

California Regional Water Quality Control Board
North Coast Region

ORDER NO. R1-2008-0033

FOR

IN-SITU TREATMENT OF CONTAMINATED SOIL AND GROUNDWATER

UNION PACIFIC RAILROAD
Former West Coast Metals Site
99 Frances Street
Santa Rosa, California

Sonoma County

The California Regional Water Quality Control Board, North Coast Region (hereinafter the Regional Water Board), finds that:

1. Union Pacific Railroad (UPRR) (hereinafter the Discharger) submitted a report of waste discharge (ROWD) on May 15, 2007, August 27, 2007, and January 7, 2008 proposing to conduct in-situ treatment of chlorinated volatile organic compounds (CVOCs) in soil and groundwater at the former West Coast Metals site, located at 99 Frances Street in Santa Rosa, California (hereinafter Site). The Discharger proposes to conduct an interim remedial action of enhanced in-situ bioremediation to promote reductive dechlorination, thereby remediating chlorinated volatile organic compounds in soil and groundwater.
2. The Site is an undeveloped 9.5 acres, enclosed by fencing. Current land use surrounding the Site includes mixed commercial, industrial, and residential. The Site was a scrap metals salvage and recycling facility, formerly occupied by West Coast Welders Supply from 1967 to 1979, and by West Coast Metals, Inc. from 1979 to 1986. Soil and groundwater at the Site are contaminated with CVOCs, including trichloroethene (TCE) and associated break-down products.
3. The Site is located on the eastern edge of the Santa Rosa Plain (See Figure 1: Site Location Map). Shallow unconsolidated sediments beneath the plain consists of alluvial fan deposits characterized by lenticular beds of poorly sorted gravel, sand, silt, and clay which exist widely in varying thickness.¹
4. The direction of groundwater flow at the site is predominately to the west-southwest. There are four identified groundwater bearing zones at the site. The A-zone exists from the water table to a depth of approximately 25 feet below ground surface (bgs), the B-zone from 25 to 40 feet bgs, the C-zone from 45 to 65 feet bgs, and the D-zone beginning at 65 feet bgs. There appears to be a high degree of variability between the thickness and depth of the A and B zones and are generally interconnected at various locations over the site.
5. A pilot study was conducted in 2006 to determine a feasible remedial option for soil and groundwater cleanup. The study consisted of three injection events of

¹ Geomatrix Consultants, November 15, 1991, *Report of Findings: Installation of Off-site Monitoring Well Network, Hydrology, and Groundwater Analytical Results*, Former West Coast Metals Facility, 99 Frances Street, Santa Rosa, California

an organic food-grade substrate used to enhance microbial growth and thus promoting dechlorination of CVOCs. The pilot study selected the substrate cheese whey. The results of the pilot study showed successful reductive dechlorination of CVOCs.

6. The Discharger proposes an interim remedial action (IRA) to inject an organic food grade substrate on an annual basis, for two years. A direct push rig will be used for initial injections into twenty two borings spaced fifteen feet apart along a 300 foot transect. Twenty injection points will target the B-zone aquifer (25-40 feet bgs) and two injection points will target the C-zone aquifer (45-65 feet bgs). Proposed injection locations are focused on-site in the identified source area (Figure 2: Site Map).
7. During the reductive dechlorination treatment process, a food source is provided for the existing microorganisms in the aquifer. The microorganisms consume the food substances and donate hydrogen electrons in the course of their metabolism. The microorganisms use the CVOCs (such as TCE) as electron acceptors. During this process, the parent compounds break down to more toxic intermediary CVOCs (i.e., vinyl chloride). However, this is temporary and the dechlorination of vinyl chloride should continue to occur with further breakdown to non-toxic end products (e.g., carbon dioxide, chloride, and water, Figure 3: Reductive Dechlorination).
8. Enhanced in-situ bioremediation dechlorination typically involves the addition of an organic substrate to supply the subsurface with hydrogen. There are several organic substrates which can be naturally degraded and fermented in the subsurface that result in the generation of hydrogen. Some commonly used organic substrates include lactate, corn syrup, molasses, vegetable oils, yeast extract whey or other milk solids, Hydrogen Releasing Compound (HRC™), or a combination of various products.
9. The Discharger has selected Hydrogen Releasing Compound-Advanced (HRC-A™) as the organic food-grade substrate for the initial injection event. HRC-A is a glycerol-polyacetate ester that slowly releases lactate in contact with water, providing a time release source of fermentable material that then permeates the aquifer surrounding the point of introduction. Fermentation of the released lactate and its degradation products generates dissolved hydrogen which provides a high-energy electron donor suitable for supporting reductive dechlorination. The addition of organic, food-grade substrates to promote in-situ bioremediation appears to be a feasible and effective remedial option at this Site.
10. The nature of subsequent injection events will be determined after a full evaluation of all performance monitoring data in order to adjust character, location, and/or volume of the discharge for optimal results. Other injection methods may also be employed to achieve greater distribution of the organic food grade substrate. Additional injections within the Site that differ from the initial injection areas are authorized under these Waste Discharge Requirements in accordance with the terms and conditions of this Order.
11. The pilot study results showed that manganese and/or iron can potentially be locally mobilized by the reducing conditions created during the remedial process. However, the pilot study demonstrated that these metals will be precipitated/immobilized down-gradient of the treatment zone when the conditions return to their preexisting state. Results of the pilot study also demonstrated an increase in vinyl chloride in most monitoring wells. This increase was subsequently followed by a decrease in concentrations in most

