
Central Valley Regional Water Quality Control Board

16 March 2023

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FINAL NOTICE OF APPLICABILITY, GENERAL ORDER WASTE DISCHARGE REQUIREMENTS NO. R5-2015-0012, PLUME CG041-017, BEALE AIR FORCE BASE (AFB), YUBA COUNTY

The Air Force Civil Engineer Center (AFCEC) submitted a Notice of Intent (NOI) dated 4 January 2022 requesting coverage under General Order No. R5-2015-0012, *General Waste Discharge Requirements for In-situ Groundwater Remediation and Discharge of Treated Groundwater to Land*. Based on information in your submittal, it is our determination that this project meets the requirements of the general order. All the requirements contained in this general order are applicable to your project. You are assigned Order No. R5-2015-0012-078.

Project Location:

The project is located south of Gavin Mandery Drive between Best Slough and Dry Creek in the southeast area of Beale AFB, California.
Assessor's Parcel Number: Not applicable
Township 15N, Range 5E, Section S33

Project Description:

Plume CG041-017 represents groundwater underlying Site OT017, a drum disposal area near Best Slough. Trichloroethene (TCE) is the primary chemical of concern in groundwater and the existing plume is approximately 800 feet wide and 1,700 feet long. In 2021, the maximum concentration of TCE in groundwater was 240,000 micrograms per liter ($\mu\text{g/L}$) at well 17L006MW in the primary source area. As part of the interim remedy, two slurry walls have been constructed to surround the primary and secondary source areas. The primary slurry wall encompasses approximately five acres just south of Best Slough. Dense non-aqueous phase liquid (DNAPL) is believed to be present in the primary source area. A second slurry wall in the secondary source area surrounds approximately four acres of the secondary source area just outside (south) of the primary source area. The downgradient side of the second slurry wall contains a

MARK BRADFORD, CHAIR | PATRICK PULUPA, ESQ., EXECUTIVE OFFICER

permeable reactive barrier (PRB) consisting of zero valent iron (ZVI). A groundwater extraction and treatment system (GETS) has operated at Plume CG041-017 since 2001. The GETS extracts groundwater from two lateral drains (interceptor trench) near the southern boundary of the primary source area. The purpose of the GETS is to maintain an inward groundwater gradient within the primary source area slurry wall. Groundwater is treated with granular activated carbon (GAC) and an air stripper and effluent is discharged to the Base sanitary sewer system.

Work activities planned for the subject project are described in the *Plume CG041-017 Remedial Action Work Plan (RAWP)* (CH2M Hill, 2018). The Discharger plans to inject emulsified vegetable oil (EVO) into thirty (30) injection wells. Approximately 107,000 pounds of EVO is anticipated to be used with an overall injection volume of approximately 464,000 gallons.

Thirty (30) injection wells (17C170IW through 17C199IW) will be installed at the locations shown on Figure 1. The wells will be advanced through alluvial soils to competent bedrock. Depth to groundwater is anticipated to range from about 10 to 15 feet bgs with depth to bedrock from approximately 20 to 35 feet bgs. The transects of wells immediately north and west of the primary source area slurry wall will be screened across the bottom 15 feet of the aquifer from 20 to 35 feet bgs. The screen interval is designed to prevent short-circuiting of EVO between the injection wells and the interceptor trench that is approximately 15 feet deep. The remaining injection wells will be screened from 15 feet to 35 feet bgs. Three injection wells (17C197IW through 17C199IW) will be installed exterior (southwest) of the primary source area slurry wall to address increasing TCE in the vicinity. In addition, a portion of the soil-bentonite primary slurry wall separating the primary and secondary source areas will be replaced with ZVI and sand to form a PRB. The PRB will be constructed to a depth of 25 feet bgs to passively treat groundwater contaminated with chlorinated VOCs.

Injection will be performed in three phases: Phase 1 will consist of injections outside of the slurry wall, Phase 2 will consist of injections in the northern portion of the eastern and western treatment zones, and Phase 3 will consist of injections in the southern portion of the eastern and western treatment zones. The GETS will be reconfigured to operate as an EVO injection and recirculation system. A 5,000-gallon aboveground storage tank will be installed at the GETS treatment pad to store EVO which will be mixed with clean potable water as a 3 percent solution by volume. Two Dosatron pumps installed in parallel will receive treated water from the GAC system. The EVO and water mixture will be conveyed to the injection wellheads using 1-inch-diameter PVC piping. The injection flow rate is anticipated to be 2 gallons per minute (gpm) at each injection well. The existing air stripper will remain at the treatment pad, though will be taken out of operation.

Two bioreactors will be constructed in the primary source area at former disposal Trenches 2 and 3 (Figure 1). Each bioreactor will be about 4 feet wide and 15 feet deep

and remove approximately 100 bank cubic yards of soil. The length of the bioreactors will correspond to the disposal trenches. Trench 2 is believed to be about 75 feet long, however, the bioreactor will be only 60 feet long to avoid trenching in the access road.

One monitoring well will be lowered into each bioreactor excavation prior to backfilling. Backfill will consist of a 60:40 mixture of composted mulch and gravel sprayed with vegetable oil. A reactive iron powder will be added to the mulch placed at the bottom third of bioreactor to promote abiotic reduction of VOCs. Mulch and gravel backfill will be placed to approximately 6 feet bgs and remaining backfill will consist of excavated soil to maintain the protective soil cover. Headspace readings (one sample per 20 cubic yards of backfill) will be taken from soil intended for backfill using a photoionization detector (PID). If PID readings are elevated (greater than 50 parts per million [ppm]), the soil will be segregated and stockpiled for offsite disposal. The bioreactors will be plumbed to the GETS and extracted groundwater will be conveyed to the bioreactors through a redundant infiltration irrigation system (a primary and secondary) installed on top of the mulch.

The proposed injections could potentially create vinyl chloride or increase dissolved iron, total organic carbon (TOC), or total dissolved solids (TDS) concentrations in the treatment area. If vinyl chloride, dissolved iron, TOC, or TDS are more than 20 percent greater than their respective baseline concentrations, or if water quality objectives listed in Finding 18 of the General Order are exceeded in the designated compliance wells, then AFCEC will implement one or more of the contingency measures presented below in the Contingency Plan section.

As part of this Order, groundwater monitoring will be performed in accordance with the attached Monitoring and Reporting Program (MRP) to confirm injection of EVO is not adversely impacting groundwater quality, and to monitor the progress of the remedy.

The tentative Notice of Applicability was issued for a 30-day public comment period on 15 December 2022. The public comment period ended on 17 January 2023. No comments were received from the public.

General Information:

1. The project will be operated in accordance with the requirements contained in the General Order No. R5-2015-0012, and in accordance with the information submitted in the Notice of Intent and specified in this Notice of Applicability.
2. Injection of materials into the groundwater beneath Plume CG041-017, other than EVO, zero valent iron, guar gum, and materials specified in the contingency plan, is prohibited.
3. Failure to abide by the conditions of the General Order could result in an enforcement action as authorized by provisions of the California Water Code.

4. US Air Force shall comply with the attached Monitoring and Reporting Program Order No. R5-2015-0012-078 and any revisions thereto as ordered by the Executive Officer.
5. Comply with Contingency Plan as follows:

Contingency Plan:

The General Order requires a contingency plan for corrective actions should water quality exceed the requirements of the Order at the points of compliance. The General Order prohibits concentrations of vinyl chloride, dissolved manganese, or TDS more than 20 percent greater than their respective baseline levels, or exceedances of water quality limits at points of compliance.

Baseline concentrations of vinyl chloride, dissolved iron, and TDS will be determined prior to the injections following the procedures specified in the Notice of Intent, Attachment B. The 95 percent upper prediction limit (UPL) will serve as the baseline concentration for each analyte. If a compound is not detected above the laboratory reporting limit, then the reporting limit will serve as the baseline concentration for that compound.

If there is an exceedance of a trigger level at a downgradient compliance well (17H015AMW, 17H015BMW, or 17C168MW) or surface water sampling location (17L008SW, 17008SW, or SWPARKS), a confirmation sample will be collected within 10 days of learning of the exceedance. If the exceedance is confirmed, the Central Valley Water Board will be notified in writing within 10 days.

If an exceedance is confirmed in a downgradient compliance well, a corrective action work plan will be submitted to the Water Board for approval within 30 days. The Work Plan will include one or more of the following:

1. Increased monitoring frequency
2. Expanded monitoring network
3. In-situ chemical oxidation downgradient from the ERD treatment area, or to reduce concentrations of any electron donors or dissolved metals mobilized within the ERD treatment zone
4. Optimization of the bioreactor, or
5. Resumption of pumping by the GETS to create a gradient toward the source area.

