropriate to evaluate a chemical's potential estrogenic effects based on the MCLs.

No data are presently available in the scientific literature concerning threshold levels (i.e., the lowest environmental concentrations in soil, air or water) that may

induce estrogenic effects in humans. These data would be needed to evaluate the chemical levels found to date in Project reclaimed water. Due to the unavailability of scientific data, an evaluation criterion for environmental estrogens was not developed.

Pathogenic Viruses, Bacteria and other Disease Organisms

The drinking water criteria for coliforms are more stringent than the reclaimed water criteria. A Public Water System is in violation of the total coliform MCL for drinking water when more than 5 percent of the samples collected during any month are total coliform-positive (for water systems that collect at least 40 samples per month) or more than one sample collected during any month is total coliform-positive (for water systems that collect less than 40 samples per month). Retesting of the water supply must not be positive for fecal coliform or *E. coli*. If the Project alternatives would cause the water quality at a domestic water intake to exceed these requirements, then the impact would be considered significant.

The California Department of Health Services has established treatment requirements for a variety of reclaimed water uses (Title 22, CCR §60301 *et seq.*). These requirements are believed to be capable of reducing pathogenic constituents to acceptable levels. The California Department of Health Services has proposed changes to the existing regulations and submitted these changes for public review and comment. These revisions have not been formally adopted, but are currently being used as guidance by some regulatory agencies, such as the Regional Water Quality Control Boards (Regional Boards) (Hulquist 1996).

The most stringent regulations in Title 22 currently require secondary treatment of wastewater plus the advanced treatment processes of coagulation, clarification, filtration, and disinfection. As of May 1996, the level of disinfection required depends upon the ultimate use of the water but the most restrictive requirement (for nonrestricted recreational impoundments and spray irrigation) is a median coliform level that does not exceed 2.2 MPN per 100 mL and a maximum coliform level that does not exceed 23 MPN/100 mL more than once in a 30-day period. Filtration must produce turbidity of 2 turbidity units of less.

Table 4.7-8

Summary of Primary and Secondary Maximum Contaminant Levels

Chemical / Constituent	State (mg / L)	Federal (mg / L)	Chemical / Constituent	State (mg / L)	Federal (mg / L)
PRIMARY MCLs			1,1-Dichloroethane	0.005	N/A
INORGANICS			1,2-Dichloroethane	0.0005	0.005
Aluminum	1	N/A	1,1-Dichloroethylene	0.006	0.007
Antimony	0.006	0.006	cis-1,2-Dichloroethylene	0.006	0.07
Arsenic	0.05	0.05	trans-1,2-Dichloroethylene	0.01	0.1
Asbestos	7 MFL[1]	7 MFL[1]	Dichloromethane	0.005	0.005
Barium	1	2	1,2-Dichloropropane	0.005	0.005
Beryllium	0.004	0.004	1,3-Dichloropropylene	0.0005	N/A
Cadmium	0.005	0.005	Ethylbenzene	0.7	0.7
Chromium	0.05	0.1	Monochlorobenzene	0.07	0.1
Copper	1.3[2]	1.3[2]	Styrene	0.1	0.1
Cyanide	0.2	N/A	1,1,2,2-Tetrachloroethane	0.001	N/A
Lead	0.015[2]	0.015[2]	Tetrachloroethylene	0.005	0.005
Mercury	0.002	0.002	Toluene	0. 15	1
Nickel	0.1	0.1	1,2,4-Trichlorobenzene	0.07	0.07
Nitrate[3]	10	10	1,1,1-Trichloroethane	0.2	0.2
Nitrate + Nitrite[3]	10	10	1,1,2-Trichloroethane	0.005	0.005
Nitrite[3]	1	1	Trichloroethylene	0.005	0.005
Selenium	0.05	0.05	Trichlorofluoromethane	0.15	N/A
Thallium	0.002	0.002	1,1,2-Trichloro-1,2,2-Trifluoroethane	1.2	N/A
			Trihalomethanes	0.1	0.1
ORGANICS			Vinyl Chloride	0.0005	0.002
Volatiles			Xylenes	1.750[4]	10
Benzene	0.001	0.005			
Carbon Tetrachloride	0.0005	0.005	**Non-Volatiles**		
1,2-Dichlorobenzene	0.6	0.6	Alachlor	0.002	0.002
1,4-Dichlorobenzene	0.005	0.075	Atrazine	0.003	0.003
Non-Volatiles (continued)			Polychlorinated Biphenyls	0.0005	0.0005
Bentazon	0.018	N/A	Simazine	0.004	0.004
Benzo(a)pyrene	0.0002	0.0002	Thiobencarb	0.07	N/A
Carbofuran	0.018	0.04	Toxaphene	0.003	N/A
Chlordane	0.0001	0.002	2,3,7,8-TCDD (Dioxin)	3×10^{-8}	3×10^{-8}
2,4-D	0.07	0.07	2,4,5-TP (Silvex)	0.05	0.05
Dalapon	0.2	0.2			

Table 4.7-8

Summary of Primary and Secondary Maximum Contaminant Levels

Chemical/Constituent	State (mg/L)	Federal (mg/L)	Chemical/Constituent	State (mg/L)	Federal (mg/L)
Dibromochloropropane	0.0002	0.0002	**RADIOACTIVITY[5]**	**(pCi/L)**	
Di(2-ethylhexyl)adipate	0.4	0.4	Radium-226 and Radium-228	5	N/A
Di(2-ethylhexyl)phthalate	0.004	0.006	Gross Alpha particle activity[6]	15	N/A
Dinoseb	0.007	0.007	Tritium	20,000	N/A
Diquat	0.02	0.02	Strontium-90	8	N/A
Endothall	0.1	0.1	Gross Beta particle activity	50	N/A
Endrin	0.002	0.002	Uranium	20	N/A
Ethylene Dibromide	0.00005	0.00005			
Glyphosate	0.7	0.7	**SECONDARY MCLs**		
Heptachlor	0.00001	0.0004	Aluminum	N/A	0.05-0.2
Heptachlor Epoxide	0.00001	0.0002	Chloride	250	250
Hexachlorobenzene	0.001	0.001	Copper	1.0	1.0
Hexachlorocyclopentadiene	0.05	0.05	Iron	0.3	0.3
Lindane	0.0002	0.0002	Manganese	0.05	0.05
Methoxychlor	0.04	0.04	Silver	N/A	0.1
Molinate	0.02	N/A	Sulfate	250	250
Oxamyl	0.2	0.2	Total Dissolved Solids	500	500
Pentachlorophenol	0.001	0.001	Zinc	5	5
Picloram	0.5	0.5			

Source: California Code of Regulations, Federal Code of Regulations

Notes:
[1] MFL = million fibers per liter; MCL for fibers exceeding 10 μm in length.
[2] Action level.
[3] As nitrogen.
[4] MCL as either an isomer or a sum of isomers.
[5] pCi/L, picoCuries per liter.
[6] Includes radium-226 but not radon and uranium. Gross alpha particle measurement may be substituted for measurement of radium-226 and radium-228.

Hazardous Materials/Waste

The hazardous materials/waste criterion is based on the CEQA requirement that lead agencies consult the lists of hazardous waste sites compiled pursuant to Section 65962.5 of the California Government Code to determine whether the proposed Project alternatives are located on a site which is included on any of the lists. The lists are

compiled by the Regional Water Quality Control Boards, the California Department of Toxic Substances Control, and the California Integrated Waste Management Board.

While CEQA only requires that the Project alternative be examined for hazardous waste issues, a distance of 500 feet was selected to ensure that nearby properties do not have hazardous waste contamination issues that may affect or that may be affected by the proposed project alternatives.

Hazardous Materials Storage and Use

The hazardous materials storage and use criterion is based on the requirements of the Public Safety Sections of local General Plans, which list goals, objectives, and/or policies for reducing potential damage from hazardous materials. These requirements are derived from State regulations (e.g., California Health and Safety Code §25500 *et seq.*) which require local agencies such as fire departments to administer programs for storing and handling of hazardous materials.

Construction Hazards

The criteria for safety hazards during construction are based on safety regulations (Title 8, CCR §1500 to §1938) regarding construction sites. While the regulations have been promulgated to protect workers in the construction industry, the Project alternatives have components, such as pipelines, that may be built in areas accessible to the public. The criteria have been developed to protect the public in areas where they may encounter construction activities.

