B.F. Goodrich Superfund Site

U.S. Environmental Protection Agency • Region 9 • San Francisco, CA • January 2010

EPA Seeks Public Comment on Groundwater Cleanup Plan

Introduction

This fact sheet presents the U.S. Environmental Protection Agency's (EPA) plan to begin cleanup of contaminated groundwater at the B.F. Goodrich Superfund Site (Site) in Rialto, California. The Site is located about 60 miles east of the city of Los Angeles.

EPA seeks your feedback on this proposed cleanup plan. Your comments and suggestions may result in changes to the plan.

After EPA reviews all public comments on the plan and on related documents, it will adopt and implement a final cleanup plan. EPA's preferred action, described in more detail on pages 10 - 12, is to design and construct groundwater extraction wells, pipelines, water treatment systems, and other facilities needed to prevent the contaminated groundwater from spreading into uncontaminated and less contaminated areas.

This plan describes the importance of the groundwater as a source of drinking water to residents and businesses in the Rialto area, and the nature and extent of the contamination at the Site. In addition to discussing the preferred cleanup action, this plan describes EPA's cleanup objectives and the relative effectiveness, cost, and feasibility of other cleanup options that EPA considered, but chose not to propose at this time. EPA may propose additional cleanup at the Site in future actions.

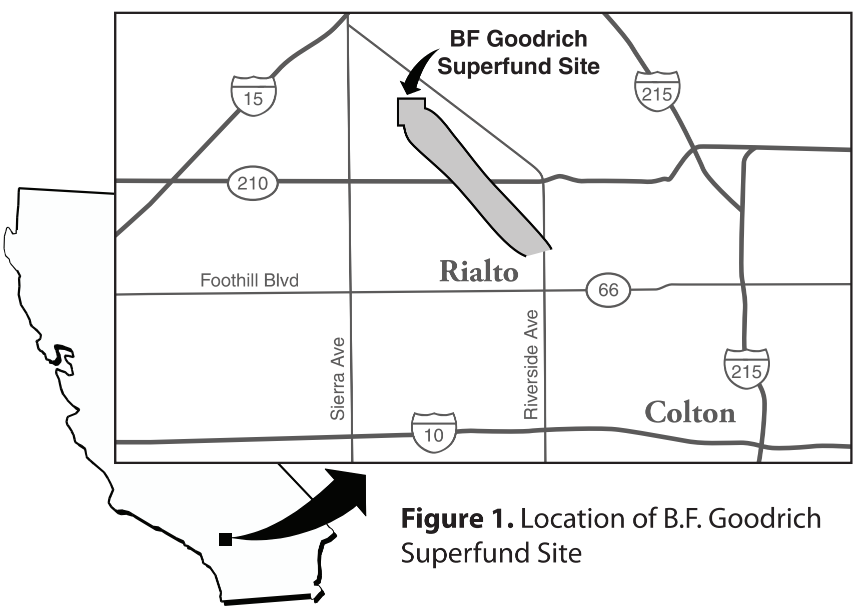

Figure 1. Location of B.F. Goodrich Superfund Site

Public Meeting

EPA will hold a public meeting to explain and answer questions about its Proposed Plan. Oral and written comments will also be accepted at the meeting. The meeting will take place on:

Wednesday, February 10, 2010
6:30 p.m. - 8:30 p.m.

Rialto Senior Center
1411 S. Riverside Ave.
Rialto, CA 92376

EPA Seeks Your Comments on this Proposed Cleanup Plan

EPA welcomes your comments on the Proposed Plan and other documents in EPA's Administrative Record file. Comments may be made at the public meeting on Wednesday, February 10, 2010, or submitted by email, fax, or regular mail **no later than March 8, 2010,** unless EPA extends the comment period. See EPA's B.F. Goodrich Site website for notice of any extension in the comment period. You can send your comments to:

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EPA, the California Regional Water Quality Control Board (Santa Ana Region), the California Department of Toxic Substances Control, the cities of Rialto and Colton, and local water utilities have been working jointly to investigate and clean up contaminated soil and groundwater at the Site. EPA is the lead agency for this proposed cleanup.

For a detailed description of the information and analyses upon which this plan is based, see the Remedial Investigation and Feasibility Study (RI/FS) Report and other documents available in the Administrative Record file for this proposal. See page 13 for information on how to obtain these documents.

Community Participation

EPA representatives provided an update on its investigation and cleanup efforts at a public meeting in Rialto on December 2, 2009, and will provide future updates through public meetings, fact sheets, public notices, and its website. EPA has begun preparation of a formal Community Involvement Plan for the Site, which should be completed in 2010.

Site Background

The B.F. Goodrich Site includes contaminated soil and groundwater in an industrial area in Rialto, California known as the "160-acre area." The Site also includes contaminated groundwater that has spread from the 160-acre area to the southeast. The 160-acre area is part of a larger area developed by the United States Army in the 1940s as a storage facility for rail cars transporting ordnance (military supplies) to the Port of Los Angeles. It was subsequently used by a variety of private businesses to manufacture and test solid-fuel rocket propellant, solid-fuel missile and rocket motors, military flares, fireworks, and other products.

