

7.0 Technical Assessment

This section assesses the performance and effectiveness of the implemented remedial actions at the site in satisfying ROD requirements and protecting human health and the environment.

7.1 Zone 1 Remedial Actions

This section presents a technical assessment of the remedy for Zone 1.

7.1.1 Question A: Is the remedy functioning as intended by the decision documents?

The remedy selected for Zone 1 in the RODs is functioning as intended by the RODs. Fencing and other security measures are in place, properly implemented, and sufficient to restrict access to Zone 1. The existing cover system in Zone 1 has been effective in isolating waste and contaminants and preventing direct exposure to site-related contaminants. More comprehensive remedial measures are currently being evaluated for the final cover system in the original disposal area to ensure long-term effectiveness and permanence. A remedy to address the original disposal area will be selected in the fourth ROD amendment based on the evaluation presented in the Draft SFS Report (reissue expected in 2007).

The current groundwater extraction system in Zone 1 is operating as intended by the second and fourth RODs by treating and reducing the migration of contaminated groundwater in Zone 1. Groundwater extracted from Zone 1 is effectively being treated at the PTP in Zone 2. Concentrations of COCs identified in the previous RODs are relatively stable. Based on recent routine and non-routine groundwater monitoring reports, contaminant concentrations in Zone 2 are significantly lower than those in Zone 1 and are decreasing. Additional groundwater monitoring is necessary to identify trends in concentrations of recently identified COCs (perchlorate, 1,4-dioxane, pesticides, and NDMA) in Zone 1. Improvements to the PTP are necessary to treat these new contaminants.

The performance and maintenance of dewatering in the source area as identified in the fourth ROD has not been fully optimized. Additional measures are being evaluated in the Draft SFS Report to address further dewatering in Zone 1 to mitigate future releases from the source area to groundwater and to prevent migration of contaminated groundwater to downgradient areas. Further dewatering will also prevent surface seepage that could potentially occur.

Although fencing and other security measures serve as engineering controls and restrict access to the site, additional restrictions should be implemented to prevent exposure to contaminants in the original disposal area. Deed restrictions such as LUCs have not been selected as part of the remedy in previous decision documents but should be evaluated for the final remedy for Zone 1. The LUC could restrict future land uses and prohibit uncontrolled disturbance of soil within the original disposal area in Zone 1. In addition, a

LUC should restrict the construction of buildings in Zone 1 until potential risks through the indoor air exposure pathway are evaluated. These measures would build upon the remedial measures selected in the previous RODs to prevent future exposure to elevated concentrations of contaminants in soil. A more thorough evaluation of ICs for the site is presented in Appendix E.

7.1.2 Question B: Are the assumptions used at the time of remedy selection still valid?

Regulatory Review

A summary of the regulatory review performed for Zone 1 is presented in Appendix F. No changes to existing ARARs for Zone 1 were identified during the regulatory review.

Assumptions in the Human Health Risk Assessment

A toxicity assessment was performed as part of this five-year review to determine if the assumptions used in the performing the baseline and supplemental HHRA remain valid. This assessment is presented in Appendix G.

Since the Supplemental HHRA was submitted in 1995, there have been a number of changes to the toxicity values for certain constituents of concern at the site. However, these changes have not affected the protectiveness of the remedy. For carcinogenic effects, revisions to the toxicity values for 1,4-dichlorobenzene indicate a reduced excess cancer risk associated with potential oral exposure to this compound than was previously estimated. For non-carcinogenic effects, revisions to toxicity values for chlorobenzene and chloroform indicate a reduced hazard index from exposure to these chemicals than was previously estimated.

The greatest uncertainty with toxicological changes for site contaminants is associated with TCE. In 2001, USEPA's Office of Research and Development released "Trichloroethylene Health Risk Assessment: Synthesis and Characterization" for external peer review. This toxicity evaluation is under review by several external scientific panels, and may result in changes to toxicity factors for TCE. Based on the results of the TCE toxicity evaluation currently underway, the risk posed by TCE at the site should be re-evaluated during the next five-year review.