Flooding Hazards

The criterion for flooding is based on information contained in the Public Safety sections of local General Plans. The plans generally recognize the importance of reducing the potential hazard due to flooding as might occur from dam failure and inundation. Most General Plans within the project area do not directly refer to dam failure and subsequent inundation in policy statements or goals, but do identify the protection of human life and resources from potential flooding hazards.

Vector Control

The criterion for disease vectors is based on the requirements of the Marin/Sonoma Mosquito Abatement District and the Vector Biology and Control Branch of the California Department of Health Services, which are responsible for overseeing the mosquito prevention program within the Project area. The Abatement District has issued criteria for mosquito prevention in wastewater reclamation or disposal projects.

METHODOLOGY

Water Use, Reuse, and Discharge

The potential human health impacts from exposure to reclaimed water are evaluated by comparing the concentration of the chemical and biological components in historical data from reclaimed water from the Laguna Plant with California and Federal regulatory standards for public drinking water supplies and California regulatory requirements for the use of reclaimed water, and by evaluating the chemical and biological components in a human health risk assessment using guidelines published by the California EPA, Department of Toxic Substances Control.

Exposure Pathways

Potential pathways of exposure to the chemicals and microorganisms in reclaimed water include domestic use of water for drinking and bathing, recreational use, irrigation use, and consumption of fish that have contacted reclaimed water (Table 4.7-9). Most exposure pathways (consumption of fish is a possible exception) would result in dilution, filtration, or degradation of the constituents in the soil, surface water, or groundwater prior to human exposure. Because concentrations are already low (i.e., below drinking water standards) for most chemicals and microorganisms in reclaimed water, these environmental fate processes are expected to further reduce the potential exposure for these constituents. However, in areas that are near potential reservoir sites environmental fate processes may not be adequate to protect the health of persons using water from nearby wells if nitrate levels in reclaimed water remain at their historic concentrations (refer to Section 4.6, Groundwater).

For some chemicals (e.g., pesticides, mercury) even extremely low concentrations in water or sediments have the potential to bioaccumulate in fish tissue to concentrations high enough to pose health risks to fish consumers. This exposure pathway was examined in the human health risk assessment by comparing water concentrations to EPA water quality criteria for ingestion of aquatic organisms and water; by evaluating data from bioaccumulation/magnification studies performed in 1991 and 1994 at the Kelly Farm Demonstration Wetland; and by applying the EPA's methodology for fish advisories to data collected for the State's Toxic Substances Monitoring Program. Although maximum and/or mean concentrations of some chemicals exceeded the EPA's water quality criteria, no level of bioaccumulation that would present a human health risk was found in animal data collected at Kelly Pond, or in the Russian River or Mark West Creek downstream of the Laguna Plant's current discharge point (Parsons Engineering Science, Inc. 1995).

Table 4.7-9

Summary of Possible Exposure Pathways

Pathway	Comments
Russian River to Domestic Water Supply	Potentially complete pathway; Russian River flows will dilute discharge; Groundwater will dilute discharge; Discharge occurs for a maximum of 7.5 months per year
Fish Consumption	Potentially complete pathway; Animal data indicate that this pathway is not significant
Recreational Use	Potentially complete pathway; Discharge occurs during portion of year when swimming and wading uses are low; Fishers protected by clothing
Urban and Agricultural Irrigation	Potentially complete pathway; Orders of magnitude smaller exposure than domestic water use scenario; Ingestion discouraged by State-mandated posting of warning signs and design requirements
Storage Ponds	No probable complete pathway; Ponds are fenced and public access is restricted
Reservoirs to Domestic Water Supply	Potentially complete pathway; Groundwater dilution of nitrates may not be adequate at some reservoir sites
Geyser Injection	No probable complete pathway; Closed system of pipes and tanks; Water injected in excess of 3,000 feet below ground surface

Source: Parsons Engineering Science, Inc. February 1996

Toxicity Assessment and Risk Characterization

Hazard quotients are used to evaluate the noncarcinogenic health effects of the chemical components. A hazard quotient of less than 1.0 indicates that a chemical is not expected to produce an adverse health effect. Excess cancer risks are used to evaluate carcinogenic health effects of the chemical components. In general, excess cancer risks greater than one in a million (1×10^{-6}) to one in one-hundred thousand (1×10^{-5}) are considered by the State of California to pose a significant threat to human health (Title 22, California Code of Regulations, §12703). For this assessment the lower excess cancer risk of 1.0×10^{-6} is used as a screening level for carcinogenic health effects. This is the most health-protective value.

The analysis of risk from the detected biological components in the Laguna Plant effluent is evaluated by comparing the data to a known infective dose (*Giardia*), to background concentrations (total coliform and heterotrophic bacteria), and to regulatory standards (total coliform).

Chemical and biological components that do not pass the screen are examined further and are evaluated as to their environmental fate (chemical or biological degradation), attenuation (loss of viability in the case of pathogens), filtration, dilution by groundwater or surface water, background concentrations, and

comparison to state and federal drinking water standards (Maximum Contaminant Limits, MCLs) and reclaimed water standards.

Fish Consumption

Water quality and organismal data from the Kelly Farm Pond bioaccumulation study and from the Regional Water Quality Control Board's Toxic Substances Monitoring Program on the Russian River are used to evaluate the potential human health hazard associated with the consumption of fish. Water quality data are compared to water quality criteria proposed by the U.S. EPA for the combined consumption of aquatic organisms and water and for the consumption of aquatic organisms alone. Organismal data are examined to evaluate whether chemicals are bioaccumulating in the food web.

The following technical reports were used in the evaluation of potential Project impacts:

- *Human Health Effects and Wildlife Effects of Environmental Estrogens* (Parsons Engineering Science, Inc. 1995); and
- *Human Health Risks from Chemical and Biological Components of Reclaimed Water* (Parsons Engineering Science, Inc. 1995).

Hazardous Materials/Waste

The potential human health impacts from exposure to hazardous materials/waste from uncontrolled releases of hazardous materials are evaluated by compiling a list of reported hazardous materials or hazardous waste sites within 500 feet of pipeline alignments.

Hazardous Materials Storage and Use

The potential human health impacts from exposure to hazardous materials used during Project construction or operation are evaluated by comparing proposed uses with California and Federal regulations regarding the storage and use of hazardous materials.

Construction Hazards

The potential safety impacts from hazards associated with construction activities are evaluated in the context of California and federal regulations.

Flood Hazards

Potential risk for dam failure was analyzed in the context of compliance with regulations that are in place to ensure that the public is protected from flooding hazards. These include regulations of the Division of Safety of Dams and the Office of Emergency Services. Additional information regarding analysis of potential inundation areas downstream of reservoirs is presented in Section 4.19.

Vector Control

The potential human health impacts from exposure to mosquitoes are evaluated by identifying Project components that may increase potential mosquito habitat. Practices regarding irrigation water use are evaluated to determine whether they would comply with Marin/Sonoma County Mosquito Abatement District and Department of Health Services, Vector Control Branch guidelines.

ENVIRONMENTAL CONSEQUENCES (IMPACTS) AND RECOMMENDED MITIGATION

No Action Alternative

Table 4.7-10

Public Health and Safety Impacts by Component - No Action Alternative

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.1.1. Will the No Action Alternative expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms, at concentrations detrimental to human health?	Exceedence of State or Federal drinking water standards or human health-based criteria at a domestic water source, or DHS standards for reclaimed water.	Does not exceed standards	O&M	❍
7.1.2. Will the No Action Alternative expose workers or the public to hazards from a known hazardous waste site?	Ground disturbance within 500 feet of a hazardous waste site(s).	None	C	==
7.1.3. Will the No Action Alternative increase potential exposure of the public to hazardous materials due to a chemical release?	Any increase in use or storage of hazardous materials not in accordance with state and federal hazardous materials/waste regulations	None	C, O&M	==
7.1.4. Will the No Action Alternative expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of accessible excavations or creation of an accessible open body of water?	Use of heavy machinery, vehicles or equipment; creation of excavations; or creation of an open body of water in public areas not in accordance with State construction safety regulations.	None	C, O&M	==

Table 4.7-10

Public Health and Safety Impacts by Component - No Action Alternative

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.1.5. Will the No Action Alternative expose public to a flooding hazard?	Increased hazard due to construction not in accordance with state and federal regulations.	None	P	==
7.1.6. Will the No Action Alternative increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?	Greater than 0 acres of new mosquito habitat	None	O&M	==

Source: Parsons Engineering Science , Inc., 1996

Notes: 1. Type of Impact:
C Construction
O&M Operation and Maintenance
P Permanent

2. Level of Significance codes:
❍ Less than significant impact; no mitigation proposed
== No impact

Impact: **7.1.1. Will the No Action Alternative expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms at concentrations detrimental to human health?**

Analysis: *Less than Significant; Alternative 1.*

See Impact 7.9.1 in this section for a discussion of impacts from discharge of reclaimed water.

