2007 Annual Performance Evaluation Report
Volume 1

Baldwin Park Operable Unit of the San Gabriel Valley

Superfund Sites

Los Angeles County, California

Prepared for:

Baldwin Park Operable Unit Cooperating Respondents

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ABBREVIATIONS

1,1-DCE	1,1-Dichloroethene
1,2-DCA	1,2-Dichloroethane
1,2,3-TCP	1,2,3-Trichloropropane
AAWC	Azusa Agricultural Water Company
AJ	Aerojet
ALR	Azusa Land Reclamation
ARARs	Applicable or Relevant and Appropriate Requirements
AVWC	Azusa Valley Water Company
bgs	below ground surface
BPOU	Baldwin Park Operable Unit
BPOUSC	Baldwin Park Operable Unit Steering Committee
CC	Conrock Company
CDM	Camp, Dresser, and McKee
CDWC	California Domestic Water Company
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIC	Covina Irrigation Company
COC	Chemical of Concern
COI	City of Industry
CRs	Cooperating Respondents
DPH	California Department of Public Health
DQO	Data Quality Objectives
EDB	Ethylene Dibromide
EPA	U.S. Environmental Protection Agency
ERM	ERM-West, Inc.
ESD	Explanation of Significant Differences
FSP	Field Sampling Plan
ft/d	Feet Per Day
ft/ft	Feet Per Foot
f.k.a	Formerly Known As
GAC	Granular Activated Carbon
gpm	gallons per minute
HLA	Harding Lawson Associates
ISEP®	Calgon Ionic Separation Process
LACO	Los Angeles County
LACDPW	Los Angeles County Department of Public Works
LACSD	Los Angeles County Sanitation Districts
LDC	Laboratory Data Consultants
LPGAC	Liquid-Phase Granular Activated Carbon
LPVCWD	La Puente Valley County Water District
MCL	Maximum Contaminant Level
MICR	Maximum Individual Cancer Risk
msl	Mean Sea Level
NDMA	N-Nitrosodimethylamine

NL	Drinking Water Notification Level
ng/L	Nanograms Per Liter
PCE	Tetrachloroethene
PE	Performance Evaluation
PRP	Potentially Responsible Party
PSEP	Performance Standards Evaluation Plan
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RI	Remedial Investigation
ROD	Record of Decision
RMSE	Root-mean squared error
RWQCB	Regional Water Quality Control Board – Los Angeles Region
SA	Subarea
SCAQMD	South Coast Air Quality Management District
SGVWC	San Gabriel Valley Water Company
SOW	Statement of Work
SMR	Self Monitoring Reports
SVOC	Semi-Volatile Organic Compound
SWS	Suburban Water Systems
TIC	Tentatively Identified Compound
TCE	Trichloroethene
UAO	Unilateral Administrative Order
µg/L	Micrograms Per Liter
UV	Ultraviolet
VCWD	Valley County Water District
VOC	Volatile Organic Compound
VPGAC	Vapor Phase Granulated Activated Carbon
WE	Water Entity
WY	Water Year

2007 PERFORMANCE EVALUATION REPORT

Baldwin Park Operable Unit
San Gabriel Valley, California

1.0 INTRODUCTION

This document presents the 2007 Performance Evaluation (PE) Report for the Baldwin Park Operable Unit (BPOU) of the San Gabriel Valley Superfund Sites, located in the San Gabriel Basin, Los Angeles County, California. This report was prepared jointly by Geomatrix Consultants, Inc. (Geomatrix) and ERM-West, Inc. (ERM), on behalf of the BPOU Cooperating Respondents (CRs). The CRs are:

- Aerojet-General Corporation
- Azusa Land Reclamation Company, Inc. (ALR)
- Fairchild Holding Corporation
- Hartwell Corporation
- Chem Waste Management (as successor to Oil and Solvent Process Company)
- Reichhold, Inc.
- Winco Enterprises Inc. (formerly known as [f.k.a.] Wynn Oil Company)

This report meets the requirements for the PE Report, as required by Unilateral Administrative Order 2000-13 (UAO) and the supporting Statement of Work (SOW), issued by the U.S. Environmental Protection Agency (EPA) Region IX on June 30, 2000 and amended on February 28, 2002.

1.1 BACKGROUND

Beginning in 1979, volatile organic compounds (VOCs) were detected in groundwater within the San Gabriel Basin (the Basin). In May 1984, four areas of groundwater contamination were listed as San Gabriel Valley Areas 1-4 on EPA's National Priorities List based on available water-quality data. Subsequent investigation by EPA and others revealed widespread VOC contamination in the Basin. As a result, EPA subsequently divided the Basin into seven Remedial Investigation (RI) areas to focus characterization on the extent of contamination and plan remedial actions. EPA later designated some of these RI areas as operable units. RI Area 5 was designated as the BPOU.

Although many of the figures provided in this report depict a generalized boundary to the area of impacted groundwater in the BPOU (Figure 1-1), the precise boundary of the BPOU has not been determined, but an approximate boundary is presented to provide a point of reference on the figures.

Since 1986, EPA, various Potentially Responsible Parties (PRPs), and numerous other entities have compiled and evaluated groundwater-quality data from the Basin. Initial field investigations conducted by EPA in the BPOU included the installation and sampling of one multiport monitoring well and the sampling of water supply wells. In 1990, EPA issued a Basinwide Technical Plan that described options for remediation of VOC plumes through the Basin. In 1992, EPA published an Interim RI Report for the Basin.

In 1993, EPA issued a Feasibility Study Report for the BPOU. This report evaluated various remedial alternatives for the remediation of groundwater in the BPOU. In 1994, EPA issued a Record of Decision (ROD) for the BPOU interim remedy. The ROD identified 17 chemicals of concern (COCs), all of which were VOCs. EPA's selected remedy consisted of pumping and treating approximately 19,000 gallons per minute (gpm) of contaminated groundwater. In approximately 1995, the Baldwin Park Operable Unit Steering Committee (BPOUSC) began to perform pre-remedial design activities, including additional characterization of the extent of VOC-contaminated groundwater and the development of a groundwater extraction plan. Eight multiport monitoring wells were installed and sampled and 26 existing water-supply and monitoring wells were sampled to provide additional characterization of the extent of VOC contamination in the BPOU. The results of these pre-remedial design activities were submitted to EPA in the Draft Pre-Remedial Design Report, dated December 1996 (Camp, Dresser, and McKee [CDM], 1996). The groundwater extraction plan was revised on several occasions. Following review and comment by EPA, the Draft Final Pre-Remedial Design Report, dated September 1997 (CDM, 1997) was issued.

In mid-1997 and then in 1998, certain constituents that were not previously considered as COCs in the ROD, perchlorate, N-nitrosodimethylamine (NDMA), and 1,4-dioxane, were discovered in groundwater within the BPOU. Consequently, EPA requested that the BPOUSC characterize the distribution of these constituents, as well as conduct further characterization of VOCs in groundwater within the BPOU. As a result, the BPOUSC installed and sampled four additional multiport monitoring wells and conducted additional groundwater sampling to evaluate the extent of VOCs, perchlorate, NDMA, and 1,4-dioxane in groundwater in the BPOU.

The results of these investigations and several groundwater extraction plan options were presented to EPA in the Addendum to the Pre-Remedial Design Report, dated January 14, 1999 (Harding Lawson Associates [HLA], 1999). Throughout 1999, these groundwater extraction plan options were refined and new options were formulated. These changes were made in response to comments from EPA and the Main San Gabriel Basin Watermaster (Watermaster). This resulted in a range of candidate groundwater extraction plans with total groundwater extraction rates ranging from 19,500 to 21,500 gpm.

In May 1999, EPA issued an Explanation of Significant Differences (ESD) to supplement the 1994 ROD. The ESD depicted an extended southern portion of the BPOU plume, in Subarea 3, to reflect the results of the additional investigations, and added perchlorate, NDMA, and 1,4-dioxane to the list of COCs. In June 2000, EPA issued the UAO, requiring various PRPs (identified in the UAO as "Respondents"), including but not limited to the CRs, to design, construct, and operate the BPOU interim remedy identified in the ROD, as revised by the ESD. In addition, beginning in the late 1990s, various water agencies, producers, and other water entities (collectively, the "Water Entities" or "WEs") with regulatory oversight and/or financial or other interests in the BPOU groundwater filed lawsuits or asserted claims against the BPOU PRPs for damages allegedly suffered as a result of contamination of the groundwater and water supply wells in the BPOU area. Thereafter, the CRs entered into negotiations with the WEs, which culminated in March 2002 with the CRs and WEs executing the BPOU Project Agreement to implement the BPOU Project. The BPOU Project Agreement was declared effective as of May 9, 2002.

While the BPOU Project Agreement negotiations were underway, the CRs prepared the Remedial Design/Remedial Action Work Plan and the Conceptual Design Report for the implementation of the remedy (HLA, 2000a and HLA, 2000b). The Preliminary Design Report was prepared by the WEs and submitted to EPA in April, 2001 (Watermaster, 2001).

In August 2006, EPA requested that the CRs include in the BPOU monitoring program additional sampling for non-COC VOCs and non-target volatile and semi-volatile compounds (Tentatively Identified Compounds, or TICs). In response to EPA's request, the CRs provided a proposal for non-COC groundwater analysis and reporting in a technical memorandum dated August 24, 2006 (Geomatrix, 2006a). This proposal included the following:

- Information on sampling and analysis of 1,2,3-trichloropropane (1,2,3-TCP);
- A proposal for reporting results for non-COC VOCs in a subset of multiport monitoring wells located upgradient of each Subproject ("early warning" wells);
- A proposal for monitoring of non-target VOCs and semi-volatile organic compounds (SVOCs) in a subset of multiport monitoring wells located upgradient of each Subproject ("early warning" wells), and;
- A proposal for periodic analysis of 1,2,3-TCP in Subarea 3.

EPA approved the August 24, 2006, proposal in a letter dated September 13, 2006, subject to the addition of several additional wells. The complete requirements for non-COC groundwater analysis and reporting were summarized in a technical memorandum dated September 29, 2006 (ERM, 2006).

On October 3, 2006, EPA provided a letter approving the BPOU Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP) subject to submittal of final versions of these documents with the complete requirements for non-COC groundwater analysis and reporting. Final versions of the QAPP and FSP were submitted in November 2006 (Geomatrix, 2006b; Stetson, 2006a) and were approved by EPA in a letter dated February 12, 2007. In the February 12, 2007, letter EPA also requested that a data management plan be prepared as an addendum to the QAPP. The report, Data Management Plan for the Baldwin Park Operable Unit Performance Standards Evaluation Plan Monitoring Program was submitted to EPA on May 17, 2007 (Laboratory Data Consultants, Inc. [LDC] 2007).

The FSP for Air, Brine, and Treated Water was submitted to EPA on August 14, 2006 (Stetson 2006b) and the corresponding QAPP for Air, Brine, and Treated Water was submitted on March 16, 2007 (Geomatrix, 2007a).

1.2 Overview of the Response Action

The UAO and SOW direct the Respondents to design, construct, and implement the remedy described in the ROD and ESD, and to achieve the Performance Standards in accordance with the UAO. The WEs are designing, constructing, and operating (either directly or through contractors) groundwater extraction and treatment facilities (Subprojects), which provide for groundwater extraction and treatment in two general areas of the BPOU (Figure 1-2). The treated groundwater is supplied for direct potable use.

Upon completion of the various Subprojects, a total of approximately 23,250 gpm of groundwater will be extracted, 7,000 gpm from the northern portion of the plumes (Subarea 1), and 16,250 gpm from the southern portion of the plumes (Subarea 3). Extracted groundwater will be treated using a treatment train that is designed to remove all COCs to levels acceptable for direct use. The treatment train varies among the treatment plants but generally consists of a series of contaminant treatment processes including air stripping and/or liquid-phase granular activated carbon (LPGAC) to remove VOCs, ion exchange to remove perchlorate, and ultraviolet (UV)/oxidation to remove 1,4-dioxane and NDMA.

1.3 Summary of Remedial Action Objectives And Performance Standards

Two of the key performance standards are defined in the UAO as follows:

> *The remedial objectives of the Baldwin Park OU are to prevent future increases in, and begin to reduce concentrations of, trichloroethene, tetrachloroethene, carbon tetrachloride, and other VOCs, along with perchlorate, N-nitrosodimethylamine, and 1,4-dioxane in groundwater in the Baldwin Park area (hereafter referred to as contaminants or contaminated groundwater) by limiting further migration of contaminated groundwater into clean and less contaminated areas or depths that would benefit most from additional protection and by removing contaminants from the aquifer.*

The BPOU Project involves the design, installation, operation, and maintenance of groundwater extraction systems in two areas of the BPOU. The two areas are designated in the ROD and ESD as Subarea 1 (the upper area) and Subarea 3 (the lower area). Remedial objectives for the two Subareas are described below.