monitoring wells, indicating successful dechlorination of vinyl chloride (Figure 4: Reductive Dechlorination Graph). The contingency plan, as specified in the ROWD, will be implemented in the event that statistically significant increasing concentrations are observed at sentry wells or an evaluation of data indicates loss of hydraulic control and/or increased migration of pollutants off-site. Contingency measures may include increased monitoring, decreased injections, ceasing injections or reactivating the groundwater extraction and treatment system (GETS)². Activation of the GETS system will prevent off-site migration.

12. Fourteen groundwater monitoring wells will be monitored to determine the effectiveness of the interim remedial action. The monitoring well network identified for remedial effectiveness monitoring consists of monitoring wells: MW-9 (B), MW-39 (B), MW-40(B), MW-41(A), MW-42 (B), MW-43 (A), MW-44 (B), MW-45 (C), MW-46 (A), MW-47 (B), MW-48 (C), E-202 (B), E-205 (B), E-206 (C). Monitoring wells are located within and down-gradient of the injection area. Initial samples will be collected prior to injections, one month after injections, and quarterly thereafter. Monitoring will continue for the duration of the project or until the Executive Officer concurs that water quality conditions have returned to baseline levels.
13. The proposed interim remedial action is consistent with the antidegradation provisions of the State Water Resources Control Board Resolution No. 68-16. The in-situ groundwater treatment is designed to accelerate cleanup at the Site, and ultimately restore the beneficial uses of groundwater.
14. The Regional Water Board's Water Quality Control Plan for the North Coast Region includes water quality objectives and receiving water limitations.
15. Surface water in the Santa Rosa plains flow to the Russian River and its tributaries. The beneficial uses of the Russian River include:
 - municipal and domestic supply
 - agricultural supply
 - industrial process supply
 - groundwater recharge
 - navigation
 - hydropower generation
 - water contact recreation
 - non-contact water recreation
 - commercial and sport fishing
 - warm freshwater habitat
 - cold freshwater habitat
 - wildlife habitat
 - migration of aquatic organisms
 - spawning, reproduction, and/or early development.
16. Beneficial uses of groundwater include: municipal and domestic water supply, industrial water supply, industrial process water supply, and agricultural water supply as identified in the Water Quality Control Plan for the North Coast Region.
17. Drinking water in the area is supplied by the City of Santa Rosa municipal water system. A City municipal well is located within 500 feet from the Site. The well is

² Union Pacific Railroad is covered under Waste Discharge Requirements Order No. R1-2006-0048, General NPDES Permit No. CAG911001 for Discharges of Highly Treated Groundwater To Surface Waters Following Extraction and Cleanup of Groundwater Polluted with Petroleum Hydrocarbons and Volatile Organic Compounds.

not currently in use, but is reserved as an emergency well. TCE has been detected in the well up to 25 parts per billion (ppb). Individual water supply wells exist in the City limits and are used predominantly for irrigation.

