

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION
TENTATIVE

ORDER NO. R5-2007-

WASTE DISCHARGE REQUIREMENTS

FOR
THE UNITED STATES AIR FORCE
BEALE AIR FORCE BASE
ENHANCED IN-SITU BIOREMEDIATION OF VOLATILE ORGANIC CONSTITUENTS AT
SITE 31
YUBA COUNTY

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

1. The United States Air Force (hereafter Discharger), submitted the *Site 31 Remedial Action Work Plan* (Draft Work Plan) on 5 February 2007 for the design and operation of an enhanced in-situ bioremediation system (EISB system). The EISB system is intended to provide remediation of a portion of polluted groundwater at Beale Air Force Base in Yuba County. The Draft Work Plan provides the information required in a Report of Waste Discharge.
2. The project area is in Section 33, T15N, R5E, MDB&M and is shown in Attachment A, which is attached hereto and made part of this Order by reference. The project area is known as Environmental Restoration Program (ERP) Site 31 and the proposed remediation is being conducted as part of a performance based contract between the Discharger and CH₂M-Hill. CH₂M-Hill will construct and operate the EISB system.
3. Clean up of sites that have groundwater polluted by Volatile Organic Constituents (VOCs) can be complex and difficult. Traditional pump and treat or vapor extraction systems may not work effectively in complex geologic conditions or at sites with low-permeability soils. If properly designed and managed, the addition of treatment enhancing substances (TES) such as those used in the EISB system can be an effective treatment technology capable of enhancing the bioremediation of VOCs in groundwater and reducing cleanup times. The operation of an EISB treatment system within the area of a groundwater plume is intended to provide an environmentally beneficial and efficient cleanup. The discharge of TES to groundwater must be conducted in a manner that improves corrective action treatment capabilities but also minimizes any additional degradation of groundwater quality with constituents of TES.
4. The Discharger proposes to use sodium lactate as the TES to stimulate enhanced reductive dechlorination of VOCs in groundwater at Site 31. The addition of soluble carbon substrates, such as sodium lactate, through injection, stimulates natural anaerobic microorganisms to produce a reducing

environment that provides dechlorination of VOCs. Findings 19 through 25 describe how the Discharger will implement the EISB treatment at Site 31. The Discharger may also use emulsified oil or cheese whey instead of sodium lactate if these substances are more cost effective.

5. The Discharger previously operated an EISB system at Site 10, which is about 1 mile north of Site 31. In addition to a TES, the EISB system at Site 10 also injected KB-1™. KB-1™ is a proprietary non-pathogenic microbial community, which is an enrichment derived from naturally occurring bacteria found in soil and groundwater. Findings 10 through 17 describe the EISB system at ERP Site 10. The Discharger may use KB-1™ at Site 31, if necessary.
6. Groundwater beneath Beale Air Force Base contains VOCs, primarily trichloroethene (TCE) and tetrachloroethene (PCE) and their degradation products. TCE and PCE are solvents that were used primarily in cleaning operations and have Primary Drinking Water Standards (MCLs) of 5 micrograms per liter (ug/L). In addition, the California Office of Environmental Health Hazard Assessment has established Public Health Goals for TCE and PCE in water of 0.8 ug/L and 0.06 ug/L, respectively.

BACKGROUND

7. Site 31 is in the south-central portion of Beale AFB, on the southwest corner of the intersection of 9th and K Streets. The site includes concrete foundations, which are all that remain of Building 896. Building 896 was the site of a former laundry facility that operated during the 1940's. The site is now surrounded by open grazing land to the west and south, the Bulk Storage Area (Site 18) to the east and a contractor staging area to the north.
8. The Air Force has constructed 30 monitoring wells at Site 31 and Site 18, which is 500 feet upgradient of Site 31. Subsurface investigations identified clay and silt in the upper forty feet of the vadose zone and below this depth, from 40 to 90 feet below ground surface, sand and silty sands. Below 90 feet, site investigations encountered coarse grained gravels. The depth to groundwater is about 50 feet. The groundwater flow direction is to the west. Groundwater elevation measurements suggest a downward vertical gradient exists beneath the site, which has contributed to the vertical migration of groundwater pollution at Site 31.
9. The maximum historical concentration of TCE in groundwater beneath Site 31 is 18,000 ug/L. The main VOC source area at Site 31 appears to be just west of former Building 896 and is shown in Attachment B, which is attached hereto and made part of this Order by reference. The TCE concentrations detected in monitoring wells downgradient of former Building 896 show an increasing trend over the last 3 years, which may be a function of changing groundwater flow conditions at the site. Groundwater elevations have risen by 30 feet in the

last 15 years in this portion of the Base. The rise in the water table may have resulted in the mobilization of residual VOCs in the soil column.