The flow rates of the bioreactors may be reduced to provide increased residence time within the bioreactor. Additional electron donors could be injected into the bioreactors to improve treatment efficiency. Also, bioaugmentation (addition of a commercial *Dehalococcoides*) may be performed within the bioreactor. If excessive leakage is observed in the southwestern corner of the primary slurry wall as evidenced by

increasing VOC concentration trends in nearby wells, a PRB may be constructed in that area as discussed in Appendix C of the RAWP (CH2M Hill, 2018). If data indicate reducing conditions are no longer prevalent within the PRB as suggested by oxidation-reduction potential (ORP) and pH readings, or if VOC treatment is diminishing, the PRB will be evaluated for removal and replacement.

If hydrogen sulfide is measured in air at a concentration greater than 1 part per million (ppm) during performance monitoring at groundwater wellheads or subgrade vaults, and a second reading confirms the concentration, administrative or engineering controls will be implemented.

All contingency measures agreed to by Central Valley Water Board and the U.S. Air Force will be fully implemented within 6 months of detecting one of these conditions.

If you have any questions or comments regarding this letter, please contact Mark Clardy at (916) 464-4719 or by email at Mark.Clardy@waterboards.ca.gov.

**Original Signed by JOHN J. BAUM for
Date: 03-16-2023**

PATRICK PULUPA
Executive Officer

Attachments

REFERENCE

CH2M Hill. 2018. *Plume CG041-017 Remedial Action Work Plan, Beale Air Force Base, California*. Final. June.

cc: *Electronic submittal*

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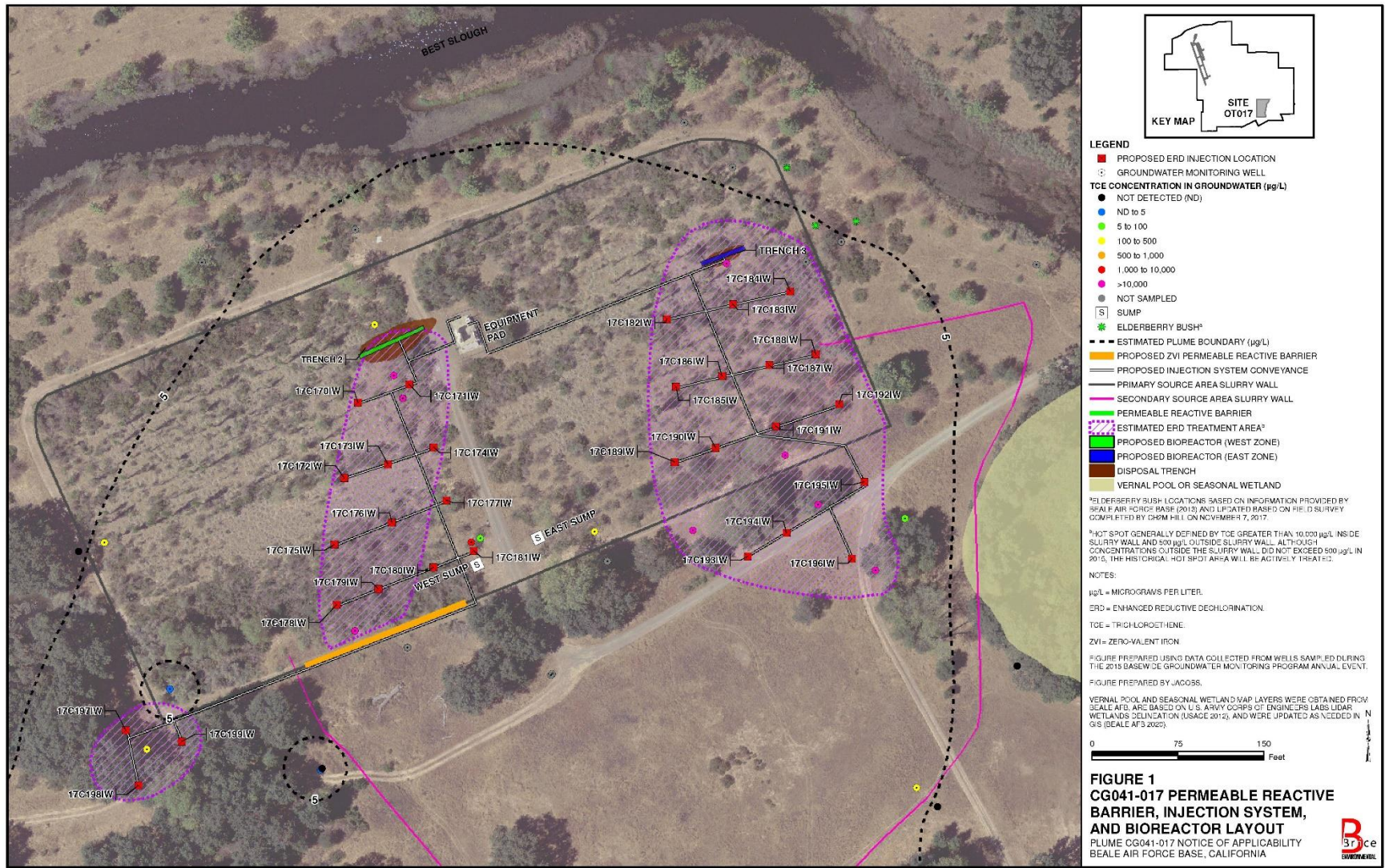
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LEGEND

- PROPOSED ERD INJECTION LOCATION
- GROUNDWATER MONITORING WELL
- TCE CONCENTRATION IN GROUNDWATER (µg/L)**
- NOT DETECTED (ND)
- ND to 5
- 5 to 100
- 100 to 500
- 500 to 1,000
- 1,000 to 10,000
- >10,000
- NOT SAMPLED
- Ⓢ SUMP
- ★ ELDERBERRY BUSH¹
- ESTIMATED PLUME BOUNDARY (µg/L)
- PROPOSED ZVI PERMEABLE REACTIVE BARRIER
- PROPOSED INJECTION SYSTEM CONVEYANCE
- PRIMARY SOURCE AREA SLURRY WALL
- SECONDARY SOURCE AREA SLURRY WALL
- PERMEABLE REACTIVE BARRIER
- ESTIMATED ERD TREATMENT AREA²
- PROPOSED BIOREACTOR (WEST ZONE)
- PROPOSED BIOREACTOR (EAST ZONE)
- DISPOSAL TRENCH
- VERNAL POOL OR SEASONAL WETLAND

¹ELDERBERRY BUSH LOCATIONS BASED ON INFORMATION PROVIDED BY BEALE AIR FORCE BASE (2013) AND UPDATED BASED ON FIELD SURVEY COMPLETED BY CHRM HILL ON NOVEMBER 7, 2017.

²HOT SPOT GENERALLY DEFINED BY TCE GREATER THAN 10,000 µg/L INSIDE SLURRY WALL AND 500 µg/L OUTSIDE SLURRY WALL, ALTHOUGH IF CONCENTRATIONS OUTSIDE THE SLURRY WALL DO NOT EXCEED 500 µg/L IN 2015, THE HISTORICAL HOT SPOT AREA WILL BE ACTIVELY TREATED.

NOTES:
 µg/L = MICROGRAMS PER LITER.
 ERD = ENHANCED REDUCTIVE DECHLORINATION.
 TCE = TRICHLOROETHENE.
 ZVI = ZERO-VALENT IRON.

FIGURE PREPARED USING DATA COLLECTED FROM WELLS SAMPLED DURING THE 2015 BASEWIDE GROUNDWATER MONITORING PROGRAM ANNUAL EVENT.
 FIGURE PREPARED BY JACOBS.

VERNAL POOL AND SEASONAL WETLAND MAP LAYERS WERE OBTAINED FROM BEALE AFB. ARE BASED ON U.S. ARMY CORPS OF ENGINEERS LASER LIDAR WETLANDS DEMONSTRATION USAGE (2012), AND WERE UPDATED AS NEEDED IN GIS (BEALE AFB 2022).

