USEPA Superfund
Interim Action Record of Decision

Source Area Operable Unit
B.F. Goodrich Superfund Site
San Bernardino County, CA
EPA ID: CAN000905945

September 30, 2010

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Acronyms and Abbreviations

ARARs	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	Chemicals of Concern
DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DTSC	California Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
HQ	hazard quotient
LGAC	liquid-phase granular-activated carbon
MCLs	Maximum Contaminant Levels
MSL	mean sea level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NPV	Net Present Value
O&M	operation and maintenance
OU	operable unit
PRPs	potentially responsible parties
RAOs	Remedial Action Objectives
RASP	Rialto Ammunition Backup Storage Point
RCB	Rialto-Colton groundwater basin
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSL	Regional Screening Level

SA OU	Source Area Operable Unit
SCAQMD	South Coast Air Quality Management District
TCE	trichloroethene
TSD	Treatment, Storage, and Disposal
VFD	variable frequency drive
VGAC	vapor-phase granular-activated carbon
VOCs	volatile organic compounds
Water Board	California Regional Water Quality Control Board, Santa Ana Region
WVWD	West Valley Water District

Part 1: The Declaration

1.1 Site Name and Location

The Source Area Operable Unit (Source Area OU or SA OU) of the B.F. Goodrich Superfund Site (Site) is located in San Bernardino County in the city of Rialto, California. See Figure 1 for the Site location. The CERCLIS ID for the Site is CAN000905945.

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) selects an interim remedy for the Source Area OU of the B.F. Goodrich Superfund Site. The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for the Site. The State of California concurs with the selected remedy.

1.3 Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment, and/or from pollutants or contaminants from this Site which may present an imminent and substantial endangerment to public health or welfare.

1.4 Description of the Selected Remedy

EPA's selected remedy for the Source Area OU of the B.F. Goodrich Site is a groundwater pump and treat system intended to limit the movement of contaminated groundwater from the 160-acre source area. The 160-acre source area (160-acre area) is where most or all of the contaminants entered the groundwater and testing has identified the highest levels of groundwater contamination. The selected remedy is the first of at least two planned remedies to address contaminated groundwater at the Site. The Remedial Action Objectives (RAOs) of this first remedy are to: 1) protect water supply wells and groundwater resources by limiting the spread of contaminated groundwater from the 160-acre area; and 2) remove the contaminants from the groundwater. The remedy will be designed to intercept and provide hydraulic control (also known as hydraulic containment or hydraulic capture) of contaminated groundwater in a targeted area of contamination during all expected groundwater flow conditions.

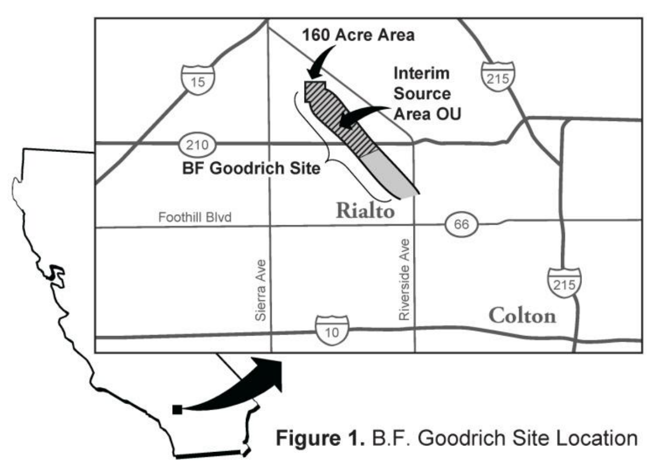

Figure 1. B.F. Goodrich Site Location

To evaluate compliance with EPA's objectives, the remedy includes a monitoring program that will provide data to determine if the remedy is achieving hydraulic control of the targeted area of contamination. The evaluation will examine if the hydraulic capture zone created by the remedy encompasses the targeted portions of the aquifers during all groundwater flow conditions.

Compliance with EPA's objectives will also be evaluated by determining if contaminant concentrations in groundwater at compliance wells constructed downgradient of the extraction locations decrease over time.

In addition to the SA OU, one or more additional remedies are planned to address human health risks posed by contaminated groundwater that has already moved past the area targeted by this remedy. EPA also plans to determine the appropriate in situ cleanup goals for the aquifer and evaluate the feasibility of cleaning up contaminated soil.

The remedy for the SA OU includes the construction and operation of the following components, as depicted in Figure 2.

- Groundwater extraction wells pumping approximately 1,500 to 3,200 gallons per minute (gpm) of contaminated water, located approximately 1.5 miles downgradient of the 160-acre source area and no more than 1,500 feet downgradient of the Intermediate and Regional Aquifer Target area defined in Section 2.4.8
- Liquid-phase granular-activated carbon (LGAC) or other effective water treatment systems to reduce the concentrations of trichloroethene (TCE) and other volatile organic compounds (VOCs) in the extracted groundwater below levels allowed by federal and state drinking water standards
- Ion exchange water treatment systems or other effective water treatment systems to reduce the concentration of perchlorate in the extracted groundwater below the level allowed by the state drinking water standard

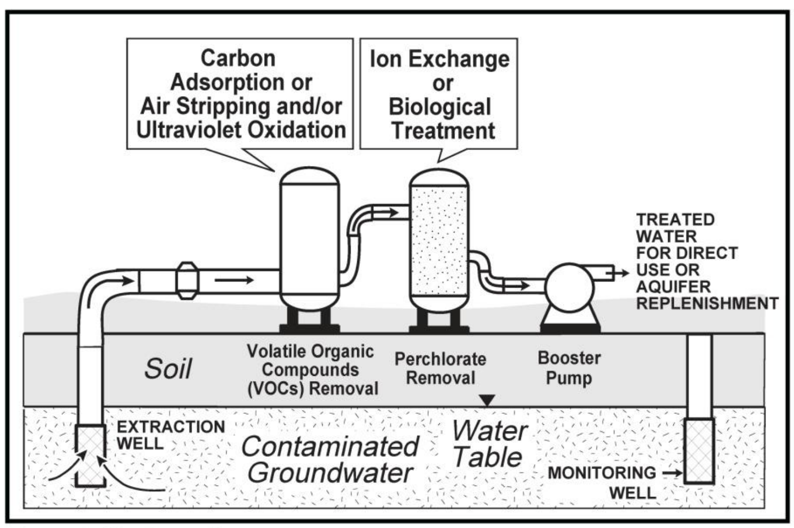

Figure 2. Site Remedy

- Pipelines and pumps to convey the contaminated water from the groundwater extraction wells to the treatment plant
- Pipelines and pumps to convey the treated water from the treatment plant to one or more local water utilities for distribution to the utility's customers as drinking water supply (or to reinjection wells to replenish the aquifer if agreements cannot be reached with the water utilities in a reasonable period of time to distribute the water)
- A groundwater monitoring program

The extraction, treatment, and conveyance systems will have a capacity of 3,200 gpm unless EPA determines during the remedial design process that more or less capacity is required to meet the RAOs.

1.5 Statutory Determinations

The selected remedy is protective of human health and the environment in the short term and is intended to provide adequate protection until a final ROD is signed. The remedy complies with federal and state requirements that are applicable or relevant and appropriate to this interim remedial action, and is cost-effective.

Although this interim action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, the remedy does utilize treatment and thus supports the statutory mandate. Because this action does not constitute the final remedy for the Site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action. Subsequent actions are planned to fully address the threats posed by conditions at this Site.

Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within 5 years after commencement of the remedial action. Because this is an interim action ROD, review of this Site and remedy will be ongoing as EPA continues to develop remedial alternatives for the Site.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for this Site.

- Chemicals of concern (COCs) and their respective concentrations (Section 2.6.1)
- Baseline risk represented by the COCs (Section 2.6.4)
- Cleanup levels established for COCs and the basis for these levels (Section 2.11.2.2)
- Current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD (Section 2.5)
- Potential groundwater use that will be available at the Site as a result of the selected remedy (Section 2.11.4)
- Estimated capital, annual operation and maintenance (O&M), and total present value costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.11.3)
- Key factors that led to selecting the remedy (such as how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria) (Section 2.11.1)

1.7 *Authorizing Signatures and Support Agency Acceptance of Remedy*

This ROD documents the Interim Remedy for contaminated groundwater at the Source Area Operable Unit of the B.F. Goodrich Site. The remedy was selected with the concurrence of the State of California. The Assistant Director of the Regional Superfund Division has been delegated the authority to approve and sign this ROD.

Kathleen Salyer | 9/30/10

Kathleen Salyer
Assistant Director, Superfund Division
California Site Cleanup Branch
U.S. Environmental Protection Agency Region IX

Date

Part 2: Decision Summary

2.1 Site Name, Location, and Description

The B.F. Goodrich Superfund Site includes soil and groundwater contaminated with perchlorate, trichloroethene, and other chemicals in an industrial area in Rialto, California known as the 160-acre area. The Site, located about 60 miles east of the city of Los Angeles, also includes contaminated groundwater that has spread from the 160-acre area. See Figure 1 for the Site location and Figure 3 for an aerial photo of the Rialto area (looking to the northwest toward the San Gabriel and San Bernardino Mountains). Land use in the area overlying the contaminated groundwater is largely industrial, commercial, and residential, and a limited amount of open space. EPA's CERCLIS ID No. for the Site is: CAN000905945.

Figure 3. Aerial Photo of the Rialto Area (looking to the northwest)

From 2002 until about 2008, the California Regional Water Quality Control Board, Santa Ana Region (Water Board) led investigation and cleanup efforts at the Site. EPA added the Site to the Superfund National Priorities List (NPL) in September 2009 and is now the lead agency for the Site. The Water Board is the primary state agency supporting EPA's efforts.

The California Department of Toxic Substances Control (DTSC) is also involved at the Site. DTSC's primary responsibility is the investigation and remediation of an operation on the 160-acre area associated with a former treatment, storage, and disposal facility (a TSD facility).

The groundwater at or near the Site is a vital resource for residents of the cities of Rialto and Colton. The Rialto-Colton groundwater basin (RCB), in which some or all of the Site is located, has in recent years supplied more than 8 million gallons of drinking water per day, enough water to meet the needs of tens of thousands of area residents. The contamination has forced the closure of many drinking water supply wells in the basin.

EPA's response activities at the Site have been conducted primarily under the authority established in the federal Superfund law, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. Section 9601 et seq. Remedial investigation work at and near the Site has been completed by EPA, Potentially Responsible Parties, local water utilities, the County of San Bernardino, the U.S. Geological Survey, and others.

Since about 2005, the U.S. Department of Defense (DOD) has spent or committed approximately $20 million in public funds to the Rialto area, primarily to demonstrate and evaluate water treatment technologies capable of removing perchlorate from contaminated water supply wells. Some of water treatment systems installed with DOD funding are now operated by local water utilities. The water treatment systems have been installed on wells some distance from the 160-acre area; not in the areas targeted by the SA OU. The State of California has also provided or committed approximately $19 million in funds to pay for water treatment systems at and near the Site.

The SA OU is not intended to address an area of groundwater contamination to the south and west of the 160-acre area, which originates, at least in part, in an area where earthen-covered concrete storage igloos were constructed by the U.S. Army in the 1940s. That area is now known as the former bunker area and is shown in Figure 4. Most of the igloos were demolished in 1998 after the County of San Bernardino purchased the property for expansion of the Mid-Valley Sanitary Landfill (MVSL).

2.2 Site History and Enforcement Activities

The following sections provide a site history, and summarize enforcement activities and community participation activities at the Site.

2.2.1 Site History

In 1942, the U.S. Army acquired 2,822 acres of mostly undeveloped land for use as the Rialto Ammunition Backup Storage Point (RASP). The U.S. Army subsequently developed and operated on approximately 740 of the 2,822 acres. The 740-acre area includes most or all of the 160-acre area. The RASP included a network of rail spurs to store rail cars, bunkers adjacent to the rail spurs, approximately 20 earthen-covered concrete storage igloos, approximately four magazines used to store ammunition, and assorted buildings. The RASP was an inspection, consolidation, and storage facility for railcars transporting bombs, ammunition, and other ordnance to the Port of Los Angeles, California. The materials handled at the RASP are likely to have included flares and other pyrotechnics containing perchlorate salts.

In 1946, after World War II ended, the United States government sold the RASP property. Since then, portions of the former RASP property have been used by a variety of defense contractors, fireworks manufacturers, and others who used perchlorate salts and other chemicals in their manufacturing processes or in their products.

From about 1952 to 1957, the West Coast Loading Corporation tested and manufactured pyrotechnic devices onsite. West Coast Loading Corporation manufactured photoflash flares and ground-burst simulators, both containing potassium perchlorate, used its facility in 1957 to dry a large amount of ammonium perchlorate, and disposed of wastes onsite.

From about 1957 to 1962, B.F. Goodrich Corporation (Goodrich) conducted research, development, testing, and production of solid-fuel rocket propellant and solid-fuel missile and rocket motors containing ammonium perchlorate, used chlorinated solvents in its operations, and disposed of wastes in one or more onsite pits.

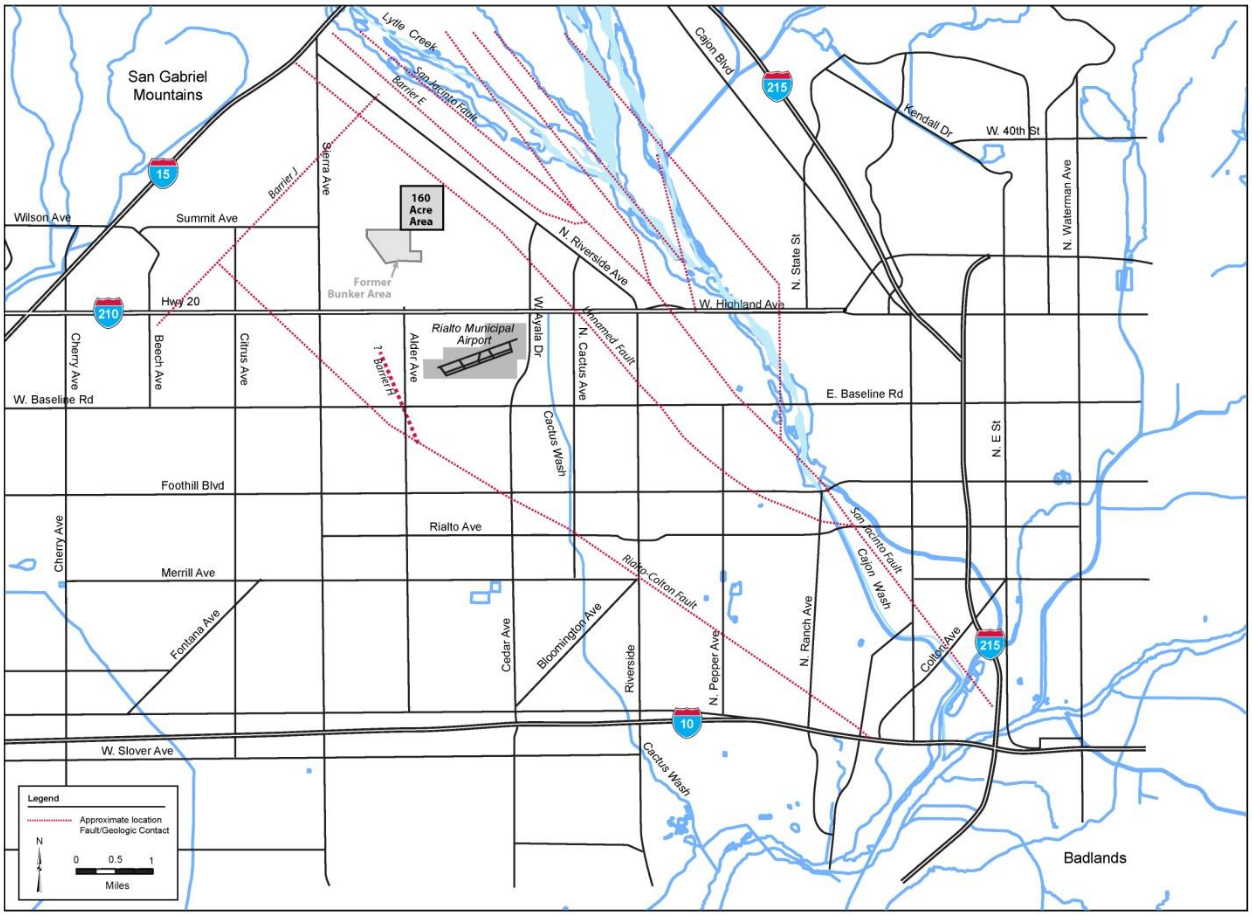

Figure 4. B.F. Goodrich Site and Vicinity Key Features

From about 1968 to 1987, Pyrotronics (including its Apollo, Red Devil, and California Display Fireworks divisions) manufactured, tested, and distributed pyrotechnics containing potassium perchlorate, and disposed of wastes onsite.

Since 1979, Pyro Spectaculars Inc. (PSI), a public display fireworks operator, wholesaler, and importer and exporter of fireworks, has operated on the 160-acre area. PSI has tested fireworks, burned waste materials, and disposed of wastes onsite.

Since about 1989, American Promotional Events – West (APE-West) has operated on the 160-acre area. APE-West has tested and stored fireworks containing potassium perchlorate and burned defective and off-spec fireworks onsite.

2.2.2 Enforcement Activities

Enforcement efforts by the State of California began in about 2002, when the Water Board directed multiple parties to investigate the extent of soil and/or groundwater contamination at and near the Site. Between 2002 and 2008, the Water Board issued approximately 23 directives to current and past property owners and tenants pursuant to state authority, requiring submittal of information, soil testing, and/or groundwater testing. Since 2005, the California Department of Toxic Substances Control (DTSC) has also directed and overseen soil testing on a portion of the Site.

EPA enforcement efforts have included the issuance of a Unilateral Administrative Order for Remedial Investigation (RI) work (2003), notifications to three companies that operated at the Site (or their corporate successors) and two current property owners that may be responsible for the contamination (2008), an Administrative Order on Consent for RI work (2009), and a complaint filed by the U.S. Department of Justice (DOJ) on EPA's behalf pursuant to CERCLA and the Resource Conservation and Recovery Act (RCRA) seeking reimbursement of costs and performance of response actions by the defendants to the lawsuit (2010).

2.2.3 Community Participation

The January 2010 Remedial Investigation/Feasibility Study (RI/FS) Report and Proposed Plan for the SA OU of the B.F. Goodrich Site were made available to the public on or about February 2, 2010. (Note that the RI/FS and Proposed Plan refer to the OU as the Interim Source Area Operable Unit. The name has been shortened to the Source Area Operable Unit to improve the readability of the ROD.) They were added to EPA's website and EPA's two information repositories maintained at the EPA Superfund Records Center (located at 95 Hawthorne Street in San Francisco, CA 94105) and at the Rialto Branch Library (located at 251 West 1st Street in Rialto, CA 92376). Documents included in the Administrative Record file were also made available at the two repositories. Copies of the Proposed Plan were sent on February 3, 2010, by email to approximately 68 parties and by regular mail to approximately 40 parties on EPA's site mailing list. Eighty copies of the Proposed Plan were provided on or about February 5, 2010 to a local environmental justice organization. A notice of the availability of the Proposed Plan was published in the San Bernardino Sun and Riverside Press-Enterprise newspapers on February 5, 2010. A public comment period was held from February 5, 2010, to March 8, 2010. During the public comment period, on February 10, 2010, a public meeting was held to present the Proposed Plan to the community. At this meeting, EPA representatives answered questions about the proposal and received one formal public comment on the plan. EPA's responses to comments on its proposed cleanup plan are included in the Responsiveness Summary, which is part of this ROD.

EPA also held a public meeting on December 12, 2009, to provide an update on EPA's investigation and cleanup efforts and to inform the community that a proposed cleanup plan would be available early in 2010. EPA will provide future updates through public meetings, fact sheets, email updates, public notices, and its website. Additionally, EPA has begun preparation of a formal Community Involvement Plan for the Site.

2.3 Scope and Role of Operable Unit

As is the case at many Superfund sites, the problems at the B.F. Goodrich Site are complex. Because of this complexity, EPA has organized its work at the Site into two operable units (OUs). An OU defines a discrete action that is an incremental step toward cleanup of a Superfund site.

The Source Area Operable Unit (SA OU), the subject of this ROD, is the first OU at the B.F. Goodrich Site. The SA OU reflects EPA's first priority at the Site, which is to limit further spread of the most-contaminated groundwater at the Site. The interim action will neither be inconsistent with, nor preclude, implementation of the final remedy. Because this action is considered interim, EPA is not setting numeric cleanup goals for the groundwater in the aquifer at this time (i.e., *in situ* cleanup goals).

Contaminated groundwater exceeding state and/or federal Maximum Contaminant Levels (MCLs) has already moved past the area targeted by this cleanup plan. One or more additional OUs are planned to address human health risks posed by this downgradient area after groundwater flow directions and the extent of contamination in the downgradient area are better understood. In 2009 and 2010, EPA completed a $3 million effort to install new groundwater monitoring wells and carry out other testing to better define the nature and extent of contamination in the downgradient area. As of September 2010, evaluation of data from the testing is ongoing.

EPA will determine cleanup goals for the aquifer in a future action and will evaluate the feasibility of cleaning up contaminated soil at the Site.

2.4 Site Characteristics

The following sections provide a conceptual site model, an overview of the site, and a summary of groundwater resources, chemical contaminants, the Site sampling strategy, known or suspected sources of contamination, the nature and extent of contamination, and the area and depth of groundwater contamination targeted by this remedy.

2.4.1 Conceptual Site Model

In the conceptual model for the Site (see Figure 5), perchlorate was released to the environment at multiple locations on the 160-acre area over a period of decades. Release mechanisms are assumed to have included onsite disposal in one or more unlined pits, leakage or overflow from an onsite impoundment, airborne dispersion of material handled during manufacturing, disposal of contaminated rinse water onto unpaved areas, and explosions. Releases began in the 1950s, and possibly earlier. VOCs are assumed to have been released to the environment in multiple locations at the 160-acre area by onsite disposal in one or more unlined pits and/or other means.

The contaminants released to the environment contaminated surface soils, then moved downward to the groundwater through the several-hundred-foot-thick vadose zone. The downward movement of contaminants is the result of infiltration and percolation of rainfall and other liquids as well as diffusion.

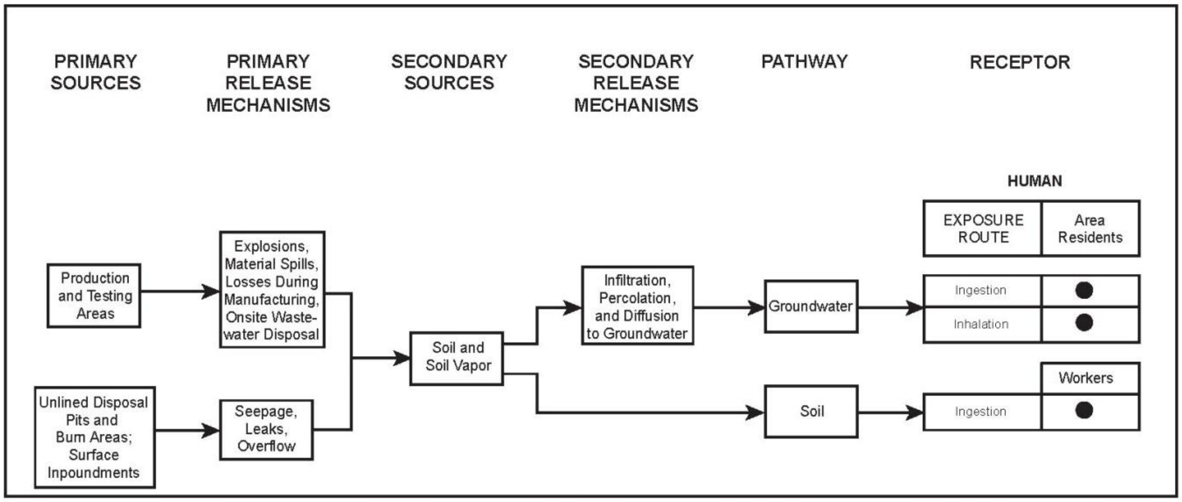

Figure 5. B.F. Goodrich Conceptual Site Model

Above-average rainfall in the Rialto Colton area during the winter of 2004-2005 resulted in a significant increase in groundwater levels later in 2005 and a one to two order of magnitude increase in groundwater contaminant concentrations at the Site. The increase in contaminant levels suggests that a significant amount of contaminant mass is still present in the vadose zone.

The contaminated groundwater poses a risk to human health if used for potable water supply. Large municipal water supply production wells are used to extract groundwater at the Site. These production wells typically draw groundwater from the Regional Aquifer with screened intervals ranging from several hundred to over one thousand feet below ground surface (bgs). There was a municipal water supply well (West Valley Water District [WVWD] Well 22) screened in the shallower interval known as the Intermediate Aquifer until the late 1990s, when the well was converted into a groundwater monitoring well.

2.4.2 Site Overview

The B.F. Goodrich Site includes contaminated soil and groundwater in a 160-acre industrial area, and contaminated groundwater that has spread from the 160-acre area over a distance of at least three miles. The land surface at the Site gently slopes from an elevation of approximately 1,700 feet above mean sea level (MSL) at the 160-acre area to approximately 1,300 feet above MSL several miles to the southeast. Most rainfall at the Site occurs from about November through April, with mean annual precipitation in the city of San Bernardino (located approximately 7 miles east of the Site) of approximately 16 inches. The average maximum summer temperature is 96 degrees Fahrenheit; the average winter minimum is 40 degrees Fahrenheit.

There are no perennial streams or rivers or natural wetlands at the Site. The most prominent surface water feature at the Site is the Cactus Wash, which is a former stream channel that has been channelized and severely altered to accommodate development and provide flood control. See Figure 4 for the location of the Cactus Wash.

2.4.3 Groundwater Resources at the Site

The Site includes a portion of the RCB. In recent years, the groundwater basin has supplied more than 8 million gallons of drinking water per day, enough water to meet the needs of tens of thousands of area residents. There are more than 20 large municipal drinking water supply wells in the RCB. The contamination has forced the closure of many of the wells, but some of these wells, equipped with water treatment systems to remove the contaminants, have reopened and currently provide drinking water. See Figure 6 for well locations.

The RCB is an alluvial basin located south of the San Gabriel and San Bernardino Mountains. The basin is approximately 10 miles long, from 1.5 to 3.5 miles wide, and is bounded by geologic faults on its western, northern, and eastern sides.

The RCB is filled with unconsolidated alluvial material consisting of sand, gravel, and boulders interbedded with lenticular deposits of silt and clay. Alluvial sediments in much of the RCB are about 500 to 1,000 feet deep. The unconsolidated alluvium is underlain by partly consolidated and consolidated continental deposits. The basement complex consists of metamorphic and igneous rocks.

The unconsolidated alluvial material contains groundwater in multiple water-bearing layers. At the 160-acre area, the depth to groundwater in the first layer, known as the Intermediate Aquifer, is currently about 400 to 450 feet bgs. The Intermediate Aquifer is unconfined, about 50 to 100 feet thick, and is underlain by a laterally extensive aquitard. It is comprised of multiple thin water-bearing units separated by thin aquitards and dry intervals. The deeper water-bearing layer, known as the Regional Aquifer, is generally unconfined to partly confined, and is about 300 to 500 feet thick. Potentiometric heads are as much as 150 feet higher in the Intermediate Aquifer than in the underlying Regional Aquifer, resulting in a strong downward hydraulic gradient between the two aquifers. About one to one and half miles to the southeast of the 160-acre area, the Intermediate Aquifer disappears and only the Regional Aquifer is present. Figure 7 depicts the two aquifers.

Groundwater flow in the RCB is strongly influenced by the presence of several geologic faults that restrict groundwater flow. Groundwater in the Intermediate Aquifer generally flows to the southeast, parallel to two major faults, at a speed of up to several feet per day. Groundwater in the Regional Aquifer generally flows to the southeast at an average rate of about one foot per day. Groundwater elevations and flow rates in the RCB vary both seasonally and year to year. The primary cause of this variability is year to year change in precipitation and associated recharge, although seasonal and year-to-year variability in groundwater pumping also affects water levels and groundwater flow directions.

Historical water level measurements from water supply wells screened in the Regional Aquifer indicate that water levels have varied by more than 100 feet during the period of record (1962-2009). From 2001 to 2009, drought and increased groundwater production have caused a significant decline in groundwater levels.

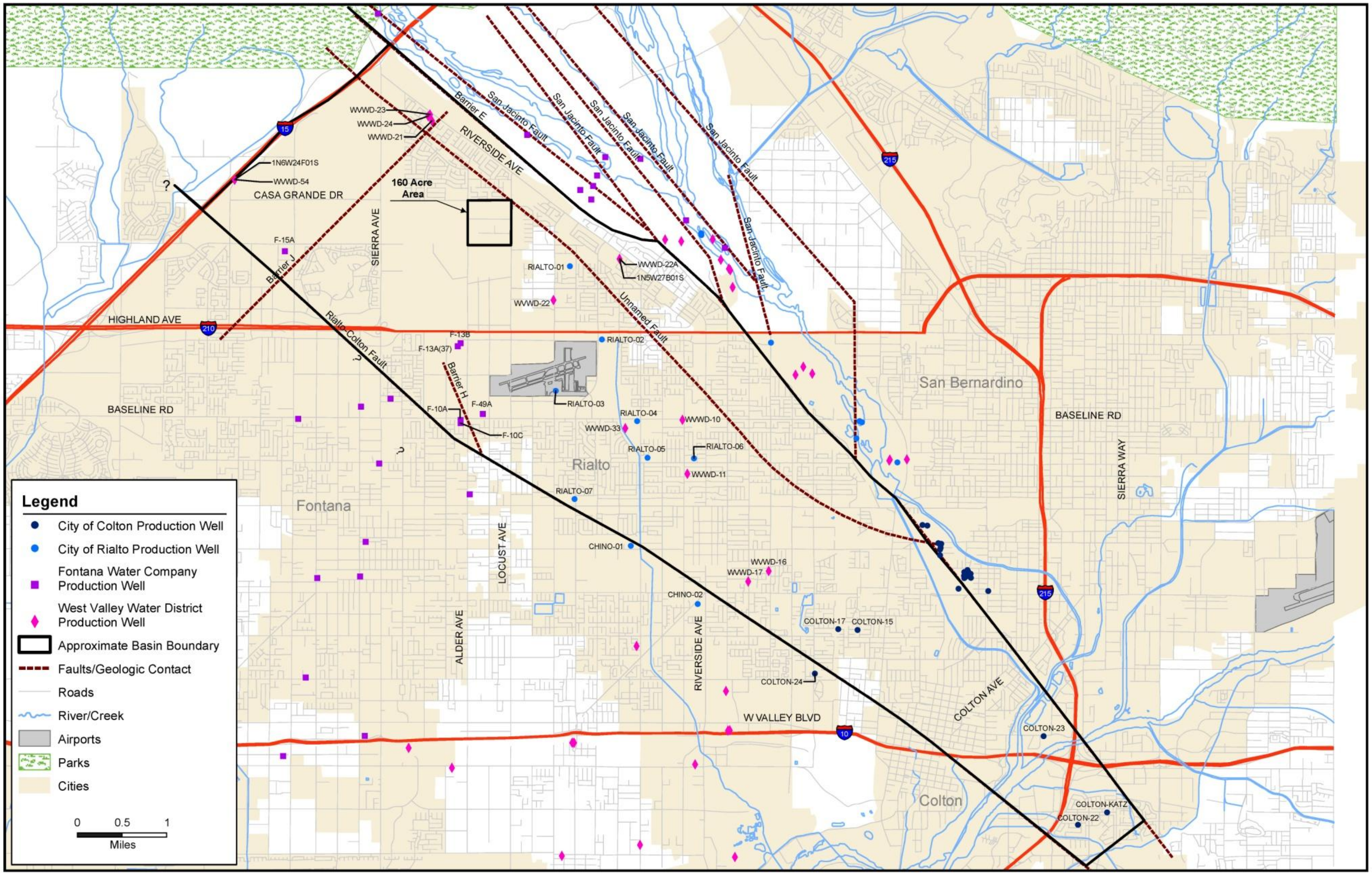

Figure 6. Drinking Water Supply Well Location Map

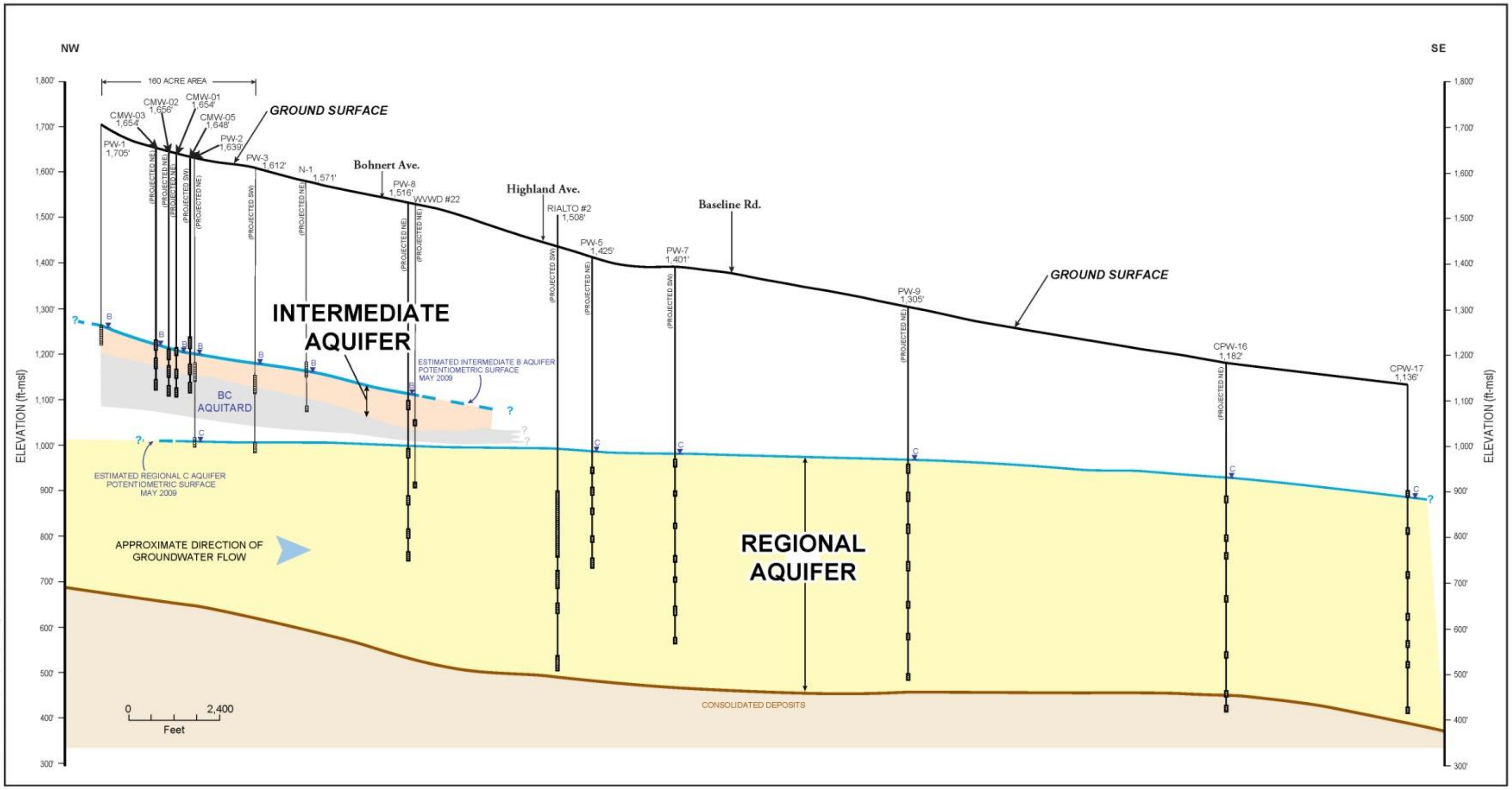

Figure 7. Rialto-Colton Groundwater Basin Aquifers

The primary source of water to the RCB is subsurface inflow from adjacent groundwater basins. Most of the groundwater leaves the RCB via municipal drinking water supply wells or as subsurface flow into adjacent groundwater basins. EPA has developed a groundwater flow model to help evaluate the effectiveness of remedial alternatives, as described in the January 2010 RI/FS Report.

2.4.4 Chemical Contaminants

Table 1. Chemicals of Concern ***B.F. Goodrich Site - Source Area OU ROD***
carbon tetrachloride
chloroform
methylene chloride
trichloroethene (TCE)
perchlorate

Table 1 lists the chemicals of concern (COCs) at the Site. They include perchlorate, TCE, carbon tetrachloride, chloroform, and methylene chloride. The latter four chemicals are VOCs. Perchlorate salts are inorganic chemicals used as oxidizers in rocket propellant, flares, fireworks, and other products. TCE and carbon tetrachloride are cleaning solvents used extensively in the 1950s and 1960s. Employees of businesses that operated in the 160-acre area in the 1950s and 1960s have testified that perchlorate, TCE, and other solvents were handled or used at the Site. Perchlorate, TCE, and carbon tetrachloride can persist in groundwater for decades.

2.4.5 Sampling Strategy

EPA used data from its groundwater sampling efforts in January 2008 and March and April 2009, and existing data generated by a variety of sources between 2003 and 2009, to provide information needed for the RI/FS.

EPA's January 2008 sampling effort included the collection and analysis of groundwater samples from 42 existing groundwater wells or well zones. Some groundwater monitoring wells have as many as six sampling ports to allow the collection of discrete samples from various depths. The wells are located upgradient, on, and as far as about three miles downgradient of the 160-acre area.

EPA's March and April 2009 sampling effort included the collection and analysis of groundwater samples from 55 existing wells or well zones. The wells are located upgradient, on, and as far as about five miles downgradient of the 160-acre area. In both sampling events, EPA selected key wells to verify results generated by other parties and to update results from wells that had not been sampled recently. Additional details regarding these sampling events are provided in the January 2010 RI/FS Report and in supporting documents in the Administrative Record.

EPA also used groundwater data generated by Potentially Responsible Parties (PRPs), local water utilities, and others between 2004 and 2009 for over 90 groundwater wells or well zones.

EPA also used soil and soil gas data generated by EPA, PRPs, current property owners, and others to characterize current and potential sources of groundwater contamination at the Site. A partial list of reports documenting the results of soil and soil gas testing at the Site is included as Table 1-1 in the January 2010 RI/FS Report.

2.4.6 Known or Suspected Sources of Contamination.

Groundwater testing at eight locations on or at the downgradient end of the 160-acre area (at the CMW-1 through CMW-5 groundwater monitoring well clusters, and at the PW-2, PW-3, and PW-4 groundwater monitoring wells) indicates that there are multiple locations on the 160-acre area where COCs have reached the groundwater. See Figure 8 for well locations. Groundwater testing upgradient of the 160-acre area (e.g., wells WVWD-24 and PW-1) indicates that there are only minor sources of perchlorate and no sources of TCE or other VOCs immediately upgradient of the 160-acre area. Perchlorate has been detected in the upgradient well PW-1 in 3 of 17 sampling events, at concentrations ranging from 1.2 to 6.3 micrograms per liter (µg/L). TCE has not been detected in PW-1 or WVWD-24. The PW-1 through PW-4 wells monitor one depth interval in the Intermediate Aquifer and the CMW locations each include three wells that monitor a different depth interval in the Intermediate Aquifer. Soil and soil gas testing have identified multiple locations where COCs have been spilled, dumped, or otherwise released at ground surface on the 160-acre area.