10. A Soil Vapor Extraction System (SVE) operated at Site 31 from 1998 to 2005 near Building 896. The SVE system was optimized several times and removed over 1000 pounds of VOCs from the vadose zone. After reaching asymptotic VOC removal rates and after having met all other shut-down criteria, the SVE system was decommissioned in 2006.
11. The horizontal hydraulic groundwater gradient along the axis of the TCE plume is 0.002 foot per foot in a westerly direction. The groundwater flow velocity is estimated at about 7 feet per year (ft/yr) in the upper water-bearing zone (from 50 to 9080 feet bgs) and about 110 ft/year in the lower water-bearing zone (from 90 to 120 feet bgs).

SITE 10 ENHANCED BIOREMEDIATION PROJECT

12. The Discharger is performing a full-scale EISB Project at Site 10 using sodium lactate and KB-1™. The EISB system at Site 10 is treating source areas that contain concentrations of TCE above 1000 ug/L. The Discharger provided a Remedial Action Construction Evaluation Report and other monitoring reports as required by Order No. R5-2004-0131 for the Site 10 groundwater cleanup activities. The monitoring reports submitted by the Discharger indicate compliance with Order No. R5-2004-0131.
13. The Site 10 EISB Project demonstrated the cost/benefit of implementing EISB remedial action using sodium lactate and KB-1™. The most significant factors that affected the feasibility of implementing the EISB remedy at Site 10 included: the appropriate dosage of sodium lactate required to achieve complete dechlorination of VOC constituents, the appropriate number and placement of injection and extraction wells, appropriate drilling methods for constructing wells and appropriate well casing diameter.
14. The Site 10 EISB pre-design fieldwork, which was necessary to design an effective treatment system included: specific capacity testing, calculation of hydraulic gradients, groundwater flow modeling to predict hydraulic response and collection of baseline field parameters. The Discharger collected baseline field parameters for specific conductance, pH, oxidation-reduction potential (ORP), dissolved oxygen, water temperature, and turbidity. The Discharger has continued collecting groundwater samples within the Site 10 treatment area and the downgradient compliance monitoring wells and has provided analysis for VOCs and metals (including hexavalent chromium).
15. The Discharger has optimized the EISB system over the last two years and has constructed additional injection and extraction wells that were arranged to create groundwater recirculation loops. Construction of the injection and extraction wells was conducted in two phases. A phased construction

approach allowed optimization of a treatment system and allowed focused cleanup of the source zones. The total volume of sodium lactate solution that was added to groundwater from September 2005 to August 2006 was 3127 gallons (60 percent solution of sodium lactate).

16. The EISB system was designed to provide adequate amounts of electron donor to the groundwater to stimulate enhanced reductive chlorination of chlorinated ethenes in the source area of Site 10. After anaerobic conditions were established in the subsurface, a specifically adapted culture of microorganisms, in the form of KB-1™, was injected to provide greater degradation rates. The VOC source area that was treated during this remediation effort has TCE concentrations greater than 500 ug/L.
17. The final EISB system for Site 10 consists of three independent distribution systems. A vacuum was observed in the above ground piping during the first phase of the EISB operation. The vacuum caused air to enter the system at the end of each pump discharge cycle. The air introduced into the injection wells increased biofouling and decreased the performance of the injection wells. The use of Dole valves at the injection wells eliminated the vacuum, which reduced the biofouling issue and significantly reduced the need to add chemicals such as citric acid, which provides biofouling control in the injection wells. The addition of citric acid had a tendency to destroy the KB-1™ culture, which reduced the ability to provide dechlorination of TCE.
18. Analytical sampling performed for the treatment area wells and the injection wells, prior to sodium lactate injection, indicated maximum concentrations of 1310 ug/L TCE, 3440 ug/L cis-1,2 DCE and 43 ug/L PCE. Post-injection sampling performed after the first phase of EISB system operation indicated TCE concentrations were below detection limits in the injection wells and were reduced by at least 50 percent from baseline concentrations in most of the treatment area monitoring wells. TCE daughter products, commonly produced during bioremediation, were detected in the treatment area. However, sample data show decreasing concentration trends for these daughter products. Table 1 provides a summary of analytical data for several monitor wells located within the Phase 1 treatment area.