Testing to determine the sources, number, and extent of chemical contamination in the soil and groundwater began in 2003. The testing has been conducted by businesses that currently operate or formerly operated at the 160-acre area, current property owners, San Bernardino County, local water utilities, and EPA.

The groundwater at the Site is a vital resource for residents of Rialto and Colton. The Rialto-Colton groundwater basin, in

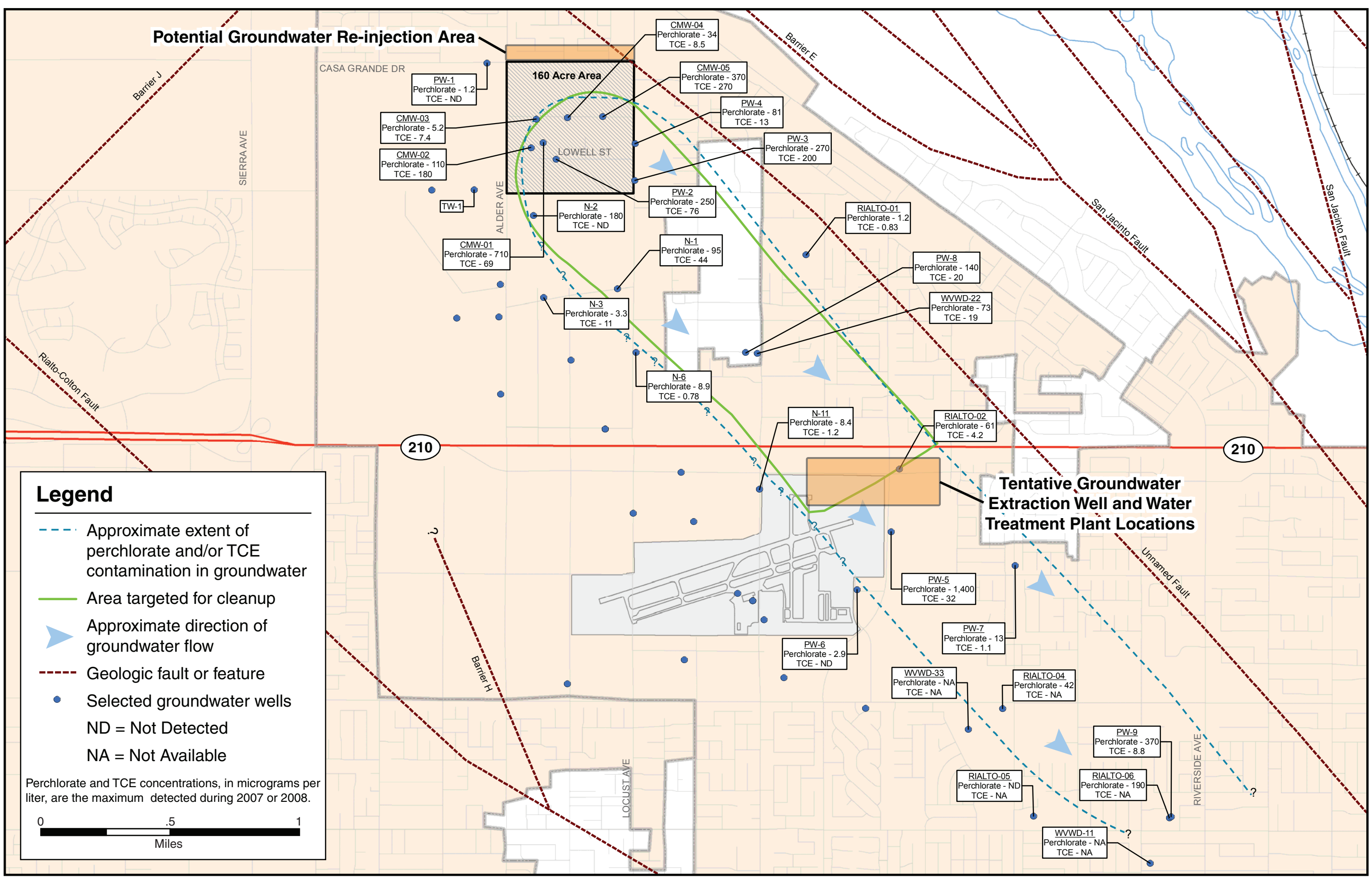

Figure 2. Approximate extent of perchlorate and/or trichloroethene (TCE) contamination

