EXPLANATION OF SIGNIFICANT DIFFERENCES
TO THE 1998 INTERIM RECORD OF DECISION
PUENTE VALLEY OPERABLE UNIT
SAN GABRIEL VALLEY SUPERFUND SITES, AREA 4

Introduction and Purpose

The United States Environmental Protection Agency (EPA) is updating the Superfund cleanup plan for the Puente Valley Operable Unit ("Puente Valley OU") of the San Gabriel Valley (Figure 1) in Los Angeles County, California in response to the recent detection of two new pollutants in the groundwater underlying the area. The EPA adopted the original Puente Valley OU cleanup plan in 1998 after extensive public comment. The original cleanup plan is outlined in the 1998 Interim Record of Decision (Interim ROD). The 1998 cleanup plan calls for containing the VOC-contaminated groundwater in the shallow and intermediate groundwater zones at the mouth of the Puente Valley and treating it to remove the contaminants. The goals of the 1998 cleanup plan are to prevent exposure of the public to groundwater contaminated with volatile organic compounds or VOCs, including tetrachloroethylene (PCE), trichloroethylene (TCE), and other chlorinated solvents. This Explanation of Significant Difference (ESD) updates the Superfund cleanup plan to address the two newly detected contaminants, which include:

- 1,4-dioxane, a stabilizer in chlorinated solvents; and
- perchlorate, used in solid rocket fuel and other applications.

These two contaminants will need to meet all on-site and off-site requirements, as applicable. The chemicals of potential concern requiring containment are listed in Table 2 of Attachment 1 of this ESD. Since 1,4-dioxane is believed to be co-located with the VOCs, providing lateral and vertical containment for VOCs should also provide lateral and vertical containment for 1,4-dioxane, as required by the Performance Criteria. However, should the 1,4-dioxane need further lateral or vertical containment then additional action would be required.

The detection of 1,4-dioxane and perchlorate will change the cleanup project in the Puente Valley OU significantly. That is, the technologies that are typically used to remove chlorinated solvents from water (air stripping and carbon adsorption) do not effectively remove 1,4-dioxane or perchlorate. Therefore, where containment and treatment of 1,4-dioxane is necessary, different treatment technologies would need to be implemented. Likewise, should the treatment of perchlorate be necessary, a technology appropriate for perchlorate treatment would be needed. The installation of additional treatment facilities to treat 1,4-dioxane, and if necessary perchlorate, in the groundwater significantly increase the cost of the cleanup, as described below. Final decisions on treatment processes will be made during the remedial design and remedial action.

Additionally, the criteria by which performance of the remedy is measured ("Performance Criteria") have been modified. That is, if the Performance Criteria are exceeded or it is more likely than not that the Performance Criteria are going to be exceeded at any time during the Remedial Action, a reasonable amount of time will be allowed to take the necessary actions to

bring the system back into compliance. The modified Performance Criteria are set forth in detail in Attachment 1 of this ESD.

When significant, but not fundamental changes are needed in a Superfund cleanup plan, the EPA informs the community through an Explanation of Significant Differences (ESD). EPA has determined that an ESD is appropriate because the interim remedy remains as outlined in the Interim ROD: to contain contaminated groundwater in the shallow and intermediate zones at the mouth of the Puente Valley and to treat it to remove the contaminants. This ESD does not finalize the interim remedy.

The lead agency for the Puente Valley OU cleanup is EPA and the support agency is the California Department of Toxic Substances Control.

EPA is issuing this Explanation of Significant Differences to satisfy its public participation responsibilities under CERCLA Section 117(c) and NCP Section 300.435(c)(2)(i).

This ESD will become part of the Administrative Record file for the Puente Valley OU pursuant to NCP Section 300.825(a)(2) and will be available to the public at the following locations:

EPA Region 9 Superfund Records Center
75 Hawthorne Street
San Francisco, CA 94105 • (415) 536-2000

The Record Center's hours are 8:00 am to 5:00 p.m., Monday through Friday.

West Covina Public Library
1601 West Covina Parkway
West Covina, CA 91790
(626) 962-3541

Rosemead Library
8800 Valley Boulevard
Rosemead, CA 91770
(626) 573-5220

For hours of operation, interested parties may call the libraries at the numbers listed above.

The ESD is also available on the EPA's web site at http://yosemite.epa.gov/r9/sfund/rodex.nsf under the San Gabriel Valley (Area 4) heading.

The Puente Valley Cleanup: A Brief History

San Gabriel Valley Groundwater Contamination

Groundwater contamination in the San Gabriel Valley was discovered in 1979. In 1984, the EPA added four portions of the San Gabriel Valley to the national Superfund list: Areas 1 through 4. The Puente Valley OU is referred to as the *San Gabriel Valley Area 4* Superfund Site. Investigations by the EPA and other parties revealed the large extent of groundwater contamination in the Puente Valley OU and the San Gabriel Valley. During the past 20 years,

numerous water supply wells throughout the San Gabriel Valley have been found to be contaminated with chlorinated solvents and other VOCs. In response to the contamination, water companies have shut down contaminated wells, installed new treatment facilities, and taken other steps to ensure that they can continue to supply clean drinking water to the public.

Puente Valley Groundwater Contamination

In 1997, the Puente Valley Steering Committee ("PVSC"), a group of Potentially Responsible Parities ("PRPs") in the Puente Valley OU, completed the Remedial Investigation ("RI"), and EPA completed the Feasibility Study ("FS") for the Puente Valley OU. The RI determined that PCE, TCE, and other VOCs were contaminating the shallow and intermediate groundwater zones, underlying most of the City of Industry, and portions of the cities of La Puente and Walnut. Businesses and industrial operations in Puente Valley and surrounding areas had used these chemicals for degreasing, metal cleaning, and other purposes, and had released them to the ground through a combination of on-site disposal, careless handling, leaking pipes, and other means.

The RI/FS found that the uppermost, or shallow, groundwater zone contains most of the contaminant mass from the various sources. VOC contaminant concentrations in portions of the shallow zone are hundreds of times drinking water standards (see Figure 2). In the intermediate zone, VOC contaminant concentrations are lower, but still exceed drinking water standards (see Figure 3).

EPA and members of the PVSC have since installed and sampled numerous shallow and intermediate zone monitoring wells; modeled the contaminant flow in the shallow and intermediate zones; and completed much of the treatment system design. Ultimately, these efforts will aid in finalizing the shallow and intermediate zone containment designs and lead to the implementation of the groundwater treatment systems that will contain the contamination.