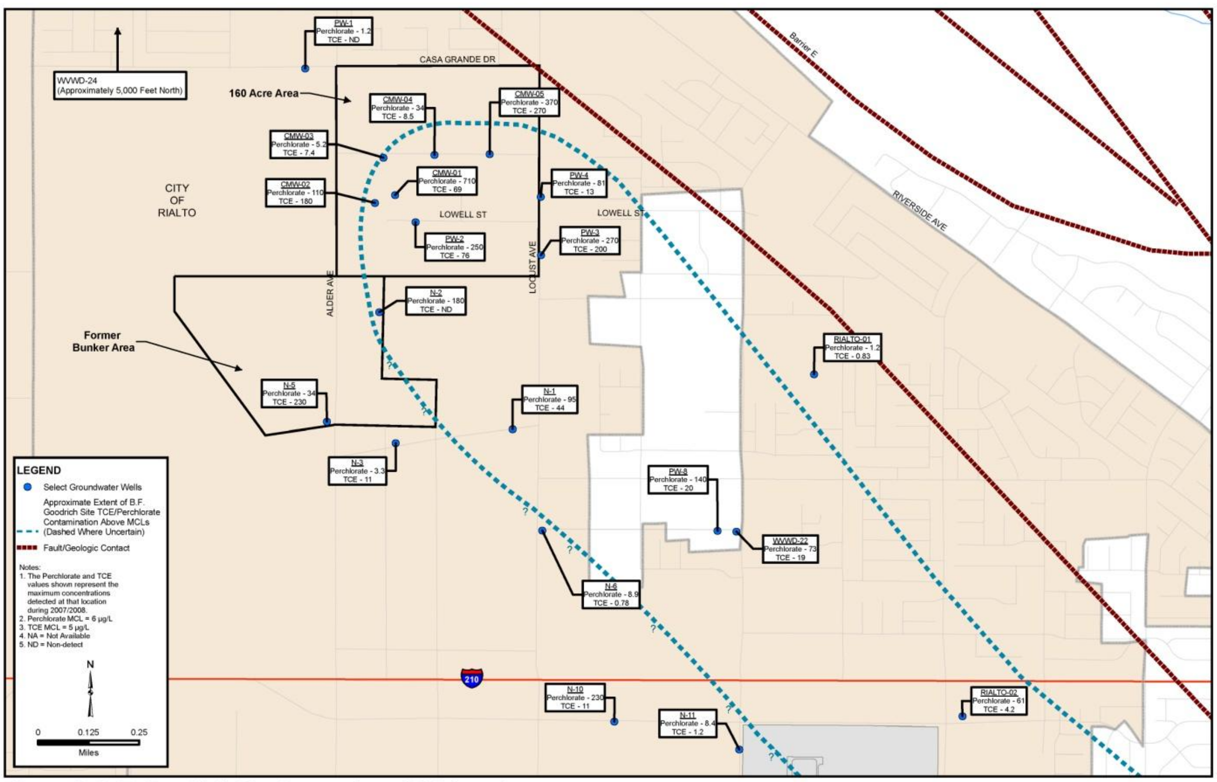

Figure 8. B.F. Goodrich Site Source Area Well Locations

2.4.7 Nature and Extent of Contamination at the Site

The maximum perchlorate and TCE concentrations at the Site detected in groundwater samples analyzed in 2007 and 2008 are shown in Figure 11. A contour has been drawn on the figure to indicate the approximate extent of contamination in excess of drinking water MCLs associated with the Site.

The highest perchlorate concentration detected in groundwater at the Site is 10,000 μg/L. This concentration was detected at groundwater monitoring well PW-2 in April 2006, after Intermediate Aquifer water levels rose dramatically in 2005 in response to record rainfall in early 2005. The 10,000 μg/L perchlorate level was two orders of magnitude higher than the concentration measured less than 12 months earlier at the same location, suggesting that there was (and continues to be) substantial contaminant mass in the Intermediate Aquifer and overlying vadose zone. The peak TCE concentration of 1,500 μg/L was detected in groundwater monitoring well CMW-1A, in July 2006.

As shown in Figure 6, approximately 4,000 feet downgradient of the 160-acre area is WVWD well WVWD-22, which was used as a water supply well until 1990. It was later converted into a monitoring well cluster with screens in the Intermediate and Regional Aquifers. Well WVWD-22 is the location where TCE and perchlorate contamination were first detected at the Site. TCE was detected first, in 1989, then perchlorate in 1997. Perchlorate concentrations in well WVWD-22 have been as high as 1,000 μg/L; TCE concentrations have been as high as 76 μg/L. Perchlorate and/or TCE have affected four City of Rialto groundwater wells at the Site and may have affected other WVWD and City of Colton wells.

As illustrated in Figure 9, the groundwater contamination at the 160-acre area (shown at the left end of the figure) appears to be limited to the Intermediate Aquifer and portions of the BC Aquitard. The exact location where the contaminated groundwater first moves downward from the Intermediate Aquifer into the Regional Aquifer has not been determined, but is likely to be downgradient of the 160-acre area. The downward movement could be the result of leakage through the BC Aquitard or, more likely, from downward movement through wells screened in both aquifers. At the WVWD-22 well site, monitoring data confirm that groundwater in both the Intermediate and Regional Aquifers is contaminated. Further downgradient from the 160-acre area, between wells WVWD-22 and Rialto-02, the BC Aquitard pinches out and the Intermediate and Regional Aquifers merge.

Contaminated groundwater originating at the 160-acre area has been detected further downgradient of WVWD-22 at monitoring well PW-5, located approximately two miles from the 160-acre area; at well PW-7, located another 0.5-mile downgradient; and at well PW-9, located one mile further downgradient. At well PW-5, perchlorate concentrations as high as 1,000 μg/L were detected in 2008 and 2009. This concentration is more than 160 times the California MCL of 6 μg/L. TCE in well PW-5 reached 27 μg/L, considerably above the MCL of 5 μg/L. At well PW-9, perchlorate concentrations were as high as 390 μg/L in 2008 and 2009, exceeding the California MCL by a factor of 65. TCE has also exceeded the MCL at this well location, which is adjacent to the Rialto-06 municipal water supply well. More recent sampling, which occurred after the completion of the January 2010 RI/FS report, found increased concentrations of perchlorate. Perchlorate at PW-5 increased from 970 μg/L in March 2009 to 1,600 μg/L in April 2010; and perchlorate at PW-9 increased from 390 μg/L in March 2009 to 400 μg/L in April 2010. The April 2010 results have been added to the Administrative Record.

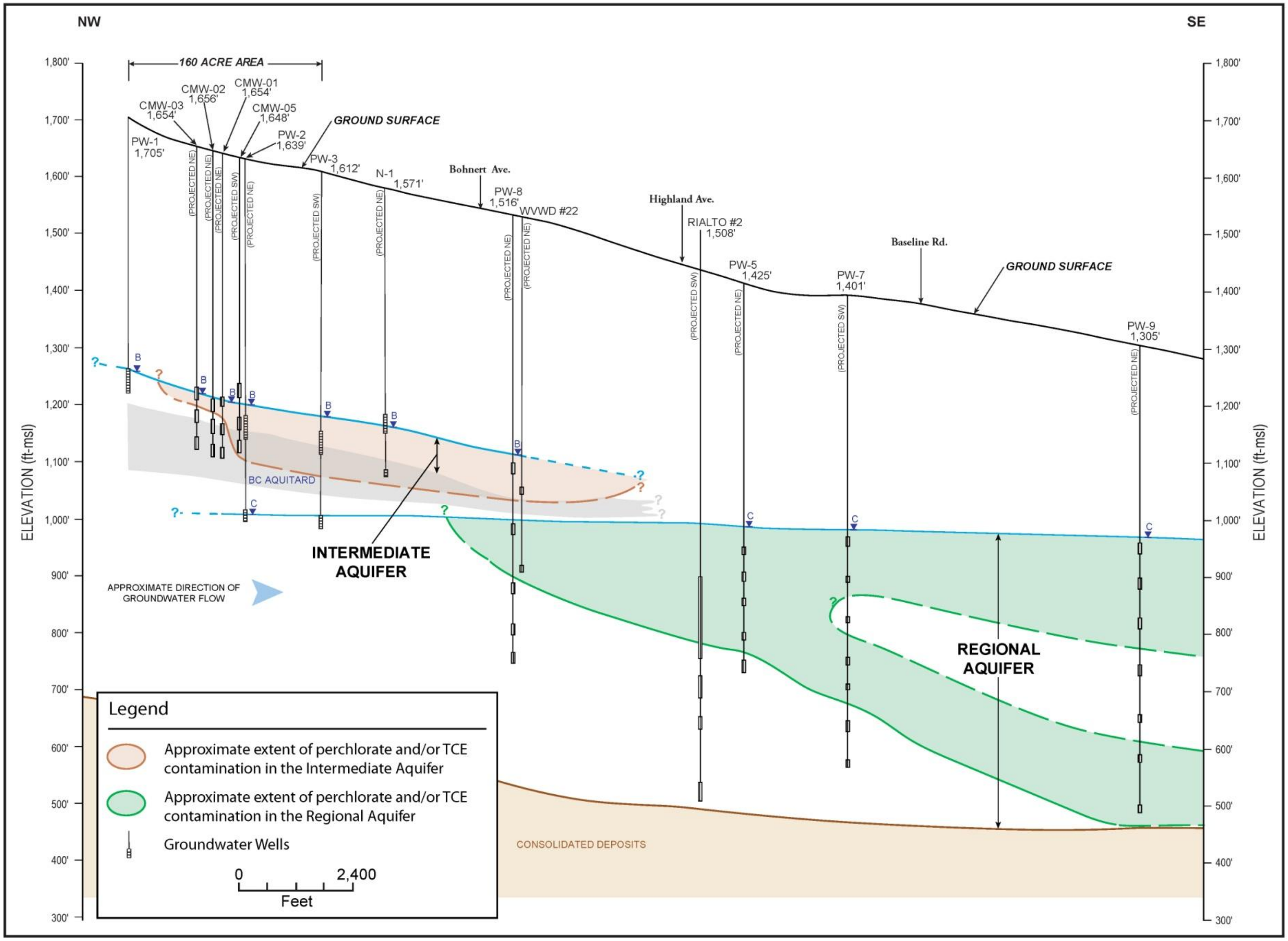

Figure 9. Approximate Vertical Extent of Groundwater Contamination

Perchlorate concentrations at the City of Rialto's water supply well Rialto-06, which is located about three miles downgradient of the 160-acre area, steadily increased between about 2000 and 2009 (see Figure 10).

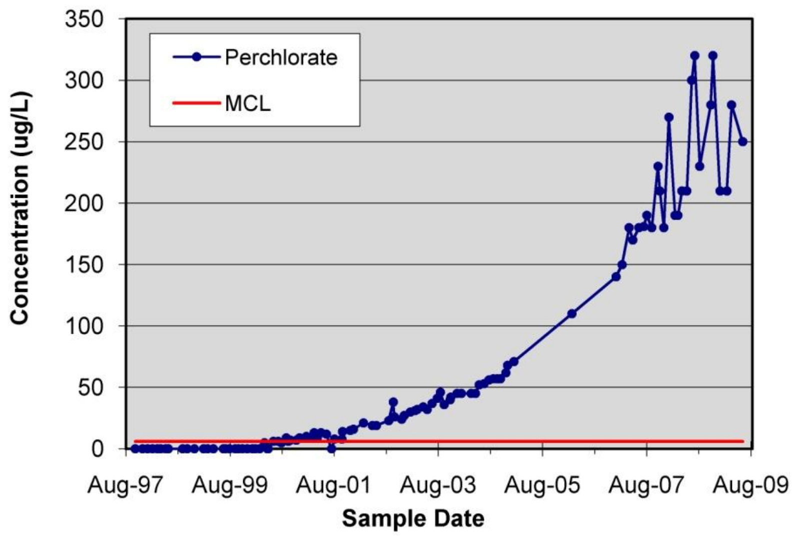

Figure 10. Perchlorate Concentrations at the Rialto-06 Drinking Water Well

Perchlorate concentrations at the City of Rialto's water supply well Rialto-04, located about 2.5 miles downgradient of the 160-acre area, also steadily increased beginning in about 2004. The perchlorate concentration in the Rialto-06 well exceeded 300 μg/L in late 2008, and was measured at 230 μg/L in April 2010 (the most recent data available). The April 2010 result has been added to the Administrative Record. The extent of the contamination downgradient of Rialto-06 (to the south or southeast) has not been delineated and groundwater flow directions in the area downgradient of Rialto-06 are not well-understood. These data gaps do not limit or interfere with the evaluation of remedial alternatives in the SA OU RI/FS, but additional data are needed to determine what additional remedial actions are appropriate downgradient of Rialto-06.

EPA has also reviewed other results from April 2010 and other data that became available after completion of the January 2010 RI/FS Report to determine if there have been significant changes in the nature or extent of contamination that would affect EPA's evaluation of the SA OU. The data, which have been added to the Administrative Record, include: results from the January 2010 analysis of groundwater samples from monitoring wells CPW-16 and CPW-17 (January 15, 2010); results from the analysis of groundwater samples from monitoring wells CMW-1 through CMW-5 (May 2010 and August 2010); a report summarizing the results of a study completed by Emhart Industries in 2009 (February 2010); a report prepared by Geologic Associates with updated hydrogeologic modeling of groundwater flow and transport within the northern RCB (February 2010); and three quarterly monitoring reports prepared by Geologic Associates presenting the results of groundwater monitoring related to the Rialto-03 groundwater treatment system (February 2010, April 2010, and August 2010). After review of these data, EPA has concluded that there have not been significant changes in the nature or extent of contamination that would affect EPA's evaluation of the SA OU.

2.4.8 Area and Depth Targeted in this Operable Unit

The SA OU targets the most contaminated groundwater at the Site, which extends from the 160-acre area about 1.5 miles to the southeast. The targeted area includes the portion of the aquifer where perchlorate has been detected in groundwater at a concentration as high as 10,000 μg/L (1,600 times the MCL), and TCE has been detected in groundwater at a concentration as high as 1,500 μg/L (300 times the MCL). Carbon tetrachloride has also been detected above its drinking water standard of 0.5 μg/L. In the targeted area downgradient of the 160-acre area (e.g., at PW-8), perchlorate concentrations evaluated in the RI/FS (from 2008 and 2009) were up to 20 times the MCL (118 μg/L) and TCE concentrations were more than eight times the MCL (46 μg/L). Perchlorate at PW-8 increased from 118 μg/L in March 2009 to 180 μg/L in April 2010; and TCE at PW-8 decreased slightly from 46 μg/L in March 2009 to 37 μg/L in April 2010. The April 2010 results have been added to the Administrative Record.

The areas of contaminated groundwater targeted for hydraulic control (the target or targeted area) are defined as the portion of the Intermediate Aquifer contaminated with perchlorate or TCE above MCLs, the underlying portion of the Regional Aquifer contaminated with perchlorate or TCE above MCLs, and an additional portion of the Regional Aquifer extending downgradient to where the Intermediate and Regional aquifers merge. The targeted area is shown on Figure 11 in plan view and on Figure 12 as a vertical cross section.

The *upgradient boundary* of the target area in the Intermediate Aquifer is near CMW-3, the northernmost monitoring well on the 160-acre area where the level of groundwater contamination consistently exceeds MCLs. The upgradient boundary of the target area in the Regional Aquifer is the location where contaminated groundwater begins to move downward from the Intermediate Aquifer into the Regional Aquifer. The assumed location is at well WVWD-22, where perchlorate and TCE are present in the multi-port monitoring well PW-8, located adjacent to WVWD-22, at concentrations above the MCL in its uppermost Regional Aquifer monitoring zone. Before it was converted into a monitoring well in 1999, WVWD-22 was a production well screened across both the Intermediate and Regional aquifers. The well was operated only sporadically and, given the strong vertically downward gradients observed in the area, may have acted as a conduit for downward migration of contamination into the Regional Aquifer before it was converted into a monitoring well.

It is also possible that contaminated groundwater has moved downward from the Intermediate to the Regional Aquifer via other wells screened in both aquifers, or directly through the BC Aquitard. Given the low permeability of the BC Aquitard, very long vertical migration times are expected where the aquitard is laterally extensive (i.e., beneath and immediately downgradient of the 160-acre area) and movement through the BC Aquitard is less likely to be a major contributor to vertical migration. Direct migration through the aquitard is more likely toward the downgradient portion of the Intermediate Aquifer, near where the Intermediate and Regional Aquifers merge.

The *downgradient boundary* of the target area is where the Intermediate and Regional Aquifers merge. The aquifers appear to merge between WVWD-22 and Rialto-02. The location appears to be close to and possibly just upgradient of the Rialto-02 well.

It is expected that additional monitoring wells will be installed during the remedial design phase of the remedy to refine the upgradient and downgradient boundaries of the targeted area. There are no monitoring wells completed in the Regional Aquifer upgradient of well WVWD-22, although there are three piezometers screened in the Regional Aquifer at the 160-acre area (PW2A, PW3A, and PW4A). Based on the interpreted depth of contamination in the vicinity of the Rialto-02 well, the maximum depth of the Regional Aquifer target area is approximately 650 to 700 feet bgs.

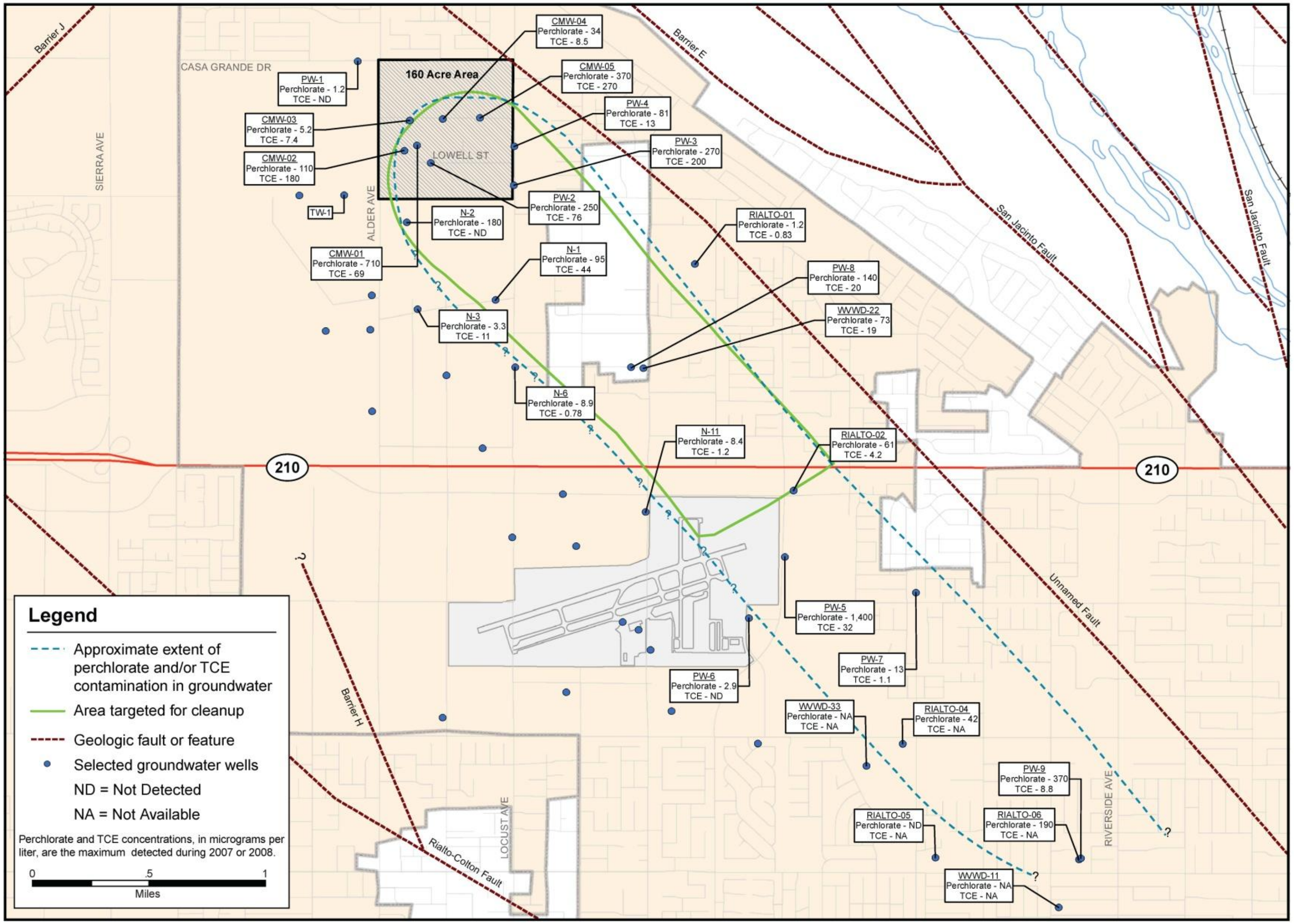

Figure 11. Approximate Extent and Targeted Area of Groundwater Contamination

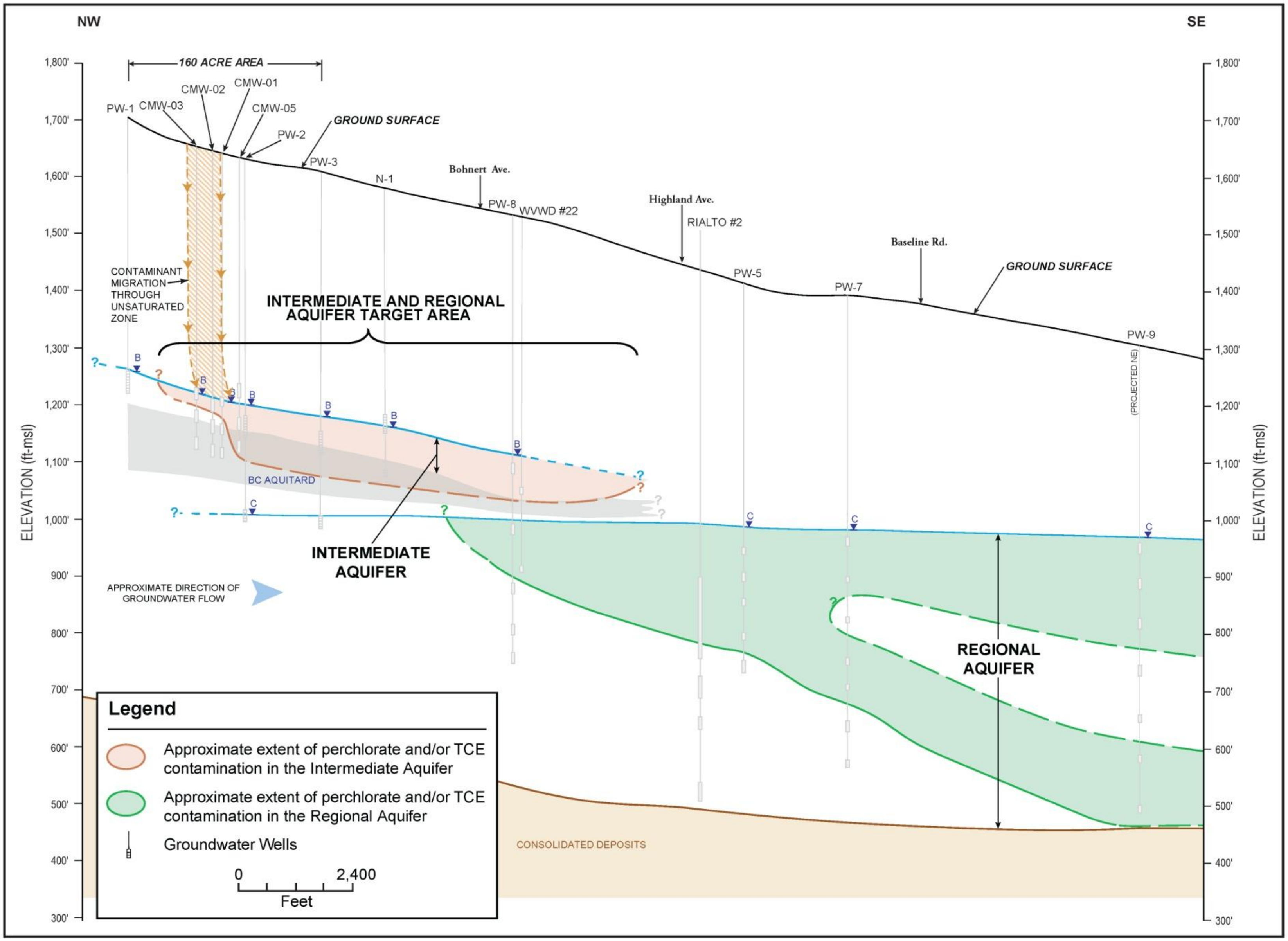

Figure 12. Targeted Area of Groundwater Contamination (Vertical Cross Section)

2.5 Current and Potential Future Resource and Land Use

The RCB is an important source of drinking water for the cities of Rialto, Colton, and Fontana. Between 1997 and 2007, the RCB supplied approximately 7.5 to 16 million gallons per day (MGD) to residents and businesses in the region. There are four water utilities responsible for the majority of the groundwater pumping in the RCB: the City of Rialto, WVWD, the City of Colton, and Fontana Water Company (FWC).

A 1961 decree entered in San Bernardino County Superior Court restricts pumping of groundwater from the RCB (The Lytle Creek Water & Improvement Company vs. Fontana Ranchos Water Company, et al., Action 81264). The decree allows unlimited pumping from the basin by parties to the decree if the average of the spring-high water levels at three wells specified in the decree (the index wells) exceeds 1,002.3 feet above mean sea level (MSL). When the level is between 969.7 and 1,002.3 feet above MSL, a party's entitlement is the sum of the amounts specified in the decree. If the average spring-high water level drops below 969.7 feet above MSL, the entitlement is reduced by 1 percent for every foot the average is below 969.7 feet above MSL, but not by more than 50 percent. There is a dispute among the parties to the Decree over the time period that restrictions, if in effect, apply.

Designated existing or potential beneficial uses for the RCB in the 2008 State of California Water Quality Control Plan are municipal and domestic supply, agricultural supply, industrial service supply, and industrial process supply.

Because the selected remedy only addresses groundwater, current and reasonably anticipated future land uses have limited relevance to the selected remedy. The primary relevance is in the selection of locations for the water treatment equipment and other facilities to be constructed as part of the remedy. These decisions will be made post-ROD, during the remedial design phase. Land use at the Site is a mix of residential, industrial, and commercial uses, with limited open space.

2.6 Summary of Site Risks

EPA is taking action at the SA OU because the groundwater at the Site is a current source of drinking water to tens of thousands of residents and businesses, the levels of contamination in groundwater exceed federal and/ or state drinking water standards, the calculated site-specific Hazard Index value significantly exceeds one, and contaminated groundwater continues to spread into uncontaminated and less contaminated portions of the groundwater aquifer. This interim action is necessary to stabilize the Site, prevent further environmental degradation, and achieve significant risk reduction while a final remedial solution is being developed.

EPA's decision to take action is based on a baseline risk assessment, which estimates the risks posed by the Site if no action is taken. The baseline risk assessment, included in its entirety as Section 1.7 of the January 2010 RI/FS report, also identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline risk assessment for this Site.

Because there is no known exposure pathway in which ecological receptors could be exposed to contaminated groundwater, an ecological risk assessment was not completed as part of this interim action.

2.6.1 Contaminant Identification

Perchlorate and most VOCs detected in the January 2008 and March/April 2009 groundwater sampling conducted by EPA have been identified as COCs. The COCs are perchlorate, carbon tetrachloride, chloroform, methylene chloride, and TCE.

Table 2 lists the COCs detected in groundwater and presents the range of concentrations detected for each COC in the Intermediate and Regional Aquifers in the 2008 and 2009 sampling events, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the Site), exposure point concentrations for each of the COCs detected in groundwater, and the statistical measure used to derive the exposure point concentration. Higher contaminant concentrations detected at some locations by others than EPA before 2008 were not used in the risk assessment. Exposure point concentrations are the concentrations used to estimate exposure and risk from each COC in the groundwater. The highest detected value was used as the exposure point concentration for each COC. The maximum value was used rather than the 95 percent upper confidence limit on the arithmetic mean concentration. This is the typical approach when the available data set is relatively small. Table 2 indicates that perchlorate and TCE were the most frequently detected COCs in groundwater at the Site.

For each multiport monitoring well or monitoring well cluster, all of the analytical results from wells or zones screened in the same aquifer (Intermediate or Regional) were averaged together. This approach provides a single concentration estimate for each aquifer at each well location. For the wells that were sampled both in 2008 and 2009, only 2009 data were used.

The January 2008 and March/April 2009 groundwater sampling results were obtained and evaluated in accordance with procedures detailed in EPA-approved field and laboratory planning documents.

2.6.2 Exposure Assessment

In the exposure assessment, EPA identifies exposure pathways based on the Conceptual Site Model for the Site. Receptors that could potentially be exposed to the contaminated groundwater include current and future residents that receive drinking water from groundwater wells near the 160-acre area. Exposure could occur through inhalation (VOCs only) or ingestion (VOCs or perchlorate) of the contaminants present in the groundwater. Inhalation of contaminants can occur during showering and other activities that enhance the movement of volatile chemicals from water to air. Exposure through dermal contact is not expected to be a significant pathway for these constituents.

Table 2. Measured Range of Concentrations for COCs and Exposure Point Concentrations *B.F. Goodrich Site - Source Area OU ROD* **Scenario Timeframe:** Current **Medium:** Groundwater **Exposure Medium:** Groundwater						
Exposure Point	**Chemical of Concern**	**Minimum Conc. Detected (µg/L)**	**Maximum Conc. Detected (µg/L)**	**Frequency of Detection**	**Exposure Point Concentration**	**Statistical Measure**
Intermediate Aquifer Groundwater	carbon tetrachloride	0.6	0.6	1 of 8	0.6	Max
	chloroform	0.2	0.3	3 of 8	0.3	Max
	methylene chloride	ND	ND	0 of 8	0.3	Max
	TCE	3	93	7 of 8	93	Max
	perchlorate	9	120	7 of 8	120	Max
Regional Aquifer Groundwater	carbon tetrachloride	ND	ND	0 of 13	0.3	Max
	chloroform	3.5	3.5	1 of 13	3.5	Max
	methylene chloride	0.3	0.3	1 of 13	0.3	Max
	TCE	0.3	5.8	9 of 13	5.8	Max
	perchlorate	1	288	10 of 13	288.1	Max

Notes:

If all results for a COC were non-detect, the Exposure Point Concentration was calculated using one-half of the highest reporting limit for the samples analyzed for that COC.

µg/L = micrograms per liter

ND = not detected

Max = maximum concentration

In keeping with EPA guidance for a baseline risk assessment, the risk assessment assumes that federal and state drinking water regulations that prohibit the use of contaminated water are not enforced.

2.6.3 Toxicity Assessment

Tables 3 and 4 summarize the source of toxicity information for each COC and, for noncancer effects, the target organ.

2.6.4 Risk Characterization

The risk characterization uses the outputs of the exposure and toxicity assessments to quantitatively characterize baseline risks associated with exposure to contaminated Intermediate and Regional Aquifer groundwater.

As part of the risk characterization, the exposure estimates were compared to primary California MCLs, EPA MCLs, and EPA tap water Regional Screening Levels (RSLs). The RSLs reflect potential exposure through ingestion and inhalation. RSLs are risk-based concentrations derived from standardized equations combining assumptions about human exposure to contaminants with EPA toxicity data. RSLs are considered by EPA to be protective for humans (including sensitive groups) over a lifetime. For chemicals that exceed MCLs, MCL exceedance ratios (maximum chemical concentrations divided by the lower of the state or EPA MCL) were estimated.

As summarized in Table 3, primary MCL exceedance ratios in the Intermediate Aquifer are 1.2 for carbon tetrachloride, 19 for TCE, and 20 for perchlorate. In the Regional Aquifer, the MCL exceedance ratios are 1.2 for TCE and 48 for perchlorate.

Table 3. Risk Characterization Summary – Exceedances of MCLs
B.F. Goodrich Site - Source Area OU ROD

Chemical of Concern	Maximum Contaminant Level (µg/L)	EPA or CA MCL?	Maximum Conc. (µg/L)	MCL Exceedance Factor	Maximum Conc. (µg/L)	MCL Exceedance Factor
			Intermediate Aquifer Groundwater		Regional Aquifer Groundwater	
Carbon Tetrachloride	0.5	CA	0.6	1.2	< 0.5	-
Chloroform	80	EPA and CA	0.3	-	3.5	-
Methylene Chloride	5	EPA and CA	< 0.5	-	0.3	-
TCE	5	EPA and CA	93	19	5.8	1.2
Perchlorate	6	CA	120	20	288.1	48

Notes:
The lower of the EPA or California MCL (CA MCL) is listed.
There is no MCL for chloroform. The value listed (80 µg/L) is for total trihalomethanes.

For carcinogens, risks are also expressed as the incremental probability that an individual could develop cancer over a lifetime as a result of exposure to the carcinogen. The risk estimates are probabilities often expressed in scientific notation (e.g., 1×10^{-6} or 10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an excess lifetime cancer risk because it would be in addition to the risks of cancer individuals face from nonsite causes such as smoking or exposure to too much sun. The chance that a typical individual would develop cancer from nonsite sources has been estimated to be as high as one in three. EPA's generally acceptable risk range for site-related exposures is 10^{-4} to 10^{-6}, with the 10^{-6} risk level used as the point of departure.

To estimate cancer risk, the maximum exposure estimate was divided by the RSL concentration designated for cancer evaluation. The resulting ratio was multiplied by 1×10^{-6} to estimate chemical-specific risk for a reasonable maximum exposure. The chemical-specific risks were then summed to estimate the total cancer risk associated with exposure to contaminated groundwater in each of the Intermediate and Regional Aquifers.

As shown in Table 4, the total cancer risk in the two aquifers is between 2×10^{-5} (Regional Aquifer) and 6×10^{-5} (Intermediate Aquifer).

Table 4. Risk Characterization Summary – Carcinogens *B.F. Goodrich Site - Source Area OU ROD*				
Chemical of Concern	**Regional Screening Level (µg/L)**	**Source of Toxicity Information**	**Estimated Lifetime Cancer Risk – Exposure to Intermediate Aquifer**	**Estimated Lifetime Cancer Risk - Exposure to Regional Aquifer**
carbon tetrachloride	0.20	IRIS	2.9×10^{-6}	NA
chloroform	0.19	CA OEHHA	1.6×10^{-6}	1.81×10^{-6}
TCE	1.7	CA OEHHA	5.5×10^{-5}	3.41×10^{-6}
			TOTAL CANCER RISK = 6×10^{-5}	**TOTAL CANCER RISK = 2×10^{-5}**

Notes:

CA OEHHA = California Office of Environmental Health Hazard Assessment, part of the California Environmental Protection Agency

IRIS = EPA's Integrated Risk Information System

The potential for noncarcinogenic effects was also evaluated by comparing the estimated exposure level over a specified time period with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ<1 indicates that a receptor's estimated dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. If multiple chemicals of concern affect the same target organ (for example, the liver) or act through the same mechanism of action, a Hazard Index (HI) is calculated by adding the HQs for the chemicals of concern. An HI<1 indicates that toxic noncarcinogenic effects from all contaminants are unlikely. An HI > 1 indicates that site-related exposures may present a risk to human health.

To estimate the noncancer hazard quotient for the SA OU, the maximum exposure estimate was divided by the noncancer RSL concentration. Because perchlorate is the only constituent that exceeded a noncancer RSL, the HQ and HI are equal.

As shown in Table 5, the site-specific HIs of 5 (Intermediate Aquifer) and 11 (Regional Aquifer) exceed 1, indicating potential health impacts from exposure to contaminated groundwater at the Site.

Table 5. Risk Characterization Summary – Noncarcinogens *B.F. Goodrich Site - Source Area OU ROD*					
Chemical of Concern	**Regional Screening Level (µg/L)**	**Primary Target Organ**	**Source of Toxicity Information**	**Non-Carcinogenic Hazard Quotient - Exposure to Intermediate Aquifer Groundwater**	**Non-Carcinogenic Hazard Quotient - Exposure to Regional Aquifer Groundwater**
carbon tetrachloride	24	liver	IRIS	0.024	NA
chloroform	130	liver	IRIS	0.002	0.027
perchlorate	26	thyroid	IRIS	5	11
				TOTAL HI = 5	**TOTAL HI = 11**

Notes:

NA = not applicable

2.6.5 Uncertainties

In accordance with EPA guidance for a baseline human health risk assessment, it is assumed that drinking water regulations that prohibit or limit the consumption of contaminated water are not enforced. This assumption is likely to lead to an overestimation of actual exposure and associated risks and hazards. In addition, no functioning groundwater extraction wells are known to currently exist in the Intermediate Aquifer (but there is no prohibition against their installation).

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment, and from actual or threatened releases of pollutants or contaminants from this Site which may present an imminent and substantial endangerment to public health or welfare.

2.6.6 Summary of Ecological Risk Assessment

This interim action addresses risks to human health that could result from human consumption and use of contaminated groundwater. Because there is no known exposure pathway in which ecological receptors could be exposed to contaminated groundwater, an ecological risk assessment was not completed as part of this interim action.

EPA will evaluate the potential for construction-related impacts on ecological receptors, if any, when tentative locations are selected for the construction of the groundwater wells, water treatment facilities, pipelines, and other components of the remedy. Tentative decisions are expected early in the remedial design phase. Land use in the area where the remedy is likely to be constructed is primarily industrial, commercial, and residential, with limited open space.

2.7 Remedial Action Objectives

The RAOs for the Source Area OU of the B.F. Goodrich Site are to:

- Protect water supply wells and groundwater resources by limiting the spread of contaminated groundwater from the 160-acre area.
- Remove the contaminants from the groundwater.

As noted above, the groundwater at the Site is an important source of drinking water. Limiting the spread of contaminated groundwater should reduce contaminant mass loading to downgradient areas, reducing human health risk by reducing the likelihood and/or magnitude of exposure.

The RAOs do not address contaminated soil at the Site or contaminated groundwater downgradient of the SA OU and do not specify *in situ* cleanup goals for the contaminated groundwater (e.g., allowable TCE or perchlorate concentrations in the aquifer). Additional actions may be needed to address contaminated soil, determine appropriate *in situ* cleanup goals, and/or address downgradient areas of groundwater contamination.

2.8 *Description of Remedial Alternatives*

EPA has evaluated how well each of four action alternatives, and a no-action alternative, satisfies the RAOs and other requirements.

2.8.1 Description of Remedial Alternative Components

All of the action alternatives include groundwater extraction wells, water treatment systems, conveyance systems, and groundwater monitoring wells. The principal differences between the remedial alternatives are in their extraction and treatment capacity (and the resulting difference in their capability to achieve the RAOs during extended wet periods), the assumed use of the groundwater after treatment, and the water treatment technology used to remove perchlorate from the groundwater.

2.8.2 Common Elements and Distinguishing Features of Each Remedial Alternative

The five remedial alternatives are labeled: Alternative 1, Alternative 2a, Alternative 2b, Alternative 3, and the No-Action Alternative. The No-Action Alternative does not include active remediation or monitoring. As summarized in Table 6 and illustrated in Figure 2, the four action alternatives are groundwater pump-and treat systems consisting of five key components.