Mitigation: No mitigation is proposed.

Impact: **7.1.2 - 5. Will the No Action Alternative impact public health and safety based on evaluation criteria 1 through 5?**

Analysis: *No Impact; Alternative 1.*
The No Action alternative will have no effect on public health and safety because there will be no construction activity.

Mitigation: No mitigation is needed.

Headworks Expansion Component

Table 4.7-11

Public Health and Safety Impacts by Component - Headworks Expansion

Evaluation Criteria	Point of Significance	Impact	Type of Impact[1]	Level of Significance[2]
7.2.1. Will the headworks expansion component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms, at concentrations detrimental to human health?	Exceedence of State or Federal drinking water standards or human health-based criteria at a domestic water source, or DHS standards for reclaimed water.	--	O&M	--
7.2.2. Will the headworks expansion component expose workers or the public to hazards from a known hazardous waste site?	Ground disturbance within 500 feet of a hazardous waste site(s).	None	C	==
7.2.3. Will the headworks expansion component increase potential exposure of the public to hazardous materials due to a chemical release?	Any increase in use or storage of hazardous materials not in accordance with State and Federal hazardous materials/waste regulations	Increase in accordance with State and Federal haz mat/waste regulations	O&M	❍
7.2.4. Will the headworks expansion component expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of accessible excavations; or creation of an accessible open body of water?	Use of heavy machinery, vehicles or equipment; creation of excavations; or creation of an open body of water in public areas not in accordance with State construction safety regulations.	None	C, O&M	==
7.2.5. Will the headworks expansion component expose public to a flooding hazard?	Increased hazards due to construction not in accordance with state and federal regulations.	None	P, O&M	==

Table 4.7-11

Public Health and Safety Impacts by Component - Headworks Expansion

Evaluation Criteria	Point of Significance	Impact	Type of Impact[1]	Level of Significance[2]
7.2.6. Will the headworks expansion component increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?	Greater than 0 acres of new mosquito habitat	None	O&M	==

Source: Parsons Engineering Science, Inc., 1996

Notes:
1. Type of Impact:
C Construction
O&M Operation and Maintenance
P Permanent

2. Level of Significance codes:
❍ Less than significant impact; no mitigation proposed
-- Not Applicable
== No impact

Impact: 7.2.1, 2, 4, 5, 6. Will the headworks expansion component impact public health and safety based on evaluation criteria 1, 2, 4, 5, and 6?

Analysis: *No Impact; All Alternatives.*

The headworks expansion would not release any reclaimed water to the environment.

Although the Laguna Plant appears on several hazardous material lists, the new pumps will be built inside an existing building and installation activities will not affect or be affected by hazardous materials/wastes issues at the plant.

Alternative 1 does not have a headworks expansion component.

Mitigation: No mitigation is needed.

Impact: 7.2.3. Will the headworks expansion component increase potential exposure of the public to hazardous materials due to a chemical release?

Analysis: *Less than Significant; Alternatives 2, 3, 4, and 5.*

Some increased use of liquid chlorine will be expected if the capacity of the headworks is increased. If increased use were roughly proportional to the increase in flow (use is also dependent on total solids in the waste stream) from 18 to 21 mgd, the median daily use will increase to about 3,500 pounds. However, the maximum weight of chlorine that could be

stored on site (68,000 pounds) will not change. The increased daily usage will result in a small increase in the required frequency of tank truck deliveries from the current rate of one delivery about every 12 days (assuming that the tank truck volumes remain the same) to about one delivery every 10 days.

Existing monitoring and alarm systems and safety procedures as described in the Laguna Plant's Process Safety Plan will remain in place and will provide protection against accidental releases and exposure to the public. All storage and use will be in accordance with governing state and federal regulations.

The current Laguna Plant Hazardous Materials Management Plan addresses the storage and handling of chlorine and other hazardous materials during the operation of the water reclamation plant and maintenance facilities. Because of the increased yearly usage of chlorine at the plant, the Hazardous Materials Management Plan will require updating to reflect this change.

No Impact; Alternative 1.

This alternative does not have a headworks component.

Mitigation: *Alternatives 2, 3, 4, and 5.*

2.3.14. Update Existing Hazardous Materials Management Plan.

Alternative 1. No mitigation is needed.

After Mitigation: *Less than Significant after Mitigation; Alternatives 2, 3, 4, and 5.*

Annual updates of the Hazardous Materials Management Plan for chlorine storage and use at the Laguna Plant will mitigate potential impacts.

Urban Irrigation Component

Table 4.7-12

Public Health and Safety Impacts by Component - Urban Irrigation

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.3.1. Will the urban irrigation component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms, at concentrations detrimental to human health?	Exceedence of State or Federal drinking water standards or human health-based criteria at a domestic water source, or DHS standards for reclaimed water.	Does not exceed standards	O&M	❍

Table 4.7-12

Public Health and Safety Impacts by Component - Urban Irrigation

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.3.2. Will the urban irrigation component expose workers or the public to hazards from a known hazardous waste site?	Ground disturbance within 500 feet of a hazardous waste site(s).	None	C	==
7.3.3. Will the urban irrigation component increase potential exposure of the public to hazardous materials due to a chemical release?	Any increase in use or storage of hazardous materials not in accordance with state and federal hazardous materials/waste regulations	None	C, O&M	==
7.3.4. Will the urban irrigation component expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of accessible excavations or creation of an accessible open body of water?	Use of heavy machinery, vehicles or equipment; creation of excavations; or creation of an open body of water in public areas not in accordance with State construction safety regulations.	None	C, O&M	==
7.3.5. Will the urban irrigation component expose public to a flooding hazard?	Increased hazard due to construction not in accordance with state or federal regulations.	None	P	==
7.3.6. Will the urban irrigation component increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?	Greater than 0 acres of new mosquito habitat	None	O&M	==

Source: Parsons Engineering Science , Inc., 1996

Notes: 1. Type of Impact:
C Construction
O&M Operation and Maintenance
P Permanent

2. Level of Significance codes:
❍ Less than significant impact; no mitigation proposed
== No impact

Impact: 7.3.1. Will the urban irrigation component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms, at concentrations detrimental to human health?

Analysis: *Less than Significant; Alternatives 2 and 3.*

These alternatives irrigate urban areas, potentially including business parks, golf courses, parks and schools, in the Fountaingrove and Bennett Valley areas. These facilities currently irrigate with potable water.

Replacement of potable water with reclaimed water potentially could expose persons using these facilities to any chemicals or microorganisms in reclaimed water via inhalation, dermal absorption, or inadvertent ingestion of spray irrigation. If harmful chemicals or microorganisms are present at high enough concentrations they may induce adverse health effects. The potential for these adverse effects has been evaluated in a human health risk assessment (Parsons Engineering Science, Inc. 1995).

The human health risk assessment quantitatively assessed the health risk from domestic use (e.g., drinking, showering, washing) of undiluted reclaimed water based on historic chemical and biological data for the Laguna Plant effluent. Exposure to the chemicals and microorganisms in reclaimed water via contact with irrigation water was evaluated qualitatively but not quantified. This approach was taken because the potential uptake of chemicals or microorganisms from exposure to irrigation water would be much smaller than potential uptake via exposure to reclaimed water in a domestic use scenario, which includes ingestion, inhalation, and dermal contact with reclaimed water. Chemicals that do not present an adverse health risk under the domestic use scenario would not present an adverse health risk under the urban irrigation scenario.

In the domestic use scenario, nitrate and nitrite are the only compounds that exceed California and federal drinking water standards and the human health criteria. The nitrate concentrations in reclaimed water will be similar to a very weak solution of fertilizer, and they do not present a significant health risk from irrigation. Ingestion during irrigation exposure (possibly of a few milliliters on an irregular basis) will be less than ingestion in the domestic exposure, which assumes a person drinks 2 liters of water per day.

Microorganism concentrations (coliform bacteria) are below levels set by the State for reclaimed water use for spray irrigation. In addition, the concentrations of *Giardia lamblia* do not present an unacceptable risk based on the EPA's risk criterion as stated in the Surface Water Treatment Rule and calculated in the human health risk assessment. No other pathogenic microorganisms (*Cryptosporidium*, *Legionella*, *Salmonella*, *Shigella*, or enteric viruses) were detected in the Laguna Plant effluent.