As a part of the design process, more field investigations were conducted to aid in the understanding of the extent of contamination and subsurface conditions. Consequently, the interpretation of the extent of contamination and the characteristics of the subsurface have been refined. More specifically, the shallow zone contamination dips down as it migrates north, towards the mouth of the Puente Valley. This is primarily a result of dipping subsurface geology that characterizes the shallow zone. Likewise, the subsurface geology in the intermediate zone, which lies below the shallow zone, also dips down as the contamination migrates north, towards the mouth of Puente Valley. Consequently, the contamination in the shallow and intermediate zones is located at greater depths at the mouth of the Puente Valley than at upgradient locations.

The vertical characteristics of the subsurface have also been more refined as additional field data has been gathered. This is particularly relevant in the eastern portion of the shallow zone plume, where the strong hydraulic gradient imposed by nearby production wells exerts a vertical pull on the shallow zone contamination into the intermediate zone.

Understanding the aquifer properties is important because the shallow and intermediate zones are being addressed by two separate containment systems with two sets of Performance Criteria. Both the shallow and intermediate zone systems must be contained to prevent the further migration of contaminants laterally and vertically above the respective Performance Criteria. The regional shallow zone Remedial Action includes groundwater containment at the mouth of the Puente Valley. However, one portion of the shallow zone Remedial Action (i.e., south of Puente Creek) will be addressed through a facility-specific Cleanup and Abatement Order ("CAO") administered by the Los Angeles Regional Water Quality Control Board ("RWQCB"). If the facility-specific cleanup work does not adequately contain the contamination south of Puente Creek, EPA may require additional action south of Puente Creek as part of the regional shallow zone Remedial Action.

Mid-Valley Monitoring

Mid-valley monitoring shall consist of a sufficient number of monitoring wells in the mid-valley area in the intermediate and deep zones to monitor potential migration of contamination from the intermediate zone to the deep zone, and to provide an early warning of up-valley conditions that may eventually impact the mouth of Puente Valley. Further discussion of Mid-Valley monitoring is in Section VI of Attachment 1 of this ESD.

Record of Decision

On September 28, 1998, the EPA adopted a cleanup plan for the Puente Valley OU known as the *Puente Valley Operable Unit Interim Record of Decision (ROD).* The plan addresses the contamination described in the RI/FS. The goals of the 1998 cleanup plan are to prevent exposure of the public to VOC-contaminated groundwater, limit the movement of VOC-contaminated groundwater into clean or less contaminated areas and depths, reduce the impact of continued contaminant migration on downgradient water supply wells, and protect future uses of uncontaminated areas.

The 1998 cleanup plan calls for containing the VOC-contaminated groundwater in the shallow and intermediate groundwater zones at the mouth of the Puente Valley OU, and treating it to remove the VOC contaminants. More specifically, the plan calls for the construction and operation of groundwater extraction wells, treatment facilities, and conveyance facilities capable of pumping and treating the volume of water necessary to treat the VOC-contaminated groundwater from the shallow and intermediate groundwater zones. The plan requires construction of new wells and treatment facilities for vertical and horizontal containment of the contamination in the shallow zone. The plan allows for construction of new facilities or the use of existing treatment systems and pipelines for both zones. It also allows for the use of existing water supply wells to provide intermediate zone containment. Final decisions on extraction rates and locations will be made during the remedial design phase of the project.

The 1998 Interim ROD selected a remedy that "is an interim measure to contain contaminant migration." (Interim ROD, 11-88). The Interim ROD established Performance Criteria for

containment at the mouth of the Puente Valley in two groundwater zones: the shallow zone and the intermediate zone. The Interim ROD shallow zone performance criteria were established as follows: "*The remedial action shall prevent groundwater in the shallow zone with VOC contamination above ten-times the ARARs listed in Table 1* [of the Interim ROD] *from migrating beyond its current lateral and vertical extent as described in the RI/FS for the PVOU.*" The Interim ROD intermediate zone performance criteria were established as follows: "*The remedial action shall provide sufficient hydraulic control to prevent groundwater in the intermediate zone with VOC contamination above ARARs listed in Table 1* [of the Interim ROD] *from migrating beyond the B7 Well Field Area. The B7 Well Field Area is defined as the area encompassed by (1) the wells listed in Table 5* [of the Interim ROD] *and (2) the current downgradient extent of contamination above ARARs in the intermediate zone, in the vicinity of the wells located in Table 5* [of the Interim ROD]."

After the Interim ROD was signed, and Special Notice letters were sent out, the PRPs were unable to make a unified offer for all of the work (i.e., shallow zone and intermediate zone cleanup, and Mid-Valley monitoring). In an effort to keep the cleanup process moving forward as expeditiously as possible, EPA carved out implementation of the remedy such that the intermediate and shallow zone work would be conducted by two different PRP groups or parties.

Reason for this Action: Detection of 1,4-Dioxane and Perchlorate in the Puente Valley OU

After the discovery in 1997 and 1998 of 1,4-dioxane, perchlorate, and NDMA in the Baldwin Park area, and hexavalent chromium in the San Fernando Valley, approximately 10 miles northeast of the San Gabriel Valley, the Los Angeles RWQCB requested that facilities in several areas of the San Gabriel Valley, including the Puente Valley OU, sample their groundwater monitoring wells for these "emergent chemicals." In 2002, the PRPs in the Puente Valley OU were required to sample selected shallow, facility-specific groundwater monitoring wells within areas of VOC contamination for emergent chemicals. In addition, as a part of the remedial design work in the shallow and intermediate zones, new monitoring wells were constructed and sampled.

Hexavalent chromium, NDMA, 1,4-dioxane, and perchlorate were all detected in shallow zone and intermediate zone groundwater in the Puente Valley OU. However, based on the sampling results, only the 1,4-dioxane and potentially perchlorate require treatment. The concentrations of 1,4-dioxane exceeded the State Notification Level in several sampling wells, with the maximum concentration exceeding 20 times the State drinking water Notification Level of 3 ug/L. In addition, historical facility-specific sampling results have shown groundwater concentrations around 5,000 ug/L for 1,4-dioxane. The concentrations of hexavalent chromium and NDMA did not exceed the State Notification Levels and therefore, do not require treatment pursuant to this ESD.

As a result of the additional sampling, EPA has determined that containment of 1,4-dioxane to meet the Performance Criteria of ten-times the Notification Level will be necessary in the shallow zone, and may be necessary in the intermediate zone to meet the Notification Level.

The treatment of perchlorate may be necessary in order to meet surface water discharge requirements pursuant to the Interim ROD, as modified by the ESD. If the end use of the treated water is an off-site activity, such as delivery into a public water supply; perchlorate treatment may be necessary to comply with all Federal, State and local laws in existence at the time, including any necessary drinking water permits. The need to implement the perchlorate treatment systems will be determined during the initial start-up of the shallow zone and intermediate zone Remedial Actions, when actual concentrations of the discharge can be measured to determine the need for perchlorate treatment.