- **Extraction of Contaminated Groundwater:** Each of the four action alternatives assumes that contaminated groundwater is pumped from the Regional Aquifer at or near the downgradient end of the Intermediate Aquifer, about one and one half miles to the southeast of the 160-acre area. EPA also considered the cost, effectiveness, and feasibility of extracting contaminated groundwater closer to the 160-acre area, but concluded that it was likely to be more expensive, less effective, and of uncertain feasibility. The four action alternatives assume that groundwater would be pumped from two wells designed to intercept and limit the spread (in other words, to provide hydraulic control) of contaminated groundwater from the targeted area into downgradient portions of the Regional Aquifer (also known as hydraulic containment or hydraulic capture). The alternatives differ in their extraction and treatment capacity and may differ in their capability to achieve the RAOs during extended wet periods, as described below and in more detail in the January 2010 RI/FS Report.

- **Treatment of the Groundwater to Remove Contaminants:** Each of the four action alternatives assumes the use of a water treatment technology known as LGAC to remove TCE and other VOCs from the groundwater, the same treatment goals for the VOCs, and disinfection of the water after contaminant removal. The alternatives assume the same treatment goal for perchlorate but differ in the technology used to remove perchlorate from the groundwater, as described below. After use, spent granular-activated carbon and other wastes would be sent to an EPA-approved facility for treatment or disposal. EPA also evaluated air stripping and advanced oxidation, two alternative VOC removal technologies.

- **Conveyance Systems to Transport the Groundwater:** Each of the four action alternatives assumes the construction of pipelines and pumps to convey water from the extraction wells to the treatment plant and from the treatment plant to the delivery location. The alternatives differ in the length of pipeline and amount of pumping needed to lift water from the treatment plant to the delivery location.

- **Use of the Groundwater after Removal of the Contaminants:** The alternatives differ in the assumed use of the groundwater after the contaminants are removed. The two possible uses are delivery to a local water utility for distribution to residents and businesses, and replenishment of the aquifer by reinjection.
- **Groundwater Monitoring:** Each of the four alternatives assumes the construction of at least eight new small-diameter groundwater monitoring wells, called piezometers, periodic monitoring of the new piezometers and existing groundwater monitoring wells, and analysis of monitoring data to evaluate the performance of the project and optimize its operation.

Table 6. Major Components of the Remedial Alternatives
B.F. Goodrich Site - Source Area OU ROD

Remedial Alternative	Groundwater Extraction Wells	LGAC or other Groundwater Treatment Technology (VOCs)	Groundwater Treatment Technology (perchlorate)	Extraction and Treatment Capacity	Pipelines and Pumps (i.e., conveyance systems)	Use of Treated Water	Groundwater Monitoring Program
No-Action	-	-	-	-	-	-	-
1	✓	✓	Ion Exchange	1,650 gpm	✓	Drinking water	✓
2a	✓	✓	Ion Exchange	3,200 gpm	✓	Drinking water	✓
2b	✓	✓	Biological Treatment	3,200 gpm	✓	Reinjection/ Aquifer replenish-ment	✓
3	✓	✓	Ion Exchange	5,000 gpm	✓	Drinking water	✓

The No-Action Alternative

The No-Action Alternative does not require active remediation or monitoring. It has no direct cost. It is included to provide a baseline for comparison to the other remedial alternatives.

Alternative 1 – Pump and Treat 1,500 to 1,650 gpm of Contaminated Groundwater and Use the Treated Water as Drinking Water Supply (Present Value Estimate = $24.2 million)

Alternative 1 consists of two groundwater extraction wells, an LGAC water treatment system, pipelines and booster pumps, and a groundwater monitoring program. Figure 13 shows the tentative extraction and treatment locations. Alternatives 2a, 2b, and 3 include these same elements.

Alternative 1 requires the construction of wells, water treatment systems, and pipelines capable of extracting and treating up to 1,650 gpm of contaminated groundwater. It assumes that extraction and treatment at a rate of 1,500 gpm rate would be adequate to satisfy the RAOs during most groundwater conditions. The 1,500 gpm extraction rate is based on particle tracking simulations of groundwater and contaminant movement using a computerized site-specific numeric groundwater flow model. During extended wet periods, when above-average rainfall causes significant increases in groundwater levels and groundwater hydraulic gradients in the Regional Aquifer, the extraction rate would increase up to the 1,650 gpm capacity of the system. Extended wet periods have occurred every 5 years on average over the past 50 years. If extraction occurred at 1,500 gpm 80 percent of the time and at 1,650 gpm 20 percent of the time, the average extraction and treatment rate would be 1,530 gpm.

Alternative 1 assumes that the groundwater is used as drinking water supply after the contaminants are removed. Alternatives 2a and 3 include the same assumption. Alternative 1 assumes that the water would be delivered to WVWD, which would distribute the water to its residential and business customers. WVWD has large distribution facilities (such as, pipelines and tanks) relatively close to the assumed treatment plant location.

Alternative 1 assumes the use of ion exchange as the perchlorate removal technology. Alternatives 2a and 3 include the same assumption. The treatment goals for TCE, carbon tetrachloride, and perchlorate in the extracted groundwater are 5.0, 0.5, and 6 μg/L, respectively. In practice, the water treatment technologies used to remove the COCs are expected to reduce the concentration of most of the COCs to levels substantially below MCLs. These treatment goals also apply to Alternatives 2a, 2b, and 3.

Alternative 1 (and Alternatives 2a, 2b, and 3) would result in the generation of treatment residuals (primarily spent carbon and/or resin), which would be treated or disposed offsite.

Estimated capital, annual O&M, and total present value costs are summarized in Table 7. Each of the four action alternatives is expected to take from one to two years to construct, and to operate for a period of several years to decades.

Table 7. Remedial Alternative Cost Estimates
B.F. Goodrich Site - Source Area OU ROD

Alternative	Capital Cost	Annual O&M Cost[1]	Total NPV[2] - 15 years O&M	Total NPV[2] - 30 years O&M
1	$ 9,600,000	$1,200,000	$20,300,000	$24,200,000
2a	$13,100,000	$1,300,000	$25,000,000	$29,300,000
2b	$21,800,000	$1,500,000	$35,600,000	$40,500,000
3	$18,300,000	$1,500,000	$31,900,000	$36,800,000

Notes:

[1]Annual O&M cost estimates for Alternatives 1, 2a, and 3 assume that the water utilities receiving the treated groundwater reimburse the operator of the remedy at a rate of $75/acre-foot to offset the utilities avoided costs of producing the water. The actual rate may differ.

[2]The Total NPV is the sum of the Capital Cost and the net present value of future O&M costs, assuming a 7 percent discount rate.

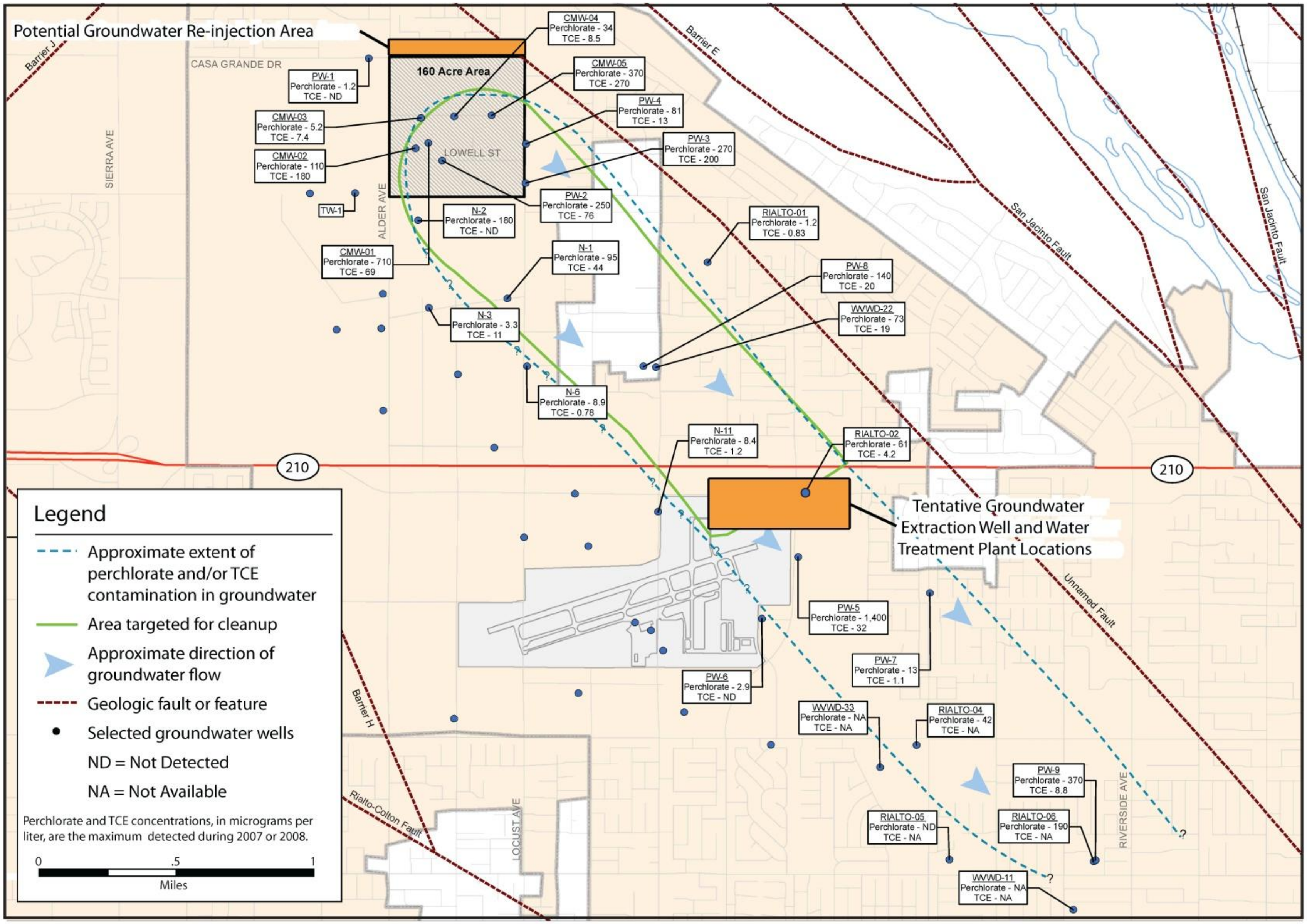

Figure 13. Approximate Extraction, Treatment, and Reinjection Locations

Alternative 2a – Pump and Treat 1,500 to 3,200 gpm of Contaminated Groundwater and Use the Treated Water as Drinking Water Supply (Present Value Estimate = $29.3 million)

Alternative 2a consists of two groundwater extraction wells, a LGAC water treatment system, pipelines and pumps, and a groundwater monitoring program (as does Alternative 1). Alternative 2a includes almost double the extraction and treatment capacity of Alternative 1 (3,200 gpm in Alternative 2a compared to 1,650 gpm in Alternative 1). It is assumed that groundwater would be extracted and treated at a rate of 1,500 gpm most of the time, and that higher extraction rates would be needed only during extended wet periods. During these periods, extraction could increase up to the maximum extraction rate of 3,200 gpm. The average flow rate would increase only modestly above that in Alternative 1 because periods requiring higher pumping rates are expected to be infrequent. If extraction occurred at 1,500 gpm 80 percent of the time and at 3,200 gpm 20 percent of the time, the average extraction and treatment rate would be 1,840 gpm.

Alternative 2a assumes that the groundwater is used as drinking water supply after the contaminants are removed, and that ion exchange is used as the perchlorate removal technology, as do Alternatives 1 and 3. It is assumed that the groundwater is distributed by WVWD.

Alternative 2b – Pump and Treat 1,500 to 3,200 gpm of Contaminated Groundwater and Reinject the Treated Groundwater to Replenish the Aquifer (Present Value Estimate = $40.5 million)

Alternative 2b is the same as Alternative 2a except that it assumes: (1) a biological treatment process for removal of perchlorate from the contaminated groundwater (rather than ion exchange); and (2) reinjection of the treated water to replenish the Regional Aquifer (rather than direct use as drinking water supply). Potential reinjection locations are shown in Figure 13.

Alternative 2b assumes that aquifer replenishment would require the construction of two deep injection wells located along the northern boundary of the 160-acre area, installation of more than three miles of pipeline to convey the treated water to the injection wells, and more pumping (compared to Alternative 2a) to move the treated water from the treatment plant to the delivery location.

Alternative 3 – Pump and Treat 1,500 to 5,000 gpm of Contaminated Groundwater and Use the Treated Water as Drinking Water Supply (Present Value Estimate = $36.8 million)

Alternative 3 assumes two groundwater extraction wells, a LGAC water treatment system, pipelines and pumps, and a groundwater monitoring program (as do Alternatives 1 and 2).

Alternative 3 includes the construction of a much larger groundwater extraction and treatment system than Alternatives 1, 2a, or 2b. It would operate at a rate similar to the other alternatives most of the time (approximately 1,500 gpm), but would have additional capacity (up to 5,000 gpm) to operate at higher rates during extended wet periods. It assumes triple the treatment capacity of Alternative 1 (5,000 gpm in Alternative 3 compared to 1,650 gpm in Alternative 1). If extraction occurred at the maximum 5,000 gpm rate 20 percent of the time, the average rate would be 2,200 gpm.

Alternative 3 assumes that the groundwater is used as drinking water supply after the contaminants are removed, and the use of ion exchange as the perchlorate removal technology, as do Alternatives 1 and 2a. Because of the higher extraction and treatment rate, it is assumed that pipelines must be built to convey the treated groundwater to WVWD and to FWC.

Key ARARs associated with the action alternatives are summarized in Table 8.

Table 8. Key Applicable or Relevant and Appropriate Requirements
B.F. Goodrich Site - Source Area OU ROD

ARAR	Importance
Federal Safe Drinking Water Act (SDWA), 42 U.S.C. 300 et seq., National Primary Drinking Water Standards, including 40 CFR 141.61 and 40 CFR 141.62	Establish MCLs for TCE (5 µg/L), perchlorate (6 µg/L), carbon tetrachloride (0.5 µg/L), and other COCs in the treated groundwater.
State of California Domestic Water Quality and Monitoring Regulations, California Safe Drinking Water Standards (MCLs), 22 CCR § 64431, and § 64444	
Clean Air Act, South Coast Air Quality Management District (SCAQMD), SCAQMD Regulation XIII, comprising Rules 1301 through 1313, SCAQMD Rule 1401, SCAQMD Rule 1401.1, and SCAQMD Rules 401 through 403	Limits toxic air emissions if air stripping is used for VOC removal.
California Porter-Cologne Water Quality Act, California Water Code 13240 Water Quality Control Plan (Basin Plan) for the Santa Ana River Basin, Chapters 2(Plans and Policies), 3(Beneficial Uses), and 4 (Water Quality Objectives)	Provides standards used to determine discharge limits if treated groundwater is reinjected or temporarily discharged to surface water.

2.8.3 Expected Outcome of Each Alternative

Alternative 1 – Pump and Treat 1,500 to 1,650 gpm of Contaminated Groundwater and Use Treated Water as Drinking Water Supply

Alternative 1 is expected to satisfy the RAOs during most groundwater conditions. During extended wet periods, however, when above-average rainfall in the region causes significant increases in groundwater hydraulic gradients in the Regional Aquifer, the maximum extraction rate (1,650 gpm) is unlikely to be adequate. This limitation would potentially reduce the alternative's effectiveness in preventing the spread of contaminated groundwater.

Alternative 2a – Pump and Treat 1,500 to 3,200 gpm of Contaminated Groundwater and Use Treated Water as Drinking Water Supply

Alternative 2a would provide hydraulic control of the targeted area of groundwater contamination over a wider range of conditions than Alternative 1. Based on an evaluation of the magnitude and duration of periods of above-average rainfall over the last 50 years, and other factors affecting hydraulic gradients, Alternative 2a should achieve RAOs during all expected groundwater conditions. There is some uncertainty because the performance of the remedy would depend on future rainfall patterns and pumping rates at other wells near the Site, but the groundwater monitoring program that would be a part of the alternative would allow EPA to evaluate whether the remedy is achieving its hydraulic control objective and modify the project if needed. Modifications could include adjusting extraction rates, modifying the extraction wells, or installing new wells.

Alternative 2b – Pump and Treat 1,500 to 3,200 gpm of Contaminated Groundwater and Reinject the Treated Groundwater to Replenish the Aquifer

The expected outcome of Alternative 2b is the same as for Alternative 2a.

Alternative 3 – Pump and Treat 1,500 to 5,000 gpm of Contaminated Groundwater and Use Treated Water as Drinking Water Supply

The additional extraction and treatment capacity assumed in Alternative 3 would provide a greater level of confidence that the project would provide complete hydraulic control during extended wet periods, but the outcome is expected to be similar to Alternatives 2a and 2b.

None of the remedial alternatives include restoration of the aquifer as a remedial objective (i.e., reducing perchlorate and TCE levels in the aquifer to a level that allows unrestricted use of the groundwater). A decision on whether restoration is feasible will be made in a subsequent decision document.

2.9 Summary of Comparative Analysis of Alternatives

The following sections summarize the comparative analysis of alternatives presented in the detailed analysis section of the January 2010 RI/FS Report. A separate section addresses each of the nine remedy selection criteria.

2.9.1 Overall Protection of Human Health and the Environment

The Overall Protection of Human Health and the Environment criterion addresses whether or not an alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls.

The evaluation of Overall Protection of Human Health and Environment is based largely on the long-term effectiveness criterion. The No-Action Alternative and Alternative 1 are not considered protective. Alternatives 2a, 2b, and 3 are considered protective. None of the remedial actions would exacerbate site conditions.

Limitations of the No-Action Alternative include the increased potential for human exposure to contaminated groundwater; the increased likelihood that concentrations of site-related COCs will increase at active water supply wells downgradient of the 160-acre area; the increased cost and difficulty of operating existing water treatment facilities if contaminant concentrations increase; and the increased cost, difficulty, and time required for control and restoration of the contaminated portions of the aquifer.

Alternatives 1 through 3 would reduce short- and long-term risks to human health and the environment by limiting the spread of contaminated groundwater from the highly contaminated source areas at the 160-acre area into less-contaminated areas and depths. That would reduce impacts on downgradient water supply wells and protect future uses of less-contaminated and uncontaminated portions of the aquifer. Alternative 2 would result in higher rates of groundwater extraction and more robust hydraulic control than Alternative 1, and Alternative 3 would include additional groundwater extraction capacity and potentially more robust control compared to Alternatives 2a and 2b, although the difference in hydraulic control, if any, is likely to be minimal.

Alternatives 1 through 3 would reduce the toxicity, mobility, and volume of the contaminants (or contaminated groundwater) and remove significant contaminant mass from the aquifer. The VOC and perchlorate treatment technologies would be effective in meeting federal and state drinking water standards. Alternatives 1, 2a, and 3 also offer the benefit of making available a clean water supply source to one or more water utilities whose wells are currently affected by the contamination and are further threatened by continued contaminant migration.

The negative impacts associated with the alternatives include the disruption that would result from installation of pipelines and other components of the remedy, and the impacts of handling and disposing of treatment residuals (e.g., spent carbon, spent resin, and/or waste biomass from biological treatment).

2.9.2 Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and NCP § 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA section 121(d)(4).

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site.

Only those state standards that are identified by a state in a timely manner, are more stringent than federal requirements, and are promulgated and uniformly applied may be applicable.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site.

Only those state standards that are identified in a timely manner, are more stringent than federal requirements, and are promulgated and uniformly applied, may be relevant and appropriate.

The Compliance with ARARs criterion addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of federal and state environmental statutes.

All of the Alternatives, except the No-Action Alternative, have common ARARs associated with the construction and operation of a groundwater pump and treat system. Most of the ARARs are associated with the use of treated groundwater, and management and disposal of treatment residuals.

Acquisition of permits would not be necessary for onsite activities.

All of the alternatives will attain their respective federal and state ARARs, except as described in Section 2.12.2.

2.9.3 Long-Term Effectiveness

Long-term effectiveness and permanence refers to residual risk, and the ability of a remedy to maintain reliable protection of human health and the environment over time, once the RAOs are met. Residual risk can result from exposure to untreated waste or treatment residuals. The magnitude of the risk depends on the nature and quantity of the wastes and the adequacy and reliability of controls, if any, that are used to manage untreated waste and treatment residuals. For this interim remedy, untreated waste refers to contaminated groundwater not removed from the aquifer. Treatment residuals may include spent carbon, spent resin, and waste biomass from biological treatment.

The performance of the alternatives in relation to this criterion has been evaluated primarily by estimating the extent to which each alternative prevents the migration of contaminated groundwater into clean and less-contaminated areas. The evaluation also considers the relative magnitude of the treatment residuals.

The No-Action Alternative, in which no active remediation or monitoring occurs, is ranked low in relation to the Long-Term Effectiveness and Permanence criterion. If no action is taken, contaminated groundwater will continue to spread, increasing the likelihood of future increases in contaminant concentrations in downgradient portions of the aquifer, increasing risk by increasing the likelihood and/or magnitude of exposure, and increasing the eventual cost, difficulty, and time required for restoration of the aquifer.

In contrast to the No-Action Alternative, the four action alternatives would be relatively effective in meeting the RAOs of this interim remedy. All four action alternatives are expected to achieve RAOs during most groundwater conditions, reducing the short- and long-term risks to human health and the environment by inhibiting downgradient migration of contamination and removing substantial contaminant mass. The remedial alternatives would:

- Minimize increases in the extent and levels of contamination, decreasing the potential for human exposure
- Potentially reduce the need for water utilities with active downgradient water supply wells to install new water treatment systems
- Reduce the cost and difficulty of operating existing treatment facilities by preventing highly contaminated groundwater from reaching these systems
- Reduce the eventual cost, difficulty, and time required for hydraulic control and restoration of the aquifer

The action alternatives are expected to differ in effectiveness during extended wet periods that significantly increase groundwater levels and hydraulic gradients in the Regional Aquifer. The evaluation of long-term effectiveness is based primarily on computer simulations of groundwater flow conducted to estimate the extent to which extraction at the specified rates and locations would intercept contaminated groundwater moving from the targeted area. The computer model and the results of the computer simulations are described in the January 2010 RI/FS Report.

Alternative 1 may not be fully effective during extended wet periods, potentially limiting the alternative's effectiveness in preventing the spread of contaminated groundwater. Alternative 1 is ranked moderate in relation to the Long-Term Effectiveness and Permanence criterion.

Alternatives 2a and 2b are likely to achieve RAOs during all expected groundwater conditions. There is some uncertainty because the performance of these alternatives would depend on future rainfall patterns and pumping rates at non-remedy wells at or near the Site. Alternatives 2a and 2b are ranked high in relation to the Long-Term Effectiveness and Permanence criterion.

Alternative 3 is expected to achieve RAOs with a high level of certainty during all expected groundwater conditions and would have the capacity to maintain hydraulic control during more extreme hydraulic conditions. Alternative 3 is also ranked high in relation to the Long-Term Effectiveness and Permanence criterion.

The alternatives would differ in the contaminant mass removed because of the varying extraction and treatment rates of the alternatives, as described in the Reduction of Toxicity, Mobility, or Volume through Treatment section below.

Also considered in relation to this evaluation criterion is the health risk resulting from treatment residuals. In Alternatives 1 through 3, if LGAC is used for VOC treatment, the spent carbon would be transported offsite for regeneration or disposal. If air stripping with vapor-phase granular-activated carbon (VGAC) off-gas controls is used, residual risk would result from air emissions in addition to the handling and disposal of spent carbon if used for off-gas treatment. Off-gas treatment would be designed to meet air emissions requirements and limit the incremental risk from air emissions to acceptable levels. Compliance with RCRA and Department of Transportation regulations would result in minimal risks being associated with spent carbon and spent resin treatment residuals. The magnitude of the residual risks from treatment residuals for Alternatives 2 and 3 would be slightly higher than for Alternative 1 because the higher average extraction rates would generate slightly more waste.

Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. Because this is an interim action ROD, review of this Site and remedy will be ongoing as EPA develops additional remedial alternatives for the Site.

2.9.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternatives 1 through 3 all satisfy the statutory preference for treatment and would employ treatment technologies that would reduce the volume of contaminants by inhibiting contaminant migration, and reduce the toxicity and volume of contaminants (or contaminated groundwater) by reducing contaminant concentrations to low or non-detectable levels in groundwater pumped to the surface for treatment.

The ion exchange and biological treatment processes for perchlorate removal, and LGAC for VOC removal, would permanently remove the contaminants from the extracted groundwater, greatly reducing mobility. Air stripping and advanced oxidation technologies, the alternative

VOC removal technologies, would also permanently remove the contaminants from the extracted groundwater.

All four technologies are partially or fully destructive technologies in that most or all of the contaminants are ultimately sequestered or converted to non-toxic products. With LGAC, the contaminants are typically destroyed when the carbon is reactivated. With air stripping, a majority of the VOCs are likely to be removed by an off-gas control process. If carbon is used, the contaminants are typically destroyed when the carbon is reactivated. With advanced oxidation, most of the VOCs are destroyed by the oxidation process. The biological process considered for perchlorate removal in Alternative 2b is also a destructive technology. The use of disposable resin for perchlorate treatment may also result in permanent destruction of the perchlorate if the resin is incinerated.

There would be minor differences in toxicity, mobility, and volume reduction in proportion to the average extraction and treatment rate of the alternative (i.e., slightly greater reductions in Alternatives 2a and 2b than in Alternative 1, and possibly a slightly greater reduction in Alternative 3 than in Alternatives 2a and 2b). Alternative 1 would remove an estimated 1,600 pounds and 15,800 pounds of TCE and perchlorate, respectively, over 30 years. Alternatives 2a and 2b would remove an estimated 1,900 pounds and 19,300 pounds of TCE and perchlorate, respectively, and Alternative 3 would remove an estimated 2,300 pounds and 23,100 pounds of TCE and perchlorate, respectively. The mass removal estimates are based on the estimated average groundwater extraction rates of 1,530, 1,840, 1,840, and 2,200 gpm for Alternatives 1, 2a, 2b, and 3, respectively. The mass removal rate for Alternative 3 is likely to be less than estimated, however, because the average groundwater extraction rate is likely to be less than 2,200 gpm. The 2,200 gpm estimate assumes that Alternative 3 operates at its 5,000 gpm capacity 20 percent of the time, but extraction rates above 3,200 gpm (the capacity of Alternative 2) are expected to be needed infrequently, if at all.

2.9.5 Short-Term Effectiveness

Short-term effectiveness addresses adverse impacts that may be posed to workers, the community, and the environment during construction of the remedy.

All four action alternatives are assigned a high ranking for short-term effectiveness. None of the alternatives pose unmitigable risks to the community during construction, nor do any of the alternatives pose unmitigable risks to workers beyond typical hazards associated with large construction projects.

It is expected that Alternatives 1 through 3 would require one to two years to construct using similar construction methods. Noise and dust abatement during construction, and onsite treatment or offsite disposal of the contaminated drill cuttings and purge water, would protect the community during construction.

There may be minor differences between the alternatives in the time required for construction. Alternative 2b (and, to a lesser extent, Alternative 3) may take longer to construct than Alternatives 1 and 2a due to the longer pipelines needed to convey water from the treatment plant.

2.9.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy during design, construction, and operation. It also considers factors such as the availability of services and materials, administrative feasibility, and coordination with other governmental entities.

None of the alternatives are assigned a high ranking for the implementability criterion (see Table 9), reflecting the need to acquire land or arrange access for the construction of extraction wells, treatment facilities, and conveyance facilities, other difficulties associated with a construction project in a developed area, and agreements with water utilities needed to carry out Alternatives 1, 2a, and 3.

Implementation of Alternatives 1, 2a, and 3 would require agreements with water utilities to distribute the treated groundwater generated by the remedy, specifying the amount of water each utility would accept; the treated water delivery location; and responsibility for operational, liability, financial, and regulatory requirements. Discussions with water rights holders may also be needed to address limitations on groundwater pumping resulting from the 1961 Rialto-Colton decree and the sustainability of current groundwater pumping rates in the RCB.

Alternative 1 is assigned a moderate to high ranking, reflecting the fact that it is the least complex alternative, probably requiring the fewest participating parties and fewest agreements. Alternatives 2a, 2b, and 3 are assigned a moderate ranking. Alternatives 2a, 2b, and 3 involve periodic distribution of larger volumes of water than Alternative 1 (up to 3,200 gpm for Alternatives 2a and 2b; up to 5,000 gpm for Alternative 3). In Alternatives 2a and 3, distributing this additional treated water may require arrangements with additional parties (particularly in Alternative 3). Alternative 2b would not require agreements to distribute water to local water utilities, but may pose additional obstacles due to the long pipeline needed to move water from the treatment plant to the injection wells.

Alternative 3 also requires larger conveyance systems and treatment facilities than Alternatives 1 and 2a, increasing the likelihood that difficulties would be encountered in acquiring property or arranging access, resulting in potential delays.

Implementation of each alternative would require the fabrication of treatment plant equipment, pumps, and conveyance pipe, but none of the required equipment or materials are out of the ordinary and all required services and materials are likely to be available, including qualified contractors for construction and operation of the technologies under consideration.

The extraction, treatment, and conveyance technologies included in Alternatives 1 through 3 are widely used and are generally known to be proven and reliable. The biological treatment process for perchlorate removal assumed in Alternative 2b is less widely used than ion exchange, although it has been demonstrated to be effective. No significant difficulties are expected because of the type of technologies employed.

All of the alternatives include an extensive monitoring program to evaluate remedy performance and to provide early warning of changes in contaminant concentrations or groundwater flow that may require modifications in extraction rates, well locations, or treatment methods to ensure attainment of RAOs and ARARs.

None of the remedial alternatives is expected to interfere with the implementation of future response actions at the Site.

Table 9. Evaluation and Comparison of Remedial Alternatives
B.F. Goodrich Site - Source Area OU ROD

Alternative	Protection of Human Health and Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume (TMV) Through Treatment	Short-term Effectiveness	Implementability	Capital Cost (O&M) [Present Value] *Million $*
No-Action Alternative	No protection to human health or the environment.	**NA**	**LOW –** Does not provide hydraulic control.	**NA**	**NA**	**NA**	**$0**
1. Pump and Treat 1,500 to 1,650 gpm; Use Treated Water as Drinking Water Supply	Reduces migration of contaminated groundwater. Overall protection lower than other alternatives because of incomplete hydraulic control during extended wet periods. Providing the treated water to a local water utility helps offset the impacts of the contamination on existing water supply wells.	**HIGH** – Would meet all ARARs.	**MODERATE** – Full control during low and intermediate water level conditions, but partial control during high water conditions. Minimal risk from treatment residuals.	**HIGH** – Meets preference for treatment and provides significant reduction of TMV.	**HIGH** – No unmitigable risks to the community, workers, or the environment during construction and implementation.	**MODERATE to HIGH** – Uses proven technologies, but many administrative issues to be resolved, primarily associated with potable use of the treated water.	**$9.6 {$1.2/year} [$24.2]**
2a. Pump and Treat 1,500 to 3,200 gpm; Use Treated Water as Drinking Water Supply	Similar to Alternative 1, but complete hydraulic control achieved during all expected groundwater conditions provides better overall protection of human health and the environment.	**HIGH** – Would meet all ARARs.	**HIGH** – Full control during all expected groundwater conditions. Minimal risk from treatment residuals.	**HIGH** – Meets preference for treatment and provides significant reduction of TMV.	**HIGH** – Similar to Alternative 1, but more pipeline construction and larger treatment plant.	**MODERATE** – Similar to Alternative No. 1, but higher peak flow rate may pose greater administrative challenge.	**$13.1 {$1.3/year} [$29.3]**
2b. Pump and Treat 1,500 to 3,200 gpm; Reinject Treated Groundwater to Replenish the Aquifer	Similar to Alternative 2a but at higher cost. Non-potable end use may improve implementability of the alternative, but eliminate the benefit the treated water provides to local water utilities.	**HIGH** – Would meet all ARARs.	**HIGH** – Similar to Alternative 2a, with minor difference in treatment residuals.	**HIGH** – Meets preference for treatment and provides significant reduction of TMV.	**HIGH** – Similar to Alternative No. 1, but more pipeline construction.	**MODERATE** – May be easier to implement than Alternative 2a, but significantly greater pipeline construction may pose greater administrative challenge.	**$21.8 {$1.5/year} [$40.5]**
3. Pump and Treat 1,500 to 5,000 gpm; Use Treated Water as Drinking Water Supply	Similar to Alternative 2a. Slightly higher level of confidence but at increased cost. Also likely to be more difficult to implement due to higher peak flow rates.	**HIGH** – Would meet all ARARs.	**HIGH** – Similar to Alternative 2a, but with higher level of confidence. Minimal risk from treatment residuals.	**HIGH** – Meets preference for treatment and provides significant reduction of TMV.	**HIGH** – Similar to Alternative 2a, but more pipeline construction and larger treatment plant.	**MODERATE** – Similar to Alternative No. 2a, but higher peak flow rate may pose greater administrative challenge.	**$18.3 {$1.5/year} [$36.8]**

Notes:

Costs are millions of dollars.

NA= Not Applicable.

NPV = Net Present Value (based on 30 years of O&M and a 7 percent discount rate).

2.9.7 Cost

The estimated Net Present Value (NPV) of the least expensive action alternative (Alternative 1) is $24.2 million. The estimated NPV of the most expensive alternative (Alternative 2b) is $40.5 million, primarily due to the high capital costs associated with the long pipeline from the treatment plant to the injection well locations, higher pumping costs, and the higher cost of biological treatment (compared to ion exchange). Alternatives 2a and 3 have estimated NPVs of $29.3 million and $36.8 million respectively. The NPV is a measure of the capital and operation and maintenance (O&M) costs over a period of 30 years. It is calculated as the sum of the capital and O&M costs, with O&M costs discounted to the present at a rate of seven percent per year.

No direct costs are associated with the No-Action Alternative. Costs are summarized in Table 7.

2.9.8 State Acceptance

The State has expressed its support for the selected remedy. In a letter dated September 28, 2010, the Executive Officer of the Regional Water Quality Control Board, Santa Ana Region (RWQCB), as lead agency for the State, concurred with EPA's selected remedy. The Executive Officer of the RWQCB, and the Acting Deputy Director of the California Department of Toxic Substances Control, clarified comments made in the September 28, 2010, letter in a second letter dated September 30, 2010.

2.9.9 Community Acceptance

During the public comment period, one commenter (the County of San Bernardino) expressed support for EPA’s preferred alternative.

One commenter (WVWD) opposed the reinjection component of Alternative 2b. Three commenters (Goodrich Corporation, FWC, and Dinah L. Watson) expressed disapproval of EPA’s proposed cleanup plan in whole or in part for differing reasons, implicitly supporting the No-Action Alternative.

2.10 Principal Threat Wastes

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a Site wherever practicable. The principal threat concept is applied to the characterization of source materials at a Superfund Site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material. Non-aqueous phase liquids (NAPLs) in groundwater may be a source material, and may be present at the Site, but their presence at the Site has not yet been established and NAPL is not being directly addressed by the SA OU.

2.11 Selected Remedy

EPA's selected remedy for the B.F. Goodrich Site Source Area OU includes the major elements of Alternative 2a, with added flexibility in the extraction, treatment, conveyance, and groundwater use components as described in detail below.

2.11.1 Summary of the Rationale for the Selected Remedy

Based on the information currently available, EPA has concluded that the selected remedy meets the threshold criteria and provides the best balance of trade-offs among the remedial alternatives.

The selected remedy is a groundwater pump and treat system intended to limit the movement of contaminated groundwater from the 160-acre source area during all expected future groundwater conditions, thereby satisfying the RAOs of protecting water supply wells and groundwater resources downgradient of the 160-acre area and removing contaminants from the groundwater. The selected remedy will result in permanent and significant reduction in the mobility of perchlorate, TCE, and other COCs in groundwater downgradient of the 160-Area Area, and a permanent and significant reduction in the volume of contaminated groundwater downgradient of the 160-Area Area. The selected remedy includes the installation of multiple new groundwater monitoring wells and piezometers and the monitoring of new and existing wells to optimize and evaluate remedy performance.

The most decisive considerations that affected the selection of the remedy were:

- the increased effectiveness and modest increase in cost of increasing the groundwater extraction and treatment capacity from 1,650 to 3,200 gpm (the assumed capacities in Alternatives 1 and 2a, respectively);
- the lower cost, similar level of effectiveness, and easier implementation of an extraction and treatment system having a capacity of 3,200 gpm rather than 5,000 gpm (the capacities in Alternatives 2a and Alternative 3, respectively);
- the expectation that the selected remedy will achieve RAOs during all expected groundwater conditions, and the ability to increase pumping or make other modifications to the remedy if the groundwater monitoring program indicates that the RAOs are not being achieved during all expected groundwater conditions; and
- the importance of making the treated groundwater available as a source of drinking water (rather than reinjection into the aquifer) and lower estimated cost if EPA succeeds in making arrangements for use of the treated water as drinking water supply.

One comment received during the public comment period supported EPA's preferred alternative. None of the other comments supported a particular remedial alternative (although several implicitly supported the No-Action Alternative). The State concurred with EPA's selected remedy in letters dated September 28, 2010 and September 30, 2010.

2.11.2 Description of the Selected Remedy

EPA's selected remedy for the Source Area OU of the B.F. Goodrich Site is a groundwater pump and treat system. The remedy is intended to intercept and provide hydraulic control of contaminated groundwater moving from the 160-acre source area, where most or all of the contaminants entered the groundwater and the highest levels of groundwater contamination have been measured. The remedy includes the construction and operation of the following components, which are described in more detail in subsequent sections of this ROD.

- groundwater extraction wells located no more than 1,500 feet downgradient of the Intermediate and Regional Aquifer Target Area (defined below);
- water treatment systems to remove TCE and other VOCs from the extracted groundwater;
- water treatment systems to remove perchlorate from the extracted groundwater;
- pipelines and pumps to convey the contaminated groundwater from the extraction wells to the treatment plant;
- pipelines and pumps to convey the treated water from the treatment plant to one or more local water utilities for distribution to the utilities' customers as municipal water supply (or for aquifer replenishment via new groundwater reinjection wells if agreements cannot be reached with the water utilities in a reasonable period of time); and
- a groundwater monitoring program.

The targeted area of groundwater contamination encompasses portions of the Intermediate and Regional Aquifers:

- The *Intermediate Aquifer Target Area* is the portion of the aquifer within the footprint of and downgradient of the 160-acre area where COC concentrations in groundwater exceed chemical-specific ARARs. The upgradient boundary of the Target Area is near groundwater monitoring well CMW-3, the northernmost groundwater monitoring well on the 160-acre area where the concentrations of COCs have consistently exceeded chemical-specific ARARs. The downgradient boundary of the Target Area is where the Intermediate Aquifer is no longer present as a distinct aquifer. The downgradient boundary is in the vicinity of the 210 Freeway, approximately one and one-half miles to the southeast of the 160-acre area.
- The *Regional Aquifer Target Area* is the portion of the Regional Aquifer underlying the Intermediate Aquifer Target Area where the concentrations of the COCs in groundwater exceed chemical-specific ARARs. The upgradient boundary of the Regional Aquifer Target Area is at or upgradient of well WVWD-22.

The remedy must satisfy the performance criteria described in the following section.

2.11.2.1 Performance Criteria

The performance criteria for the selected remedy are as follows: The remedial action shall provide sufficient hydraulic control to prevent the movement of groundwater from the Target Area into clean or less contaminated portions of the aquifers.

Compliance with the performance criterion shall be verified by demonstrating hydraulic control of the targeted area and reducing groundwater concentrations at compliance locations (specified below) over time. Compliance shall initially be determined by demonstrating hydraulic control. After the remedy has operated for a period of time, expected to last several years, compliance shall be determined by demonstrating continued hydraulic control and a decrease in COC concentrations in compliance wells over time.