18. The Regional Water Board is the lead agency for this project under the California Environmental Quality Act (Pub. Resources Code, section 21000 et seq.) (CEQA). An Initial Study/Checklist and Mitigated Negative Declaration was prepared in accordance with title 14, California Code of Regulations, section 15063. On February 28, 2008, the Regional Water Board provided notice of intent to adopt a Mitigated Negative Declaration (SCH No. _____) for the project. (California Code of Regulations, tit. 14, § 15072.) The Mitigated Negative Declaration reflects the Regional Water Board's independent judgment and analysis. After considering the Initial Study/Checklist and other documents and comments received during the public review process, the Regional Water Board hereby determines that the proposed project with mitigation measures, will not have a significant effect on the environment. Mitigation measures are incorporated as a condition of this Order. The Mitigated Negative Declaration is hereby adopted. The documents or other material, which constitute the record, are located at the Regional Water Board office located at 5550 Skylane Blvd., Santa Rosa, California. The Regional Water Board will file a Notice of Determination within five days from the issuance of this order.
19. The Regional Water Board has notified the Discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for the discharge and has provided them with an opportunity to submit written comments and recommendations.
20. Regional Water Board, at a public meeting on April 24, 2008, heard and considered all comments pertaining to the discharge.

THEREFORE, IT IS HEREBY ORDERED that the Discharger, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, shall comply with the following:

A) DISCHARGE PROHIBITIONS

1. Creation of a pollution, contamination, or nuisance, as defined by Water Code section 13050, subdivision (m), is prohibited (Health and Safety Code, section 5411).
2. The discharge of treatments additives to land, surface water, or to groundwater in areas other than approved for interim remedial actions by this Order is prohibited.
3. The migration of any metal mobilized by the treatment process or vinyl chloride or other by-products produced as part of the process is prohibited beyond the boundaries of the property owned or controlled by the Discharger.
4. The discharge of any waste not specifically regulated by this Order is prohibited.

B) DISCHARGE SPECIFICATIONS

1. The injection of organic, food-grade substrates shall not impart taste, odor, or color to, or otherwise degrade the beneficial use of areal groundwater, except for temporary taste and odor changes within the proposed treatment area.

2. The injection of organic food-grade substrates shall not impart taste, odor, or color to or otherwise degrade the beneficial uses of areal groundwater beyond the boundaries of the property owned or controlled by the Dischargers.
3. The methods for injection of organic, food-grade substrates in the proposed areas shall be conducted as described in the August 24, 2007 Interim Remedial Action Work Plan and the January 7, 2008 Addendum to Interim Remedial Action Work Plan. For additional, and similar organic food grade injections at the site, the following items shall be submitted: a) a workplan proposal to the Executive Officer for review and concurrence, b) a proposed groundwater monitoring program; c) a revised contingency plan, and d) a 30-day notification and comment period to the public and all involved agencies. If the Executive Officer finds no new significant impacts or issues, the Executive Officer may concur with the reinjection proposal. The discharger may then conduct additional injections in accordance with the terms of this Order.
4. The injection of organic, food-grade substrate shall not produce airborne hydrogen sulfide concentrations which exceed 0.03 parts per million by volume (ppmv), vinyl chloride concentration which exceed 0.01 ppmv, or methane 10% above the lower explosive limit (LEL) at the boundaries of the property owned or controlled by the Discharger.
5. When the interim remedial action is completed, the pollutant breakdown products, amendments, and by-products shall not exceed pre-injection (baseline) concentrations within or outside the treatment area.

C) PROVISIONS

1. A copy of this Order shall be available at all times to operating personnel.
2. The Discharge shall comply with all requirements, conditions and provisions set forth in Monitoring and Reporting Program Order No. R1-2008-0033. The Executive Officer of the Regional Water Board retains discretion to modify provisions of the Monitoring and Reporting Program.
3. The Discharger shall implement contingency plans and mitigation measures, as appropriate and necessary, including measures necessary to comply with the Discharge Prohibitions, Discharge Specifications, and all provisions of this Order.
4. The Discharger shall submit a remedial status report within 60 days of the each injection event. The report shall report all field activities related to the injection event, including baseline data and the data collected one month after the injection event.
5. The Discharger shall provide quarterly performance data within 45 days of each sampling event, including the results of air monitoring. Quarterly performance monitoring is to continue throughout the length of the project or until the Executive Officer concurs that the water quality conditions have returned to baseline levels.
6. The Discharger shall submit an annual remediation evaluation report one year after each injection event. The report shall summarize all data collected throughout the project and must provide a complete evaluation of all data including concentration trend evaluation, evaluation of performance monitoring parameters in terms of remedial effectiveness, provide a conclusion of the overall effectiveness of the treatment, and provide recommendations for subsequent remedial actions.