Sampling indicates that the deep zone of the Puente Valley OU is not contaminated, and therefore no cleanup is required in this zone. However, the intermediate zone Performance Criteria require that the contaminated intermediate zone water at the levels listed in Table 2 of Attachment 1 of the ESD be prevented from migrating into the deep, clean zone.

Because the emergent chemicals were discovered after EPA issued the Puente Valley OU Interim ROD in 1998, EPA is now modifying the cleanup decision to address the relevant emergent chemicals. Monitoring data indicates that 1,4-dioxane, and potentially perchlorate, will be the emergent chemicals requiring treatment in the shallow zone. Monitoring data also indicates that 1,4-dioxane and perchlorate may require treatment in the intermediate zone.

The Remedial Action shall prevent groundwater in the shallow and intermediate zones at the mouth of Puente Valley with contamination greater than or equal to ten-times and one-times, respectively, the levels listed in Table 2 of Attachment 1 of the ESD from:

(1) migrating beyond its lateral extent as measured at the time the Remedial Action containment system is Operational and Functional; and
(2) migrating vertically into the intermediate zone and deep zone, respectively.

Table 1 shows the significant differences between the remedy as presented in the 1998 Interim ROD and the action now proposed.

Description of Treatment Options

In accordance with the Interim ROD, specific treatment technologies are not prescribed. The treatment technologies used must be sufficient to meet the Performance Criteria.

1,4-Dioxane

Ultra Violet (UV) light treatment system may be used to treat 1,4-dioxane. UV light treatment consists of contaminated water passing though a tank containing numerous ultraviolet lamps. UV light treatment, in combination with injection of an oxidant such as hydrogen peroxide, removes 1,4-dioxane. UV treatment systems have successfully removed 1,4-dioxane from water in locations throughout the United States. A 2,500-gpm treatment system using UV with oxidation for 1,4-dioxane removal is in operation in the Baldwin Park Operable Unit of the San Gabriel Valley sites. UV systems also successfully treat VOCs.

Perchlorate

Since 1997, when perchlorate was discovered in the San Gabriel Valley groundwater basin, technology for removing perchlorate from groundwater has made considerable advancements.

In the biological treatment process, nutrients are added to the contaminated water to sustain microbes that destroy perchlorate. The microbes convert the perchlorate ion to oxygen and chloride, which are present at low levels in all drinking water. The biological treatment process is being used in a full-scale treatment system at the Aerojet Superfund site in northern California. Biological treatment methods are new to many water utilities, but *biologically active* filters have been used in drinking water treatment for decades to help remove particles and biodegradable organic matter.

Another perchlorate-removal technology is ion exchange, in which the perchlorate ion is replaced by chloride, a chemically similar but non-toxic ion. Ion exchange processes have been used in homes and businesses for *softening* hard water for decades. In the Spring of 2001, a 2,500-gallon-per-minute groundwater treatment system using ion exchange to remove perchlorate began operation in the Baldwin Park Operable Unit, producing potable water for use in the San Gabriel Valley.

Other technologies have been proven capable of removing perchlorate from water including resin and to a limited extent liquid-phase granular activated carbon (LGAC). Conventional filtration, sedimentation, or air-stripping technologies cannot remove perchlorate from water.

Treatment Levels

Applicable or Relevant and Appropriate Requirements (ARARs)

The treatment technologies used in the Puente Valley OU will have to be capable of effectively and reliably removing VOCs, 1,4-dioxane, and possibly perchlorate, if treatment is necessary.

ARARs include only substantive, not administrative, requirements, pertain only to on-site activities, and are frozen at the time of the ROD, or ESD. Off-site activities must comply with all applicable federal, state, and local laws, including both substantive and administrative requirements that are in effect when the activity takes place.

The 1998 Interim ROD sets forth the ARARs for the Puente Valley OU for discharges to surface water. These ARARs include: 1) the RWQCB Basin Plan, as applied in the Interim ROD; 2) Resolution 68-16, as applied in the Interim ROD; and 3) the chemical specific ARARs listed in Table 1 of the Interim ROD. The Interim ROD, also sets forth when the chemical-specific ARARs apply to CERCLA § 104(b) activities. Except as noted in this ESD, the ARARs in the Interim ROD remain unchanged.

As noted in the Interim ROD, delivery of treated water into a public water supply is considered to be an off-site activity, and must meet all legal requirements for drinking water in existence at the time the water is served, including obtaining necessary State water supply permits. This ESD does not set any ARARs for treated water delivered into a public drinking water system, and clarifies that the ARARs set forth in the Interim ROD do not apply to the service of water into a public water supply. If any treated groundwater is to be used as drinking water, it must meet all applicable Federal, State, and local drinking water standards in existence at the time the water is served, including any permit requirements.

Consistent with CERCLA section 121(e)(l), an on-site discharge from a CERCLA site to surface waters must meet the substantive National Pollutant Discharge Elimination System Permit ("NPDES") requirements, but need not obtain an NPDES permit nor comply with the administrative requirements of the permitting process. Dischargers under the NPDES program may apply for a general permit if there is an applicable general permit available for the type of discharge contemplated, or a facility specific permit. The NPDES authority under the CWA has been delegated to the state of California, and is outlined in the RWQCB Basin Plan.

If any treated water is to be discharged to surface water, except with respect to the perchlorate and NDMA levels noted below, Region 9 is selecting Table F of the General Permit[1] as an ARAR for discharges to surface water because it generally reflects the substantive requirements, or discharge levels, that the State would require EPA to meet if a permit was necessary. See Table 3 of Attachment 1. However, the General Permit selects 4 ug/L as the discharge limit for perchlorate. Since the General Permit was issued in 2002, California modified the notification level for perchlorate from 4 to 6 ug/L and set the Public Health Goal (PHG) for perchlorate at 6 ug/L. This change is reflected in the perchlorate levels California is requiring dischargers to meet pursuant to recent facility specific NPDES permits. Therefore, this ESD selects 6 ug/L as the ARAR for the surface water discharge of treated water containing perchlorate because it is the level, or substantive requirement, the State would require EPA to meet if EPA applied for a facility specific NPDES permit.

Table F of the General Permit selects 0.00069 ug/L as the discharge limit for NDMA, but provides a non-detect result using a 5 ug/L detection level is deemed to be in compliance. EPA is selecting 0.01 ug/L for NDMA, a "to be considered" (TBC) level, as the discharge level for NDMA because it is the State Notification Level for NDMA, and 0.5 ug/L as the nondetect level which will be deemed to be in compliance with the 0.01 ug/L notification level. EPA is selecting 0.5 ug/L as the nondetect level which will be deemed to be in compliance with the Notification Level because it is the current detection limit for NDMA and because it is an order of magnitude closer to the Notification Level than the 5 ug/L selected in the General Permit.

