Draft Site Inspection Report

Perchlorate, Trichloroethene and Other Hazardous Substances Within the Rialto-Colton Groundwater Basin County of San Bernardino, California

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1.0 INTRODUCTION

According to the information reviewed by DPRA, perchlorate was first detected within the Rialto-Colton groundwater basin in 1997 during the routine monitoring of groundwater around the footprint of the Mid-Valley Sanitary Landfill ("MVSL," operated by the County of San Bernardino). The MVSL is located in the City of Rialto approximately 6.5 miles to the northwest of the City of Colton. The Santa Ana Regional Water Quality Control Board ("SARWQCB") directed the County to further assess the extent of the perchlorate in groundwater.

Beginning in 2003, the SARWQCB began issuing Cleanup and Abatement Orders to potentially responsible parties ("PRPs") directing them to investigate the nature and extent of perchlorate and trichloroethene ("TCE") in soil and groundwater.

Existing information produced by the named PRPs documents the presence of perchlorate, TCE, and other hazardous substances which forms a groundwater contaminant plume within the Rialto-Colton groundwater basin, originating from suspected source areas in the northwest portion of the City of Rialto, California (see Figure 1).

The City of Colton has detected perchlorate in three of its municipal water supply wells (Colton-15, Colton-17, and Colton-24, hereafter referred to as the "Impacted Wells") situated in the southern portion of the Rialto-Colton basin, at concentrations ranging from approximately 4 to 10 parts per billion. The City of Colton identified suspected source areas in the City of Rialto, approximately 6 miles upgradient from the City of Colton, as possible sources of perchlorate detected in the water supply wells.

In March 2005, the City of Colton retained DPRA to evaluate the nature and extent of perchlorate, TCE, and other hazardous substance contamination in and around the suspected source areas and within the Rialto-Colton basin.

DPRA prepared a Preliminary Assessment ("PA") dated November 15, 2006 consistent with the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP") (See 40 C.F.R. § 300.420(b)). The PA reviewed existing information about the release including the pathways of

exposure, exposure targets, and the source and nature of release. In the PA, DPRA reviewed and evaluated:

- the operational history of sites within the suspected source areas;
- the geology and hydrogeology within the Rialto-Colton and surrounding basins;
- groundwater production well water quality information within the Rialto-Colton basin;
- previously-conducted environmental studies related to soil and groundwater contamination within the Rialto-Colton basin; and
- the adverse health impacts of perchlorate, TCE, and other hazardous substances.

Based on this information, DPRA concluded that perchlorate and TCE appear to exist in well-defined plumes extending at least 3.25 miles downgradient from the source areas – which was the location of the then most downgradient monitoring well (PW-09). DPRA also concluded that perchlorate (and TCE and possibly related contaminants) were migrating toward and might have already reached Colton-17 and Colton-24 (DPRA, 2006), which are situated an additional 2.6 miles downgradient from PW-09. DPRA recommended Site Inspection ("SI") efforts to include the installation of monitoring wells and the sampling of groundwater at locations further downgradient between PW-09 and Colton-15, Colton-17, and Colton-24.

The NCP, among other things, provides guidance to parties performing SIs. The NCP suggests that SIs (see 40 C.F.R. § 300.420(c)):

- build upon the information collected during the PA;
- collect additional data to evaluate the release;
- develop sampling and analysis plans for data collection; and
- prepare a report identifying waste handling, contaminants, pathways of migration, and a recommendation on whether further action is warranted.

This SI presents data collected by DPRA since the PA Report (DPRA, 2006). DPRA performed the following activities in preparation of this SI:

- Drilled two exploratory boreholes, installed two multi-port groundwater monitoring wells, and collected and analyzed groundwater samples;

- Obtained current data from the California Department of Public Health for perchlorate concentrations in public wells within the basin;

- Obtained current data from the City of Colton of perchlorate concentrations in the Impacted Wells within the basin;

- Obtained site investigation data for soil and groundwater for suspected source areas produced by consultants for the PRPs, including monthly monitoring reports from Goodrich Corporation and Quarterly Monitoring Reports from the County of San Bernardino; and

- Obtained updated groundwater elevation data from the Western San Bernardino Water Master and the United States Geological Survey ("USGS").

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2.0 SITE INSPECTION DATA COLLECTION AND EVALUATION

As of 2006, perchlorate detections in groundwater monitoring wells extended over 3 miles downgradient from the suspected source areas to well PW-09, the then most downgradient monitoring well. Based on this data and the conclusions from the PA (DPRA, 2006), DPRA prepared a SI workplan for a site investigation, dated March 15, 2006, which recommended groundwater sampling locations downgradient from PW-09 and which detailed the anticipated well construction and well sampling methodologies. DPRA delivered the workplan to the SARWQCB, who provided comments and recommendations. DPRA revised the workplan on November 15, 2006 in response to the SARWQCB's comments and suggestions (DPRA 2006b). Finally, an addendum to the revised workplan was prepared September 22, 2007 to advise the SARWQCB of the final locations for well installation (DPRA, 2007).

SI field activities were performed from October 2007 through March 2008. Field activities included drilling two exploratory boreholes near the City of Colton; installing two multi-port, discrete-interval groundwater monitoring wells, CPW-16 and CPW-17; and collecting and analyzing groundwater samples from these wells. These activities characterized the horizontal and vertical extent of perchlorate, TCE, and other contaminants in soil and groundwater, and evaluated the groundwater gradient and flow direction in the southwest portion of the Rialto-Colton basin.

In addition to the field activities, DPRA collected additional data from public sources, as outlined above in Section 1.0. Groundwater elevation and chemical data from municipal production wells and site investigations conducted by PRPs were also compiled and used to revise groundwater elevation and chemical isoconcentration maps of the Rialto-Colton basin.

The following sections detail the SI methodologies and procedures.

2.1 Exploratory Borehole Drilling And Sampling

One exploratory borehole was drilled at each Westbay® installation site (Figure 2). The locations of the boreholes and wells were based on perchlorate isoconcentration and groundwater elevation contour maps constructed from the available data produced from previous investigations within the basin. The final locations were selected based on proximity to the Impacted Wells and access to property. CEH-16 is located in the public right-of-way, east of the intersection of Pepper and Rialto Avenues, approximately 1 mile northwest of Colton-17 and 0.4 miles northeast of WVWD-16. CEH-17 is situated on City of Colton property approximately 0.3 miles north of Colton-15.

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After completion of each exploratory borehole, the wells (CPW-16 and CPW-17) were drilled at least 15 feet from the exploratory boreholes.

2.1.1 Pre-drilling Activity

Prior to commencement of field activities, DPRA completed the following tasks:

- Obtained an encroachment permit, excavation permit, and lane closure permit from the City of San Bernardino for CPW-16 (Appendix A);
- Developed traffic control plans for the lane closure and encroachment permits;
- Obtained permits for the exploratory borehole drilling and groundwater monitoring well installation from the County of San Bernardino DEH (Department of Environmental Health) (Appendix A);
- Reviewed sewer, water, and storm drain utility maps at the City of San Bernardino to identify underground utility lines;
- Marked the soil boring location areas and notified Underground Service Alert ("USA") of the work prior to initiating field activities (Ticket #s A72570436, A72611658, and A73171481;
- Contracted private underground utility survey company ("ULS") on September 24, 2007 to further identify the underground utility lines;
- Cleared each borehole location to a depth of at least 5 feet below ground surface ("bgs");
- Located borings at least 2 feet away from known utilities. A fiber optic line was marked approximately 5 feet south from its actual location by USA causing the boring CEH-16 to be closer to an underground utility than the 5 feet proposed in the workplan;
- Contracted WDC, a California-licensed drilling contractor to conduct the exploratory borehole drilling and monitoring well installation.

2.1.2 Borehole Drilling

All drilling operations were continuously observed and all drill cuttings, changes in drilling conditions, and samples obtained from the continuous core sample and split-spoon samples were logged by qualified geologists working under the supervision of a state registered geologist. The lithologic logs of both boreholes are in Appendix B.

Each borehole was drilled using a truck-mounted mud rotary Speed Star 30K drilling rig. The exploratory borehole (CEH-16) was drilled to approximately 1,003 feet bgs using a 6-inch outside diameter mud rotary drilling bit and a 94 mm wireline coring system. However, because of large gravel and less than 20% recovery of core samples (<20%), wireline coring was not used

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for CEH-17. CEH-17 was drilled to approximately 1,003 feet bgs using a 6-inch outside diameter mud rotary drilling bit. Soil samples were collected using a split-spoon sampler.

Approximately 20 feet of steel conductor casing was set at the surface of each borehole to stabilize the borehole and maintain near surface integrity. The first 20 feet of each borehole was drilled using air rotary and the remaining borehole was drilled using the mud rotary method. The conductor casing was removed after the drilling.

The bentonite drilling mud was monitored for density, viscosity, and sand content with a mud balance, a marsh funnel, a measuring cup, and a sand content kit, respectively. The mud weight was kept below 70 pounds/cubic foot, the viscosity between 40 and 60 seconds, and the sand content at less than 3 percent. The excess drill cuttings were transferred into roll-off bins for temporary storage, pending disposal offsite. Waste was disposed of in accordance with the appropriate waste regulations by Haz Mat Trans (Appendix C).

The drilling equipment and materials were cleaned in the field using a high-pressure steam cleaner. Sampling equipment was scrubbed with Alconox® solution, and then rinsed with distilled water. Before and after samples were collected, any reusable sampling tools were scrubbed with an Alconox® solution, rinsed in potable water, and finally rinsed again with distilled water. Water used during drilling was supplied from a nearby municipal hydrant or provided by the City of San Bernardino for CEH-16 and the City of Colton for CEH-17. The water used for drilling was sampled and analyzed for perchlorate using EPA method 314.0, for chromium VI using EPA method 218.6, and for VOCs using EPA method 8260B.