Monitoring Well Location	¹ Baseline Conc. (2004-2005)	¹ Feb 2006 Sampling Event	¹ May 2006 Sampling Event	¹ Aug 2006 Sampling Event	¹ Nov 2006 Sampling Event
10C039RW	1050/22.4/ND	1.27/4.74/196	.45/99.8/54.4	.16/7.8/8.37	Not sampled
10M004MW	1180/2500/ND	24.9/56.5/33.7	.79/33.8/78.1	128/67.1/25	27.7/37/18
10C048MW	923/110/ND	58.1/111/44.9	17.7/20.4/9.58	20.4/26.6/17.2	2.97/4.4/2.87
10C0044RW	459/9.32/ND	590/340/11.7	51.6/559/18.4	23.2/285/13.2	2.7/43.4/20.6
10C041RW	75.9/26/ND	1.61/467/128	12.8/202/28.4	80.4/14/21.3	Not sampled
10C038RW	1080/329/ND	23.5/125/28.3	12.8/202/28.4	6.4/67/22	Not sampled

¹TCE/cis-1,2-DCE/Vinyl Chloride

PROPOSED REMEDIATION PROJECT

19. Layout and operation of the EISB system at Site 31 to be subject to these waste discharge requirements is designed to provide treatment of the water-bearing zone located between 50 and 120 feet below ground surface. The EISB treatment area, shown in Attachment C, which is attached hereto and made part of this Order by reference, overlays the 1000 µg/L TCE plume area and extends over 4 acres. The Site 31 EISB system will include the installation of up to 10 injection wells and 10 extraction wells, which will be aligned in well pairs. The location of the injection and extraction wells will be modified as necessary to assure treatment of the 1000 µg/L TCE plume area. However, the Discharger will consider whether it is feasible to modify the treatment area to provide cleanup of the 500 µg/L TCE plume area. Each injection well will be located approximately 150 feet upgradient of each corresponding extraction well to achieve the desired recirculation and treatment of polluted groundwater.
20. The distribution of sodium lactate, emulsified oil and/or cheese whey may operate in any one of three modes: active, passive or active/passive. Passive operation would rely on the natural hydraulic gradients to distribute the amendments and bacteria in the saturated zone. The active system would induce a hydraulic gradient by extracting and injecting groundwater in the treatment zone. The active/passive operation would rely on a combination of the both the active and passive modes.
21. The area treated by the EISB system is divided into a treatment zone area and a transition zone area as shown in Attachment D, which is attached hereto and made part of the Order by reference. The treatment zone area includes injection wells and extraction wells that deliver amendments to provide degradation of VOCs. The transition zone area surrounds the treatment zone area and is the area where anaerobic conditions, created by the EISB system, will return to natural aerobic conditions. Within the transition zone area it is expected that the reduced metals that may be mobilized from soils in the treatment zone will be oxidized and precipitate, becoming immobile. Further, it is anticipated that VOC daughter products such as vinyl chloride, which may migrate from the treatment zone, will degrade aerobically inside the transition zone. Residual concentrations of electron donors (e.g. sodium lactate), potentially migrating from the treatment zone, are anticipated to be removed through microbial respiration in the transition zone.
22. The Discharger proposes to inject sodium lactate, emulsified oil and/or cheese whey beginning in May 2007. Injection will occur over a 3-year period. The Discharger anticipates that it may require up to three years, following injection, to achieve sufficient reduction in TCE mass and to achieve aquifer cleanup goals within the treatment zone. Attachment D shows the proposed layout of

injection and extraction wells, and the monitoring wells from which analytical data will be collected to evaluate the cleanup activities.

23. The Discharger estimates that the stoichiometric electron donor demand, using sodium lactate, is approximately 562 milligrams of lactate per liter of groundwater. This is equivalent to approximately 205,000 pounds per year of 60 percent commercial grade sodium lactate. Dosing calculations assume a 4-acre treatment area, 30-foot thick aquifer zone with a total porosity of 30 percent, and a target sodium lactate concentration of 527 milligrams per liter. The Discharger estimates that the injected sodium lactate has an estimated sodium concentration of approximately 115 mg/L. The flow rate of extracted groundwater is expected to range from 3 to 6 gallons per minute (gpm).
24. A groundwater flow model was developed for Site 31 and was presented in the Remedial Investigation Report submitted by the Discharger in May 2006. The model and well configuration was based on the known extent of VOCs and aquifer testing that was conducted during the field investigations. Modeling predictions were used to develop the proposed well configuration, are shown in Attachment C. The model was run under steady-state conditions using the heads generated by the May 2005 flow field as the initial condition. Using the model generated flow field, flow lines were started at the perimeter of the anticipated treatment zone and tracked forward for 2 years. The area covered by these flow lines represented the transition zone. The hydraulic data will be field verified during installation of the injection and extraction wells. It is therefore possible that the well configuration shown in Attachment C could change based on knowledge gained during construction of the EISB system.
25. Performance of the EISB system will be assessed by monitoring the decline of VOC concentrations. The Discharger will also provide VOC mass estimates that remain in groundwater during frequencies specified in the MRP.