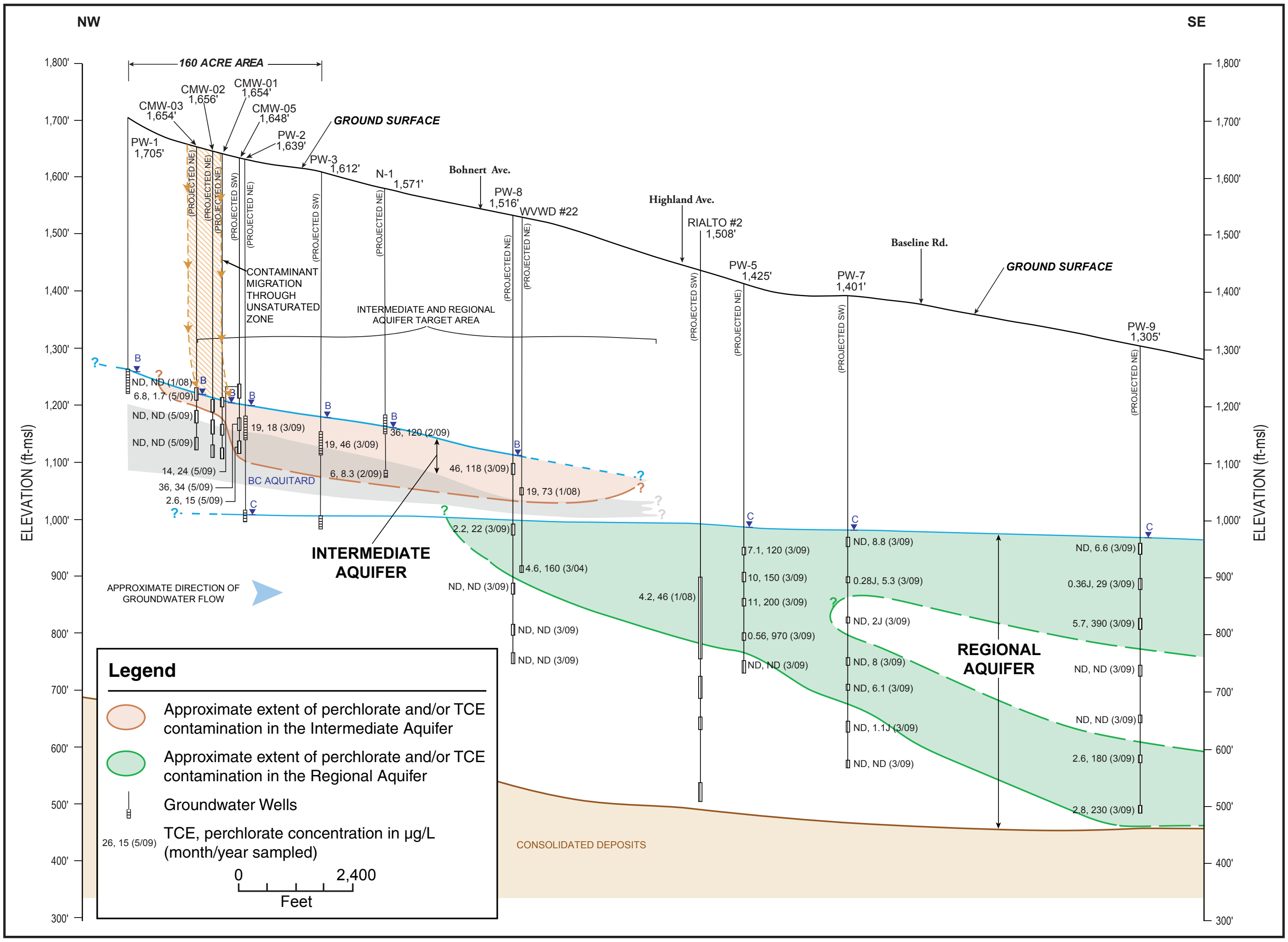

Figure 3. Approximate extent of trichloroethene (TCE) and/or perchlorate contamination

which the Site is located, has in recent years supplied more than 8 million gallons of drinking water per day, through large municipal water supply wells that pump water from hundreds of feet below ground. That is 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, requiring water utilities to pump more water from wells in clean outlying areas or to install costly water treatment systems.

Site Characteristics

The area of groundwater contamination is at least several miles long and has reached depths of 800 feet below ground, as shown in Figures 2 and 3. Testing is underway to determine the full extent of contamination. The figures show the approximate area where the concentrations of contaminants in the groundwater exceed Federal or State drinking water standards (known as Maximum Contaminant Levels or MCLs).

Area Targeted for Cleanup

EPA's cleanup plan is directed at the most-contaminated groundwater at the Site, which extends from the 160-acre area about 1 ½ miles to the southeast. The tentative location for the groundwater wells and water treatment systems that EPA is proposing as part of this plan is northeast of the Rialto Municipal Airport, just south of the Foothill Freeway (Route 210) in Rialto. Figure 2 shows the approximate location.

Groundwater

The Rialto-Colton groundwater basin has multiple water-bearing layers. In the area targeted for cleanup, the depth to the first layer, known as the Intermediate Aquifer, is currently about 400 to 450 feet. The Intermediate Aquifer is about 50 to 100 feet thick. The deeper water-bearing layer, known as the Regional Aquifer, is about 300 to 500 feet thick. To the southeast of the area targeted for cleanup, only the Regional Aquifer is present.