2.1.3 Borehole Geophysics

After completion of each exploratory borehole, the borehole was cleaned and the mud was thinned to facilitate geophysical logging. The geophysical methods used to assist with the identification of discrete water-bearing units include:

- Caliper Log: used as a tool for recording borehole diameter;
- Electric Logs: used to correlate the types of formation materials:
    - Spontaneous-Potential Log: used in the determination of lithology and water quality;
    - Single-Point Resistance Log: used to identify the porosity and the dissolved ion content of water in the pores;
    - Six-Foot Lateral Log.
- Gamma Ray Log: used to identify clay and shale-bearing zones and potential barriers to groundwater flow;

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- Sonic Velocity Variable Density Log: used in porosity determination.

Geophysical logs were used to estimate water levels and to select well screen intervals for the completion of the Westbay® wells. Geophysical logs were also used to correct and correlate depths and classifications on the geological field logs (Appendix D).

2.1.4 Borehole Abandonment

After the geophysical logging activities, each borehole was sealed by placement of neat cement using tremie pipe and positive displacement techniques from the total depth to ground surface.

2.2 Westbay® Monitoring Well Drilling and Installation

Two multi-port Westbay® groundwater monitoring wells were installed within 15 feet of each exploratory borehole. In accordance with the workplan, new boreholes were drilled for the monitoring wells, and were drilled to a depth of approximately 800 ft bgs for CPW-16 and 738 ft bgs for CPW-17. Approximately 20 feet of 12.75-inch outside diameter steel conductor casing was set at the surface of each borehole to stabilize and maintain the near-surface integrity of the borehole. The conductor casing was drilled using air rotary and the remaining borehole was drilled using a 12.25-inch outside diameter mud-rotary drilling bit.

The bentonite drilling mud was monitored for weight, viscosity, and sand content with specific equipment. The mud weight was kept below 70 pounds/cubic foot, the viscosity between 40 and 60 seconds, and the sand content at less than 3 percent.

2.2.1 Well Casing Installation and Development

Monitoring well construction was conducted according to the requirement of the California DWR Water Well Standards Bulletin 74-90, Supplement to Bulletin 74-81.

The lithologic and geophysical logs of the exploratory boreholes were used to design the well casing screen intervals. The design of other deep multi-port monitoring wells located in the basin (PW-08 and PW-09) was also taken into consideration.

New casing and well screen was used to construct the monitoring well. The 4-inch diameter outer well casings include blank stainless steel, screened stainless steel, and low carbon steel casing. The screened stainless steel casing consists of approximately 10 feet wire-wrap with 0.020-inch horizontal slots in the sections to contain Westbay® ports. A 40-foot sump was installed beneath the lowest well screen in CPW-16 and a 20-foot sump was installed beneath the

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lowest well screen in CPW-17. Centralizers were installed every 40 feet to provide a minimum 2-inch clearance between the borehole wall and the well casing during construction activities.
The low carbon steel casings and stainless steel casings were joined using mechanical connectors. The low carbon steel riser pipe was connected with the stainless steel casing at a depth of 20 feet above the water table. Only stainless steel casings were used below the water table.

A sand pack (#2/12) was placed to fill the annular space from 2 feet below to approximately 2 feet above the top of each well screen. The depth to the top and bottom of the filter pack was verified by measurement, using a weighted tape.

Annular seals were installed between each fine-grained transition sand layer and above the top sand layer to prevent cross contamination between strata. The annular seal consisted of bentonite chips mixed with #3 sand. A ratio of approximately 3:1 bentonite chips to sand was used for the annular seal to isolate each screened section.

A Portland cement/bentonite grout mixture was installed from the top of the uppermost transition seal to the ground surface. A ratio of approximately 10:1 Portland cement to bentonite was used for the surface seal.

The monitoring wells were completed with a 12-inch traffic rated, flush-mounted box surrounded by approximately 2 feet of concrete to protect the wellhead from damage and to prevent surface water from entering the well casing. The well construction details are shown on the lithologic logs for each borehole Appendix B, and are summarized in Table 2.

Each monitoring well was developed thoroughly before proceeding with the installation of the multi-port Westbay® wells. The well development and Westbay® well installation procedures are described in Appendix E.

2.2.2 Monitoring Well Survey

A California-licensed survey company Hunsaker & Associates performed the well survey for horizontal and vertical coordinates, and the elevation of the top of the well casings on February 21, 2008 (Appendix F). Surveyors provided measurements for the horizontal well locations to a precision of 0.1 feet, elevations for the top of the well casings to a precision of 0.01 feet, and the rim of the surface completion to a precision of 0.01 feet.

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2.2.3 Waste Management

The primary investigation-derived waste consisted of drilling cuttings mixed with drilling mud, well development water, monitoring well purge water, and decontamination rinse water. Soil cuttings and the drilling mud mixture were stored in 20-cubic-yard roll off bins approved by the U.S. Department of Transportation ("DOT"). Samples of waste were collected from roll off bins to characterize the contents for disposal. Soil samples were placed in 8-ounce wide-mouth glass jars, shipped by courier to the certified laboratory CalScience, and analyzed for total petroleum hydrocarbons ("TPH") – full carbon chain (EPA method 8015B), VOCs (EPA method 8260B), perchlorate (EPA method 314.0), Title 22 Metals (EPA method 6010B), electrical conductance, and moisture content.

Water generated during the well development and sampling of the monitoring well was stored onsite in 21,000-gallon Baker tanks. Grab samples of the water were collected from each Baker tank and analyzed for TPH – full carbon chain (EPA method 8015B), VOCs (EPA method 8260B), perchlorate (EPA method 314.0), Title 22 Metals (EPA method 6010B), and total dissolved solids (EPA method 160.1).

Drill cuttings, drilling mud, and well development water were disposed of at Philadelphia Recycling Mine in Mira Loma, California. Well development water for CPW-16 was disposed of at Remedy Environmental in Anaheim, California. Approximately 886 tons of waste was generated during drilling and well development activities. The waste manifests are in Appendix C.

2.3 Additional Groundwater Data

Groundwater samples were first collected during the final stages of well development. Samples collected at individual screen intervals of the 4-inch wells at this stage using a straddle packer were a baseline for comparison with subsequent analytical data collected from the Westbay® wells. Prior to groundwater sampling at the 4-inch outer well, static water levels were measured to the nearest 0.01 feet using an electronic water level meter. After purge water quality parameters (temperature, pH, specific conductance, dissolved oxygen ["DO"], oxidation-reduction potential ["ORP"], and turbidity) stabilized in three consecutive readings to within 10% using a submersible pump, groundwater samples were collected from the discharge line of the pump. The process was repeated at each screened interval. Sampling equipment was decontaminated prior to use at each well. The laboratory results of these samples are in Appendix G.

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Purging prior to final sampling was not necessary because samples from the individual Westbay® ports were collected directly from the aquifer. Before sampling the Westbay® wells, pressure was measured at each screened interval using a MOSDAX® probe and subsequently converted to a groundwater elevation (Table 2). A MOSDAX® probe was used to collect groundwater samples at each measurement port in accordance with the specific Westbay® well sampling procedure (Appendix E). The sampling probe was decontaminated prior to use at each zone.

Once collected, groundwater samples were transferred into laboratory-supplied containers and placed in coolers with ice. Samples were transported to California-certified laboratories CalScience in Garden Grove and Test America in Colton for analysis with the chain of custody. The groundwater samples were analyzed primarily for perchlorate (EPA method 314.0), inorganic cations (calcium, magnesium, sodium, potassium) (EPA method 6010B), inorganic anions (sulfate, nitrate, phosphate, chloride) (EPA method 300.0), bicarbonate (HCO_3^-) and carbonate (CO_3^{2-}) (standard 2320B), chlorate (EPA method 300.1), VOCs (EPA method 8260B), chromium VI (EPA method 218.6), and NDMA (EPA method 1625C(M)).

CPW-16 and CPW-17 were sampled in February and March 2008 using a MOSDAX® probe and sampling tubes. Perchlorate was detected in all CPW-16 well intervals above the laboratory detection limit except CPW-16E. Perchlorate was detected at CPW-16D by Test America (4.4 ug/l) but not by CalScience (<2 ug/l). Perchlorate was not detected at any of the sampling intervals for CPW-17 (Table 3a).

TCE was not detected at or above the laboratory detection limits for groundwater samples except for CPW-16B (1.3 ug/l). TCE was not detected at above the laboratory limit in the trip blanks and equipment blanks (Table 3).

Quality requirements were satisfied by collecting quality assurance/quality control ("QA/QC") samples during the water sampling. The QA/QC samples were analyzed primarily for perchlorate (EPA method 314.0) and VOCs (EPA method 8260B) (Table 3, Appendix G).

Additional groundwater data, including perchlorate concentrations and groundwater elevations, was obtained from several public sources including the California Department of Public Health, the Watermaster of Western San Bernardino, the USGS, and the City of Colton. Groundwater data was also obtained from data produced by the PRPs and submitted to the SARWQCB. This information was used to compile a regional groundwater elevation map and isoconcentration maps.

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2.4 Additional Soil Data

Soil sampling was conducted at exploratory borehole locations CEH-16 and CEH-17. Soil samples were collected at the 0, 5, 10, and 15 foot intervals and analyzed for perchlorate (EPA method 314.0) and VOCs (EPA method 8260B). Soil samples at the 0 and 5 foot intervals were collected using a hand auger and transferred to laboratory supplied glass jars with a Teflon® lined lid. Subsequent soil samples from CEH-16 were collected from air percussion drill cuttings and transferred to glass jars with Teflon® lined lids. Soil samples from CEH-17 at the 10 foot and 15 foot intervals were collected using a split-spoon sampler with stainless steel sleeves, lined with Teflon® film and capped. After samples were collected they were transferred to chilled coolers with ice. Samples were transported to the laboratory using a courier with the appropriate chain-of-custody forms. Perchlorate or VOCs were not detected at or above the laboratory detection limits for soil samples for CEH-16 and CEH-17 (Table 4).