0 75 150 Feet

FIGURE 1
CG041-017 PERMEABLE REACTIVE BARRIER, INJECTION SYSTEM, AND BIOREACTOR LAYOUT
 PLUME CG041-017 NOTICE OF APPLICABILITY
 BEALE AIR FORCE BASE, CALIFORNIA



CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. R5-2015-0012

WASTE DISCHARGE REQUIREMENTS
GENERAL ORDER FOR
IN-SITU GROUNDWATER REMEDIATION
AND DISCHARGE OF TREATED GROUNDWATER TO LAND

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

1. On 6 December 2008 the Regional Water Board adopted General Order No. R5-2008-0149, General Order for In-Situ Groundwater Remediation at Sites with Volatile Organic Compounds, Nitrogen Compounds, Perchlorate, Pesticides, Semi-Volatile Compounds, Hexavalent Chromium and/or Petroleum Hydrocarbons. Between 2008 and 2014, over 50 Notices of Applicability (NOA) were issued for coverage under Order R5-2008-0149. It was apparent that some improvements to the order were warranted. The significant improvements consist primarily of additions to the pollutants covered under the order, specifying effluent limitations if an ex-situ treatment system is utilized, adding discharge of treated groundwater as part of a pump and treat system, and incorporating several modifications to the monitoring and reporting program to increase its functionality and versatility.
2. Order R5-2008-0149 and the NOAs issued pursuant to that Order are still in effect. No additional NOAs will be issued under that Order. The Order will be proposed for rescission once all of the projects under that Order are completed and the NOAs issued have been terminated. This updated version of the Order is not more restrictive to the projects covered under Order No. R5-2008-0149 and thus it is not necessary to enroll them under this Order.
3. Pursuant to Section 13263, subdivision (i) of the California Water Code (CWC), the Regional Water Quality Control Board may prescribe general waste discharge requirements (WDRs) for discharges produced by similar operations, involving similar types of wastes, and requiring similar treatment standards.
4. Discharges of volatile organic compounds (VOCs), perchlorate, nitrogen, pesticides, semi-volatile compounds, hexavalent chromium, sulfate and petroleum hydrocarbons have degraded groundwater at numerous sites within the Central Valley Region and cause or threaten to cause pollution or nuisance and adversely affect existing and potential beneficial uses of groundwater resources. Remediation of groundwater at these sites includes the use and application of in-situ biological, chemical, and/or physical treatments to degrade pollutants, or change them to less toxic or less mobile forms.
5. In-Situ remediation processes include adding amendments to create oxidizing or reducing conditions in the groundwater. Examples of such amendments include oxygen, alcohols, sugars, permanganate, ozone and lactate. Amendments may also be added to enhance bacteria populations. Examples of those amendments include nutrients (phosphorous,

nitrogen, potassium) and microbes. The amendments are usually injected into the treatment area or are added to extracted groundwater and recharged into the treatment area followed by extraction in a recirculation mode. The remediation may include extraction and treatment of groundwater, with the discharge of the treated groundwater back to the aquifer, applied to the land surface or injected into the vadose zone. The remediation processes can include groundwater extraction, treatment, and recirculation or discharge of treated groundwater to ground within the area undergoing treatment. For example, amendments may be injected into the treatment zone, or actively circulated through the treatment zone with groundwater recirculation. Treated groundwater may be discharged and further treated by land application. Pollutants other than those listed above, amendments, and treatment processes other than those listed, may also be considered for use under this Order. For those instances the applicability of the technology to the pollutant must be demonstrated, such as in a pilot test. Additional details are supplied in the Information Sheet, attached to this Order.

6. Adoption of general WDRs for these processes would: a) simplify the application process for dischargers, b) prevent regulatory delays to groundwater remediation activities, c) reduce time needed for Regional Water Board staff to prepare and the Regional Water Board to adopt WDRs for common remedial activities in the Central Valley Region, d) enhance protection of surface water quality by eliminating some discharges of treated groundwater to surface water, and e) provide a comparable level of water quality protection to individual, site-specific WDRs.
7. This Order regulates the use and application of in-situ biological, chemical, and physical treatments to clean up waste constituents in groundwater. The dischargers regulated by this Order are more appropriately regulated by general WDRs than individual WDRs because the Regional Water Board regulates many sites using this type of process, the cleanup of these type of sites is of high priority and the issuance of individual WDRs is time-consuming without providing additional benefit, and the types of treatment used have similar effects that can reasonably be regulated with general WDRs. This Order does not preclude the adoption of individual WDRs where appropriate.
8. The amendments that can be used to remediate groundwater pollution at a site in the Central Valley Region under this Order are limited to those listed in the CONDITIONS OF ELIGIBILITY, listed below. This Order is not intended for use and application of other materials to remediate groundwater pollution or for remediation of waste constituents in groundwater other than VOCs, perchlorate, nitrogen compounds (nitrate, ammonia, etc.), some selected pesticides and semi-volatile organic compounds, sulfate and petroleum hydrocarbons, unless it is demonstrated in a bench test that the technology is likely to be effective on the particular pollutant under site specific conditions.
9. The application of any material to groundwater may result in unintended adverse effects to groundwater quality. To comply with this Order, any potential adverse water quality effects that may occur must be localized, of short-term duration, and may not affect existing or potential beneficial uses of groundwater. Groundwater quality will be monitored before and after addition of any materials to verify both the effectiveness of the remediation and that no long-term adverse effect on beneficial uses of groundwater has occurred.

10. The addition of materials to remediate groundwater may require bench-scale and/or small-scale pilot testing prior to design and implementation of full-scale remediation. The addition of amendments to conduct pilot studies is also covered under this Order.

REGULATORY CONSIDERATIONS

11. *The Water Quality Control Plan, Fourth Edition, for the Sacramento and San Joaquin River Basins, Fourth Edition and The Water Quality Control Plan, Second Addition, for the Tulare Lake Basin* (hereafter Basin Plans) designate beneficial uses, establishes water quality objectives (WQOs), contains prohibitions, 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 Plans.
12. The designated beneficial uses of underlying groundwater include, but are not limited to:
 - a. Municipal and domestic water supply (MUN);
 - b. Agricultural water supply (AGR);
 - c. Industrial service supply (IND); and
 - d. Industrial process supply (PRO).
13. The Basin Plans establish numerical and narrative water quality objectives for surface water and groundwater within the basin, and recognizes that water quality objectives are achieved primarily through the Board's adoption of waste discharge requirements and enforcement orders. Where numerical water quality objectives are listed, these are limits necessary for the reasonable protection of beneficial uses of the water. Where compliance with narrative water quality objectives is required, the Board will, on a case-by-case basis, adopt numerical limits in orders, which will implement the narrative objectives to protect beneficial uses of the waters of the state. Finding No. 18 lists those numerical limits for compliance with the narrative objectives for this Order.
14. The Basin Plans identify numerical water quality objectives for waters designated as municipal supply. These are the maximum contaminant levels (MCLs) specified in the following provisions of Title 22, California Code of Regulations: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Table 64449-A (Secondary Maximum Contaminant Levels-Consumer Acceptance Limits) of Section 64449. The Basin Plans' incorporation of these provisions by reference is prospective, and includes future changes to the incorporated provisions as the changes take effect. The Basin Plans recognize that the Board may apply limits more stringent than MCLs to ensure that waters do not contain chemical constituents in concentrations that adversely affect beneficial uses.
15. The Basin Plans contain narrative water quality objectives for chemical constituents, tastes and odors, and toxicity. The toxicity objective requires that groundwater be maintained free of toxic substances in concentrations that produce detrimental physiological

responses in humans, plants or animals. The chemical constituent objective requires that groundwater shall not contain chemical constituents in concentrations that adversely affect beneficial uses. The tastes and odors objective requires that groundwater shall not contain tastes or odors producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

16. State Water Board Resolution No. 92-49 (hereafter Resolution No. 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 Water Board Resolution No. 68-16 (hereafter Resolution No. 68-16) and the Basin Plan. Pursuant to Resolution No. 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.
17. Resolution No. 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 sites subject to this Order within the defined treatment zone due to the amended groundwater injection. The temporary degradation allowed by this Order is consistent with Resolution No. 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 No. 92-49; (3) the degradation is limited in scope and duration; (4) best practicable treatment and control, including adequate monitoring and a contingency plan to assure protection of water quality are required; and (5) the discharge will not cause WQOs to be exceeded beyond the transition zone and it is expected that increases in concentrations above WQOs caused by the treatment will be reduced over time. If the background concentration of a not-targeted-for-remediation constituent already exceeds the WQO listed in Finding 18, then the concentration of the constituent in the amendment as added to groundwater cannot exceed the WQO for that constituent. A slight residual increase in salts may occur at some sites subject to this Order but will be limited to a maximum 20 percent increase over background and less than the WQO listed below in Finding No. 18. See Groundwater Limitation E.3.
18. This Order addresses water quality as it relates to the amendments being injected, as well as the byproducts and breakdown products produced by the reactions of the injectants, pollutants being treated and native geological materials. Cleanup criteria for groundwater are established in an appropriate enforcement document such as a Record of Decision, Cleanup and Abatement Order, or Remedial Action Plan and are not discussed further as a part of this Order. As discussed above, amendments are injected to groundwater to stimulate reduction in concentrations of the target waste constituent and the target waste constituent may undergo a series of transformations to other constituents as it degrades.