To demonstrate hydraulic control, there must be evidence that the hydraulic capture zone created by the remedy encompasses the Intermediate Aquifer and Regional Aquifer Target areas during all anticipated flow conditions (e.g., by evaluating the flow paths of particles originating within the Target Area). "All anticipated flow conditions" refers to the groundwater flow velocities resulting from wet, average, and dry periods in the hydrologic cycle. The capture zone shall be estimated by measuring groundwater levels and using a groundwater flow model capable of particle tracking simulations or a similar approach. Hydraulic control shall occur shortly after startup of the remedy and be maintained thereafter. Implementation of the remedial action shall not result in adverse effects to water supply wells that are not part of the remedial action (e.g., significant increases in the concentrations of COCs or significant movement of contaminated groundwater toward non-remedy wells).

The compliance locations shall be two or more downgradient compliance monitoring wells located approximately 500 to 1,500 feet downgradient of the groundwater extraction wells operated as part of the remedy. Compliance well screens shall be designed to minimize the dilution of groundwater samples and be sufficient in number and adequately located to verify that groundwater moving from the Target Area is intercepted by the remedy extraction wells.

2.11.2.2 Detailed Description of the Selected Remedy

Groundwater Extraction

The remedy shall include the installation of one or more new groundwater extraction wells needed to achieve the performance criteria. An existing, inactive production well owned by the City of Rialto (Rialto-02) may be used as one of the remedy extraction wells if remedial design evaluations confirm that the well is properly located and suitably constructed. Figure 13 depicts the Rialto-02 well location and the area, to the northeast of the Rialto Municipal Airport in Rialto, California, where one or more new groundwater extraction wells may be located. Final decisions on the locations of the groundwater extraction wells shall be made during remedial design.

Based on preliminary computer modeling conducted during the RI/FS, a total extraction capacity of 3,200 gpm shall be needed to satisfy the performance criteria during all anticipated groundwater conditions. This target capacity may be modified during the remedial design process if EPA determines that more or less capacity is required to satisfy the performance criteria.

Based on groundwater flow and particle tracking modeling simulation completed as part of the RI/FS, the estimated long-term average pumping rate from the remedy extraction wells is 1,840 gpm and the estimated typical flow rate is 1,500 gpm. Each extraction well shall be equipped with a variable frequency drive (VFD) to allow operation over the anticipated range of extraction rates.

Groundwater Treatment

The extracted groundwater shall be treated using an ion exchange or biological treatment process to remove perchlorate. The perchlorate removal technology shall be selected during remedial design. Based on evaluations completed during the RI/FS, EPA expects that ion exchange will be the least expensive, effective technology for perchlorate removal; however biological treatment has also been demonstrated as effective and implementable. If ion exchange is used, the type of resin to be used in the ion exchange process shall be selected during the remedial design phase.

The groundwater shall also be treated to remove TCE and other VOCs. The VOC treatment shall be LGAC, air stripping, and/or an advanced oxidation process. The VOC removal technology shall be selected during remedial design. The LGAC system, if used, shall be equipped with backwash facilities to remove carbon fines after carbon change-out. If air stripping is used, requirements of the South Coast Air Quality Management District (SCAQMD) are potentially applicable and an off-gas treatment technology may be required for the air discharged from the air stripper. Off-gas treatment may be accomplished with VGAC or catalytic oxidation.

Any spent resin or carbon requiring disposal shall be sent to an EPA-approved disposal facility.

If the treated water is distributed to local water utilities as potable water supply (the assumed end use option for the treated water), the extracted water shall be treated to reduce COC concentrations below Federal and State MCLs. In practice, the water treatment technologies used to remove the COCs are expected to reduce the concentration of most COCs to levels substantially below MCLs.

Table 10. Cleanup Goals for Chemicals of Concern (COCs) in Extracted and Treated Groundwater
B.F. Goodrich Site - Source Area OU ROD

COC	Reporting Units	Federal MCL (µg/L)	California MCL (µg/L)	Cleanup Level	Basis for Cleanup Level
Carbon Tetrachloride	µg/L	5	0.5	0.5	California MCL
Chloroform (Trichloromethane)	µg/L	80[1]	80[1]	80[1]	Federal MCL
Methylene Chloride (Dichloromethane)	µg/L	5	5	5	Federal MCL
Perchlorate	µg/L	none	6	6	California MCL
Trichloroethene (TCE)	µg/L	5	5	5	Federal MCL

Notes:
[1]The values listed for chloroform are for the combined concentration of four trihalomethanes: chloroform, dibromochloromethane, bromodichloromethane, and bromoform.

If water is distributed to local water utilities as potable water supply, the water may need to be disinfected to CDPH standards prior to discharge to a local water utility's distribution system. If disinfection is necessary, a thorough evaluation of disinfection system requirements shall be performed during remedial design to select the disinfectant to be used and determine whether effluent storage tanks are required at the treatment plant to meet CDPH requirements for contact time (the concentration-time or CT requirement). If the treated water is reinjected into the aquifer, the need for disinfection or other secondary treatment shall be evaluated during remedial design.

The water treatment systems shall be designed to account for the expected operating range. The estimated typical operational rate is 1,500 gpm; the estimated peak rate is 3,200 gpm. The treatment plant location shall be selected during remedial design.

Treated Water End Use

The selected remedy includes a preference for use of the treated water by one or more local water utilities as municipal drinking supply. There are several local water utilities with infrastructure and water rights in the RCB that could potentially be recipients of treated water from the selected remedy, including WVWD, FWC, the City of Rialto, and the City of Colton. A final decision about which utilities, if any, will accept the treated water shall be made during remedial design based on cost, the ease or difficulty of reaching agreement with the utilities, and other factors. Agreement may be needed on the length of time the utilities will commit to accept treated water; improvements to existing facilities required for delivery of treated water; cost-sharing; treated water quality and disinfection requirements; delivery locations and pressures, flow rates and other operational considerations; and water rights and other legal and financial considerations.

It is anticipated that negotiating the required agreement(s) will take considerable time and effort. If the required agreement(s) cannot be reached in a reasonable period of time, EPA may implement an alternate end use option. The alternate end use option is reinjection of the treated water into the Regional Aquifer upgradient of the 160-acre area as described in Alternative 2b. If the selected end use is reinjection, additional remedial design evaluations shall be conducted to select the appropriate number and location of injection wells.

Conveyance Systems

The specific conveyance systems required for the selected remedy shall be determined during remedial design after the extraction well, treatment plant, and treated water delivery locations are finalized. This section briefly summarizes the types of conveyance facilities assumed in Alternative 2a and in the remedy cost estimates. These assumptions are expected to be representative of the facilities required as part of the remedy.

In the RI/FS, it is assumed that the extracted groundwater will be conveyed from the extraction wells to the treatment system in 12- to 16-inch-diameter subsurface pipelines located in city streets. Extraction well pumps will be sized to provide sufficient head to lift the water from the aquifer and convey it to the treatment plant. In the RI/FS, the assumed pipeline routes from the extraction wells to the treatment plant were along West Highland Avenue, Easton Street, and Ayala Drive.

In the RI/FS, it was assumed that the treated water would be delivered from the treatment system to the WVWD potable water system through a subsurface 18-inch-diameter pipeline along Easton Street. Depending on the delivery location, a pump station may be required at the treatment plant to boost the treated water to the elevation necessary to match system pressure at the connection location. In the RI/FS, it was assumed that the connection to WVWD would occur at an existing 30-inch potable water line located in Cactus Avenue.

Groundwater Monitoring

Groundwater monitoring is a key component of the selected remedy and shall be carried out to demonstrate compliance with the performance criteria. In addition, groundwater monitoring shall occur to provide early warning of changes in contaminant conditions upgradient of the groundwater extraction locations and changes in groundwater elevations that could affect hydraulic control or treatment system performance. Upgradient conditions that could affect system operations include increases or decreases in the lateral or vertical extent of contamination, increases or decreases in contaminant concentrations, or detection of new contaminants that could require extraction rate or treatment plant modifications. Changes in groundwater elevations can affect the extraction rates needed to provide hydraulic control.

For remedy monitoring, at least two nested piezometer pairs shall be installed near each extraction well to provide water level data for use in evaluating hydraulic control. The piezometers shall provide for the measurement of hydraulic head at multiple locations and multiple depth intervals to help define the size of the extraction well capture zone. The estimated completion depths for the new, nested piezometers are 450 and 650 feet.

As described in Section 2.11.2.1, compliance wells for monitoring chemical-specific ARARs shall be located no more than 1,500 feet downgradient of the extraction wells. Compliance monitoring wells shall be approximately 700 feet deep.

Existing monitoring wells may be used to help meet remedy monitoring objectives. Arrangements to use existing monitoring wells, and decisions on the number, location, and design of the new monitoring wells needed to satisfy groundwater monitoring objectives, shall be made during remedial design. Monitoring frequencies and analytes shall also be determined during remedial design. Estimated monitoring frequencies are semiannual or annual for both water level and water quality monitoring.

2.11.3 Summary of the Estimated Remedy Costs

Summaries of the estimated capital, O&M, and present value costs of the major components of the selected remedy are included in Tables 11a and 11b. Table 11a assumes that the treated groundwater is supplied for potable drinking water use; Table 11b assumes that the treated groundwater is reinjected to replenish the aquifer. The information in the tables is based on the best available information regarding the anticipated scope of the remedy. Changes in costs may occur as a result of new information and data collected during the remedial design phase. As is the practice at federal Superfund sites, these are order-of-magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual cost.

Table 11a. Detailed Cost Estimate for the Selected Remedy – Drinking Water End Use *B.F. Goodrich Site – Source Area OU ROD*			
Capital Costs (Drinking Water End Use)			
Major System/Component	**Quantity**	**Unit Cost**	**Cost**
CONVEYANCE & WELL SYSTEM COSTS			
Water Pipelines			
10" Pipeline to Treatment Plant	100	$ 72	$ 7,000
12" Pipeline to Treatment Plant	3,100	$ 82	$ 253,000
18" Pipeline to West Valley Water District	3,600	$ 117	$ 422,000
Extraction Wells and Well Pumps/Well Heads			
New Extraction Well System	1	$ 618,579	$ 619,000
Piezometers (2 clusters per extraction well)	4	$ 100,000	$ 400,000
Extraction Well VFDs and PLC	2	$ 40,000	$ 80,000
Booster Pump Station			
Pump to WVWD Reservoir- 3,200 gpm	1	$ 186,294	$ 186,000
CONVEYANCE SYSTEM SUBTOTAL			***$ 1,967,000***
GROUNDWATER TREATMENT PLANT			
Untreated Water Tank			
Holding Tank- 10,000 gallon	1	$ 47,984	$ 48,000
Treatment Plant Feed Pump			
Feed Pump (3,200 gpm @280 feet of head)	2	$ 88,939	$ 178,000
Flow indicating totalizer	1	$ 4,000	$ 4,000
Bag Filter System			
Bag Filters- 1,650 gpm each	3	$ 20,403	$ 61,000
LGAC Adsorber System			
LGAC adsorber column pairs - 20,000 pounds, 10' Dia.	7	$ 177,674	$ 1,244,000
Flow indicating totalizer and Diff. Pressure Switch	14	$ 4,590	$ 64,000
Backwash System and Rinse Recovery- 30,000 gallons	1	$ 118,581	$ 119,000
Ion Exchange System			
Resin adsorber columns (3 pairs, 12' diameter)	3	$ 305,288	$ 916,000
Initial Resin Charge (6 vessels @ 350 cu ft)	2100	$ 333	$ 699,000

Table 11a. Detailed Cost Estimate for the Selected Remedy – Drinking Water End Use ***B.F. Goodrich Site – Source Area OU ROD***			
Capital Costs (Drinking Water End Use)			
Major System/Component	**Quantity**	**Unit Cost**	**Cost**
Chlorination System			
Holding Tank, metering pumps, chlorine analyzer, mixer, etc.	Lump	$ 75,000	$ 75,000
TREATMENT PLANT Equipment *(Material Only)*			$ 3,408,000
Labor For Equipment Installation			$ 511,000
Sitework	2.5%		$ 98,000
Mechanical - Piping	15.0%		$ 588,000
I & C	5.0%		$ 196,000
Electrical	10.0%		$ 392,000
Common Facilities	Lump		$ 226,000
Building/Lab & Site Improvements	Lump		$ 101,000
Metals	5.0%		$ 196,000
TREATMENT PLANT SUBTOTAL			***$ 5,716,000***
Engineering- Design/Technical Support (8% of Construction)	8%		$ 615,000
Contractor Overhead, Profit, General Conditions, Mob/Demob	~23%		$ 1,858,000
Construction Management	5%		$ 477,000
Construction Contingency	25%		$ 2,505,000
TOTAL ESTIMATED CAPITAL COSTS			**$ 13,138,000**

Table 11a. Detailed Cost Estimate for the Selected Remedy – Drinking Water End Use
B.F. Goodrich Site – Source Area OU ROD

Annual O&M Costs (Drinking Water End Use)				
Equip. Name	**per Unit**	**Units**	**Unit Cost**	**Cost**
Electrical Power				
Extraction Wells to Treatment Plant (1,840 gpm)	1,999,682	kW-hr		
Treatment Plant Pumps and Miscellaneous Equipment	726,904	kW-hr		
Booster Pump Station	312,331	kW-hr		
Total	3,039,000	kW-hr	$ 0.12	$ 365,000
Carbon Make-up				
LGAC (240 pounds/day)	87,600	lb C	$ 0.80	$ 70,000
Chemicals/Materials				
Ion Exchange Resin	2,970	acre-feet	$ 145	$ 430,000
Chlorine, Filter Bags, LGAC Backwash Sludge Disposal				$ 23,000
Analytical				
Treatment Plant, Extraction and Monitoring Wells				$ 72,000
Labor				
Operating, Administrative and Management	5,930	hours	$19.50 to $42	$ 196,000
Subcontracts				
Monitoring Wells Sampling (Subcontract)	1	lump sum	$ 90,000	$ 90,000
Regulatory Monitoring Reports	1	lump sum	$ 25,000	$ 25,000
Parts				
2% of Treatment Plant Capital	2%			$ 114,000
OPERATIONS AND MAINTENANCE SUBTOTAL				**$ 1,385,000**
O&M Contingency	10%			$ 139,000
SUBTOTAL O&M BEFORE PURVEYOR REIMBURSEMENT				**$ 1,524,000**
Purveyor Reimbursement at $75 per acre-foot	2,970	acre-feet	$75	**$ 223,000**
ESTIMATED ANNUAL O&M COSTS				**$ 1,301,000**
NET PRESENT VALUE OF THE ESTIMATED O&M COSTS				**$ 16,144,000**
TOTAL ESTIMATED PRESENT WORTH FOR SELECTED REMEDY				**$ 29,282,000**

Table 11b. Detailed Cost Estimate for the Selected Remedy – Reinjection/Aquifer Replenishment End Use
B.F. Goodrich Site – Source Area OU ROD

Capital Costs (Aquifer Replenishment End Use)			
Major System/Component	**Quantity**	**Unit Cost**	**Cost**
CONVEYANCE & WELL SYSTEM COSTS			
Water Pipelines			
10" Pipeline to Treatment Plant	100	$ 72	$ 7,000
12" Pipeline to Treatment Plant	3,100	$ 82	$ 253,000
18" Pipeline to Injection Wells	17,600	$ 117	$ 2,061,000
Freeway Crossing	500	$ 535	$ 267,000
Extraction Wells and Well Pumps/Well Heads			
New Extraction Well System	1	$ 618,579	$ 619,000
Piezometers (2 clusters per extraction well)	4	$ 100,000	$ 400,000
Extraction Well VFDs and PLC	2	$ 40,000	$ 80,000
Injection Wells	2	$ 430,576	$ 861,000
Booster Pump Station			
Pump to Injection Wells	1	$ 288,899	$ 289,000
CONVEYANCE SYSTEM SUBTOTAL			**$ 4,837,000**
GROUNDWATER TREATMENT PLANT			
Untreated Water Tank			
Holding Tank- 10,000 gallon	1	$ 47,984	$ 48,000
Treatment Plant Feed Pump			
Feed Pump (3,200 gpm @280 feet of head)	2	$ 88,939	$ 178,000
Flow indicating totalizer	1	$ 4,000	$ 4,000
Bag Filter System			
Bag Filters- 1,650 gpm each	3	$ 20,403	$ 61,000
LGAC Adsorber System			
LGAC adsorber column pairs - 20,000 pounds, 10' Dia.	7	$ 177,674	$ 1,244,000
Flow indicating totalizer and Diff. Pressure Switch	14	$ 4,590	$ 64,000
Backwash System and Rinse Recovery- 30,000 gallons	1	$ 118,581	$ 119,000

Table 11b. Detailed Cost Estimate for the Selected Remedy – Reinjection/Aquifer Replenishment End Use ***B.F. Goodrich Site – Source Area OU ROD***			
Capital Costs (Aquifer Replenishment End Use)			
Major System/Component	**Quantity**	**Unit Cost**	**Cost**
Ion Exchange System			
Resin adsorber columns (3 pairs, 12' diameter)	3	$ 305,288	$ 916,000
Initial Resin Charge (6 vessels @ 350 cu ft)	2100	$ 333	$ 699,000
Chlorination System			
Holding Tank, metering pumps, chlorine analyzer, mixer, etc.	Lump	$ 75,000	$ 75,000
TREATMENT PLANT Equipment *(Material Only)*			$ 3,408,000
Labor For Equipment Installation			$ 511,000
Sitework	2.5%		$ 98,000
Mechanical - Piping	15.0%		$ 588,000
I & C	5.0%		$ 196,000
Electrical	10.0%		$ 392,000
Common Facilities	Lump		$ 226,000
Building/Lab & Site Improvements	Lump		$ 101,000
Metals	5.0%		$ 196,000
TREATMENT PLANT SUBTOTAL			**$ 5,716,000**
Engineering- Design/Technical Support (8% of Construction)	8%		$ 844,000
Contractor Overhead, Profit, General Conditions, Mob/Demob	~23%		$ 2,552,000
Construction Management	5%		$ 655,000
Construction Contingency	25%		$ 3,440,000
TOTAL ESTIMATED CAPITAL COSTS			**$ 18,044,000**

Table 11b. Detailed Cost Estimate for the Selected Remedy – Reinjection/Aquifer Replenishment End Use
B.F. Goodrich Site – Source Area OU ROD

Annual O&M Costs (Aquifer Replenishment End Use)				
Equip. Name	**per Unit**	**Units**	**Unit Cost**	**Cost**
Electrical Power				
Extraction Wells to Treatment Plant (1,840 gpm)	1,999,682	kW-hr		
Treatment Plant Pumps and Miscellaneous Equipment	726,904	kW-hr		
Booster Pump Station	1,047,452	kW-hr		
Total	3,774,000	kW-hr	$ 0.12	$ 453,000
Carbon Make-up				
LGAC (240 pounds/day)	87,600	lb C	$ 0.80	$ 70,000
Chemicals/Materials				
Ion Exchange Resin	2,970	acre-feet	$ 145	$ 430,000
Chlorine, Filter Bags, LGAC Backwash Sludge Disposal				$ 23,000
Analytical				
Treatment Plant, Extraction and Monitoring Wells				$ 72,000
Labor				
Operating, Administrative and Management	5,930	Hours	$19.50 to $42	$ 196,000
Subcontracts				
Monitoring Wells Sampling (Subcontract)	1	lump sum	$ 90,000	$ 90,000
Regulatory Monitoring Reports	1	lump sum	$ 25,000	$ 25,000
Parts				
2% of Treatment Plant Capital	2%			$ 114,000
OPERATIONS AND MAINTENANCE SUBTOTAL				**$ 1,473,000**
O&M Contingency	10%			$ 147,000
SUBTOTAL O&M				**$ 1,620,000**
ESTIMATED ANNUAL O&M COSTS				**$ 1,620,000**
NET PRESENT VALUE OF THE ESTIMATED O&M COSTS				**$ 20,103,000**
TOTAL ESTIMATED PRESENT WORTH FOR THE SELECTED REMEDY				**$ 38,147,000**

Notes:

The Net Present Value of the Estimated O&M costs and the Total Estimated Present Worth for the Selected Remedy are based on a 7% discount rate and 30 years of O&M. Capital cost estimates are not discounted.

Assumed pipeline routes and treatment technologies may be refined during remedial design, affecting costs. Cost estimates are expected to be within a +50 to -30% accuracy range.

2.11.4 Expected Outcomes of Selected Remedy

The selected remedy will limit the movement of groundwater contaminated with high levels of VOCs and perchlorate from the 160-acre source area. This will reduce risk to human health, and help protect future uses of drinking water supply wells and groundwater resources downgradient of the 160-acre area. Although unrestricted use of the aquifer is not an objective of this remedy, the remedy will begin the process of restoring the contaminated aquifers by removing contaminants from the groundwater. The remedy will reduce the eventual cost, difficulty, and time required for restoration of the aquifer.

The remedy will start protecting downgradient areas shortly after startup and will continue to protect downgradient areas during the full range of expected future groundwater conditions.

Cleanup levels for removal of the primary COCs from the extracted groundwater are summarized on Table 10. As noted in Section 2.11.2.2, EPA will use the federal and state drinking water MCLs as the minimum cleanup levels for the treated groundwater. If the treated water is distributed to local water utilities as potable water supply (the assumed end use option for the treated water), the extracted water will be treated to lower levels as required by the CDPH. The treated groundwater from the remedy is expected to provide a reliable, long-term supply of clean water for municipal (e.g., drinking water) use by one or more local water utilities.

As noted in Section 2.3, one or more additional remedies are planned to address human health risks and protect existing and future beneficial uses of the aquifer affected or threatened by contaminated groundwater that has already moved past the area targeted by this remedy.

2.12 Statutory Determinations

This section provides a brief, site-specific description of how the selected remedy satisfies the statutory requirements of CERCLA §121 (as required by NCP §300.430(f)(5)(ii)), and explains the five-year review requirements for the selected remedy.

2.12.1 Protection of Human Health and the Environment

The selected remedy will reduce human health risk by limiting the spread of highly contaminated groundwater into clean and less contaminated portions of the RCB, reducing the likelihood and, potentially, the magnitude of human exposure to contaminated groundwater. The remedy targets groundwater in the highly contaminated 160-acre source area where contaminant concentrations have exceeded the levels allowed in drinking water by a factor of 1,600 or more. The RCB is a current source of drinking water to tens of thousands of people.

If no action is taken, contaminated groundwater will continue to spread, increasing the likelihood of future increases in contaminant concentrations in downgradient portions of the aquifer, increasing risk by increasing the likelihood of exposure, and increasing the eventual cost, difficulty, and time required for restoration of the aquifer.

The selected remedy includes above-ground water treatment systems to remove the COCs (perchlorate and VOCs) from the extracted groundwater. After treatment, the extracted groundwater will achieve all ARARs identified in this ROD. The remedy also requires compliance with ARARs associated with the disposal of treatment residuals and control of air emissions, if any, to eliminate or minimize short-term risks and cross-media impacts. The remedy includes an extensive monitoring program to evaluate the performance of the remedy.

At present, there is no known exposure pathway in which ecological receptors could be exposed to contaminated groundwater at the Site.

2.12.2 Compliance with Applicable or Relevant and Appropriate Requirements

The SA OU remedy shall comply with ARARs as described in Tables 12 through 14, except when additional studies and investigations may be undertaken pursuant to CERCLA section 104(b) (CERCLA section 104(b) activities) during remedial design. EPA expects to fully comply with ARARs during most CERCLA section 104(b) activities, but there may be activities during which EPA concludes that it is not practicable to comply fully. Such activities may include discharges of untreated or partially treated groundwater resulting from the development and testing of new groundwater extraction wells, but may also include other temporary high flow, high volume discharges.

In such cases, EPA will evaluate the practicability of fully complying with ARARs, and comply with the EPA policy that removal actions "will comply with ARARs to the extent practicable, considering the exigencies of the circumstances" (55 Fed. Reg. 8756). Studies and investigations undertaken pursuant to CERCLA section 104(b), such as activities conducted during RI/FS, are considered removal actions (55 Fed. Reg. 8756).

Tables 12 through 14 provide a complete list of ARARs. Because this remedy is an interim action that does not include restoration of the aquifer as an objective, EPA is not, at this time, establishing chemical-specific ARARs as *in situ* cleanup goals for contaminated groundwater at the Site. In situ cleanup goals will be addressed in a subsequent decision document.

ARARs are frozen at the time the ROD is signed, but offsite requirements are not (e.g., drinking water standards applicable to treated water delivered for potable use). Offsite requirements in effect at the time the action occurs must be met, even if they differ from those in effect at the time the ROD is signed.

2.12.3 Cost-Effectiveness

EPA must select a remedy that is cost effective. The NCP defines a cost-effective remedy as one whose “costs are proportional to its overall effectiveness.” More than one remedial alternative can be cost effective, and EPA is not required to select the most cost-effective alternative. Overall effectiveness is determined by evaluating three of the balancing criteria: long-term effectiveness; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness.

In EPA’s judgment, the selected remedy for the SA OU is cost-effective. EPA made this judgment after evaluating the overall effectiveness of the alternatives that satisfied the threshold criteria (i.e., Alternatives 2 and 3), and then comparing overall effectiveness to costs.

EPA’s judgment is based on the high ranking assigned to Alternatives 2a and 2b for the three balancing criteria. Alternatives 2a and 2b provide the elements of, and would have the same overall effectiveness as, the selected remedy. Alternative 3 is also ranked high on the three balancing criteria, but at higher cost (26 percent higher than Alternative 2a, assuming potable use of the treated water).

Alternative 1 is less expensive than the selected remedy (17 percent less than Alternative 2a, assuming potable use of the treated water), but also potentially less effective (ranked moderate in long-term effectiveness and not fully protective of human health). EPA has concluded that the incremental cost of the remedy provides a significant increase in overall effectiveness by increasing the likelihood that the remedy will prevent the spread of contaminated groundwater during all anticipated groundwater conditions.

EPA judges the No-Action Alternative as neither protective of human health nor cost-effective.

Table 12. Chemical-specific Applicable or Relevant and Appropriate Requirements
B.F. Goodrich Site - Source Area OU ROD

Source	Citation	ARAR Status	Description	Comment
Federal Safe Drinking Water Act (SDWA), 42 U.S.C. 300 et seq.	National Primary Drinking Water Standards, including 40 CFR 141.61 and 40 CFR 141.62	Relevant and Appropriate	Establishes national primary drinking water standards, including Maximum Contaminant Levels (MCLs), to protect the quality of water in public water systems. MCLs are enforceable standards and represent the maximum concentrations of contaminants permissible in a public water system.	The remedy will result in the use of treated groundwater as drinking water supply or for aquifer replenishment. In either case, water treatment systems will reduce the concentrations of perchlorate, TCE, and other COCs to below EPA or State MCLs, whichever is lower. MCLs are considered relevant and appropriate.
State of California Domestic Water Quality and Monitoring Regulations	California Safe Drinking Water Standards (MCLs), 22 CCR § 64431, and § 64444	Relevant and Appropriate	Establishes California MCLs. Some California MCLs are more stringent than the federal MCLs, and some California MCLs are established chemicals for which there are no federal MCLs. The more stringent limit is determined on a chemical-by-chemical basis.	There is a California MCL for perchlorate but no federal MCL. The California MCL for carbon tetrachloride is lower than the federal MCL for carbon tetrachloride.
SDWA, 42 USC 300 et seq.	National Primary Drinking Water Standards, 40 CFR 141, including 40 CFR 141.23 and 40 CFR 141.24	Relevant and Appropriate	Requires monitoring to determine compliance with MCLs.	

Note:

CCR = California Code of Regulations

CFR = Code of Federal Regulations

Table 13. Action-specific Applicable or Relevant and Appropriate Requirements *B.F. Goodrich Site - Source Area OU ROD*				
Source	**Citation**	**ARAR Status**	**Description**	**Comment**
Clean Air Act, South Coast Air Quality Management District (SCAQMD)	SCAQMD Regulation XIII, comprising Rules 1301 through 1313 SCAQMD Rule 1401 SCAQMD Rule 1401.1 SCAQMD Rules 401 through 403	Potentially Applicable	Rules 1301 through 1313 establish new source review requirements. Rule 1303 requires that all new sources of air pollution in the district use best available control technology (BACT) and meet appropriate offset requirements. Emissions offsets are required for all new sources that emit in excess of 1 pound per day of VOCs. SCAQMD Rule 1401 requires that best available control technology for toxics (T-BACT) be employed for new stationary operating equipment if the cumulative carcinogenic impact from air toxics would exceed the maximum individual cancer risk limit of 1 in 1 million (1 × 10-6) without T-BACT. SCAQMD Rule 1401.1 applies to discharges that are within 500 feet of a school and requires that the discharges from a facility do not create a cancer risk in excess of 1 in 1 million (1 × 10-6) at the school. SCAQMD Rule 401 limits visible emissions from a point source. SCAQMD Rule 402 prohibits discharge of material that is odorous or causes injury, nuisance, or annoyance to the public. SCAQMD Rule 403 limits downwind particulate concentrations.	Construction activities must comply with all substantive SCAQMD requirements, if applicable. If air stripping is used to remove VOCs from groundwater, air emissions must meet substantive SCAQMD requirements, if applicable.

Table 13. Action-specific Applicable or Relevant and Appropriate Requirements ***B.F. Goodrich Site - Source Area OU ROD***				
Source	**Citation**	**ARAR Status**	**Description**	**Comment**
RCRA Subtitle C Hazardous Waste Identification and Generator Requirements; California Hazardous Waste Regulations, Generator Requirements	22 CCR, Division 4.5, Chapter 11 Identification and Listing of Hazardous Waste	Potentially Applicable	A solid waste is a RCRA hazardous waste if it exhibits any of the characteristics of ignitability, corrosivity, reactivity, or toxicity identified in 22 CCR 66261.21, 66261.22(a)(1), 66261.22(a)(2), 66261.23, 66261.24(a)(1), 22 CCR 66262.11, and 22 CCR 66260.200, or if it is listed as a hazardous waste in Article 4 of Chapter 11. Under the California RCRA program, wastes can be classified as non-RCRA, state-only hazardous wastes if they exceed the soluble threshold limit concentration (STLC) or the total threshold limit concentration (TTLC) values listed in 22 CCR 66261.24(a)(2).	Wastes generated during construction of the remedy (e.g., drill cuttings or soil from pipeline installation) or operation of the remedy (e.g., treatment residuals such as spent carbon or resin) will be characterized and managed in accordance with substantive provisions of any applicable RCRA requirements.
Federal SDWA Underground Injection Control (UIC) Regulations, 42 U.S.C. §300f et seq.	40 CFR 144.12-144.13	Potentially Applicable	Prohibits injection wells from 1) causing a violation of primary MCLs in the receiving waters, and 2) adversely affecting the health of persons. Provides that contaminated groundwater that has been treated may be reinjected into the formation from which it is withdrawn if such injection is conducted pursuant to a CERCLA cleanup and is approved by EPA.	If reinjected to replenish the aquifer, groundwater will be treated to comply with UIC requirements.

Table 13. Action-specific Applicable or Relevant and Appropriate Requirements
B.F. Goodrich Site - Source Area OU ROD

Source	Citation	ARAR Status	Description	Comment
Resource Conservation and Recovery Act §3020	42 U.S.C. §6939b	Relevant and Appropriate	Provides that the ban on the disposal of hazardous waste into a formation that contains an underground source of drinking water shall not apply to the injection of contaminated groundwater into the aquifer if: (i) such injection is part of a response action authorized by CERCLA; (ii) such contaminated groundwater is treated to substantially reduce hazardous constituents prior to such injection; and (iii) such response action will, upon completion, be sufficient to protect human health and the environment.	If determined to be hazardous waste, groundwater will be reinjected into the aquifer only if it is treated as part of the CERCLA response action and the action is protective of human health and the environment.
California Porter-Cologne Water Quality Act, California Water Code 13240	Water Quality Control Plan (Basin Plan) for the Santa Ana River Basin, Chapters 2(Plans and Policies), 3(Beneficial Uses), and 4 (Water Quality Objectives)	Relevant and Appropriate	The California Porter-Cologne Water Quality Act incorporates the requirements of the federal Clean Water Act (CWA) and implements additional standards and requirements for surface waters and groundwaters of the state. The Regional Water Quality Control Board, Santa Ana Region (RWQCB) formulates and enforces water quality standards as defined in the Basin Plan. The Basin Plan identifies the beneficial uses of surface and ground waters and establishes water quality objectives necessary to protect beneficial uses. Water quality objectives impose limitations on receiving waters, rather than on discharges, and are applicable to any body of water that receives discharge from remedial activities associated with this OU. The Basin Plan also incorporates State Water Resources Control Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California." Resolution No. 68-16 requires	Substantive provisions of Chapters 2, 3 and 4 of the Basin Plan will be relevant and appropriate if remediation includes reinjection of treated water to replenish the aquifer or if there are temporary discharges to surface water during design, construction, or operation of the remedy.

Table 13. Action-specific Applicable or Relevant and Appropriate Requirements
B.F. Goodrich Site - Source Area OU ROD

Source	Citation	ARAR Status	Description	Comment
			maintenance of existing state water quality unless it is demonstrated that a change will benefit the people of California, will not unreasonably affect present or potential uses, and will not result in water quality less than that prescribed by other state policies.	
Federal Water Pollution Control Act 33 USC 1311, 1314(b)		Potentially Applicable	Provides requirements for effluent limitations from point sources.	Substantive provisions potentially apply if remediation includes temporary discharges to surface water during design, construction, or operation of the remedy.
Federal Water Pollution Control Act 33 USC 1342,1344	33 CFR 323.1 et seq.	Potentially Relevant and Appropriate	Provides requirements for discharges from point sources into waters of the United States. Waters of the United States are defined in 40 CFR 122.2 . The dredge and fill requirements are for discharges into the navigable waters of the United States.	Substantive provisions may be relevant and appropriate if remediation includes temporary discharges to surface water during design, construction, or operation of the remedy and/or discharge of dredged or fill material
California Toxics Rule.	40 CFR 131.36(d)(10)(ii)	Applicable	The California Toxics Rule is a federal regulation promulgated under the Federal Water Pollution Control Act that sets numeric criteria for certain pollutions in inland waters. It applies to waters assigned an aquatic life or human health use classification in a California Regional Water Quality Control Plan.	Criteria will be applicable if there are temporary discharges to surface water during design, construction, or operation of the remedy.
California Land Disposal Restrictions, Requirements for Generators	22 CCR 66268.1 et seq. Also 22 CCR 66268.3, 22 CCR 66268.7, 22 CCR 66268.9, 66268.40 and 22 CCR 66268.50	Potentially Applicable	Compliance with land disposal regulation treatment standards is required if hazardous waste (e.g. contaminated soil) is placed on land.	Land disposal requirements may apply to the disposal of spent carbon generated during the treatment of groundwater for VOCs and, potentially, to the disposal of treatment residuals associated with other technologies if the wastes are determined to be hazardous wastes. Wastes will be characterized before shipment offsite to determine whether land disposal restriction treatment standards apply and, if so, whether the waste meets the treatment standards.

Table 13. Action-specific Applicable or Relevant and Appropriate Requirements
B.F. Goodrich Site - Source Area OU ROD

Source	Citation	ARAR Status	Description	Comment
California Hazardous Waste Regulations, Generator Requirements	22 CCR 66262.34(a)(1)(A)	Relevant and Appropriate	Hazardous waste stored onsite should be placed in containers or tanks that are in compliance with California Hazardous Waste Regulations.	Storage of any hazardous waste accumulated onsite must be in compliance with substantive requirements for interim status facilities.
California Hazardous Waste Regulations, Storage of Hazardous Waste	22 CCR 66265.170 et seq. (Article 9) 22 CCR 66265.190 et seq. (Article 10)	Applicable	Regulates the use and management of hazardous waste in containers, compatibility of hazardous wastes with containers, and special requirements for certain hazardous wastes.	Substantive provisions of Articles 9 and 10 will be applicable if hazardous waste is generated and accumulated onsite.

Table 14. Location-specific Applicable or Relevant and Appropriate Requirements
B.F. Goodrich Site - Source Area OU ROD

Requirement	Citation	Applicable or Relevant and Appropriate?	Description of Requirement	Action to be Taken to Attain Requirement
National Historic Preservation Act (NHPA), (16 U.S.C. § 470 et seq. Historic Sites Act of 1935, 16 U.S.C. 461 et seq.	36 CFR Parts 62,63,66,68 36 CFR Part 800 36 CFR 62.6(d) 36 CFR Part 65 36 CFR 63, 36 CFR 800	Potentially Applicable	The NHPA requires federal agencies to take into account the effect of any federally assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places (NRHP). Under the Historical Sites Act, the Secretary of the Interior is authorized to designate areas as national natural landmarks for listing on the National Registry of Natural Landmarks. Requires preservation of historical sites, buildings and objects that are discovered that have national significance.	The Site has not been designated as having historic value to warrant inclusion in the NRHP, or listed as a national natural landmark under the Historic Sites Act, but EPA will evaluate whether any site or structure encountered during implementation of the remedy is eligible.
The Archaeological and Historic Preservation Act (AHPA), 16 U.S.C. 469 et seq. Archaeological Resources Protection Act (ARPA), 16 U.S.C. 470	43 CFR Part 7	Potentially Applicable	AHPA provides for preservation of historical and archaeological data that might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program. The ARPA prescribes steps to be taken by investigators to preserve data. If remedial activities would cause irreparable loss or destruction of significant scientific, prehistoric, historical, or archaeological data, mandatory data recovery and preservation activities would be necessary.	EPA will evaluate whether any terrain to be altered during implementation of the remedy may affect archaeological or historical data.

Table 14. Location-specific Applicable or Relevant and Appropriate Requirements *B.F. Goodrich Site - Source Area OU ROD*				
Requirement	**Citation**	**Applicable or Relevant and Appropriate?**	**Description of Requirement**	**Action to be Taken to Attain Requirement**
The Endangered Species Act (ESA), 16 U.S.C. 1531, et seq. California Endangered Species Act, California Fish and Game Code, Division 3, Chapter 1.5 Native Plants Protection Act, California Fish and Game Code, Division 2, Chapter 10 1907-1908	50 CFR Part 200; 50 CFR Part 402 CCR 2050-2089 CCR 1908	Potentially Applicable	The ESA requires consultation with the resource agencies for remedial actions that may affect threatened or endangered species or their critical habitat. Section 7 of the ESA requires that federal agencies consider whether their actions will jeopardize the existence of species that are listed as threatened or endangered by the United States Fish and Wildlife Service or the National Marine Fisheries Service or their critical habitat. The California ESA establishes requirements for species and subspecies native to California. Establishes requirements to protect endangered native plants or rare native plants. Substantive provisions of these three acts may apply if applicable species and/or habitat are identified.	EPA will evaluate planned construction locations for threatened or endangered species or their critical habitat, and request consultation with appropriate resource agencies if implementation of the remedy may affect threatened or endangered species or their critical habitats.
Migratory Bird Treaty Act, 16 USC 703 California Fish and Game Code, Division 4, Part 2 Chapter 1	50 CFR 10.13 CCR 3003,3005,3511,3513	Potentially Applicable	Substantive provisions of the Act that protect migratory birds or any part, nest, or egg of any such bird may be applicable. Substantive provisions of the California regulations that protect the nests or eggs of birds are potentially applicable.	EPA will determine during remedial design if remedial activities may affect migratory birds and comply with applicable requirements.