OTHER

26. The EISB system proposed in this Order has the potential to cause an increase in concentration of some dissolved metals and other VOC daughter products inside the treatment zone and transition zone that could exceed baseline concentrations. It is also possible that sodium concentrations will increase significantly above baseline concentrations due to the addition of sodium lactate. The Discharger has provided estimates of salt loading that may occur within the treatment zone and it is anticipated that increases in sodium concentrations will be temporary. It is reasonable and appropriate that groundwater monitoring be conducted by the Discharger to demonstrate that metals and other indicator constituents, including VOC daughter products and injectants and their breakdown products, return to baseline concentrations within the treatment and transition zones shown in Attachment D.

27. The EISB system will initially be operated in an active re-circulation mode until stable anaerobic conditions are established within the treatment zone. Stable anaerobic conditions are anticipated to occur 6 to 12 months after initial injection. If cis-1,2 –DCE is persistent as the dominant daughter product of TCE, the Discharger may provide bioaugmentation using the KB-1™ microbial culture.
28. The Discharger experienced significant biofouling within the injection wells at the Site 10 EISB system. To address potential biofouling of injection wells for the Site 31 EISB system, the Discharger proposes using sodium hypochlorite (bleach) as the primary biofouling control agent. Alternative biofouling control agents that may be used include chlorine dioxide and citric acid. Bleach will be added to the injection wells on a weekly basis. The target dose of bleach is estimated to be 50 mg/L for 10 minutes assuming a groundwater extraction rate of 5 gpm and a stock bleach concentration of 5.25 percent (typical for household bleach).
29. The cleanup activities covered under this Order will also be referenced in an Interim Record of Decision that the Discharger is preparing. This Interim Record of Decision does not address the distal portion of the VOC plume at Site 31. The Discharger will address the distal portion of the VOC plume with a different remedial approach, such as monitored natural attenuation. A Final Record of Decision (ROD) for groundwater remediation at Beale Air Force Base will include, in part, the selected remedy for all of Site 31 – the area covered by this cleanup project and the areas upgradient and downgradient from the EISB treatment area. Thus, the ROD will address residual pollutants within the EISB treatment area.

BASELINE SAMPLING

30. The Discharger will collect groundwater samples to assess site condition baseline concentration ranges for pollutants, ions, metals, and other by-products, at least one week prior to the injection of sodium lactate, emulsified oil and/or cheese whey. The baseline groundwater samples will be collected from the compliance monitoring wells and monitoring wells within the treatment and transition zones, as defined in Findings No. 21 and 22. Baseline sample analyses will include all constituents and associated analytical methods listed in MRP No. R5-2007-XXXX. The sampling data will be used to determine baseline concentrations for these constituents, as appropriate, using USEPA and Regional Water Board staff approved statistical methods to define the 95% upper confidence limit for a specified constituent based on the analytical results from all the samples collected at all the sample locations. Baseline concentrations are defined as those values contained within the 95% confidence interval. Immediately before baseline sampling begins, groundwater elevation levels will be measured at each baseline monitoring well location.

CONTINGENCY PLAN

31. The Discharger has submitted a contingency plan in the Draft Work Plan that would address potential violations of this Order. The Discharger proposes to implement the contingency plan if dissolved manganese, vinyl chloride or lactic acid are detected above baseline concentrations in any of the downgradient compliance monitoring wells. Under the contingency plan, if groundwater monitoring data indicate that any of these constituents are above baseline concentrations, the Discharger will conduct confirmation sampling within 7 days of receiving these results and will also notify Regional Board staff. The Discharger believes, based on the groundwater flow velocity estimates for the site, that the soonest dissolved manganese, lactic acid or vinyl chloride would be expected to reach downgradient compliance monitoring wells is about 2 years after initial injection of sodium lactate. Provision D.4 describes how the contingency plan would be implemented by the Discharger. Provision D.3 identifies the compliance monitoring network for the EISB system.
32. The Contingency Plan, and any approved revisions thereto, includes provisions to install, if needed, additional monitoring wells to confirm the exceedance of baseline conditions. If exceedance of baseline conditions is confirmed, then pursuant to the Contingency Plan, the Discharger will operate the EISB in an active mode, as described in Finding 20. If necessary, the Discharger will install additional extraction or injection wells to address violations of this Order. The installation and operation of additional extraction and injection wells would require submittal of a Corrective Action Work Plan, describing modifications to the EISB system. Prior to implementation, the Corrective Action Work Plan must be approved by the Executive Officer. The Order, including the Monitoring and Reporting Program, would be revised, as necessary, to reflect the operation of the new system and evaluate the adequacy of the VOC treatment and the reduction of dissolved metals concentrations and other pollutants to pre-treatment conditions.