1.3.1 Subarea 1 Remedial Objectives

In Subarea 1, the movement of COCs in groundwater will be limited by groundwater extraction at rates and locations that will establish the necessary groundwater flow field, such that the resultant capture zone limits migration from known or suspected source areas and depths and removes chemical mass. Source areas and depths include locations believed to contain a significant mass of soil contamination (i.e., vadose zone) or a subsurface source of dissolved-phase groundwater contamination. In Subarea 1, the remedial objectives are designed to prevent groundwater near source areas with higher concentrations of COCs from moving downgradient toward areas with lower concentrations of COCs. As part of the groundwater extraction process, chemical mass will be removed from Subarea 1 groundwater.

1.3.2 Subarea 3 Remedial Objectives

In Subarea 3, the movement of COCs in groundwater will be limited by groundwater extraction at rates and locations that will establish the necessary groundwater flow field to reduce the potential for groundwater containing unacceptable concentrations of tetrachloroethene (PCE), trichloroethene (TCE), carbon tetrachloride, perchlorate, NDMA, 1,4-dioxane or other COCs from moving into areas where these chemicals are not present at unacceptable concentrations. As part of the groundwater extraction process, chemical mass will be removed from Subarea 3 groundwater.

1.3.3 Performance Standards

Two distinct performance standards have been derived from the Remedial Objectives cited above: 1) limit further migration of COCs in groundwater, and 2) remove COCs from groundwater. Achievement of these performance standards will prevent future increases in concentrations, begin to reduce concentrations, and prevent the spread of COCs from more contaminated areas to less contaminated areas. These two performance standards are described in more detail below.

1.3.3.1 Performance Standard 1 - Limit Migration of Chemicals of Concern

The BPOU extraction plan was developed using an EPA-approved three-dimensional finite-element groundwater flow model, DYNFLOW. In 2002, the model was updated using a similar code, FEFLOW. The construction and calibration of this model relies on many years of data collection activities in the BPOU, including water level measurements and water-quality sampling. The model was calibrated using water level data from a 20-year period (1982 to 2002). Following calibration, the model was run in a forward/predictive manner to select locations and depths of groundwater extraction wells that would allow the remedy to achieve the objectives described above. Review of geophysical logs from exploratory borings at the extraction well locations as well as logs from other wells in the BPOU suggested the presence of relatively thick, fine-grained layers that can be correlated across Subarea 3 but that do not extend north to Subarea 1. These layers are present at approximately -200 and -500 feet msl. As a result, the well screened intervals for new extraction wells in Subarea 3 were designed so that they could capture the entire vertical extent of contaminated groundwater without creating hydraulic connections across these layers. Therefore, shallow extraction wells were screened above the layer at -500 feet msl and deep extraction wells were screened below the layer at -500 feet msl. Aquifer testing in the extraction wells confirmed that the layer at -500 feet msl acts as a confining unit that provides hydraulic separation between the shallow and deep extraction intervals. In 2005, the groundwater flow model was modified to incorporate the confining units in Subarea 3. The groundwater flow model is updated annually with quarterly pumping and recharge data that are compiled from various sources. The CR group will continue to make refinements to the groundwater model to incorporate the results of field testing and other information, such as aquifer testing at new extraction and production wells, and thereby improve the model's ability to simulate observed groundwater conditions in localized areas. Updates and refinements to the groundwater model will be reported in annual PE reports. The calibrated model is the primary tool that will be used to assess system performance in terms of limiting the migration of COCs.

1.3.3.2 Performance Standard 2 - Removal of Chemical Mass

This performance standard, removal of chemical mass, will be met through extraction and treatment of groundwater from the BPOU plumes. Documentation of the removal of chemical mass will use measured flow rates from groundwater extraction wells and results of water-quality sampling and analysis for these same extraction wells. Using these data, the mass removal for selected COCs will be estimated on an annual basis. Cumulative chemical mass removed from the aquifer will also be reported.

1.4 APPROACH TO PERFORMANCE MONITORING AND EVALUATION

Performance monitoring and evaluation focuses on the operation of the proposed groundwater extraction system as it relates to: 1) limiting further migration of groundwater contamination into less contaminated areas, and 2) removing chemical mass from groundwater. This approach involves both short-term and long-term evaluation of extraction system performance. Short-term PE will rely heavily on the use of groundwater modeling to demonstrate that extraction well operation is limiting further migration of groundwater contamination into less contaminated areas. Other short-term PE activities will include assessments of changes in groundwater flow conditions, temporal and spatial changes in groundwater quality, and the estimation of chemical mass removal by extraction wells. Short-term PEs will be documented in annual PE reports.

Evaluations of long-term performance of the BPOU Project will be reported in Five-Year Reviews as described in the Performance Standards Evaluation Plan (PSEP) (Geomatrix, 2004a). Time-concentration analyses for COCs will be the primary measure of long-term remedy performance. In addition, groundwater modeling and particle tracking will be used to support the evaluation of long-term remedy performance. The model will be used with other data interpretation techniques such as potentiometric maps, well hydrographs, and time-concentrations plots for selected wells to validate observed concentration trends for COCs. The goals for long-term PEs are to determine whether: 1) water quality in areas located downgradient of the Subarea 1 extraction system, but upgradient of the Subarea 3 extraction system, is improving over time, 2) concentrations of COCs in Subarea 3 extraction wells are decreasing over time, 3) water quality in Subarea 1, upgradient of the extraction wells, is improving over time, and 4) concentrations of COCs in Subarea 1 extraction wells are decreasing over time.

1.5 CONTENT OF PERFORMANCE EVALUATION REPORTS

As outlined in the PSEP, the annual PE reports should generally contain the following:

- BPOU-wide potentiometric maps to assist in evaluating changes in groundwater flow patterns in the BPOU;
- Groundwater plume maps and chemical cross sections and an evaluation of any changes in the extent of groundwater contamination within the BPOU;
- Time-concentration plots for selected key constituents for selected monitoring wells;
- Contaminant mass-removal estimates for each extraction well using average flow rates and water-quality sampling results from the extraction wells;
- Results of computer model simulations of extraction system performance and a description of any refinements to groundwater flow models used to evaluate system performance;
- An overall assessment of remedial system performance in relation to Performance Standards established for the BPOU Project; and
- Recommendations for changes to the monitoring program outlined in the PSEP including scheduled changes to the monitoring frequency or monitoring locations.

Although not specifically outlined in the PSEP, EPA has requested that PE reports also address the performance of the BPOU Project relative to "other project requirements" associated with the implementation of the BPOU Project. These “other project requirements” are not considered performance standards, as they do not directly relate to the remedial objectives of the BPOU Project as defined by EPA, but rather relate to the operational performance of, or discharge requirements for, the various Subprojects following construction. Consequently, only those "other project requirements" that are considered "Other Potential Performance Standards" during system operation are addressed in this PE report. These “Other Potential Performance Standards” include the following:

- Achievement of treated-water effluent requirements in accordance with California Department of Public Health (DPH; formerly the Department of Health Services ([DHS]) Drinking Water Operating permits;
- Air-emission monitoring requirements in accordance with EPA Applicable or Relevant and Appropriate Requirements (ARARs);
- Monitoring and reporting of brine discharges to the Los Angeles County Sanitation Districts (LACSD) system in accordance with Industrial Waste Discharge permits; and
- Demonstration of proper disposal of waste associated with treatment operations. Applicable waste streams include, but are not limited to, spent granular activated carbon and spent ion-exchange resins.

2.0 STATUS OF REMEDIAL ACTIONS

This section presents the status of remedial actions undertaken to implement the BPOU interim remedy. These actions include additional construction, startup testing, and operation of the Valley County Water District (VCWD) Lante Subproject in Subarea 1; operation of the La Puente Valley County Water District (LPVCWD) Subproject; operation of the San Gabriel Valley Water Company (SGVWC) B6 Subproject; and ongoing construction, startup testing, and interim operation of the SGVWC B5 Subproject in Subarea 3. The status of the BPOU Subprojects is also described in the monthly progress reports submitted to EPA pursuant to Paragraph 85, Section XV of the UAO.

2.1 SUBAREA 1 REMEDIAL ACTION STATUS

Subarea 1 remedial actions consist of groundwater extraction from the VCWD SA1-1, SA1-2, and SA1-3 (Lante) wells and treatment at the VCWD Lante Treatment Plant, which is owned and operated by VCWD. The report, Revised Draft Interim Remedial Action Report (Stetson, 2005), prepared and submitted to EPA in March 2005, provides a summary of the VCWD Lante Subproject background, construction, and completion activities. Construction of the VCWD Lante Treatment Plant began in 2002 and was completed in 2005. The original construction activities included drilling and equipping two new extraction wells (SA1-1 and SA1-2), re-equipping the SA1-3 (Lante) well, installing associated piezometers, constructing raw and treated water pipelines, and constructing the treatment plant. Additional construction work in 2006 and 2007 included adding liquid-phase granular activated carbon (LPGAC) treatment and replacing the resin-based vapor control system with vapor-phase granular activated carbon (VPGAC). The treatment plant consists of four air-stripping towers and associated carbon off-gas treatment units for VOC removal, LPGAC for 1,2,3-TCP removal, two regenerable ion-exchange carousels (Calgon Ionic Separation Process [ISEP®]) for perchlorate removal, and four UV/oxidation units for 1,4-dioxane and NDMA removal. Treated water is conveyed to the VCWD distribution system. A portion of the treated water is conveyed via a treated water pipeline to Suburban Water Systems (SWS).

On November 11, 2005, DPH issued domestic water supply Permit Amendment 1910009PA-003, authorizing VCWD to operate the VCWD Lante Treatment Plant. In January 2006, 1,2,3-TCP was detected in the VCWD extraction wells. Subsequent testing confirmed the presence of 1,2,3-TCP. Beginning on February 21, 2006, VCWD began discharging treated water to Big Dalton Wash while a 1,2,3-TCP treatment technology was selected and constructed. LPGAC was selected as the treatment technology and the design and construction of a LPGAC system was completed in Spring 2007. LPGAC startup testing was completed in May 2007 and on July 18, 2007, DPH issued an amended permit to VCWD to resume delivering potable water.

As a result of operational problems, the resin-based off-gas control system was removed and replaced with VPGAC. A temporary VPGAC system was installed while a permanent system was designed and constructed. The temporary system was operational in June 2007 and the permanent system is expected to be fully operational in April 2008. The air strippers also experienced operational problems with calcium carbonate precipitation in the towers and packing. Tower cleaning was initiated in October 2007 and was completed in February 2008. A further report evaluating pro-active measures to reduce or eliminate calcification in the future is expected shortly.

The SA1-1 and SA1-2 wells were the primary extraction wells that operated in 2007. The SA1-3 (Lante) well operated intermittently, generally to balance 1,2,3-TCP concentrations to meet water-quality limits for discharge prior to the LPGAC coming online.

Other treatment system improvements or evaluations initiated in 2007 included:

- Pilot testing of several single pass ion exchange resins for perchlorate removal;
- Monitoring 1,2,3-TCP breakthrough in the new LPGAC to develop a predictive understanding of carbon bed life;
- Evaluation of chlorine residuals in treated water; and
- Preparation of a design/build request for proposal for the single pass ion exchange system.

In 2007, VCWD treated 8,002 acre-feet of water with an average flowrate of 4,963 gpm (Table 2-1). Production nearly doubled from the prior year's average flowrate of 2,659 gpm.

2.2 SUBAREA 3 REMEDIAL ACTION STATUS

Subarea 3 remedial actions consist of the LPVCWD, SGVWC B6, and SGVWC B5 Subprojects that are designed to extract and treat an average flowrate of 16,250 gpm (design capacity 18,100 gpm) as discussed below.

2.2.1 La Puente Valley County Water District Subproject Status

The LPVCWD Subproject extracts, treats, and delivers water to the public under a DPH permit that was issued on February 15, 2001, and subsequently amended as Permit No.