Drinking Water is Regularly Tested to Ensure Compliance With EPA and State Drinking Water Standards

Drinking water supplied to residents and businesses in the Rialto area is regularly tested to ensure compliance with EPA and State drinking water standards. Drinking water wells not meeting EPA and the State standards have been equipped with water treatment systems to remove the contaminants or shut down.

Groundwater in the Intermediate Aquifer generally flows to the southeast at up to several feet per day. Groundwater in the Regional Aquifer generally flows to the southeast at an average rate of about one-half foot per day.

Groundwater levels, and the rate at which groundwater moves, vary seasonally and year to year. The primary cause of the variability is year to year changes in precipitation in the region.

Chemical Contaminants

The primary contaminants in the groundwater are trichloroethene (TCE) and perchlorate. Low concentrations of carbon tetrachloride and other volatile organic compounds (VOCs) have also been detected. Perchlorate is an inorganic chemical used as an oxidizer in rocket propellant, flares, fireworks, and other products. TCE is an organic cleaning solvent that was extensively used in the 1950s and 1960s. Employees of businesses that operated in the 160-acre area in the 1950s and 1960s have testified that perchlorate and cleaning solvents were handled or used at the Site. The chemicals probably contaminated the soil and groundwater from intentional onsite disposal and spills. Neither TCE nor perchlorate readily degrade when dumped or spilled and both can persist in groundwater for decades.

Nature and Extent of Contamination

In the area of groundwater contamination targeted for cleanup, TCE, perchlorate, and carbon tetrachloride have been detected at concentrations above Federal and/or State drinking water standards. The highest TCE concentration measured is more than three hundred times the drinking water standard of 5 micrograms per liter (μg/L). The perchlorate concentrations in most of the groundwater monitoring wells exceed the drinking water standard of 6 μg/L by a factor of ten or more. The highest perchlorate concentration measured is more than one thousand times the drinking water standard. Carbon tetrachloride has also been detected at one monitoring well above its drinking water standard of 0.5 μg/L . The highest concentrations of TCE and perchlorate were measured after heavy precipitation in early 2005 caused large increases in groundwater levels in the Intermediate Aquifer, suggesting that there is a substantial amount of contamination remaining in the soil and groundwater. In recent testing in 2009, TCE and perchlorate concentrations remained well above drinking water standards.

Scope and Role of this Operable Unit (OU)

EPA's first priority at the Site, reflected in this plan, is to limit further spread of the most-contaminated groundwater at the Site.

EPA has designated the area of highly contaminated groundwater targeted in this cleanup plan as the Interim Source Area Operable Unit. The term "operable unit" (OU) defines a discrete action that is an incremental step toward cleanup of a Superfund site. 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).

Some contaminated groundwater has already moved past the area targeted by this cleanup plan. Additional cleanup actions are planned for this "downgradient" area after groundwater flow directions and the extent of contamination in the downgradient area are better understood. In 2009, EPA completed a $2 million effort to install new groundwater monitoring wells to better define the nature and extent of contamination in the downgradient area and help determine what additional cleanup actions may be needed.

Potentially Responsible Parties

EPA has named three companies that operated at the Site (or their corporate successors), and two current property owners, as Potentially Responsible Parties (PRPs). The Superfund law makes certain owners and "operators" at a site responsible for investigation and cleanup work. The PRPs have completed some of the soil and groundwater testing upon which this Proposed Plan is based.

In a future action, EPA may propose to set cleanup goals for the aquifer. EPA is also examining the value of cleaning up contaminated soil. EPA's ultimate goal at the Site is to clean up the groundwater to the point that it is safe to drink without having to treat the chemical contaminants.

EPA's Reasons for Taking Action

Cleanup of the targeted area of groundwater contamination is needed because the levels of contamination exceed Federal and/or State drinking water standards. Recently measured levels of contamination in the groundwater exceed standards for TCE, perchlorate, and carbon tetrachloride by factors of up to 19, 48, and 1.2 respectively.

To evaluate the need for cleanup, EPA also estimated the "hazard index" that could result in the unlikely event that Federal and State drinking water standards are not enforced, and people drink (or inhale vapors from) groundwater at the most contaminated parts of the Site. Making this worst case assumption, the hazard index would be as high as 11. A hazard index greater than one indicates the potential for adverse health effects.

It is EPA's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in this Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment, or from the actual or threatened releases of pollutants or contaminants from this Site which may present an imminent and substantial endangerment to public health or welfare.

EPA and State Roles

From 2002 until about 2008, the California Regional Water Quality Control Board, Santa Ana Region, 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 leading cleanup efforts at the Site.

Remedial Action Objectives

The primary and secondary remedial action objectives of the cleanup described in this plan 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.