REGULATORY CONSIDERATIONS

33. *The Water Quality Control Plan, Fourth Edition, for the Sacramento and San Joaquin River Basins, Fourth Edition*, (hereafter Basin Plan) designates beneficial uses, establishes water quality objectives (WQOs), contains implementation plans and policies for protecting waters of the basin, and incorporates by reference plans and policies adopted by the State Water Resources Control Board (State Water Board). Pursuant to ¶ 13263(a) of the California Water Code (CWC), waste discharge requirements must implement the Basin Plan.

34. The designated beneficial uses of underlying groundwater include:
 - a. Municipal and domestic water supply (MUN);
 - b. Agricultural water supply (AGR);
 - c. Industrial service supply (IND); and
 - d. Industrial process supply (PRO).

35. State Water Board Resolution No. 92-49 (hereafter Resolution 92-49) requires the Regional Board to require actions for cleanup and abatement of discharges that cause or threaten to cause pollution or nuisance to conform to the provisions of State Board Resolution No. 68-16 (hereafter Resolution 68-16) and the Basin Plan. Pursuant to Resolution 92-49, the Regional Board shall ensure that dischargers are required to clean up and abate the effects of discharges in a manner that promotes attainment of either background water quality, or if background levels of water quality cannot be restored, the best water quality which is reasonable and which complies with the Basin Plan, including applicable WQOs.

36. Resolution 68-16 requires the Regional Board in regulating discharges to maintain high quality waters of the State until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and potential beneficial uses, and will not result in water quality less than that described in plans and policies (e.g., quality that exceeds WQOs). Temporal degradation of groundwater may occur at this site within the defined treatment zone due to the amended groundwater injection. The temporary degradation allowed by this Order is consistent with Resolution 68-16 since (1) the purpose is to accelerate and enhance remediation of groundwater pollution and such remediation will benefit the people of the State; (2) the discharge facilitates a project to evaluate the effectiveness of cleanup technology in accord with Resolution 92-49; (3) the degradation is limited in scope and duration; (4) best practicable treatment and control, including adequate monitoring and hydraulic control to assure protection of water quality, are required; and (5) the discharge will not cause WQOs to be exceeded beyond the treatment zone and transition zones. A slight residual increase in salts (sodium concentrations above baseline concentrations) will likely occur but is expected to reduce over time following inflow of groundwater from upgradient of the treatment area.

37. As described in the Basin Plan, groundwater cleanup goals range between background concentrations to the water quality objectives (WQO), unless background for naturally occurring constituents is higher than the WQO, in which case the cleanup goals are the background concentrations. For this site, the background concentrations for VOCs are the detection limits, since these compounds are not known to be present upgradient of the site. For some pollutants, ions, metals, and other by-products associated with the injection of sodium lactate, background concentrations may need to be developed or may be represented by baseline concentrations. The applicable WQOs for this

cleanup are based on the narrative toxicity objective and chemical constituents. Numerical limits in this Order implement the narrative objective. The following are numerical criteria and their sources and the numeric MCLs relevant to the VOCs that could potentially be discharged or could be generated because of the discharge, along with the controlling WQO at this site:

Constituent	Limits	WQO ¹	Reference
1,2 dichloroethane	Toxicity	0.4 µg/l	California Public Health Goal in Drinking Water
Vinyl Chloride	Toxicity	0.5 µg/l	California Public Health Goal in Drinking Water
Cis 1,2 dichloroethene	Chemical Constituent	6.0 µg/l	California Department of Health Services Primary MCL ²
Trichloroethene	Toxicity	0.8 µg/l	California Public Health Goal in Drinking Water
Tetrachloroethene	Toxicity	0.06 µg/l	California Public Health Goal in Drinking Water
Total Dissolved Solids	Chemical Constituent	450 mg/l	Agricultural Water Quality Goals (Food and Ag Org. of United Nations)

¹ WQO - Water Quality Objective

²MCL - Maximum Contaminant Level

38. The action to adopt these Waste Discharge Requirements for the United States Air Force is exempt from the provisions of the California Environmental Quality Act (Public Resources Code Section 21000, et seq.) (CEQA) because it: (1) authorizes activity that will result in a minor modification to land pursuant to Title 14, California Code of Regulations, Section 15304; (2) consists of an action by a regulatory agency authorizing actions for the protection of the environment pursuant to Title 14, California Code of Regulations, Section 15308; and (3) authorizes minor cleanup actions costing \$1.5 million or less that are taken to prevent, minimize, stabilize, mitigate, or eliminate the release or threat of release of a hazardous waste or substance pursuant to Title 14, California Code of Regulations, Section 15330.