Assumptions Used in Selecting the Remedy

As presented in Section 6.4.2, new COCs have been identified since the remedy for Zone 1 was selected. Improvements to the existing PTP are necessary to address these contaminants. This is being performed through design and installation of a PRS, pilot studies, and design of a proposed new PTP.

7.1.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

A screening-level ecological risk assessment (ERA) was performed (CH2M HILL, 2005) to evaluate whether site contaminants have the potential to affect sensitive ecological receptors. The ERA made the following conclusions:

- Existing analytical data suggest a potential risk to ecological receptors from dioxins, metals, and perchlorate in soil and from dioxins in sediment in Pyrite Creek. A low likelihood of risk would be expected if ecological risks at the site were to be evaluated further by refining exposure parameters.
- An evaluation of background metal concentrations would clarify whether metals in soil at the site pose a significant risk to plants and/or invertivorous small mammals.
- Plant samples should be collected for plants that serve as forage for wildlife to evaluate bioaccumulation of perchlorate in plants and perchlorate doses to herbivorous receptors.
- Evaluations on the distribution of perchlorate and p-CBSA in soil should continue and new ecotoxicity information for these analytes should be evaluated as it becomes available.
- Inhalation of VOCs presents a potential risk to burrowing mammals. This risk is expected to be mitigated by the installation of a permanent cap over the former disposal ponds (to be selected as part of the remedy in the fourth ROD amendment). A thicker replacement cover would further mitigate potential risks to burrowing mammals associated with inhalation exposures.

Based on the information presented above, additional data should be collected to verify the conclusions of the ERA.

7.2 Zone 2 Remedial Actions

This section presents a technical assessment of the remedy for Zone 2.

7.2.1 Question A: Is the remedy functioning as intended by the decision documents?

The Mid-Canyon groundwater extraction system and the PTP are functioning as intended by the second ROD. The extraction system has been effective in intercepting and reducing contaminant migration in the upper groundwater flow system (alluvium). As mentioned in the previous Five-Year Review Report (CH2M HILL 2001), studies and evaluations completed between 1998 and 2000 indicate that some of the existing extraction wells may not be optimally located to intercept contaminated groundwater in the deeper flow channels and weathered bedrock units. Although no changes were made to the extraction system since then, the effectiveness of the Zone 2 extraction system can be demonstrated by the decline in contaminant concentrations within and downgradient of Zone 2. Additional groundwater monitoring is necessary to identify trends in concentrations of recently identified COCs in Zone 2.

As summarized in monthly O&M reports, the PTP has been effective in treating contaminated groundwater extracted from Zone 2. The system has been optimized over time. An example of the optimization that has been performed on the system includes installation of a PRS. This system was added to the PTP to treat pesticides and reduce the volume of pesticide-rich filter cake, which requires incineration. Filter presses were also replaced to increase the efficiency of the PTP.

7.2.2 Question B: Are the assumptions used at the time of remedy selection still valid?

Regulatory Review

A summary of the regulatory review performed for Zone 2 is presented in Appendix F. No changes to existing ARARs for Zone 2 were identified during the regulatory review.

Assumptions in the Human Health Risk Assessment. A toxicity assessment was performed to determine if the assumptions used in performing the baseline and supplemental HHRA remain valid. This assessment is presented in Appendix G.

Assumptions Used in Selecting the Remedy. The remedial design assumptions for the groundwater extraction system in Zone 2 and the PTP remain valid. As identified during the previous five-year review, the existing extraction system may need to be expanded to improve contaminant capture and achievement of the RAOs. A more detailed review of site conditions is needed before system optimization can be performed.

New COCs have been identified since the remedy for Zone 2 was selected. The contaminants include perchlorate, 1,4-dioxane, pesticides, and NDMA. Improvements to the existing PTP are necessary to address these contaminants. These improvements are being performed through design and installation of the PRS, pilot studies of new treatment components, and design of a new PTP.

7.2.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

A screening-level ERA was performed to evaluate whether site contaminants have the potential to affect sensitive ecological receptors. A summary of the recommendations included in the *Final Screening-Level Ecological Risk Assessment* (CH2M HILL, 2005) is presented in Section 7.1.3.

7.3 Zone 3 Remedial Actions

This section presents a technical assessment of the remedy for Zone 3.