Installation of Groundwater Wells

Between April and December 2009, EPA completed a $2 million effort to install a network of 900-foot deep groundwater monitoring wells in Rialto to provide information needed to plan future cleanup actions at the Site.

Summary of Remedial Alternatives

EPA has evaluated how well each of five cleanup options, described further below, satisfies the remedial action objectives and other requirements. The five options are labeled: Alternative 1, Alternative 2a, Alternative 2b, Alternative 3 and a "no-action" option. The no-action option does not include active remediation or monitoring and is an option that EPA is required to evaluate.

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 about 1½ miles to the southeast of the 160-acre area, at or near the location where the Intermediate Aquifer ends. The wells would be operated to limit the spread of contaminated groundwater from the "targeted areas" into down-gradient portions of the Regional Aquifer (i.e., to provide "hydraulic control" or "containment" of groundwater in the targeted areas). EPA concluded that extracting contaminated groundwater closer to the 160-acre area would probably be less effective. The alternatives differ in their extraction and treatment capacity and may differ in their capability to achieve the remedial action objectives during extended wet periods, as described below.
- **Treatment of the Groundwater to Remove Contaminants:** Each of the four alternatives assumes the use of a water treatment technology known as "liquid phase granular activated carbon" (LGAC) to remove TCE and other volatile organic compounds from the groundwater, and disinfection of the water after contaminant removal. The alternatives would provide the same level of treatment but differ in the capacity of the treatment

systems and 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.

- **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 possible uses are delivery to a local water utility for distribution to residents and businesses, and re-injection into the aquifer.
- **Conveyance Systems to Transport the Groundwater:** Each of the four 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 needed and amount of pumping needed to lift water from the treatment plant to the delivery location.
- **Groundwater Monitoring:** Each of the four alternatives assumes the construction of at least eight new small-diameter groundwater monitoring wells, called piezometers, and periodic monitoring of the new piezometers and existing groundwater wells. The monitoring is needed to evaluate the performance of the project and optimize its operation.

Each of the four action alternatives is expected to take from one to two years to construct, achieve remedial action objectives soon after startup, and operate for a period of several years to decades.

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

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

Alternative 1 requires the construction of wells, 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 remedial action objectives during most groundwater conditions. The 1,500 gpm rate is based on computer "particle tracking" simulations conducted with a site-specific numeric groundwater flow model. During extended wet periods, however, when above-average rainfall in the region causes significant increases in groundwater levels and groundwater hydraulic gradients in the Regional Aquifer,

Water Treatment Technologies

Liquid Phase Granular Activated Carbon Adsorption (LGAC) uses a charcoal-like material to remove TCE and other contaminants from water. The carbon is replaced when it loses its capacity to adsorb contaminants, and the "spent" carbon is typically disposed or regenerated offsite.

Air Stripping can also be used to remove TCE from groundwater. In a typical air stripper, water is pumped to the top of a tower and allowed to trickle downward as air is blown upward, transferring the TCE (and any other volatile contaminants) from the water to the air. The contaminated air is often further treated to remove or destroy the contaminants.

Advanced Oxidation Processes can also be used to remove TCE from groundwater. They often use ultraviolet light and a chemical oxidant to chemically alter or destroy contaminants. In a typical groundwater treatment system, a small amount of hydrogen peroxide is added to the contaminated water, which is then exposed to ultraviolet light.

Ion Exchange is similar to LGAC, except that a synthetic resin is used instead of a charcoal-like material. In a system designed to remove perchlorate, perchlorate ions in the water are adsorbed onto the resin and replaced with chloride ions. The resin is replaced when it loses its capacity to adsorb perchlorate and is typically disposed or regenerated offsite.

Biological treatment uses microbes to destroy perchlorate in water. A complete treatment system may include the bioreactor (in which the microbes are maintained) followed by aeration (to reoxygenate the water), filtration (to remove residual biomass), and disinfection. Biological treatment has been used to remove perchlorate from groundwater in Northern California since the late 1990s, and has been tested extensively at the Site. If used to supply potable water, a lengthy approval process is expected.

higher extraction rates would be needed. Extraction would increase up to the maximum rate of 1,650 gpm. The 1,650 gpm rate is unlikely to be adequate, however potentially limiting the alternative's effectiveness in preventing the spread of contaminated groundwater. Based on a review of rainfall amounts over the past 50 years, wet periods have occurred every five years on average.

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 West Valley Water District (WVWD), which would distribute the water to its residential and business customers. WVWD has large distribution facilities (e.g., 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 ug/L respectively, but it is expected that TCE and perchlorate concentrations would be reduced to lower levels, probably 1 ug/L or less. These treatment goals also apply to Alternatives 2a, 2b, and 3.

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

Alternative 2a also consists of two groundwater extraction wells, a LGAC water treatment system, pipelines and pumps, and a groundwater monitoring program. Alternative 2a assumes almost double the extraction and treatment capacity of Alternative 1 (3,200 gpm in Alternative 2a compared to 1,650 in Alternative 1). In Alternative 2a, as 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% of the time, and at 3,200 gpm 20% of the time, the average rate would be 1,840 gpm.