The injected chemical itself may leave residuals of its constituent components, as well as cause changes in groundwater chemistry that liberate metals found in the formation geomaterials. Background/baseline concentrations of metals and total dissolved solids will be established pursuant to the attached Monitoring and Reporting Program. The applicable WQOs are the narrative toxicity objective, Primary and Secondary Maximum Contaminant Levels, and the narrative taste and odor objective as found in the Basin Plan. Numerical limits in this Order implement those WQOs. The following Table presents the numerical WQOs for potential waste constituents of concern at the site:

Constituent	WQO	Reference
trichloroethene	0.8 µg/L	California Public Health Goal
tetrachlorethene	0.06 µg/L	California Public Health Goal
vinyl chloride	0.05 µg/L	California Public Health Goal
cis 1,2-dichlorethene	6 µg/L	Primary Maximum Contaminant Level
1,2-dichlorethene	10 µg/L	Primary Maximum Contaminant Level
1,2-dichloroethane	0.4 µg/L	California Public Health Goal
1,1-dichloroethene	6 µg/L	Primary Maximum Contaminant Level
1,1-dichloroethane	3 µg/L	California Public Health Goal
1,2,3-trichloropropane	0.0007 µg/L	Draft California Public Health Goal
1,2-dichloropropane	0.5 µg/L	California Public Health Goal
1-chloropropane	280 µg/L	IRIS
propene	28 µg/L	Taste and Odor
iron	300 µg/L	Secondary Maximum Contaminant Level
manganese	50 µg/L	Secondary Maximum Contaminant Level
hexavalent chromium	10 µg/L	California Maximum Contaminant Level
total chromium	50 µg/L	Primary Maximum Contaminant Level
total dissolved solids	500 mg/L	Secondary Maximum Contaminant Level
sulfate	250,000 µg/L	Secondary Maximum Contaminant Level
sodium	20,000 µg/L	USEPA Health Advisory
bromate	10 µg/L	Primary Maximum Contaminant Level
chloride	106,000 µg/L	Agricultural Water Quality Goal – Food and Ag
Nitrate-N	10,000 ug/L	Primary Maximum Contaminant Level
Ammonium	1,500 ug/L	Taste and Odor
Perchlorate	6 ug/L	Primary Maximum Contaminant Level
Petroleum Hydrocarbons (gasoline)	5 ug/L	Taste and Odor
Diesel Oil	100 ug/L	Taste and Odor
Cyanide	150 µg/L	California Maximum Contaminant Level

- Some amendments used to stimulate degradation of waste constituents in groundwater have a salt component (generally sodium or potassium). Upon completion of the intended degradation process, the salt component remains. The groundwater in the Central Valley is severely degraded by salts and the Regional Water Board is intent on minimizing the discharge of salts to the groundwater. The use of non salt-containing injectants is preferred, and the Discharger is required to demonstrate that there are no non salt-containing injectant alternatives that will cost-effectively promote the degradation of the target constituent before being allowed to use a salt-containing injectant. See Discharge Specification D.3. Furthermore, the Discharger is required to establish background salt concentrations (total dissolved solids) and monitor the groundwater for changes in salt

concentrations during the life of the project. Increases in salt concentrations in ground water are restricted by Groundwater Limitation E.3, below.

20. On 6 February 2015, the Regional Water Board adopted a Mitigated Negative Declaration for this Order pursuant to the f the California Environmental Quality Act (Public Resources Code Section 21000, et seq.).
21. 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 Plans.
 - c. The wastewater does not need to be managed according to Title 22CCR, Division 4.5 and Chapter 11 as a hazardous waste.

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

- d. The application of amendments to groundwater is at the direction of the Regional Water Board to cleanup and abate conditions of pollution or nuisance resulting from the unauthorized discharge of waste.
 - e. Wastes removed from the immediate place of release must be discharged according to the Title 27 regulations; and
 - f. The cleanup actions intended to contain wastes at the place of release shall implement the Title 27 regulations to the extent feasible.
22. 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 Monitoring and Reporting Program are necessary to assure compliance with this Order. The Discharger operates the facility that discharges the waste subject to this Order.

23. 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 local county where the site is located pursuant to California Water Code Section 13801 apply to all monitoring and injection wells.
24. 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)." The injection of groundwater within the treatment zone in compliance with this Order, with or without the treatment for the constituents of concern, complies with Section 3020(2)(b) of RCRA.
25. Section 13304.1(b) of the California Water Code requires that the Regional Board shall consult with the affected groundwater management entity, if any, affected public water systems, and the State Department of Public Health prior to setting applicable water quality standards to be achieved at groundwater cleanup sites that are associated with an aquifer that is used as a drinking water source. Prior to issuing a Notice of Applicability under this Order for a specified project, the Regional Board will consult with the appropriate interested agencies.
26. Section 13307.5 of the California Water Code requires specific public participation actions if the site cleanup is being undertaken pursuant to a cleanup and abatement order. When applying this Order to sites subject to a cleanup and abatement order, the required public participation will be adhered to.

OTHER

27. 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.
28. 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.

29. The Discharger and interested agencies and persons were notified of the intent to prescribe waste discharge requirements for this discharge and provided with an opportunity for a public hearing and an opportunity to submit written comments.
30. In a public meeting, all comments pertaining to this Order were heard and considered.

IT IS HEREBY ORDERED that, pursuant to Sections 13263 and 13267 of the California Water Code, Dischargers, 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:

A. CONDITIONS OF ELIGIBILITY

1. A discharger may seek coverage under this Order to:
 - a. Add specific amendments directly to groundwater or indirectly through the soil column for the purpose of facilitating in situ remediation of waste constituents. The Discharger must demonstrate the effectiveness of the selected amendment(s), and demonstrate control of side reactions and breakdown products under site conditions.
2. To be covered under this Order, a discharger must provide the following:
 - a. A Notice of Intent/Report of Waste Discharge (Attachment A) following the instructions included in Attachment B, including additional information as required in Attachment 1 to the Notice of Intent;
 - b. A Regional Water Board approved Work Plan, Work Plan Addendums (if applicable), and/or a Remedial Action Plan or Cleanup Plan which includes application of an amendment that qualifies for coverage under this Order (The approval for the Work Plan or Remedial Action Plan needs to be dated within 24 months of the date of the Notice of Intent);
 - c. A proposed Monitoring and Reporting Program, based on Attachment C, incorporated herein by reference;
 - d. The first annual fee in accordance with the current version of the California Code of Regulation, Title 23, Division 7, Chapter 9, Waste Discharge Report and Requirements Article 1 -- fees for a discharge. The check or money order shall be made payable to the "State Water Resources Control Board".
 - e. A Contingency Plan to be implemented to correct unacceptable water quality effects.
3. This Order covers the following actions:

- a. Pilot studies of limited extent and duration:
 - i. When the amendments have previously been demonstrated (previous pilot tests or full-scale operations) to achieve the desired results and side reactions, byproducts, breakdown products, and residuals are understood.
 - ii. When processes to remove byproducts, breakdown products, and residuals are identified and discussed in the Remedial Action Work Plan or Report of Waste Discharge.
 - b. Full-scale applications:
 - i. When it has been demonstrated in a pilot study, or full-scale application at this site or a similar site, that the desired results can be achieved and side reactions, breakdown products, and residuals do not result in long-term adverse water quality effects.
4. Coverage under this Order applies to the following groups of amendments, except as specifically excluded in A5 below, provided the conditions in A1, A2, and A3 are satisfied:
- a. Amendments that create reducing conditions (i.e., amendments that provide carbon, energy, electrons and/or macronutrients). Examples include:
 - i. Zero valent metals such as iron or zinc
 - ii. Easily degradable carbon sources such as glucose, acetate, citric acid, acetic acid, ethanol, methanol and others
 - iii. Slowly degradable carbon sources such as edible oils, poly-lactate, and other hydrogen release compounds
 - iv. Polysulfides
 - v. Macro nutrients such as nitrate, phosphate, and potassium
 - vi. Microorganisms cultured on site materials.
 - b. Amendments that create oxidizing conditions (i.e., amendments that provide oxygen or otherwise gain electrons). Examples include:
 - i. Air
 - ii. Oxygen
 - iii. Ozone
 - iv. Potassium or sodium permanganate
 - v. Oxygen release compounds
 - vi. Hydrogen peroxide

- c. Multiple amendments (includes application of reducing agents or oxidizing agents or both applied concurrently or over time as proposed in an approved Work Plan and the Notice of Intent). Examples include:
 - i. Establishing a reducing zone immediately downgradient of an oxidizing zone to reduce hexavalent chromium that may be produced under oxidizing conditions
 - ii. Providing a slowly degradable carbon source along with polysulfides to precipitate sulfates as metal sulfides.
 - d. Tracer compounds as discussed in Attachments A and B (Notice of Intent/Report of Waste Discharge).
 - e. Biofouling control agents such as chlorine dioxide, chlorine and bleach.
5. Amendments specifically excluded from coverage under this Order:
- a. Amendments that may cause violent exothermic reactions, such as Fenton's reagent.