The potential for adverse health effects from reclaimed water is also controlled by State regulations which restrict the use of reclaimed water for irrigation in areas where food is handled and drinking water fountains are located (22 CCR 60310). The State requires all publicly accessible areas where reclaimed water is used to be posted with conspicuous signs that include the warning, "RECLAIMED WATER - DO NOT DRINK." The Project will comply with these regulations and with guidance for system design and maintenance, labeling, and operation as described in the *Urban Irrigation Management Guidelines* (Questa Engineering Corporation. 1996). Water that is to be used for spray irrigation is

required by the California Department of Health Services to be adequately disinfected, oxidized, coagulated, clarified, and filtered wastewater, with a coliform count not to exceed 2.2 most probable number (MPN) per 100 mL (based on the last 7 days for which analyses have been completed) at some point in the treatment process (Table 4.7-2). The total number of coliform cannot exceed 23 per 100 mL in more than one sample within a 30-day period.

No Impact; Alternatives 1, 4, and 5.

These alternatives do not have an urban irrigation component.

Mitigation: No mitigation is proposed.

Impact: 7.3.2, 3, 4, 5, 6. Will the urban irrigation component impact public health and safety based on evaluation criteria 2, 3, 4, 5, and 6?

Analysis: *No Impact; All Alternatives.*

The urban irrigation component involves no construction of facilities. There is no flood hazard associated with urban irrigation.

Alternatives 1, 4, and 5 do not have an urban irrigation component.

Mitigation: No mitigation is needed.

Pipeline Component

Table 4.7-13

Public Health and Safety Impacts by Component - Pipelines

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.4.1. Will the pipeline component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms, at concentrations detrimental to human health?	Exceedence of State or Federal drinking water standards or human health-based criteria at a domestic water source, or DHS standards for reclaimed water.	Does not exceed standards	O&M	❍
7.4.2. Will the pipeline component expose workers or the public to hazards from a known hazardous waste site?	Ground disturbances within 500 feet of hazardous waste site(s).	Yes	C	⊙

Table 4.7-13

Public Health and Safety Impacts by Component - Pipelines

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.4.3. Will the pipeline component increase potential exposure of the public to hazardous materials due to a chemical release?	Any increase in use or storage of hazardous materials not in accordance with state and federal hazardous materials/waste regulations.	None	C, O&M	==
7.4.4. Will the pipeline component expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of accessible excavations; or creation of an accessible open body of water?	Use of heavy machinery, vehicles or equipment; creation of excavations; or creation of an open body of water in public areas not in accordance with State construction safety regulations.	None	C, O&M	==
7.4.5. Will the pipeline component expose the public to a flooding hazard?	Increased hazard due to construction not in accordance with state and federal regulations.	None	P	==
7.4.6. Will the pipeline component increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?	Greater than 0 acres of new mosquito habitat.	None	O&M	==

Source: Parsons Engineering Science, Inc., 1995

Notes: 1. Type of Impact:
C Construction
O&M Operation and Maintenance
P Permanent

2. Level of Significance codes:
⊙ Significant impact before mitigation; less than significant impact after mitigation
❍ Less than significant impact; no mitigation proposed
== No impact

Impact: 7.4.1. Will the pipeline component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms, at concentrations detrimental to human health?

Analysis: *Less than Significant; Alternatives 2, 3, 4, and 5A.*

Neither construction nor operation of the pipelines will release reclaimed water to the environment. Therefore, there will be no exposure to the public.

Temporary exposure of the public to runoff from a pipe rupture could result in similar impacts as those described under urban irrigation, but for a very brief time period. These impacts include exposure to reclaimed water at levels in excess of the MCL for nitrate, however, the limited duration, pathways of exposure, and quantity ensures that such impacts will be less than significant.

No Impact; Alternatives 1 and 5B.

These alternatives do not have a pipeline component.

Mitigation: No mitigation is proposed.

Impact: 7.4.2. Will the pipeline component expose workers or the public to hazards from a known hazardous waste site?

Analysis: *Significant; Alternatives 2, 3, 4, and 5A.*

Construction of all of the pipelines may be affected by nearby releases of hazardous materials/wastes. Construction could be affected both by identified hazardous waste sites, and potentially by soil contamination associated with major transportation corridors (highways and railroad rights-of-way). The pipeline-related construction activities that may potentially be impacted by releases of hazardous materials include clearing and grubbing, trench excavations, installation or realignment of underground utilities, and boring and jacking operations. These activities will require soil excavation and possibly dewatering, which may expose or otherwise encounter hazardous materials/wastes. Specific project impacts resulting from encountering hazardous materials/wastes during pipeline construction include potential exposure of workers or the public to toxic chemicals in the environment, further contamination of environmental media, and project schedule delays and budgetary impacts as a result of characterization, removal, and/or disposal of hazardous materials/wastes encountered.

The potential pathways of exposure during the construction phase include dermal contact with contaminated soil and/or groundwater and inhalation through exposure to vapors migrating through the soils and into trenches. Impacts to environmental media could occur through the influence of dewatering systems on local contaminated plumes and the excavation of soil, which will provide a low-pressure zone that may attract migrating vapor phase contaminants.

No Impact; Alternatives 1 and 5B.

These alternatives do not have a pipeline component.

Mitigation: *Alternatives 2, 3, 4, and 5A.*

2.3.15. Construction Management Program

Alternatives 1 and 5B. No mitigation is needed.

After Mitigation: *Less than Significant after Mitigation; Alternatives 2, 3, 4, and 5A.*

Proper management of any contaminated soil encountered during construction will mitigate impacts to a less than significant level.

Impact: 7.4.3. Will the pipeline component increase potential exposure of the public to hazardous materials due to a chemical release?

Analysis: *No Impact; All Alternatives.*

Any hazardous materials used in construction or operation of the pipelines will be used and stored in accordance with state and federal regulations regarding hazardous materials.

Alternatives 1 and 5B do not have a pipeline component.

Mitigation: No mitigation is needed.

Impact: 7.4.4. Will the pipeline component expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of accessible excavations, or the creation of an accessible open body of water?

Analysis: *No Impact; All Alternatives.*

Construction of pipelines will utilize heavy machinery, vehicles, and equipment. All such equipment will be operated in accordance with state regulations regarding construction safety. There are no proposed construction equipment or techniques which will be unsafe if safety regulations are followed.

Construction of pipelines will create excavations within public rights-of-way. However, all excavations will be protected from the public at all times and constructed in accordance with state regulations regarding construction safety. There are no proposed excavations which will be unsafe if safety regulations are followed. No new water bodies will be created because of pipeline construction or operation.

Alternatives 1 and 5B do not have a pipeline component.

Mitigation: No mitigation is needed.

Impact: 7.4.5. Will the pipeline component expose the public to a flooding hazard?

Analysis: *No Impact; All Alternatives.*

The analysis of potential flooding from a pipeline rupture is presented in Surface Water Hydrology under Impact 4.4.7. The only facility which will be impacted by the pipe rupture is the road in which it is located. In the event of an earthquake, the primary impact on the road will be due to ground shaking or rupture rather than a pipeline break.

Alternatives 1 and 5B do not have a pipeline component.

Mitigation: No mitigation is proposed.

Impact: 7.4.6. Will the pipeline component increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?

Analysis: *No Impact; All Alternatives.*

Neither construction nor operation and maintenance of the pipelines will create an open body of water where mosquitoes could breed.

Any ponding created from a pipeline rupture will be temporary and will not exist long enough to support mosquitoes or other disease vectors.

Alternatives 1 and 5B do not have a pipeline component.

Mitigation: No mitigation is needed.