Alternative 2a would achieve capture under 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 is expected to achieve remedial action objectives 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 cleanup is achieving its hydraulic containment objective and modify the project if needed. Modifications could include adjusting extraction rates, modifying the extraction wells, or installing new wells.

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 Re-inject the Treated Groundwater

Alternative 2b is the same as 2a except that it assumes: 1) a biological treatment process for removal of perchlorate from the contaminated groundwater (rather than ion exchange); and 2) re-injection of the treated water into the aquifer (rather than direct use as drinking water supply). Potential re-injection locations are shown in Figure 2. The biological treatment process is described further on page 6.

Alternative 2b assumes that re-injecting the water would require the construction of two 700-foot deep injection wells located along the northern boundary of the 160-acre area, installation of long pipelines to convey the treated water to the injection wells, and more costly pumping (compared to Alternative 2a) to move the treated water from the treatment plant to the delivery location.

It is assumed that the State Water Resources Control Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," would apply to the re-injected water.

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

Alternative 3 also assumes two groundwater extraction wells, a LGAC water treatment system, pipelines and pumps, and a groundwater monitoring program.

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. The additional capacity would provide a greater level of confidence that the project would provide complete hydraulic containment 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% 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 Fontana Water Company.

Evaluation of Remedial Alternatives

To determine which alternative to select, EPA evaluates and compares the remedial alternatives using nine evaluation criteria. The nine criteria are summarized in Figure 4. EPA categorizes the nine criteria into three groups: (1) threshold criteria, (2) balancing criteria, and (3) modifying criteria.

An alternative must meet the threshold criteria to be chosen as the preferred alternative. The threshold criteria are "overall protection of human health and the environment" and "compliance with ARARs" (unless an ARAR is waived). The comparison of remedial alternatives is based primarily on the balancing criteria. The balancing criteria are "Long-Term Effectiveness and Permanence," "Reduction of Toxicity, Mobility, or Volume through Treatment," "Short-Term Effectiveness," "Implementability," and "Cost." The modifying criteria are "State Acceptance" and "Community Acceptance."

EPA's Nine Evaluation Criteria For Superfund Remedial Alternatives

1 **Overall Protection of Human Health and the Environment**
This evaluation criterion assesses whether each alternative adequately protects human health and the environment from unacceptable risks posed by contaminants at a site. It draws on the assessments conducted as part of other evaluation criteria.

2 **Compliance with ARARs**
This evaluation criterion is used to determine if each alternative would comply with federal and state ARARs, or whether invoking waivers to specific ARARs is justified.

3 **Long-Term Effectiveness and Permanence**
This evaluation criterion examines the risk remaining at a site after a remedial alternative has been implemented and the remedial action objectives have been met. In the evaluation completed to support this plan, the primary focus is the adequacy and reliability of the remedial alternatives and the controls that may be required to manage the risk posed by treatment residuals and untreated wastes.

4 **Reduction of Toxicity, Mobility, or Volume through Treatment**
This evaluation criterion addresses the extent to which an alternative employs treatment technologies that permanently and significantly reduce the toxicity, mobility, and volume of hazardous materials at the Site.

5 **Short-Term Effectiveness**
This evaluation criterion considers the effects of each alternative on workers, the community, and the environment during the construction and implementation process.

6 **Implementability**
This evaluation criterion is used to evaluate the technical feasibility and administrative feasibility (that is, the ease or difficulty) of implementing each alternative and the availability of required services and materials during implementation.

7 **Cost**
This evaluation criterion estimates the cost of implementing each alternative, including engineering, construction, and operation and maintenance costs (O&M) incurred over the life of the project. The cost estimates in this plan include a 25 percent contingency for capital costs and a 10 percent contingency for O&M costs.

In this plan, the costs of the remedial alternatives are compared using the estimated net present value (NPV) of the alternative. The assumed period of operation is 30 years; the assumed discount rate is 7 percent.

8 **State Acceptance**
This criterion considers whether the State agrees with the EPA's preferred alternative and supporting analyses.

9 **Community Acceptance**
This criterion considers whether the community agrees with the EPA's preferred alternative and supporting analyses. EPA gives significant weight to comments submitted on its Proposed Plan in evaluating community acceptance.

Selected Remedy

Figure 4. EPA's Nine Evaluation Criteria

In the discussion below, the alternatives are evaluated in relation to the threshold criteria and the balancing criteria. A more detailed description of this evaluation is provided in the RI/FS report. EPA will consider the Community Acceptance criterion after review of public comments on this proposal. Table 1 summarizes EPA's ranking of the alternatives in relation to the criteria.

"Compliance with ARARs," "Reduction of Toxicity, Mobility, or Volume through Treatment," "Short-Term Effectiveness."