B. NOTIFICATION OF COVERAGE

Project coverage under this Order shall not take effect until the Executive Officer notifies the Discharger in writing, by issuance of a Notice of Applicability which shall be a part of this Order, that coverage has been issued. The Executive Officer will not issue notification of project coverage under this Order prior to providing notice and a 30-day public comment period on the proposed issuance of coverage. Notification of project coverage under this Order shall not be issued if the Executive Officer finds that there may be significant effects on water quality, or finds that significant public controversy has arisen or will likely arise from the issuance of project coverage by this Order and that individual Waste Discharge Requirements should be considered at a regularly scheduled Regional Water Board meeting.

C. DISCHARGE PROHIBITIONS

1. The discharge of any amendment or other materials not specifically regulated by this Order is prohibited. These amendments and materials are those listed in the approved Work Plan required in A.2.b and the Notice of Applicability, as listed above.
2. Creation of a pollution, contamination, or nuisance, as defined by Section 13050 of the California Water Code (CWC), is prohibited.
3. The discharge of amendments or wastes to surface water or surface water drainage courses is prohibited.

4. The discharge of amendments to land or groundwater in areas other than that proposed for remediation is prohibited.
5. Discharge of waste classified as 'hazardous' under Section 2521, Chapter 15 of Title 23 or 'designated', as defined in Section 13173 of California Water Code is prohibited.
6. The discharge of amendments to property that is not under the control of the Discharger is prohibited. The "area under the control" of the Discharger is considered to be at the horizontal borders of the application area and owned by the Discharger and/or where the Discharger holds an agreement with the property owner for purposes of investigation and remediation.
7. If background groundwater contains concentrations of a constituent found in the amendment, above its WQO as listed in Finding 18, then the concentration of the constituent in the amendment as added cannot be greater than its WQO.

D. DISCHARGE SPECIFICATIONS

1. The Discharger shall not inject any amendments into the aquifer prior to receiving the Notice of Applicability nor prior to the construction of all necessary monitor wells listed in the Monitoring and Reporting Program.
2. The groundwater shall not be amended with materials other than those approved in the Notice of Applicability.
3. The Discharger will minimize the amount of amendments injected to the extent practicable.

E. GROUNDWATER DISCHARGE SPECIFICATIONS

1. The discharge from a groundwater treatment plant shall be only to those locations shown on Attachment E as provided with each individual Notice of Applicability.
2. The discharge flow from the groundwater treatment system shall not exceed that specified in the Notice of Applicability.
3. In the cases where treated or amended groundwater is recirculated back into the contaminant plume as part of in-situ treatment, non-target pollutants in the injectant must meet the limitations in Table 1 below or background concentrations as determined under Monitoring and Reporting Program R5-2015-0012.
4. In the cases where treated groundwater as part of a groundwater extraction and treatment system is discharged, or as part of an in-situ treatment project discharge outside of the plume, then the discharge shall not contain pollutants, for which the

Discharger is responsible for, in excess of the values found in Table 1. For constituents that are not the responsibility of the Discharger, the concentrations shall not exceed background values as established under Monitoring and Reporting Program R5-2015-0012.

Table 1: Effluent Limits for groundwater discharged to land (above or below ground surface):

Constituent	Effluent Limit
trichloroethene	0.5 µg/L
tetrachlorethene	0.5 µg/L
vinyl chloride	0.5 µg/L
cis 1,2-dichlorethene	0.5 µg/L
1,2-dichlorethene	0.5 µg/L
1,2-dichloroethane	0.4 µg/L
1,1-dichloroethene	0.5 µg/L
1,1-dichloroethane	0.5 µg/L
1,2,3-trichloropropane	0.5µg/L
1,2-dichloropropane	0.5 µg/L
1-chloropropane	0.5 µg/L
propene	28 µg/L
perchlorate	6 ug/L
carbon tetrachloride	0.5 µg/L
cyanide	10 µg/L
dieldrin	0.0022 µg/L

- In the case of application of extracted groundwater to land as part of a phytoremediation project, then the discharge shall not contain concentrations of pollutants that are not targeted for phytoremediation in excess of those in Table 1. For pollutants not found in Table 1, the concentrations shall not exceed background concentrations as established under Monitoring and Reporting Program R5-2015-0012. In addition, if the phytoremediation project is for the remediation of nitrogen, then the discharge shall not be excess of the value determined to be needed for plant growth as specified in the Notice of Applicability.

F. GROUNDWATER LIMITATIONS

- The discharge shall not cause the pH of the groundwater at the compliance points, downgradient and outside the treatment and transition zones, to shift outside the range of 6.5 to 8.5.
- The release, injection, discharge, or addition of amendments from a remediation system shall not cause the groundwater at the compliance wells listed in Table 1 of the Monitoring and Reporting Program, which is attached to the Notice of Applicability, and any revisions thereto, to contain concentrations of chemical constituents, including the amendments and by-products of the in-situ treatment process, in amounts that exceed the Water Quality Objectives listed in Finding No. 18.

3. The release, injection, discharge or addition of amendments from a remediation system shall not cause the groundwater at the compliance wells listed in Table 1 of the Monitoring and Reporting Program attached to the Notice of Applicability, and any revisions thereto, to contain concentrations of metals, total dissolved solids, or electrical conductivity that are more than 20% greater than their respective background concentrations, as established by the Monitoring and Reporting Program attached to the Notice of Applicability, and any revisions thereto.
4. The release, injection, discharge or addition of amendments from a remediation system shall not cause the groundwater to contain taste or odor producing substances that cause nuisance or adversely affect beneficial uses at the compliance monitor points designated in Table 1 of the Monitoring and Reporting Program attached to the Notice of Applicability, and any revisions thereto.

F. 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 Provisions.
2. The Discharger shall comply with the Monitoring and Reporting Program, attached to the Notice of Applicability, and any revisions thereto, as ordered by the Executive Officer.
3. If an aboveground groundwater treatment system is used, then **at least 15 days prior to the commencement of operation** the Discharger shall submit an Operation and Maintenance (O&M) Plan for the groundwater treatment facilities. The O&M Plan shall instruct field personnel on how to manage the day-to-day discharge operations to comply with the terms and conditions of this Order and how to make field adjustments, as necessary. A copy of the O&M Plan shall be kept at the facility for reference by operating personnel. Key personnel shall be familiar with its contents. The O&M plan shall be modified as needed to respond to changes in system operations.
4. The Discharger may be required to submit technical 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.
5. All technical reports required herein that involve planning, investigation, evaluation, or design or other work requiring interpretation or proper application of engineering or geologic sciences, shall be prepared by, or under the direction of, persons registered to practice in California pursuant to California Business and Professions Code, sections 6735, 7835 and 7835.1. To demonstrate compliance with Title 16, CCR, Sections 415 and 3065, all technical reports must contain a statement of the

qualifications of the responsible registered professional(s). As required by these laws, completed technical reports must bear the signature(s) and seal(s) of the registered professional(s) in a manner such that all work can be clearly attributed to the professional responsible for the work.

6. A copy of this Order shall be maintained at the project site and be available at all times to operating personnel.
7. Provisions of this Order are severable. If any provision of these requirements is found invalid, the remainder of this Order shall not be affected.
8. 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 this Order.
9. In the event of a violation of the order, or any material change in the character, location, or volume of the discharge, or if 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 amendments, pollutants or byproducts outside the specified treatment and transition areas;
 - 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 within 24-hours after 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 amendments, waste constituents or byproducts outside the specified treatment and transition areas shall include an assessment of and schedule for implementation of the contingency plans required in the Notice of Applicability.