[1] The General Permit is California Regional Water Quality Control Board, Los Angeles Region (LARWQCB), Order No. R4-2002-0107, "Waste Discharge Requirements for Discharges of Treated Groundwater from Investigation and/or Cleanup of Volatile Organic Compounds Contaminated-Sites to Surface Waters in Coastal Watersheds of Los Angeles and Ventura Counties (GENERAL NPDES PERMIT NO. CAG914001)."

Except as noted below, the ARARs identified in the 1998 Interim ROD remain unchanged.

1) Tables 2 and 3 of Attachment 1 of this ESD replace Table 1 of the Interim ROD. Table 2 of attachment 1 lists the chemicals of concern requiring containment and the containment level. Table 3 of attachment 1 lists chemical specific ARARs that apply to discharges to surface water.

⊕△ This ESD clarifies that the ARARs set forth in the Interim ROD do not apply to the service of water into a public water supply. If any treated groundwater is to be used as drinking water, it must meet all applicable Federal, State, and local drinking water standards in existence at the time the water is served, including any permit requirements.

3) For chemicals requiring containment in Table 2 of attachment 1 that do not have a containment level, monitoring shall be required. However, since no containment levels are provided, these chemicals will not be evaluated to determine whether the Performance Criteria are being met.

Estimated Cost

In the 1998 Interim ROD, EPA estimated the cost to contain and treat the VOC-contaminated groundwater to be approximately $8.3 million for capital costs associated with construction, and $1.3 million per year for annual operations and maintenance costs. EPA has revised the cost estimate to account for the additional treatment of the newly detected chemicals in shallow and intermediate groundwater, and a greater volume of water needing treatment. The current capital cost estimate to contain and treat for VOCs and 1,4-dioxane is approximately $22 million, with an estimated $2.3 million per year for annual operations and maintenance activities. However, should perchlorate treatment be necessary the total capital cost would be approximately $23.3 million, and an estimated $2.9 million per year for annual operations and maintenance activities.

The revised cost estimates are based on an evaluation of the latest treatment options for 1,4-dioxane and perchlorate. However, based on the estimated combined effluent concentrations, perchlorate may not need to be treated.

In addition, the revised cost estimate is also based on the updated extraction and treatment rates necessary to obtain groundwater containment for the Interim Remedial Action. More specifically, the 1998 cleanup plan estimated that the total extraction rate for the shallow and intermediate zones at approximately 1,700 gallon per minute (gpm). Currently, the extraction rate is estimated to be around 1,375 gpm in the shallow zone and approximately 1,000 gpm in the intermediate zone. The revised total estimated extraction rate of 2,375 gpm equates to an approximate 40 percent increase in the volume of water requiring treatment. The cost estimates contained herein do not include the costs of the shallow zone Remedial Action south of Puente Creek, which will be addressed by a facility-specific CAO administered by the RWQCB.

The additional treatment necessary to remove 1,4-dioxane, and potentially perchlorate, as well as the increase in the volume of water needing treatment are the primary factors responsible for the rise in cleanup cost estimates in the Puente Valley OU.

Final Selection of Treatment Technologies

Final selection of treatment technologies for 1,4-dioxane and perchlorate will be completed during the remedial design. However, the need to implement the designed 1,4-dioxane and perchlorate treatment systems will be determined during the initial start-up of the shallow zone and intermediate zone Remedial Actions, when actual concentrations of the treatment plants discharge can be measured to determine the need to install perchlorate treatment.

State Concurrence

The California Department of Toxic Substances Control documented concurrence with this ESD in a letter dated May, 20, 2005.

Statutory Determination

As required by CERCLA Section 121(d), the modified cleanup plan for the Puente Valley OU remains protective of human health and the environment and will meet all ARARs identified in the 1998 Interim Record of Decision, as modified by this ESD.

Public Participation Compliance

An ESD notice will be published in June 2005 in a local newspaper as required by the NCP, section 300.435(c)(2)(i)(B). The public participation requirements set out in the NCP, sections 300.435(c)(2)(i) and 300.825(a)(2) will continue to be met.

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June 14, 2005
Date

Table 1. Comparison of Cleanup Plans – Most Aspects of the 1998 Plan Have Not Changed

Remedial Action Categories	Original Cleanup Plan	Updated Cleanup Plan
Remedial Objectives	Prevent exposure, limit further migration of contaminated groundwater, reduce impacts on down-gradient water supply wells, protect future uses of clean areas.	Same
Groundwater Extraction Areas	Extract groundwater from the intermediate zone and the shallow zone at the mouth of Puente Valley	Same
Groundwater Treatment Wells	Four wells in the shallow zone and four wells in the intermediate zone	The number of wells will be determined during the Remedial Design and Remedial Action
Groundwater Extraction Wells and Rates	Extract contaminated groundwater at rates needed to meet remedial objectives. Determine final rates during remedial design. Initial estimate was 1,700 gpm combined extraction rate for the shallow and intermediate zones. Calls for 8 extraction wells.	Estimated total extraction rate has increased to 2,375 gpm. Number of extraction wells will be determined during the remedial design and remedial action.
Groundwater Treatment Technologies	Use air stripping with off gas treatment or liquid-phase granular-activated carbon (LGAC) to remove VOCs from the groundwater. Finalize technologies during remedial design.	Technologies to remove VOCs have not changed. Use of either ion exchange or biological treatment process to remove perchlorate. UV light with oxidation can be used to remove 1,4-dioxane and VOCs. Select technologies during remedial design.
Groundwater Containment and Treatment Standards	Design treatment systems to meet Performance Criteria, which are to contain contaminants to below the levels in Table 1 of the Interim ROD in the intermediate zone, and to below 10-times the levels in Table 1 of Interim ROD in the shallow zone. Extracted water must be treated to meet all ARARs.	Areas of containment were modified to reflect the current state of the plume. 1,4-dioxane has been added to the contaminants of concern requiring containment. The basic Performance Criteria remain the same, but have been clarified. Also, the method of measuring compliance with the Performance Criteria has changed (Attachment 1,Compliance with Performance Criteria). Extracted water must be treated to meet all ARARs, as modified by this ESD.
Use of Treated Groundwater	Discharge to surface water or to a water supply line for municipal use.	Same
Project Costs	Estimated capital costs of $8.3 million; estimated operation and maintenance costs of $1.3 million per year.	The estimated capital and O&M cost without perchlorate treatment are approximately $22 million, and $2.3 million per year, respectively. The estimated capital and O&M cost with limited perchlorate treatment is estimated at $23.3 million and $2.9 million per year.