Table 14. Location-specific Applicable or Relevant and Appropriate Requirements
B.F. Goodrich Site - Source Area OU ROD

Requirement	Citation	Applicable or Relevant and Appropriate?	Description of Requirement	Action to be Taken to Attain Requirement
Native American Graves Protection and Repatriation Act (NAGPRA), 25 USC 3001 et seq. California Native American Graves Protection and Repatriation Act, California Health and Safety Code 8011	43 CFR Part 10	Potentially Applicable	Substantive provision of the federal and state acts apply to the identification, protection and appropriate disposition of human remains, funerary objects, sacred objects, cultural items and/or cultural patrimony.	EPA will comply with substantive provisions of applicable requirements if human remains, funerary objects, sacred objects, cultural items and/or cultural patrimony are encountered during remedy construction.

Table 15. Other Federal Requirements
B.F. Goodrich Site – Source Area OU ROD

Requirement	Description of Requirement	Action to be Taken to Attain Requirement
Executive Order 11593 Protection and Enhancement of the Cultural Environment	Requires that federal agencies take timely steps to make records of any property listed on the NRHP that may be substantially altered by a federal action.	EPA will determine during remedial design if remedial activities may affect any properties listed on the NRHP.
Executive Order on Floodplain Management, Executive Order 11988	Requires that federal agencies evaluate the potential effects of activities in a floodplain to avoid, to the extent possible, adverse effects associated with direct and indirect development. In addition, EPA has developed guidance, the *Policy on Floodplains and Wetlands Assessments for CERCLA Actions* (EPA, 1985).	EPA will determine during remedial design if remedial activities may occur in a floodplain and avoid adverse effects to the extent possible.
Protection of Wetlands Executive Order No. 11990	Requires avoidance to the extent practicable the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands if a practical alternative exists. Wetlands are defined as waters of the United States in 40 CFR 122.2. Wetlands include those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstance do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.	EPA will determine during remedial design if remedial activities may affect wetlands.
Indian Sacred Sites Executive Order No. 13007	Requires federal agencies to avoid disturbing sacred Indian sites on Federal lands.	EPA will determine during remedial design if remedial activities will occur on Federal lands and sacred Indian sites may be present.

2.12.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies are practicable at the SA OU, until EPA obtains sufficient data to select a final remedy. The remedy incorporates treatment processes that are expected to permanently destroy the contaminants in the extracted groundwater. EPA has also determined that the selected remedy provides the best balance of tradeoffs as compared to the other options in terms of the five balancing criteria and two modifying criteria. The selected remedy is discussed below in relation to the alternatives that were not selected for each of the balancing and modifying criteria.

- Long-Term Effectiveness and Permanence: The selected remedy is expected to achieve RAOs during all expected groundwater conditions and is ranked high in relation to the Long-Term Effectiveness and Permanence criterion. Alternative 3 is also ranked high in relation to this criterion. In addition, Alternative 3 would have the capacity to maintain hydraulic control during more extreme hydraulic conditions. Alternative 1 may not be fully effective during extended wet periods, potentially limiting the alternative's effectiveness in preventing the spread of contaminated groundwater. Alternative 1 is ranked moderate in relation to the Long-Term Effectiveness and Permanence criterion. This criterion was a decisive criterion in the selection decision.
- Reduction of Toxicity, Mobility, or Volume through Treatment: The selected remedy satisfies the statutory preference for treatment and would employ treatment technologies that would significantly reduce the volume (and mass) of contaminants by inhibiting contaminant migration, and reduce the toxicity and volume of contaminants by removing contaminants from the extracted groundwater. The alternatives that were not selected would similarly satisfy the statutory preference for treatment and employ treatment technologies that would significantly reduce the toxicity and volume of contaminants. There would be minor differences in toxicity, mobility, and volume reduction in proportion to the average extraction and treatment rate of the alternative (in other words, slightly greater reductions in the selected remedy than in Alternative 1, and potentially a slightly greater reduction in Alternative 3 than in the selected remedy).
- Short-Term Effectiveness: The selected remedy and Alternatives 1 and 3 are all assigned a high ranking for short-term effectiveness. None of the alternatives pose unmitigable risks to the community during construction, nor do any of the alternatives pose unmitigable risks to workers beyond typical hazards associated with large construction projects.
- Implementability: The selected remedy is ranked moderate in relation to the implementability criterion, reflecting the need to acquire land or arrange access for the construction of extraction wells, treatment facilities, and conveyance facilities, other difficulties associated with a construction project in a developed area, and agreements that may be needed with third parties for implementation. Alternative 3 is ranked similarly. Alternative 1 is assigned a moderate to high ranking, reflecting the fact that it may require fewer participating parties and fewer agreements.

- Cost: It is EPA's judgment that the selected remedy is cost effective. The additional cost of the selected remedy compared to Alternative 1 (17 percent more, assuming potable use of the treated water) will provide a significant increase in overall effectiveness by increasing the likelihood that the remedy will prevent the spread of contaminated groundwater during all anticipated groundwater conditions. The incremental cost of Alternative 3 (26 percent higher, assuming potable use of the treated water), is not justified by a commensurate increase in long-term effectiveness. This criterion was a decisive criterion in the selection decision.
- State acceptance: The State concurs with the selected remedy.
- Community acceptance: One commenter supported EPA's proposed remediation strategy, and four commenters expressed disapproval of EPA's proposed cleanup plan in whole or in part.

  One of the disapproving comments opposed the alternate end use option for the treated groundwater (reinjection) but favored EPA's preferred end use option (direct use of the treated groundwater as drinking water supply). EPA has carefully considered the comment, as described in Part 3 of this ROD, and concluded that reinjection remains an appropriate alternate end use option for the treated groundwater and should be included as an element of the remedy.

  EPA also considered the other comments expressing disapproval of EPA's proposed cleanup plan, as described in Part 3 of this ROD. None of these comments support one of the other action alternatives. Instead, the comments state that EPA did not provide adequate support in the RI/FS for the proposed remedy (one comment), EPA's proposal is "incomplete and premature" (one comment), or that EPA's proposal would not result in the water being "completely and thoroughly cleaned" (one comment). After careful consideration of the comments, EPA has concluded that it has provided an adequate rationale for its action, and that it is appropriate for EPA to take action now rather than select the No-Action Alternative and wait to take action until additional studies are completed.

2.12.5 Preference for Treatment as a Principal Element

The SA OU remedy will treat VOCs and perchlorate in the extracted groundwater. By utilizing treatment as a significant element of the remedy, the remedy will satisfy the statutory preference that remedies employ treatment as a principal element.

2.12.6 Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

2.13 Documentation of Significant Changes

The Proposed Plan for the SA OU was released for public comment in February 2010. The Proposed Plan identified, as EPA's preferred alternative, the groundwater extraction, treatment, conveyance, and monitoring facilities included in Alternative 2a, with the aquifer replenishment component from Alternative 2b as an alternate option for use of the treated groundwater, and the flexibility to modify some elements of the alternative during the remedial design process.

EPA reviewed all written and verbal comments submitted during the public comment period. In response to the comments, EPA has made two changes:

> In response to a comment from the Goodrich Corporation, EPA has added additional flexibility in the selection of the water treatment process to be used for removal of perchlorate from the contaminated groundwater. This change would allow a biological treatment process (referred to as a bioreactor in the Goodrich comment), such as the one planned for the Rialto-06 project, to be used as part of the remedy.
>
> In response to a comment from WVWD, EPA is clarifying that additional remedial design evaluations shall be conducted to select the appropriate number, location, and design of groundwater injection wells if the treated groundwater is reinjected.

It was determined that no other changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

Part 3: Responsiveness Summary

The purpose of this Responsiveness Summary is to provide EPA's responses to comments received on the January 2010 Proposed Plan and RI/FS Report for the SA OU. During the public comment period, EPA received nine sets of comments on its proposed cleanup plan. Eight comments were submitted in writing (by regular mail or email) and one was made verbally during the public meeting held on February 10, 2010. A transcript of the public meeting, including the public comment, was prepared by a court reporter and is included in the Administrative Record.

The nine sets of comments can be summarized as follows:

- one set of comments was received from a party identified by EPA as a PRP for the B.F. Goodrich Site (Goodrich Corporation),
- one set of comments was received from a party responsible for an area of groundwater contamination to the south and west of the B.F. Goodrich Site (San Bernardino County),
- four sets of comments were received from public water suppliers affected by the groundwater contamination in the Rialto-Colton Basin or in adjacent groundwater basins (City of Riverside, WVWD [provided two sets of comments], and FWC)
- one comment was received from an individual who identified herself as a homeowner (Dinah L. Watson),
- one comment was received from an individual who identified himself as a consultant (Clay A. Rosson), and
- one comment was received from a vendor of a water treatment technology (Western Water Treatment Company).

3.1 Stakeholder Issues and Lead Agency Responses

One commenter, the County of San Bernardino, expressed support for EPA's proposed remediation strategy.

Four commenters expressed disapproval of EPA's proposed cleanup plan in whole or in part. Goodrich Corporation stated that EPA did not provide adequate support in the RI/FS for the proposed remedy. WVWD expressed opposition to Alternative 2b, which is partially incorporated into the selected remedy by the inclusion of aquifer replenishment as a backup option for use of the treated groundwater. Dinah L. Watson commented that EPA's proposal sounds like a "bad plan" because the water would not be "completely and thoroughly cleaned." FWC stated that EPA's proposal is "incomplete and premature."

In response to the Goodrich Corporation comments, EPA responds that there is adequate support in the RI/FS for the selected remedy and that all information necessary for the selection of a remedy has been considered. The basis for EPA's response is explained in detail in Appendix A. EPA's selected remedy incorporates one of the concerns expressed by the Goodrich Corporation by allowing the use of an existing biological treatment system such as the one planned as part of the Rialto-06 project.

In response to the WVWD comments, EPA disagrees with WVWD's comments that Alternative 2b is not viable and that reinjection of groundwater is infeasible. Based on evaluations described in the January 2010 RI/FS report, EPA has concluded that it adequately evaluated the cost, effectiveness, and implementability of aquifer replenishment and that reinjection is a feasible option for the SA OU. The basis for EPA's response is explained in detail in Appendix A. EPA's selected remedy incorporates one of the concerns expressed by WVWD by clarifying that additional remedial design evaluations would need to be conducted to select the appropriate number, location, and design of groundwater injection wells if the treated groundwater is used to replenish the aquifer.

In response to the comment from Dinah Watson that EPA's proposal sounds like a "bad plan" because the water would not be "completely and thoroughly cleaned," EPA agrees that additional cleanup of the RCB is likely to be needed beyond that proposed as part of the SA OU. Rather than wait until all testing at the Site has been completed, EPA chose to divide the Site into two parts, and begin cleanup of the portion of the Site where enough testing and analysis has been completed to proceed. A more complete response is provided in Appendix A.

In response to FWC's comment that EPA's proposal is "incomplete and premature," EPA affirms its conclusion that all information necessary for the selection of a remedy has been considered, the evaluations completed as part of the RI/FS and documented in the January 2010 RI/FS Report are technically supported and appropriate, there is adequate support in the RI/FS and this ROD for the selected remedy, and EPA has properly focused its efforts on the B.F. Goodrich Site (rather than other contamination problems in the region). The basis for EPA's response is explained in detail in Appendix A.

Four commenters offered information or expressed opinions about the B.F. Goodrich Site but did not offer specific comments on the remedial alternatives or EPA's preferred alternative.

3.2 Technical and Legal Issues

No single issue was raised by a significant number of commenters. Because EPA did not receive a large number of comments, and the comments address a wide variety of issues, EPA has prepared point-by-point responses to all comments received. The responses are provided in Appendix A, along with the comments in their entirety.

Appendix A
Detailed Responses to Comments

Comments by: Peter Duchesneau of Manatt, Phelps and Phillips LLP on behalf of Goodrich Corporation

Comment GR-1. ***As indicated below, Goodrich believes that there is not adequate support in the RI/FS for the selected remedial alternative, including its location, and that other important considerations relevant for the selection of the remedial alternative have not been addressed. As such, EPA should revisit the RI/FS and its justification of the selected remedial alternative.***

➢EPA Response: As explained below, EPA has concluded that there is adequate support in the RI/FS for the selected remedy and that all information necessary for the selection of a remedy has been considered.

Comment GR-2. ***The RI/FS does not take into account all available data and does not adequately address the relationship of the purported plume from the 160-acre area, for which the RI/FS proposes an interim remedy, with other sites in the Rialto-Colton Basin connected with perchlorate and/or trichloroethylene (TCE). This would affect the outcome of the modeling and the design and success of the proposed remedy. For instance, other available groundwater analytical data exists in the basin that has not been incorporated into the RI/FS, is left out of the plume depicted in Figure 7, and is not utilized in the groundwater modeling (e.g., N-16 and F-27). The RI/FS also fails to address or incorporate recent available data from EPA's own monitoring wells (see attached).***

➢EPA Response: Commenter is correct that the RI/FS does not take into account all available data in the RCB; however, the RI/FS takes into account data that are relevant to the evaluation of remedial alternatives and selection of a remedy for the Source Area Operable Unit (SA OU) of the B.F. Goodrich Site.

The primary data types considered in the RI/FS are measured groundwater levels, measurements of hydrogeologic properties, measured pumping rates for existing groundwater wells, groundwater sampling results, and soil sampling results.

Sources of these data include (but are not limited to) an initial EPA groundwater sampling event in January 2008, a second EPA groundwater sampling event in March and April 2009, soil and groundwater testing results generated by PRPs under EPA or State oversight, groundwater level measurements and test results for municipal water supply wells provided by Rialto area water utilities, studies of the Rialto-Colton groundwater basin by the U.S. Geological Survey, and investigations of the former bunker area completed by San Bernardino County and its consultants under State oversight.

Data were generated, compiled, and evaluated for the 160-Acre Area, for other portions of the Rialto-Colton groundwater basin targeted by the SA OU, and for portions of the Rialto-Colton groundwater basin and adjoining groundwater basins upgradient, cross-gradient, and downgradient of the area targeted by the SA OU.

EPA considered data from a large number of monitoring wells, well clusters, and water supply wells, including, among others:

- Goodrich Corp. wells PW-1, PW-2, PW-3, PW-4, PW-5, PW-6, PW-7, PW-8, PW-9
- Emhart/PSI wells CMW-01, CMW-02, CMW-03, CMW-04, CMW-05
- City of Colton wells CPW-16, CPW-17
- Rialto-01, Rialto-02, Rialto-03, Rialto-04, Rialto-05, Rialto-06
- Colton 15, Colton 17, Colton 24
- USGS cluster wells 1N/5W-29Q, 1S/5W-11F, 1S/4W-20H_3S, 1S/5W-13B_4S, 1N/5W-29Q_3S, 1S/5W-3A
- WVWD-22, WVWD-24, WVWD-33
- San Bernardino County wells M-1_D, M-2_4, M-3_4, M-4_D, M-5_4, M-6_4
- San Bernardino County wells N-1, N-3, N-4, N-5, N-6, N-7, N-8, N-9_D, N-10_D, N-11_D, N-12, N-13_D, N-14, N-15_D
- San Bernardino County wells F-3, F-6, F-6A, F-32
- Target TW-1

These data are used to evaluate potential health risks from contaminated groundwater (see Section 1.3.3 of the RI/FS Report), define the nature and extent of contamination (including definition of the target areas described in Section 3.2.2 of the RI/FS Report), understand the relationship between the SA OU and the overall B.F. Goodrich Site, and understand the relationship between the SA OU and other sources of perchlorate and TCE contamination in and near the RCB, including the former bunker area described in Section 1.6.2 of the RI/FS Report.

Commenter makes two specific statements in support of its claim that the RI/FS does not take into account all available data and does not adequately address the relationship of the groundwater contamination addressed by the SA OU (referred to as a plume) to other sites in the RCB where perchlorate and/or TCE have been detected.

First, commenter states that *For instance, other available groundwater analytical data exists in the basin that has not been incorporated into the RI/FS, is left out of the plume depicted in Figure 7, and is not utilized in the groundwater modeling (e.g., N-16 and F-27).* Commenter is correct that the RI/FS Report does not comment on groundwater analytical data from every well in the Rialto-Colton area, or depict all groundwater analytical results in the figures included in the report. (It is assumed that the commenter is referring to Figure 1-7. There is no Figure 7 in the RI/FS Report.) The RI/FS Report includes comments on, and/or depicts the results from, key wells needed to understand the nature and extent of contamination at the Site or satisfy other goals of the RI/FS. For example, Section 1.6 of the RI/FS Report discusses the concentrations of perchlorate and TCE in groundwater samples collected from key wells at the Site.

It is neither necessary nor helpful to include data from every well in the RCB in the RI/FS Report. Doing so would make the report more difficult to read and the figures more difficult to interpret. Wells N-16 and F-27 are not key wells because they are located far to the west/southwest of the SA OU and there are numerous monitoring wells located between N-16 and F-27, to the southwest, and the BF Goodrich Site, to the northeast, that have been used to define the extent of both the SA OU contamination and the former bunker area contamination. Wells N-16 is located approximately 0.5 mile to the southwest of the area known to be affected by the B.F. Goodrich Site; F-27 is located approximately 1 mile to the southwest of the area known to be affected by the B.F. Goodrich Site.

Second, commenter states that *The RI/FS also fails to address or incorporate recent available data from EPA's own monitoring wells (see attached)*. Commenter is correct that EPA did not provide a detailed discussion of data from six new groundwater monitoring wells installed by EPA between April and November 2009. Data from the new wells were not needed for the purposes of the RI/FS and, in any case, few data were available from the new wells at the time that the RI/FS was completed. Five of the six wells were installed downgradient of the area targeted by the selected remedy to help evaluate the need for a second remedy at the site (i.e., they are located outside of the area addressed by the SA OU). Water quality data from the sixth well (EPA-MP4), which is located in the area addressed by the SA OU, were not available at the time the RI/FS report was completed. (The first groundwater sampling results from EPA-MP4 were available from the analytical laboratory on 1/7/10.) EPA does show the locations of the new wells in several figures in the RI/FS report (Figures 1-2, 1-4, and 3-2) and mentions that their installation was underway (RI/FS report, Table 1-1). EPA has added the results of the analyses of groundwater samples from the six new wells, from August 2009, December 2009, March 2010, and/or April 2010, to the Administrative Record. The results do not affect EPA's evaluation of remedial alternatives or remedy selection decision.

Commenter also states that the alleged omissions would affect the design and success of the proposed remedy. Commenter is correct in noting that the RI/FS does not include all data needed to design a remedy. As noted in the RI/FS Report, and consistent with EPA regulations and guidance, additional data collection is planned during the remedial design process. EPA states in the RI/FS Report (p. 1-1) that: **"**Enough RI work has been completed to develop, evaluate, and select a remedial alternative. Additional data collection and analysis are anticipated during remedial design to further define project details."

Comment GR-3. ***Similarly, the history of the area and the identification of potential sources in the basin set forth in the RI/FS are incomplete and inaccurate. The RI/FS does not adequately consider the potential contribution to the "operable unit" from other sources in the basin, despite some of them being mentioned in the RI/FS (e.g., the bunker area). Some potential sources, such as the Denova site and the Broco manufacturing location, are ignored, despite being identified the administrative record. Moreover, while focusing on site locations associated with perchlorate, EPA has not investigated other potential sources of TCE in the basin despite listing the site on the National Priorities List based upon TCE. Without an accurate assessment of at least the available data, EPA cannot accurately characterize the purported plume or design an appropriate remedy.***

➯EPA Response: The SA OU of the BF Goodrich Site addresses contaminated groundwater in a portion of the site, extending from the 160-acre area about 1 ½ miles to the southeast. Except for a small portion of the targeted area of groundwater contamination that may be affected by contaminated groundwater originating from the former bunker area (discussed further in response to comment FWC-15), the known and suspected sources of the groundwater contamination addressed by the SA OU are located on the 160-acre area, including the Broco manufacturing area located at the southeast corner of the 160-acre area. Soil testing results for the Broco manufacturing area are described in several documents included in the Administrative Record, including 8/1/05 and 1/27/06 reports by Blasland, Bouck & Lee, Inc. and 6/23/06, 7/27/07, and 9/4/08 reports by Kleinfelder Inc. EPA disagrees with the comment that the identification of potential sources in the basin set forth in the RI/FS is "incomplete and inaccurate."

Commenter makes the statement that the history of the area is incomplete and inaccurate, but offers no explanation or support for the statement. The history is provided as background only, and provides adequate detail to support the purposes of the RI/FS.

EPA provides information on the former bunker area in the RI/FS report (Section 1) and in the administrative record as background and as sources of data on groundwater quality and groundwater movement, **not** because EPA has concluded that the former bunker area is a significant source of the contamination addressed by the SA OU. It is stated in at least two locations in the RI/FS report that the former bunker area is not part of the BF Goodrich Site (Sections 1.3.3 and 1.6.2). Investigation and cleanup of soil and groundwater contamination associated with the former bunker area is being directed and overseen by the Water Board.

As noted in the comment, EPA included documents related to the former Denova and Broco locations in the Administrative Record. These documents were listed, along with other documents providing soil, soil gas, and groundwater data from locations downgradient of the 160-Acre Area, in Table 1-1 of the RI/FS report. EPA is unclear what the commenter means in stating that EPA ignored these potential sources.

TCE is a COC for the SA OU, and EPA and others have investigated the presence of TCE at the site as part of many of the investigations listed in Table 1-1 of the RI/FS. Investigations completed to date that included analysis of environmental samples for TCE include the results described in the 4/11/2003 report by PES Environmental, Inc., the 12/15/2003 report by Kleinfelder, Inc., the 4/20/2004 report by Locus Technologies, the 3/24/2005 report by GeoSyntec Consultants, the 2/10/2005 report by Environ International Corp., the 4/15/2005 report by Kleinfelder, Inc., the January 2006 report by Blasland, Bouck & Lee, Inc, the 3/30/2007 report by Environ International Corp. and Adverus, the 10/21/2006 report by Geosyntec Consultants, and the 4/22/2008 report by DPRA. They also include the January 2008 groundwater sampling event by EPA and CH2M HILL, the May and September 2009 sampling of soil vapor probes installed at or near the former B.F. Goodrich disposal pit, and the March 2009 groundwater sampling event by EPA and CH2M Hill. All of these reports are included in the Administrative Record for the SA OU. Additional investigations are underway as EPA conducts an RI/FS for a second operable unit at the Site.

As noted in the prior response, additional data collection and analysis are anticipated during remedial design to further define project details. If minor changes are detected in the extent of contamination or plume targeted by the SA OU, they can be accommodated during the design process.

Comment GR-4. ***The RI/FS does not adequately explain or support the basis for implementing an interim remedy and locating the selected remedial alternative at Rialto-2. EPA indicates that the operable unit is an incremental step toward cleanup and that its proposed action is considered "interim." However, in proposing two options and selecting the interim remedy, the RI/FS does not take into account the impact of other remedial measures***

that would later be needed in the basin as a result, including the total costs of the combined anticipated remedial actions.

Although the RI/FS sets forth the basis for ruling out Option 1, which proposed extracting contaminated groundwater from the Intermediate Aquifer at or downgradient of the 160-acre area, it does not adequately explain the reasoning for placing an extraction system at Rialto-2 under Option 2. The RI/FS merely explains that its downgradient target area boundary is downgradient of the merging of the Intermediate and Regional aquifers, which distinguishes it from Option 1. However, the location of Option 2 is questionable in light of the RI/FS indicating that contamination above the MCL is detected further down the basin and at higher levels than in the Rialto-2 area, such as in PW-5 (TCE at 32 ug/L and perchlorate at 1,400 ug/L) and PW-9 (TCE at 8.8 ug/L and perchlorate at 370 ug/L). The RI/FS should therefore consider other potential locations for the remedy, including in the area of Rialto-6, as discussed below.

⇘EPA Response: EPA has adequately explained the basis for the remedy selected in this Record of Decision. EPA's proposal and selected remedy are based on the January 25, 2010 RI/FS Report and other documents included in the Administrative Record. EPA adequately explains the basis for its decision to locate the remedy at or near Rialto-02, in the RI/FS Report and in the supplemental information provided as part of this response.

As described in Section 2.1 of the RI/FS and in the Proposed Plan, the objectives of the SA OU are to: 1) protect water supply wells and groundwater resources by limiting the spread of contaminated groundwater from the 160-acre area; and 2) remove the contaminants from the groundwater. These objectives are consistent with and encouraged by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and EPA policies and guidance (e.g., as summarized in *Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration* June 26, 2009, OSWER Directive 9283.1-33). The five key principals identified in the 2009 OSWER Directive are:

1) If groundwater that is a current or potential source of drinking water is contaminated above protective levels (e.g., for drinking water aquifers, contamination exceeds Federal or State MCLs or non-zero MCLGs), a remedial action under CERCLA should seek to restore that aquifer to beneficial use (e.g., drinking water standards) wherever practicable.

2) Groundwater contamination should not be allowed to migrate and further contaminate the aquifer or other media (e.g., vapor intrusion into buildings; sediment; surface water; or wetland).

3) Technical impracticability waivers and other waivers may be considered, and under appropriate circumstances granted if the statutory criteria are met, when groundwater cleanup is impracticable; the waiver decision should be scientifically supported and clearly documented.

4) Early actions (such as source removal, plume containment, or provision of an alternative water supply) should be considered as soon as possible. ICs [Institutional Controls] related to groundwater use or even surface use, may be useful to protect the public in the short-term, as well as in the long-term.

5) ICs should not be relied upon as the only response to contaminated groundwater or as a justification for not taking action under CERCLA. To ensure protective remedies, CERCLA response action cleanup levels for contaminated groundwater should generally address all pathways of exposure that pose an actual or potential risk to human health and the environment.

Four of the five principals are relevant to the SA OU.

Principal #1 applies to the SA OU because the Rialto-Colton groundwater basin is a current source of drinking water and is contaminated above protective levels (Federal and State MCLs). Although EPA is not establishing restoration of the aquifer as an objective of the SA OU, the SA OU will reduce the time required and eventual cost of restoration. EPA expects that some or all of the aquifer can be restored and expects to establish MCLs or alternative levels as cleanup goals for the aquifer in a subsequent decision document.

Principal #2 applies to the SA OU because the contaminated groundwater targeted by the SA OU continues to spread, further contaminating the aquifer. The basis for this statement, and the impacts of continued movement of the contaminated groundwater, are described in Sections 3.3.1, 5.2.1, and 5.3 of the RI/FS Report, which discuss the base-case modeling simulation and No-Action Alternative.

Principal #4 applies in that it encourages early actions such as plume containment, which is an objective of the SA OU.

Principal #5 applies in that the SA OU does not rely on ICs as the only response action or as a justification for not taking action.

As noted in the comment (and described in Section 3.2 of the RI/FS Report), EPA evaluated two options for satisfying the RAOs as a first step in the development of the remedial alternatives evaluated in the RI/FS. The first option, hydraulic control option #1, is to extract contaminated groundwater from the Intermediate Aquifer at or downgradient of the 160-acre area to limit the movement of contaminated groundwater into downgradient portions of the Intermediate Aquifer and the Regional Aquifer. The second option is to extract contaminated groundwater from the Regional Aquifer at or downgradient of the 160-acre area to limit the movement of contaminated groundwater into downgradient portions of the Regional Aquifer.

As explained in the RI/FS Report, Option 1 was screened out based on its high cost and uncertain effectiveness. Option 1 called for extraction of contaminated groundwater from the Intermediate Aquifer, which is not fully saturated and can support only limited pumping during periods of low to intermediate water levels. This would make it expensive to construct and difficult to operate an effective groundwater containment system, prompting the decision to exclude Option 1 from the remedial alternatives.

The remedial alternatives make use of hydraulic control Option #2, in which contaminated groundwater is extracted solely from the Regional Aquifer. To avoid having to extract groundwater from the Intermediate Aquifer, extraction is planned immediately downgradient of the end of the Intermediate Aquifer, rather than immediately downgradient of the 160-Acre Area.

The area of contaminated groundwater targeted for hydraulic containment (the target area or targeted areas) includes contaminated portions of the 160-acre area and the area between the

160-acre area and the downgradient end of the Intermediate Aquifer. More specifically, the targeted area is defined in the RI/FS as the portion of the Intermediate Aquifer contaminated with perchlorate and TCE above MCLs, and the underlying portion of the Regional Aquifer contaminated with perchlorate and TCE above MCLs.

The RI/FS includes a more detailed narrative description and several figures depicting the boundaries of the targeted area. The narrative is provided in Section 3.2.2; the depictions are include as Figures 1-5 and 1-6 in vertical cross section, and Figure 3-2 in plan view.

To hydraulically contain the targeted areas in the most cost-effective manner, EPA expects that groundwater extraction wells will be located no more than 1,500 feet downgradient of the Intermediate and Regional Aquifer Target area. As stated in the RI/FS Report, the location where the aquifers merge "appears to be close to and possibly just upgradient of the Rialto-02 well." The remedial alternatives included in the RI/FS Report assume that the Rialto-02 well is used as part of the remedy and that Rialto-02 is supplemented with a second well located approximately one-half mile to the west of Rialto-02. EPA's Proposed Plan states that *EPA's preferred alternative would include the flexibility to refine the targeted area of groundwater contamination if new information demonstrates to EPA's satisfaction that contaminant concentrations in groundwater, or the location where the Intermediate Aquifer ends, differ from those assumed*. The selected remedy retains the flexibility proposed in the Proposed Plan (see ROD Section 2.11.2) and EPA expects that additional evaluations will be completed as part of the remedial design process to refine the boundaries of the target areas and optimize the extraction locations.

The Rialto-06 location is almost 2 miles from the downgradient end of the targeted area and more than 3 miles from the 160-acre area. The RI/FS does not evaluate the cost or effectiveness of extracting groundwater from the Rialto-06 location, but EPA expects that extraction that far from the targeted area would be a much more costly and/or less effective means of achieving the RAOs. There would be a greater risk that contaminated groundwater moving from the 160-acre area would not be intercepted by the remedy.

As noted in the comment, there is substantial contamination downgradient of the SA OU target area, as reflected in TCE and perchlorate levels at wells PW-5 and PW-9. EPA expects that additional actions will be needed to address this contamination, as explained in Sections 1.61 and 2.1.2 of the RI/FS and in EPA's January 2010 Proposed Plan. The Rialto-06 area is one of many possible locations for an additional response action.

Commenter states that the RI/FS does not take into account the impact of other remedial measures that would later be needed in the basin…, including the total costs of the combined anticipated remedial actions. EPA has taken into account future actions to the extent feasible (e.g., the evaluations completed in the RI/FS reflect EPA's best estimates of future groundwater pumping rates and locations, as described in the subsection labeled "Pumping Assumptions at Non-Remedy Wells" in Section 3.3.1 of the RI/FS report), and concluded that the SA OU remedy is needed regardless of any future groundwater extraction that occurs at the Rialto-06 well.

EPA has concluded that it appropriately considered cost as one of the nine evaluation criteria used to evaluate remedial alternatives, as described in Section 5.3.7 of the RI/FS report. EPA's evaluations included a comparison of its preferred remedial alternative to a no-action alternative.

As described in Section 2.11.4, EPA concluded that the selected remedy will reduce the eventual cost, difficulty, and time required for restoration of the aquifer.

Comment GR-5. ***The RI/FS does not adequately assess the long-term effectiveness and performance and the implementability of the selected remedy, as required under the evaluation criteria. Despite recognizing the importance of the safe yield and limited available water rights in the Rialto-Colton Basin (see, e.g., RI/FS Sections 2.3 and 2.4, respectively) and indicating that the current rate of groundwater production may not be sustainable, the RI/FS does not adequately address the long term implementability of the selected alternative or factor in the impact from the operations of other existing and future systems, including the additional cleanup actions planned downgradient in the basin as referenced by EPA. The reliance of the RI/FS on the fact that water could be discharged into reinjection wells as a viable option to minimize or avoid water rights issues is entirely unsupported and not consistent with the law or the facts.***

➬EPA Response: EPA has adequately assessed the long-term effectiveness and implementability of the remedial alternatives, as required by the NCP and in accordance with EPA guidance. Specifically, EPA has adequately considered the two topics identified in the comment: the operation of existing groundwater extraction systems and the operation of future systems (to the extent they are known).

EPA agrees with the comment that the operation of groundwater extraction wells other than those pumped as part of EPA's remedy (in other words, other pumping) may affect EPA's remedy. To address the effects of other pumping on EPA's remedy, the RI/FS accounts for historical extraction of groundwater from other wells in the basin in the groundwater modeling simulations (see Section 3.3.1 of the RI/FS Report), EPA met with the owners of other wells to develop reasonable projections about future groundwater extraction rates, and the remedy incorporates a performance monitoring system that will provide data needed to evaluate the effects of other pumping and identify any needed modifications to the operation of the remedy.

The RI/FS Report also specifically identifies over-pumping in the basin (the safe yield), the 1961 water rights decree, and other water supply-related issues that will require attention during implementation of the remedy (see Sections 2.2, 2.3, and 5.3.6 in the RI/FS Report). EPA agrees that these issues could complicate implementation of the remedy, as reflected in the rankings assigned to the remedial alternatives (none were assigned a high ranking). EPA is including two different options for use of the treated groundwater produced by the remedy (direct potable use and aquifer replenishment by reinjection) to lessen potential delays associated with water supply related implementation issues. EPA expects that any water provided to a water utility would be counted against existing water rights and satisfy a portion of the utility's existing demand for water such that the majority of the groundwater extraction occurring as part of the remedy would not be new extraction.

The comment asserts that the RI/FS relies on the fact that reinjection would minimize or avoid water rights issues. EPA has determined that reinjection may avoid or minimize certain water rights issues by returning the extracted groundwater back to the aquifer, but EPA's remedy selection decision does not rely on this view. EPA does not agree with the comment that EPA's position is "entirely unsupported and not consistent with the law or the facts."

As described in response to comment FWC-7, there is a difference in opinion between the water rights holders over interpretation of the 1961 decree, which further complicates any determination of the effect of the 1961 decree on EPA's remedy.

EPA expects that these issues will be resolved through discussion and negotiation and that ultimately, they will not prevent implementation of the remedy.

Comment GR-6. ***Further, the RI/FS references a project to construct a bioreactor to treat water from Rialto-6 (page 1-7). Goodrich understands that this project is "shovel ready" as West Valley Water District ("WVWD") and the City of Rialto have completed design plans to treat groundwater from WVWD-11 and Rialto-6, which have been submitted to the California Department of Public Health for Proposition 84 funding. Yet, the RI/FS does not consider the possibility of utilizing this project as the foundation of a remedial alternative, nor the need or ability to simultaneously operate both the selected remedial alternative and the WVWD/Rialto system.***

➪EPA Response: Commenter is correct in stating that in its RI/FS, EPA has not considered the possibility of using the planned Rialto-06 project (also referred to as the WVWD/Rialto system) as a foundation of a remedial alternative. EPA expects that extracting groundwater from the Rialto-06 location would be a more costly and less effective means of achieving RAOs than extraction in the vicinity of Rialto-02, as discussed in response to comment GR-4 above.

Nevertheless, some or all of the Rialto-06 project could be incorporated into the SA OU remedy or a future remedy at the site. As described in Section 2.11.2 of this ROD, EPA is deferring decisions on the water treatment technologies, treatment plant location, and the user of the treated water until the remedial design phase of the remedy.

EPA has considered the simultaneous operation of both the selected remedy and the proposed WVWD/Rialto system. EPA has discussed the WVWD/Rialto system with representatives of WVWD and the city of Rialto, informing them that EPA has determined, based on current information, that some pumping at the Rialto-06 location is likely to be beneficial, but that it is not yet possible to determine what rate is appropriate.

EPA is not aware of any reason that the selected remedy and the Rialto-06 project cannot be simultaneously operated. The sum of the average pumping rates for the selected remedy (estimated at 1,840 gpm, equivalent to 3,000 acre-feet/year) and the Rialto-06 project (estimated at 2,000 gpm, equivalent to 3,200 acre-feet/year) is less than recent pumping from the basin. EPA has, however, expressed a broader concern that the total amount of pumping in the basin in recent years may not be sustainable (see Section 2.4 of the RI/FS), because of long-term declines in Regional Aquifer water levels, but that concern is not specific to the selected remedy or to the Rialto-06 project. EPA representatives have had preliminary discussions with the four major pumpers in the RCB, and expect to have additional discussions during the remedial design phase to coordinate operation of EPA's remedy, the Rialto-06 project, and other pumping in the RCB.

Comment GR-7. ***In revisiting the RI/FS, EPA should consider the value of first initiating the proposed system in the area of Rialto-6, which, given the status of its design, funding and local community support, could be installed significantly faster than the remedial alternative selected in the RI/FS. In addition to WVWD and Rialto, Goodrich also understands that other parties are participating in the project at Rialto-6, including the Department of Defense, which***

has committed $3 million toward the bioreactor, and the State of California's Cleanup and Abatement Account, which has designated approximately $3 million for the project.

✎EPA Response: As explained in the response to comment GR-6, the Rialto-06 system should not substitute for EPA's remedy, but portions of the Rialto-06 project, and other existing projects, may be incorporated into the remedy for the SA OU or incorporated into a future remedy. Decisions on the extent to which existing systems can be incorporated into the SA OU will be made during remedial design.

Comment GR-8. ***Despite the RI/FS being silent as to EPA's own well results, EPA's test results from Well MP-1 (August, 2009 and December 2009) have not shown any contamination, at any depth, thereby supporting the understanding that contamination has not migrated nearly as far as depicted on RI/FS Figure 1-5 (nearly to CPW-17), but rather is not far beyond the Rialto-6 area. These results further support the need for the RI/FS to be reevaluated and to consider whether implementation of the remedy further downgradient in the area of Rialto-6 would be overall more effective.***

✎EPA Response: Commenter correctly notes that results from groundwater samples collected in August and December 2009 from EPA's Well EPA-MP1 did not detect perchlorate above the reporting limit of 2 micrograms per liter (µg/L). Perchlorate results from a third round of samples, collected in April 2010, were below the reporting limit of 1 µg/L. (The April 2010 results have been added to the Administrative Record.) Based on the these results, the depiction of the extent of contamination shown downgradient of Rialto-06 in Figure 1-5 should be qualified to reflect uncertainty about the downgradient end of contamination originating at the 160-Acre Area.

The extent of contamination downgradient of Rialto-06 and PW-9 is likely to be an important consideration in the selection of a remedy for the area downgradient of the SA OU. It has little relevance to the SA OU because it does not change EPA's understanding of the extent of contamination to be addressed by the SAO OU, the appropriateness of EPA's RAOs, or the cost, effectiveness, or implementability of the remedial alternatives evaluated in the RI/FS for the SA OU. Hence EPA disagrees with the statement that the remedy for the SA OU needs to be revaluated.

In addition, it is premature to conclude that contamination is "not far beyond the Rialto-06 area." There are numerous wells potentially downgradient of Rialto-06 contaminated by perchlorate and/or TCE whose source is uncertain. These include but are not limited to the municipal water supply wells WVWD 11, WVWD 16, WVWD 17, Colton 15, and Colton 17. As stated in the RI/FS Report (Section 1), EPA is carrying out additional data collection and analysis to better define the nature and extent of perchlorate and VOC contamination in downgradient areas to determine what additional remedial action may be needed.

Comments by: Kevin S. Milligan P.E., Utilities Assistant General Manager - Water, Riverside Public Utilities on behalf of the City of Riverside

<u>Comment Riverside-1</u>. ***Riverside applauds the EPA's designation of the BF Goodrich site as a Superfund site, and is encouraged by EPA's efforts to begin addressing the contamination. Riverside strongly encourages the EPA to focus on characterizing the southerly edges of the contamination plume and providing safeguards to prevent further migration of the plume. Although the San Jacinto and the Rialto-Colton faults appear to restrict groundwater flow into and out of the basin, there is no barrier on the Southeastern portion of the basins (USGS, 1997). The lack of barrier has allowed the contamination to travel into the Riverside basin, thereby impacting Riverside's wells.***

A comprehensive remedy for the BF Goodrich site must include provisions for characterization of the plume and prevention of further migration of the plume.