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

- a. existence of this Order; and
 - b. the status of the discharger's annual fee account
11. 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 the waste discharge.
12. Chemical, bacteriological, and bioassay analyses must be conducted at a laboratory certified for such analyses by the State Department of Public Health.
13. All reports, Notice of Intent, or other documents required by this Order, and other information requested by the Regional Water Board shall be signed by a person described below or by a duly authorized representative of that person.
 - a. for a corporation: by a responsible corporate officer such as: (a) a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function; (b) any other person who performs similar policy or decision making functions for the corporation; or (c) the manager of one or more manufacturing, production, or operating facilities if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
 - b. Reports required by this Order, other information requested by the Regional Water Board, and Notices of Intent may be signed by a duly authorized representative provided:
 - i. the authorization is made in writing by a person described in paragraph (a) of this provision;
 - ii. the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company; and
 - iii. the written authorization is submitted to the Regional Water Board prior to or together with any reports, information, or applications signed by the authorized representative.
 - c. Any person signing a document under paragraph (a) or (b) of this provision shall make the following certification: "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly

gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted, is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

14. The Discharger shall permit authorized staff of the Regional Water Board:
 - a. entry to the project site covered by this Order 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 groundwater or any discharge .
15. The Regional Water Board may review this Order periodically and may revise requirements when necessary. In addition, the discharger shall file a report of waste discharge with the Executive Officer at least 120 days before making any material change or proposed change in the character, location, or volume of the discharge.
16. This Order is in effect until terminated by the Executive Officer. Project coverage under this Order may be terminated by the Executive Officer at any time upon giving reasonable notice to the discharger.

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 6 February 2015.

Original Signed by: _____
PAMELA C. CREEDON, Executive Officer

ATTACHMENT A

Notice of Intent

CG041-017 Emulsified Vegetable Oil Injections



DEPARTMENT OF THE AIR FORCE
AIR FORCE CIVIL ENGINEER CENTER
JOINT BASE SAN ANTONIO LACKLAND TEXAS

January 04, 2022

MEMORANDUM FOR CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL
BOARD (CVRWQCB)
ATTN: MR. MARK CLARDY

FROM: AFCEC/CZOW
6451 B Street, Bldg 2535
Beale AFB, CA 95903

SUBJECT: Notice Of Intent (NOI) — CG041-017 Emulsified Vegetable Oil Injections

1. The attached NOI complies with the terms of General Waste Discharge Order No. R5-2015-0012. This NOI addresses the injection of emulsified vegetable oil to address chlorinated solvent contamination in groundwater at CG041-017 at Beale Air Force Base.

2. Please note that the Air Force intends to comply with the requirements of General Waste Discharge Order No. R5-2015-0012, and the Monitoring and Reporting Program issued by you for this injection. Injection of emulsified vegetable oil will be performed starting in 2022. Biofouling control agents (e.g. household bleach) may be used where injection capacity at injection wells has been significantly reduced after the first round of injections. If the performance objectives of the bioreactor are not being met, the following optimization steps may be taken: liquid substrate injection (added to the top of the bioreactor) and bioaugmentation (addition of a commercial Dehalococcoides). Monitoring will continue until objectives of the MRP have been met. Once objectives have been met, a request will be submitted to Central Valley Regional Water Board staff to terminate the WDR for CG041-017, at which time monitoring specified in the MRP will be discontinued. Monitoring of the contaminant plume would continue in accordance with the Basewide Groundwater Monitoring Program.

3. Any questions can be directed to me at 530-634-2606, email: darren.rector.2@us.af.mil.

DARREN RECTOR, Civ, DAF
Restoration Program Manager

3 Attachments:

- A. RWQCB notice of Intent Form
- B. Contingency Plan
- C. Proposed Monitoring Plan

cc:

John Murphy/CVRWQCB
Kimiye Touchi/California Department of Toxic Substances Control (DTSC)
Dominique Forrester/DTSC

ATTACHMENT A

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

NOTICE OF INTENT

TO COMPLY WITH THE TERMS OF
GENERAL WASTE DISCHARGE REQUIREMENTS ORDER NO. R5-2015-0012
IN-SITU GROUNDWATER REMEDIATION
AND DISCHARGE OF TREATED GROUNDWATER TO LAND

1. RESPONSIBLE PARTY INFORMATION

Owner Name: Beale Air Force Base				
Mailing Address: 9 CES/CEIB 6601 B Street				
City/Locale: Beale AFB	County: Yuba	State: CA	Zip: 95903	Telephone Number: (530) 634-2606
Operator Name (if different than above): Brice Environmental Services Corporation				
Mailing Address: 3700 Centerpoint Dr	County: Anchorage	State: AK	Zip: 99503	Telephone Number: (916) 402-1467
Contact Person: Scott Dressler	Title: Site Manager		Telephone Number: (916) 717-0829	
Owner Type: (check one) Individual <input type="checkbox"/> Corporation <input type="checkbox"/> Partnership <input checked="" type="checkbox"/> Other: U.S. Air Force				

2. TREATMENT SITE INFORMATION

Site Name: Beale AFB, CG041-017				
Physical Address: 9th and L Streets				
City/Locale: Beale AFB	County: Yuba	State: CA	Zip: 95903	Telephone Number: (530) 634-2606

3. LOCATION OF FACILITY

Assessor's Parcel #: Not Applicable	Closest Surface Water: (e.g. Sacramento River) Best Slough
Township/Range/Section: T 15N R 5E S 33 B&M Mount Diablo	

4. REASON FOR FILING

<input type="checkbox"/> New Pilot Study	<input type="checkbox"/> Changes in Ownership/Operator
<input checked="" type="checkbox"/> New Full-Scale Treatment	<input type="checkbox"/> Other
<input type="checkbox"/> Update Plot Study	
<input type="checkbox"/> Update Full-Scale Treatment	

5. LOCAL PERMITS

Has an agency issued permits or other entitlements (e.g., conditional use permit, building permit, hazardous materials storage permit, air permit, well permit) for the site? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
For each permit or entitlement, list the type, issuing agency, and date of issuance:

Notice of Intent for General WDRs Order No. R5-2014-XXXX
 IN-SITU GROUNDWATER REMEDIATION AND
 DISCHARGE OF TREATED GROUNDWATER TO LAND

- 2 -

6. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

Has a CEQA determination been made by an agency? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Name of agency:
Type of Determination: <u>General WDR No. R5-2015-0012</u>	Date of Determination:
If the CEQA determination was made after the date of adoption of this General WDR, then include a copy of the CEQA determination with this NOI.	

7. PROCESS

<input type="checkbox"/> Single-Injection Points <input type="checkbox"/> Continuous Injection <input checked="" type="checkbox"/> Recirculation System		
Amendments to be added: EVO, substrate, microbial consortia	Volumes of Amendments per Month: <u>2631-3515 pounds</u>	Storage on Site? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Pollutants to be treated: <u>Trichloroethene</u>	Rates of amendment additions: <u>See Work Plan</u>	Max rate of amendment addition: <u>See Work Plan</u>
Extraction and Injection Rates (give units) <u>Average: 2 gpm Maximum: 2 gpm</u>		Treatment Methods and flows (give units): <u>Average: 2 gpm Maximum: 2 gpm</u>

8. WASTES GENERATED

Check All That Apply:	
<input type="checkbox"/> Treatment Wastewater	<input type="checkbox"/> Domestic Wastewater (separate system)
<input type="checkbox"/> Stormwater	<input checked="" type="checkbox"/> Solid waste - Type <u>Personal protective equipment, empty containers, decontamination water</u>

9. AMENDMENT STORAGE

Describe the type(s) of storage vessels, including capacity of each, that will be used to store amendments: <u>5,000 gallon polypropylene tank, 8.5' DIA (PLASTICMART PART # A-VT5000-102 OR EQUIVALENT)</u>
How will liquid be stored and monitored to prevent spillage? <u>Tank will be installed on the concrete pad inside the primary slurry wall.</u>

10. CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."	
Print Name: <u>Darren Rector</u>	Title: <u>Environmental Restoration Program Manager</u>
Signature: <u>Original signed by Darren Rector</u>	Date: <u>4 Jan 2022</u>

Attachment B: Contingency Plan

The contingency plan was taken from the *Final Plume CG041-017 Remedial Action Work Plan*.

Contingency Plan

The contingency plan provides a general overview of efforts that the Air Force would take to address a confirmed adverse impact to groundwater outside the treatment zone. The contingency plan includes a phased approach involving the following elements:

1. Increased monitoring frequency
2. Expanded monitoring network
3. In situ chemical oxidation downgradient from the ERD treatment area, or to reduce concentrations of any electron donors or dissolved metals mobilized within the ERD treatment zone
4. Optimization of the bioreactor
5. Resumption of pumping by the GETS to create a gradient toward the source area

The contingency plan is triggered if an exceedance of vinyl chloride, dissolved iron, or TDS above a trigger level occurs in a downgradient CMW (17H015AMW, 17H015BMW, or 17C168MW) or surface water sampling location (17L008SW, 17008SW, and SWPARKS), which would constitute an adverse impact to groundwater outside the transition zone. The trigger level is defined as the greater of (1) twice the baseline concentration of the analyte or (2) the analyte's MCL, whichever is greater. If a vinyl chloride, dissolved metal, or TDS concentration in a downgradient CMW exceeds a trigger level, a confirmation sample will be collected. If the exceedance is confirmed, the Central Valley Water Board will be notified in writing. Contingency measures, including optimization or expansion of the bioreactors, would be implemented if it is determined that the bioreactors are not providing adequate treatment of VOCs within the treatment zone.