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3.0 FINDINGS

This section combines the findings discussed in the PA (DPRA, 2006) with the findings from the SI efforts described above, in Section 2. Section 3.1 describes the groundwater contaminant plume, as it has been further defined by SI efforts. Section 3.2 describes the suspected source areas, all of which lie at or near the beginning of the groundwater contaminant plume. Section 3.3 summarizes soil contamination data, primarily from soil samples collected within the suspected source areas. Section 3.4 summarizes the characteristics of perchlorate and TCE. Finally, Section 3.5 summarizes exposure pathways, including the travel of perchlorate through groundwater and into municipal drinking water supply wells.

3.1 Extent of Perchlorate, TCE, and other Hazardous Substances in Groundwater

3.1.1 Summary of Groundwater Investigations

In addition to DPRA's recently-performed groundwater investigation (summarized in Section 2.0 above), many other groundwater investigations have occurred in the Rialto-Colton groundwater basin. These investigations date back to at least 1987, and continue to the present.

Between 1987 to 1998, the County of San Bernardino installed 31 groundwater monitoring wells (F-1 through F-11, F-14 through 32, and F-2A) to monitor the groundwater quality in the vicinity of the MVSL (GeoLogic Associates, 1998).

Beginning in 1997, production wells in the basin within the cities of Colton, Rialto and San Bernardino, have been monitored for perchlorate (Figure 2). Concentrations of perchlorate have been detected in public wells as high as 820 ug/l (California DHS, 2007). Because of these detections, many production wells have been abandoned, placed off-line or subsequently treated (Plaintiffs City of Rialto and Rialto Utility Authority's Second Amended and Supplemental Complaint, 2004).

As of 2002 to early 2005, the County of San Bernardino installed 18 groundwater monitoring wells (F-6A, N-1 through N-15, S-1, and S-2) at or downgradient of the MVSL to monitor the extent of perchlorate and other chemicals in groundwater (GeoLogic Associates, 2004 and 2005). The detection of perchlorate in November 2004 was reported to be as high as 350 ug/l at N-8 (GeoLogic Associates, 2005).

From May 2004 to September 2004, four monitoring wells (PW-01 through PW-04) were installed near or very close to the suspected source areas by Goodrich Corporation (GeoSyntec,

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2005). The most recent detection of perchlorate (PW-01 thru PW-04) was reported by GeoSyntec Consultants as ranging from below detection limit (0.65 ug/l) to 1,400 ug/l (GeoSyntec, 2008). The most recent sampling results also detected TCE in wells PW-01 through PW-04 ranging from below detection limit (0.26 ug/l) to 9.4 ug/l.

In 2005, the County of San Bernardino installed the first phase of a Groundwater Treatment System ("GWTS") at Rialto-3 located at the Rialto Airport. The GWTS was constructed to intercept, contain, and treat impacted groundwater in accordance with Regional Water Quality Control Board ("RWQCB") Order R8-2004-007 (GeoLogic Associates, 2006a). Four groundwater monitoring wells (M-1 through M-4) were installed to monitor perchlorate for the GTWS at Rialto-3 (GeoLogic Associates, 2005). The most recent detection of perchlorate in November 2007 was reported to be as high as 70 ug/l at M-1 (deep) (GeoLogic Associates, 2008).

By August 2006, five new multi-port Westbay® groundwater monitoring wells (monitoring wells PW-05 through PW-09) were installed by Goodrich Corporation downgradient from the suspected source areas (GeoSyntec, 2006a) pursuant to the Administrative Settlement Agreement from the RWQCB and as part of Goodrich Corporation's Remedial Investigation (GeoSyntec, 2006b). The highest concentration of perchlorate detected in wells PW-05 through PW-09 was in February 2007 at a concentration of 1,400 ug/l. TCE was also detected in PW-05 through PW-09 at a concentration of 32 ug/l (GeoSyntec, 2007).

In the most recent sampling event at well PW-09 in February 2007, perchlorate was detected at a maximum concentration of 270 ug/l. TCE was also detected at a concentration of 5.0 ug/l (GeoSyntec, 2007).

Five monitoring wells (CMW-01 through CMW-05) were installed by Pyro Spectaculars, Inc. ("PSI") and Emhart Industries, Inc. ("EII") in 2005 and 2006, to further study the nature and extent of perchlorate in soil and groundwater within the area of the 160-acre parcel. These wells were installed in the vicinity of the "McLaughlin Pit" between the northern and southern areas of the 160-acre property where former manufacturing and disposal practices took place (SARWQCB, 2006). In well CMW-01, located immediately downgradient of both the McLaughlin Pit and a former earthen/disposal burn pit, perchlorate and TCE have been detected at concentrations as high as 770 ug/l and 87 ug/l, respectively (SARWQCB, 2006).

The locations of the wells installed as part of previous groundwater investigations (as well as municipal production wells) are shown in plan view on Figure 2, and in cross section on Figures 3a-3c.

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3.1.2 Groundwater Investigation Findings

The investigations summarized above and the SI efforts described in section 2.0 yield findings concerning groundwater flow direction and rate, as well as the presence of a groundwater contamination plume within the Rialto-Colton basin.

The SI efforts detected groundwater at an approximate depth of 240 to 250 feet bgs in unconfined conditions. Groundwater elevations from many wells within the Rialto-Colton basin during dates ranging from November 2007 to March 2008 are plotted on Figures 4a-4d. These figures show a general direction of groundwater flow to the southeast with an average gradient of approximately 0.003. In sampling performed in late February and early March 2008, perchlorate was detected in five of seven screened intervals in CPW-16 (approximately 1.6 miles downgradient of PW-09) at concentrations ranging from 4.4 to 34 ug/l. Perchlorate was not detected in CPW-16 at two of the depth intervals (D and E), 417 and 513 feet, but was detected in three screened intervals above and the two screened intervals below, indicating a vertically stratified and bifurcated plume that extends approximately 715 feet bgs at this location.

Perchlorate was not detected at or above the laboratory detection limit of 2.0 ug/l in any of the seven screened intervals in CPW-17, which lies near Colton-17 and Colton-24, but to the northeast. During this same general timeframe, however, perchlorate was detected at Colton-17 and Colton-24 at concentrations ranging from 4.3 to 6.2 ug/l. As discussed in the PA (DPRA, 2006), over the past 7 years, detectable perchlorate concentrations in Colton-17 and Colton-24 have ranged from approximately 1.8 to 10 ug/l.

Based on the general regional groundwater elevation contours and the chemical gradient within the basin from the source areas to CPW-16, and the detection of perchlorate in Colton-17 and Colton-24, perchlorate was expected to be present in CPW-17. The absence of perchlorate in CPW-17 may be explained by a change in the groundwater flow direction which would influence the perchlorate plume to migrate toward the south. The southeastern portion of the basin that is crossed by the Santa Ana River is a major recharge area, and historical groundwater elevation contours typically show deflection of the direction of flow to the south (USGS 2001). We interpret the northeastern edge of the distal portion of the perchlorate plume likely to be west and south of CPW-17. The north-trending fault depicted on Figure 2 after Anderson (2004) may also influence groundwater flow and transport of perchlorate between CPW-16 and CPW-17. Future sampling at CPW-17 will confirm the presence or absence of perchlorate.

Based on the SI data and the data collected at upgradient locations (see Section 3.1.1), Figure 5 provides an isoconcentration map of perchlorate in groundwater, showing the estimated location of a perchlorate contamination plume. As Figure 5 indicates, the plume originates in the immediate vicinity of the suspected source areas, where the highest concentrations of perchlorate in groundwater occur. The plume appears to have traveled approximately nearly 6 miles to reach

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at least as far as Colton-17 and Colton-24. In the immediate vicinity of Colton-15, Colton-17, and Colton-24 the amount of data does not allow for a precise identification of the plume's boundaries, and thus queried lines are used to indicate the interpreted boundaries of the plume. Future assessment will allow for more precise conclusions.

NDMA was not detected in either well at or above the laboratory detection limit. Chlorate was detected in CPW-16 at a maximum concentration of 299 ug/l. Chlorate was detected in CPW-17 at a maximum concentration of 22 ug/l (Table 3b). TCE was not detected at or above the laboratory detection limit in any of the groundwater samples collected from CPW-16 or CPW-17. An isoconcentration map of TCE in groundwater is shown on Figure 6. Like the case for perchlorate, the TCE plume appears to originate at the suspected source areas and is traveling downgradient.

3.2 Suspected Source Areas

The suspected source areas include: 1) the 160-acre parcel; 2) the MVSL and former Department of Defense bunker area; and 3) other properties in the nearby vicinity at 2298 West Stonehurst Avenue (Figure 2).

A number of parties have owned or leased or currently own or lease property or conduct activities within the suspected source areas. These parties include:

- Apollo Manufacturing Co.;
- American Promotional Events, Inc.- West;
- Astro Pyrotechnics, Inc.;
- Atlas Fireworks Company, Inc.;
- Black & Decker Inc.;
- California Fireworks Display Company;
- County of San Bernardino;
- EII;
- Goodrich Corporation;
- Ken Thompson, Inc.;
- Kwikset Locks, Inc.;
- PSI;
- Pyrotronics Corp.;
- Rialto Concrete Products, Inc.;
- Red Devil Fireworks Company;
- Stonehurst Site, LLC;
- Thomas O. Peters;
- The 1996 Thomas O. Peters and Kathleen S. Peters Revocable Trust;
- Trojan Fireworks Co.;
- United Fireworks Manufacturing Company, Inc.;
- West Coast Loading Corporation;

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- Whittaker Corporation.

Ownership and operations by these parties date back to approximately 1952. Operations at the suspected source areas include Department of Defense-contracted operations, hazardous waste disposal facilities, fireworks assembly and manufacturing, and sanitary landfill (Class III) operations.