04-16-02PA-000 issued on May 8, 2002. The LPVCWD Subproject consists of extraction wells LPVCWD 2 and LPVCWD 3, two air strippers and associated off-gas treatment for VOC removal, an ISEP® carousel for perchlorate removal, and UV/oxidation for 1,4-dioxane and NDMA removal operating at a capacity of up to 2,500 gpm. Treated water is conveyed to LPVCWD's distribution system and, when available, a portion of the treated water is also provided to SWS.

Measures to optimize the ISEP® equipment were initiated in 2006 and were completed in early 2007. As a result of the optimization work, the rotation time of the ISEP carousel was increased from 11.5 hours to 15.5 hours and the brine flowrate was decreased by five percent. These changes to the ISEP operation increased bicarbonate and raised the pH in the treated water, and lowered salt use requirements. In addition, in December 2007, the LPVCWD Subproject began testing an alternative salt supplied by Morton Salt from their Long Beach site to determine if this lower cost salt can be used at all BPOU ISEP® facilities.

To better balance groundwater flow to the air strippers, in June 2007 the piping from the extraction wells to the air strippers was reconfigured. The larger air stripper now receives all the water from the more contaminated LPVCWD 2 and the small air stripper receives most of the flow from the less contaminated LPVCWD 3.

To address sanding issues in LPVCWD 2 and 3, a new well, LPVCWD 5, was drilled and installed in 2007. LPVCWD 5 is still in the process of being developed and equipped and should become operational in late Spring 2008, as the sole LPVCWD water supply well used on a regular basis.

Technical performance reports are prepared under Provision 33 of the DPH operating permit and are required to be submitted annually to DPH. The most recent of these reports, Technical Performance Report for the La Puente Valley County Water District Treatment Facility (Stetson, 2007a), describes the status and performance of the LPVCWD facility for the period May 1, 2006, to April 30, 2007. In addition, LPVCWD submits monthly compliance reports to DPH; these compliance reports are included in monthly progress reports provided to EPA.

Treatment system improvements or evaluations initiated in 2007 included:

- Pilot testing of several single pass ion exchange resins for perchlorate removal; and
- Design and procurement of single pass ion exchange equipment.

In 2007, approximately 3,951 acre-feet of groundwater were extracted and treated for an average annual flowrate of 2,449 gpm (Table 2-1). This average annual flowrate exceeded the target groundwater extraction rate of 2,250 gpm and was considerably higher than the prior year's average flowrate of 1,887 gpm.

2.2.2 San Gabriel Valley Water Company B6 Subproject Status

The SGVWC B6 Subproject remedial action consists of groundwater extraction from the SGVWC B25A, B25B, B26A, and B26B wells (with B6C and B6D included as backup wells) and treatment at the SGVWC B6 Treatment Plant, which is owned and operated by SGVWC. Construction of the SGVWC B6 Subproject began in 2002 and the SGVWC B6 Treatment Plant was completed in 2005. Construction activities included drilling, installing, and equipping the new extraction wells, installing associated piezometers, constructing raw and treated water pipelines, and constructing the treatment plant. The treatment plant consists of four air-stripping towers and associated carbon off-gas treatment units for VOC removal, two ISEP® carousels for perchlorate removal, and four UV/oxidation units for 1,4-dioxane and NDMA removal. Treated water is conveyed to the SGVWC distribution system. The Interim Remedial Action Report (Stetson, 2004) prepared and submitted to EPA in September 2004 provides a summary of B6 Subproject background, construction, and completion activities.

On June 8, 2005, DPH issued domestic water supply Permit Amendment No. 1910039PA-002, authorizing SGVWC to operate the SGVWC B6 Treatment Plant using the existing onsite B6C and B6D wells. SGVWC began delivering potable water from the SGVWC B6 Treatment Plant to customers on July 12, 2005. The permit was further amended by DPH with Permit Amendment No. 1910039-004 on February 17, 2006, to incorporate the operation of offsite wells B25A, B25B, B26A, and B26B.

Technical performance reports are prepared under Provision 15 of the DPH operating permit and are required to be submitted annually to DPH. The most recent report, Technical Performance Report for the San Gabriel Valley Water Company Plant B6 Water Treatment Facility (Stetson, 2007b), describes the status and performance of the SGVWC B6 Treatment Plant for the period April 1, 2006, to March 31, 2007. In addition, SGVWC submits monthly compliance reports to DPH; these compliance reports are included in monthly progress reports provided to EPA.

Treatment system improvements or evaluations initiated in 2007 included:

- Pilot testing of several single pass ion exchange resins for perchlorate removal; and
- Evaluation of land purchase alternatives to locate proposed single pass ion exchange equipment.

In 2007, the SGVWC B6 Subproject extracted and treated approximately 11,670 acre-feet of water with an average annual flowrate of 7,235 gpm (Table 2-1). This average annual flowrate exceeded the target extraction rate of 6,500 gpm and was greater than the prior year's annual average flowrate of 6,174 gpm.

2.2.3 San Gabriel Valley Water Company B5 Subproject Status

The SGVWC B5 Subproject remedial actions consist of groundwater extraction from the SGVWC B5B, B5E, and City of Industry (COI) 5 wells and treatment at the SGVWC B5 Treatment Plant, which is owned and operated by SGVWC. The treatment plant operated on an interim basis in 2007 while awaiting issuance of a DPH drinking water permit.

The treatment plant consists of LPGAC for VOC removal, single-pass ion-exchange for perchlorate removal, and UV/oxidation units for 1,4-dioxane and NDMA removal. Treated water is currently being discharged to waste and will be conveyed to the SGVWC and COI distribution systems when a drinking water permit is issued. Construction was largely completed in early 2007. The Interim Remedial Action Report (Stetson, 2006c) prepared and submitted to EPA in September 2006 provides a summary of SGVWC B5 Subproject background, construction, and completion activities. The status of the SGVWC B5 Subproject construction is described in monthly progress reports to EPA.

Startup testing conducted to support permitting was completed in March 2007. The 97-005 documents were prepared in draft and are being reviewed by DPH. DPH comments on the final draft 97-005 report are expected in Spring 2008. Following the public review process, a final permit is expected in May 2008. SGVCWC B5C and B5D operated on an interim basis from March 2007 through the end of the year with the exception of October and November, when discharges were prohibited due to the Los Angeles County Department of Public Works (LACDPW) work in the San Gabriel River channel. COI 5 was tested and pumping equipment was in the process of being selected, ordered, and installed. In 2007, the SGVWC B5 Subproject extracted and treated approximately 4,036 acre-feet of water with an average flowrate of 2,455 gpm (Table 2-1).

3.0 PERFORMANCE MONITORING ACTIVITIES

As described in the PSEP, monitoring activities for the assessment of the interim remedy performance consist of two phases. The first phase consisted of baseline potentiometric and water-quality monitoring prior to extraction well startup and was completed in April 2005. The second phase involves more frequent potentiometric and water-quality monitoring (referred to as the BPOU-wide monitoring in the PSEP) during startup and initial operation of the extraction wells, followed by reduced monitoring frequencies after several years of continuous operation. The second phase of monitoring began in April 2005, although not all of the extraction wells were fully operational at that time. Potentiometric monitoring was performed on an increased frequency, as required, from April 2005 through November 2006. Water-quality monitoring was performed on an increased frequency, as required, during all of 2006. In a technical memorandum dated November 2, 2006 (Geomatrix, 2006c), the CRs proposed several modifications to the PSEP groundwater monitoring program as follows:

- Reducing the potentiometric monitoring frequency in piezometers and multiport wells from monthly to quarterly beginning in December 2006;
- Reducing the water-quality monitoring frequency in four multiport monitoring wells (MW 5-24, 5-25, 5-26, and 5-27) from quarterly to semi-annually beginning in Spring 2007; and
- Low-flow sampling in the Los Angeles County (LACO) Key Well.

EPA approved these modifications via e-mail correspondence on November 13, 2006. In the e-mail correspondence, EPA also approved the following changes to the PSEP monitoring program:

- Replacement of ALR MW-1 with ALR MW-1R; and
- Removal of three wells that have been destroyed including Azusa Valley Water Company (AVWC) 2 (01902114), Azusa Gen 1 (01902536), and Azusa Gen 3 (01902538).

In early 2007, AJ MW-1 was abandoned because adjacent mining activities caused this well to be unsafe for routine groundwater sampling. EPA recommended substituting ALR MW-9 for AJ MW-1 in the PSEP groundwater monitoring program beginning in 2007; the CRs agreed to the substitution via e-mail correspondence on February 12, 2007.

All changes to the PSEP groundwater monitoring program that are described above were implemented in 2007. Potentiometric monitoring, water-quality monitoring, extraction well testing, and groundwater modeling activities that were completed in support of performance assessment activities during 2007 are discussed in the following sections.

3.1 POTENTIOMETRIC MONITORING

Potentiometric monitoring of wells included in the PSEP continued to be conducted by the Watermaster and CRs throughout 2007. Locations of the wells included in the BPOU-wide potentiometric monitoring program are shown on Figure 3-1 and their monitoring schedules are presented in Table 3-1. The potentiometric monitoring frequency for extraction wells, piezometers, and multiport monitoring wells was adjusted in 2007 from monthly to quarterly as specified in Table 4.1 of the PSEP. Potentiometric monitoring completed for the PSEP during 2007 included the following:

- Potentiometric data were collected quarterly in 11 extraction wells, with a few exceptions: SA1-3 (Lante) was not accessible for water level measurement during the first quarter of 2007 and COI 5 was not accessible for water level measurement during the fourth quarter of 2007. Potentiometric data were not collected during 2007 in LPVCWD 3 because the well was not accessible for water level measurement during the scheduled monitoring event; however, quarterly water level measurements were collected in LPVCWD 2.

- Potentiometric data were collected quarterly in 16 piezometer clusters, three single piezometers, and 18 multiport monitoring wells, with a few exceptions: one piezometer cluster (PZ1-1B S/D) was not accessible for water level measurements during the first, second, and third quarters of 2007; one piezometer cluster (PZ1-3B S/D) was not accessible for water level measurements during the first and second quarters of 2007; one piezometer (PZ3-5BB) was not accessible for water level measurements during the first quarter of 2007.

- Potentiometric data were collected weekly in one conventional monitoring well, the LACO Key Well.

- Potentiometric data were collected semi-annually in seven conventional monitoring wells.

- Potentiometric data were collected semi-annually in 27 existing production wells with one exception; one production well (AZUSA 5) was not accessible for water level measurements during the second half of 2007.

In addition to the potentiometric data required by the PSEP, potentiometric data were also collected from various wells for other purposes, including quarterly monitoring at the MW 5-28 monitoring well cluster and continuous monitoring at selected sites during aquifer testing at the SGVWC B5 Subproject. Potentiometric monitoring data at the MW 5-28 monitoring well cluster are used to supplement the PSEP monitoring program upgradient of SWS well fields that are located to the east of the BPOU.

3.2 WATER-QUALITY MONITORING

Water-quality monitoring of new and existing wells included in the PSEP continued to be conducted by the Watermaster and the CRs throughout 2007. Locations of wells included in the BPOU-wide water-quality monitoring program are shown on Figure 3-2 and their monitoring schedules are presented in Table 3-2. Groundwater samples were analyzed for the 20 COCs listed in PSEP Table 2-1, including: 1,4-dioxane, NDMA, perchlorate, and VOCs. Groundwater samples were also analyzed for nitrate and sulfate because of their importance to treatment plant operations and potable use. Groundwater-quality monitoring completed for the PSEP during 2007 included the following:

- Groundwater samples were collected annually from five conventional monitoring wells.
- Groundwater samples were collected annually from 16 production wells. In five of the production wells that are currently inactive, discrete water-quality sampling was performed using dedicated low-flow sampling equipment that is installed at specific elevations within the well screened interval of each well.
- Groundwater samples were collected semi-annually from one conventional monitoring well and 18 existing multiport wells, with a few exceptions: the shallowest port in MW 5-03 (port 10) was dry during the Spring and Fall sample events; the shallowest port in WHICO MP-1 (port 6) was dry during the Fall sample event, and; sample containers for analysis of VOCs in MW 5-01 ports 1 and 2 from the Spring sample event were lost at the laboratory and were not analyzed.
- Groundwater samples were collected quarterly from 11 extraction wells, with a few exceptions: groundwater samples were not collected in SA1-3 (Lante) in the first and third quarters of 2007 because this well was not in service during the scheduled sampling event; groundwater samples were not collected in COI 5, SGVWC B5B, and SGVWC B5E in the fourth quarter of 2007 because these wells were not in service during the scheduled sampling event.