7. Severability

Provisions of these waste discharge requirements are severable. If any provision of these requirements is found invalid, the remainder of the requirements shall not be affected.

8. Operation and Maintenance

The Discharger must maintain in good working order and operate as efficiently as possible any facility or control system installed by the discharger to achieve compliance with the waste discharge requirements.

9. Change in Discharge

The Discharger must promptly report to the Regional Water Board any material change in the character, location or volume of the discharge.

10. Change in Ownership

In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the discharger, the discharge must notify the succeeding owner or operator of the following items by letter, in advance of the transfer of ownership or control, and a copy of the notice must be forwarded to the Regional Water Board:

- a. existence of this Order, and
- b. the status of the Dischargers' annual fee account.

11. Vested Rights

This Order does not convey any property rights of any sort or any exclusive privileges. The requirements prescribed herein do not authorize the commission of any act causing injury to persons or property, nor protect the Discharger from his liability under federal, state, or local laws, nor create a vested right for the Discharger to continue waste discharge.

12. Monitoring

The Discharger must comply with the Contingency Planning and Notification Requirements Order No. 74-151 and Monitoring and Reporting Program R1-2008-0033 and any modifications to this document as specified by the Executive Officer. Such documents are attached to this Order and incorporated herein.

- a. Order No. 74-151 requires immediate incident reporting of unintentional or accidental spills (including emergency response actions) and diligent action to abate the effects of the discharge. Written confirmation of the incident is required within two weeks of notification.
- b. General Monitoring and Reporting Provisions require sampling and analysis performance criteria in addition to compliance reporting criteria and time frames.

13. Inspections

The Discharger shall permit authorized staff of the Regional Water Board:

- a. entry upon premises where injection is being conducted or in which any required records are kept;
- b. access to copy any records required to be kept under terms and conditions of this Order;
- c. inspection of monitoring equipment or records; and
- d. sampling of any discharge.

14. Noncompliance

In the event the Discharger is unable to comply with any of the conditions of this Order due to:

- a. breakdown of equipment;
- b. accidents caused by human error or negligence; or
- c. other causes such as acts of nature;

The Discharger shall notify the Executive Officer by telephone as soon as he or his agents have knowledge of the incident and confirm this notification in writing within two weeks of the telephone notification. The written notification shall include pertinent information explaining reasons for the noncompliance and shall indicate the steps taken to correct the problem and the dates thereof, and the steps being taken to prevent the problems from recurring.

15. Significant Changes in Discharge

The Discharger shall notify the Regional Water Board before making any significant change or proposed change in the character, location, or volume of the discharge. The Discharger shall file a report of Waste Discharge and a new order is required for any significant changes.

Certification

I, Catherine Kuhlman, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, North Coast Region, on April 24, 2008.

Catherine E. Kuhlman
Executive Officer

References

CH2MHill, January 7, 2008, Addendum to Interim Remedial Action Work Plan.

CH2MHill, August 24, 2007, *Interim Remedial Action Work Plan*.

CH2MHill, May 14, 2007, *In Situ Remediation Pilot Study Report*.

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U.S. Environmental Protection Agency, July 2000, *Engineered Approaches to In Situ Bioremediation of Chlorinated Solvents: Fundamentals and Field Applications*. Durham, North Carolina

Waste Discharge Requirements for In-Situ Groundwater Treatment Order No. R1-2008-0009

Waste Discharge Requirements for In-Situ Treatment of Volatile Organic Compounds in Groundwater Order No. R1-2004-0052

List of Figures

Figure 1: Site Location Map

Figure 2: Site Map

Figure 3: Reductive Dechlorination

Figure 4: Reductive Dechlorination Graph