160-Acre Parcel

The 160-acre parcel is bounded approximately by Casa Grande Park Avenue on the north, Locust Avenue on the east, the extension of Alder Avenue on the west, and the extension of Summit Avenue on the south (see Figure 2).

Beginning in 1952, Kwikset Locks, Inc., purchased the 160-acre parcel and West Coast Loading Corporation ("WCLC"), one of its subsidiaries, began operation at the site. From 1952-1957, WCLC was engaged in the manufacture of explosive cartridges, photoflash cartridges, flares, and other incendiary devices along with the processing of chemicals for use by government contractors to manufacture solid rocket propellant. Various chemicals were used by WCLC for manufacture and processing including TCE, organic solvents, various metals and perchlorate. In 1957, the Goodrich Corporation purchased the property from Kwikset Locks, Inc., and operated on the property from 1957-1963. Goodrich Corporation operated in several of the old manufacturing buildings formerly used by WCLC, manufacturing rocket motors, conducting research and development, and testing of solid rocket propellant. Chemicals used by Goodrich Corporation at the property included TCE and perchlorate.

In 1964, after the Goodrich Corporation sold the property, the 160-acre parcel was divided into many separate parcels and sold to various parties. In the period from 1964 to 1979 the land was used by several tenants involved with pyrotechnics and fireworks (i.e., Apollo Manufacturing Co., California Fireworks Display Company, Pyrotronics Corp., Red Devil Fireworks Company, Atlas Fireworks Company, Inc. and United Fireworks Manufacturing Company, Inc.).

Subsequently in 1979, PSI began operation on three parcels in the northern area of the 160-acre property. Historical records indicate that PSI, also a pyrotechnics company, used the site to assemble, store and test fireworks and to store and dispose of pyrotechnic waste. In its operations, perchlorate salts including potassium perchlorate were used and or disposed of at the site (SARWQCB, 2006). Presently, PSI is still in operation at the site along with American Promotional Events, Inc.- West.

PRPs listed which have not actually owned any real property or physically operated on the property include Black & Decker Inc., who is the parent corporation of EII, who is turn is associated with Kwikset Locks, Inc. and WCLC (SARWQCB, 2006).

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MVSL and the Former Bunker Area

The MVSL is located directly southwest of the 160-acre parcel, while the Former Bunker Area lies slightly north of the MVSL (see Figure 2). The MVSL has been in operation since 1958. Since then, the County of San Bernardino has acquired land that it needed for landfill expansion.

In 1994, the County purchased approximately 120 acres in the northeast area of property formerly owned and used by the Department of Defense, known as the Former Bunker Area. This property contained storage bunkers used by the military in the mid-1940's, known to have housed explosives, chemicals, propellant, oxidizers, and fireworks (SARWQCB, 2003). A portion of the property was also used as an open burn pit and for detonation of explosives by a hazardous waste facility (SARWQCB, 2004a).

Within the area the County purchased in 1994, a sand and gravel operation (Robertson's Ready Mix) is currently leasing a portion of the property and another area of the property is being used for the stockpile of soil by Robertson's Ready Mix (SARWQCB, 2004a).

Other Properties-2298 West Stonehurst Avenue

Other suspected source properties lie just south of the 160-acre parcel (Figure 2). Beginning in approximately 1969, manufacturing operations have been conducted on the site known as 2298 West Stonehurst Ave., by AMEX Products, Inc. ("AMEX"), Tasker Industries, Trojan Fireworks Company, and Astro Pyrotechnics, Inc. (a division of PSI).

AMEX operations included the design, testing, and fabrication of military and commercial pyrotechnic and explosive devices, all known to contain perchlorate. Tasker Industries acquired AMEX. In 1972, Tasker Industries merged in Whittaker Corporation, becoming owner of the property and in 1974, Thomas O. Peters purchased the property along with additional Lot 7. In 1974, Trojan Fireworks Co. began operating at the now 5 acre site where it manufactured commercial fireworks until 1988. Known ingredients of fireworks include perchlorate salts. Subsequently in 1988, PSI purchased a portion of the Trojan Fireworks Co. (Astro Pyrotechnics, Inc.) which in turn also assembled fireworks products (SARWQCB, 2004b). Other entities associated with the property include the 1996 Thomas O. Peters and Kathleen S. Peters Revocable Trust and Stonehurst Site, LLC. There are no active operations at the site.

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Evidence of Releases from Suspected Source Areas

Existing information suggests that the discharge of perchlorate, TCE, and other hazardous substances occurred from a variety of historical operations within the suspected source areas, including: 1) designing, manufacturing, loading, assembling, testing, and research and development of products which involved the use of perchlorate compounds and/or TCE; 2) the processing of chemicals and storage of perchlorate and/or TCE; and 3) the storage and/or disposal of wastes from such activities.

Products manufactured by various parties within the suspected source areas included explosive cartridges, photoflash cartridges, seal control devices, flares, ground burst simulators, rockets (solid rocket propellant) and fireworks products. Testing of these products occurred in many areas. Disposal of unused products and off-spec products as well as manufacturing and/or assembly wastes occurred on the ground in unlined earthen disposal pits and/or in burn pits. Also evidenced in historical records is the occurrence of several major fires and explosions which occurred throughout the period of occupancy at the various facilities (SARWQCB, 2006).

From 1999-2001, Robertson's Ready Mix used unlined desilting ponds for sand and gravel wash operations on land owned by the County of San Bernardino (land purchased and formerly known as the Former Bunker Area). Use of these ponds for the washing of sand and aggregate may have mobilized existing perchlorate and TCE from the subsurface into the groundwater (Adverus, 2005).

3.3 Summary of Soil Contamination Findings

As the following discussion suggests, soil investigations performed by a number of consultants on behalf of PRPs have identified perchlorate compounds in soil (and groundwater) at or near facilities known to have used, stored, or handled perchlorate and perchlorate containing materials in the northern portion of the Rialto-Colton basin. As also discussed below, soil investigations conducted during the SI at downgradient locations did not detect any perchlorate contamination in the soil.

3.3.1 Prior Soil Investigations

Site investigations and assessments for perchlorate in the vicinity and within the suspected source areas began in 2003 (SARWQCB, 2006) (Table 5). These consisted of soil investigations which have included soil borings, trenching, and sampling of soil and soil gas. These investigations have been conducted by consultants representing the different parties who own or who have operated or continue to operate within the suspected source areas. The most recent soil investigation occurred in September and October 2006 within the 160-acre property (Environ, 2007).

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160 Acre Parcel

Extensive soil borings and soil sampling events have been conducted at the 160-acre property in areas where perchlorate was known to be used or disposed of. Soil samples in the northern portion of the 160-acre property which included the former manufacturing areas of previous PRPs and the southern area of the 160-acre property where there was historic disposal and burn pits, including the McLaughlin Pit, indicate that perchlorate was used in these areas. Perchlorate was detected in the soil at the northern area at concentrations as high as 7,400 ug/kg, indicating that perchlorate was used in the former manufacturing buildings on the property. Soil in the southern area and former disposal and burn pit areas exhibited high concentrations of perchlorate in the shallow soil (< 20 feet bgs) at 6,800 ug/kg. Another area in the southern portion of the property known as the McLaughlin Pit, exhibited extremely high concentrations of perchlorate in both the shallow (< 20 feet bgs) and in the deep soil. Perchlorate was detected in the shallow soil (< 20 feet bgs) at a maximum concentration of 205,000 ug/kg, intermediate soil (20 to 180 feet bgs) at a maximum concentration of 190,000 ug/kg and in deeper soil (200 to 435 feet bgs) at a maximum concentration of 1,500 ug/kg (SARWQCB, 2006).

MVSL and Former Bunker Area

In 1998, an offsite migration study of offsite soils and groundwater was conducted to assess the impacts of VOCs. Soil investigations at the MVSL relating to perchlorate, were conducted in 2003 when the County purchased land located within the Former Bunker Area. Specifically, because of the historical use of the Former Bunker Area, in late 2002 through 2003, the County conducted a soil investigation which included the sampling of stockpiled bunker debris, drilling and sampling of shallow and deep exploratory boreholes (SARWQCB, 2003). A third phase of study occurred in mid-2004 and involved the drilling of five exploratory borings and five groundwater monitoring wells (GeoLogic Associates, 2004).

Other Properties-2298 West Stonehurst Avenue

Soil investigation began on the property in November 2003, in which exploratory trenches were advanced and soil samples were analyzed for VOCs and perchlorate. Perchlorate concentrations ranged from 1.2 mg/kg to 32 mg/kg (SARWQCB, 2004b). In 2004, a site assessment was conducted to further assess the site (Table 5).

3.3.2 Current Soil Investigation

Soil types encountered during DPRA's SI efforts consisted predominantly of gravels and sand-gravel mixtures in the upper 300 feet of each well location. Below this depth, sands and silts with clayey interbeds predominate. The geology interpreted from well logs from other consultants, the

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USGS, and from public production wells are shown on Figures 3a-3c. The geology encountered and logged by DPRA in each of the CPW wells is shown in cross section on Figure 3a.

Perchlorate and TCE were not detected at or above the laboratory detection limit in any of the soil samples analyzed. Perchlorate and TCE were not expected to be detected in the soil at the locations of CPW-16 and CPW-17 because of the distance (over 4.8 miles) from the suspected source areas.

3.4 Perchlorate and TCE Characteristics

3.4.1 Perchlorate

Perchlorate salts (most commonly in the form of ammonium perchlorate and potassium perchlorate) are a white or colorless powder primarily used in the manufacture of solid propellants for rockets and missiles, fireworks, road flares, blasting agents, and automobile air bags. Other uses of perchlorate salts include use in nuclear reactors, electronic tubes, additives in lubricating oils, tanning and finishing leather, fixer for fabrics and dyes, electroplating, aluminum refining, rubber manufacture, and the production of paints.