In addition to groundwater-quality monitoring required by the PSEP, other groundwater-quality monitoring was performed to supplement the PSEP during 2007 including the following:

- Groundwater-quality samples were collected quarterly from the MW 5-28 monitoring well cluster, with the exception of the first of quarter 2007. Groundwater-quality data at the MW 5-28 monitoring well cluster is used to supplement the PSEP monitoring program upgradient of SWS well fields that are located to the east of the BPOU. Groundwater samples from MW5-28 were analyzed for the COCs and chemicals of interest including VOCs, 1,4-dioxane, NDMA, perchlorate, nitrate, and sulfate.

- Groundwater-quality samples were collected from SGVWC B5B, SGVWC B5E, and COI 5 to monitor water quality during aquifer testing that was completed at these wells in 2007.

As discussed in Section 1.1, EPA requested additional groundwater-quality monitoring that is not outlined in the PSEP program including the following:

- Annual groundwater-quality samples were collected for analysis of 1,2,3-TCP in MW 5-01 (ports 7-11 only), MW 5-05, MW 5-08, MW 5-15, MW 5-19, MW 5-20, and MW 5-23.

- Annual groundwater-quality samples were collected for analysis of non-COC VOCs and ethylene dibromide (EDB) in VCWD Big Dalton and in the following multiport wells: MW 5-01 (ports 7-11), MW 5-03 (ports 4-9; port 10 was dry), MW 5-05, MW 5-08 (ports 3-4), MW 5-11, MW 5-13, MW 5-15, MW 5-19 (ports 4-5), MW 5-20 (ports 3-4), and MW 5-23 (ports 3-5).

- Annual groundwater-quality samples were collected for analysis of VOC and SVOC TICs in VCWD Big Dalton and in the following multiport wells: MW 5-01 (ports 7-11), MW 5-03 (ports 4-9; port 10 was dry), MW 5-05, MW 5-08 (ports 3-4), MW 5-11, MW 5-13, MW 5-15, MW 5-19 (ports 4-5), MW 5-20 (ports 3-4), and MW 5-23 (ports 3-5).

Results of the water-quality monitoring are presented in Section 5.2.

3.3 EXTRACTION WELL TESTING

Long-term aquifer testing was conducted at the SGVWC B5 Subproject from May 7 through July 9, 2007, in three wells (SGVWC B5B, SGVWC B5E, and COI 5) to evaluate the long-term hydraulic response of the aquifer to groundwater extraction. Water levels were monitored in the pumping well and in 17 observation wells during each aquifer test. Results of the aquifer testing were presented in a technical memorandum submitted to EPA in December 2007 (Geomatrix, 2007b). A summary of the SGVWC B5 aquifer testing results is provided in Section 5.3.

3.4 GROUNDWATER MODELING

As described in Section 6.1.1 of the PSEP (Geomatrix, 2004a), the BPOU groundwater model is the primary tool for assessing extraction system performance. Annual simulations consist of quarterly stress periods of basin-wide groundwater flow conditions. The BPOU groundwater model is described in the Comprehensive Groundwater Modeling Report, dated July 29, 2005 (Geomatrix, 2005). Previous updates to the model are described in the Addendum to the Comprehensive Groundwater Modeling Report, dated September 8, 2006, (Geomatrix, 2006d) and a technical memorandum dated December 14, 2007 (Geomatrix, 2007b).

3.4.1 Groundwater Model Update

As part of the December 14, 2007, technical memorandum (Geomatrix, 2007b), the groundwater model was updated through the end of water year (WY) 2005-06 with current recharge, pumping, and water level data. Since that time, the groundwater model has been updated through the end of WY2006-07 (ending June 2007) with current recharge, pumping, and water level data.

Water level data from WY2006-07 were obtained from LACDPW to update the time-variant head boundaries that are used to simulate inflows from the Chino Basin and outflows to Whittier Narrows. The boundary condition for Whittier Narrows was based on water levels in nearby wells LACO Well 2947F and Pico County Water Well 10. Well 2947F was destroyed in early 2007 and was replaced by Well 2947PP; water level data from Well 2947PP will be used to calculate the Whittier Narrows boundary from the first quarter of 2007 onward. All other boundary conditions remain as described in the Comprehensive Groundwater Modeling Report (Geomatrix, 2005).

Records from WY2006-07 were obtained from the LACDPW to update the recharge from spreading basins. Table 3-3 summarizes the updated recharge rates for each spreading basin and river reach used in the model for the entire model simulation period (WY1982-2007). Records for WY2006-07 were obtained from LACDPW for the precipitation stations used to update the portion of basin recharge that is derived from precipitation and irrigation return flows. Table 3-4 summarizes the updated recharge rates from precipitation and irrigation return flows for each precipitation zone used in the model for the entire simulation period (WY1982-2007). Figure 3-3 presents the total quarterly recharge volumes from water conservation facilities (spreading basins and river reaches) and aerially distributed recharge (precipitation and irrigation return flows) for the entire model simulation period.

Groundwater pumping for WY2006-07 was updated from the 2006-2007 San Gabriel Valley Watermaster Annual Report (Watermaster, 2007). No new wells were identified through review of the Watermaster Annual Report and the San Gabriel Basin Database that is maintained by CH2M-Hill and EPA. Figure 3-4 presents the quarterly pumping for the entire simulation period. Groundwater pumping in WY2006-07 continued to exhibit similar seasonal trends as previous years; the largest amount of pumping occurred during the peak of the dry season in the third quarter of the calendar year, and the smallest amount of pumping occurred during the peak of the wet season in the first quarter of the calendar year. Table 3-5 presents the updated list of all pumping wells used in the BPOU groundwater model, including the observed and simulated well screened intervals. Figure 3-5 shows a comparison of total recharge and total pumping through the entire model simulation period. As shown on Figure 3-5, total groundwater pumping of approximately 283,730 acre-feet during WY2006-07 was the highest combined pumping observed for the entire simulation period and represents an increase of approximately 24,160 acre-feet compared to WY2005-06.

As described in the technical memorandum dated December 14, 2007 (Geomatrix, 2007b), the following changes were made to the groundwater model in 2007:

- Refinement of the hydraulic conductivity distribution in the vicinity of the SGVWC B5 Subproject based on aquifer testing that was completed during 2007.

- Refinement of the hydraulic conductivity distribution in the vicinity of Puente Valley in response to EPA comments on the Comprehensive Groundwater Modeling Report (Geomatrix, 2005) and the Addendum to the Comprehensive Groundwater Modeling Report (Geomatrix, 2006d).

3.4.2 Performance Evaluation Simulations

Once the BPOU remedy is fully operational, PE simulations will be developed using the updated BPOU groundwater model and the transient particle tracking code, FETRAC, that is described in the Addendum to the Comprehensive Groundwater Modeling Report (Geomatrix, 2006d). The PE simulations will be developed using the updated BPOU groundwater model to demonstrate that the remedy is limiting the migration of COCs in groundwater by simulating actual pumping conditions in the BPOU project extraction wells and current water level conditions.

4.0 TREATMENT PLANT MONITORING ACTIVITIES

This section summarizes methods used to monitor treatment plant performance. Treatment plant operational results are presented in Section 6.0.

4.1 SUBAREA 1 – VALLEY COUNTY WATER DISTRICT LANTE TREATMENT PLANT

The VCWD Lante Treatment Plant operated on an interim basis, commonly at reduced flow rates, throughout 2007. Raw water, partially treated water, and fully treated water were routinely sampled and analyzed for COCs, 1,2,3-TCP, inorganic chemicals, and other diagnostic parameters to evaluate the effectiveness of treatment processes and to monitor the quality of the fully treated water. From January 1 to July 17, 2007, extracted water was treated and discharged to Big Dalton Wash. Since the LPGAC system became operational on July 18, 2007, treated water was delivered to VCWD and SWS customers. Water-quality data, as obtained, are summarized in the monthly progress reports to EPA.

In August 2006, by mutual agreement among EPA, South Coast Air Quality Management District (SCAQMD), and VCWD, air stripper and off gas control system permits with SCAQMD were cancelled and EPA assumed compliance oversight with respect to operations formerly covered by the SCAQMD permits. In 2007, weekly air samples were collected from the influent and effluent, for each operating off-gas control unit (both the resin and temporary VPGAC replacement systems). All air samples were analyzed by EPA Method TO-15. Temporary VPGAC systems, installed to replace the resin-based systems consist of three 15,000-pound single vessel units. The temporary VPGAC was changed out on November 13, 2007, under the rental agreement with Siemens Water Technologies Corporation. As they are received, certificates of disposal are provided to EPA in the monthly progress reports.

Since the LPGAC system to treat 1,2,3-TCP only became operational in July 2007, none of the carbon was exhausted and no carbon vessel change outs were required in 2007.

Waste brine and water softener wastes produced by the ISEP® system were discharged under Industrial Wastewater Permit No. 16112 from the LACSD, issued on August 5, 2004. Brine discharges occurred throughout 2007 while the treatment plant was operating. Quarterly brine discharge samples were collected and analyzed for VOCs, SVOCs, perchlorate, 1,4-dioxane, sulfide, oil and grease, chloride, alkalinity, calcium, magnesium, total toxic organics, suspended solids, and chemical oxygen demand. Quarterly Self Monitoring Reports (SMRs) were submitted to LACSD and EPA on or before April 15, July 15, and October 15, 2007, and

January 15, 2008. The SMRs summarize flow, pH, and brine quality data collected during the quarter.

4.2 SUBAREA 3 – LA PUENTE VALLEY COUNTY WATER DISTRICT TREATMENT PLANT

The LPVCWD Treatment Plant operated on a full-time basis in 2007, experiencing periodic downtime associated with routine maintenance and infrequent and unplanned operational interruptions. Raw and treated water sampling was performed in accordance with the DPH permit and included weekly sampling for VOCs, perchlorate, 1,4-dioxane, NDMA, and various inorganic and physical parameters. The weekly sampling results were included in monthly progress reports submitted to DPH as a requirement of LPVCWD's drinking water permit. These results were also included in the monthly progress reports to EPA.

In August 2006, by mutual agreement among EPA, SCAQMD, and LPVCWD, air strippers and off-gas unit permits were cancelled and EPA assumed compliance oversight with respect to operations formerly covered by the SCAQMD permits. The VOC treatment equipment consists of a 30-foot tall air-stripping tower with a single 7,000 pound vapor phase carbon adsorber and a 41-foot tall air-stripping tower with a single 20,400 pound vapor phase carbon adsorber. In 2007, air compliance samples were collected weekly and analyzed by EPA Method TO-15. The VPGAC was changed out in February 16, April 26, September 5, and November 7, 2007. All carbon was disposed of at the Carbon Activated Corporation (Carbon Activated) facility in Compton, California, which is authorized to accept Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) wastes. As they were received, copies of disposal manifests for change out of spent granular activated carbon were provided to EPA in the monthly progress reports.

Waste brine and water-softener wastes were discharged under an Industrial Wastewater Discharge Permit issued by LACSD. Quarterly brine discharge sampling was performed for VOCs, SVOCs, perchlorate, 1,4-dioxane, sulfide, oil and grease, chloride, alkalinity, calcium, magnesium, total toxic organics, suspended solids, and chemical oxygen demand. Four quarterly SMRs were prepared and submitted to LACSD and EPA on or before April 15, July 15, and October 15, 2007, and January 15, 2008.

Additional sampling and monitoring was associated with the ISEP® optimization program that was completed in early 2007. Sampling was primarily for nitrate, perchlorate, sulfate, calcium, magnesium, pH, hardness and alkalinity.

4.3 SUBAREA 3 – SAN GABRIEL VALLEY WATER COMPANY B6 TREATMENT PLANT

The SGVWC B6 Treatment Plant operated continuously in 2007, experiencing periodic downtime associated with routine maintenance and infrequent unplanned interruptions. Production was primarily from SGVWC B25A, B25B, B26A, and B26B; SGVWC B6C and B6D were infrequently operated as standby drinking water sources.

Raw and treated water sampling was performed in accordance with the DPH permit and included sampling for COCs, inorganic chemicals, and other diagnostic parameters. Water-quality data were summarized in monthly reports to DPH and were included in the monthly progress reports to EPA.