If hydrogen sulfide is measured in air at a concentration greater than 1 part per million¹ during performance monitoring at groundwater wellheads or subgrade vaults, and a second reading confirms the concentration, administrative or engineering controls will be implemented.

In the event of potential plume migration beyond downgradient wells (defined by the MRP) at concentrations above the cleanup level, additional monitoring, modeling, or treatment may be implemented as corrective actions.

Exceedances of vinyl chloride, dissolved iron, or TDS above baseline conditions could occur outside the treatment zone if incomplete degradation occurs. The flow rates of the bioreactors may be reduced to provide increased residence time within the bioreactor. Additional electron donors could be injected into the bioreactors to improve treatment efficiency.

¹ The 1-part-per-million value is based on the exposure limit for hydrogen sulfide as documented in the Beale AFB Accident Prevention Plan (Brice, 2021).

Attachment C: Proposed Monitoring Program

The proposed monitoring program was taken from the *Final Plume CG041-017 Remedial Action Work Plan* (CH2M HILL, 2018).

Injection Monitoring

The criteria that will be used to evaluate ERD delivery effectiveness during injection is presented in Table 1. Injection performance monitoring wells (PMWs) (see Figure 1) and the injection wells will be used for the collection of oxidation-reduction potential (ORP), turbidity, and water level data. These data will only be collected from the injection monitoring wells before and after injection.

TABLE 1
ERD Injection Monitoring Parameters
Plume CG041-017 Notice of Intent, Beale Air Force Base, California

Parameter	Frequency	Guidance
Injected volume	Twice daily	11,409 to 15,211 gallons
Flow to each injection well	Twice daily	Assumed flow rate of 2 gpm
Injection pressure	Twice daily	Remain below calculated maximum pressure (17 psi) to prevent fracturing aquifer formation or hydraulic jacking of injection wells
ORP and turbidity	Daily	Used to confirm breakthrough of injection front at PMWs (data cannot be collected at injection wells plumbed to the system during injection)
EVO volume	Daily	2,631 to 3,508 pounds per well
Depth to water in nearby wells	Variable	Used to confirm hydraulic influence
Evidence of surfacing	Daily	Check nearby monitoring wells, storm drains, and vaults
Visual inspection of Best Slough	Weekly through the end of recirculation	Visually inspect Best Slough northwest of the injection wells for evidence of a sheen that might indicate discharge of EVO to the stream

Operational, Maintenance, and Monitoring Procedures for Injection and Bioreactor System

The Plume CG041-017 injection system is designed to operate continuously and automatically. Maintenance procedures for the GETS are described in the system *Operation and Maintenance Manual* (Versar, 2001).

The injection system and bioreactors will be monitored monthly to support operation and maintenance (O&M) of the injection system and bioreactors. Parameters that will be monitored as part of routine system O&M are shown in Table 2.

TABLE 2
 Monthly Data Collection
 Plume CG041-017 Notice of Intent, Beale Air Force Base, California

Parameter	Guidance
Pressure at wellheads and bioreactors	If excessive pressure is observed (greater than 75 pounds psi, equivalent to the shutoff pressure for the GETS), then the groundwater conveyance is clogging (possible biofouling).
Totalizers at wellheads and bioreactors	Ensure that total gallons pumped agree with instantaneous flow rates over time. If discrepancies are observed, the totalizers may be sticking or there may be a leak in the conveyance piping.
Instantaneous flow rate	Maintain design flow rate of 2 gpm.
Water level at 17C203MW	If depth to water < 3 feet, valve back flow rate.
Water level at 17C204MW	If depth to water < 3 feet, valve back flow rate.

Performance Monitoring for the ERD Remedy

Thirteen PMWs were selected because they are located inside the treatment zone. Three downgradient compliance monitoring wells (CMWs) were selected based on their locations and screen intervals relative to the plume. One upgradient background monitoring well will monitor upgradient water quality. The monitoring plan for the plume will be evaluated and optimized annually in the BGMP annual report.

The purpose of the performance monitoring is to assess the long-term effectiveness of the ERD remedy, which includes the injection system and bioreactors. Four rounds of semiannual sampling will be conducted after injection and construction of the bioreactor to determine whether COC concentrations have decreased from baseline conditions after treatment (baseline conditions are defined as groundwater concentrations before implementation of the remedy). Specific wells, sampling frequency, and analytical parameters for each sampling event are presented in Table 3. The samples will be analyzed in the field for temperature, conductivity, turbidity, pH, ORP, and dissolved oxygen. Groundwater samples will be analyzed in the laboratory for VOCs, sulfate, TOC, TDS, and dissolved iron. An initial round of groundwater samples will be collected prior to injection. In addition to the monitoring wells in Table 3, the baseline event will include samples from the injection wells. Hydrogen sulfide and methane are produced as a by-product of ERD treatment. During performance monitoring, a GEM 2000 (or equivalent instrument) will be used to monitor hydrogen sulfide and methane concentrations in air at groundwater wellheads and within subgrade vaults to confirm that by-products are not a risk to onsite workers. Detections of hydrogen sulfide and methane greater than 1 part per million and 5 percent will trigger safety actions that are identified in the field safety instructions. Post-injection sampling will be conducted and reported under the BGMP.

TABLE 3
 Proposed Groundwater Monitoring Plan for ERD Remedy
 Plume CG041-017 Notice of Intent, Beale Air Force Base, California

Location	Well Type	Sample Frequency ^a	Air Quality Parameters					
			(field measurement) ^b	VOCs (SW8260B)	Sulfate (SW9056)	TOC (SW9060)	TDS ^b (SM2540C)	Dissolved Iron (SW6010B)
17C018MW	PMW	Semiannual	X	X	X	X	X	X
17C168MW	CMW	Semiannual	X	X	-	X	X	X

TABLE 3

Proposed Groundwater Monitoring Plan for ERD Remedy
 Plume CG041-017 Notice of Intent, Beale Air Force Base, California

Location	Well Type	Sample Frequency ^a	Air Quality Parameters (field measurement) ^b	VOCs (SW8260B)	Sulfate (SW9056)	TOC (SW9060)	TDS ^b (SM2540C)	Dissolved Iron (SW6010B)
17C203MW	PMW	Semiannual	X	X	X	X	X	X
17C204MW	PMW	Semiannual	X	X	X	X	X	X
17C205MW	PMW	Semiannual	X	X	X	X	X	X
17C206MW	PMW	Semiannual	X	X	X	X	X	X
17C207MW	PMW	Semiannual	X	X	X	X	X	X
17C208MW	PMW	Semiannual	X	X	X	X	X	X
17H015AMW	CMW	Semiannual	X	X	-	X	X	X
17H015BMW	CMW	Semiannual	X	X	-	X	X	X
17L005MW	PMW	Semiannual	X	X	X	X	X	X
17L006MW	PMW	Semiannual	X	X	X	X	X	X
17L008MW	PMW	Semiannual	X	X	X	X	X	X
17U12AMW	PMW	Semiannual	X	X	X	X	X	X
17U12BMW	PMW	Semiannual	X	X	X	X	X	X
17V004MW	Background	Semiannual	X	X	-	X	X	X
17V012MW	PMW	Semiannual	X	X	X	X	X	X
17L0085W	CMW	Semiannual	X	X	-	X	X	X
170085W	CMW	Semiannual	X	X	-	X	X	X
SWPARKS	CMW	Semiannual	X	X	-	X	X	X

^aSample frequency should be reduced to annual after 2 years.

^bField measurement for methane and hydrogen sulfide using a GEM 2000 (or equivalent instrument).

^cTDS will be correlated to electrical conductance with 10 percent lab confirmation in future sampling events.