Storage Reservoir Component

Table 4.7-14

Public Health and Safety Component Impacts - Storage Reservoirs

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.5.1. Will the storage reservoir component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms, at concentrations detrimental to human health?	Exceedence of State or Federal drinking water standards or human health-based criteria at a domestic water source, or DHS standards for reclaimed water.	Yes; nitrate	P	⊙
7.5.2. Will the storage reservoir component expose workers or the public to hazards from a known hazardous waste site?	Ground disturbance within 500 feet of a hazardous waste site(s).	None	C	==

Table 4.7-14

Public Health and Safety Component Impacts - Storage Reservoirs

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.5.3. Will the storage reservoir component increase potential exposure of the public to hazardous materials due to a chemical release?	Any increase in use or storage of hazardous materials not in accordance with state and federal hazardous materials/waste regulations.	None	C O&M	==
7.5.4. Will the storage reservoir component expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of accessible excavations or creation of an accessible open body of water?	Use of heavy machinery, vehicles or equipment; creation of excavations; or creation of an open body of water in public areas not in accordance with State construction safety regulations.	None	C O&M	==
7.5.5. Will the storage reservoir component expose the public to a flooding hazard?	Increased hazard due to construction not in accordance with state and federal regulation.	No	P	==
7.5.6. Will the storage reservoir component increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?	Greater than 0 acres of new mosquito habitat.	Greater than 0 acres	O&M	⊙

Source: Parsons Engineering Science, Inc., 1996

Notes:

1. Type of Impact:
   - C — Construction
   - O&M — Operation and Maintenance
   - P — Permanent
2. Level of Significance codes:
   - ❍ — Less than significant impact; no mitigation proposed
   - ⊙ — Significant impact before mitigation; less than significant impact after mitigation
   - == — No impact

Impact: 7.5.1. Will the storage reservoir component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms, at concentrations detrimental to human health?

Analysis: *Significant; Alternatives 2 and 3.*

Seepage from reservoirs may result in levels of nitrate in private water supply wells that exceed maximum contaminant limits for drinking water.

Refer to Groundwater Section 4.5, evaluation criteria 1 and 2 for additional discussion.

No Impact; Alternatives 1, 4 and 5.

These alternatives do not have a storage reservoir component.

Mitigation: *Alternatives 2 and 3.*

2.3.12. Provide replacement water supply for affected wells.

Alternatives 1, 4, and 5. No mitigation is needed.

After Mitigation: *Less than Significant after Mitigation; Alternatives 2 and 3.*

Replacement water supply will mitigate public health impacts.

Impact: 7.5.2. Will the storage reservoir component expose workers or the public to hazards from a known hazardous waste site?

Analysis: *No Impact; All Alternatives.*

No potential hazardous waste sites were identified within 500 feet of any reservoir site. The Two Rock reservoir site is over a half mile from the existing landfill footprint of the Sonoma County Central Disposal Site. Because the landfill site is also separated from the reservoir by a drainage divide, groundwater analyses have determined that the reservoir will not be affected by any possible contamination from the landfill. Given the lack of any reported hazardous waste sites and that reservoirs are located in rural, upland areas, it is unlikely that hazardous waste issues at these sites will impact public safety.

Alternatives 1, 4, and 5 do not have a storage reservoir component.

Mitigation: No mitigation is needed.

Impact: 7.5.3. Will the storage reservoir component increase potential exposure of the public to hazardous materials due to a chemical release?

Analysis: *No Impact; All Alternatives.*

Any hazardous materials used in the construction or operation of the storage reservoirs will be stored and used in accordance with state and federal regulations regarding hazardous materials.

Alternatives 1, 4, and 5 do not have a storage reservoir component.

Mitigation: No mitigation is needed.

Impact: **7.5.4. Will the storage reservoir component expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of an accessible excavations; or creation of an accessible open body of water?**

Analysis: *No Impact; All Alternatives.*

Potential reservoir sites are located in rural areas with limited public access. General construction site safety procedures that limit public access (e.g., fencing) will further limit public access. Because the properties on which the reservoirs are located will be permanently fenced, public access to reservoirs will be limited during their operation and will not impact public safety. Heavy machinery and excavations will exist during construction but will be used in accordance with state construction safety regulations.

Alternatives 1, 4, and 5 do not have a storage reservoir component.

Mitigation: No mitigation is needed.

Impact: **7.5.5. Will the storage reservoir component expose the public to flooding hazard?**

Analysis: *No Impact; All Alternatives.*

All reservoirs will be created by damming a natural drainage or valley by means of an earth-filled embankment dam. Some reservoirs will include a smaller back/dam or saddle dams which will isolate a portion of the drainage area or adjoining drainage areas from the reservoir.

The design and construction of the reservoirs shall adhere to standards set by the California Department of Water Resources Division of Safety of Dams. The Division of Safety of Dams believes that adherence to these design and construction standards greatly reduces the probability of dam failure and is protective of public safety (Head 1996). During operation, the reservoirs will be visually inspected on a regular basis to ensure that the embankments, control structures, access roads, and monitoring instrumentation are maintained. All impediments will be removed from the spillway and other control structures as soon as they are observed.

Historically, earthen dams most often fail because an unusually heavy rain causes overtopping of the dam or because undetected surface or internal erosion, deformation, or sliding has weakened the dam. Contributing factors in these failures are improper siting, a lack of maintenance and monitoring, or inappropriate modification to an older structure (Jansen 1988). Maintenance, surveillance, and preparedness for emergencies are recognized as important activities that insure the safety of dams. With implementation of these measures, the risk of dam failure is estimated to be less than significant. Additional information regarding design of dams to withstand failure, and case histories of other dam failures in California is presented in Section 4.19. Although failure is extremely unlikely, the

California Office of Emergency Services requires preparation of an inundation map and development of a downstream evacuation plan for areas within the potential inundation area (California Water Code §6002, and California Government Code §8589.5). This requirement is discussed in Chapter 2, Measure 2.2.14, Dam Safety.

Alternatives 1, 4, and 5 do not have a storage reservoir component.

Mitigation: No mitigation is proposed.

Impact: 7.5.6. Will the storage reservoir component increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?

Analysis: *Significant; Alternatives 2 and 3.*

The impoundment of water will create potential habitat for mosquitoes. Shallow reservoirs with a large surface area to volume ratio, such as Tolay, will be more likely to create mosquito habitat than deeper reservoirs. Reservoirs with irregular shorelines will also be more likely to create mosquito habitat. Reservoirs will generally be filled during the winter and early spring and emptied during the summer as water is withdrawn for irrigation. Thus, potential mosquito habitat will be created by the reservoirs from the beginning of the rainy season (November) through late summer (September).

No Impact; Alternatives 1, 4 and 5.

These alternatives do not have a storage reservoir component.

Mitigation: *Alternatives 2 and 3.*

2.3.16 Mosquito Prevention Program

Alternatives 1, 4 and 5. No mitigation is needed.

After Mitigation: *Less than Significant after Mitigation; Alternatives 2 and 3.*

Mosquito abatement measures will reduce impacts to less than significant.

Pump Station Component

Table 4.7-15

Public Health and Safety Impacts by Component - Pump Stations

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.6.1. Will the pump station component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria or other disease organisms, at concentrations detrimental to human health?	Exceedence of State or Federal drinking water standards or human health-based criteria at a domestic water source, or DHS standards for reclaimed water.	None	O&M	==
7.6.2. Will the pump station component expose workers or the public to hazards from a known hazardous waste site?	Ground disturbance within 500 feet of a hazardous waste site(s).	Yes	C	⊙
7.6.3. Will the pump station component increase potential exposure of the public to hazardous materials due to a chemical release?	Any increase in use or storage of hazardous materials not in accordance with state and federal hazardous materials/waste regulations.	None	C, O&M	==
7.6.4. Will the pump station component expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of accessible excavations; or creation of an accessible open body of water?	Use of heavy machinery, vehicles or equipment; creation of excavations; or creation of an open body of water in public areas not in accordance with State construction safety regulations.	None	C, O&M	==
7.6.5. Will the pump station component expose the public to a flooding hazard?	Increased hazard due to construction not in accordance with state and federal regulations.	None	P	==
7.6.6. Will the pump station component increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?	Greater than 0 acres of new mosquito habitat.	None	O&M	==

Source: Parsons Engineering Science, Inc., 1996

Notes:
1. Type of Impact:
C Construction
O&M Operation and Maintenance
P Permanent

2. Level of Significance codes:
⊙ Significant impact before mitigation; less than significant impact after mitigation
-- Not Applicable
== No impact

Impact: **7.6.1, 5, 6. Will the pump station component affect public health and safety based on evaluation criteria 1, 5 and 6?**

Analysis: *No Impact; All Alternatives.*

There will be no reclaimed water released to the environment or to open bodies of water; therefore no exposure to reclaimed water, flooding, or mosquito habitat will occur.

Mitigation: No mitigation is needed.