In August 2006, by mutual agreement among EPA, SCAQMD, and SGVWC, permits for the four air strippers and off-gas units were cancelled and EPA assumed compliance oversight with respect to operations formerly covered by the SCAQMD permits. Air samples are collected weekly from the air inlet, mid-point, and outlet to the vapor phase carbon beds. These data were included in the monthly progress reports to EPA. All four pairs of lead-lag carbon beds were changed out in February 2007, and two lead beds were changed out in July 2007. The carbon was reactivated at Carbon Activated's facility in Compton, California, which is approved by EPA to accept CERCLA wastes. Copies of disposal manifests for change out of spent granular activated carbon were provided as they were received in monthly progress reports to EPA.

Waste brine and water-softener wastes produced by the ISEP® system were discharged under Industrial Wastewater Permit No. 16499 issued on February 17, 2004. Brine discharges occurred throughout 2007. Quarterly brine discharge sampling is required, and was performed for VOCs, SVOCs, perchlorate, 1,4-dioxane, sulfide, oil and grease, chloride, alkalinity, calcium, magnesium, total toxic organics, suspended solids, and chemical oxygen demand. Four quarterly SMRs that summarize 2007 discharges and brine quality data were submitted to LACSD and EPA on or before April 15, July 15, and October 15, 2007, and January 15, 2008.

4.4 SUBAREA 3 – SAN GABRIEL VALLEY WATER COMPANY B5 TREATMENT PLANT

The SGVWC B5 Treatment Plant operated on an interim basis from March 2007 to the end of the year while the DPH permitting was in progress. Startup testing and subsequent routine sampling included analysis for COCs, inorganic chemicals, and other diagnostic parameters.

There are no air discharges from the SGVWC B5 Treatment Plant because VOCs are removed using LPGAC. In addition, there are no brine discharges because perchlorate is removed using single pass ion exchange. The SGVWC B5 Treatment Plant is expected to begin permitted operation in May 2008.

5.0 PERFORMANCE MONITORING RESULTS

Potentiometric and groundwater-quality monitoring data obtained for the PSEP during 2007 were collected in support of performance monitoring during continued construction, testing, and operation of the BPOU remedy. Results of potentiometric and water-quality monitoring are presented in the following sections.

5.1 POTENTIOMETRIC MONITORING RESULTS

The primary objective of the potentiometric monitoring described in Section 3.1 is to verify that the BPOU groundwater flow model accurately reflects the observed flow field and to verify that the remedy is limiting further migration of COCs in groundwater. As noted in Section 6.1.2 of the PSEP, results from potentiometric monitoring are also used to develop potentiometric surface maps to assist in evaluating changes in groundwater flow patterns in the BPOU.

Key components of the assessment of water level data include the following:

- Regional water level fluctuations due to basin-wide recharge and pumping conditions;
- Local-scale water level fluctuations due to ongoing groundwater production and extraction system pumping;
- Regional and local-scale lateral hydraulic gradients and flow directions; and
- Regional and local-scale vertical hydraulic gradients and flow directions.

Potentiometric monitoring results for 2007 are discussed in the following sections.

5.1.1 Water Level Fluctuations

Long-term regional water level conditions in the BPOU are evaluated using water level data for the LACO Key Well. Figure 5-1 shows the water levels measured in the Key Well from 1982 through 2007. During 2007, groundwater levels in the LACO Key Well declined approximately 25 feet from approximately 234 feet mean sea level (msl) in January 2007 to approximately 209 feet msl in December 2007. Review of 2007 monitoring data suggests that the observed water level decline in the LACO Key Well occurred in response to below average recharge and higher than average pumping in 2007.

Figures 5-2 and 5-3 show water levels in multiport monitoring wells MW 5-03 and MW 5-20. The hydrographs for MW 5-03 and MW 5-20 represent water level conditions in Subarea 1, in the northern portion of the BPOU, and in Subarea 3, in the southern portion of the BPOU, respectively. As shown on Figures 5-2 and 5-3, water levels in both Subarea 1 and Subarea 3 declined during 2007. Water levels in Subarea 1 declined approximately 23 feet between March and December 2007 while water levels in Subarea 3 declined approximately 16 feet during the same period. Water level data depicted on Figure 5-2 indicate that all ports in MW5-03 exhibit similar trends. As shown on Figure 5-3, water levels in the deeper ports of MW 5-20 (Ports 1 – 4) exhibited higher rates of decline than the shallow ports during the period between March and September 2007. During the period from September through December 2007, water levels in the deeper ports increased while water levels in the shallow ports continued to decline. As discussed in Section 1.3.3.1, the difference in the observed water level trend between the shallow and deep ports is likely the result of confining units in Subarea 3 that provide hydraulic separation between pumping in the shallow and deep extraction intervals.

5.1.2 Lateral Hydraulic Gradients

Generalized potentiometric surface maps for the shallow and deep extraction intervals were developed based on water level data collected in the multiport monitoring wells to assess observed groundwater flow patterns and gradients across the BPOU. Figures 5-4 and 5-5 show observed groundwater flow conditions in the shallow (above -500 feet msl) and deep (below -500 feet msl) extraction intervals in June 2007. Figures 5-6 and 5-7 show observed groundwater flow conditions in the shallow and deep extraction intervals in December 2007. Evaluation of observed groundwater flow patterns on a more detailed scale is limited by spatial variations in hydrostratigraphy and significant short-term water level fluctuations that occur in response to variations in local recharge and pumping.

As shown in Figures 5-6 through 5-9, groundwater flows towards the southwest, with a more westerly gradient in Subarea 3 in the vicinity of the SGVWC B5 Subproject and the California Domestic Water Company (CDWC) Bassett wellfield. Compared to regional groundwater flow directions observed in 2006, Figures 5-6 through 5-9 show that observed groundwater flow directions in Subarea 1 appear to be oriented in a more westerly direction in 2007. This is consistent with the variation in groundwater flow directions that has been observed in the past; groundwater flow directions are more southerly during higher water level conditions and are more westerly during lower water level conditions.

Regional-scale lateral hydraulic gradients were estimated using water levels measured in MW 5-03 and MW 5-20 during June and December 2007. Estimated lateral hydraulic gradients are summarized in Table 5-1. The following observations are presented based on the results shown in Table 5-1:

- Estimated lateral hydraulic gradients in the shallow extraction interval ranged from 3.7×10^{-4} to 6.5×10^{-4} toward the southwest.

- Estimated lateral hydraulic gradients in the deep extraction interval ranged from 6.9×10^{-4} to 1.2×10^{-3} toward the southwest.

- Lateral hydraulic gradients continue to be lower in the shallow extraction interval above -500 feet msl compared to lateral hydraulic gradients in the deep extraction interval below -500 feet msl.

5.1.3 Vertical Hydraulic Gradients

Water level measurements in multiport monitoring wells and piezometer clusters installed near extraction wells indicate that vertical hydraulic gradients vary throughout the BPOU. As discussed in Section 5.1.1, hydrographs shown on Figures 5-2 and 5-3 represent water level conditions in Subarea 1 (MW 5-03), in the northern portion of the BPOU, and in Subarea 3 (MW 5-20), in the southern portion of the BPOU, respectively. As shown on Figure 5-2, hydrographs for ports at different depths in MW 5-03 plot essentially on top of each other, indicating that there is no significant vertical hydraulic gradient in Subarea 1. However, as shown on Figure 5-3, hydrographs for ports at different depths in MW 5-20 are separated by up to 25 feet, indicating that there are significant vertically downward hydraulic gradients in Subarea 3.

Vertical hydraulic gradients calculated at selected multiport wells and piezometer clusters located in Subarea 1 and Subarea 3 are summarized in Table 5-2. The estimates summarized in Table 5-2 are based on semi-annual water level conditions in June/July 2007 and October/December 2007. As shown in Table 5-1, vertical hydraulic gradients continue to be lower in Subarea 1 compared to vertical hydraulic gradients in Subarea 3. Estimated vertical hydraulic gradients in Subarea 1 ranged from 7.7×10^{-4} upward to 1.7×10^{-3} downward. Estimated vertical hydraulic gradients in Subarea 3 ranged from 1.9×10^{-2} to 3.2×10^{-2} and are consistently downward.

5.2 GROUNDWATER QUALITY

Groundwater samples were collected from wells in the PSEP monitoring program to evaluate groundwater-quality conditions during continued construction, testing, and operation of the BPOU remedy. As described in Section 3.2, groundwater samples were analyzed for the 20

COCs listed in PSEP Table 2-1 including: 1,4-dioxane, NDMA, perchlorate, and VOCs. Groundwater samples were also analyzed for nitrate and sulfate because of their importance to treatment plant operations and potable use. As described in Section 3.2, other groundwater-quality monitoring was performed to supplement the PSEP during 2007. Water-quality monitoring results for 2007 are discussed in the following sections.

5.2.1 Water-Quality Results

Water-quality results for the PSEP in 2007 are summarized in Table 5-3. Table 5-3 also includes results from the MW 5-28 monitoring well cluster. An evaluation of the 20 COCs relative to their compliance with or exceedance of either California Maximum Contaminant Levels (MCLs) or, if no MCL has been established, California Drinking Water Notification Levels (NLs) and their frequency of occurrence was submitted to EPA in the technical memorandum dated February 17, 2004 (Geomatrix, 2004b). This memorandum recommended that interpretations of the spatial distribution and temporal trends of COCs in groundwater focus on seven selected COCs including: 1,2-dichloroethane (1,2-DCA); 1,4-dioxane; carbon tetrachloride; NDMA; perchlorate; PCE; and TCE. These seven COCs were selected because they meet one or more of the following criteria:

- Observed levels of the compounds meet or exceed either MCLs or, if no MCL has been established, the NLs, as applicable;
- They occur relatively frequently in the BPOU; and
- They may be a controlling compound relative to effectiveness of treatment processes used in BPOU Treatment Plants.

Although this report contains approximate depictions of the interpreted current spatial distribution and concentration trends of the seven selected COCs in groundwater, such depictions are at best approximate and are further evaluated in Sections 5.2.3 and 5.2.4 as well as Section 4.0 of Appendix A.

Results for other water-quality monitoring that was performed at EPA request to supplement the PSEP in 2007 are summarized as follows:

- Water-quality results for 1,2,3-TCP in a subset of multiport wells are presented in Table 5-4. Concentrations of 1,2,3-TCP were detected at levels that exceeded the NL (5 nanograms per liter [ng/L]) in several Subarea 1 monitoring wells, with the highest concentrations in MW 5-11. Concentrations of 1,2,3-TCP were also detected at levels that exceeded the NL at locations in the mid-plume region. Concentrations of 1,2,3-TCP did not exceed the NL in Subarea 3 monitoring locations.

- Water-quality results for EDB in a subset of multiport wells and in VCWD Big Dalton are presented in Table 5-5. No concentrations of EDB were detected at the method reporting limit (RL). EDB was detected in the sample from port 1 in MW 5-15 at a concentration between the RL and the method detection limit (DL).

- Water-quality results for non-COC VOCs in a subset of multiport wells and VCWD Big Dalton are presented in Table 5-6. Five non-COC VOCs were detected in various wells. All non-COC VOC results were below their respective MCL or NL.

- Water-quality results for VOC and SVOC TICs in a subset of multiport wells were presented in a technical memorandum dated December 17, 2007 (ERM, 2007). Two of the tentatively identified compounds were reported at concentrations above MCLs using SVOC analyses including PCE and TCE; these two compounds are currently addressed by the remedy for VOC treatment within the BPOU. Five other compounds that were detected at very low levels (less than 1 micrograms per liter [μg/L]) were tentatively assigned a specific chemical association that have no current regulatory standard or limit. A hydrocarbon class of compound was tentatively identified in 17 samples at very low concentrations.

- Water-quality results for VOC and SVOC TICs in VCWD Big Dalton are presented in Table 5-7. Two tentatively identified compounds were detected in VCWD Big Dalton at concentrations below the RL including heptacosane and tetratetracontane.

5.2.2 Data Validation and Data Quality Assessment

Data management activities for the BPOU Project continues to be migrated to LDC under contract to the Watermaster. LDC utilizes EDMSi, an EQUIS web-based database, for the management of historical data that was compiled from the EPA San Gabriel Basin database, CRs, WEs, and other relevant sources. New PSEP water-quality data are reported to LDC by laboratories and are validated in EDMSi as part of the real-time integrated automated Tier 1A/1B process and Tier 3 selection. As specified by the QAPP (Geomatrix, 2006b), Tier 1A/1B validation was performed by LDC on all water-quality data collected in support of the PSEP monitoring program and Tier 3 review was performed on approximately ten percent of the PSEP data. Results of the data validation are used to evaluate laboratory performance and ensure that data quality is acceptable to meet BPOU Project objectives.