39. The discharge is exempt from the requirements of *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste*, set forth in the Title 27, California Code of Regulations (CCR), section 20005 et seq. (hereafter Title 27), which allows a conditional exemption from some or all of the provisions of Title 27. The exemption, pursuant to Title 27 CCR Section 20090(b), is based on the following:

- a. The Regional Water Board is issuing waste discharge requirements.
- b. The discharge is in compliance with the applicable Basin Plan.
- c. The wastewater does not need to be managed according to Title 22CCR, Division 4.5 and Chapter 11 as a hazardous waste.

Title 22 CCR Section 20090(d) allows exemption for a project to cleanup a condition of pollution that resulted from an unauthorized release of waste based on the following:

- d. The discharge of sodium lactate, emulsified oil and/or cheese whey to groundwater is at the direction of the Regional Water Board to cleanup and abate conditions of pollution or nuisance resulting from the unauthorized release of pollutants.
- e. Wastes removed from the immediate place of release will be discharged according to the Title 27 regulations; and
- f. The remedial actions intended to contain wastes at the place of release shall implement the Title 27 regulations to the extent feasible.

40. Section 13267(b) of the California Water Code provides that:

“In conducting an investigation specified in subdivision (a), the Regional Board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste outside of its region that could affect the quality of the waters of the state within its region shall furnish under penalty of perjury, technical or monitoring program reports which the Regional Board requires. The burden, including costs of these reports, shall bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. In requiring these reports, the Regional Board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports.”

The technical reports required by this Order and the attached MRP No. R5-2007-xxxx are necessary to assure compliance with these WDRs. The Discharger operates the facility that discharges the waste subject to this Order.

- 41. The California Department of Water Resources sets standards for the construction and destruction of groundwater wells, as described in *California Well Standards Bulletin No. 74-90* (June 1991) and *Water Well Standards: State of California Bulletin No. 94-81* (December 1981). These standards, and any more stringent standards implemented by the Regional Water Board or adopted by the Yuba County pursuant to California Water Code Section 13801 apply to all monitoring and injection wells.
- 42. Section 3020(b)(2) of the Resource Conservation and Recovery Act (RCRA) states that prior to injection into or above an underground source of drinking water, contaminated groundwater shall be “...treated to substantially reduce hazardous constituents prior to such injection.” In a letter dated 10 December 1999, the United States Environmental Protection Agency, Office of Solid Waste and Emergency Response (OSWER) states, “if extracted groundwater is amended at the surface (i.e., “treated”) before reinjection, and the subsequent in-situ bioremediation achieves a substantial reduction of

hazardous constituents the remedy would satisfy Section 3020(b)(2).”
Therefore, the injection of groundwater within the treatment zone at this site, with or without the treatment for VOCs, complies with Section 3020(2)(b) of RCRA.

43. Pursuant to California Water Code Section 13263(g), discharge is a privilege, not a right, and adoption of this Order does not create a vested right to continue the discharge.
44. All the above and the supplemental data and information and details in the attached Information Sheet, which is incorporated by reference herein, were considered in establishing the following conditions of discharge.
45. The Discharger and interested agencies and persons were notified of the intent to prescribe WDRs for this discharge and provided with an opportunity for a public hearing and an opportunity to submit written views and recommendations.
46. In a public meeting, all comments pertaining to these Waste Discharge Requirements were heard and considered.

IT IS HEREBY ORDERED that, pursuant to Sections 13263 and 13267 of the California Water Code, the United States Air Force, its agents, successors, and assigns, in order to meet the provisions contained in Division 7 of the California Water Code, and regulations and guidelines adopted thereunder, shall comply with the following while conducting the above described cleanup activities:

[Note: Other prohibitions, conditions, definitions, and some methods of determining compliance are contained in the attached “Standard Provisions and Reporting Requirements for Waste Discharge Requirements” dated 1 March 1991, incorporated herein.]

A. Discharge Prohibitions

1. Discharge of wastes or any pollutant to surface waters or surface water drainage courses is prohibited.
2. Discharge of waste classified as ‘hazardous’ under Title 23 CCR Section 2521 or ‘designated’ as defined in California Water Code Section 13173 is prohibited.
3. The discharge/injection of sodium lactate, emulsified oil, cheese whey, KB-1™, bleach, chlorine dioxide or citric acid by the Discharger at a location or in a manner different from that described in Findings 19 through 28 or the Contingency Plan provided in the Draft Work Plan, or any approved revisions thereto, is prohibited.