⇘<u>EPA Response</u>: EPA agrees that more work is needed to characterize the area of groundwater contamination that has already moved beyond the area targeted by EPA's selected remedy and to determine what additional remedies are needed. As described in the January 2010 RI/FS Report and Proposed Plan, EPA has begun efforts to characterize this area. At present, there are **not** sufficient data to conclude that contaminated groundwater from the B.F. Goodrich Site has traveled into the Riverside Basin.

<u>Comment Riverside-2</u>. ***The City of Riverside began domestic water operation in 1913, and now provides water service to over 280,000 customers, including almost all residents in the City except for a small number of residents that live in the higher elevations of the City.***

The City is wholly dependent upon groundwater resources. The City extracts groundwater from the Bunker Hill and Riverside North and South Basins. Approximately 60% of the water is pumped from the Bunker Hill Basin and 40% is pumped from the Riverside Basin.

The City pumps from a total of 14 wells in the Riverside North and South Basins. Attached hereto is a map showing the location of the wells in relation to the B.F. Goodrich site. Within the Riverside South Basin, seven wells are located in the North Orange Well Field and water is conveyed to the distribution system through the 60-inch North Orange transmission pipeline. In the Riverside North Basin, four wells pump to the new John W. North Treatment Plant and three wells pump directly into the 60-inch Gage Pipeline.

The North Treatment Plant was constructed to bring new water supplies online and eliminate the City's reliance on imported Colorado River and State Project water. The North Treatment Plant cost approximately $25.7 million, with approximately 50% of Proposition 50 grant funds from the State of California (authorized by ballot initiative in November 2002 to construct water-related infrastructure that reduces Southern California's consumption of imported water from the Colorado River), with the remaining portion funded by the City. The North Treatment Plant began commercial operations on September 4, 2008, allowing Riverside to

become water independent except for emergency conditions, with fiscal year 2009 having no demand on either Colorado River water or the State Project water.

On March 31, 2009, the City filed the above-referenced lawsuit against various parties, including Emhart lndustries, lnc., Goodrich Corporation, and Pyro Spectaculars, lnc., to protect its drinking water supplies against perchlorate contamination. The City had detected perchlorate in several of its wells in the Riverside Basin, in levels that exceeded state guidelines. To date, and at the request of B.F. Goodrich, the City has been granted several extensions of time by the court to serve its complaint and begin undertaking discovery. The reasons for such continuances are to allow the defendants and the State of California's Regional Water Quality Control Board, Santa Ana Region, to engage in settlement negotiations. (Attached is a copy of the complaint.)

⇘EPA Response: EPA will consider the information provided on the city's water infrastructure as it conducts the RI/FS for the area of groundwater contamination downgradient of the SA OU.

Comment Riverside-3. ***Since September of 2008, Riverside has been sampling abandoned wells located northerly of its active wells. The RI/FS is specific to a relatively limited geographic area in the Rialto-Colton Basin, addressing perchlorate and volatile organic compound (VOC) groundwater contamination in a portion of the site that includes the 160-acre area and an area extending approximately 1.5 miles downgradient (southeast) from the 160-acre site. The 160-acre site is approximately 9 miles upgradient of the RPU Flume Tract wells (Figure 1). The RI/FS study proposes a treat/capture zone 1.5 miles downgradient of the site, but does not address the regional aquifer and that portion of the plume that has already migrated to the southeast beyond the proposed capture zone. Figure 1 shows a summary of perchlorate sampling and analysis completed by RPU. The nearest upgradient well from the Flume Tract which has recently detected perchlorate is the Patterson Well, approximately 2 miles upgradient of the Flume Tract wells and approximately 7 miles downgradient of the 160-acre site (9.4 ug/L, 8/8/09). Based on this observation, a portion of the perchlorate plume extending approximately 5.5 miles downgradient of the proposed capture zone is not being addressed.***

⇘EPA Response: The available data do not, at this time, support the conclusion that contaminated groundwater from the B.F. Goodrich Site has traveled a distance of seven miles, as assumed in the comment. However, EPA continues to investigate the downgradient extent of contamination at the Site and will make use of the sampling results generated by the City of Riverside as part of its investigation. See response to comment Riverside-1 for additional discussion.

Comment Riverside-4. ***The RI/FS report cites groundwater flow velocities calculated by GeoLogic of 2 to 4 feet per day in the Intermediate Aquifer and 1 foot per day in the Regional Aquifer near the Rialto 03 Well. Figures 2 through 4 show potential plume migration velocities of 2, 5, and 8 feet/day, respectively. Using a velocity of 5 feet/day, perchlorate may be detected in the Flume Tract Wells as soon as 2014. These numbers are only estimates in the absence of any reliable pump test data in the area. RPU recommends redirecting a portion of the EPA resources to conduct a controlled pump test in the vicinity of the Rialto-Colton Basin downgradient of the Patterson Well in order to more accurately calculate potential travel time of the perchlorate plume. As the plume approaches the Santa Ana River channel, velocities in the recent channel deposits may be considerably higher.***

↳EPA Response: The prediction made in the comment ("perchlorate may be detected in the Flume Tract Wells as soon as 2014") assumes that contaminated groundwater from the B.F. Goodrich Site has already reached a point about one-half mile beyond the Patterson Well and that the groundwater is moving at a rate of 5 feet per day. The available data do not, at this time, support the conclusion that contaminated groundwater from the B.F. Goodrich Site has reached the Patterson Well, and the 5 feet per day estimate likely overestimates the average groundwater velocity in the area downgradient of the Patterson Well

EPA agrees that more information is needed to understand groundwater movement downgradient of the SA OU, and is conducting RI activities to acquire additional information and determine what additional cleanup efforts are needed to address contamination originating from the 160-acre area. The RI activities will likely include, at the appropriate time, pump tests similar to those recommended in the comment. The locations of any future pump tests may differ from those recommended in the comment.

Comment Riverside-5. ***The portion of the Rialto-Colton and North Riverside groundwater basins displayed in Figures 2 through 4 is a critical groundwater supply component for numerous agencies in addition to RPU. Domestic water supply wells in the area include RPU Flume Tract Wells 2, 3, 4, and 6; City of Colton Wells 23, 30, and 31; and Meeks and Daley Wells 36 and (new) Well 36. The combined pumping capacity of production wells in the area immediately downgradient of the nearest detected perchlorate (in the Patterson Well) is approximately 25 million gallons per day (mgd). The RPU Flume Wells alone produce and deliver 10 mgd to the J.W. North Treatment Plant.***

RPU continues to sample and analyze selected wells shown in Figure 1 and perchlorate analyses compiled to date indicate that the perchlorate levels are consistent and have in fact elevated over time in the Patterson Well, ranging from 7.0 ug/L in 2008 to 9.4 ug/L in 2009. The RI/FS report addresses the point source of the contamination, but the larger regional implications downgradient of the capture zone need to be addressed in a proactive manner. In order to predict the velocity of the plume and projected detection in production wells in the area, additional pump tests are required in order to calculate aquifer parameters specific to this region of the basin. RPU will assist in this effort as required in order to comprehensively address this issue.

↳EPA Response: EPA agrees that the RCB, and adjoining groundwater basins, are critical sources of drinking water for the region, and that additional investigation is needed downgradient of the SA OU. The investigations will likely include pump tests to estimate aquifer properties. EPA appreciates the city's offer to assist in future investigations. As noted in the response to comment Riverside-4, the timing and location of pump tests will be determined as EPA's remedial investigation progresses.

Comment by: Clay A. Rosson, Environmental Engineer/ Sustainability Consultant

I am aware of the plume locations in the basin. As you may be aware by now, there are two plumes. The longer one is coming from the 160-acre site, while the shorter one is flowing from the bunker complex beneath the sedimentation ponds of the concrete operation. We know exactly when those sedimentation ponds were created in 2001. Therefore, we know exactly how long it took to create the shorter plume further to the west. It is effectively a transport experiment that was permitted by San Bernardino County and the City of Rialto. If you take the distance and divide it by time traveled, you will have the effective transport of the shorter plume. You can do this on the back of an envelope. Now for the best part. With the effective transport number, you can determine roughly how long it will take for perchlorate to reach the Santa Ana River. You can also determine when the contamination hit groundwater at the 160-acre site in the 1980's. I am somewhat disappointed that your agency seems to be ignoring the impending pollution of the Santa Ana River with perchlorate which I have determined will happen within 3-5 years from the logic I have just outlined for you. Another important point that needs to be addressed is that the Cactus Basin, operated continuously as a stormwater basin by San Bernardino County Flood Control District, has contributed to the spreading of perchlorate contamination. It is easy to see from any of the figures supplied by the Rialto: Roadmap to Remedy, although the agencies left Cactus Basin off the map. See how the concentrations of perchlorate radically drop when they reach Cactus Basin due to the dilution from stormwater flows. If you let Santa Ana River be contaminated, all the water treatment facilities will have to be upgraded that have water rights to Santa Ana River water. You should weigh the cost of upgrading the water treatment plants against pumping and treating the plume before it reaches the river.

➬EPA Response: EPA agrees that there are two (or more) plumes of groundwater contamination in the Rialto-Colton groundwater basin. However, EPA disagrees with the conclusion that contamination will reach the Santa Ana River in three to five years. Available data on groundwater flow conditions in the RCB indicate that groundwater flow and contaminant transport rates are slower than assumed in the comment.

In addition, EPA does not agree that the available data demonstrate that the Cactus Basin has contributed to the spread of perchlorate contamination. EPA's groundwater level contours and groundwater flow evaluations do not indicate that the Cactus Basin has any substantive impact on groundwater flow or contaminant movement.

EPA lacks sufficient information to agree or disagree with other statements regarding the relative length of the plumes and groundwater travel times for the western plume.

As described in response to comment Riverside-1, EPA is conducting additional remedial investigation work to determine the extent of contamination at the Site, and the direction and rate at which contaminated groundwater moves downgradient of the area targeted by the SA OU. Additional remedial actions will likely be needed downgradient of the SA OU remedy.

Comment by: Dinah L. Watson, Homeowner

This sounds like a bad plan. Why wouldn't the water be completely and thoroughly cleaned. If you're going to clean it at all, clean it completely. Too many people in my neighborhood have died of cancer, and even more have thyroid gland problems. The home owners of Rialto keep paying and paying and it seems nothing is being done. No half baked plans please. Research and find out the best and most complete way to clean it up before spending anymore money.

⇘EPA Response: The testing needed to develop a cleanup plan for the entire site is underway but has not yet been completed. Rather than wait until all testing at the site has been completed, EPA chose to divide the site into two parts, and begin cleanup of the part where enough testing and analysis has been completed to determine the best way to carry out the cleanup.

EPA expects to develop a second cleanup plan for the remaining portion of the site after sufficient testing and analysis have been completed, to ensure that the money spent on cleanup is properly spent.

All water pumped to the surface as a part of EPA's action will be treated to remove the contaminants of concern. The treatment goals for TCE, carbon tetrachloride, and perchlorate in the extracted groundwater are 5.0, 0.5, and 6 ug/L, respectively. These are the standards enforced by EPA and the State of California to ensure that the drinking water does not pose an unacceptable risk to human health. It is expected that TCE and perchlorate concentrations would, in practice, be reduced to levels substantially below MCLs.

Comment by: George Slajchert, Western Water Equipment Company

We request the opportunity to meet with you at your convenience for approx. one hour to present a new technology that did not appear in your options on Table 2 of this report.

An extensive study of perchlorate destruction has been carried out at Lawrence Berkeley National Laboratory using electro-chemo-bio process, patented, for which we have just completed a pilot unit. We feel this process will address the B.F. Goodrich Superfund site contaminated aquifer cleanup to near, nondeterminant level that will meet drinking water standards.

⇘EPA Response: EPA representatives have spoken with Mr. Slajchert, and concluded that there is insufficient information available at this time to consider use of the technology referred to in the comment.

Comments by: GeoLogic Associates, on behalf of the County of San Bernardino

Comment GeoLogic-1: ***In our view, the report provides a good initial characterization of existing perchlorate and trichloroethene impacts to groundwater associated with the" 160-acre parcel" area (i.e., the Eastern Plume). The report also identifies an appropriate remediation strategy to intercept, contain and treat high concentration impacts just downgradient of the 160 Acre Site. Addressing these releases near the terminus of the Intermediate Aquifer is particularly appropriate given that impacts will be more difficult to address as they move downgradient and become more subject to changes in the regional flow stresses. These measures should also minimize the time required for cleanup of impacted areas downgradient of Rialto-02.***

We further agree that the remedial design phase should include as an element some additional field work and modeling to define the optimal location and pumping strategies for this remedial program. Further, it is our expectation that a more optimized location for the additional extraction well will enable containment under a wider range of conditions than is assumed in the RI/FS. We also understand and agree with the operable unit approach set forth in this document, which contemplates the potential need for additional remedial action to address the distal end of the Eastern Plume. Finally, we endorse and agree with the approach of managing the Eastern Plume as separate and distinct from the Western Plume, as EPA has proposed in this document.

➩EPA Response: EPA appreciates the support for the proposed remedy and overall approach for addressing the B.F. Goodrich Site contamination.

Comment GeoLogic-2: ***Section 1.5.2 Local Hydrogeology, Page 1-10, paragraph 1. We note that the text refers the reader to Figures 1-5 and 1-6 for the location of well MW-4 and its relationship to the BC Aquitard, but that those figures do not currently identify that well. Similarly, Figure 1-4 does not appear to identify the location of Rialto-02. Also, the text refers to the wells installed by EPA as "MW" wells while the figures appear to reference those wells as "MP" wells.***

➩EPA Response: Commenter is correct that Figures 1-5 and 1-6 do not show the location of EPA well MW-4 (also known as EPA-MP4). The location of EPA-MP4 is shown in two other figures in the RI/FS Report (Figures 1-2 and 1-4).

Commenter is also correct that Figure 1-4 does not show the location of Rialto-02. The location of Rialto-02 is shown in Figures 1-2, 1-5, and 1-6.

Commenter correctly notes that two naming conventions are used for the new EPA wells in the text and figures. In the future, EPA intends to use the naming convention in the figures (e.g., EPA-MP1, EPA-MP2).

Comment GeoLogic-3: Page 1-10, paragraph 2. The report notes that the groundwater flow gradient in the northwestern and central portions of the RCB is 0.003 foot per foot (ft/ft) to 0.012 ft/ft. This range appears to represent gradients in both the flatter regional aquifer

(currently approximately 0.0016 ft/ft near Rialto Well No. 3) and the steeper intermediate aquifer (typically about 0.015 to 0.020 ft/ft southwest of the 160-acre area), based on field measurements of each aquifer. We suggest clarifying the text to distinguish these aquifer gradients, since groundwater flow gradients have important implications with respect to contaminant migration.

⇘EPA Response: The range of hydraulic gradients referenced in the text represents Regional Aquifer conditions only, not the Intermediate Aquifer. The gradients were estimated using 1994 and 1996 water level contours presented in the USGS reports cited in the RI/FS Report for the northern half of the RCB. EPA concurs that the hydraulic gradients observed in the Intermediate Aquifer are generally much higher than those observed in the Regional Aquifer.

Comment GeoLogic-4: ***Page 1-10, paragraph 4, last sentence. Text references Figure 1-6 but the correct reference appears to be Figure 1-4.***

⇘EPA Response: As the commenter notes, the correct reference is to Figure 1-4.

Comment GeoLogic-5: ***Page 1-11, paragraph 4, last sentence. The text notes that the significant spiking of perchlorate and TCE levels in response to a rise in groundwater levels indicates that a large mass of perchlorate and TCE remains in the Intermediate Aquifer. We agree and note further that this spiking also suggests that significant perchlorate and TCE mass remains within the vadose zone beneath that site.***

⇘EPA Response: EPA concurs that there is a reasonable likelihood that significant contaminant mass remains in the vadose zone beneath portions of the 160-acre area.

Comment GeoLogic-6: ***Section 1.7.1 Contaminant Identification. Page 1-13, First paragraph of section. Text indicates that benzene, carbon tetrachloride, chloroform, methylene chloride and TCE comprise the detected VOCs. EPA's list of detected VOCs for its January 2008 sampling round is considerably longer and includes 22 VOCs in addition to TCE. However, with 3 low-level exceptions, all of the other 22 VOCs were detected at trace concentrations. Review of the sampling results reported by GeoSyntec Corporation for the BF Goodrich "PW" wells indicates that these trace-level VOC detections are also inconsistent over time. Considering the nature of these VOCs, it seems probable that many, if not most, of the low- and trace-level VOC detections are associated with field sampling conditions (e.g., generator exhaust) or laboratory processes. This distinction is important because certain VOCs are consistently detected in Western Plume but are essentially absent from the Eastern Plume. These unique VOCs in the Western Plume are a strong indication that the Western Plume is not commingling into the Eastern Plume.***

⇘EPA Response: Commenter is correct that the statement in the text does not list all of the VOCs detected in the January 2008 sampling event. The statement should have read: "Detected VOCs *include* benzene, carbon tetrachloride, chloroform, methylene chloride and TCE."

EPA agrees that many of the VOCs detected on and downgradient of the 160-acre area during the January 2008 sampling event have been detected at trace concentrations (i.e., less than 1 ug/L).

EPA also agrees that certain VOCs have been detected more consistently, and often at higher concentrations, in the western plume, than at the B.F. Goodrich Site.

There is **insufficient** evidence to support the statement that it is probable that many, if not most, of the low-and trace-level VOC detections are associated with field sampling conditions (e.g., generator exhaust) or laboratory processes.

Comment GeoLogic-7: ***Section 2.2.1 Potential Chemical-Specific ARARs. Page 2-3, First paragraph, second sentence. The text notes that TCE and perchlorate are the primary chemicals of potential concern (COPC) but that other VOCs are also present in selected wells. As noted in the comment concerning Section 1.7.1, many, if not most, of the low- and trace-level VOC detections that have been identified by the EPA appear to be associated with field sampling or laboratory conditions.***

↳EPA Response: See response to Comment GeoLogic-6. The ROD lists perchlorate, TCE, chloroform, methylene chloride, and carbon tetrachloride as COCs for this remedy.

Comment GeoLogic-8: ***Section 3.2.1 - Hydraulic Control Options. Page 3-2. The County agrees that hydraulic control of the Intermediate Aquifer by a series of extraction wells would be problematic. The thin and variable character of the aquifer would necessitate a large number of extraction wells whose operational conditions would likely be highly variable, inefficient, and potentially ineffective.***

↳EPA Response: Comment noted.

Comment GeoLogic-9: ***Evaluation of the Rialto-3 Aquifer Test. Page 3-5. The text discusses the 2006 Rialto Well No. 3 aquifer pumping test data as evaluated by GeoLogic Associate (2007), and an alternative analysis completed by CH2MHILL using the proprietary computer model, MLU. We note that the hydraulic conductivity on the eastern side of the basin is one of the parameters that can be refined during the remedial design phase for the remedy. Of note, and as detailed in the Updated Hydrogeologic Model report, when integrated in GeoLogic Associates' updated model, the Regional Aquifer horizontal (Ky) and vertical (Kv) hydraulic conductivity results obtained in the MLU analyses (120 ft/d and 6 ft/d, respectively) yielded essentially the same groundwater flow results as were achieved using GeoLogic Associates' Kh and Kv values of 80 ft/d and 8 ft/d (i.e., no significant flow or contaminant transport differences were identified in the updated model when the MLU values were input for the Regional Aquifer).***

Although GLA's updated groundwater flow model yields similar hydraulic head calibration statistics for conductivity values calculated by the EPA versus those calculated by GLA, the modeled gradients and head elevations using the EPA's conductivity values are significantly lower than observed during the modeled time period. We believe the conductivity value of 80 feet/day results in a better match of modeled to observed conditions. In addition, the County recently completed an aquifer pumping test of Rialto Well No. 3. This updated data yielded hydraulic conductivity values that are similar to those that were derived from the 2006 pump tests. (GLA 2010, Appendix A).

↳EPA Response: EPA concurs that additional refinement of the hydraulic conductivity estimates on the eastern side of the basin in the vicinity of the selected remedy should be considered during remedial design. EPA has not yet evaluated the results of the recently completed aquifer testing conducted by GeoLogic; however, the differences in conductivity presented in the EPA model versus the GeoLogic model are not expected to have a significant impact on the technical evaluations conducted for the RI/FS.

The range of extraction rates proposed for the remedy (1,500 to 3,200 gpm) is likely similar to the range of extraction rates that would be generated from a model using GeoLogic's conductivity estimates.

Comment GeoLogic-10: ***Model Simulations to Evaluate the Effectiveness of Additional Extraction - General Approach. Page 3-5, last paragraph. The text indicates that an extraction well in addition to Rialto-02 will be needed to contain the impacts from the 160 Acre Site. We agree that an extraction well in additional to Rialto-02 would be appropriate, and understand that the optimal location for such a well will be developed as a component of the remedial design phase. Our experience with the Western Plume suggests that a location due south of the proposed EW-1 location could provide better plume containment efficiency than the EW-1 location shown in the RI/FS. Similarly, we understand that an optimal depth and screen interval for the extraction well will be developed as an element of the remedial design, and it is our understanding that the depth anticipated in the RI/FS for EW-1 (650 feet) is intended as a placeholder subject to further analysis.***

↳EPA Response: EPA concurs that a location to the south or southeast of the current location shown for EW-1 could potentially provide more efficient hydraulic containment than the location shown in the RI/FS Report. The optimal extraction well locations will be selected during remedial design concurrent with a more thorough evaluation of the location where the BC aquitard pinches out or is no longer effective.

The depth of any remedy extraction well will depend on the well's location along with the depth of contamination in the area targeted for hydraulic containment. The depth requirements are not expected to be significantly different than the 650 feet assumed in the RI/FS report.

Comment GeoLogic-11: ***Pumping Assumptions at Non-Remedy Wells. Page 3-7, Second paragraph. This section of the text discusses historical pump rates at the Rialto Well No. 3 treatment system. Please note that Rialto Well No. 3 has operated at approximately 1650 gpm (near its full capacity) since July 3, 2009. As detailed in the Updated Hydrogeologic Model (GLA, February 26, 2010), under current groundwater conditions, this rate is more than sufficient to fully contain the Western Plume consistent with the RAOs for that remedial action, and that lower pumping rates might be used in the future if current gradients and groundwater levels remain constant. The County is currently working with the RWQCB and the City of Rialto to identify pumping rates that assure plume containment and City water supply needs.***

↳EPA Response: The 1,650 gpm extraction rate reported for Rialto Well No. 3 is the average rate during the days in which the project operated, not the average rate over a period of months or years (as assumed in EPA's modeling). The average extraction rate for Rialto Well No. 3 over the last year has probably been less than 1,500 gpm.

Regardless, the actual rate does not appear to differ significantly from the 1,500 gpm rate assumed in the RI/FS modeling simulations. Future groundwater modeling simulations will incorporate updated pumping data from Rialto-03 and other production wells in the vicinity of the remedy

Comment GeoLogic-12: ***Page 3-8, First full paragraph. We agree that the Eastern Plume remedy design should consider the increased groundwater gradient that will be produced by relatively continuous operation of Rialto-06. As indicated in USGS reports (e.g., Woolfenden and Koczot, 2001), the groundwater gradient at or near Rialto-06 increases naturally compared to areas upgradient of it and regular operation of Rialto-06 will exacerbate this condition. This could affect plume containment requirements near Rialto-02 and EW-l.***

➥EPA Response: Comment noted. EPA will evaluate potential impacts of Rialto-06 pumping on the selected remedy during remedial design. However, EPA does not expect Rialto-06 pumping to have a significant impact on the remedy because of its location relative to the pumping planned as part of the selected remedy (almost two miles downgradient).

Comment GeoLogic-13: ***Page 3-8, Second paragraph. The text includes a discussion of the pumping rates of the Fontana Water Company. Please note that the County's Updated Hydrogeologic Model (GLA, February 26, 2010) includes the corrected Fontana Water Company annual pumping rates. Moreover, the corrected pumping rates have not significantly affected the model results compared to results presented in 2007.***

➥EPA Response: Comment noted.

Comment GeoLogic-14: ***Model Limitations. Page 3-10, Third bullet. The text notes that "very little data" exists regarding hydrogeologic conditions in the Intermediate Aquifer as a limitation of the model. This statement appears to reflect the relative lack of data regarding the Intermediate Aquifer within the Eastern Plume area; however, considerable hydrostratigraphic data has been developed by the County for this unit within the Western Plume area. This data gap for the Eastern Plume appears to be an important element of the remedial design phase. To avoid this statement being taken out of context it would be helpful to clarify that this statement refers to the Eastern Plume only, as the focus of the RI/FS is the northern portion of the Eastern Plume.***

➥EPA Response: The statement regarding the limited availability of data describing hydrogeologic conditions in the Intermediate Aquifer refers to the eastern portion of the Intermediate Aquifer from the 160-acre area to where it pinches out near the 210 Freeway.

Comment GeoLogic-15: ***Full Containment during All Expected Groundwater Conditions. Page 3-12. This section indicates that the maximum pumping rate required of the proposed interim remedy for the Eastern Plume would be approximately 3200 gpm. As discussed above, this value can likely be refined and improved during the remedial design phase when the location of the additional extraction well will be optimized. In addition to Eastern Plume containment, we also note that well EW-1 should be optimally located with respect to the location of the low concentration trough that exists between the Eastern and Western plumes to minimize potential adverse impacts on the Western Plume containment system being operated by the County.***

➥EPA Response: As noted above, EPA anticipates conducting additional evaluations during remedial design to refine the locations of the remedy extraction wells and their flow rates. These evaluations will take into account any updated interpretations of the extent of B.F. Goodrich Site contamination in the areas targeted for hydraulic control and will seek to optimize hydraulic control while minimizing impacts on nearby production wells and the County's ongoing hydraulic containment system operations (i.e., the remedy for the former bunker area).

EPA does not anticipate that the design capacity will differ substantially from the 3,200 gpm rate assumed in the RI/FS Report.

Comment GeoLogic-16: ***Full Containment during All Groundwater Conditions. Page 3-12. This section appears to suggest that high groundwater elevation conditions are not expected to occur for periods long enough to affect plume containment capabilities. However, even if these higher groundwater conditions were to re-occur, it is our expectation that if the location of the additional extraction well is optimized during the remedial design period, that a 3200 gpm containment system should be capable of capturing the plume under a wider range of conditions than is assumed in the RI/FS analysis.***

⇘EPA Response: Comment noted. EPA agrees that an optimized 1,500 to 3,200 gpm system will be capable of providing the required containment under a very wide range of hydraulic conditions.

Comments by: West Valley Water District (WVWD)

WVWD-1: ***Remedial Alternative 2B is not a viable remedial alternative and should be removed from consideration. This is primarily due to the following facts, inadequate analysis in the RI/FS, and/or other factors not mentioned or considered in the RI/FS:***

⇘EPA Response: EPA disagrees that Alternative 2b is not a viable remedial alternative. Although Alternative 2b is not the selected remedy, EPA has identified reinjection (a key component of Alternative 2b) as an alternate end use option if agreements cannot be reached with water utilities in a timely fashion for use of the treated water. EPA has concluded that aquifer replenishment by reinjection is a viable option and that its inclusion in the remedy is warranted to minimize delays that could result if lengthy negotiations with third parties are required for potable use of the treated groundwater. EPA explains the basis for its position in responses to subsequent comments.

WVWD-2: ***The reasons are listed below in summary fashion and further explanation follows this summary list:***

1) ***The location and technical manner in which the RI/FS proposes reinjection in the Rialto-Colton Basin (the Basin), is technically infeasible based on geologic conditions presented in the RI/FS. Geologically, two reinjection wells are proposed along West Casa Grande Drive, with well screens from 450 to 700 feet below ground surface (bgs). However, as shown in RI/FS in Figure 1-5 at this location (about even with well PW-1), there is an approximately 100 foot thick aquitard interpreted between a depth of approximately 500 to 600 feet bgs.***

⇘EPA Response: The injection well screen intervals assumed in the RI/FS Report are in error. The targeted depth interval should start immediately below the BC aquitard and extend down into the Regional Aquifer from approximately 650 to 850 feet bgs. This error results in a minor increase in capital costs for installation of the injection wells and does not affect the technical feasibility of reinjection. If EPA intends to inject the treated groundwater for aquifer replenishment, additional evaluations will be completed during remedial design to select exact screen depths.

WVWD-3: ***Even if the geological conditions were more favorable for reinjection north of the 160-Acre site, a significant period of pilot testing and much more infrastructure would be necessary. The "field testing" discussed in the RI/FS significantly underestimates the level of study needed for proper design. The duration of this pilot testing would at best extend the time to implementation, and will likely demonstrate that reinjection is technically infeasible anywhere in the northern-Basin area, given the Basin hydrogeologic and contaminant conditions.***

⇘EPA Response: EPA disagrees with the claim that a significant period of pilot testing would be required for reinjection. If constructed, the injection wells will be tested to determine their capacity during remedial design, but the testing would not differ substantially from the aquifer tests that will be conducted at the groundwater extraction locations whether or not injection wells are used. Additional testing of a reinjection system, if built, may also occur during remedial design or start-up of the remedy but is not expected to cause significant delays in project implementation.

The RI/FS adequately describes and evaluates the pipelines, pump stations, and other infrastructure required for reinjection.

The statement that pilot testing would "likely demonstrate that reinjection is technically infeasible anywhere in the northern-Basin area" is not supported. In the absence of new data to indicate otherwise, EPA disagrees.

WVWD-4: ***There was a lack of analysis presented concerning potential adverse hydraulic (and contaminant migration) implications of reinjection immediately upgradient of the source area.***

➮EPA Response: EPA does not anticipate that reinjection of treated groundwater into the Regional Aquifer north of the 160-acre area will have significant adverse hydraulic or contaminant transport impacts, or that there will be significant unintended hydraulic consequences. There is no known contamination in the Regional Aquifer for a considerable distance downgradient of the planned injection well locations. The contamination located just downgradient of the proposed injection well locations is in the Intermediate Aquifer, where the hydraulic heads are approximately 200 feet higher than those in the Regional Aquifer, indicating significant separation between the two aquifers. However, during the remedial design phase, if reinjection is being considered for end use of the treated water, EPA will conduct additional groundwater modeling and hydraulic analysis to assess the potential impacts of reinjection on groundwater flow, contaminant transport, and the effectiveness of the remedies for the B.F. Goodrich Site and the former bunker area to the west. If necessary, injection well locations will be adjusted to minimize potential negative impacts.

WVWD-5: ***Reinjection is a more complex and less implementable Remedial Alternative in relation to water rights than direct potable use, and the RI/FS did not acknowledge this. The Consent Decree for the Basin clearly restricts groundwater extraction only to parties subject to the decree. The very significant and lengthy process of resolving water rights for reinjection by a non-Decree party, will hold-up implementation of any Remedial Alternative including reinjection for years, if not prevent it entirely.***

➮EPA Response: There will be institutional issues to resolve if the treated groundwater is reinjected, including those raised by the 1961 Decree (the "The Lytle Creek Water & Improvement Company vs. Fontana Ranchos Water Company, et al.," Action 81264), but their resolution would not necessarily be more challenging or time consuming than the issues raised by supplying treated groundwater for potable use. The potable end use option will require detailed arrangements with the participating water utilities to resolve operational, liability, financial, and water rights issues.

WVWD-6: ***The RI/FS underplayed and did not highlight important State ARARs related to the reinjection, specifically compliance with RWQCB Basin policies, given reinjection is proposed directly to a drinking water aquifer. This additional ARAR may add significant cost, or time to implementation for the project (e.g. additional treatment requirements).***

➮EPA Response: EPA does not agree that State ARARs related to reinjection would be a significant factor in the time required for or cost of remedy implementation when compared to the time consuming process that is required to obtain CDPH approval for use of the treated water as a drinking water supply. Portions of the Water Quality Control Plan (Basin Plan) for the Santa Ana River Basin, including the State Water Resources Control Board Resolution No. 68-16, *Statement of Policy with Respect to Maintaining High Quality of Waters in California*, are identified as ARARs for the selected remedy (see Section 2.12.2 of this ROD).

WVWD-7: ***There will be very vigorous opposition to any remedial alternative involving reinjection.***

➥EPA Response: To date, only WVWD and, to a lesser extent, Goodrich have expressed concern about reinjection as a potential end use option. The primary end use option selected in the ROD is use of the treated water as a drinking water supply. Reinjection has been identified as an alternate option in case agreements cannot be reached in a timely manner with local water utilities for use of the water. EPA does not expect vigorous opposition to reinjection under this scenario.

WVWD-8: ***For all of the reasons above, the true cost of Remedial Alternative 2B will increase significantly above that presented in the RI/FS, making it much less feasible. In combination with the technical infeasibility of the Alternative as proposed in the RI/FS, the qualitative rankings for Alternative 2B should change as follows:***

- ***Reduction in Toxicity/Mobility: decrease to Moderate to Low (from High)***
  - ***this reduction is due to there having been no analysis presented of whether contaminants will be mobilized by reinjection in ways other than anticipated.***
- ***Implementability: decrease to Low (from Moderate):***
  - ***This reduction is because: this option is less implementable for technical/geologic reasons; an increased need for extensive pilot testing; the potential need for additional treatment; and, from a water-rights perspective.***
- ***Costs: cost likely will significantly increase if the RI/FS analysis for Alternative 2B is refined, let alone, if reinjection is even shown to be implementable.***

➥EPA Response: EPA does not agree with the Commenter that changes are needed to the qualitative rankings for Alternative 2b.

- Alternative 2b will not result in contaminants being mobilized through reinjection and remains ranked High for the reduction in toxicity/mobility criterion.

- The implementability of Alternative 2b remains moderate. Similar to the other remedial alternatives, there will be significant administrative requirements associated with implementation of Alternative 2b. However, EPA does not consider Alternative 2b to be less implementable than the other alternatives.

- None of the potential concerns raised in the WVWD comments would result in significant changes to the Alternative 2b cost estimates presented in the RI/FS. The increase in cost that would result from correcting the injection well depth would not result in a significant change in the total estimated cost of Alternative 2b.

WVWD-9: Further details regarding the summary comments above follow:

As stated in the RI/FS, "injection wells are prone to clogging and can potentially require considerable maintenance…", as such, the fact that the reinjection wells in the RI/FS were

grossly proposed as being screened from a depth of 450 to 700 feet bgs, when significant finer grained layers are present, shows that insufficient evaluation of the geological feasibility of reinjection was conducted. The finer grained layers are evident on the geological log for nearest deep well (PW-2A) and are clearly shown on RI/FS Figure 1-5 at the location of well PW-1. On Figure 1-5 of the RI/FS, the B/C Aquitard has an interpreted thickness of more than 100 feet in the vicinity of well PW-1 (along West Casa Grande Drive), and occurs at a depth of about 500 to 600 feet bgs (which is directly in the proposed reinjection well screen zone). These simple geological facts alone raise significant concerns about the feasibility of reinjection of the proposed volume and flow-rate of water along West Casa Grande Drive (in only two wells), and also shows a lack of sufficient analysis of this key geological limitation related to the reinjection proposed in Alternative 2B of the RI/FS.

➪EPA Response: As stated in the response to WVWD-2, the estimated injection well depths listed in the RI/FS are incorrect. If installed, the wells would be screened in the Regional Aquifer immediately beneath the BC Aquitard with a total depth of approximately 850 feet. In addition, if injection testing to be conducted during remedial design indicates that an additional injection well (or wells) are needed, this is not expected to be a significant change to the scope or total cost of the remedy.

WVWD-10: ***Without any pilot testing, which will take several months (if not years), the hydraulic properties of the aquifer at any location in the Basin to receive the intended amount and flowrate of water are unknown and the proposal may not be implementable, even if the geologic conditions were not as infeasible as where/how the RI/FS proposed performing reinjection. The RI/FS does mention, "field testing," as part of the remedial design; however, this testing should have clearly been identified as being critical to the potential success or failure of this remedial option and is more than a minor design consideration and will add very significant costs.***

➪EPA Response: As stated in the response to WVWD-3, EPA does not agree that the testing required for injection would be significantly more complicated or would take significantly longer than groundwater extraction well aquifer testing. In general, an aquifer's hydraulic capacity for injection is not significantly lower than its capacity for extraction. Complications can occur if the chemistry of the two waters is not compatible. The treated water may require some type of chemical adjustment prior to reinjection, but this process is not expected to be significantly more complex or expensive than will be required for treatment of water for a drinking water end use. Water supplied for a drinking water end use may require chemical treatment for disinfection, pH adjustment, and/or corrosion control.

WVWD-11: ***There may be serious significant unintended hydraulic consequences of reinjection (e.g. contaminant migration in ways/manners other than intended), especially in the north portion of the Basin so close to the source area (10's of feet away), where there is a highly faulted and very heterogeneous depositional environment. Extensive groundwater modeling should be performed solely to assess the potential effect of reinjection on the contaminant distribution and remedial effectiveness of both the 160-Acre efforts and those related to contamination released from properties now owned by the County of San Bernardino.***

➪EPA Response: Please see the response to WVWD-4.

WVWD-12: ***The RI/FS in terms of implementability for Alternative 2b states that, "Alternative 2b would not require agreements with the water purveyors for receipt of treated water and use of pumping rights,…" and also in the identification and screening section states, "Other potential advantages to reinjection are the minimization or avoidance of water rights issues,…". These statements are inaccurate and inconsistent with the law of water rights in California. The right to withdraw water is clearly limited in the Basin Consent Decree, and it is n over-reaching assumption of RI/FS that somehow reinjection avoids water rights issues, when in fact it complicates them.***

⇘EPA Response: EPA agrees that reinjection would also require consideration of water rights issues and that the referenced statements in the RI/FS Report do not make this clear. This clarification does not change the relative ranking of the remedial alternatives, or EPA's decision to include reinjection as an alternate end use option. Please see response to WVWD-5 for additional discussion.

WVWD-13: ***The RI/FS did not mention one of the most important ARARs for Alternative 2b, which would be a RWQCB permit for reinjection, given the injection proposed is directly in a drinking water aquifer. Although there are Federal injection regulations, state and basin-specific regulations should also be evaluated. In particular, under the RWQCB requirements, treatment may be required to lower levels than anticipated by the RI/FS and/or for constituents not already planned for (e.g. nitrate or metals mobilized/solubilized by reinjection).***

⇘EPA Response: As stated in EPA's response to WVWD-6, this ROD does identify State ARARs related to reinjection.

The treatment processes needed to meet RWQCB discharge requirements for reinjection are not expected to differ substantially from the treatment needed to meet CDPH drinking water requirements. The planned treatment processes are expected to reduce the concentration of most COCs to levels substantially below MCLs.

Based on available water quality data in the vicinity of the expected extraction well locations, elevated nitrate levels are not expected in the treated groundwater. The technical basis for WVWD's statement that treatment may be required for "metals mobilized/solubilized by reinjection" is not clear.

EPA complies with substantive provisions of applicable or relevant and appropriate federal and state requirements, but does not obtain permits for onsite actions at Superfund Sites.

WVWD-14: ***Between the complexities of the water rights questions, the geological infeasibility, lack of any extensive technical analysis of reinjection and/or potential adverse impacts, the need for pilot studies, additional permitting, and environmental analysis outside of the USEPA's purview, there may likely be significant water purveyor and/or public opposition to Alternative 2B.***

⇘EPA Response: EPA has considered the detailed comments provided by WVWD, and concluded that reinjection remains a viable remedial alternative and was properly evaluated in the RI/FS.