Data qualifiers that were assigned during the Tier 1A/1B and Tier 3 reviews are shown with the groundwater-sampling results summarized in Table 5-3. Based on the data validation efforts and the evaluation of field quality control (QC) samples, three 1,4-dioxane sample results were rejected (MW 5-17 ports 1 and 2 on March 19, 2007, and EPA MW 5-10 port 3 on March 27, 2007); all other analytical sample results are considered usable to support the BPOU Project Data Quality Objectives (DQOs). Results of Tier 3 data review were submitted by LDC to the Watermaster on July 27 and October 12, 2007, and on January 11 and February 11, 2008 (LDC, 2007b, 2007c and 2008a, 2008b). The Tier 3 results were submitted by the Watermaster to EPA via e-mail and are also posted on a secure LDC BPOU web portal.

5.2.3 Distribution of Selected Chemicals of Concern

Consistent with previous annual reports, water-quality data from wells screened at selected depths within the aquifer were interpreted using the three-dimensional EarthVision® geospatial modeling software. A detailed description of the approach used for the development of plume maps and chemical cross sections for the seven selected COCs is presented in Appendix A. Generalized distributions of these seven COCs are presented on maps in Figures 5-8 through 5-14. These generalized distribution maps represent the composite lateral extent of each individual chemical at all depths in groundwater. The lateral distribution of the selected COCs is also shown in plan view at three specific elevation intervals in Appendix A. The three elevation intervals correspond to two shallow extraction intervals and one deep extraction interval, as follows:

- Shallow extraction interval between the water table and -200 feet msl;
- Shallow extraction interval between -200 feet and -500 feet msl; and
- Deep extraction interval below -500 feet msl.

The plume maps for the three elevation intervals shown in Appendix A include two sets of isoconcentration contours on each map. Isoconcentration contours at “discrete” elevations are shown for thin slices through the plumes at -50, -350 and -550 feet msl. Isoconcentration contours for “composite” elevation intervals are also shown for thick wedges of the plumes between the water table and -200 feet msl, between -200 and -500 feet msl, and below -500 feet msl.

Given the three-dimensional nature of the plumes, the reader is encouraged to consider the three-dimensional visualization that is inset in the corner of each figure when reviewing the two-dimensional plume maps and chemical cross sections. The three-dimensional visualizations will provide the appropriate context within which to review the two-dimensional isoconcentration contours shown on each plume map and chemical cross section. It should be noted that the water-quality data used to create the three-dimensional plume interpretations are posted on the plume maps according to the composite elevation intervals described above. Therefore, in many instances the discrete contours may not appear to correspond to water-quality data that are within the composite elevation interval but that are either above or below the elevation of the discrete contours.

Chemical cross sections showing the vertical distribution of selected COCs along four discrete transects are also shown in Appendix A. Cross section A-A' represents a north-south transect that is aligned generally with the longitudinal axis of the COC plumes. In previous years, two north-south transects were used to create chemical cross sections on the east and west margins of the COC plumes. However, the alignments of these cross sections were not ideally located and made the evaluation of the distribution of contaminants along the longitudinal axis of the plume difficult. As a result, cross section A-A' presented in this report is more closely aligned with the longitudinal axis of the COC plumes and, therefore, is more representative of the continuous longitudinal distribution of the COC plumes. Cross sections B-B', C-C', and D-D' represent east-west or northwest-southeast transects that are aligned generally perpendicular to the dominant groundwater flow direction in the BPOU. Cross sections B-B', C-C', and D-D' show the distribution of the COC plumes in the upgradient, mid-plume, and downgradient areas of the BPOU and include various production wells that are vulnerable to lateral migration of the COC plumes toward the west or east. Cross section C-C' is generally unchanged from previous annual reports but is slightly realigned so that it passes directly through several wells that were previously projected onto the cross section.

The depictions of plume geometry presented in Appendix A and summarized on Figures 5-8 through 5-14 represent the estimates of the distribution of the COCs in the BPOU in 2007. However, as with any approach used to interpolate data between known data points, there are uncertainties and limitations to the approach that may result in alternative interpretations of the distribution of COCs in groundwater. These uncertainties and limitations are summarized as follows:

- For clarity, and as requested by EPA, we have depicted the seven principal COCs in separate plume maps at three elevations. Plumes for the various COCs overlap (and/or diverge) at various depths throughout the impacted areas.

- The plume maps and chemical cross sections attempt to depict the dynamic and temporally changing three-dimensional distribution of COCs in groundwater with static two-dimensional images. While these maps and cross sections show two-dimensional isoconcentration contours of the COC plumes in plan view and in profile, they represent interpolated approximations of the distribution of COCs in groundwater based on available data. The exact subsurface distribution of the COCs cannot be completely ascertained given these and other potential limitations. The spatial and temporal spread of the chemical data may not encompass the entire distribution of chemicals in the groundwater (i.e., additional assumptions are necessary as to chemical concentrations in areas that may not be completely represented by monitoring wells). In particular, results of the interpolation should be carefully evaluated in areas where available data are limited or concentrations change significantly over short distances.

- Alternative interpretations of the distribution of the COC plumes are possible and may differ from the plume depicted here by utilizing plumes drawn manually using professional judgment. For example, plume maps and chemical cross sections for certain COCs portray discontinuous plumes in areas where the plumes may in fact be continuous.

- As described in Appendix A, the plume interpretations generally incorporate water-quality data for the period from September through November 2007. However, where data were not available for that time period, data from the next closest date during the January through December 2007 time period were utilized. While using such an expanded data set is helpful to some degree in the contouring exercise, it introduces additional uncertainties in comparing data taken from different time periods and assuming that the ultimate projection is a consistent one. Moreover, even using this temporally diverse data set, there are inevitable gaps in the existing data that limit our ability to define the distribution of COCs in groundwater completely. In addition, the EarthVision® software used to create the plume maps and chemical cross sections utilizes certain algorithms to interpolate or "fill in" data gaps in order to provide a more comprehensive picture of the distribution of COCs. Although the EarthVision® software objectively applies the selected interpolation scheme, other software and other interpolation schemes may be applied that may generate reasonable, yet differing, results, each appropriately honoring the available monitoring data. This is not a unique limitation of the EarthVision® software, but simply a limitation of any methodology with limited data. Consequently, the interpretation may result in differences between actual and interpreted concentrations at any given point in the Project area.

- The Duarte Fault is represented as a diffuse zone of faulting on the plume maps and chemical cross sections. However, no faulting was explicitly represented in any way in the 3D grid used to interpolate the plumes. The diffuse fault zone is considered to be a reasonable representation of the uncertainty in the fault's location as it has several fault splays concealed beneath alluvial deposits.

- The northern-most limits of the COCs depicted on the plume maps are uncertain due to the limited amount of data available to the CR group from other EPA-named PRPs, including the Mobil/Lockheed/Valspar group, as well as other entities that may be PRPs in the northern portions of the BPOU. The most recent available data from several PRP monitoring wells located north of the Duarte Fault indicates detections of several COCs such as TCE and PCE. In some cases the most recent detections were at concentrations that exceeded MCLs. Because the most recent data available for some of these PRP wells are several years old, such results were not explicitly included in the 2007 interpretation of the distribution of the COC plumes. However, to present an interpretation of the distribution of the COC plumes that recognizes COC detections in the most recently available data from PRP monitoring wells north of the Duarte Fault, the isoconcentration contours for TCE and PCE are shown extending upgradient (north) to the Duarte Fault zone.

Evaluation of both the generalized plume maps shown on Figures 5-8 through 5-14 and the detailed elevation-specific plume maps and chemical cross sections that are shown in Appendix A resulted in the following general observations and apparent changes in the spatial distribution of COCs in the BPOU compared to the previous year:

- The longitudinal extent of the longest COC plumes extends from north of the Duarte Fault zone in Subarea 1, approximately 7.5 miles towards the southwest, where the plumes terminate near the confluence of Avocado Creek and the San Gabriel River.

- The maximum lateral extent of the various COC plumes generally overlap throughout their extent, with the exception of the 1,4-dioxane plume, which has a much smaller lateral extent in comparison to other COC plumes.

- The vertical extent of the various COC plumes ranges from depths of approximately 600 feet below ground surface (bgs) to the north of Arrow Highway, in Subarea 1, to approximately 1,000 feet bgs in Subarea 3. The COC plume with the maximum vertical extent is carbon tetrachloride.

- In Subarea 1, the lateral extent of the 1,4-dioxane plume appears slightly wider compared to the previous year primarily as the result of higher concentrations in the shallowest ports of several multiport wells on the west side of the plume including MW 5-13, MW 5-17, and WHICO MP-1. The 1,4-dioxane plume appears to be vertically disconnected in the area of MW 5-24 with the deeper portion separated by approximately 600 vertical feet from the shallower and more laterally extensive portion of the plume. These deeper detections of 1,4-dioxane are considered anomalous and may be the result of contamination introduced into the formation or the borehole mudcake during well construction.

- In Subarea 1, the lateral extent of carbon tetrachloride appears slightly wider compared to the previous year primarily as the result of higher concentrations of carbon tetrachloride on the east side of the plume in the shallowest port of MW 5-18.

- In Subarea 1, the lateral extent of perchlorate appears slightly narrower compared to the previous year due to the non-detect results in 2007 at ALR MW-1R and ALR MW-8. In the previous year, concentrations of perchlorate were detected between the RL and DL and the results were qualified as estimated (J-qualifier).

- In Subarea 3, the lateral extent of perchlorate appears to extend slightly farther to the east than depicted in the previous year due to increased concentrations of perchlorate detected during 2007 in SWS 139W2, SWS 140W5, and the MW 5-28 monitoring well cluster.

- In Subarea 3, the downgradient extent of several COC plumes appears to be slightly different than the previous year due to slight changes in COC concentrations in various wells near the terminus of the plumes. The downgradient extents of 1,2-DCA, carbon tetrachloride, and TCE appear to be slightly reduced from the previous year whereas the extent of the NDMA plume appears to be slightly greater than the previous year.

When reviewing the general observations presented above, apparent changes in the interpreted spatial distribution of a particular COC plume from year to year should be considered with due caution. Historical variations in chemical concentrations have been observed seasonally and from year to year as basin water levels vary. In some instances, observed COC concentrations have fluctuated above and below MCLs (or NLs) and RLs (or DLs) during the span of one or two years or even from one sampling event to the next. Therefore, very slight changes in water quality results from one sampling event to the next may significantly alter the interpreted spatial extents of the COC plumes that are depicted on the plume maps and chemical cross sections. Therefore, while the apparent short-term changes in the interpreted plume extents may be representative of seasonal or annual changes, the apparent short-term changes should not be considered as representative of longer-term (multi-year) trends until such observations can be confirmed over several years. This is particularly important for wells located along the perimeter of the plumes.

5.2.4 Temporal Trends

Temporal trends in chemical concentrations for the seven selected COCs were evaluated by developing time-concentration graphs for all wells in the PSEP water-quality monitoring network as presented on Figures 5-15 through 5-21. Time-concentration graphs were created for selected multiport wells included in the BPOU-wide water-quality monitoring program for the period from 1982 through December 2007 using available data in the BPOU Project database. The graphs include data that were collected for BPOU performance monitoring activities as well as DPH and the Regional Water Quality Control Board (RWQCB) monitoring requirements. Concentrations of chemicals detected in groundwater samples are plotted using closed circles; chemicals not detected in groundwater samples were plotted at the reporting limit using open circles. Groundwater-quality results in multiport monitoring wells are grouped on the time-concentration graphs according to port elevations in three elevation intervals as follows: between the water table and -200 feet msl, between -200 and -500 feet msl, and below -500 feet msl.

Based on a review of the time-concentration graphs shown on Figures 5-15 through 5-21, the following observations are presented:

- Monitoring wells MW 5-11, MW 5-13, and MW 5-18 are located in the upgradient area of the COC plumes, north of Arrow Highway in the Subarea 1 portion of the BPOU. These wells are considered to be general indicators of the quality of groundwater that is flowing toward downgradient extraction wells installed for the VCWD Lante Subproject. Considering the historical data from these three multiport wells, concentrations of most COCs have generally decreased in 2007.