7.3.1 Question A: Is the remedy functioning as intended by the decision documents?

The groundwater extraction system and the LCTF in Zone 3 are functioning as intended. Water quality monitoring data for locations downgradient of the Zone 3 extraction system indicate a reduction of contaminants in groundwater in the upper alluvial interval underlying Zone 3. Recent evaluation of the effectiveness of the extraction system in Zone 3 indicates that the current system may not be optimally extracting groundwater from deeper flow (CH2M HILL, 2003). Optimization of the extraction system in Zone 3 may be required.

7.3.2 Question B: Are the assumptions used at the time of remedy selection still valid?

Regulatory Review

A summary of the regulatory review performed for Zone 3 is presented in Appendix F. No changes to existing ARARs for Zone 3 were identified during the regulatory review.

Assumptions in the Human Health Risk Assessment. A toxicity assessment was performed to determine if the assumptions used in performing the baseline and supplemental HHRA remain valid. This assessment is presented in Appendix G.

Assumptions Used in Selecting the Remedy. The assumptions used to select the remedy for Zone 3 are generally still valid.

7.3.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

A screening-level ERA was performed to evaluate whether site contaminants have the potential to affect sensitive ecological receptors. A summary of the recommendations included in the *Final Screening-Level Ecological Risk Assessment* (CH2M HILL, 2005) is presented in Section 7.1.3.

An evaluation of the extraction system using a groundwater flow model was completed in March 2003, following the installation of 29 new monitoring wells (GLA, 2003b; CH2M HILL, 2003). This effectiveness evaluation examined the ability of the extraction wells to capture the contaminant plumes in all three hydrostratigraphic units (alluvium, weathered bedrock, and unweathered bedrock). According to the evaluation, the current extraction system in Zone 3 does not optimally intercept deeper flow. Although evaluation of the extraction system effectiveness indicated possible deficiencies, no new extraction wells have been installed to date.

7.4 Zone 4 Remedial Actions

This section presents a technical assessment of the remedy for Zone 4.

7.4.1 Question A: Is the remedy functioning as intended by the decision documents?

The Zone 4 groundwater extraction system has been effective in preventing further migration of TCE, chloroform, nitrate, and sulfate to downgradient areas and in remediating the site-related groundwater contamination in the Glen Avon community. The Zone 4 remedy is functioning as intended by the decision documents, and is meeting the RAOs defined in the fourth ROD.

7.4.2 Question B: Are the assumptions used at the time of remedy selection still valid?

Regulatory Review

A summary of the regulatory review performed for Zone 4 is presented in Appendix F. That review identified one change to the existing ARARs specified for Zone 4. The South Coast Air Quality Management District (SCAQMD) Regulation XI, Rule 1167 for air stripping operations was rescinded in December 1988. This was established as an action-specific ARAR in the fourth ROD and is no longer applicable. One location-specific to be considered (TBC) criteria was identified for Zone 4, as summarized below.

VOC Emissions within 500 Feet of a School. The SCAQMD Regulation XIV, Rule 1401.1 (adopted November 4, 2005) regulates emissions of toxic air contaminants from new sources within 500 feet of a school. If there are direct VOC emission points from the CWTS, then substantive requirements of the SCAQMD Regulation XIV, Rule 1401.1 is a location-specific TBC regarding location of the CWTS.

Assumptions in the Human Health Risk Assessment

A toxicity assessment was performed as part of this five-year review to determine if the assumptions used in the performing the baseline and supplemental HHRAs remain valid. This assessment is presented in Appendix G.

Assumptions Used in Selecting the Remedy

The assumptions initially used to select the groundwater remedial action in Zone 4 are partly valid. The rate of decrease of TCE, chloroform, and sulfate contaminant levels in the groundwater plume in the community is consistent with expectations for the groundwater remedy established in ROD. The presence and extent of perchlorate contamination in Zone 4 groundwater was unknown at the time of remedy selection and is currently under investigation by DTSC. A RI/FS is currently being performed to characterize the nature and extent of the perchlorate plume and propose remedial actions for treatment.