Impact: **7.6.2. Will the pump station component expose workers or the public to hazards from a known hazardous waste site?**

Analysis: *Significant; Alternatives 2, 3 and 4.*

Construction of the pump stations may be affected by nearby releases of hazardous materials/wastes. The pump station-related construction activities that may potentially be impacted by releases of hazardous materials include clearing and grubbing, excavations, and installation or realignment of underground utilities. These activities will require soil excavation and possibly dewatering, which may expose or otherwise encounter hazardous materials/wastes. Specific Project impacts resulting from encountering hazardous materials/wastes during pump stations construction include potential exposure of workers to toxic chemicals in the environment, further contamination of environmental media, and Project schedule delays and budgetary impacts as a result of characterization, removal, and/or disposal of hazardous materials/wastes encountered.

The potential pathways of exposure to workers during the construction phase include dermal contact with contaminated soil and/or groundwater and inhalation of vapors migrating through the soil and into trenches. Impacts to environmental media could occur through the influence of dewatering systems on local contaminated plumes and the excavation of soil which would provide a low-pressure zone that may attract migrating vapor phase contaminants.

No Impact; Alternatives 1 and 5.

These alternatives do not have a pump station component.

Mitigation: *Alternatives 2, 3, and 4.*

2.3.15. Construction Management Program

Alternatives 1 and 5. No mitigation is needed.

After Mitigation: *Less than Significant after Mitigation; Alternatives 2, 3, and 4.*

Appropriate soil management will reduce impacts to less than significant.

Impact: 7.6.3. Will the pump station component increase potential exposure of the public to hazardous materials due to a chemical release?

Analysis: *No Impact; All Alternatives.*

Any hazardous materials used in the construction or operation of the pump stations will be stored and used in accordance with state and federal regulations regarding hazardous materials.

Alternatives 1 and 5 do not have a pump station component.

Mitigation: No mitigation is needed.

Impact: 7.6.4. Will the pump station component expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of excavations; or creation of an accessible open body of water?

Analysis: *No Impact; All Alternatives.*

Pump stations will be constructed adjacent to transmission pipelines in areas that are generally accessible to the public. Although heavy equipment (e.g., backhoes, excavators, trucks) will be used to construct the pumping stations, general construction safety practices such as site fencing or barricades will protect the public from these hazards during construction activities. Construction activities will not impact public safety.

Alternatives 1 and 5 do not have a pump station component.

Mitigation: No mitigation is needed.

Agricultural Irrigation Component

Table 4.7-16

Public Health and Safety Impacts by Component - Agricultural Irrigation

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.7.1. Will the agricultural irrigation component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria or other disease organisms, at concentrations detrimental to human health?	Exceedence of State or Federal drinking water standards or human health-based criteria at a domestic water source, or DHS standards for reclaimed water.	Does not exceed standards	O&M O&M-CP	❍ ❍
7.7.2. Will the agricultural irrigation component expose workers or the public to hazards from a known hazardous waste site?	Ground disturbance within 500 feet of a hazardous waste site(s).	Yes	C	⊙
7.7.3. Will the agricultural irrigation component increase potential exposure of the public to hazardous materials due to a chemical release?	Any increase in use or storage of hazardous materials not in accordance with state and federal hazardous materials/waste regulations.	None	C, O&M	==
7.7.4. Will the agricultural irrigation component expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of accessible excavations or creation of an accessible open body of water?	Use of heavy machinery, vehicles or equipment; creation of excavations; or creation of an open body of water in public areas not in accordance with State construction safety regulations.	None	C, O&M	==
7.7.5. Will the agricultural irrigation component expose the public to a flooding hazard?	Increased hazard due to construction not in accordance with state and federal regulations.	None	P	==

Table 4.7-16

Public Health and Safety Impacts by Component - Agricultural Irrigation

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.7.6. Will the agricultural irrigation component increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?	Greater than 0 acres of new mosquito habitat.	Temporary	O&M	❍

Source: Parsons Engineering Science, Inc., 1996

Notes:

1. Type of Impact:
   - C — Construction
   - O&M — Operation and Maintenance
   - P — Permanent
2. Level of Significance codes:
   - ⊙ — Significant impact before mitigation; less than significant impact after mitigation
   - ❍ — Less than significant impact; no mitigation proposed
   - == — No impact

Impact: **7.7.1. Will the agricultural irrigation component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms, at concentrations detrimental to human health?**

Analysis: *Less than Significant; Alternatives 2 and 3.*

Alternatives 2 and 3 propose an expansion of existing agricultural irrigation areas. About 18,000 acres of privately owned potential agricultural irrigation property is included in the West County area, 2,500 acres in the Sebastopol area, and 15,000 acres in the South County area. Of this total potential acreage, about 3,800 to 6,500 acres, depending upon the alternative, will actually be required. The irrigation season typically runs from March through November although there is a winter irrigation program which can be implemented as part of the Contingency Plan during dry winters.

Use of reclaimed water for agricultural irrigation via spray or drip methods (flood and furrow irrigation will not be used) could expose persons to any chemicals or microorganisms in reclaimed water via inhalation, dermal absorption, or inadvertent ingestion of spray irrigation or residues on crops. Persons could also be temporarily exposed to ponded reclaimed water from an accidental release; pipe break or over watering. If harmful chemicals or microorganisms are present at high enough concentrations they may induce adverse health effects. The potential for these adverse effects has been evaluated in a human health risk assessment (Parsons Engineering Science,

Inc. 1996). This analysis was summarized above under Impact 7.3.1 for urban irrigation. Public health issues of agricultural irrigation are essentially the same as those for urban irrigation.

No Impact; Alternatives 1, 4 and 5.

These alternatives do not have an agricultural irrigation component.

Mitigation: No mitigation is proposed.

Impact: 7.7.2. Will the agricultural irrigation component expose workers or the public to hazards from a known hazardous waste site?

Analysis: *Significant; Alternatives 2 and 3.*

Several hazardous materials/waste sites have been identified within 500 feet of agriculture irrigation areas.

No Impact; Alternatives 1, 4 and 5.

These alternatives do not have an agricultural irrigation component.

Mitigation: *Alternatives 2 and 3.*

2.3.15. Construction Management Program

Alternatives 1, 4, and 5. No mitigation is needed.

After Mitigation: *Less than Significant after Mitigation; Alternatives 2 and 3.*

Appropriate soil management will reduce impacts to less than significant.

Impact: 7.7.3. Will the agricultural irrigation component increase potential exposure of the public to hazardous materials due to a chemical release?

Analysis: *No Impact; All Alternatives.*

Any hazardous materials used in the construction or operation of the agricultural irrigation areas will be stored and used in accordance with state and federal regulations regarding hazardous materials.

Alternatives 1, 4, and 5 do not have and agricultural irrigation component.

Mitigation: No mitigation is needed.

Impact: 7.7.4. Will the agricultural irrigation component expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; creation of accessible excavations; or creation of an accessible open body of water?

Analysis: *No Impact; All Alternatives.*

Agricultural irrigation facilities will be constructed in areas that are generally not accessible to the public. General construction safety

practices such as site fencing, barricades, or signage will protect the public from these hazards during construction activities. Construction activities will not impact public safety.

Alternatives 1, 4, and 5 do not have and agricultural irrigation component.

Mitigation: No mitigation is needed.

Impact: 7.7.5. Will the agricultural irrigation component expose the public to a flooding hazard?

Analysis: *No Impact; All Alternatives.*

There is no danger of flooding due to agricultural irrigation even from an accidental release.

Alternatives 1, 4, and 5 do not have and agricultural irrigation component.

Mitigation: No mitigation is needed.

Impact: 7.7.6. Will the agricultural irrigation component cause an increase in the potential exposure of the public to disease vectors (i.e., mosquitoes)?

Analysis: *Less than Significant; Alternatives 2 and 3.*

Ponding may occur when irrigation rates exceed crop uptake, evapotranspiration, and percolation. Surface water that persists for more than four days provides potential habitat for mosquito larvae. Measure 2.2.7, Prohibit Creation of Mosquito Habitat, adopted as part of the Project, would reduce irrigation water ponding and over irrigation, thereby minimizing the potential for creation of mosquito habitat. Accidental ponding will be temporary and will not last long enough for mosquito habitat to develop.

No Impact; Alternatives 1, 4 and 5.

These alternatives do not have an agricultural irrigation component.

Mitigation: No additional mitigation is proposed.