ATTACHMENT 1

COMPLIANCE WITH PERFORMANCE CRITERIA

Compliance with Performance Criteria

1.0 Background

The 1998 Interim Record of Decision (Interim ROD) selected a remedy that "is an interim measure to contain contaminant migration." (Interim ROD, 11-88). The Interim ROD established Performance Criteria for containment at the mouth of the Puente Valley in two groundwater zones: the shallow zone and the intermediate zone. The Interim ROD identifies the zones as follows:

> "The shallow zone generally encompasses the upper 100 feet of the saturated aquifer, including the interval between the water table and approximately 150 feet bgs. The intermediate zone generally includes the relatively coarse-grained interval between the shallow zone and deeper portions of the aquifer used for ground-water production." (Interim ROD, 10-3).

Investigations to date conducted subsequent to the 1998 Interim ROD indicate that 1) a clear boundary does not exist between the shallow and intermediate zones; 2) 1,4-dioxane is present at levels requiring containment in the shallow zone, and possibly in the intermediate zone; and 3) groundwater contamination extends further laterally and vertically than was understood at the time of the 1998 Interim ROD. Maps showing EPA's current interpretation of VOCs in the shallow and intermediate zones are shown on Figures 2 and 3, respectively of the ESD.

In addition, investigations have shown that 1,4-dioxane at the mouth of the Puente Valley is generally co-located with the VOCs. Consequently, meeting the Performance Criteria for VOCs should also meet the Performance Criteria for 1,4-dioxane. However, should the 1,4-dioxane need further lateral or vertical containment beyond that which is required for containing VOCs, then additional action would be required.

EPA also determined that the shallow zone extends deeper in the mouth of the valley than was interpreted at the time of the 1998 Interim ROD. EPA now believes that the shallow zone at the mouth of the valley generally encompasses the upper 150 to 200 feet of the saturated aquifer, including the interval between the water table and approximately 250 to 300 feet bgs. The intermediate zone generally includes the relatively coarse-grained interval between the shallow and the deep zones. The deep groundwater zone is the main portion of the aquifer that is used for domestic groundwater production. In general, at the mouth of Puente Valley, the upper part of the deep zone is at a depth of approximately 400 to 430 feet bgs. A few of the domestic production wells at the mouth of Puente Valley have upper-screened intervals within the intermediate zone. The shallow zone shall be deemed not to extend below the depths corresponding to the current upper perforated intervals of San Gabriel Valley Water Company production wells B7C and B11B

(280 and 302 feet below ground surface [bgs], respectively), and Suburban Water Systems production well 147W3 (300 feet bgs).

Monitoring well data demonstrate that the majority of contaminant mass from sources at the mouth of Puente Valley is staying in the shallow zone. However, there is a downward hydraulic gradient in the area and some contaminant mass is migrating downward and into the intermediate zone, particularly in the eastern area. Contamination is observed in the intermediate zone, but at lower concentrations than what is observed in the shallow zone. Currently, the deep zone at the mouth of Puente Valley does not exhibit contamination, and production wells screened only in the deep zone do not exhibit contamination.

Differentiation between the shallow and intermediate zones shall be based on the observed hydrostratigraphy, contaminant concentrations, production well screened intervals, and hydraulic heads. In some areas within the mouth of Puente Valley, it is difficult to differentiate the generalized hydrostratigraphic zones. Consequently, zone differentiation will be based on multiple lines of evidence, including groundwater quality data, hydraulic head data, hydrostratigraphy, and depth with respect to the upper screened intervals of mouth-of-valley production wells (e.g., San Gabriel Valley Water Company wells B7C, B11A, and B11B, and Suburban Water Systems well 147W3). Numerical modeling may also be used to help differentiate the generalized hydrostratigraphic zones. The generalized aquifer zones are described in more detail in the Table 1, below.

Table 1 Puente Valley Operable Unit Aquifer Zones

Generalized Hydrostratigraphic Zone	Unique Characteristics Relevant to Performance Criteria
Shallow Zone	The shallow zone shall be deemed not to extend below the depths corresponding to the current upper perforated intervals of San Gabriel Valley Water Company production wells B7C and B11B (280 and 302 feet below ground surface [bgs], respectively), and Suburban Water Systems production well 147W3 (300 feet bgs). The majority of the contaminant mass at the mouth of the Puente Valley is migrating within the shallow zone. However, there is a downward hydraulic gradient in the area and some contaminant mass is migrating downward and into the intermediate zone, particularly in the eastern area. Depending on the location within the mouth of the Puente Valley, some lateral contaminant migration is toward the northwest, and some toward the north and then northwest.
Intermediate Zone	The intermediate zone includes water bearing strata in the interval between the shallow zone and the deep zone. The deep zone is the primary source of groundwater production in the mouth of Puente Valley. Several production wells at the mouth of Puente Valley produce water from the intermediate zone (e.g., upper screened intervals of 280 and 300 feet below ground surface). Consequently, the intermediate zone is characterized by a lower hydraulic head than the shallow zone. However, the

	intermediate zone is not necessarily isolated from the shallow zone everywhere at the mouth of Puente Valley. All the contamination in the intermediate zone originated in the shallow zone, either at the mouth of Puente Valley or at sources up valley. In the western portion of the mouth of Puente Valley, intermediate zone contamination may primarily originate at sources "up valley." In contrast, in the eastern portion of the mouth of Puente Valley, the main source of intermediate zone contamination is shallow zone contamination at the mouth of the Puente Valley that has migrated down into the intermediate zone. As previously noted, several existing potable supply wells at the mouth of Puente Valley produce water from the intermediate and deep zones. Production from the intermediate zone at the mouth of Puente Valley creates a cone of depression or sink for most intermediate zone groundwater in that area. Consequently, these existing production wells are the current downgradient limit for much of the intermediate zone groundwater flow at the mouth of Puente Valley.
Deep Zone	The deep groundwater zone is the main portion of the aquifer that is used for domestic groundwater production. In general, at the mouth of Puente Valley, the deep zone extends from a depth of approximately 400 to 1,130 feet bgs. Because production wells at the mouth of Puente Valley produce most of their water from this zone, hydraulic heads are lower in this zone, compared to the shallow and intermediate zones. Also, this zone currently does not exhibit contamination.

2.0 Performance Criteria

The process by which compliance with shallow and intermediate zone Performance Criteria is measured has been modified and is outlined below. More specifically, the Interim ROD calls for a noncompliance determination as soon as a shallow or intermediate zone compliance well detection shows concentrations above the respective Performance Criteria. In contrast, the modifications presented below allow for a period of time to bring the system back into compliance. In addition, the Performance Criteria language for the shallow and intermediate zones have been clarified, as described below.

2.1 Performance Criteria for the Shallow Zone

The Remedial Action shall prevent groundwater in the shallow zone at the mouth of Puente Valley with contamination greater than or equal to ten-times the levels listed in Table 2[1] from:

[1] The values in Table 2 are identical to Table 1 of the Interim ROD, except 1,4-dioxane is added to the chemicals requiring containment and chemicals that had no associated value in the Interim ROD were deleted.