The four action alternatives (Alternatives 1, 2a, 2b, 3) are all ranked similarly in "Compliance with ARARs," "Reduction of Toxicity, Mobility, or Volume through Treatment," and "Short-Term Effectiveness."

The four action alternatives are all expected to comply with all ARARs.

The four action alternatives would all reduce the mobility and volume of the contaminated groundwater, although there would be minor differences 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 a slightly greater reduction in Alternative 3 than in Alternatives 2a and 2b).

The four action alternatives would all result in similar levels of adverse short-term impacts (e.g., construction impacts from installation of pipelines, risks associated with handling and disposal of used carbon). Consequently, all alternatives are assigned a high ranking for short-term effectiveness because no unmitigable risks are expected to the community, workers, or the environment during construction and implementation. There may be minor differences between the alternatives resulting from the slightly higher rate at which carbon, resin, or other treatment residuals are generated in Alternatives 2a and 2b (compared to Alternative 1) and Alternative 3 (compared to Alternatives 2a and 2b). There could also be minor differences in residual risk if air stripping is used for VOC removal instead of LGAC (as described in the Preferred Alternative section below).

Long-Term Effectiveness

The action alternatives differ in their long-term effectiveness. All four action alternatives are expected to achieve remedial action objectives during most groundwater conditions, but they are expected to differ in effectiveness during extended wet periods that result in significantly increased groundwater levels and increased groundwater 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 areas. The computer model and the results of the computer simulations are described in the RI/FS report.

Table 1. Comparison of Remedial Alternatives

Alternative	Overall Protection of Human Health and the Environment	ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume	Short-term Effectiveness	Implementability	Cost (30 yr NPV)
No Action	Low	NA	Low	NA	NA	NA	—
1	Med	High	Med	High	High	Med to High	$24.2M
2a	High	High	High	High	High	Med	$29.3M
2b	High	High	High	High	High	Med	$40.5M
3	High	High	High	High	High	Med	$36.8M

NA = not applicable

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.

Alternative 2a is expected to achieve remedial action objectives 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. Alternatives 2a and 2b are ranked high in relation to the "Long-term Effectiveness and Permanence" criterion.

Alternative 3 is also expected to achieve remedial action objectives with a high level of certainty during all expected groundwater conditions and would have the capacity to maintain hydraulic containment during more extreme hydraulic conditions. Alternative 3 is also ranked high in relation to the "Long-term Effectiveness and Permanence" criterion.

There would also be differences in the contaminant mass removed due to the varying extraction and treatment capacity of the alternatives. Alternative 1 would remove an estimated 1,600 lbs. and 15,800 lbs. of TCE and perchlorate, respectively over 30 years. Alternatives 2a and 2b would remove approximately 1,900 lbs. and 19,300 lbs. of TCE and perchlorate, respectively and Alternative 3 would remove approximately 2,300 lbs. and 23,100 lbs. of TCE and perchlorate, respectively.

The "no action" alternative, in which no active remediation or monitoring would occur, 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, and increasing the eventual cost, difficulty, and time required for containment or restoration of the aquifer.

Cost

The four action alternatives differ in cost. No direct costs are associated with the No-Action Alternative. 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 cost and O&M costs, with O&M costs discounted to the present at a rate of 7% per year.

Implementability

The four action alternatives differ in how they are ranked in "Implementability." None of the alternatives are assigned a high ranking for this evaluation criterion, reflecting the need to 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. The agreements would specify the amount of water each purveyor would accept, the treated water delivery location, and operational, liability, financial, and other arrangements, 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.

Overall Protection of Human Health and Environment

The evaluation of Overall Protection of Human Health and Environment is based largely on the long-term effectiveness criterion. The no action alternative is ranked low. Alternatives 1 is ranked moderate and Alternatives 2a, 2b, and 3 are ranked high in relation to this criterion.

EPA's Preferred Alternative

EPA's preferred alternative includes the major elements of Alternative 2a, and some added flexibility in the extraction, treatment, conveyance, and groundwater use components as described below. The preferred alternative would be designed to hydraulically-contain contaminated groundwater in the targeted areas of contamination during all expected groundwater conditions. This would satisfy the remedial objectives of protecting water supply wells and groundwater resources downgradient of the 160-acre area and removing contaminants from the groundwater.

Table 2. Summary of Remedial Alternatives

Alternative	Estimated Average Extraction and Treatment Rate	Peak Extraction and Treatment Rate	Perchlorate Removal Technology	Water Use	Capital Cost	Operation and Maintenance Cost	Net Present Value (NPV)
No Action	—	—	—	—	—	—	—
1	1500 gpm	1650 gpm	Ion exchange	Drinking water	$9.6 M	$1.2M /yr	$24.2M
2A	1840 gpm	3200 gpm	Ion exchange	Drinking water	$13.1M	$1.3M /yr	$29.3M
2B	Same as 2a	Same as 2a	Biological treatment	Re-injection to the aquifer	$21.8M	$1.5M /yr	$40.5M
3	2200 gpm	5000 gpm	Ion exchange	Drinking water	$18.3M	$1.5M /yr	$36.8M

Note: Alternatives 1, 2a, 2b, and 3 all assume the use of two deep groundwater extraction wells, liquid phase granular activated carbon (LGAC) for VOC removal, disinfection, pipelines and pumps, and a groundwater monitoring program.