Perchlorate compounds are soluble in water, with ammonium perchlorate having an aqueous solubility of 185 grams per liter. Potassium perchlorate is less soluble at approximately 15 grams per liter. Once dissolved, the perchlorate anion is extremely mobile in aqueous systems. Perchlorate persists in the environment under typical groundwater and surface water conditions because of its low reactivity and has an extremely low sorption potential.

3.4.2 TCE

TCE is a colorless, highly volatile liquid that is miscible in water and many organic solvents. TCE is a synthetic chemical primarily used as an industrial solvent in metal degreasing and cleaning operations and also used as a solvent for waxes, fats, resins, and oils. Historically, TCE has been used as an anesthetic, grain fumigant, and disinfectant. Though TCE readily evaporates and may undergo biodegradation, it is persistent in soil and groundwater as well as being an intermediate degradation product of tetrachloroethene. Additional degradation products of TCE are 1,1-dichloroethene, 1,2-dichloroethene, and vinyl chloride.

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3.5 Exposure Pathways

3.5.1 Rialto-Colton Basin Hydrogeologic Setting

The Rialto-Colton basin covers 40-square miles in western San Bernardino County (Figure 1). The basin is bounded by the Rialto-Colton fault on the southwest and the San Jacinto fault on the northeast. The basin spans a width of approximately 3-1/2 in the northwest and a width of approximately 1 mile in the southeast.

Stratigraphically, the basin has been divided into four units: unconsolidated, partly consolidated, consolidated, and basement complex of varying sedimentary consolidation. The uppermost stratigraphic unit is composed of unconsolidated dune sands, river-channel deposits, younger alluvium, and older alluvium. In general this unit consists of sand, gravel, and boulders interbedded with lenticular deposits of silt and clay (Woolfenden and Kadhim, 1997). The "partly consolidated" unit is continental in origin and generally consists of gravel, sand, silt, and clay. These sediments are primarily found as lenticular bodies within the basin and can be found in outcrop at the base of the San Gabriel Mountains to the northwest and in the San Timoteo Badlands to the southeast (Woolfenden and Koczot, 2001). The "consolidated" deposits within the basin are well indurated clays with compacted/cemented sand lenses and conglomeratic beds. There is no surface exposure of the "consolidated" unit within the basin (Woolfenden and Kadhim, 1997; Dutcher and Garrett, 1963). The basal stratigraphic unit, the "basement complex," is primarily composed of metamorphic and igneous rocks that crop out at the base of the San Gabriel Mountains (Dutcher and Garrett, 1963).

The stratigraphic units of the basin are typically offset by northwest trending strike-slip faults. The majority of the northeastern margin of the basin is defined by the San Jacinto fault. The San Jacinto fault is an active, right lateral, northeast trending, strike slip fault with a vertical component that decreases northward (Dutcher and Garrett, 1963). The trace of the San Jacinto fault is accurately delineated due to various indicators of differential movement including scarps, terraces and ridges (Ducther and Garrett, 1963). To the west of the San Jacinto fault is an unnamed fault which borehole data indicates has experienced vertical displacement (Woolfenden and Kadhim, 1997). The southwestern margin of the basin is defined by the Rialto-Colton fault. The position of the Rialto-Colton fault is approximated due to the lack of surface expression within the study area. A steep hydrologic gradient from the basin to the neighboring Chino basin is used in part to approximate the trace of the Rialto-Colton fault. Subsurface geologic data from well logs, seismic and gravimetric studies on either side of the suspected fault indicate an uplift of the basement complex ranging from 1200-2100 feet (Anderson et. al., 2004; Woolfenden and Kadhim, 1997; Dutcher and Garrett, 1963).

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In addition to the Rialto-Colton and San Jacinto faults, three primary hydrologic barriers as defined by faulting (Barrier E, Barrier J and Barrier H) exist in the basin. These barriers have no surface expression and their existence is derived from differences in groundwater elevation along a transect perpendicular to the barrier (Dutcher and Garrett, 1963). Barrier E, a splay of the San Jacinto fault, defines the northeastern most portion of the basin, separating it from the Lytle basin. Evidence for the extension of Barrier E north of Barrier J has recently been found although groundwater flow across Barrier E in this portion of the basin is generally not effected (Woolfenden and Koczot, 2001; Woolfenden and Kadhim, 1997). South of Barrier J however, groundwater elevations are displaced 25-50 feet. This indicates that the competence of this barrier, as a restriction to groundwater flow, increases in a northerly direction as it intersects with the San Jacinto fault (California Department of Water Resources (DWR), 2003; Wildermuth Env. Inc., 2000; Woolfenden and Kadhim, 1997). Barrier J is northeast trending and is defined by a 100 foot (California DWR, 2003) to 400 foot (Woolfenden and Koczot, 2001) drop in groundwater elevation perpendicular to its trace. Groundwater flow across this barrier is believed to be restricted to only the uppermost stratigraphic unit (Unconsolidated unit) where it cascades down the hydrologic gradient into the basin (California DWR, 2003; Woolfenden and Koczot, 2001; Woolfenden and Kadhim, 1997; Dutcher and Garrett, 1963). Barrier H, a minor hydrologic flow restrictor, generally trends toward the northwest into the basin (Woolfenden and Koczot, 2001; Woolfenden and Kadhim, 1997; Dutcher and Garrett, 1963). Variations in groundwater elevations up to 100 feet across this barrier have been observed. (Dutcher and Garrett, 1963).

A recent gravimetric study conducted by Anderson et. al. (2004) suggests that the subsurface trace of the Rialto-Colton fault is a series of disjointed fault segments that step leftward out of the basin near the Impacted Wells. Evidence suggests a northerly trending fault splay that may split the basin, potentially separating Colton-15 and Colton-17 from Colton-24. Inconsistencies between the data collected and analyzed by Anderson et al. (2004) and established observations by previous investigators suggest that the Anderson interpretation is both tentative and possibly an approximation. More extensive research is necessary to verify the geohydrologic implications of these data on the basin. It is possible that the geohydrologic analysis necessary to complete the work proposed in this plan will provide data that can be used to clarify the impacts of the gravimetric study conducted by Anderson et al. (2004).

Attempts to separate groundwater within the basin into well defined aquifer units using stratigraphically recognizable, fine-grained aquitards have proven problematic. The inability of the fine-grained beds within the basin to separate groundwater into well defined aquifers led to

the division of the basin into four water-bearing units: 1) River channel deposits; 2) Upper water-bearing unit; 3) Middle water-bearing unit; and 4) Lower water-bearing unit. These divisions are based on water levels, water chemistry, and lithologic/geophysical logs. All water-bearing units within the basin appear to be hydraulically connected and each water-bearing unit may potentially include more than one stratigraphic unit. The "consolidated" deposits and the "basement complex" underlie the lower water-bearing unit and are not considered part of the groundwater system.

Recent work by GeoSyntec (2006a) indicates that the aquitard separating the Middle water-bearing unit from the Lower water-bearing unit may pinch out south of PW-08 and may not exist in the vicinity of PW-05 and PW-06.

The River channel deposits near the Santa Ana River and the Upper water-bearing unit both primarily consist of coarse sands, gravels, and boulders with interbedded fine grained layers of clay or clay lenses (Woolfenden and Koczot, 2001; Woolfenden and Kadhim, 1997; Dutcher and Garrett, 1963). These units are highly permeable and allow infiltration of surface waters into the water table (Woolfenden and Kadhim, 1997). Generally these units are unsaturated throughout the basin. When saturated, hydraulic conductivities range from approximately 300 to 500 feet/day. When saturated, the hydraulic conductivity is approximately 337 feet/day. The Middle water-bearing unit is present throughout the basin and is chiefly composed of coarse to medium sand with interbedded clays and silts, ranging in thickness from 240-600 feet (Woolfenden and Koczot, 2001; Woolfenden and Kadhim, 1997). In general, this unit thickens and becomes finer grained in the northwestern portion of the basin. Groundwater saturates the entire thickness of this unit. Hydraulic conductivities range from approximately 13 to 80 feet/day. The Lower water-bearing unit is also found throughout the basin and is composed mainly of interbedded sands and clays. The thickness of this unit increases toward the northwest from 100 feet to approximately 400 feet near Barrier J. Similar to the Middle water-bearing unit, the Lower water-bearing unit is saturated throughout its thickness. Hydraulic conductivities range from 9 to 20 feet/day.

Vertical flow components in both the unsaturated and saturated zones can only be approximated. However, Woolfenden and Koczot (2001), use the value of one-tenth the horizontal hydraulic conductivity of the respective unit for vertical conductance. Given the coarse-grained nature of these sediments, this appears to be a rough approximation. Cross referencing work performed on Linden Ponds, southeast of the potential sources of perchlorate, which are artificial recharge basins, indicated vertical conductance values of approximately 5 feet/day. In addition,

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Woolfenden and Koczot (2001), approximated the travel time for the imported water to reach the water table from land surface (330 feet) at 220 days.

The groundwater flow direction within the basin is principally controlled by faults and barriers. Therefore, due to the northwest-southeast trends of the major restrictive faults and barriers, groundwater flows toward the southeast throughout the majority of the Basin, slowly turning toward the southwest approaching the Santa Ana River (California DWR, 2003; Wildermuth Environmental, Inc., 2000; Woolfenden and Koczot, 2001; Woolfenden and Kadhim, 1997; Fife et. al., 1976; Dutcher and Garrett, 1963).

3.5.2 Groundwater Pathway

Groundwater within the Rialto-Colton basin provides a pathway for the travel and, primarily through municipal supply wells, an actual or threatened exposure pathway to humans – including persons served by the City of Colton's water supply.