7.4.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

A screening-level ERA was performed to evaluate whether site contaminants have the potential to affect sensitive ecological receptors. A summary of the recommendations included in the *Final Screening-Level Ecological Risk Assessment* (CH2M HILL, 2005) is presented in Section 7.1.3.

DTSC began an investigation of perchlorate in groundwater at the site in May 2001. The investigation is ongoing and a RI/FS report documenting the findings of that investigation is expected in 2008. The effectiveness of the existing extraction and treatment system in addressing perchlorate in Zone 4 will be evaluated as part of the RI/FS. In 2003, actions were taken to amend the CWTS to reduce perchlorate concentrations in effluent to comply with recently adopted discharge limits (4 µg/L) to Pyrite Creek. Operation of the perchlorate removal system at the CWTS has resulted in perchlorate concentrations in the system effluent that are below permitted discharge limits.

As a result of actions taken since the last five-year review report was issued, controls have reduced the potential exposure of residents to contamination in groundwater within Zone 4. Bottled water service and, ultimately, service to the public water supply have been provided to residents in Glen Avon. The private wells are now used for irrigation purposes only. However, interviews with DTSC management and the of Riverside Department of Environmental Health revealed that there are no legally-enforceable restrictions on use of existing private wells in the Glen Avon community in Zone 4. As presented in Appendix E, distribution of informational flyers or public notices to the owners and/or occupants of residences with private wells may be an appropriate institutional control to notify them that uses of water at these wells is restricted.

The Riverside Department of Environmental Health allows installation of new wells within a pre-defined boundary in Glen Avon (based on a 1986 contaminant plume map) for agricultural and monitoring uses only. Installation of domestic wells within this area is not permitted. This 1986 boundary should be re-defined based on current plume boundary information.

8.0 Issues, Recommendations, and Follow-Up Actions

This section discusses the issues identified during the five-year review and provides recommendations to address them. Table 8-1 summarizes the issues, recommendations, and follow-up actions and presents the party responsible, oversight agency, and the current and future effect that the issue has on the protectiveness of the environment and human health.

TABLE 8-1
 Issues, Recommendations, and Follow-Up Actions
Third Five-Year Review Report, Stringfellow Superfund Site, Riverside County, California

Zones	Issue	Recommendations and Follow-Up Actions	Party Responsible	Over-sight Agency	Milestone Date	Affects Protectiveness (Y/N)	
						Current	Future
1, 2, 3, 4	New COCs	Continue routine groundwater monitoring to identify trends in new COC concentrations over time. Complete RI/FS for perchlorate.	DTSC	USEPA	Ongoing. Completion of RI/FS in 2008.	N	Y
1, 2, 4	Insufficient ICs	Include ICs as a component of the remedy selected in future decision documents to prevent exposure to site contaminants.	DTSC	USEPA	December 2009	N	Y
1, 2, 3, 4	ERA	Collect additional data to verify conclusions of 2005 ERA.	DTSC	USEPA	December 2008	N	Y
2, 3	Effectiveness of extraction system	Evaluate need for extraction system upgrades or optimization.	DTSC	USEPA	December 2007	N	Y

Issue – Zones 1, 2, 3, and 4

Additional COCs (perchlorate, pesticides, 1,4-dioxane, NDMA) have been identified in groundwater since the remedies for Zones 1 through 4 were selected.

Recommendation – Zones 1, 2, 3, and 4

While groundwater monitoring and other site characterization activities are currently underway to address the new COCs, further characterization is required to identify trends in concentrations in groundwater over time and to ensure that the existing extraction

systems provide for adequate capture of new COCs. Pilot studies and evaluations to support the design of the proposed new PTP to treat these contaminants should continue. RI/FS activities, including soil and groundwater characterization, risk assessments, and evaluation of remedial alternatives, should continue to support the selection of a final remedy to address perchlorate in groundwater in Zone 4. Remedies for the new COCs will be selected in future decision documents, which include a fourth ROD amendment (expected in 2008) and a fifth ROD (expected in 2009).

Issue – Zones 1, 2, and 4

ICs are inadequate to ensure future receptors are not exposed to contaminants in soil and groundwater at the site.