- Monitoring wells MW 5-05, MW 5-08, and MW 5-15 are located in the mid-plume area of the COC plumes, downgradient of Subarea 1 and upgradient of Subarea 3. These wells are considered to be general indicators of the quality of groundwater that is flowing downgradient toward the SGVWC B5 and B6 Subprojects, and LPVCWD Subproject extraction wells. Considering the historical data from these multiport wells, concentrations of most COCs in MW 5-05 and MW 5-15, located towards the center of most plumes, generally remained elevated above the MCL or NL in 2007. Higher concentrations were generally observed in the deeper ports relative to the shallow ports. Concentrations of COCs in MW 5-08, located on the western edge of the plume, were generally similar to observed concentrations for previous years although several COCs at that well location have decreased in concentration over the last three year period.

- Monitoring wells MW 5-19 and MW 5-23 are located within Subarea 3, upgradient of the SGVWC B5 Subproject extraction wells and the CDWC Bassett wellfield. These wells are considered to be general indicators of groundwater quality in the southern portion of the BPOU and representative of the quality of groundwater that is flowing downgradient toward the SGVWC B5 Subproject extraction wells and CDWC Bassett wellfield. In the shallowest extraction interval, above -200 feet msl, concentrations of COCs have been decreasing since 2001. In the extraction interval between -200 feet and -500 feet msl, concentrations of the COCs have remained relatively unchanged in MW5-19; COCs have generally increased in MW 5-23 in this depth interval. In the deep extraction interval, below -500 feet msl, concentrations of the COCs continued to remain below reporting limits in both MW 5-19 and MW 5-23, with the exception of carbon tetrachloride concentrations, which appear to have generally increased over time.

Observed increases or decreases in the concentration of a particular COC during a single sampling event should not be considered as a significant change in the overall trend of chemical concentrations at a particular well. Historical variations in chemical concentrations have been observed seasonally and from year to year as basin water levels vary. In some instances, observed COC concentrations have fluctuated above and below MCLs (or NLs) and RLs (or DLs) during the span of one or two years or even from one sampling event to the next.

5.3 WELL TESTING RESULTS

Aquifer testing was conducted in three extraction wells at the SGVWC B5 Subproject from May to July 2007. Results from aquifer testing were used to develop estimates of aquifer hydraulic properties, to evaluate the continuity of low permeability confining units in the vicinity of the SGVWC B5 extraction wells, and to evaluate the long-term hydraulic response of the aquifer to groundwater extraction associated with the SGVWC B5 Subproject. Hydraulic conductivity estimates are presented on Table 5-8. Aquifer testing results are summarized as follows:

- Hydraulic conductivities estimated from aquifer testing conducted on the SGVWC B5 Subproject extraction wells range from 107.2 to 661.6 ft/d. These hydraulic conductivities are generally consistent with previous estimates developed from aquifer tests conducted at other Subarea 3 extraction well locations.

- Hydrostratigraphic separating units interpreted at -200 and -500 feet msl in other areas of the BPOU appear to be present in the vicinity of the SGVWC B5 Subproject extraction wells. Based on the review of geophysical logs and observed water level responses to the aquifer testing, the hydrostratigraphic separating unit that is interpreted at approximately -200 feet msl at the SGVWC B5 well site and other areas of the BPOU is interpreted at a slightly higher elevation (-100 feet msl) at the COI San Fidel wellfield.

- Refinements to the distribution of hydraulic conductivity in the BPOU groundwater model were implemented based on the results of the aquifer tests. These refinements are intended to represent the hydraulic properties of the aquifer in the vicinity of the extraction wells as a whole and may not represent small scale heterogeneities that appear to be present in the shallower portions of the aquifer.

- The refined BPOU groundwater model accurately simulates groundwater flow conditions in the vicinity of SGVWC B5 Subproject extraction wells as demonstrated by simulations of pumping from SGVWC B5B, SGVWC B5E, and COI 5 extraction wells.

Detailed analyses of these long-term aquifer tests at the SGVWC B5 Subproject were provided as Attachment A to the technical memorandum, Update to BPOU Groundwater Model, submitted to EPA in December 2007 (Geomatrix, 2007b).

5.4 GROUNDWATER MODELING RESULTS

As described in Section 3.4, the BPOU groundwater model was updated with data through the end of WY2006-07. Groundwater model simulations continued to be evaluated using water level observations at 76 monitoring and production well locations that were selected as long-term basin-wide calibration targets, including 36 targets located in the BPOU area. Water level observations for WY2006-07 were updated from the San Gabriel Basin Database, California Department of Water Resources, LACDPW, the United States Geological Survey National Water Information System, and from data collected as part of the PSEP Monitoring Program.

As described in Section 5.1.1, WY2006-07 included a large basin-wide decline in water levels that occurred in response to below average recharge and higher than average total pumping from all wells in the San Gabriel Valley. Simulated and observed water levels at the LACO Key Well for the entire simulation period are shown on the hydrograph on Figure 5-22. Simulated and observed water levels in multiport wells in Subarea 1 and 3 are shown on the hydrographs on Figures 5-23 and 5-24. As shown on Figures 5-22 through 5-24, the groundwater model continues to simulate seasonal and multi-year water level changes that are observed throughout the BPOU.

Updated model calibration statistics are summarized in Table 5-9. The average basin-wide model residual (the average difference between model simulated and observed heads) for the long-term simulation is -2.66 feet. The average model residual for the 36 observation wells within the BPOU area is 0.39 feet. The root-mean squared error (RMSE) for the calibrated model is 17.60 feet for the entire model and 9.58 feet for the BPOU area. The updated annual model water balance for each water year and the average annual model water balance are summarized in Table 5-10.

5.5 GROUNDWATER EXTRACTION AND CHEMICAL MASS REMOVAL

Monthly groundwater extraction volumes for 2007 were compiled from monthly reports and submitted to DPH and EPA in monthly progress reports. Groundwater extraction volumes for all extraction wells that were operational in 2007 are shown in Table 2-1. Average monthly and average annual extraction rates are also provided in Table 2-1 together with design extraction rates for each extraction well, target operational extraction rates, and EPA-approved extraction rates for each well. Design extraction rates are based on the peak design capacity of the treatment plants whereas target operational extraction rates generally assume ten percent downtime for each well for treatment plant maintenance. The EPA-approved extraction rates shown in Table 2-1 are based on groundwater flow model simulations performed in 2000 and

2001 and represent the average extraction rates necessary to achieve the remedial action objectives.

Estimates of chemical mass removed from extracted groundwater in 2007 for the LPVCWD, SGVWC B6, and VCWD Lante Subprojects are presented in Section 6.0.

6.0 TREATMENT PLANT PERFORMANCE RESULTS

This section presents a summary of the operational performance results for those treatment plants that were operational in 2007.

6.1 SUBAREA 1 – VALLEY COUNTY WATER DISTRICT LANTE SUBPROJECT

As described earlier, the VCWD Lante Treatment Plant operated throughout 2007, discharging treated water to waste and providing potable water after the LPGAC system was permitted by DPH in July. Approximately 8,002 acre-feet of groundwater were extracted and treated from the three production wells for an annualized production rate of about 4,963 gpm.

Water-quality data collected from the individual production wells and from the fully treated water are summarized in Table 6-1. Table 6-1 also includes the design concentrations and expected average influent concentrations for the VCWD Lante Treatment Plant together with applicable MCLs and NLs for the COCs. Raw water concentrations exceeded design concentrations for only one compound, 1,1-dichloroethene (1,1-DCE), in wells SA1-1 and SA1-2. No COCs were detected at concentrations exceeding MCLs or NLs in the fully treated water; however, 1,2,3-TCP was detected in the fully treated water prior to installation of the LPGAC equipment. Figures 6-1 to 6-14 illustrate raw and treated water concentration trends relative to the applicable MCL or NL. In general, COC concentrations appeared to be relatively constant or decreasing in the three production wells with few exceptions. Nitrate in wells SA1-1 and SA1-2 was increasing, as was 1,4-dioxane and 1,1-DCE in SA1-3.

Average concentrations for untreated influent and fully treated water are summarized in Table 6-2. Mass removed was calculated by using the average raw water concentration for each COC from each of the three production wells and multiplying that result by the volume of water treated, with the appropriate dimensional conversion. In these calculations, concentrations below the detection limit were treated as zero. For the compounds considered, approximately 4,725 pounds of chemical mass were removed by the VCWD Lante Treatment Plant in 2007. This is more than twice the mass removed in 2006, reflecting the higher average flow rates realized by the treatment plant in 2007. Consistent with the influent concentrations, perchlorate, TCE, PCE, and 1,1-DCE represent most of the total mass removed.

Inlet and exhaust air quality data for 2007 are summarized in Table 6-3 for the four air strippers and the resin and carbon off-gas abatement systems. As expected from water-quality data, PCE, TCE, and 1,1-DCE were the primary VOCs detected in the vapor phase. Table 6-4 provides a summary of air risk and hazard calculated from compounds detected in the air exhaust. Risk was calculated using SCAQMD Tier 4 procedures and compared against ARARs. Calculated risk and hazard values were below ARARs for the Maximum Individual Cancer Risk (MICR), acute hazard, chronic hazard, and cancer burden.

In 2007, the VCWD Treatment Plant discharged approximately 86,652,000 gallons of waste brine to the LACSD sewer with an annual average discharge rate of approximately 165 gpm. In general, discharges met permit requirements with the exception of infrequent and short-term pH excursions below the permit limit of 6.0. The low pH excursions continue to be assessed and corrected as they are identified. Brine flows and pH data are summarized in Table 6-5.

6.2 SUBAREA 3 – LA PUENTE VALLEY COUNTY WATER DISTRICT SUBPROJECT

In 2007, the average annual flowrate at the LPVCWD Treatment Plant was 2,449 gpm, which exceeded the target of 2,250 gpm prescribed by the extraction plan. Approximately 3,951 acre-feet of groundwater were extracted and treated from LPVCWD 2 and 3.

Water-quality data are summarized for the compounds 1,2-DCA, carbon tetrachloride, PCE, TCE, perchlorate, 1,4-dioxane, NDMA, and nitrate in Table 6-6. Figures 6-15 to 6-21 illustrate raw and treated water concentration trends relative to the applicable MCL or NL. All treated water concentrations were below the MCLs, NLs, or reporting limit. TCE and carbon tetrachloride were the only compounds detected in the raw water at concentrations exceeding the design concentration and only in LPVCWD 2. In general, COC concentrations in the raw water were stable with the exception of NDMA, which showed increasing trends in both production wells.

Average chemical concentrations for treatment plant influent and treated water are summarized in Table 6-7 together with the volume of water treated and the total mass removed per chemical. In these calculations, concentrations below the detection limit were treated as zero. For the COCs considered, approximately 1,010 pounds of chemical mass were removed from the aquifer. This is nearly double the 587 pounds removed in 2006, largely because the annual extraction rate was higher in 2007 and production was from both LPVCWD 2 and LPVCWD 3. In 2006, pumping was mainly from LPVCWD 3, which has lower COC concentrations than LPVCWD 2.

Air quality data collected weekly from the Small Tower and Large Tower inlet and outlet are summarized in Table 6-8. A summary of the air risk and hazard associated with the off-gas

GAC systems is provided in Table 6-9. The MICR, acute hazard, chronic hazard, and cancer burden were not exceeded in 2007.

The LPVCWD Treatment Plant discharged approximately 10,054,000 gallons of waste brine to the LACSD sewer in 2007 with an average annual discharge rate of 19 gpm. Brine flows and pH data are summarized in Table 6-10. Discharges met permit requirements with the exception of short-term pH excursions below the permit limit of 6.0. The pH excursions continue to be diagnosed and corrected as they occur.

6.3 SUBAREA 3 – SAN GABRIEL VALLEY WATER COMPANY B6 SUBPROJECT

In 2007, the average annual flowrate at the SGVWC B6 Treatment Plant was 7,235 gpm, which exceeded the EPA extraction plan target of 6,500 gpm. Approximately 11,760 acre-feet of groundwater were extracted and treated.

SGVWC B6 Treatment Plant raw water-quality data are collected monthly and treated water data are collected weekly (Table 6-11). Table 6-11 also includes the design and expected average influent concentrations for the SGVWC B6 Treatment Plant together with applicable MCLs and NLs for the COCs. With the exception of carbon tetrachloride in SGVWC B26B and infrequently in SGVWC B25B, raw water concentrations did not exceed design concentrations in the production wells. No COCs were detected at concentrations exceeding MCLs or NLs in the fully treated water. Figures 6-22 to 6-31 illustrate raw and treated water concentration trends relative to the applicable MCL or NL. COC concentrations were relatively constant through the year with the following notes:

- PCE concentrations slightly increased in SGVWC B25A;
- TCE concentrations slightly increased in SGVWC B25A, B25B, and B26B; and
- Nitrate concentrations slightly increased in SGVWC B25A and B26A.