Recent water level and water quality data within the Rialto-Colton basin indicates that perchlorate and TCE from the suspected source areas are migrating toward the Impacted Wells. Water level data compiled for November 2007 through March 2008 in the basin indicates a southeast trending groundwater flow direction, from the suspected source areas toward the Impacted Wells (see Figures 4A-4d). Groundwater flow has historically been to the southeast in the basin (GeoSyntec, 2006c).

Figures 5 and 6 depict perchlorate and TCE plumes within the Rialto-Colton basin based on water quality data collected from production wells and environmental monitoring wells. As these figures show, perchlorate and TCE seem to exist in a well-defined plume extending from the suspected source areas downgradient to well CPW-16.

3.5.3 City of Colton Drinking Water Supply, Impacted Wells, and Well Head Treatment

The City of Colton relies on groundwater for the majority of its municipal drinking water supply. Colton extracts groundwater from the Rialto-Colton, Riverside North, and Bunker Hill groundwater basins.

Colton-15, Colton-17, and Colton-24, all of which are located within the Rialto-Colton groundwater basin, have been impacted by perchlorate. These wells lie approximately 6.5 miles

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southeast of the suspected source areas, and approximately 2.6 miles downgradient from the area where prior groundwater studies have been conducted.

The first detection of perchlorate within the Impacted Wells was recorded in 1997 at Colton-15 with a concentration of 7 ug/l. Subsequently, since 1997, perchlorate has been detected at concentrations ranging from 4.2 to 10.0 ug/l within all three Impacted Wells as shown on Table 6 (California DHS, 2007).

In 2002, the City of Colton removed Colton-17 and Colton-24 from service and subsequently installed a wellhead treatment system to remove perchlorate from the drinking water to a level of non-detect. The treatment system became operational in August of 2003 and consists of a fixed-bed non-regenerable anion exchange resin treatment system (DTSC, 2006). The resin used in this system must be periodically replaced when it reaches the end of its lifespan. The City of Colton has and continues to incur costs which range from approximately $400,000 to $1,000,000 annually for the operation and maintenance of the treatment systems for all three wells. This includes the operational and maintenance such as electricity and resin exchange (SAWPA, 2004).

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4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

Numerous operations handled, manufactured, and/or disposed of perchlorate, TCE, and other contaminants within the suspected source area. Soil investigations within this area detected perchlorate and TCE at many locations. A perchlorate and TCE plume originates from the suspected source areas and travels along the path of groundwater flow.

Groundwater exists at an approximate depth of 240 to 250 feet bgs in unconfined conditions. Groundwater flows to the southeast with an average gradient of approximately 0.003, from the suspected source areas toward the City of Colton, including Colton-17 and Colton-24.

In sampling performed in late February and early March 2008, perchlorate was detected at concentrations ranging from 4.4 to 34 ug/l. Perchlorate was not detected in CPW-17, which is situated near Colton-15, Colton-17, and Colton-24, but to the northeast. During this same general timeframe, however, perchlorate was detected at Colton-15, Colton-17, and Colton-24 at concentrations ranging from 3.2 to 6.0 ug/l. As discussed in the PA (DPRA, 2006), over the past 7 years, perchlorate concentrations in Colton-15, Colton-17, and Colton-24 have ranged from approximately 1.8 to 10 ug/l. The non-detection of perchlorate in CPW-17 may be due to the flow direction which trends south and, therefore, would tend to move west of CPW-17 and more directly toward Colton-15, Colton-17, and Colton-24. Future sampling at well CPW-17 will confirm the presence or absence of perchlorate.

Based on the SI data and the data collected at upgradient locations, a perchlorate and TCE plume originates in the immediate vicinity of the suspected source areas, where the highest concentrations of these contaminants in groundwater occur. The plume appears to travel approximately 6 miles to reach at least as far as Colton-15, Colton-17, and Colton-24. In the immediate vicinity of Colton-15, Colton-17, and Colton-24 the amount of data does not allow for a precise identification of the plume's boundaries and, thus, dotted lines are used to indicate the estimated boundaries of the plume. Future assessment will allow for more precise conclusions.

The perchlorate plume appears to have impacted Colton-15, Colton-17, and Colton-24 and generally presents a continuing threat to the water quality of the City of Colton.

4.2 Recommendations

- DPRA recommends that CPW-16 and CPW-17 be sampled monthly. The next scheduled sampling is mid-April 2008.

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- DPRA recommends completing a Remedial Investigation/Feasibility Study ("RI/FS") in accordance with the NCP. As part of the RI/FS, DPRA recommends the following specific activities:

  - Groundwater modeling efforts to estimate the flow and contaminant transport of perchlorate and TCE in the Rialto-Colton basin.

  - Depth-discrete sampling within municipal production wells WVWD-16 and Colton-17 using a combination of straddle packers and low-flow purge methods to attempt to obtain depth discrete samples.

  - Notwithstanding groundwater modeling and depth-discrete sampling at WVWD-16 and Colton-17 to further define the extent of the perchlorate plume, DPRA believes that additional monitoring wells will need to be installed. Based on groundwater modeling and depth-discrete sampling efforts, DPRA recommends the installation of one additional multi-port Westbay® monitoring well to the west of CPW-17. The Mill Street flood control basin owned by the City of Colton is located approximately 3,200 feet west-northwest of CPW-17. It was a potential location for the installation of a monitoring well prior to the final selection of CPW-17. The location of an additional well here is expected to intercept the perchlorate plume as it turns toward the west in the lower portion of the basin. It is possible, depending on the evaluation of new data, that more than one additional monitoring well will need to be installed to define the boundaries of the perchlorate plume.

- The City of Colton should continue to operate its well head treatment system at Colton-17 and Colton-24. Without the perchlorate treatment system in place, a strong risk exists that Colton would have already served water which contains perchlorate at concentrations ranging from 4 to 10 parts per billion, based on previous perchlorate detections (Table 6). In addition, test results from CPW-16 suggest higher concentrations of perchlorate will impact Colton's wells. In the future, when the size and extent of the perchlorate, TCE, and other hazardous substance plume in the Rialto-Colton basin is fully characterized, the City of Colton may reevaluate whether the well head treatment system most efficiently prevents perchlorate from reaching its citizens, or whether another system is otherwise warranted.

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5.0 REFERENCES

Anderson, M. L., Matti, J., Jachens, R. C., 2004. Structural Model of the San Bernardino Basin, California, from Analysis of Gravity, aeromagnetic, and Seismicity Data. Journal of Geophysical Research, v. 109, no. B04404, 20 p.

Adverus, 2005. Workplan for Additional Soil and Groundwater Investigation, 160-Acre Parcel, Rialto, California. October 27, 2005.

California Department of Health Services (DHS). 2008. http://www.dhs.ca.gov/ps/ddwem/chemicals/perchl/perchlorateforweb-recent.XLS.

California Department of Water Resources (DWR). 2003. California's Groundwater: Bulletin No. 118, 265 p.

Department of Toxic Substances Control (DTSC). 2006. http://www.dtsc.ca.gov/TechnologyDevelopment/upload/TD_REP_Perchlorate-Alternatives.pdf

DPRA 2006a. Preliminary Assessment Report. November 15, 2006.

DPRA 2006b. Work Plan For Installation And Sampling of Groundwater Monitoring Wells Near The City Of Colton, November 15, 2006

DPRA, 2007 Addendum To Revised Work Plan For Installation And Sampling of Groundwater Monitoring Wells Near The City Of Colton. September 28, 2007

Dutcher, L. C., and Garrett, A. A. 1963. Geologic and Hydrologic Features of the San Bernardino Area, California with Special Reference to Underflow across the San Jacinto Fault. Geological Survey Water-Supply Paper 1419. Washington: United States Government Printing Office. 119 p.

ENVIRON International Corporation, 2007. Revised Focused Summary Report Of Investigation of WCLC, Use Areas 160-Acre Site Rialto, California. March 31, 2007.

Fife, D. L., Rodgers, D. A., Chase, G. W., Chapman, R. H., and Sprotte, E. C. 1976. Geologic Hazards in Southwestern San Bernardino County, California: California Division of Mines and Geology, Special Report 113, 40 p.

GeoLogic Associates. 1998. Phase II (Offsite) Evaluation Monitoring Program Report, Technical Report and Appendices, MVSL, County of San Bernardino, California. June, 1998.

GeoLogic Associates. 2004. Draft Interim Remedial Investigation/Feasibility Study Perchlorate and VOC Impacts to Groundwater, Rialto, California. September, 2004.

GeoLogic Associates. 2005. Proposed Groundwater Monitoring Program Perchlorate and VOC Treatment Program, Rialto Airport, Rialto, California. August 14, 2005.

DRAFT

GeoLogic Associates. 2006. Groundwater Monitoring Report, First Quarter (Winter) 2006, Rialto GWTS Perchlorate and VOC Investigation San Bernardino County, California. May 2, 2006.

GeoLogic Associates. 2008. Groundwater Monitoring Report, Fourth Quarter (Fall) 2007, Rialto GWTS Perchlorate and VOC Remediation, San Bernardino County, California. March 2008.

GeoSyntec Consultants. 2005. Draft Additional Remedial Investigation Work Plan, 160-Acre Parcel, Rialto, California. October 12, 2005.

GeoSyntec Consultants. 2006a Goodrich Corporation Progress Report for the Month of July 2006 160-Acre Parcel, Rialto, California. August 8, 2006.

GeoSyntec Consultants. 2006b Draft Additional Interim Remedial Investigation Report, 160-Acre Parcel and Surrounding Areas, Rialto, California. October 21, 2006.

GeoSyntec Consultants, 2006c Goodrich Corporation Progress Report for the Month of May 2006, 160-Acre Parcel, Rialto, California. June 8, 2006.

GeoSyntec Consultants. 2007. Goodrich Corporation Progress Report for the Month of February 2007; 160-Acre Parcel, Rialto, California. March 9, 2007.