As noted in response to comment WVWD-7, only WVWD has expressed significant concerns with Remedial Alternative 2b. Please see responses to comments WVWD-2 through WVWD-13 for responses to comments about the technical feasibility of reinjection, reinjection well design, the impacts of field testing, the potential for adverse or unintended impacts, State ARARs, the ranking of the remedial alternatives, and the need for permits.

Comment by: Mr. Don Olinger made at the BF Goodrich Superfund Site Public Meeting, February 10, 2010

Right. Okay. Good evening everybody. I'm Don Olinger. I'm with the West Valley Water Board. I'm one of the board of directors.

Mr. Praskins, I'm very impressed, very pleased someone of your stature to be here at a community meeting. I believe you were here, also, in December. This is the second meeting. You could tell by some of the questions and concerns here tonight that there's considerable anxiety still about the safety of our water supply in this community. I might -- something that is relevant, I think might be important for EPA West Valley Water District engaged the services of a reputable public opinion company. They did a survey just 2 months ago. There were 400 people in the Rialto or greater Rialto area, mostly West Valley water customers, that were asked questions. And something that would be indigenous to what we're talking about here tonight, one of the questions had to do with do you feel that protecting our water supply from contamination pollutants is important? Well, you would expect, you know, you'd get about a hundred percent on that. There's 98.1 percent of community residents of the respondents indicated that they thought that was extremely important. Here is the zinger, the one that I think you should be concerned about, the public should be concerned about. There is a perception out there -- despite valiant efforts on our part, West Valley Water District, to accommodate the public through newsletters and through phone calls, answering questions that -- that come to our district all the time. People still have the perception that the water in this area still has a lot of perchlorate in it and that their lives are in danger because of it. And I answer this question all the time knowing I've been in the community about 50 years or so and so I know a lot of people. People who are highly educated, knowledgeable still come up and say, "Don, you know, I've known you for a long time. You're on the board. Is our water really safe to drink? We keep buying bottled water, which is pretty expensive. And they are still concerned about the perchlorate. Your being here tonight, because of your stature up there, you know, EPA director will raise anxieties to a certain degree because they say this high part public official is down here, and he's down here for some reason, you know. And yet, we know, those of us who are here, that you're here to help in our situation.

And now, let me give you the results of what the public is thinking in terms of whether or not our water is safe. Let me get the right one here. Only 55 percent of the 400 respondents in Rialto 2 months ago felt that our water was truly free of perchlorate and other pollutants. 47 percent were not fully satisfied, and 18 percent were dissatisfied. In other words, they still have doubts. So I just thought maybe this information would be helpful to you in terms of the urgency of helping us, you know, with the perchlorate cleanup. It's a real problem here in our community, and thank you very much for your concern.

➬<u>EPA Response</u>: The comment describes public perceptions and concerns about the quality of the region's water supply. EPA appreciates the comment and will consider these observations in its community relation activities at the Site.

Comments by: Frederic Fudacz of Nossaman LLP on behalf of Fontana Water Company (includes as an enclosure comments by John List of Flow Science on behalf of Fontana Water Company)

Comment FWC-1. ***FWC, a division of San Gabriel Valley Water Company, is the largest water utility in the Rialto Colton, No Man's Land and Northeastern Chino Basins. These Basins provide a critically needed water supply which FWC must rely on to provide water service to a population of approximately 154,000 residents and businesses throughout its 52 square mile service area. This service area encompasses most of the City of Fontana, portions of the Cities of Rialto, Rancho Cucamonga, and Ontario, as well as adjacent unincorporated areas of the County of San Bernardino ("County").***

FWC pumps groundwater from 24 production wells in the Affected Region which is contaminated by perchlorate and VOC contamination. Eight of Fontana Water Company's wells have had perchlorate levels reach or exceed the maximum contaminant level ("MCL") of 6 ppb established by the California Department of Public Health. And all of those wells have been shut down and cannot be used without first treating the water.

In addition to those eight wells, Fontana Water Company has five wells in the Rialto Colton and No Man's Land basins which are also contaminated with perchlorate at varying concentrations below the MCL. All of these wells are down gradient from, and in close proximity to, the Goodrich Site and the Mid-Valley Sanitary Landfill ("MVSL") operated by the County and recognized by the Santa Ana Regional Board and the EPA as a source of perchlorate and VOC contamination.

There is persuasive hydrological and chemical evidence that the perchlorate in the FWC wells comes from the MVSL and the Goodrich Site. Dr. List has submitted reports to the EPA dated October 6, 2008 and December 10, 2009 which validate this conclusion based upon known groundwater flow trajectory data as well as the results of a preliminary perchlorate isotope study. Dr. List's analysis is supported by EPA's own modeling efforts with respect to the Proposed Plan. Figure A-8 from the RI/FS indicates that perchlorate from the Goodrich Site as well as the MVSL is impacting FWC's wells.

➪EPA Response: EPA appreciates the information provided by FWC describing its water supply infrastructure and water quality problems. EPA and FWC representatives have had numerous communications about these matters over the last seven years, and EPA included several documents prepared by FWC representatives in the Administrative Record for the remedy, including documents dated March 27, 2003, May 28, 2003, and November 21, 2008. EPA has also added the October 6, 2008, and December 10, 2009, submittals from Dr. List, and a March 27, 2009, letter from EPA to FWC (which addresses several issues raised in the comment), to the Administrative Record.

Based on currently available data, including the FWC submittals identified above, EPA does not agree that there is persuasive hydrological and chemical evidence that the perchlorate detected in FWC wells in the Rialto-Colton or Chino groundwater basins originates from the B.F. Goodrich

Site. See responses to other FWC comments for more detailed responses to FWC's claim that FWC wells in the Rialto-Colton or Chino groundwater basins are affected by the B.F. Goodrich Site.

<u>Comment FWC-2</u>. *FWC acknowledges that the Proposed Plan purports to be interim. Nonetheless, the Remedial Investigation should comprehensively analyze the evident impacts to FWC's wells (or at least present a plan to do so) and provide some assurance that these impacts will be addressed. FWC's 154,000 customers deserve no less.*

⇘<u>EPA Response</u>: EPA has completed a Remedial Investigation and Feasibility Study to support the selection of a remedy for the SA OU, and is conducting additional investigations to evaluate the need for additional response actions at the Site. EPA's additional investigations will include an analysis of the impacts on any FWC wells believed to be affected or threatened by the Site. EPA does not plan, as part of the B.F. Goodrich Site RI/FS, to analyze the impacts on FWC wells where there is not a reasonable basis to suspect that the wells have been affected by the Site.

<u>Comment FWC-3</u>. *As Dr. List's report points out, the remedial investigation is flawed in that it does not analyze the remediation efforts required to address the contamination emanating from the MVSL site. EPA incorrectly assumes that contamination from the Goodrich Site can be addressed in isolation from efforts to remediate the contamination at the adjacent MVSL site.*

⇘<u>EPA Response</u>: EPA has analyzed the remediation efforts associated with the MVSL site to the extent they are relevant to the B.F. Goodrich Site. EPA makes use of groundwater test results from investigations at the MVSL site in its evaluations at the SA OU, incorporates an assumption about the rate of groundwater extraction at the MVSL site remedy as part of its evaluation of remedial alternatives for the SA OU, and has reviewed documents related to the MVSL as they are generated to evaluate their relevance to the SA OU. EPA included six reports related to the MVSL in the Administrative Record for the SA OU, and has added four additional documents generated after completion of the January 2010 RI/FS Report.

EPA does not assume, as stated in the comment, that contamination from the Goodrich Site can be addressed in isolation. EPA expects that groundwater pumping occurring as part of the MVSL site and expected to occur as part of the SA OU remedy will need to be coordinated to ensure that neither remedy adversely affects the other and to optimize operation of the two projects.

The MVSL site referred to in the comment is also described as the former bunker area and the County Site.

<u>Comment FWC-4</u>. *In 1998, FWC entered into a settlement with San Bernardino County wherein FWC pumps and treats the water from three of its wells in the Affected Region that have been contaminated with VOCs from the MVSL. Two of these wells, F10-B and F10-C, are in the No Man's Land Basin and the third well, F49-A, is in the Rialto Colton Basin. Since 1998, pumping and treating these three wells has allowed the County to meet its obligation pursuant to the Regional Board's Cleanup and Abatement Order 98-96 to contain the VOC plume emanating from the MVSL and remediate contamination in FWC's water*

supplies from those three wells. The RI/FS neglects to even mention this remedial action let alone analyze how the Proposed Plan would impact this RWQCB mandated cleanup.

↳EPA Response: The RI/FS does account for the MVSL remedial action by incorporating assumptions about groundwater extraction at the F10-B, F10-C, and F49-A wells as part of the evaluation of remedial alternatives. These three wells are specifically mentioned in Section 3.3.1 of the RI/FS Report (in the subsection titled Pumping Assumptions at Non-Remedy Wells), and the assumed groundwater extraction rates are listed in Table 3-3. The RI/FS Report also discusses the potential impact of pumping at the F10-B, F10-C, and F49-A wells on the remedial alternatives in the subsection of Section 3.3.1 titled Selected Flow Fields: 1998, 2001, and 2004 Conditions.

Based on preliminary evaluations completed as part of the RI/FS, EPA does not expect the SA OU remedy to have a significant effect on the three FWC wells operating as part of the RWQCB (Water Board) mandated cleanup. The three wells were chosen for use in the MVSL cleanup based on the belief that they draw groundwater from the MVSL area, not the B.F. Goodrich Site, and EPA's modeling efforts support this understanding. Nevertheless, to ensure that the SA OU does not have an adverse effect on the three FWC wells, EPA has initiated discussions with the Water Board over possible changes in the pumping required by the Water Board's Cleanup and Abatement Order 98-96. In addition, EPA has included a performance criterion as part of this ROD to ensure that the SA OU does not have an adverse effect on the three FWC wells or other non-remedy wells. This criterion, included in Section 2.11.2.1 of this ROD, states that *Implementation of the remedial action cannot result in adverse effects to water supply wells that are not part of the remedial action (e.g., significant increases in the concentrations of COCs or significant movement of contaminated groundwater toward non-remedy wells).*

Comment FWC-5. ***Moreover, as Dr. List points out, the EPA's own modeling (as reflected in Figure A-8 of the RI/FS) indicates that the County's proposed perchlorate remediation program for the MVSL, utilizing Rialto Well No. 3, will not be effective in containing the perchlorate plume from the MVSL. FWC's wells continue to be exposed to this plume (and already have rising detections of perchlorate). It therefore appears that the EPA approach of focusing solely on the Goodrich Site, without regard for the contamination emanating from the MVSL, will leave FWC without a remedy for either site and continue to leave FWC's wells subject to contamination emanating from both. This artificial and unworkable delineation of responsibility between the EPA and the Regional Board has had the predictable effect of leaving FWC's perchlorate contamination concerns unaddressed.***

↳EPA Response: EPA disagrees with Dr. List's assertion that EPA's modeling (as reflected in Figure A-8 of the RI/FS) shows that the County's perchlorate remediation program for the MVSL(which is overseen by the Water Board), utilizing Rialto Well No. 3, will be ineffective. See the response to FWC-16 for further discussion of the proper use of EPA's modeling results.

EPA also disagrees that "the EPA approach of focusing solely on the Goodrich Site… will leave FWC's wells subject to contamination emanating from [the B.F. Goodrich Site]." Although EPA does not believe, based on the available data, that FWC's wells have been affected by the B.F. Goodrich Site, a primary objective of EPA's remedy is to limit the impact of the contaminated groundwater spreading from the 160-acre area on affected or threatened water supply wells.

EPA also disagrees with FWC's characterization of the division of responsibility between EPA and the Water Board (which is overseeing remediation of the MVSL) as artificial and unworkable. EPA believes that the division of responsibility is based on a proper scientific analysis of the available geologic, water level, and water quality information from the MVSL and B.F. Goodrich sites, and that EPA and the Water Board have effectively coordinated their investigation and cleanup efforts at the two sites.

Comment FWC-6. ***The RI/FS misconstrues the Rialto Basin Decree. That Decree applies to a legally defined area which does not include the No Man's Land Basin from which Fontana Water Company pumps its F10-B and F10-C wells, among others. The No Man's Land Basin covers an unadjudicated area between the legally defined areas of the Rialto Colton and Chino Basins. FWC has pumped over 3,500 acre feet per year on average over the last five years from No Man's Land Basin as part of the Regional Board approved and mandated groundwater cleanup plan for VOCs migrating from the MVSL. Fontana Water Company enjoys senior appropriative pumping rights with respect to this water production.***

➯EPA Response: EPA is unsure why the commenter believes that the RI/FS misconstrues the Rialto Basin Decree. EPA does not comment on the specific areas included in or excluded from the Rialto Basin Decree; EPA does not assert that the F10-B and F10-C wells are located within the area addressed by the Rialto Basin Decree; and, EPA does not comment on the water rights that FWC asserts it possesses from its historical pumping in the No Man's Land.

Comment FWC-7. ***Moreover, the RI/FS's discussion of the Rialto Basin Decree inaccurately depicts water production permissible under that Stipulated Judgment. The Decree permits unlimited pumping each water year (October 1 to September 30). In the middle of each water year water level measurements are taken in three key wells (in March, April and May). Depending on those water level measurements, the amount of water available under the Decree can be limited during a period of limitation (June through September). Accordingly, it is incorrect to state, as your RI/FS does on page 2-8, that "Fontana Water Company reports its entitlement is 920 acre feet." FWC has made no such report. As we pointed out by a memorandum from Frederic A. Fudacz, to Wayne Praskins, dated April 15, 2009, that entitlement is only applicable during a period of limitation and not otherwise relevant. That memorandum is attached to this letter.***

The fact that the entitlement set forth in the Decree operates as a potential production constraint only during a four-month period of limitation was a critical premise in providing the water rights to support the VOC remediation effort mandated by Cleanup and Abatement Order 98-96. FWC is the beneficiary of a standby water lease between Fontana Union Water Company and the City of Rialto, a party to the Decree, in which Rialto committed to lease FWC up to 1,600 acre feet of its Rialto Basin water rights if and only if production is required to be curtailed under the Decree. The express intent of the Standby Water Lease is to enable FWC to produce 2,000 gpm continuously from its Rialto Colton Basin wells (e.g., F49A) to fulfill the VOC remedy of FWC's water supplies. Rialto and the County both confirmed this interpretation of the Decree, in an agreement dated May 9, 2000, and no party to the Decree has ever objected to the agreement before or after it was approved following a public hearing by the County.

➯EPA Response: FWC writes that the RI/FS has inaccurately depicted water production permissible under the Rialto Basin Decree, and that "it is incorrect to state… that "Fontana

Water Company reports its entitlement is 920 acre feet." FWC further comments that "FWC has made no such report" and makes reference to an April 15, 2009, memorandum from Frederic A. Fudacz to Wayne Praskins.

EPA is unclear why FWC believes that the RI/FS inaccurately depicts water production permissible under the Rialto Basin Decree or that the statement in the RI/FS report is incorrect. The statement in the RI/FS is based on the April 15 memorandum submitted by FWC's attorney, which states that "Depending on those water level measurements [in the key wells], the amount of water allocated to Fontana Union pursuant to Sections 5 and 9 of the Decree during a period of limitation (June – September) can be 920 feet." FWC is an agent for Fontana Union.

FWC also comments that the "entitlement is only applicable during a period of limitation and not otherwise relevant." EPA agrees that the entitlement is only applicable during a period of limitation, as stated in Section 2.3 of the RI/FS report: The RI/FS states that:

> *The decree allows unlimited pumping from the basin if the average of the "spring-high water levels" at three wells specified in the decree (the "index wells") exceeds 1,002.3 feet. When the level is between 969.7 and 1,002.3 feet, a party's entitlement is the sum of the amounts specified in Section 5 of the decree (which lists amounts for each party to the decree) and Section 9 of the decree (which refers to amounts for particular wells). If the average "spring-high water level" drops below 969.7 feet, the entitlement is reduced by 1 percent for every foot the average is below 969.7 feet, but not by more than 50 percent.*

EPA concludes that FWC does not disagree with the statements in the RI/FS, but instead is using its comments as an opportunity to advocate its position on the period of time that the entitlement is applicable in years in which the Decree limits pumping. The RI/FS does not comment on this matter. Two of the other major water rights holders in the RCB submitted letters in response to FWC's comment stating that they believe that EPA accurately describes the Rialto Basin Decree in the RI/FS report. See the March 24, 2010 letter from Gerald W. Eagans to Wayne Praskins, and the May 19, 2010 letter from Danielle G. Sakai to Wayne Praskins. These letters, along with the Rialto Basin Decree, have been added to the Administrative Record for the remedy.

As stated in the comment, FWC believes that in years in which the decree limits pumping in the RCB, pumping may be limited only between June and September. EPA is aware of FWC's interpretation of the decree, but notes that at least two of the other major water rights holders in the RCB disagree with FWC's interpretation. They note in their letters that the 1961 decree clearly provides that water rights are based on a twelve month water year which begins on October 1 and ends on September 30 of the following year. As explained in the Sakai letter, in years in which the decree limits pumping in the RCB, pumping limitations are in effect at least until water levels are measured during the following year.

Figure 2-1 and Table 2-1 in the January 2010 RI/FS Report provide historical information on the average of the spring-high water level elevations at three groundwater wells specified in the 1961 decree. The average elevation has been below the 1,002.3-foot benchmark since 2003, and dropped below the 969.7 foot benchmark in 2008. Results from 2010 show a continued drop in water levels down to 962.66 feet above MSL (see the June 2, 2010 letter from Samuel H. Fuller of the San Bernardino Valley Municipal Water District, which has been added to the Administrative Record). The average water level elevation has dropped 71 feet over the last eight years, indicating that the current rate of groundwater production from the RCB may not be sustainable.

<u>Comment FWC-8</u>. ***EPA's Preferred Alternative 2A contemplates the pumping and treating of 1,500 to 3,200 gpm of contaminated groundwater and using the treated water as a drinking water supply. The alternative assumes that the treated water would be supplied to West Valley Water District even though it is noted that "it may be difficult for WVWD to accept the full 3,200 gpm of treated water that would be generated during high water level conditions." If EPA determines to go forward with its proposed interim remedy notwithstanding the concerns articulated by Dr. List and FWC, FWC believes there would be significant advantages to using FWC's Plant F49 as the site for treating water produced under the interim remedy.***

First, FWC already is developing plans for VOC and perchlorate facilities at Plant F49 to treat rising levels of contaminants in the well at that site.

Second, FWC is in a position to commit to use most, if not all of the treated water generated by the interim remedy (both alternative 2a and alternative 3) on a continuous basis and has the ability to deliver portions of that water to other local water purveyors (i.e. Rialto and WVWD) through existing or new interconnection facilities.

Third, FWC can provide ample land free of charge for the construction and proper operation of all necessary treatment facilities. The RI/FS acknowledges that there may not be sufficient room at the City of Rialto owned parcel where Rialto-2 is located to accommodate all necessary treatment facilities. To the extent that the preferred alternative would require additional land acquisition costs, using FWC's F49 site would result in additional savings.

Fourth, the modified preferred alternative would involve groundwater extraction from Rialto Well 2, from the new well EW-1, and would also include Well F49A. A 16-inch raw water delivery pipeline, approximately 11,000 feet in length, could be built from the Rialto 2 well to Plant F49 which has ample room to accommodate a treatment plant which could readily be designed to treat up to 6,000 gpm, which would be sufficient for FWC to treat water from the extraction wells contemplated by the interim remedy as well as for water FWC produces from Well F49A. Treatment would include ion exchange for perchlorate removal, liquid phase granulated activated carbon for volatile organic compound removal and disinfection. In addition, there is sufficient room at the F49 site to accommodate additional treatment modalities should, at a future date, additional contaminants or wells require remediation. Attached to this letter is a diagram showing FWC's proposed water treatment facility at plant F49 which could readily be incorporated within the preferred alternative as proposed by EPA.

Fifth, the additional capital cost to construct a 16-inch raw water pipeline for delivery of water from Rialto 2 and EW-1 to the F49 plant would likely be offset by reduced O&M expenditures. There is an elevation difference of approximately 130 feet between the location of the contemplated treatment plant in alternative 2-A and the location of Plant F49. Accordingly, there should be sufficient head pressure at F49 to substantially reduce power costs.

⇘<u>EPA Response</u>: As described in the EPA's January 2010 Proposed Plan and in this ROD, EPA will make a final decision on the treatment plant location, pipeline alignments, and the use and user of the treated groundwater, during remedial design. At that time, EPA will consider the advantages and disadvantages of supplying water to all potential users.

Comment FWC-9. ***Sixth, if FWC does not treat the water, EPA should not assume that FWC would be in a position to accept a portion of the water generated by the proposed interim remedy. As a matter of policy, FWC cannot rely on treated water from other purveyors because the company is not in a position to assure its customers that the water will be treated to fully comply with safe drinking water standards and that the water will be delivered reliably in amounts and to locations required for efficient usage within its water system. However, FWC is, by far, the largest water utility in the Affected Region, with a water system master plan to serve 250,000 customers, and is able to commit to use most if not all of the water it treats at the treatment facility if the F49 option is adopted. To the extent that either West Valley Water District or Rialto require or desire a portion of the water treated by the Plant 49 option, existing interconnections between FWC's system and those adjacent water systems would allow for delivery of such treated water.***

➭EPA Response: EPA is not assuming that FWC would accept a portion of the treated water from the SA OU remedy.

Comment FWC-10. ***Finally, in lieu of utilizing plant F49, the preferred alternative could also be modified to utilize Plant F13 for the location of the treatment plant and distribution of treated water. This plant has the advantage of being closer to the Rialto 2 well, requiring a shorter raw water pipeline. Figure 3-9 in the RI/FS already shows a proposed route for a treated water pipeline between Rialto 2 and the F13 site. This same alignment could be utilized readily for a raw water pipeline if F13 were the treatment site. However, the F13 site does not enjoy the elevation advantage of Plant F49, but has ample available land for FWC to construct and operate treatment facilities to support the proposed interim remedy.***

➭EPA Response: As described in the January 2010 Proposed Plan and in this ROD, EPA will make a final decision on the treatment plant location, pipeline alignments, and the use and user of the treated groundwater, during remedial design.

[The following comments were included in an enclosure to the letter from Fred Fudacz. They were prepared by John List of Flow Science on behalf of Fontana Water Company]

Comment FWC-11. ***The RI/FS and proposed cleanup plan are incomplete and premature for several reasons:***
1) They ignore the best scientific knowledge that is available related to the Rialto-Colton Groundwater Basin.

2) They ignore the effects of the adjacent source of perchlorate --the County's MVSL --and the remediation proposed for that site.

3) They fail to propose any remedy for the perchlorate contaminating numerous FWC wells southwest of the Goodrich and County sites.
4) The proposed remediation plan leaves a large fraction of the existing perchlorate in the ground with the potential to impact downstream water supply wells.
5) They rely upon a groundwater model that is demonstrably in error and flawed.

➭EPA Response: EPA does not agree that any of the issues raised in items 1 through 5 lead to a conclusion that the proposed cleanup plan and RI/FS are incomplete or premature. Each of the statements in items 1 through 5 is addressed in detail in responses to comments FWC-12 through FWC-23.

Comment FWC-12. *Contrary to Best Scientific Knowledge*

Although the RI/FS references (page 1-7) the seminal research paper by Anderson et al[1] that describes the structure of the Rialto-Colton Basin and the bounding faults, it contradicts the basic finding of the Anderson paper in relationship to the location and structure of the Rialto-Colton Fault (RCF). All of the figures in the RI/FS, and the description of the groundwater flow modeling performed for the RI/FS, show the RCF as a continuous impervious barrier to groundwater flow, which the Anderson et al. study shows is incorrect, both with respect to the fault location and structure. Furthermore, according to the seismic profiling of the fault area performed by the USGS (Gandhok et al[2]): "Our seismic reflection images show that the Rialto-Colton fault consists of an approximately 1-km-wide zone of small-offset (approximately 20 to 30 m) faults in the upper 1 km depth. No single large-offset fault was imaged along any of the seismic profiles."

Figure 1, below, is extracted from the Anderson paper and illustrates clearly the difference in location of the RCF Zone, as determined by the Gandhok and Anderson

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[1]Anderson, M.,J.Matti,andR.Jachens.2004. "Structural Model of the San Bernardino Basin, California, from Analysis of Gravity, Aeromagnetic, and Seismicity Data." Journal of Geophysical Research. Volume 109, B04404, doi:10.1029/200318002544.

[2]Gandhok, G.; Catching, R. D.; Rymer, M. J.; Goldman, M. R. 2003 "Shallow Geometry and Velocities Along the Rialto-Colton Fault, San Bernardino Basin, California" American Geophysical Union, Fall Meeting 2003, abstract #S21F-0393

work and the prior location of the fault, as depicted by Dutcher and Garrett[3]. A review of Plate 1 from Dutcher and Garrett actually shows that the Rialto-Colton Fault and Barrier H form a fault zone (in congruence with the findings of Gandhok et al), as opposed to a single continuous RC fault and shorter Barrier H, as depicted in the RI/FS. The basic difference between Anderson et al and Dutcher and Garrett is in the location of Barrier H and the structure of the Rialto Colton Fault (see further discussion below regarding the placement of Barrier H).

In addition to the misrepresentation of the Rialto-Colton Fault Zone (RCFZ) and Barrier H, the EPA modeling assumes that the northwestern section of the RCFZ is impervious, which is contrary to the fact that at least four hydrogeological maps of groundwater contours in the northern Chino Basin indicate flow through this section of the RCF Zone.

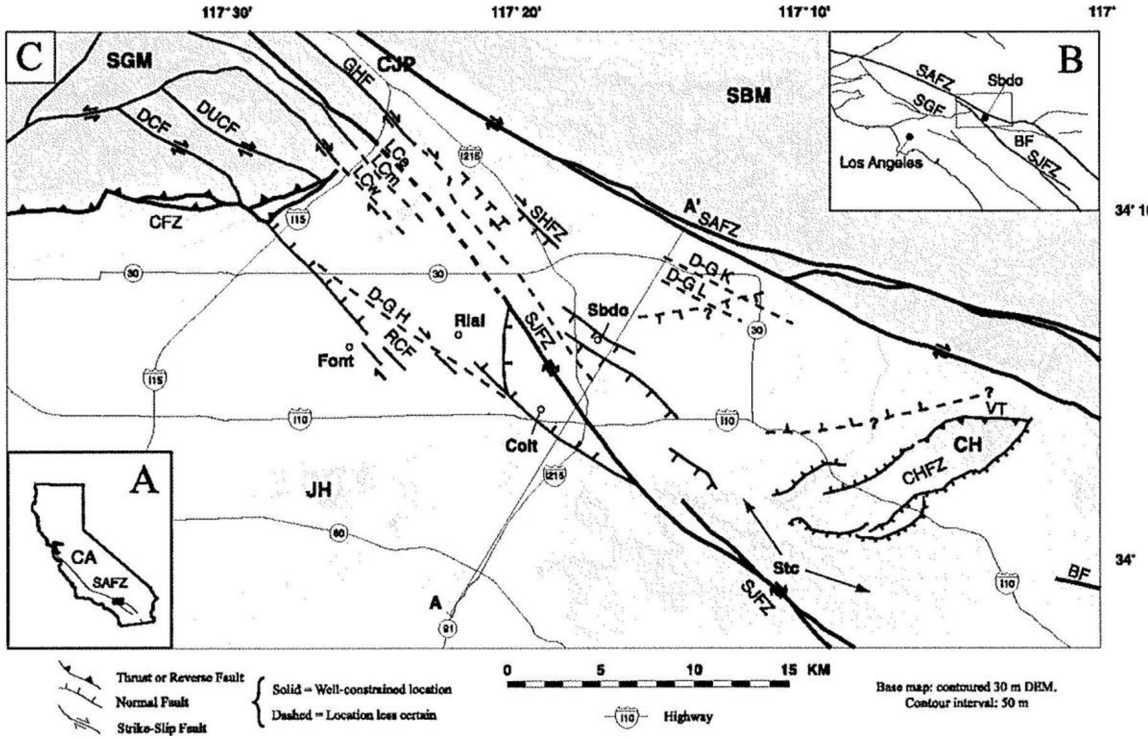

Figure 1. (a) Index map showing study area location within California. (b) Index map showing location of the study area relative to major faults. (c) Topographic map showing San Bernardino basin and vicinity. Fault and geographic feature names are given in Table 4. Sources for fault locations are: RCT'~ SHFZ, graben bounding faults, and dotted faults in the eastern portion of the basin, this study; DCF/DUCF, Morton [1976]; all other faults, Matti and Morton [1993]. Profile labeled A-A' is shown in Figure 6. Normal faults in the center of the map are inferred in the subsurface, and outline the edges of the San Bernardino graben shown in Figure 5a.

Figure 1 -Extracted from Anderson et at and illustrating the location of the Rialto-Colton Fault Zone as determined by Anderson et at (RCF) and Dutcher and Garrett (D-G H)

[3]Dutcher, L.C., and Garrett, A.A., 1963 [1964], Geologic and hydrologic features of the San Bernardino area, California-with special reference to underflow across the San Jacinto fault: U.S. Geological Survey Water-Supply Paper 1419,114 p

➪<u>EPA Response</u>: EPA agrees that the Rialto-Colton Fault (RCF) is more complex than depicted in the figures in the January 2010 RI/FS Report and is not necessarily a continuous impervious barrier to groundwater flow. EPA agrees that the RCF is most likely a fault zone as opposed to a single continuous fault. EPA also agrees that the Anderson paper, which describes gravity, aeromagnetic, and seismicity data and a new conceptual model for the San Bernardino geologic basin, provides useful information on the location and structure of the fault zone in the bedrock underlying the groundwater basin. As noted in the comment, EPA included the paper in the Administrative Record for its proposed remedy.

Although the Anderson, et al (2004) paper presents updated interpretations of the location and nature of the RCF, it does not describe or comment on the impact of the fault system on groundwater movement, or provide information or interpretations that change EPA's understanding of groundwater flow conditions in the RCB.

The location and depiction of the RCF shown on figures in the RI/FS Report and incorporated into EPA's groundwater model were developed by the USGS in prior studies of the RCB. Two relevant USGS reports, published in 1997 and 2001, are included in the Administrative Record. EPA continues to believe that the USGS studies provide a sound basis for EPA's conceptual model of the RCB. EPA does not agree with the statements in the comment that the basic findings of the Anderson paper contradict EPA's RI/FS or that EPA has misrepresented the RCF zone or other geologic features in the RCB. Instead, the findings of the Anderson paper emphasize that the depictions in the figures in EPA's RI/FS Report and in this ROD, and the assumptions made in EPA's groundwater model, reflect many simplifying assumptions, as do most figures and models. Section 3.3.1 of the January 2010 RI/FS Report describes many of the limitations in the modeling effort. Furthermore, the simplifying assumption that the RCF acts as a no-flow-barrier does not likely have a significant impact on the extraction rates needed to hydraulically control groundwater flowing in the areas targeted by the selected remedy. Estimating the extraction rates needed for hydraulic control was the primary use of the groundwater flow model in the RI/FS.

Although the RCF or fault zone is not necessarily a continuous impervious barrier to groundwater flow, and data are relatively sparse in the vicinity of RCF, water levels in the Chino Basin are generally 100 to 150 feet lower than in the RCB, indicating that the fault zone acts as a significant impediment to groundwater flow, particularly in the middle and northern portions of the RCB. EPA has prepared a figure summarizing groundwater elevations in several wells in the Chino Basin and in wells in the RCB during November and December 2009. The figure has been added to the Administrative Record. EPA cannot respond to the comment that "at least four hydrogeological maps of groundwater contours in the northern Chino Basin indicate flow through this section of the RCF Zone," because the comment is unsupported by any data or analysis.

<u>Comment FWC-13</u>. ***Contrary to Best Scientific Knowledge (cont.)***

EPA also failed to use the results obtained from its own multi-port sampling wells that were installed and sampled in 2009. None of the contaminant sampling data from these six EPA wells installed in 2009 have been included in the document, but the results of the well survey in 2009 (excluding EPA well data) are used to plot Figure 1-4. It is not clear why the data from the EPA sample wells were excluded from the RI/FS.

The results of the sampling to date from these EPA wells and others (Goodrich's PW-9; Colton's CPW-16 and CPW-17) provide an important confirmation of the existence of two deep plumes of perchlorate that are separated vertically by more than 100 feet of uncontaminated aquifer. In that the source of the lower plume has not yet been identified, it could be the Goodrich site, but it also could be from the County's former BROCO Facility (EPA ID NO. CAT080022148). Until the sources are known, the efficacy of the proposed remedial plan is uncertain and remedy selection is premature.

➭<u>EPA Response</u>: See response to GR-2 regarding the results from EPA's multi-port groundwater monitoring wells installed in 2009.

Recent groundwater monitoring results, from January, March, and April 2010 (added to the Administrative Record) provide clear evidence of distinct shallow and deep groundwater plumes at only one location (monitoring well PW-9). This well is located adjacent to an idle, deep production well (Rialto-06) that may be influencing the vertical distribution of contamination at this location. There is no evidence that the source of contamination observed in the deeper portion of PW-9 is outside of the 160-acre area. Nevertheless, EPA plans additional investigation of the nature and extent of groundwater contamination in the general vicinity of PW9 as part of its evaluation of the need for a second response action to address contaminated groundwater downgradient of the area targeted by the SA OU.

Comment FWC-14. ***2. Adjacent Source and Treatment of Perchlorate are Ignored***

The proposed Cleanup Plan does not address perchlorate contamination from the County Mid Valley Sanitary Landfill (MVSL) and the interactions between this proposed remedy and the proposed clean up operations employing Rialto #3 for the County site. It is clear from the modeling results presented in the RI/FS that the impact of the proposed remediation wells and the operation of the Fontana Water Company wells in the Rialto-Colton Basin have a very substantial impact on the remediation planned for the County's Landfill site.

According to Figure A-8 of the RI/FS, included below here as Figure 2, (and all of the other RI/FS figures that address 2004 groundwater flow conditions) the operation of the Fontana Water Company wells, particularly its well F49A treating County VOCs, appear to impact the groundwater streamline patterns. Since these are the conditions that will likely be in place for the foreseeable future this is a very important finding. If the modeling is to be believed (and there is good reason to doubt that it can be, as discussed below), this figure and all the others for 2004 conditions show that the streamline patterns for flow into the County planned remediation well Rialto #3 actually do not derive from the County site and that this well will not remediate the County's contamination. The original figure from which Figure 2 was derived (RI/FS Figure A8) does not plot streamline patterns that pass through the MVSL and so to illustrate the point streamline patterns based on the groundwater contours have been sketched onto the map, together with the location of the MVSL. From this figure it can be seen that no streamlines through the MVSL enter Rialto #3 and furthermore, it appears that the most effective remediation wells for the County site will likely be the five FWC wells F13A/B, F10B/C and F49A. Conclusion: both the EPA and County's proposed treatment systems at Rialto #2 and Rialto #3 may remove some of the perchlorate emanating from the Goodrich site, but little or no perchlorate from the County landfill.

➯EPA Response: EPA agrees that its proposed cleanup plan does not address perchlorate contamination from the County Mid Valley Sanitary Landfill (MVSL), except that some comingling of contamination between the BF Goodrich Site and the MVSL Site may occur. See response to FWC-15 for additional explanation. The former bunker area is now part of the MVSL.

EPA disagrees with the statement that its proposal does not address “the interactions between this proposed remedy and the proposed clean up operations employing Rialto #3 for the County site.” See response to GeoLogic-11 regarding the interactions between EPA’s remedy and the Rialto #3 (i.e., Rialto-03) cleanup project. As indicated in that response, operation of the County’s pump and treat remedy at Rialto-03 was incorporated into the modeling evaluations in the RI/FS at an assumed constant rate of 1,500 gpm. In its groundwater flow modeling (as explained in Section 3.3.1 of the January 2010 RI/FS Report), EPA also accounts for operation of wells FWC 49A, F-10A, F-10B, F-13A, and F-13B. EPA agrees with the comment that EPA's remedy will remove "little or no perchlorate from the County landfill."

The majority of the comment addresses the performance of the County's remedy (which includes use of the Rialto-03 well) in capturing groundwater contamination emanating from the County landfill property. This portion of the comment is not directly relevant to the SA OU and does not call into question EPA's selected remedy. The County has performed extensive independent groundwater modeling and technical evaluations to assess the performance of its remedy.

The comment notes that figures in the RI/FS appear to show that operation of some FWC wells impact the groundwater streamline patterns. EPA agrees, and explains the importance of this observation in response to comments FWC-15 and FWC-16.

<u>Comment FWC-15</u>. ***2. Adjacent Source and Treatment of Perchlorate are Ignored (cont.)***

EPA's cleanup plan and maps all assume and depict a separate perchlorate plume emanating from the Goodrich site, completely separate from the plume from the adjacent County landfill. But EPA's modeling refutes this untenable separate plume theory. The streamline patterns and particle paths shown in the model results are quite simply incompatible with two distinct contaminant plumes.

While it is understood that the streamline patterns drawn are representative of "steady state" flow conditions, and that in a situation where the flows are changing year-by-year, particle paths do not always coincide with streamlines, the results plotted in Figure 2 (and the other 2004 remediation scenarios plotted in the RI/FS Appendix A) make it very clear that a proper analysis of the remediation effort must analyze the transient flow conditions and the remediation of the County site in the Cleanup Plan.

➢<u>EPA Response</u>: Most or all of the groundwater contamination shown in figures in the RI/FS Report and in Figures 11 and 12 in this ROD is believed to originate on the 160-acre area, not the County landfill site. There may be a small area along the southwestern boundary of the area of groundwater contamination shown in Figures 11 and 12 that represents the merging or comingling of contamination originating from the 160-acre area and the County landfill site. The available groundwater quality and water level data do not rule out this possibility. EPA's modeling also indicates that, during some groundwater conditions (e.g., the low water level conditions shown in RI/FS Figure A-8), hydraulic gradients pull groundwater from the B.F. Goodrich Site in the direction of the County landfill contamination (toward the southwest), which may contribute to the comingling of the two areas of contamination.

EPA is uncertain of the basis for the comment that "EPA's cleanup plan and maps all depict a separate perchlorate plume emanating from the Goodrich site, completely separate from the plume from the adjacent County landfill." EPA's cleanup plan and maps do not attempt to depict the area of groundwater contamination associated with the County landfill.

EPA disagrees with the Commenter's assertion that EPA's modeling somehow refutes the separation of the two areas of contamination. EPA does not claim that there is no possible comingling of the two areas of contamination. Still, the extensive water quality data, groundwater level data and groundwater flow modeling results presented in the RI/FS Report support the interpretation that most, if not all, of the B.F. Goodrich Site groundwater contamination is separate from the County's groundwater contamination.

The extent of comingling, if any, will be considered during remedial design, when final decisions are made on groundwater extraction rates and locations. EPA agrees that the more detailed groundwater flow modeling evaluations planned during the remedial design and construction phases of the SA OU remedy should be based on an analysis of transient groundwater flow and should continue to account for groundwater pumping occurring as part of the County landfill remediation effort.