4. Creation of a pollution, contamination, or nuisance, as defined by Section 13050 of the California Water Code (CWC), attributable to operation of the EISB system is prohibited.

B. Discharge Specifications

1. The discharge of sodium lactate, emulsified oil, cheese whey, KB-1™, chlorine dioxide or citric acid shall be limited to the minimum necessary for effective in-situ treatment of groundwater and remain within the project areas, as shown in Attachment D.
2. The Discharger shall implement the Contingency Plan contained in the Draft Work Plan, and any Regional Board staff approved amendments thereto, to address any violation, or potential violation, of this Order including, but not limited to; conditions of soil, groundwater or air quality pollution, contamination, or nuisance created by the discharge of sodium lactate, possible breakdown products from the application of sodium lactate, excessive contaminant migration, fugitive emissions or aquifer clogging.
3. The Discharger shall maintain the ability to implement the Contingency Plan within the transition zone area shown in Attachment D and provide hydraulic control within a 100 foot radius from the downgradient edge of the transition zone of any groundwater pollutants, amendments, and breakdown products either injected or created by the EISB system. The Discharger shall maintain the ability for hydraulic control within a 100-foot radius downgradient of the transition zone area until the aquifer has recovered to pre-injection conditions, or until the Discharger can demonstrate that any parameters that exceed baseline concentrations as a result of sodium lactate injection show a decreasing trend. The ability to provide hydraulic control shall be maintained until discontinuance is approved by the Executive Officer.
4. The groundwater shall not be amended with materials other than sodium lactate, emulsified oil, cheese whey or KB-1™. However, if the Contingency Plan is implemented, the groundwater shall not be amended with materials other than sodium lactate, emulsified oil, cheese whey or KB-1™.
5. The Discharger shall not cause the permeability of the aquifer, either inside or outside of the treatment areas to be affected to such a degree that the Discharger is unable to effectively operate extraction wells for the purpose of containing the injected material and or its byproducts.
6. Objectionable odor originating at the treatment zone area shall not be perceivable beyond the limits of the Site.

C. Groundwater Limitations

1. The release, injection, discharge or addition of constituents from a remediation system shall not cause or contribute to exceedance of any water quality objective

outside of the treatment and transition zones, as delineated in Attachment D, during the project. Compliance with this Limitation to be assessed at the Points of Compliance defined in Monitoring and Reporting Program No. R5-2007-XXXX.

2. Following completion of the project, the concentrations of pollutants in groundwater shall not exceed background concentrations. Exceptions to this Limitation are concentrations of sodium, which will be released during the operation of project. The concentration of sodium at the Points of Compliance defined in Monitoring and Reporting Program No. R5-2007-XXXX shall not exceed 20% over their respective background concentrations.
3. During operation of the project, the Discharger shall not cause an increase in the concentration of amendments or redox sensitive metals outside of the treatment and transition zones.
4. The Discharger shall not cause the groundwater outside of the treatment and transition zones to contain taste and odor producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

D. Provisions

1. The Discharger shall comply with all applicable "Standard Provisions and Reporting Requirements for Waste Discharge Requirements", dated 1 March 1991, which are attached hereto and by reference a part of this Order. This attachment and its individual paragraphs are commonly referenced as "Standard Provision(s)".
2. The Discharger will be required to submit technical and monitoring reports pursuant to California Water Code Section 13267 as directed by the Executive Officer. The technical reports required by this Order are necessary to assure compliance with this Order. In accordance with California Business and Professions Code sections 6735, 7835 and 7835.1, engineering and geologic evaluations and judgments shall be performed by or under the direction of registered professionals competent and proficient in the fields pertinent to the required activities. All technical reports specified herein that contain work plans for, that describe the conduct of investigations and studies, or that contain technical conclusions and recommendations concerning engineering and geology shall be prepared by or under the direction of appropriately qualified professional(s), even if not explicitly stated. To demonstrate compliance with Title 16,CCR, Sections 415 and 3065, all technical reports must contain a statement of qualifications of the responsible registered professional(s) as well as the professional's signature and/or stamp of the seal. Violations may result in enforcement action as allowed in the Water Code.
 - a. The Discharger shall submit a Baseline Summary Report not later than **90 days** after startup of the sodium lactate injection. The Baseline Summary Report shall evaluate the natural variation and proposed baseline concentrations for the amendments and byproducts in the ambient groundwater outside of the treatment area. The Baseline Summary Report

shall be used by Regional Water Board staff to establish baseline concentrations of constituents in groundwater as required by MRP R5-2007-XXXX.