Recommendation – Zones 1, 2, and 4

While controls are currently in place in Zone 4 to reduce the potential for exposure of residents to contamination in groundwater, ICs should be selected as part of the remedy in future decision documents to prevent disturbance of soil in the original disposal area in Zone 1, to prevent buildings from being constructed in Zones 1 and 2, and to further prevent unauthorized uses of groundwater in the Glen Avon community area in Zone 4. In addition, the 1986 plume boundary map currently used by the Riverside Department of Environmental Health for well permit applications in Zone 4 should be updated based on current plume boundary information to facilitate future well permitting decisions.

Issue – Zones 1, 2, 3, and 4

The 2005 ERA identified the need for additional data to verify the conclusions of the *Final Screening-Level Ecological Risk Assessment* (CH2M HILL, 2005). Specifically, the ERA recommended that an evaluation of background metal concentrations be performed to clarify whether metals in soil at the site pose a significant risk to ecological receptors, that plant samples be collected for plants that serve as forage for wildlife to evaluate perchlorate doses to herbivorous receptors, and that evaluations on the distribution of perchlorate and para-CBSA continue to support future evaluations of the risks these analytes pose to ecological receptors.

Recommendation – Zones 1, 2, 3, and 4

Additional data should be collected as recommended in the *Final Screening-Level Ecological Risk Assessment* (CH2M HILL, 2005) to verify the conclusions of the ERA. These data should be collected so that they may be included in the fifth ROD, which is scheduled to be issued in December 2009.

Issue - Zones 2 and 3

Although decreasing contaminant concentrations suggest that the existing extraction systems in Zones 2 and 3 prevent contaminant migration to downgradient areas, modeling studies have shown that the existing groundwater extraction systems in Zones 2 and 3 may not efficiently intercept and capture site-related contaminants in deeper flow channels and weathered bedrock units.

Recommendation – Zones 2 and 3

The effectiveness of the existing extraction systems in Zones 2 and 3 should be evaluated to identify the need for system upgrades and/or system optimization. The extraction systems should be upgraded/optimized as determined to be necessary through this evaluation. System optimization and upgrades will be performed as part of the O&M program included in the amendment to the fourth ROD.

9.0 Protectiveness Statement

This section presents a protectiveness statement for each zone at the site and presents a site-wide protectiveness statement.

9.1 Protectiveness Statement for Zone 1

The remedy in Zone 1 is expected to be protective of human health and the environment upon completion, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. However, in order for the remedy to be protective in the long-term, the final remedy for Zone 1 should be implemented, including recording LUCs to prevent exposure to contamination, to ensure long-term protectiveness.

9.2 Protectiveness Statement for Zone 2

The remedy in Zone 2 is expected to be protective of human health and the environment upon completion and, in the interim, exposure pathways that could result in unacceptable risks are being controlled. However, in order for the remedy to be protective in the long-term, the final remedy for Zone 2 should be implemented, including recording LUCs to prevent exposure to contamination, to ensure long-term protectiveness.

9.3 Protectiveness Statement for Zone 3

The remedy in Zone 3 is expected to be protective of human health and the environment upon completion and, in the interim, exposure pathways that could result in unacceptable risks are being controlled. However, in order for the remedy to be protective in the long-term, the final remedy for Zone 3 should be implemented to ensure long-term protectiveness.

9.4 Protectiveness Statement for Zone 4

The remedy in Zone 4 is expected to be protective of human health and the environment upon completion and, in the interim, exposure pathways that could result in unacceptable risks are being controlled. However, in order for the remedy to be protective in the long-term, a final remedy for Zone 4, including ICs to restrict uses of private wells in Glen Avon, should be selected and implemented to ensure long-term protectiveness.

9.5 Protectiveness Statement for Stringfellow Superfund Site

The remedy for the Stringfellow Superfund Site is expected to be protective of human health and the environment upon completion and, in the interim, exposure pathways that could result in unacceptable risks are being controlled. The final remedy for the site should be implemented to ensure long-term protectiveness.

10.0 Next Five-Year Review

The next five-year review should be performed in 2011. A report to document the results of that review shall be completed by September 30, 2011.

11.0 References

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