Geysers Steamfield Component

Table 4.7-17

Public Health and Safety Impacts by Component - Geysers Steamfield

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.8.1. Will the geysers steamfield component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms, at concentrations detrimental to human health?	Exceedence of State or Federal drinking water standards or human health-based criteria at a domestic water source, or DHS standards for reclaimed water.	None	O&M	==
7.8.2. Will the geysers steamfield component expose workers or the public to hazards from a known hazardous waste site?	Ground disturbance within 500 feet of a hazardous waste site(s).	Yes	C	⊙
7.8.3. Will the geysers steamfield component increase potential exposure of the public to hazardous materials due to a chemical release?	Any increase in use or storage of hazardous materials not in accordance with state and federal hazardous materials/waste regulations.	None	C, O&M	==
7.8.4. Will the geysers steamfield component expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of accessible excavations or creation of an accessible open body of water?	Use of heavy machinery, vehicles or equipment; creation of excavations; or creation of an open body of water in public areas not in accordance with State construction safety regulations.	None	C, O&M	==
7.8.5. Will the geysers steamfield component expose public to a flooding hazard?	Increased hazard due to construction not in accordance with state and federal regulations.	None	P	==

Table 4.7-17

Public Health and Safety Impacts by Component - Geysers Steamfield

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.8.6. Will the geysers steamfield component increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?	Greater than 0 acres of new mosquito habitat.	None	O&M	==

Source: Parsons Engineering Science, Inc., 1996

Notes: 1. Type of Impact:
C Construction
O&M Operation and Maintenance
P Permanent

2. Level of Significance codes:
⊙ Significant impact before mitigation; less than significant impact after mitigation
== No impact
-- Not Applicable

Impact: **7.8.1, 3, 4, 5, 6. Will the geysers steamfield component impact public health and safety based on evaluation criteria 1, 3, 4, 5, and 6?**

Analysis: *No Impact; All Alternatives.*

Water will be injected into the geysers steamfield at a depth in excess of 3,000 feet and will not impact groundwater used as a domestic water source nor be released to the surface environment.

Construction activities for the geysers steamfield recharge will be conducted in accordance with state and federal regulations regarding materials and will not impact public safety.

Alternatives 1, 2, 3, and 5 do not have a geysers steamfield component.

Mitigation: No mitigation is needed.

Impact: **7.8.2. Will the geysers steamfield component expose workers or the public to hazards from a known hazardous waste site?**

Analysis: *Significant; Alternative 4.*

Three hazardous materials/waste sites have been identified within 500 feet of the geysers steamfield area.

No Impact; Alternatives 1, 2, 3, and 5.

These alternatives do not have a geysers steamfield component.

Mitigation: *Alternative 4.*

2.3.15 Construction Management Plan

Alternatives 1, 2, 3, and 5. No mitigation is needed.

After Mitigation: *Less than Significant after Mitigation; Alternative 4.*

Appropriate soil management will reduce impacts to less than significant.

Discharge Component

Table 4.7-18

Public Health and Safety Impacts by Component - Discharge

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.9.1. Will the discharge component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria or other disease organisms, at concentrations detrimental to human health?	Exceedence of State or Federal drinking water standards or human health-based criteria at a domestic water source, or DHS standards for reclaimed water.	Risk quotient is acceptable	O&M O&M-CP	❍
7.9.2. Will the discharge component expose workers or the public to hazards from a known hazardous waste site?	Ground disturbance within 500 feet of a hazardous waste site(s).	None	C	==
7.9.3. Will the discharge component increase potential exposure of the public to hazardous materials due to a chemical release?	Any increase in use or storage of hazardous materials not in accordance with state and federal hazardous materials/waste regulations.	None	C, O&M	==
7.9.4. Will the discharge component expose the public to safety hazards associated with operation of heavy machinery, vehicles, or equipment; or creation of accessible excavations or creation of an accessible open body of water?	Use of heavy machinery, vehicles or equipment; creation of excavations; or creation of an open body of water in public areas not in accordance with State construction safety regulations.	None	C, O&M	==
7.9.5. Will the discharge component expose the public to a flooding hazard?	Increased hazard due to construction not in accordance with state and federal regulations.	None	P	==

Table 4.7-18

Public Health and Safety Impacts by Component - Discharge

Evaluation Criteria	As Measured by	Impact	Type of Impact[1]	Level of Significance[2]
7.9.6. Will the discharge component increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?	Greater than 0 acres of new mosquito habitat.	None	O&M	==

Source: Parsons Engineering Science, Inc., 1996

Notes:
1. Type of Impact:
C Construction
O&M Operation and Maintenance
P Permanent

2. Level of Significance codes:
❍ Less than significant impact; no mitigation proposed
== No impact
-- Not Applicable

Impact: **7.9.1. Will the discharge component expose the public to chemicals, radionuclides, pathogenic viruses, bacteria, or other disease organisms, at concentrations detrimental to human health?**

Analysis: *Less than Significant; All Alternatives.*

Direct discharge of reclaimed water into the Laguna de Santa Rosa or the Russian River will not adversely affect water quality at drinking water sources and would not adversely affect human health via other potential exposure pathways. Possible human exposure pathways to reclaimed water that have been evaluated for the discharge components include movement of surface water to groundwater where it may be used as a domestic water supply, consumption of fish that have been exposed to reclaimed water, and exposure to surface water during recreational use of the river. These pathways were evaluated in a human health risk assessment for both the chemicals and microorganisms that historically have been detected in the Laguna Plant effluent (Parsons Engineering Science, Inc. 1996).

The human health risk assessment quantitatively assessed the health risk from domestic use (e.g., drinking, showering, washing) of undiluted reclaimed water and from eating fish exposed to reclaimed water. Exposure to the chemicals and microorganisms in reclaimed water via recreational contact with discharged, reclaimed water was evaluated qualitatively but not quantified. This approach was taken because the potential uptake of chemicals or microorganisms from exposure during recreational use of the Russian River or Laguna de Santa Rosa would be

much smaller than potential uptake via exposure to reclaimed water in a domestic use scenario, which includes ingestion, inhalation and dermal contact, and from eating fish. Chemicals that do not present an adverse health risk via the domestic use or fish consumption pathways will not present an adverse health risk to persons swimming or wading in the River.

Only historic concentrations of nitrate and nitrite in the Laguna Plant effluent exceed California and Federal drinking water standards and the human health criteria for the domestic use scenario (100 percent reclaimed water as a domestic water source). Discharges at a Russian River outfall, however, will be diluted with river water, which will bring the nitrate and nitrite levels below levels of concern even at the 20 percent discharge rate. In the Laguna de Santa Rosa, shallow groundwater conditions indicate that it is a groundwater discharge area, that is, during winter months (the discharge season) when groundwater levels are high, the prevailing hydrologic conditions result in movement of water from groundwater into streams (Section 4.5, Groundwater). Thus, neither discharge location will adversely affect drinking water quality at domestic water sources.

The human health risk assessment found no chemicals that presented an unacceptable risk via the fish consumption pathway. Swimming or wading will not adversely affect human health because ingestion during recreational exposure (possibly of a few milliliters on an irregular basis) would be very much less than ingestion in the domestic exposure, which assumes a person drinks 2 liters of water per day. In addition, discharge would occur during the time of year when the recreational activities that represent the highest potential level of exposure (i.e., swimming and wading) will be least likely to occur.

Microorganism concentrations (coliform bacteria) are below levels set by the State for reclaimed water usage for recreational impoundments. In addition, the concentrations of coliform bacteria in the Russian River upstream of the confluence with Mark West Creek are higher than the historical concentrations in the Laguna Plant effluent. Thus the discharge does not present any additional risk than already exists in the River, based on the presence of coliform bacteria. While *Giardia lamblia* cysts were detected in the Laguna Plant effluent, they do not present an unacceptable risk based on the EPA's risk criterion as stated in the Surface Water Treatment Rule and calculated in the human health risk assessment. In addition, *Giardia* cysts have been detected in the Russian River. No other pathogenic microorganisms (*Cryptosporidium*, *Legionella*, *Salmonella*, *Shigella*, or enteric viruses) were detected in the Laguna Plant effluent.

Mitigation: No mitigation is proposed.

Impact: **7.9.2, 3, 4, 5, and 6. Will the discharge component impact public health and safety based on evaluation criteria 2, 3, 4, 5, and 6?**

Analysis: *No Impact; All Alternatives.*

No hazardous materials/waste sites were identified within 500 feet of the Russian River outfall.

Any hazardous materials used in the construction or operation of the discharge facilities will be stored and used in accordance with state and federal regulations regarding hazardous materials.

Discharge facilities will be constructed in areas that are generally not accessible to the public. Although heavy equipment (e.g., backhoes, excavators, trucks) will be used to construct the outfall structure, general construction safety practices such as site fencing or barricades will protect the public from these hazards during construction activities. Construction activities will not impact public safety.