(1) migrating beyond its lateral extent as measured at the time the shallow zone Remedial Action containment system is Operational and Functional; and
(2) migrating vertically into the intermediate zone.

This criterion will require monitoring of both lateral and vertical contaminant migration in the shallow zone, as described below. A combination of new and existing wells will be required to adequately monitor compliance.

2.1.1 Compliance Monitoring of Lateral Migration in the Shallow Zone

Compliance wells shall be located downgradient of contamination exceeding ten-times the levels in Table 2, but within areas where there is detectable contamination. Compliance wells shall be located using best professional judgement, and at locations and depths approved by EPA in consultation with DTSC. A sufficient number of compliance wells shall be installed to monitor contaminant conditions laterally downgradient of the area at the mouth of the Puente Valley where contaminant concentrations exceed ten-times the levels in Table 2.

Compliance wells shall monitor groundwater quality in the same vertical interval of the shallow zone where upgradient containment extraction wells are installed, recognizing the shallow zone has a downward dip to the north and northwest.

2.1.2 Compliance Monitoring of Vertical Migration in the Shallow Zone

A sufficient number of vertical compliance wells shall be located to adequately monitor potential vertical migration at the mouth of Puente Valley. Compliance wells shall be located using best professional judgment and at locations and depths approved by EPA in consultation with DTSC. The vertical compliance wells shall be located at a depth that is below the vertical interval that has contaminant concentrations that exceed ten-times the levels in Table 2, but within an area that is likely to contain detectable concentrations of contaminants, unless there is no vertical interval in the lower shallow zone with contaminant concentrations less than ten-times the levels in Table 2. In that case, vertical compliance wells shall be located in the lower shallow zone where concentrations exceed ten-times the levels listed in Table 2. Hydraulic conditions may change, thus the work party or parties shall make any necessary adjustments to the containment system(s) to accommodate changes in hydraulic conditions that may compromise the effectiveness of the shallow zone containment system.

2.2 Performance Criteria for the Intermediate Zone

The Remedial Action shall prevent groundwater in the intermediate zone at the mouth of Puente Valley, with contamination greater than or equal to the levels listed in Table 2 from:

(1) migrating beyond its lateral extent as measured at the time the intermediate zone Remedial Action containment system is Operational and Functional; and
(2) migrating vertically into the deep zone.

Compliance with this criterion will require monitoring of lateral and vertical contaminant migration in the intermediate zone, as described below. A combination of new and existing wells will be required to adequately monitor compliance. Monitoring vertical compliance will be required in the deep zone downgradient of the intermediate zone containment system. The deep zone refers to the generalized hydrostratigraphic zone underlying the intermediate zone. Mouth-of-valley- production wells extract much of their water from the deep zone, which has also been referred to as the "production zone." The Remedial Action shall also intercept intermediate zone contamination to prevent it from continuing to impact the B7 Well Field Area, as well as reduce contaminant concentrations in the B7 Well Field Area (as defined in the Interim ROD). A combination of new and existing compliance and monitoring wells will be required to adequately monitor compliance.

2.2.1 Compliance Monitoring of Lateral Migration in the Intermediate Zone

If containment extraction wells are located upgradient of production wells at the mouth of Puente Valley, and the production wells continue to extract groundwater from the intermediate zone, then compliance wells shall be located between the containment extraction wells and the production wells, but within the zone of capture for the production wells. A sufficient number of compliance wells shall be installed at the mouth of Puente Valley to monitor contaminant conditions laterally downgradient of the intermediate zone containment system and upgradient of the protected production wells. Existing contamination at concentrations above the levels in Table 2 in compliance wells between the intermediate zone extraction wells and the production wells shall be monitored for a decreasing trend until concentrations are below Performance Criteria. California Department of Health Services (DHS) required sampling of production wells already impacted by contaminants may also be used to identify a trend of declining concentrations. Monitoring of hydraulic heads may also be used to help demonstrate the effectiveness of the intermediate zone remedy in intercepting further contaminant migration into the B7 Well Field Area.

Compliance wells shall monitor groundwater quality in the same vertical interval of the intermediate zone where upgradient containment extraction wells are installed, recognizing that the intermediate zone has a downward dip to the north and northwest.

If the existing production wells are replaced or modified such that they no longer produce water from the intermediate zone and only produce water from the deep zone, compliance wells shall be located downgradient of contamination exceeding levels in Table 2, but within areas where there is detectable contamination. A sufficient number of compliance wells shall be installed to monitor contaminant conditions laterally downgradient of the area at the mouth of the Puente Valley where contaminant concentrations exceed levels in Table 2. If intermediate zone compliance wells are installed before the production wells are modified to extract from the deep zone only, then the lateral compliance may be monitored at different wells during the periods before and after the production wells are modified.

If the production wells are used as part of the containment system, then compliance wells shall be installed at locations that will verify groundwater with contaminant concentrations exceeding the

levels in Table 2 is not migrating beyond its lateral and vertical extent as measured at the time that the intermediate zone containment system is Operational and Functional.

2.2.2 Compliance Monitoring of Vertical Migration in the Intermediate Zone

Vertical compliance wells shall be located using best professional judgment and at locations and depths approved by EPA in consultation with DTSC. A sufficient number of vertical compliance wells shall be located to adequately monitor potential vertical migration at the mouth of Puente Valley. If feasible, the vertical compliance wells shall be located at a depth that is below the vertical interval that exceeds the levels in Table 2, but within an area that contains detectable contaminant concentrations. However, if a vertical interval in the lower intermediate zone with contaminant concentrations less than the levels in Table 2 is not observed, compliance monitoring for vertical migration will be conducted in the deep zone, as described below. Hydraulic conditions may change, thus the work party or parties shall make any necessary adjustments to the containment system(s) to accommodate changes in hydraulic conditions that may compromise the effectiveness of the intermediate zone containment system.

Monitoring the deep zone downgradient of the intermediate zone containment system shall also be conducted to evaluate vertical migration compliance in the intermediate zone. If, further evaluation demonstrates, and EPA determines that the deep zone contamination is caused by downward migration as a result of a failure of the intermediate zone capture system, rather than contamination that has migrated into the deep zone prior to reaching the mouth-of-valley containment system, then additional action may be necessary in the intermediate zone to ensure vertical containment of contaminants above the levels in Table 2. Deep zone monitoring is discussed further below.