- b. The Discharger shall submit an Implementation/ Evaluation Report no later than **31 August 2008 or no later than one year after start-up of the sodium lactate injection at Site 31**, whichever is sooner. The Implementation/Evaluation Report shall include a description of the injection and a summary of analytical results, an evaluation of injection effectiveness and shall include any changes to the Draft Work Plan. If additional phases of injection and extraction wells are necessary and approved by the Executive Officer, as described in Provision D 4, the Discharger will submit additional Implementation/Evaluation Reports, as necessary.
3. If groundwater samples from any of the downgradient Points of Compliance, as defined in Monitoring and Reporting Program R5-2007-XXXX, are above baseline concentrations for lactic acid, vinyl chloride or dissolved manganese, the Discharger shall immediately notify Regional Board staff of the exceedance(s) and obtain confirmation samples within **7 days** of receiving the results. Within **48 hours** of receiving the confirmation sample results, the Discharger shall notify Regional Water Board staff of the results followed by written notification within **7 days**.
4. **Within 90 days** of confirming that baseline concentrations have been exceeded in any of the compliance monitoring wells and it has been determined by Regional Water Board staff that sodium lactate, emulsified oil and/or cheese whey injection is not providing adequate treatment of VOCs or the amendments and/or by-products are migrating outside of the transition zone, the Discharger shall submit a Corrective Action Work Plan for approval by the Executive Officer. The Corrective Action Work Plan shall describe which specific corrective measures specified in the Contingency Plan to address violations of this Order will be implemented along with a time schedule for implementation. The Corrective Action Work Plan must also describe which measures will be taken in the event groundwater elevation maps and/or groundwater sampling indicate that the compliance monitoring well network cannot adequately monitor the effectiveness of the EISB system. The Discharger shall provide a Corrective Action Status Summary Report no later than **60 days** after implementation of the Contingency Plan detailing activities that were implemented and described in the Corrective Action Work Plan.
5. The Discharger shall provide a water supply replacement evaluation report within **30 days** if the EISB system or any corrective action measure taken in response to implementation of the Contingency Plan adversely affects, or threatens to adversely affect, any water supply wells. The Report shall identify immediate and long-term water replacement options.
6. A copy of this Order shall be maintained at the project site and be available at all times to operating personnel. Key operating personnel shall be familiar with its contents.

7. While this Order is in effect, and prior to any change in ownership of the Site or management of this operation, the Discharger shall transmit a copy of this Order to the succeeding Owner/Operator, and forward a copy of the transmittal letter and proof of transmittal to the Regional Water Board. Transfer of privileges granted under this Order are subject to the discretion of the Executive Officer.
8. The Discharger shall comply with the attached MRP No. R5-2007-XXXX, which is part of this Order, and any revisions thereto as ordered by the Executive Officer. Modifications to the MRP No. R5-2007-XXXX may be made to continue process monitoring if any parameter does not return to pre-injection conditions. Chemical, bacteriological, and bioassay analyses must be conducted at a laboratory certified for such analyses by the State Department of Health Services.
9. Should evaluation of the EISB treatment reveal adverse effects on groundwater quality that were not anticipated, the Discharger shall notify Regional Board staff within **24 hours** of detection of the adverse effect, followed by a written summary within **2 weeks**. The Discharger shall cleanup and abate these effects pursuant to an abatement plan approved by Regional Water Board staff.
10. The Discharger shall comply with all conditions of this Order, including timely submittal of technical and monitoring reports as directed by the Executive Officer. Violations may result in enforcement action, including Regional Board or court order requiring corrective action or imposing civil monetary liability, or a revision or rescission of this Order.
11. Provisions of these WDRs are severable. If any provision of these requirements is found invalid, the remainder of these requirements shall not be affected.
12. The Discharger shall 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 WDRs.
13. 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, not protect the discharger from his liability under Federal, State, or Local laws, nor create a vested right for the Discharger to continue the waste discharge.
14. In the event the discharger is unable to comply with any of the conditions of this Order due to:
 - a. breakdown of any facility or control system or monitoring equipment installed by the Discharger to achieve compliance with this Order;

- b. migration or application of sodium lactate, pollutants or byproducts outside the specified treatment area;
- c. accidents caused by human error or negligence; or
- d. other causes such as acts of nature;

the Discharger shall notify the Regional Water Board 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 problem from recurring. The reporting of migration or application of sodium lactate, pollutants, breakdown products or byproducts outside the transition zone, as show in Attachment D, shall include an assessment of and schedule for implementation of the Contingency Plan as required in Provision D. 4.

15. The Regional Water Board may review this Order periodically and will revise these requirements when necessary.

I, Pamela C. Creedon, 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, Central Valley Region, on xx May 2007.

PAMELA C. CREEDON, Executive Officer

RRR: Date