There will be no impacts from flooding or disease vectors because no impounded bodies of water will be created.

Mitigation: No mitigation is needed.

CUMULATIVE IMPACTS

There are four impacts -- either less than significant or significant -- identified in the Public Health and Safety section:

Impact: **7.1C. Will the Project plus cumulative projects expose the public to chemicals, radionoculides, pathogenic viruses, bacteria, or other disease organisms, at concentrations detrimental to human health?**

Analysis: Alternatives 2, 3 and 5. Standards set by the State Department of Health Services for exposure to reclaimed water are protective of farm workers and other workers who are exposed for long periods every day for a long duration exposure. Therefore, the Long-Term Project has been evaluated against standards intended for long duration exposures and cumulative impacts need not be considered.

For a discussion of increased nitrate in aquifers downgradient of reservoir sites refer to the Section 4.5, Groundwater.

Impact: **7.2C. Will the Project plus cumulative projects expose workers or the public to hazards from a known hazardous waste site?**

Analysis: Alternatives 2,3,4 and 5A. This exposure is a site-specific hazard and is not subject to cumulative impacts from other projects.

Impact: 7.3C. Will the Project plus cumulative projects increase potential exposure of the public to hazardous materials due to a chemical release?

Analysis: Alternatives 2, 3, 4, and 5. Because Project use of chlorine will be fully in accordance with applicable laws, and these laws are protective of public safety considering all hazardous chemical use, cumulative impacts are less than significant.

Impact: 7.5C. Will the Project plus cumulative projects expose the public to a flooding hazard?

Analysis: Alternative 2B. The potential inundation area of the Adobe Road reservoir would overlap with the potential inundation area of the proposed City of Petaluma reservoir for a small area south of Adobe Road. Because both would be built according to state and federal regulations, this would not be a significant impact. All other reservoirs will not be affected by other projects in the area.

Impact: 7.6C. Will the Project plus cumulative projects increase the potential exposure of the public to disease vectors (i.e., mosquitoes)?

Analysis: Alternatives 2 and 3. The list of cumulative projects includes new storage reservoirs for the City of Healdsburg, the City of Petaluma, the Sonoma County Airport, and the City of Santa Rosa for Gallo properties near Cotati (an interim project). Each of these projects could provide increased mosquito habitat. The Long-Term Project impacts are identified as significant and fully mitigated. The cumulative projects listed would also be subject to the same requirements of the Marin Sonoma Mosquito Abatement District and would be fully mitigated. Cumulative impacts after mitigation are not expected.

SUMMARY OF SIGNIFICANT IMPACTS AND MITIGATION MEASURES

Table 4.7-19

Summary of Significant Impacts and Mitigation Measures - Public Health and Safety

Impact	Level of Significance	Mitigation Measure
Pipeline Component		
7.4.2. The pipeline component may be constructed on or within a known hazardous waste site.	Alt. 2 - ⊙ Alt. 3 - ⊙ Alt. 4 - ⊙ Alt. 5A - ⊙	2.3.15. Construction Management Program
Storage Reservoir Component		
7.5.1. The storage reservoir component may expose the public to chemical, radionuclides, or pathogens at concentrations detrimental to human health.	Alt. 2 - ⊙ Alt. 3 - ⊙	2.3.12. Provide replacement water supply for affected wells.
7.5.6. The storage reservoir component may increase the potential exposure of the public to disease vectors.	Alt 2 - ⊙ Alt 3 - ⊙	2.3.16. Mosquito Prevention Program
Pump Station Component		
7.6.2. The pump station component may be constructed on or within a known hazardous waste site.	Alt. 2 - ⊙ Alt. 3 - ⊙ Alt. 4 - ⊙	2.3.15. Construction Management Program
Agricultural Irrigation Component		
7.7.2. The agricultural irrigation component may expose workers or the public to hazards from a known hazardous waste site.	Alt. 2 - ⊙ Alt. 3 - ⊙	2.3.15. Construction Management Program
Geysers Steamfield Component		
7.8.2. The geysers steamfield component may expose workers or the public to hazards from a known hazardous waste site.	Alt. 4 - ⊙	2.3.15. Construction Management Program

Source: Parsons Engineering Science, Inc., 1995

Notes:
⊙ Significant impact before mitigation; less than significant impact after mitigation

SUMMARY OF IMPACTS BY ALTERNATIVE

Table 4.7-20

Summary of Impacts by Alternative -Public Health and Safety

Component	Alt 1	Alt 2A	Alt 2B	Alt 2C	Alt 2D	Alt 3A	Alt 3B	Alt 3C	Alt 3D	Alt 3E	Alt 4	Alt 5A	Alt 5B
No Action (No Project) Alternative	❍	--	--	--	--	--	--	--	--	--	--	--	--
Headworks Expansion	--	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Urban Irrigation	--	❍	❍	❍	❍	❍	❍	❍	❍	❍	--	--	--
Pipelines	--	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	--
Storage Reservoirs	--	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	--	--	--
Pump Stations	--	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	--	--
Agricultural Irrigation	--	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	--	--	--
Geysers Steamfield	--	--	--	--	--	--	--	--	--	--	⊙	--	--
Discharge	--	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

Source: Parsons Engineering Science, Inc., 1996

Notes: Level of Significance Codes

-- Not applicable

== No impact

❍ Less than significant impact; no mitigation proposed

⊙ Significant impact; less than significant after mitigation

PREPARERS, REFERENCES, AND CONSULTATION AND COORDINATION

Preparers

Dennis Brown, Parsons Engineering Science, Inc.

Reviewers

John Hake, Parsons Engineering Science, Inc.
Sandia Potter, Parsons Engineering Science, Inc.
Linda Stone, Parsons Engineering Science, Inc.
Dave Smith, Merritt Smith Consulting
Robin P. Cort, Ph.D, Parsons Engineering Science, Inc.
Anders J. Hauge, Harland Bartholomew & Associates, Inc.
Patricia I. Collins, Harland Bartholomew & Associates, Inc.
John Cummings, Ph.D., Peer Review Committee
David Ziegler, Peer Review Committee

References

HBA Team Documents

Dames and Moore. 1996. *Dam Break Inundation Analysis.* January. (Appendix J-1).

Merritt Smith Consulting. 1996. *Reclaimed Water Quality.* (Appendix H-2)

Questa Engineering Corporation. 1996. *Irrigation Management Guidelines for West County and South County Alternatives*. July. (Appendix D-19).

Questa Engineering Corporation. 1996. *Urban Irrigation Management Guidelines.* (Appendix D-20).

Parsons Engineering Science, Inc. 1995. *Human Health Effects and Wildlife Effects of Environmental Estrogens*. September. (Appendix J-2).

Parsons Engineering Science, Inc. 1996. *Human Health Risks from Chemical and Biological Components of Reclaimed Water*. February. (Appendix J-3).

Other References

CH2M Hill, Inc. 1993. *Final Report, Russian River Demonstration Study*. July.

City of Cotati. 1994. *City of Cotati, 1994 Water Quality Annual Report*.

City of Petaluma. 1994. *1994 City of Petaluma Annual Water Quality Report.*

City of Rohnert Park. 1994. *City of Rohnert Park 1994 Annual Water Quality Report.*

City of Santa Rosa. 1991. *Hazardous Materials Management Plan, Laguna Water Reclamation Plant*. December 11.

City of Santa Rosa Utilities Department. 1994. *City of Santa Rosa, Water Quality Annual Report.*

City of Sebastopol Public Works Department. 1994. *Annual Water Quality Report for the Year Ended December 31, 1994.*

Environmental Rick Information & Imaging Services. 1995. *Environmental Database Search Summary Report*.

Jansen, R.B. 1988. *Dam Safety in America,* Hydro Review, pp. 10-20. June.

Madhaven, S., K.D. Rosenman, and T. Shehata 1989. *Lead in Soil: Recommended Maximum Permissible Levels,* Environmental Research 49: 136-142.

Sonoma County Water Agency. 1994. *Sonoma County Water Agency 1994 Water Quality Report.*

USEPA. 1994. *Drinking Water Standard Setting, Question and Answer Primer, EPA 811-K-94-001*. November.

Consultation and Coordination

Persons Contacted

Head, James, Engineer, Department of Water Resources, Division of Safety of Dams, personal communication, February 2, 1996.

Hulquist, Bob, Department of Health Services, personal communication, February 2, 1996.

Correspondence

None.