Table 2 Chemicals of Concern Requiring Containment

Compound	Containment Level (ug/L)	Source
1,1-Dichloroethane	5	California MCL
1,1-Dichloroethene	6	California MCL
1,1,1-Trichloroethane	200	Federal MCL
1,1,2-Trichloro-1,2,2-trifluoroethane	1,200	California MCL
1,1,2-Trichloroethane	3	Federal MCLG
1,1,2,2-Tetrachloroethane	1	California MCL
1,2-Dichlorobenzene	600	Federal MCL
1,2-Dichloroethane	0.5	California MCL
1,2-Dichloroethene (total)	6[1]	California MCL
1,2-Dichloropropane	5	Federal MCL
1,2,4-Trichlorobenzene	70	Federal MCL
1,2,4-Trimethylbenzene	-	-
1,3-Dichlorobenzene	600	Federal MCL
1,3-Dichloropropene	0.5	California MCL
1,3,5-Trimethylbenzene	-	-
1,4-Dichlorobenzene	5	California MCL
Benzene	1	California MCL
bis(2-Ethylhexyl)phthalate	4	California MCL
Bromochloromethane	-	-
Bromodichloromethane[2]	100	Federal MCL
Bromoform[2]	100	Federal MCL
Bromomethane	-	-
n-Butylbenzene	-	-
sec-Butylbenzene	-	-
tert-Butylbenzene	-	-

[1] Value for the cis-isomer; value for trans-isomer is 10 ug/L

Carbon Disulfide	-	-
Carbon Tetrachloride	0.5	California MCL
Chlorobenzene	70	California MCL
Chloroethane	-	-
Chloroform[2]	100	Federal MCL
cis-1,2-Dichloroethene	6	California MCL
cis-1,3-Dichloropropane	-	-
Dibromochloromethane[2]	100	Federal MCL
Dibromochloropropane	0.2	Federal MCL
Di-n-butylphthalate	-	-
Dichlorofluoromethane	C	C
Ethylbenzene	700	Federal MCL
Isopropyl alcohol	-	-
Isopropyl benzene	-	-
Methylene Chloride	5	Federal MCL
Naphthalene	-	-
Styrene	100	Federal MCL
Tetrachloroethene	5	Federal MCL
Total petroleum hydrocarbons	-	-
Total petroleum hydrocarbons-	-	-
trans-1,2-Dichloroethene	10	California MCL
trans-1,3-Dichloropropane	-	-
Trichloroethylene	5	Federal MCL
Trichlorofluoromethane	150	California MCL
Toluene	150	California MCL

[2]These chemicals are trihalomethanes (THMs); the MCL listed is for all four THMs: chloroform, bromodichloromethane, dibromochloromethane, and bromoform.

Vinyl Chloride	0.5	California MCL
m,p-Xylene[3]	-	-
o-Xylene[3]	-	-
Xylenes, total	1,750	California MCL
1,4-dioxane	3	DHS State Notification Level

[3]Value for total xylenes is 10,000 ug/L; no values are provided for individual isomers

Notes: - indicates "no MCL has been established or proposed."

Table 3 ARARs for Discharge to Surface Water [1]

Constituents	Units	Limitations Discharge	
		Daily Maximum	Monthly Average
Total Suspended Solids	mg/L	150	50
Turbidity	NTU	150	50
BOD_5 20^0C	mg/L	30	20
Oil and Grease	mg/L	15	10
Settleable Solids	ml/L	0.3	0.1
Sulfides	mg/L	1.0	
Phenols	mg/L	1.0	
Residual Chlorine	mg/L	0.1	
Acetone	ug/L	700	
Acrolein	ug/L	100	
Acrylonitrile	ug/L	0.059	
Benzene	ug/L	1.0	
Bromoform	ug/L	4.3	
Carbon tetrachloride	ug/L	0.25[2]	
Chlorobenzene	ug/L	30	
Chlorodibromomethane	ug/L	0.401[2]	
Chloroethane	ug/L	100	

[1]Table F, Effluent Limitations from State of California Regional Water Quality Control Board, Los Angeles Region, *Waste Discharge Requirements for Discharge of Treated Groundwater from Investigation and/or Cleanup of Volatile Organic Compound Contaminated Sites to Surface Water in Coastal Watersheds of Los Angeles and Ventura Counties,* (General Permit No. CAG914001). All values, except perchlorate and NDMA, are taken from Table F of the General Permit. Table F of the General Permit has 4 ug/L for perchlorate and 0.00069 for NDMA.

[2]If reported detection level is greater than effluent limit, then a non-detect result using 0.5 ug/L detection level is deemed to be in compliance.

Chloroform	ug/L	100	
Dichlorobromomethane	ug/L	0.56	
1,1-Dichloroethane	ug/L	5	
1,2-Dichloroethane	ug/L	0.38[2]	
1,1-Dichloroethylene	ug/L	0.057[2]	
1,2-Dichloropropane	ug/L	0.52	
1,3-Dichloropropylene	ug/L	0.5	
Di-isopropyl ether (DIPE)	ug/L	0.8	
1,4-Dioxane	ug/L	3	
Ethylbenzene	ug/L	700	
Ethylene dibromide	ug/L	0.05[2]	
Lead	ug/L	5.2	2.6[3]
Methyl bromide	ug/L	10	
Methyl chloride	ug/L	3	
Methylene chloride	ug/L	4.7	
Methyl ethyl Ketone (MEK)	ug/L	700	
Methyl tertiary butyl ether (MTBE)	ug/L	5	
Naphthalene	ug/L	21	
N-Nitrosodimethylamine	ug/L	0.01[4]	

[3]Total recoverable metals (based on a hardness of 100 mg/L).

[4] If reported detection level is greater than the effluent limit, then a non-detect result using 0.5 ug/L detection level is deemed to be in compliance

(NDMA)			
Perchlorate	ug/L	6[5]	
Tertiary butyl alcohol (TBA)	ug/L	12	
1,1,2,2-Tetrachloroethane	ug/L	0.17[2]	
Tetrachlorethylene	ug/L	0.8	
Toluene	ug/L	150	
Total Petroleum Hydrocarbons	ug/L	100[6]	
1,2-Trans-dichloroethylene	ug/L	10	
1,1,1-Trichloroethane	ug/L	200	
1,1,2-Trichloroethane	ug/L	0.60	
Trichloroethylene	ug/L	2.7	
Vinyl Chloride	ug/L	0.5	
Xylenes	ug/L	1750	

3.0 Compliance with Performance Criteria

Compliance with Performance Criteria will be confirmed by quarterly sampling of compliance wells. Over time, if it can be demonstrated, based on historical monitoring data, that concentrations are unlikely to exceed Performance Criteria over the quarterly monitoring interval, monitoring intervals may be lengthened, if approved by EPA in consultation with DTSC. Conversely, if monitoring data demonstrate more frequent monitoring is needed, EPA may decrease the monitoring interval.

If compliance wells are initially located downgradient (laterally and vertically) of an area exceeding the Performance Criteria (i.e., ten-times the levels in Table 2 for the shallow zone, and

[5] Table F of the General Permit has 4 ug/L for perchlorate.