GeoSyntec Consultants. 2008 Goodrich Corporation Progress Report for the Month of February 2007; 160-Acre Parcel, Rialto, California. March 9, 2008

Plaintiff City of Colton Second Amended Complaint, City of Colton v. American Promotional Events, Inc.-West et al., Case No. CV 05-01479 JVW (Ex). 2005.

Plaintiff City of Rialto and Rialto Utility Authority's Second Amended Complaint, City of Rialto and Rialto Utility Authority V. United States Department of Defense et al.,Case No. ED CV 04-00079 VAP (SGLx). 2004.

Santa Ana Regional Water Quality Control Board (SARWQCB). 2003. Cleanup and Abatement Order No. R8-2003-0013 for County of San Bernardino, Solid Waste Management Division, City of Rialto, San Bernardino County. January 17, 2003.

SARWQCB. 2004a. Cleanup and Abatement Order No. R8-2003-0013-Comments on Evaluation Report on Perchlorate Impacts to Soils and Groundwater From Property Owned by San Bernardino County at the former Bunker Area Near the MVSL (MVSL). January 15, 2004.

SARWQCB. 2004b. Cleanup and Abatement Order No. R8-2004-0042 for Pyro Spectaculars, Inc., Thomas O. Peters Revocable Trust, Thomas O. Peters and Whittaker Corporation. April 30, 2004.

SARWQCB. 2005. Perchlorate in the Santa Ana Region (PowerPoint presentation). March 3, 2005.

DRAFT

SARWQCB. 2006. Amended Cleanup and Abatement Order No. R8-2005-0053 for Goodrich Corporation, Pyro Spectaculars, Inc., and Kwikset Locks, Inc., Emhart Industries, Inc., Kwikset Corporation (a Delaware Corporation), and Black & Decker Inc; October 27, 2006.

Santa Ana Watershed Project Authority (SAWPA). 2004. Draft Perchlorate Summary Report, Santa Ana River Watershed Area, California. April 2004.

Wildermuth Environmental, Inc. 2000. TIN/TDS Phase 2A: Tasks 1 through 5. TIN/TDS Study of the Santa Ana Watershed. Final Technical Memorandum. July 2000.

Woolfenden, L.R., and Kadhim, D., 1997. Geohydrology and Water Chemistry in the Rialto-Colton Basin, San Bernardino County, California: Water-Resources Investigation Report 97-4012, 101 p.

Woolfenden, L.R., and Koczot, K.M.. 2001. Numerical Simulation of Ground-Water Flow and Assessment of the Effects of Artificial Recharge in the Rialto-Colton Basin, San Bernardino County, California: Water-Resources Investigation Report 00-4243, 147 p.

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TABLE 1

Groundwater Elevations CPW-16 and CPW-17

February 25, and March 3, 2008

CPW-16 Groundwater Elevation Measured 2/25/08					
Port No.	Port Depth below Casing (ft.)	Casing Elevation (MSL)	Port Elevation (MSL)	Piezometer Level (DTW)	Groundwater Elevation (MSL)
A	295	1180.98	885.98	246.7	934.28
B	378	1180.98	802.98	247.6	933.38
C	417	1180.98	763.98	248.2	932.78
D	513	1180.98	667.98	248.9	932.08
E	638	1180.98	542.98	247.7	933.28
F	718	1180.98	462.98	249.7	931.28
G	753	1180.98	427.98	249.2	931.78

CPW-17 Groundwater Elevation Measured 3/3/08					
Port No.	Port Depth below Surface (ft.)	Surface Elevation (MSL)	Port Elevation (MSL)	Piezometer Level (DTW)	Groundwater Elevation (MSL)
A	243	1135.98	892.98	241.4	894.58
B	313	1135.98	822.98	241.8	894.18
C	413	1135.98	722.98	241	894.98
D	503	1135.98	632.98	237.4	898.58
E	563	1135.98	572.98	237.6	898.38
F	612	1135.98	523.98	238.2	897.78
G	712	1135.98	423.98	233.2	902.78

ft - Feet
DTW - Depth to water
MSL - Mean Sea Level

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TABLE 2
Well Construction Details
CPW-16 and CPW-17

Screen Interval	Casing Elevation	Ground Surface Elevation	Screen Top (ft. bgs)	Screen Bottom (ft. bgs)	Screen Top (msl)	Screen Bottom (msl)
CPW-16A	1180.98	1181.44	292	302	889.44	879.44
CPW-16B	1180.98	1181.44	375	385	806.44	796.44
CPW-16C	1180.98	1181.44	414	424	767.44	757.44
CPW-16D	1180.98	1181.44	510	520	671.44	661.44
CPW-16E	1180.98	1181.44	635	645	546.44	536.44
CPW-16F	1180.98	1181.44	715	725	466.44	456.44
CPW-16G	1180.98	1181.44	750	760	431.44	421.44
CPW-17A	1135.08	1135.98	240	250	895.98	885.98
CPW-17B	1135.08	1135.98	310	320	825.98	815.98
CPW-17C	1135.08	1135.98	410	420	725.98	715.98
CPW-17D	1135.08	1135.98	500	510	635.98	625.98
CPW-17E	1135.08	1135.98	560	570	575.98	565.98
CPW-17F	1135.08	1135.98	608	618	527.98	517.98
CPW-17G	1135.08	1135.98	708	718	427.98	417.98

All elevations are above msl (Mean Sea Level)
ft bgs= feet below grade

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TABLE 3a
Results of Perchlorate Analysis
CPW-16 and CPW-17
February and March 2008

Sample Location	CalScience	Test America	Difference	Date Sampled
CPW-16A	21	23	2	2/27/2008
CPW-16B	23	34	11	2/27/2008
CPW-16C	25	24	1	2/27/2008
CPW-16D	<2.0	4.4	4.4	2/26/2008
CPW-16E	<2.0	<1.5		2/26/2008
CPW-16F	7.3	9.7	2.4	2/25/2008
CPW-16G	17	22	5	2/25/2008
CPW-17A	<2.0	<1.5		3/5/2008
CPW-17B	<2.0	<1.5		3/5/2008
CPW-17C	<2.0	<1.5		3/5/2008
CPW-17D	<2.0	<1.5		3/4/2008
CPW-17E	<2.0	<1.5		3/4/2008
CPW-17F	<2.0	<1.5		3/4/2008
CPW-17G	<2.0	<1.5		3/3/2008

All units are micrograms per liter
<1.5 = Not reported at the laboratory reporting limit of 1.5 ug/l

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TABLE 3b
Results of Chlorate Analysis
CPW-16 and CPW-17
February and March 2008

Sample Location	MWH	Test America	Difference	Date Sampled
CPW-16A	299	310	11	2/27/2008
CPW-16B	<20	<5		2/27/2008
CPW-16C	<10	<5		2/27/2008
CPW-16D	27	32	4.4	2/26/2008
CPW-16E	<10	27	27	2/26/2008
CPW-16F	95	100	5	2/26/2008
CPW-16G	241	160	81	2/25/2008
CPW-17A	22	24	2	3/5/2008
CPW-17B	14	<5	14	3/5/2008
CPW-17C	<10	<5		3/5/2008
CPW-17D	<10	<5		3/4/2008
CPW-17E	<10	<5		3/4/2008
CPW-17F	<10	<5		3/4/2008
CPW-17G	<10	<5		3/3/2008

All units are micrograms per liter
<5.0 = Not reported at the laboratory reporting limit of 5.0 ug/l

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TABLE 4
Results of Perchlorate Analysis in Soil, CPW-16 and CPW-17,
February and March 2008

Sample Location	Depth (ft. bgs)	Perchlorate (ug/kg)	Date Sampled
CEH-16	0	<20.0	10/11/2007
CEH-16	5	<20.0	10/11/2007
CEH-16	10	<20.0	10/17/2007
CEH-16	15	<20.0	10/17/2007
CEH-17	0	<20.0	11/15/2007
CEH-17	5	<20.0	11/15/2007
CEH-17	10	<20.0	11/20/2007
CEH-17	15	<20.0	11/20/2007

ft bgs = feet below grade
ug/kg = micrograms per kilogram
<20.0 = not reported at or above the laboratory detection limit of 20 ug/kg.

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TABLE 5
SUMMARY OF PREVIOUS SOIL INVESTIGATIONS AT SUSPECTED SOURCE AREAS

Report Title	Date	Consultant
Letter from William J. McLaughlin to S. Van Stockum, San Bernardino County Department of Environmental Health Services, Regarding Hazardous Waste Site on Western Precast Products, Inc. North Rialto Property.	November 23, 1987	McLaughlin Enterprises, Inc.
Letter from William J. McLaughlin to Stephen Von Stockum, Department of Environmental Health Services, Regarding the Western Precast Products, Inc. Site.	December 9, 1987	McLaughlin Enterprises, Inc.
Revised Report, Preliminary Site Assessment (Phase I) and Preliminary Field Investigation (Phase II), Schulz Trust Property, Stonehurst and Locust Avenues, Rialto, California.	1989	Dames & Moore
Report, Site Characterization Investigation, Schulz Trust Property, Rialto, California for the San Bernardino County Solid Waste Management Department.	March 12, 1993	Dames & Moore
Letter from Jim E. Smith to Astro Pyrotechnics, Regarding Removal of Underground Storage Tank at 2298 West Stonehurst, Rialto.	July 10, 1997	San Bernardino County Fire Department
Final Report, Perchlorate Investigation, Northeast Expansion Area, Mid-Valley Sanitary Landfill, County of San Bernardino, California.	June 10, 1998	IT Corporation
Final Report, Phase II Site Assessment, Northeast Expansion Area, Mid-Valley Sanitary Landfill, County of San Bernardino, California.	June 11, 1998	IT Corporation
Offsite Migration Assessment, Mid-Valley Sanitary Landfill, County of San Bernardino, California	June 1, 1998	GeoLogic Associates
Preliminary Field and Laboratory Investigations of Perchlorate Detections in Groundwater, Mid-Valley Sanitary Landfill, County of San Bernardino, California.	July 2001	GeoLogic Associates
Phase II Environmental Site Assessment for Property Located at 3196 North Locust Avenue, Rialto, California. Prepared for TNT Fireworks.	July 6, 2001	EGA Consultants
Environmental Site Assessment and Limited Soil Sampling, 2298 West Stonehurst Drive, Rialto, California.	March 1, 2003	C.H.J Incorporated
Perchlorate Investigation Report, American Promotional Events-West Facility, 3196 North Locust Avenue, Rialto, California.	April 11, 2003	PES Consultants