Comment FWC-16. ***The Plan Fails to Propose Any Remedy for the Perchlorate Contamination Flowing to the Southwest from the Goodrich and County Sites***

The recent data report[4] for the Regional Aquifer southeast of the County site shows that in the area traversed by streamlines to the FWC wells, the Regional Aquifer contains high concentrations of perchlorate. For example, Sampling Well N-9 has a concentration of 79 ppb of perchlorate; Well N-10 has 230 ppb. The streamlines implied by the computed groundwater contours in the Regional Aquifer (plotted in red in Figure 2) show that flow to the FWC wells

[4]Groundwater Monitoring Report Third Quarter Summer 2009 Prepared by Geologic Associates on behalf of County of San Bernardino and submitted to Regional Water Quality Control Board (Santa Ana Region).

passes through this area. These wells also appear to intercept streamlines that pass through the Goodrich site. However, there are few sampling wells at the Goodrich site that extend into the Regional Aquifer so it is not known what concentrations of perchlorate actually exist in this aquifer at this site (see RI/FS Figure 1-5).

The southwesterly flow of perchlorate is further indicated by the streamline directions implied by the groundwater elevation contours plotted in RI/FS Figure 1-4. Figure 3 below has been extracted from EPA Figure 1-4 to emphasize the groundwater contours not plotted between elevation 990 and 995. Streamlines inferred from these groundwater contours (plotted in red in Figure 3) clearly show transfer of perchlorate from the County site to FWC 13A/B, which is confirmed by the high fraction of synthetic perchlorate observed in well F13A during the recent preliminary chlorine and oxygen isotope studies. The plotted streamlines also indicate possible transfer of perchlorate from the Goodrich site to FWC well F49A. (Note that this figure also indicates the correct positions of FWC wells F10B/C, which are incorrectly placed in RI/FS Appendix figures, as discussed in more detail below.)

Note also in Figure 3 that the measured groundwater contours, and their associated streamlines that transport perchlorate to the FWC wells FI3A1B, F10B/C and F49A (the purple squares on the map), agree in general form to those streamlines and contours in the same area shown in Figure 2.

The conclusion that perchlorate in FWC's wells derives from the County and possibly Goodrich sites is also supported by prior groundwater contours prepared by USGS, the studies by Anderson et al. and Gandhok et al, the initial isotope study of perchlorate in FWC wells, and a wealth of other data discussed in my prior reports to EPA beginning in October 2008. Unless this conclusion is refuted by the new perchlorate isotope and hydrogeologic studies now being conducted by the ESTCP and USGS, any perchlorate remediation plan for the Goodrich and/or County sites should also remediate perchlorate contamination in FWC's wells.

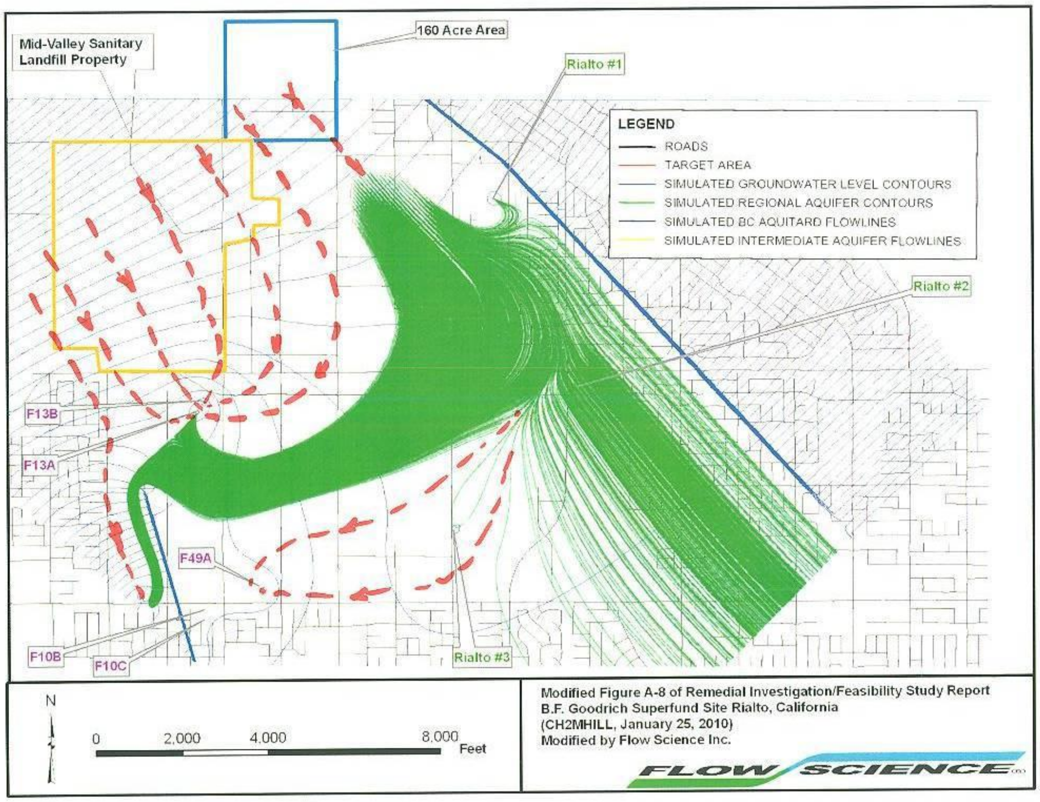

FIGURE 2 -Extracted from RI/FS Figure A-8 and modified to show Goodrich and County Landfill sites and correct positions of Wells F10B/C. Schematic streamlines added in red.

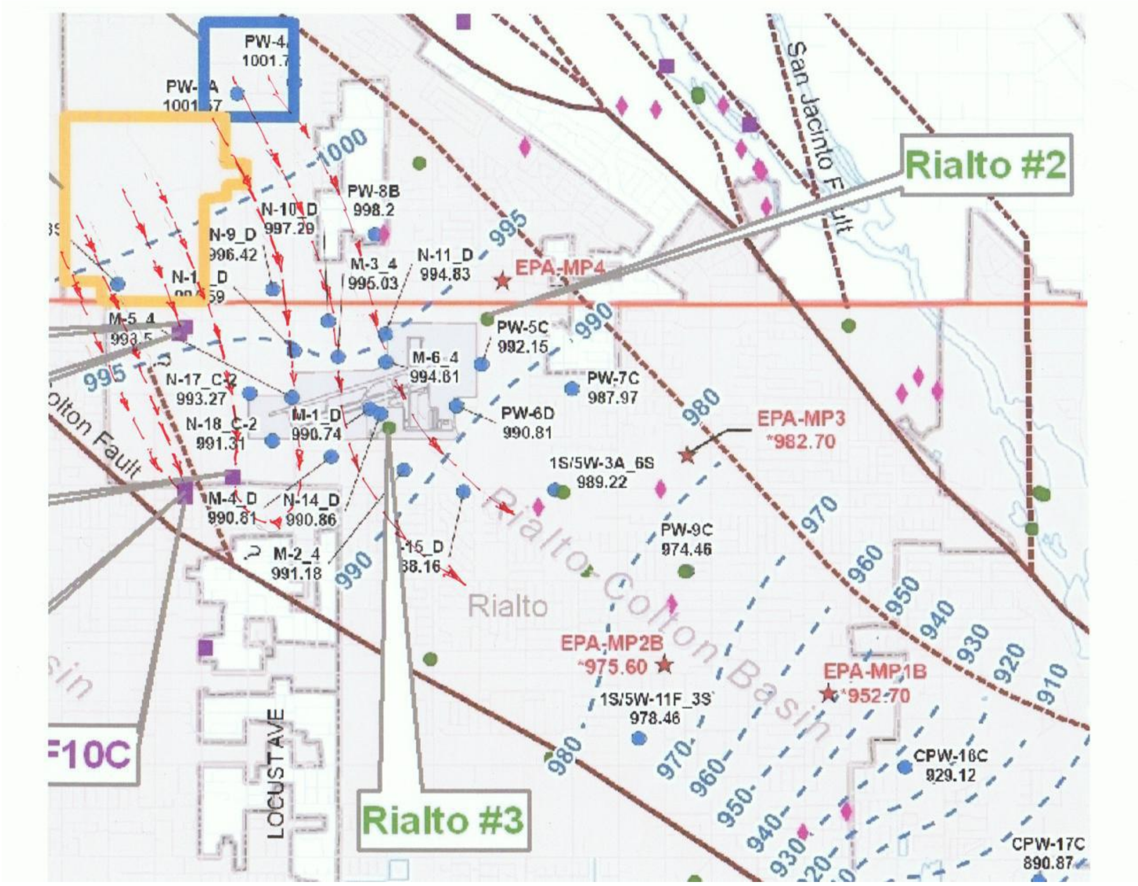

FIGURE 3 -Extracted from RI/FS Figure 1-4. Schematic streamlines added in red.

✎EPA Response: Available water quality and water level data do not support the conclusion that there is southwesterly migration of perchlorate from the 160-Area Area to FWC's wells in the western portion of the RCB. The streamlines depicted in Figure A-8 from the January 2010 RI/FS Report do not represent past or expected future conditions. They illustrate the potential movement of potentially contaminated groundwater in the extreme case that groundwater conditions observed in 2004 continued indefinitely. As stated in Section 3.3.1 of the RI/FS Report, the modeling results "should be interpreted carefully because the actual flow field varies from year to year and particular caution should be exercised in interpreting results when the selected flow field reflects extremely wet or dry years or other transient conditions."

Furthermore, EPA has carefully reviewed the figures and data provided with or referenced in the comment and does not find any evidence to support a conclusion that perchlorate contamination from the B.F. Goodrich Site has impacted FWC's wells. The streamlines added to EPA's Figures A-8 and 1-4 (included as Figures 2 and 3 in the comment) inappropriately extrapolate from the extreme conditions shown in Figure A-8 or the snapshot shown in Figure 1-4. In addition, some of the streamlines do not accurately reflect and are not implied by the interpreted contours shown in the figures.

The comment states that "there are few sampling wells at the Goodrich site that extend into the Regional Aquifer so it is not known what concentrations of perchlorate actually exist in this aquifer at this site (see RI/FS Figure 1-5)." EPA is uncertain about the meaning of this comment. A review of Figure 1-5 in the RI/FS Report shows ten monitoring wells or piezometers extending into the Regional Aquifer. As noted in comments GR-2 and FWC-13, EPA installed six additional wells in 2009, all screened in the Regional Aquifer, not shown in the figure.

See the response to comment FWC-18 regarding the possible mis-location of FWC wells 10B/C.

The comment states that "prior groundwater contours prepared by USGS, the studies by Anderson et al. and Gandhok et al, the initial isotope study of perchlorate in FWC wells, and a wealth of other data" support the conclusion that perchlorate in FWC's wells may derive from the B.F. Goodrich Site. EPA has reviewed historical groundwater contours prepared by USGS (such as those included in the 1/1/97 report by Woolfenden et al, which are included in the Administrative Record) but has not found evidence to support the claim that perchlorate contamination from the B.F. Goodrich Site has impacted FWC's wells. Although not submitted as part of the comment, EPA has also reviewed isotope measurements referenced in the comment and similarly concluded that they do not provide evidence that perchlorate contamination from the B.F. Goodrich Site has impacted FWC's wells. (See the March 27, 2009, letter from Wayne Praskins to John List, included in the Administrative Record, for additional detail.) EPA also does not concur with the claim that the studies by Anderson et al. and Gandhok et al support the conclusion that perchlorate in FWC's wells may derive from the B.F. Goodrich Site. Neither of these studies provides information that is directly relevant to the movement of perchlorate contaminated groundwater from the 160-acre area. EPA is not clear what is meant by "a wealth of other data."

Portions of this comment are directed at the County Site and are not relevant to the evaluation and selection of a remedy for the SA OU (e.g., the source of contamination at FWC wells 13A/B).

The *Groundwater Monitoring Report Third Quarter Summer 2009* referenced in the comment has been added to the Administrative Record.

Comment FWC-17. *A Large Fraction of Perchlorate Will Remain in the Ground*

The proposed Cleanup Plan relies upon two interception wells Rialto #2 and a new well EW-I, located to the west of Rialto #2, as shown in RI/FS Figure 3-6. However, referring to RI/FS Figure 1-5, included here as Figure 4, it is clear that a huge volume of perchlorate contaminated groundwater lies hydrogeologically downstream of Rialto #2 and that the Cleanup Plan will have no impact on the removal of this polluted groundwater flow stream. Concentrations of perchlorate in this downstream plume exceed 300 ppb of perchlorate (Rialto#6). The Cleanup Plan should address how this plume of perchlorate is going to be intercepted and treated.

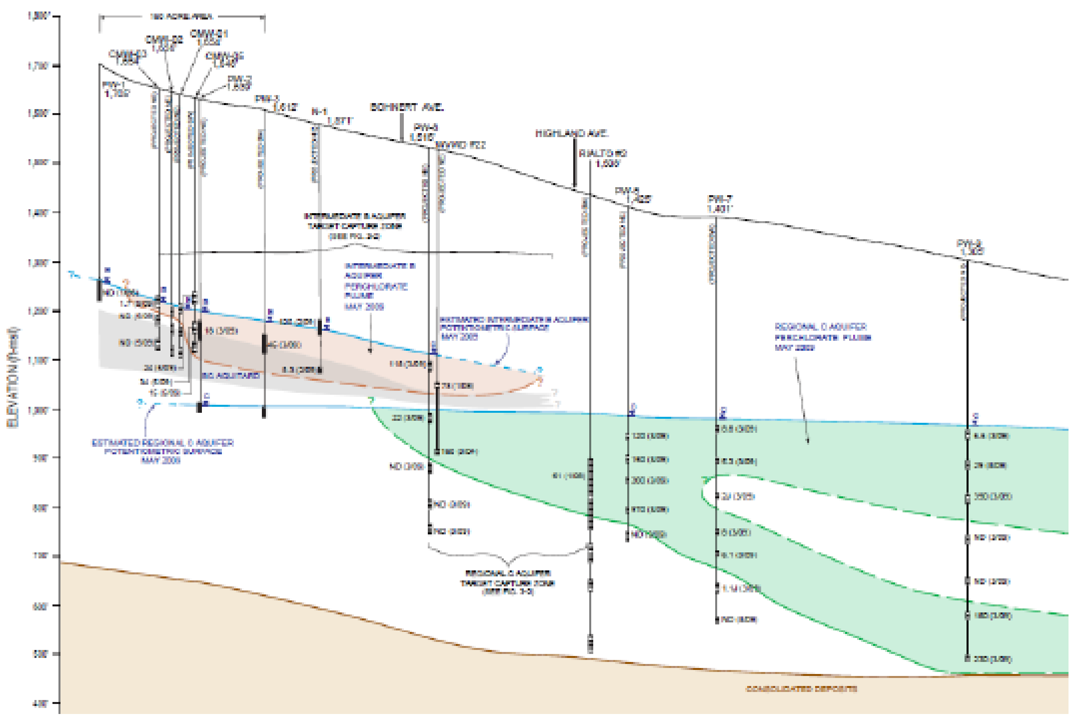

FIGURE 4 -Extracted from RI/FS Figure 1-5 to show extent of plume east of Rialto #2.

<u>EPA Response</u>: The SA OU remedy is an interim remedy intended to capture groundwater contamination migrating away from the 160-acre area source area as a first step towards complete remediation of the B.F. Goodrich Site contamination. EPA understands that there is substantial groundwater contamination downgradient of the SA OU target area, as reflected in the TCE and perchlorate levels at wells PW-5 and PW-9, in particular. EPA expects that additional actions will be needed to address this contamination, as explained in Sections 1.61 and 2.1.2 of the RI/FS Report, EPA's January 2010 Proposed Plan, and other parts of this ROD.

The testing and evaluation needed to develop a cleanup plan for the downgradient portions of the Site are underway but have not yet been completed. Rather than wait until all testing at the Site has been completed, EPA chose to divide the Site into two parts, and begin cleanup of the part where enough testing and analysis has been completed to determine the best way to carry out the cleanup (i.e., the SA OU). EPA expects to develop a second cleanup plan for the remaining portion of the Site after sufficient testing and analysis have been completed.

<u>Comment FWC-18</u>. *Reliance on a Demonstrably False Groundwater Model*

The model employed in the RI/FS is a slightly adjusted version of the Geologic Associates ground water model of the Rialto-Colton Basin. It presumes the existence (for which there is scant evidence) of a shortened section of the Dutcher and Garrett Barrier H (interpreted as an impermeable branch off the RCF into the Rialto-Colton Basin), and it assumes an impervious and contiguous RCF fault, contrary to the findings of Anderson et al. and Gandhok et al (see §1 above). The most important failings of the modeling are:

(i) The presumed position of Barrier H and the locations of FWC wells F10B and F10C are incorrectly positioned in the groundwater model. Figure 5 below is an overlay map created by Flow Science with a GIS system using Figures 1-4 and A-8 from the RI/FS. In the lower left hand comer of this figure two different locations for Barrier H can be seen. One shown as a dark blue solid line, as in Figure A-8, and the other a dotted light brown line, as in Figure 1-4. Wells F10B/C are not explicitly called out in Figure A-8, but their location is implied by the apex of the green particle paths. In Figure 1-4 these two wells are shown as overlapping light purple squares. Flow Science has checked the actual locations of Wells F10B/C and has marked these locations on Figure 5; they coincide with the locations shown in RI/FS Figure 1-4. The fact that Barrier H and the Wells F10B/C are apparently mislocated in the groundwater model will obviously change the computed groundwater contours and streamlines; how significant the change will be is difficult to assess without rerunning the model with the correct geometrical data.

Perhaps even more important than the mislocation of Barrier H is the presumption of its shape and impermeability. Given the uncertainty associated with both the location and structure of this "barrier" it would have been entirely appropriate to have performed model sensitivity analyses that omitted the barrier altogether.

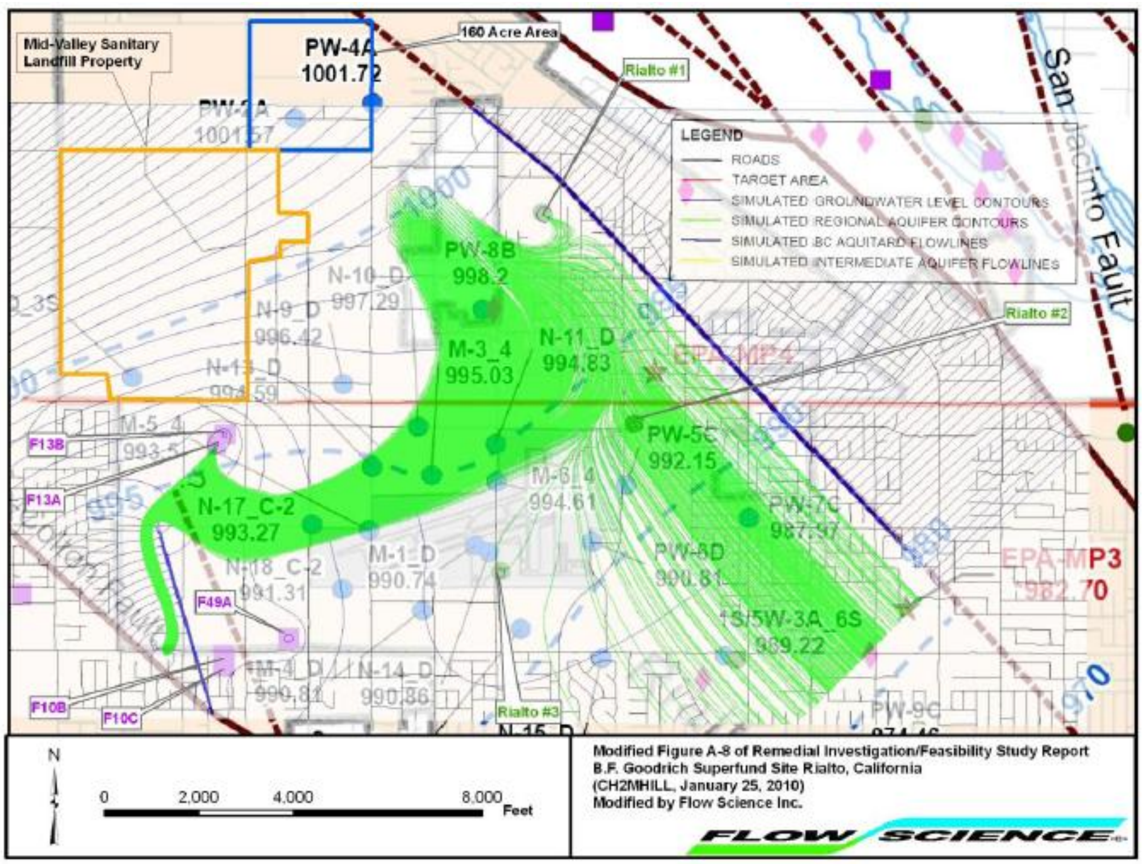

FIGURE 5 --Sections of RI/FS Figures 1-4 and A-8 in an overlay showing misplacement of Wells F10B/C and Barrier H. Figure also includes County and BROCO sites.

⇨<u>EPA Response</u>: If FWC Wells F-10B and F-10C, and Barrier H, are slightly misplaced in the groundwater model as is implied on Figure 5, EPA does not expect the change in location to have a significant impact on the remedy extraction rates or to change the relative ranking of the remedial alternatives. Nevertheless, EPA will ensure that the wells are correctly located when additional modeling simulations are conducted to refine the groundwater extraction rates and locations during remedial design.

Regardless of whether Barrier H is incorporated into the model as an offshoot of the RCF (as is currently implied in the model) or as part of a broader RCF zone as may be inferred by the Anderson et al (2004) findings, it provides a reasonable reproduction of the difference in groundwater elevations on opposite sides of the barrier. Performing additional simulations without the barrier is not a critical part of model sensitivity analyses in support of the SA OU. The groundwater elevations measured in Wells F-10B and F-10C are approximately 100 feet lower than those measured in nearby wells in the RCB (e.g., F-49A). However, EPA agrees that additional modeling should be conducted with a more sophisticated groundwater flow model during the remedial design phase (prior to remedy implementation) to more closely evaluate groundwater flow conditions in this part of the RCB.

Comment FWC-19. ***There is a failure to impose upstream boundary conditions that show a rapid rising and falling of the Intermediate Aquifer water table in response to major stormwater flows in Lytle Creek. Field work at the Goodrich site and County sites has shown that these very rapid rises in water table elevation are responsible for major influxes of perchlorate into the groundwater system through flushing of the vadose zone (see Figures 6a and 6b for the Goodrich site below; similar charts exist for the County site). Lytle Creek had exceptionally high flows in late 2004 and early 2005, which are reflected in the changing water table elevations at the Goodrich site later in 2005. The USGS[5] has also noted the extreme variability in the inflows to the Rialto-Colton Basin from the Lytle Basin (see Figure 40 of the USGS WRIR 00-4243).***

EPA Response: EPA agrees that water levels and perchlorate concentrations in the Intermediate Aquifer can vary significantly from year to year. During the RI/FS, EPA reviewed the groundwater elevation and perchlorate data included in the comment and included these data in the Administrative Record (see the monthly progress reports submitted by Geosyntec consultants).

EPA disagrees that it has failed "to impose boundary conditions that show a rapid rising and falling of the Intermediate Aquifer water table in response to major stormwater flows in Lytle Creek." The basis for this claim is unclear. The boundary fluxes assumed in the model do change dramatically each year (the model time steps are one-year increments) resulting in significant fluctuations in simulated water levels in the Intermediate Aquifer.

[5] *USGS Water Resources Investigation Report 00-4243, 2001.*

<u>Comment FWC-20</u>. *The attempted validation of the modeling as represented by RI/FS Figure A-6 (see Figure 7 below) shows a poor correlation with measured groundwater surface elevations in City of Rialto wells with elevation discrepancies of as much as 70 ft and also indicating groundwater slopes during the 1980's that are not present in the well data. In fact, the RI/FS concedes that the model even indicated flows out of the northwest boundary of the modeling region in the late 1980's and 1990's -basically saying that groundwater ran uphill! (See RI/FS Figure A-7a included here as Figure 8.)*

⇘<u>EPA Response</u>: The RI/FS Report acknowledges key limitations and uncertainties associated with the groundwater flow model used to evaluate groundwater extraction rates needed to achieve the remedial action objectives of the SA OU (see page 3-10). In the RI/FS Report, EPA clearly identifies the model limitations referred to in the comment. EPA believes that the model used during the RI/FS was adequate to support the evaluation of remedial alternatives and the selection of a remedy, including estimation of the approximate remedial pumping rates required for hydraulic capture of the targeted areas of contamination during varying groundwater conditions. EPA is confident that the groundwater extraction and treatment rate for in the selected remedy will satisfy the RAOs and performance criteria, with minor changes to the rate possible during remedial design.

<u>Comment FWC-21</u>. *It is acknowledged that the modeling does not show any transfer of perchlorate from the Intermediate Aquifer to the Regional Aquifer: "Simulations of downward movement through the Intermediate Aquifer with the larger target area provided results that may not be representative of actual conditions. The particles are shown either moving into the B Aquitard, or they become stranded in portions of the Intermediate Aquifer where the saturated thickness was limited during low to intermediate water level conditions. These simulations assume that the specified water levels continue unchanged for a period of tens or hundreds of 'years."*

However, as shown in the field data from the Goodrich site (Figures 6a and 6b) the water levels do not remain constant, and it is these changing water levels that give rise to the pulses of high concentration perchlorate in the groundwater. In the absence of any transfer from the Intermediate to the Regional Aquifer, where do the high concentrations in the Regional Aquifer come from?

PW-2 Hydrograph and Time-Series Chart

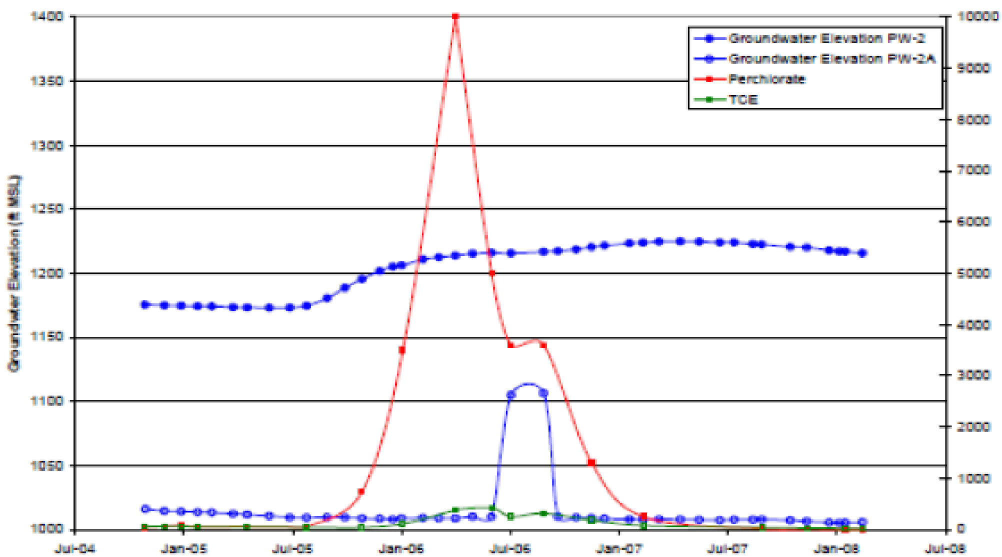

FIGURE 6a -Groundwater elevation and perchlorate in sample well PW-2 Goodrich site.
Source: Goodrich Corporation Progress Report for the Month of February 2008
160-Acre Parcel, Rialto, California
Geosyntec Project No. HA 0938

PW-3 Hydrograph and Time-Series Chart

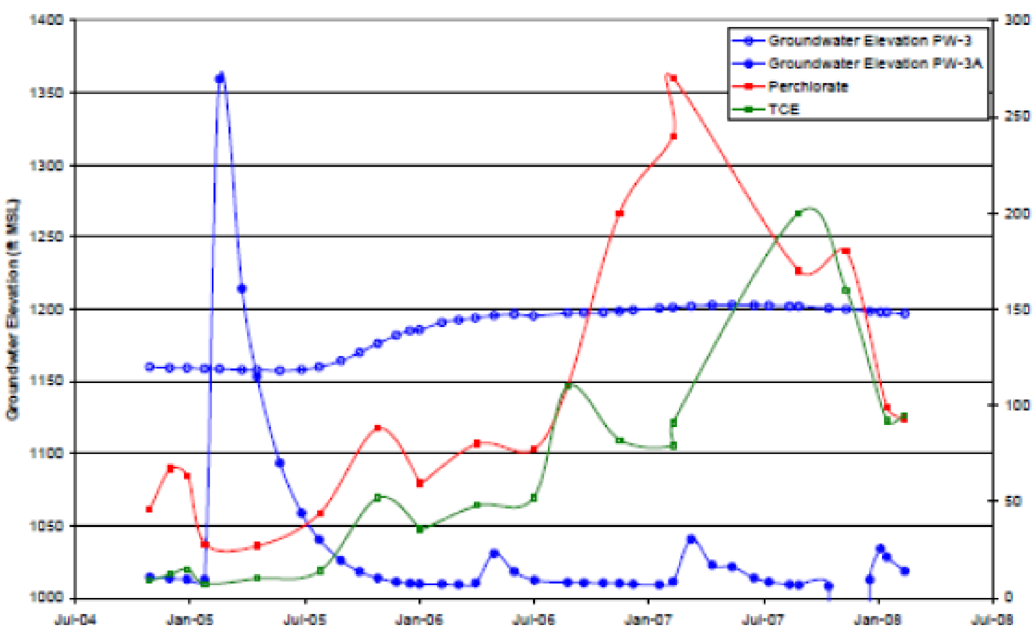

FIGURE 6b-Groundwater elevation and perchlorate in sample well PW-3 Goodrich site.
Source:
Goodrich Corporation Progress Report for the Month of February 2008
160-Acre Parcel, Rialto, California
Geosyntec Project No. HA 0938

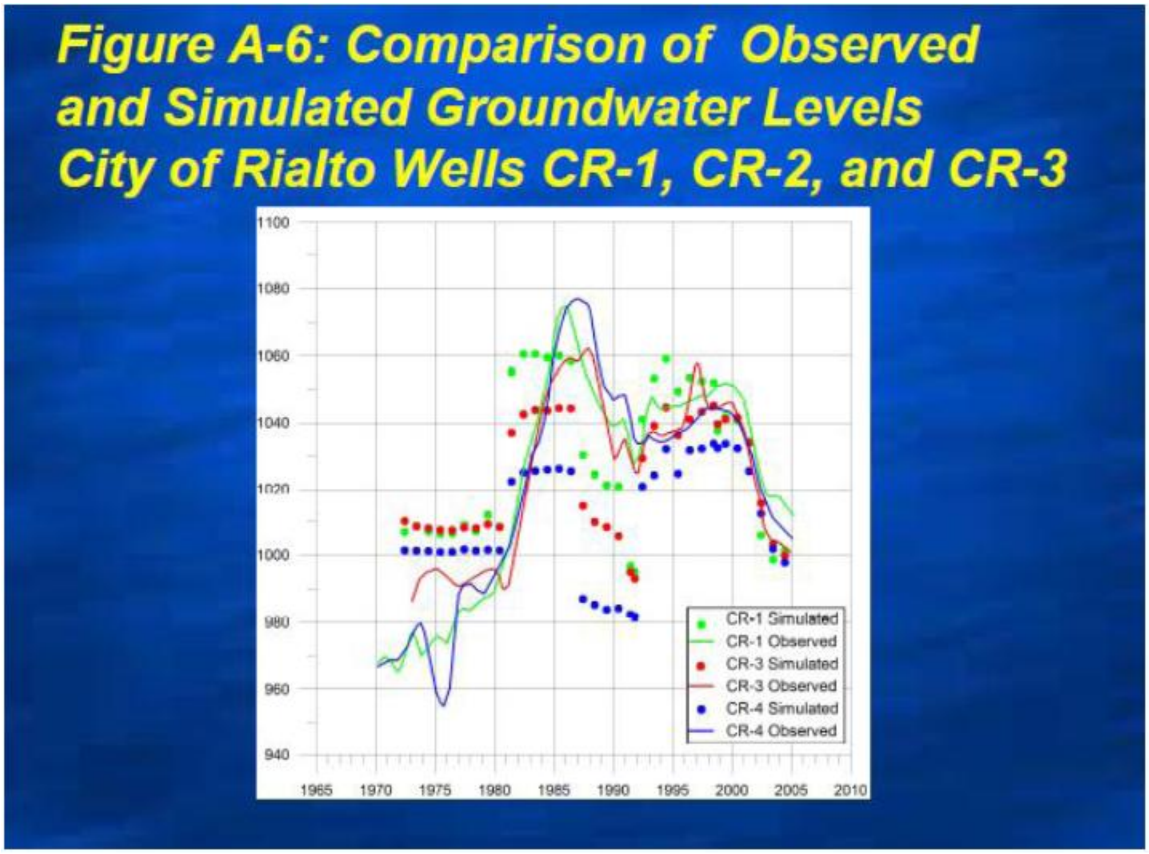

FIGURE 7 -Validation of the model versus City of Rialto wells.

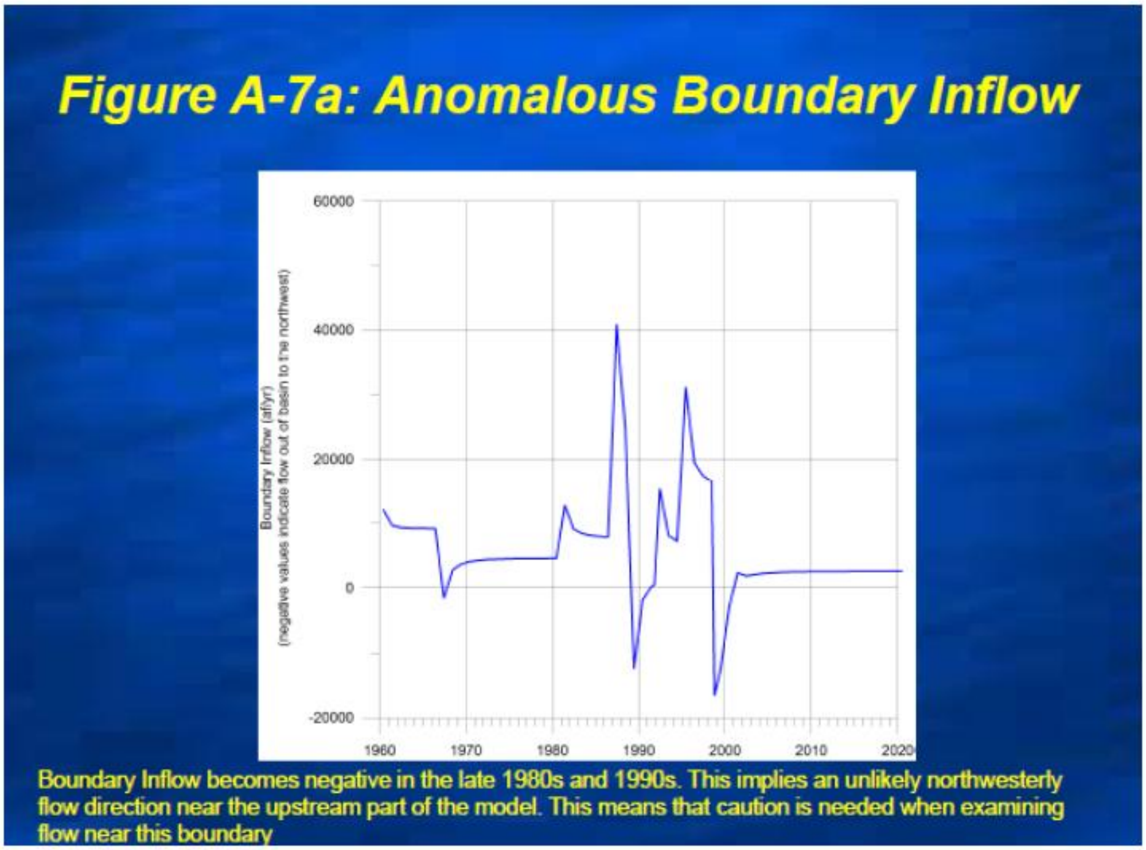

FIGURE 8 -Extracted from RI/FS Figure A-7a showing negative boundary flows at the "upstream" northwest boundary to the model.

⇨EPA Response: The comment appears to misinterpret the RI/FS Report in stating that the groundwater flow model does not show any transfer of perchlorate from the Intermediate Aquifer to the Regional Aquifer, and in posing the question “where do the high concentrations in the Regional Aquifer come from?” The model simulates the primary mechanism believed to be responsible for the transfer of groundwater contaminated with perchlorate and other COCs from the Intermediate Aquifer into the Regional Aquifer. That is the movement of groundwater from the downgradient end of the Intermediate Aquifer (where the Intermediate and Regional Aquifers merge) into the Regional Aquifer.

The statement from the RI/FS Report quoted in the comment (“Simulation of downward movement…”) refers to limitations in the proper interpretation of modeling simulations that assume that relatively dry conditions continue unchanged for tens or hundreds of years. Nevertheless, it is notable that the model suggests very slow transfer rates, consistent with the several hundred foot head difference between the two aquifers in the vicinity of the 160-acre area.

<u>Comment FWC-22</u>. ***Misrepresentations in Figure 2 of Public Notice of Comment***

Figure 2 of the document entitled "EPA Seeks Public Comment on Groundwater Cleanup Plan" completely misrepresents the extent of the contamination in the Rialto-Colton and Chino Basins. The legend to this figure: " Figure 2. Approximate extent of perchlorate and /or trichloroethene (TCE) contamination", and the depiction of the contaminated ground water plume, have entirely omitted the contributions to the groundwater contamination emanating from the County Landfill and BROC sites. Furthermore, the depiction of a single plume streaming to the southeast is contrary to EPA's own modeling results that show, in all of the figures in Appendix A for 2004 conditions, that such a uniformly streaming plume cannot be present. The figures also depict the Rialto-Colton Fault as a single entity, when in fact geological evidence developed by the USGS (discussed in Section 1 above) has shown that the fault is anything but contiguous and actually occupies a zone of at least a kilometer in width.

➥<u>EPA Response</u>: Figure 2 of EPA's Proposed Plan is not intended to illustrate contamination throughout the Rialto-Colton and Chino Basins. Figure 2 is intended to illustrate the approximate extent of contamination associated with the B.F. Goodrich Site. The comment correctly notes that the figure omits the contamination associated solely with the County's landfill property (which is not part of the Site).

See FWC-12 for a response to the comment that "the depiction of a single plume streaming to the southeast is contrary to EPA's own modeling results" and the comment regarding the depiction of the RCF.

<u>Comment FWC-23</u>. ***SUMMARY AND CONCLUSIONS***

Before EPA spends tens of millions of dollars on a remedy that is incomplete and premature, it should wait for and carefully consider the results of the comprehensive studies of groundwater hydrology and isotopes being performed under the aegis of the ESTCP by Shaw Environmental and the USGS. These studies will provide the information needed to develop the most effective cleanup plan for perchlorate generated from the two adjacent sites in the Rialto-Colton Basin.

➥<u>EPA Response</u>: As noted above, the SA OU remedy is an interim remedy intended to hydraulically control contaminated groundwater moving away from the source area where the highest levels of groundwater contamination have been detected. EPA believes that it has adequately explained the basis for the preferred alternative described in the January 2010 Proposed Plan and the remedy selected in this Record of Decision. EPA's proposal and selected remedy are based on the January 25, 2010, RI/FS Report and other documents included in the Administrative Record.

EPA does not agree with the statement that it should wait to implement this initial interim remedy until the ongoing studies are completed (another one to two years). Adequate data are currently available in the SA OU to evaluate and select an interim remedy. EPA concurs that the supplemental studies of groundwater hydrology and isotopic signatures referenced in the comment are likely to provide data that will be useful in the selection of a remedy for the downgradient portions of the Site, but they are not directly relevant to the SA OU area.