[6] This includes all fuels, gasoline, diesel, and jet fuel.

the levels in Table 2 for the intermediate zone) but within areas with detectable contaminant concentrations, then detecting contaminants in those compliance wells at concentrations that exceed the Performance Criteria indicates noncompliance, and the process of determining the need for additional remedial action required to bring the system back into compliance, shall be initiated with due diligence pursuant to a schedule approved by EPA in consultation with DTSC.

There may be instances where there is no area that meets the compliance well location criteria, as described above, but where there still must be compliance monitoring. Although these compliance wells will initially exceed Performance Criteria, they will still serve to monitor compliance with the Performance Criteria by using a trend-based analysis, as described below.

In such instances where compliance wells are initially located within areas that exceed the Performance Criteria (e.g., in the intermediate zone between containment wells and existing production wells, or at the bottom of the shallow zone where concentrations above 10-times the levels in Table 2 may extend into the intermediate zone), then a trend analysis (discussed below), possibly supported by hydraulic monitoring data, will be used to evaluate whether additional response action is necessary to meet Performance Criteria. If the trend analysis indicates increasing concentrations, then additional response action may be appropriate.

Also, if compliance wells are located downgradient (laterally and vertically) of an area that does not initially exceed Performance Criteria, and an increasing trend indicates that it is more likely than not that the Performance Criteria will be exceeded, then the process of determining the need for additional remedial action to avoid noncompliance shall be initiated with due diligence pursuant to a schedule approved by EPA in consultation with DTSC.

Although the majority of the contaminant mass at the mouth of the Puente Valley is migrating within the shallow zone, it is recognized that some contaminant mass is migrating downward into the intermediate zone, particularly in the eastern area. If EPA determines that shallow zone contamination above ten-times the levels in Table 2 continues to migrate into the intermediate zone following implementation of the remedy, the shallow zone work party shall make the necessary adjustments to the shallow zone containment system to meet the Performance Criteria, pursuant to an EPA approved schedule. However, if shallow zone contamination above the levels in Table 2, but less than 10-times the levels in Table 2, migrates into the intermediate zone, it will not constitute an exceedance of the shallow zone Performance Criteria. Migration of shallow zone contamination into the intermediate zone, whether caused by an exceedance of the shallow zone Performance Criteria or not, shall not preclude the intermediate zone work party from meeting intermediate zone Performance Criteria and protecting drinking water wells, even if additional work is required.

In areas already above the Performance Criteria, a decreasing trend in contaminant concentrations will indicate compliance. If an exceedance is observed, the system will be considered to be in compliance if concentrations exhibit a decreasing trend, ultimately decreasing to below the

Performance Criteria (i.e., ten-times the levels in Table 2 for the shallow zone, and the levels in Table 2 for the intermediate zone) within an EPA-prescribed amount of time. If EPA determines that attainment of Performance Criteria is not practical within this time frame, then EPA will establish a reasonable time frame in which Performance Criteria are to be reached. This determination may include an assessment of the hydraulic containment achieved by the remedial pumping. Conversely, an increasing trend (discussed below) indicates non-compliance.

After 3 sequential, but before 12 compliance well and/or sentinel well monitoring events have been conducted, the determination of an increasing trend shall be based on comparing the most recent monitoring data to the upper tolerance limit (UTL) calculated from previous monitoring data (UCL) for an average of 95 percent coverage with 95 percent probability using a Student's t-distribution table). If recent data exceed the UTL, then an increasing trend shall be inferred. Monitoring data shall also be plotted with a best-fit line (arithmetic linear regression) to help observe possible trends. The scale of the plot shall be approved by EPA in consultation with DTSC. After 12 temporal measurements have been collected, then the Kendall test for trend analysis shall be applied. Time-series plots shall continue to be prepared, but without the best-fit line. Only the Kendall test for trend analysis and the comparison with the UTL shall be used for determining compliance with Performance Criteria. Other statistical methods may be used for evaluating trends, if approved by EPA in consultation with DTSC.

Since the contamination does not occur as a homogeneous mass, slight, short-term increases in contaminant concentrations may not accurately indicate that a groundwater containment system is not adequately operating. Consequently, the following process and timing shall be followed to address any observed increasing trends in contaminant concentrations if:

1. an increasing trend is observed in a compliance well with initial concentrations above Performance Criteria or as soon as an exceedance is observed in a compliance well with initial concentrations less than Performance Criteria, then the process of determining the need for additional remedial action to bring the system back into compliance, shall be initiated with due diligence pursuant to a schedule approved by EPA in consultation with DTSC; and/or
2. groundwater concentrations in compliance, sentinel, and/or monitoring wells indicate that it is more likely than not that the Performance Criteria or treatment plant discharge ARARs will be exceeded, then the process of determining the need for additional remedial action to avoid noncompliance shall be initiated with due diligence pursuant to a schedule approved by EPA in consultation with DTSC.

4.0 Sentinel Monitoring Wells

EPA requires that sentinel or early-warning monitoring wells be installed far enough laterally and

vertically upgradient of the extraction wells in the shallow and intermediate zones to provide advanced warning of varying conditions that are more likely than not to adversely impact the containment system and/or treatment plant (e.g., concentrations that exceed the design limit of the treatment plant, or a previously undetected contaminant that can not be adequately treated by the constructed treatment system).

Required sentinel wells should be far enough laterally and vertically upgradient of the containment extraction wells to provide adequate lead time to respond to the varying conditions, while continuing to maintain compliance. Optional sentinel wells may be located between the containment extraction wells and compliance wells. Sentinel wells can be existing and/or new monitoring wells. Sentinel wells shall be used for both the shallow and intermediate zones.

5.0 Deep Zone Monitoring at the Mouth of Puente Valley

The objectives of the deep zone monitoring at the mouth of Puente Valley are as follows:

- To evaluate the effectiveness of the intermediate zone remedy to protect the deep zone from vertical migration of contamination from the intermediate zone at the mouth of Puente Valley; and
- To monitor the potential for deep zone contamination originating up-valley to adversely impact the deep zone at the mouth of Puente Valley.

To meet the first objective, monitoring of the deep zone, in the mouth of Puente Valley downgradient of the intermediate zone containment extraction wells will be necessary. To meet the second objective, deep zone monitoring at the mouth of Puente Valley upgradient of the intermediate zone containment extraction wells, combined with Mid-Valley monitoring (discussed below) will be necessary.

6.0 Mid-Valley Monitoring

Mid-Valley monitoring shall be conducted in the intermediate and deep zones to monitor potential migration of contamination from the intermediate zone to the deep zone, and to provide some early warning of up-valley conditions that may eventually impact the mouth of Puente Valley. If monitoring indicates the Puente Valley remedy should be expanded to include Mid-Valley remedial action, a ROD amendment may be necessary to reflect such a modification to the overall remedy. Mid-Valley monitoring will provide EPA with information that will aid in the selection of an appropriate final remedy.