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Enforcement Order Closure and Corrective Action with Substantial Endangerment Determination, in the matter of Denova Environmental, Inc., 2610 North Alder Avenue, Rialto, California 92377, EPA ID. No. CAT080022148, et al.	May 6, 2003	DTSC
Evaluation of Perchlorate Impacts to Soils and Groundwater Near Former Bunker Area, Rialto, California, Volumes I-III	October 1, 2003	GeoLogic Associates
Perchlorate Investigation Report, Pyro Spectaculars, Inc. Facility, 3196 Locust Avenue, Rialto, California.	October 15, 2003	Kleinfelder, Inc.
Subsurface Site Assessment for Perchlorate & VOCs Impacts in Soil, Former Zambelli Fireworks Storage Facility, 2170 West Stonehurst Drive, Rialto, California	April 1, 2004	California Environmental Geologists & Engineers
Preliminary Perchlorate Soil Investigation Report, Wong Chung Ming Property, 3196 North Locust Avenue, Rialto, California.	April 20, 2004	Locus Technologies
Soil Removal Work Plan, Former Denova Hazardous Waste Transfer, Storage and Disposal Facility, 610 North Alder Avenue, Rialto, San Bernardino County, California 92337.	June 25, 2004	Kleinfelder, Inc.
Draft Interim Remedial Investigation/Feasibility Study, Perchlorate and VOC Impacts to Groundwater, Rialto, California.	September 2004	GeoLogic Associates
Additional Perchlorate Investigation Report, San Bernardino County Assessor's Parcel Number 1133-071-07, 2298 West Stonehurst Drive, Rialto, San Bernardino, California 92377.	November 1, 2004	Kleinfelder, Inc.
Preliminary Soil Sampling Results and Scope of Additional Sampling, 2298 West Stonehurst, Rialto, California.	November 2, 2004	Geomatrix Consultants
Revised Draft Interim Remedial Investigation/Feasibility Study, Perchlorate and VOC Impacts to Groundwater.	January 2005	GeoLogic Associates
Surficial Perchlorate Assessment Report, Engle Property, San Bernardino County Assessor's Parcel Nos. 0239-192-04 and 113-021-01. Rialto, San Bernardino County, California 92377.	February 8, 2005	Kleinfelder, Inc.
Site Investigation, 160-Acre Parcel, Rialto, California.	February 10, 2005	Environ International Corporation
Draft Site Assessment Report, 2298 West Stonehurst Drive.	June 10, 2005	Geomatrix Consultants

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Draft Remedial Investigation Report, 160-Acre Parcel, Rialto, California.	March 24, 2005	GeoSyntec Consultants
Limited Soil Sampling Report, Former Broco, Inc. Manufacturing Facility, Rialto, California.	August 2005	Blasland, Bouck & Lee, Inc.
On-Site Soil and Groundwater Investigation at the 160-Acre Parcel	June 28, 2005	Environ International Corporation
Revised Focused Summary Report	March 31, 2007	Environ International Corporation

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TABLE 6

Perchlorate Concentrations in Colton-15, Colton-17 and Colton-24

Well Name	Sampling Date	Concentration (ug/l)
Colton-15	9/24/2001	7.8*
Colton-15	1/23/2002	ND
Colton-15	2/11/2002	ND
Colton-15	3/4/2002	5.7
Colton-15	5/9/2002	ND
Colton-15	6/25/2002	ND
Colton-15	7/30/2003	ND
Colton-15	10/23/2003	ND
Colton-15	5/3/2004	5.6
Colton-15	7/14/2005	5
Colton-15	8/9/2005	5.2
Colton-15	10/4/2005	ND
Colton-15	1/3/2006	ND
Colton-15	3/12/2007	4.8
Colton-15	3/20/2007	3.9
Colton-15	3/29/2007	3.7
Colton-15	4/4/2007	4.7
Colton-15	4/10/2007	5.3
Colton-15	4/17/2007	4.9
Colton-15	4/23/2007	4.9
Colton-15	5/1/2007	5.3
Colton-15	5/7/2007	5.2
Colton-15	5/15/2007	6.6*
Colton-15	5/30/2007	4.5
Colton-15	6/4/2207	5.9
Colton-15	6/12/2007	5.7
Colton-15	6/18/2007	4.6
Colton-15	1/22/2008	5
Colton-15	1/30/2008	4.1
Colton-15	2/5/2008	6.4
Colton-15	2/19/2008	4.8
Colton-15	2/25/2008	5
Colton-15	3/3/2008	4.6

* = Perchlorate concentration greater than or equal to MCL of 6 ug/l.
Source: http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Perchlorate.aspx,

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TABLE 6

Perchlorate Concentrations in Colton-15, Colton-17 and Colton-24

Colton-17	9/24/2001	ND
Colton-17	1/24/2002	ND
Colton-17	2/11/2002	ND
Colton-17	3/4/2002	9.2*
Colton-17	3/25/2002	9.4*
Colton-17	5/8/2002	ND
Colton-17	6/20/2002	ND
Colton-17	7/30/2003	ND
Colton-17	10/23/2003	ND
Colton-17	5/3/2004	7.7*
Colton-17	7/14/2005	7.5*
Colton-17	8/9/2005	10*
Colton-17	10/4/2005	5
Colton-17	1/9/2006	ND
Colton-17	5/22/2007	1.3
Colton-17	5/30/2007	6.2*
Colton-17	6/4/2007	8.4*
Colton-17	6/12/2007	8.2*
Colton-17	7/2/2007	6.6*
Colton-17	7/10/2007	7.7*
Colton-17	8/8/2007	3.4
Colton-17	8/20/2007	6*
Colton-17	8/28/2007	ND
Colton-17	9/4/2007	7*
Colton-17	9/24/2007	4.2
Colton-17	11/20/2007	5.9
Colton-17	12/4/2007	1.8
Colton-17	12/13/2007	5.3
Colton-17	12/26/2007	6.2*
Colton-17	1/19/2008	ND
Colton-17	3/19/2008	3.2
Colton-17	3/24/2008	6.2*

* = Perchlorate concentration greater than or equal to MCL of 6 ug/l.
Source: http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Perchlorate.aspx

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TABLE 6

Perchlorate Concentrations in Colton-15, Colton-17 and Colton-24

Colton-24	9/24/2001	6*
Colton-24	1/23/2002	4.3
Colton-24	2/11/2002	4.5
Colton-24	3/19/2002	4.4
Colton-24	5/8/2002	5.2
Colton-24	6/20/2002	4.2
Colton-24	10/6/2003	4.2
Colton-24	10/22/2003	ND
Colton-24	5/4/2004	ND
Colton-24	7/14/2005	ND
Colton-24	8/9/2005	ND
Colton-24	10/4/2005	ND
Colton-24	1/3/2006	ND
Colton-24	12/19/2006	5.2
Colton-24	12/28/2006	5.5
Colton-24	1/3/2007	3.6
Colton-24	1/10/2007	5.1
Colton-24	1/18/2007	6.1*
Colton-24	1/22/2007	5.6
Colton-24	1/29/2007	5.6
Colton-24	2/14/2007	3.6
Colton-24	2/21/2007	3.4
Colton-24	2/26/2007	5
Colton-24	3/5/2007	5.7
Colton-24	3/12/2007	4.8
Colton-24	3/19/2007	4.4
Colton-24	3/26/2007	3.7
Colton-24	4/2/2007	5
Colton-24	4/5/2007	4.2
Colton-24	4/9/2007	6*
Colton-24	4/12/2007	5.1
Colton-24	4/16/2007	5.4
Colton-24	4/23/2007	5.3
Colton-24	5/1/2007	5.5

* = Perchlorate concentration greater than or equal to MCL of 6 ug/l.
Source: http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Perchlorate.aspx,

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TABLE 6

Perchlorate Concentrations in Colton-15, Colton-17 and Colton-24

Colton-24	5/8/2007	5.6
Colton-24	5/16/2007	5.4
Colton-24	5/22/2007	4.8
Colton-24	6/18/2007	4.7
Colton-24	6/25/2007	5.8
Colton-24	7/2/2007	5
Colton-24	7/10/2007	5.9
Colton-24	7/16/2007	5.3
Colton-24	7/24/2007	5.1
Colton-24	7/30/2007	4.1
Colton-24	8/6/2007	4.7
Colton-24	8/13/2007	4.8
Colton-24	8/20/2007	4.4
Colton-24	8/28/2007	4.3
Colton-24	9/4/2007	5
Colton-24	9/11/2007	4.5
Colton-24	9/18/2007	4.4
Colton-24	9/24/2007	4.8
Colton-24	10/3/2007	5.5
Colton-24	10/9/2007	5.6
Colton-24	10/16/2007	2.3
Colton-24	10/23/2007	5.3
Colton-24	11/7/2007	6.4*
Colton-24	11/13/2007	5
Colton-24	11/27/2007	6.2*
Colton-24	12/18/2007	5.6
Colton-24	1/8/2008	3.9
Colton-24	1/14/2008	3.9
Colton-24	2/11/2008	4.7
Colton-24	2/20/2008	4.3
Colton-24	3/10/2008	4.5
Colton-24	3/25/2008	5.8

* = Perchlorate concentration greater than or equal to MCL of 6 ug/l.
Source: http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Perchlorate.aspx,

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