Average chemical concentrations for raw influent and fully treated effluent are summarized in Table 6-12, together with the volume of water treated and the total mass removed per chemical. In these calculations, concentrations below the detection limit were treated as zero. For the compounds considered, approximately 2,302 pounds of chemical mass were removed from the aquifer. Carbon tetrachloride, perchlorate, PCE, and TCE represented over 90 percent of the mass removed.

SGVWC B6 Treatment Plant air quality data are summarized in Table 6-13. Table 6-14 provides summary of air risk and hazard calculated from compounds detected in the air exhaust. Risk was calculated using SCAQMD Tier 4 procedures and compared against ARARs. Average calculated risk values were below ARARs for MICR, acute hazard, chronic hazard, and cancer burden. The maximum or instantaneous MICR ARAR was exceeded once in January 2007; however, the average MICR in January was below ARAR of 10×10^{-6}. In general, MICR throughout most of 2007 was well below 1×10^{-6}.

The SGVWC B6 Treatment Plant discharged approximately 48,335,000 gallons of waste brine to the LACSD sewer in 2007 with an average flowrate of 92 gpm. Brine flows and pH data are summarized in Table 6-15. Discharges met permit requirements with the exception of short-term pH excursions below the permit limit of 6.0 and exceedances of daily flow. The pH excursions continue to be diagnosed and corrected as causes are identified.

6.4 SUBAREA 3 – SAN GABRIEL VALLEY WATER COMPANY B5 SUBPROJECT

The SGVWC B5 Subproject operated on an interim basis in 2007, discharging treated water to waste. The average annual extraction rate was about 2,455 gpm, well below the target extraction plan rate of 7,000 gpm. Approximately 4,036 acre-feet of water were extracted and treated.

Raw water-quality data for the SGVWC B5 Treatment Plant are provided in Table 6-16, which also includes the design and expected average influent concentrations for the SGVWC B5 Treatment Plant and applicable MCLs and NLs for the COCs. Raw water concentrations did not exceed design concentrations in the production wells. COCs were not detected at concentrations exceeding MCLs or NLs in the fully treated water with the exception of 1,2-DCA on August 14, 2007, and September 12, 19, and 26, 2007; perchlorate on March 2, 2007; and NDMA on June 4 and June 20, 2007. The 1,2-DCA detections prompted a carbon change out. Subsequent analyses for perchlorate and NDMA in samples collected following the exceedances indicated concentrations below the drinking water limits. Figures 6-32 to 6-39 show raw and treated water concentration trends relative to the applicable MCL or NL. Because of the relatively few samples collected from the SGVWC B5 production wells, no conclusions regarding chemical concentration trends can be discerned.

Average chemical concentrations for raw influent and fully treated effluent are summarized in Table 6-17, together with the volume of water treated and the total mass removed per chemical. In these calculations, concentrations below the detection limit were treated as zero. For the compounds considered, approximately 119 pounds of chemical mass were removed from the aquifer. Carbon tetrachloride, perchlorate, and TCE represented most of the mass removed.

7.0 EVALUATION OF REMEDY PERFORMANCE AND TREATMENT PLANT OPERATIONS

7.1 GROUNDWATER EXTRACTION SYSTEM PERFORMANCE

As described in the PSEP and Section 3.0 of this report, the evaluation of remedy performance involves both short-term and long-term evaluation of groundwater extraction system performance. Annual PE reports will evaluate the short-term performance of the groundwater extraction system using groundwater modeling and empirical data to assess whether extraction well operation is limiting further migration of groundwater contamination into less contaminated areas. Groundwater extraction system performance is discussed in the following sections.

7.1.1 Extraction Well Performance

Based on step-drawdown testing, aquifer testing, and DPH-permitted operation, the VCWD Lante, LPVCWD, SGVWC B6, and SGVWC B5 Subproject wells are capable of achieving design extraction rates. Because of sanding problems at higher flowrates, LPVCWD operated both LPVCWD 2 and 3 extraction wells to achieve the target pumping rate of 2,250 gpm. To ensure a reliable water supply and provide flexibility if sanding or other problems arise, a new extraction well, LPVCWD 5, was installed in 2007 and will be developed, equipped and operated as the primary production well when it comes online in 2008.

7.1.2 Groundwater-Quality Trends

Spatial and temporal trends in groundwater quality in the BPOU as observed during baseline monitoring are described in Sections 5.2.1.1 and 5.2.2.2. Given that the majority of BPOU Project extraction wells have been in operation for only a few years and some are not yet at full production, it is premature to assess groundwater-quality trends as they relate to groundwater extraction system performance. Future annual PE reports and Five-Year Reviews will provide further assessment of groundwater trends as they relate to groundwater extraction system performance.

7.1.3 Groundwater Extraction and Chemical Mass Removal

The LPVCWD and SGVWC B6 Treatment Plants operated on a full time basis in 2007 and met their target extraction rates. The VCWD Lante Treatment Plant operated on an interim basis as LPGAC treatment was installed to remove 1,2,3-TCP. In addition, operational restrictions imposed by the ISEP systems due to high nitrate and sulfate concentrations in the SA1-1 and SA1-2 wells further limited treatment capacity. The VCWD Lante Treatment Plant had an average annual extraction rate of 4,963 gpm compared to the target rate of 6,000 gpm. The SGVWC B5 Treatment Plant operated intermittently at an annualized average flowrate of 2,455 gpm while the plant was being permitted.

The chemical mass removed at the VCWD Lante, LPVCWD, SGVWC B6 and SGVWC B5 Treatment Plants was 4,725 pounds, 1,010 pounds, 2,302 pounds, and 119 pounds, respectively. The BPOU project-wide total mass removed in 2007 was 8,156 pounds and since 2004 the cumulative mass removed is 15,304 pounds (Table 6-18).

7.1.4 Assessment of Migration Control

As discussed in Section 3.4.2, the assessment of migration control for the BPOU Project is dependent on the startup and continuous operation of all 11 extraction wells and all four treatment plants. Given that only the LPVCWD and SGVWC B6 Subprojects operated on a full-time basis in 2007, it is not yet practical to assess migration control for the BPOU Project. The SGVWC B5 Subproject began operating in late 2007, but at a reduced flow rate. Full-scale operation of the SGVWC B5 Subproject is not anticipated until after issuance of a DPH permit in Spring 2008.

The CRs intend to conduct simulations of hydraulic capture of BPOU Project extraction wells using the BPOU groundwater flow model and particle tracking once the extraction wells become operational on a continuous basis. The CRs will present the results of these simulations in future annual PE reports and Five-Year Reviews to assess groundwater extraction system performance as it relates to chemical migration control.

7.2 TREATMENT SYSTEM OPERATIONS

The treatment plant operations that were described in detail earlier in this report are summarized below.

7.2.1 Subarea 1 – Valley County Water District Lante Subproject

The VCWD Lante Treatment Plant discharged treated water to waste until mid-July 2007 after which it operated under its DPH drinking water permit and delivered fully treated water to SWS. The SA1-3 well was operated intermittently to manage 1,2,3-TCP concentrations as necessary. With the exception of 1,2,3-TCP when the plant was discharging to waste, the treatment plant was reliably treating extracted water to drinking water standards.

Improvements, operational problems, and issues that impacted operations and performance in 2007 and future operational issues include:

- The LPGAC system to treat 1,2,3-TCP was installed, tested, and permitted for operation by July 19, 2007;
- The air stripper off-gas control resin systems were removed and replaced with vapor phase GAC treatment systems that came on line in late 2007. While these permanent systems were installed, temporary GAC systems were used;
- The air-stripping towers experienced severe carbonate precipitation problems and required that each tower be taken off line, cleaned, and the packing replaced;
- Resin tests were concluded and indicated that single pass ion exchange to treat perchlorate is a technically and economically viable alternative to ISEP® and will result in ending perchlorate-bearing brine discharges;
- In 2008, the design for ISEP® replacement will be initiated and will evaluate options for nitrate treatment;
- Carbon change out criteria and an air compliance monitoring program will be finalized; and
- The chlorine analyzer will be relocated to allow for more mixing time relative to hydrogen peroxide and sodium hypochlorite injection.

7.2.2 Subarea 3 – La Puente Valley County Water District Subproject

The LPVCWD Subproject extracted and treated groundwater at an annual rate of about 2,449 gpm, exceeding the extraction target. The plant reliably treated raw water to drinking water standards for all COCs.

Improvements, operational problems, and issues that impacted operations and performance in 2007 and future operational issues include:

- The ISEP® optimization work was completed;
- The influent piping to the air strippers was modified for better VOC distribution;
- Resin testing was completed, single pass ion exchange equipment was selected, and single pass ion exchange design began;
- Single pass ion exchange construction will begin in 2008;
- LPVCWD 5 was drilled in 2007 and will be equipped and operational in 2008;

- Chemical dosing including peroxide, sodium hypochlorite, ortho/poly phosphate, and acid should be evaluated once LPVCWD 5 and the single pass ion exchange come online; and

- Carbon change out criteria and the air compliance monitoring program should be finalized once LPVCWD 5 is operational.

7.2.3 Subarea 3 – San Gabriel Valley Water Company B6 Subproject

The SGVWC B6 Treatment Plant extracted and treated water at an annual rate of 7,235 gpm, exceeding the extraction target of 6,500 gpm. The plant reliably treated raw water to drinking water standards for all COCs.

Improvements, operational problems, and issues that impacted operations and performance in 2007 and future operational issues include:

- Resin tests were completed and evaluation of single pass ion exchange design alternatives were initiated;

- Single pass design and construction will begin in 2008;

- Carbon change out criteria and the air compliance monitoring program will be finalized; and

- Chemical dosing should be optimized.

7.2.4 Subarea 3 – San Gabriel Valley Water Company B5 Subproject

The SGVWC B5 Treatment Plant completed startup testing and operated on an interim basis at an average annual flowrate of 2,455 gpm. The plant reliably treated raw water to drinking water standards except for certain detections of 1,2-DCA, perchlorate, and NDMA; however, all treated water was discharged to waste while the plant permitting process was being completed. The plant is expected to receive a DPH drinking water permit in May 2008.

8.0 SUMMARY AND RECOMMENDATIONS

All treatment plants are expected to be permitted and operational in 2008. Recommendations and operational issues to be addressed for the BPOU treatment plants in 2008 include:

- Proceed with design and construction of single pass ion exchange systems at the VCWD Lante, LPVCWD, and SGVWC B6 Treatment Plants;
- Develop and implement a reasonable, cost-effective, and protective off-gas air monitoring program at the VCWD Lante, LPVCWD, and SGVWC B6 Treatment Plants;
- Develop final carbon change out criteria for air stripper off-gas vapor phase GAC in order to maximize cost effectiveness and protection of human health and the environment;
- Optimize chemical amendment dosing at all treatment plants including peroxide (1,4-dioxane treatment), sodium hydroxide (pH adjustment), sodium hypochlorite (chlorination), ortho/poly phosphate (red water control), and acid (pH adjustment and calcium carbonate precipitation control in brine); and
- Evaluate use of Morton Long Beach salt at the VCWD Lante and SGVWC B6 Treatment Plants.

Recommended changes or clarifications to the overall performance monitoring program for 2008 are as follows:

- Semi-annual sampling in the multiport wells should be reduced to annual sampling except in selected ports, as required by the PSEP. The annual sampling event in the multiport wells should be conducted during September through November 2008.
- Based on the distribution of 1,4-dioxane, develop a reduced PSEP sampling program for this compound, particularly in the deeper multiport well intervals.
- Based on the results of VOC and SVOC analysis for TICs from Spring 2007 and as recommended in the December 17, 2007, memorandum from ERM (ERM, 2007), the results of TIC analyses do not suggest the presence of previously undetected chemical compounds or class of compounds that require further investigation. As a result, it is recommended that the requirement for VOC and SVOC TIC analyses be eliminated from the PSEP program.

- Similar to the requirement for TICs, analyses for non-COC VOCs do not suggest the presence of previous undetected chemical compounds that require further investigation. Consequently, it is recommended that the requirement for analyses of non-COC VOCs be eliminated from the PSEP program.

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