EPA's preferred alternative would include the construction and operation of the following (as in Alternative 2a):

- groundwater extraction wells to pump contaminated water to the surface approximately 1 ½ miles downgradient of the 160-acre area, at or near the location where the Intermediate Aquifer ends;
- water treatment systems to remove TCE and other volatile organic compounds from the groundwater to concentrations below MCLs;
- ion exchange water treatment systems to remove perchlorate from the groundwater to a concentration of 6.0 ug/L or less;
- pipelines and pumps to convey the contaminated water from the extraction wells to the treatment plant;
- pipelines and pumps to convey the treated water from the treatment plant to a local water utility for distribution to the utility's customers as drinking water supply (unless agreements cannot be reached with the utility in a reasonable period of time); and
- a groundwater monitoring program.

The extraction, treatment, and conveyance systems would be constructed with a capacity of 3,200 gpm to satisfy the hydraulic containment objective during all expected groundwater conditions, unless it is demonstrated to EPA's satisfaction during the remedial design process that more or less capacity is required to meet the remedial action objectives.

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;
- use air stripping and/or an advanced oxidation process for VOC removal instead of or in addition to LGAC, if shown to be effective and feasible. If air stripping is used, requirements of the South Coast Air Quality Management District (SCAQMD) would be applicable or relevant and appropriate;
- deliver the treated water to WVWD at locations other than assumed in EPA's RI/FS evaluation, and to water utilities other than WVWD;
- change well locations, treatment plant location, and pipeline routes from those assumed in EPA's RI/FS evaluation; and
- re-inject the treated water (as described in Alternative 2b) if agreements cannot be reached to supply water to water utilities in a reasonable period of time.

Final decisions on the above components would be made during remedial design. The estimated cost of the preferred alternative, as a NPV, is $29.3 to $38.1 million, depending on whether the treated water is supplied to a water utility ($29.3 million) or re-injected ($38.1 million).

The most decisive considerations that affected the selection of the Preferred Alternative are:

- the increased effectiveness and modest increase in cost of increasing the extraction and treatment capacity from 1,650 to 3,200 gpm (the assumed capacities in Alternatives 1 and 2a);
- 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);
- the ability to increase pumping or make other modifications to the project if the groundwater monitoring program indicates that the remedial action objectives are not being achieved;
- the importance and lower cost of using the treated groundwater as a source of drinking water; and
- the lower cost, simpler operation, and potentially faster implementation of ion exchange (as in Alternative 2a) compared to biological treatment (as in Alternative 2b) for removal of perchlorate from the groundwater.

Staff of the California Regional Water Quality Control Board, Santa Ana Region, the lead agency for the State of California at the B.F. Goodrich Site, concurs with EPA's preferred alternative.

Based on information currently available, EPA believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. EPA expects the Preferred Alternative to satisfy the following statutory requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended: 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element. The Preferred Alternative can change, however, in response to public comment and/or new information.

Technical Assistance Grant (TAG)

As part of the EPA Superfund program, EPA offers Technical Assistance Grants (TAG) to assist community groups in interpreting site-related technical information. One group at each Superfund site may obtain one grant for up to $50,000 in federal funds to be distributed over a three-year period. Some of the eligibility requirements include:

- Incorporated 501(c)3 non-profits demonstrating current or past interest in the Site
- Able to meet a 20% matching funds requirement (donated goods and services or other in-kind contributions are permissible), or obtain a waiver of this requirement
- Capable of preparing a plan to use technical assistance parallel with ongoing cleanup activities

Please contact Alejandro Diaz for more information.

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Site Repositories

The Administrative Record File, which includes the Remedial Investigation/Feasibility Study report and other Site documents, is available at:

Rialto Branch Library
251 West 1st St
Rialto, CA 92376
(909) 875-0144

Hours:
Monday, Tuesday, Wednesday: 10:00am – 8:00pm
Thursday and Friday: 10:00am – 6:00pm
Saturday: 9:00am – 5:00pm
Sunday: closed

EPA Superfund Records Center
95 Hawthorne Street, 4th floor
San Francisco, CA 94105
(415) 536-2000

Hours:
Monday through Friday: 8:00am – 5:00pm

An index of documents in the Administrative Record, selected Site documents, and additional information on the Site are also available at EPA's BF Goodrich Site web page at: **www.epa.gov/region09/bfgoodrich**

Mailing List Coupon

If you are not already on EPA's mailing list for the BF Goodrich Superfund Site, please send an email or return the coupon below to Alejandro Diaz.

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B.F. Goodrich Superfund Site

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