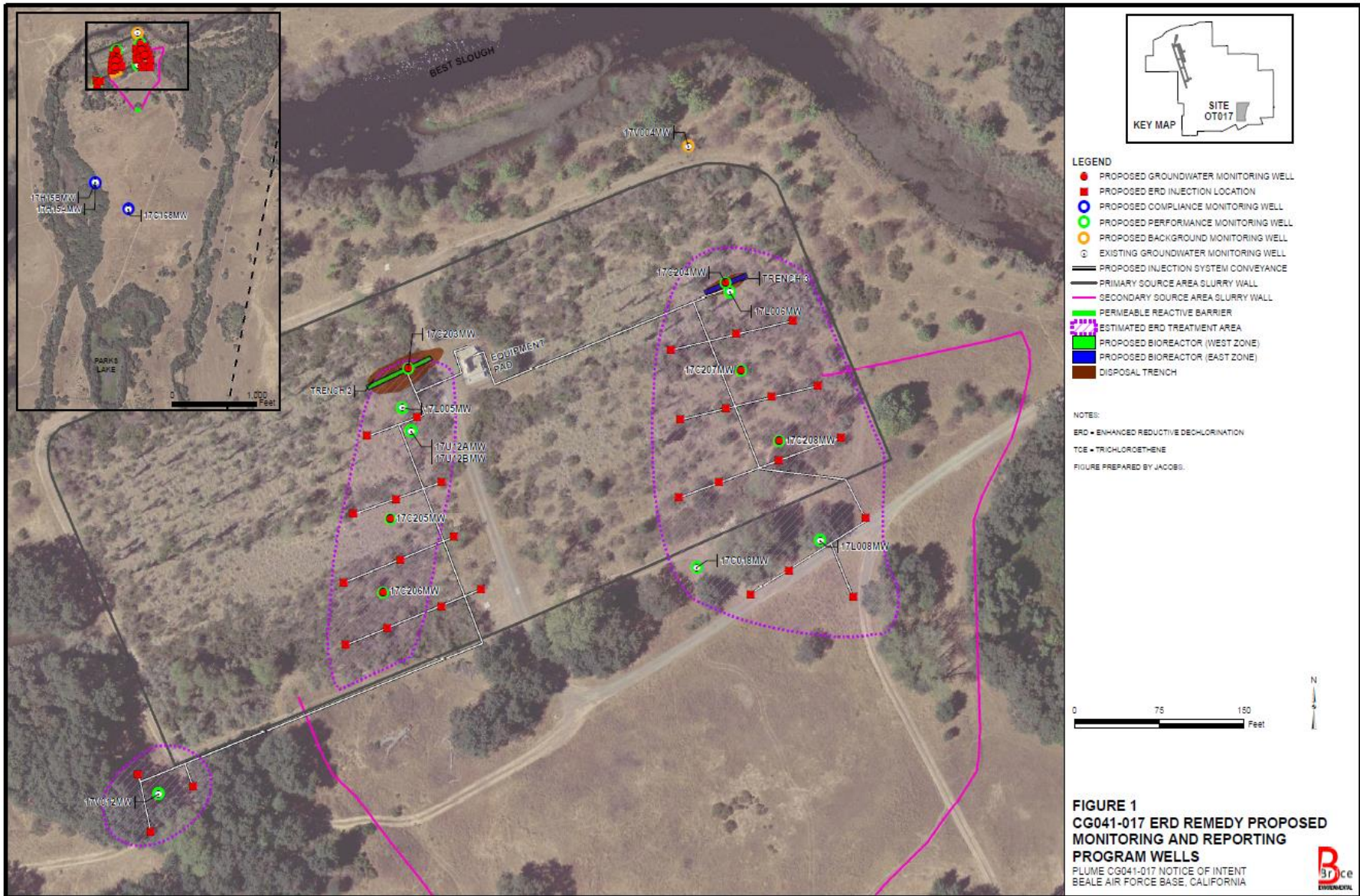
Sample results collected during subsequent BGMP events after injection will be assessed to evaluate the performance of the ERD remedy and determine whether subsequent injection phases are needed. As a preventative measure, biofouling control agents (e.g., household bleach) may be used where injection capacity at injection wells has been significantly reduced after the first round of EVO injections. A similar treatment monitoring schedule will be used for subsequent injection phases, if performed.

Compliance Monitoring

The groundwater monitoring plan (shown in Table 3) is proposed to demonstrate whether the EVO injections and bioreactors are adversely affecting the area outside the target treatment areas, specifically groundwater at downgradient compliance wells. A background well located upgradient from the target treatment areas (17V004MW) will be used to account for changes unrelated to ERD at Plume CG041-017. Table 3 is anticipated to provide the basis for the MRP to be issued by the Central Valley Water Board.

Baseline concentrations will be developed for the following constituents prior to injection and construction of the bioreactor: TDS, dissolved iron, and vinyl chloride. Using the concentrations detected during the baseline sampling event, a 95 percent upper prediction limit will be calculated for each analyte using ProUCL Version 5.1.002 statistical software for environmental applications (EPA, 2015). The 95 upper prediction limit will be used as the baseline concentration for determination of a trigger concentration for each analyte. The derivation of the trigger concentration is described below. ProUCL computes decision statistics using several parametric and nonparametric methods covering a wide range of data variability, distribution, skewness, and sample size.

If analytes are not detected at concentrations above reporting limits during baseline sampling, the reporting limit will be used as a baseline concentration. The numeric value associated with the reporting limit could change because of variations in laboratory analytical methods (e.g., sample dilution).



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ATTACHMENT B

Standard Provisions

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

STANDARD PROVISIONS AND REPORTING REQUIREMENTS
FOR
WASTE DISCHARGE REQUIREMENTS

1 March 1991

A. General Provisions:

1. The requirements prescribed herein do not authorize the commission of any act causing injury to the property of another, or protect the Discharger from liabilities under federal, state, or local laws. This Order does not convey any property rights or exclusive privileges.
2. The provisions of this Order are severable. If any provision of this Order is held invalid, the remainder of this Order shall not be affected.
3. After notice and opportunity for a hearing, this Order may be terminated or modified for cause, including, but not limited to:
 - a. Violation of any term or condition contained in this Order;
 - b. Obtaining this Order by misrepresentation, or failure to disclose fully all relevant facts;
 - c. A change in any condition that results in either a temporary or permanent need to reduce or eliminate the authorized discharge;
 - d. A material change in the character, location, or volume of discharge.
4. Before making a material change in the character, location, or volume of discharge, the discharger shall file a new Report of Waste Discharge with the Regional Board. A material change includes, but is not limited to, the following:
 - a. An increase in area or depth to be used for solid waste disposal beyond that specified in waste discharge requirements.
 - b. A significant change in disposal method, location or volume, e.g., change from land disposal to land treatment.
 - c. The addition of a major industrial, municipal or domestic waste discharge facility.
 - d. The addition of a major industrial waste discharge to a discharge of essentially domestic sewage, or the addition of a new process or product by an industrial facility resulting in a change in the character of the waste.

Waste Discharge to Land

5. Except for material determined to be confidential in accordance with California law and regulations, all reports prepared in accordance with terms of this Order shall be available for public inspection at the offices of the Board. Data on waste discharges, water quality, geology, and hydrogeology shall not be considered confidential.
6. The discharger shall take all reasonable steps to minimize any adverse impact to the waters of the state resulting from noncompliance with this Order. Such steps shall include accelerated or additional monitoring as necessary to determine the nature and impact of the noncompliance.
7. The discharger shall maintain in good working order and operate as efficiently as possible any facility, control system, or monitoring device installed to achieve compliance with the waste discharge requirements.
8. The discharger shall permit representatives of the Regional Board (hereafter Board) and the State Water Resources Control Board, upon presentations of credentials, to:
 - a. Enter premises where wastes are treated, stored, or disposed of and facilities in which any records are kept,
 - b. Copy any records required to be kept under terms and conditions of this Order,
 - c. Inspect at reasonable hours, monitoring equipment required by this Order, and
 - d. Sample, photograph and video tape any discharge, waste, waste management unit, or monitoring device.
9. For any electrically operated equipment at the site, the failure of which would cause loss of control or containment of waste materials, or violation of this Order, the discharger shall employ safeguards to prevent loss of control over wastes. Such safeguards may include alternate power sources, standby generators, retention capacity, operating procedures, or other means.
10. The fact that it would have been necessary to halt or reduce the permitted activity in Order to maintain compliance with this Order shall not be a defense for the discharger's violations of the Order.
11. Neither the treatment nor the discharge shall create a condition of nuisance or pollution as defined by the California Water Code, Section 13050.
12. The discharge shall remain within the designated disposal area at all times.

B. General Reporting Requirements:

1. In the event the discharger does not comply or will be unable to comply with any prohibition or limitation of this Order for any reason, the discharger shall notify the Board by telephone at **(916) 464-3291**
[Note: Current phone numbers for all three Regional Board offices may be found on the Central Valley Waterboards' website (http://www.waterboards.ca.gov/centralvalley/about_us/contact_us/)]
as soon as it or its agents.

Waste Discharge to Land

have knowledge of such noncompliance or potential for noncompliance, and shall confirm this notification in writing within **two weeks**. The written notification shall state the nature, time and cause of noncompliance, and shall include a timetable for corrective actions.

2. The discharger shall have a plan for preventing and controlling accidental discharges, and for minimizing the effect of such events.

This plan shall:

- a. Identify the possible sources of accidental loss or leakage of wastes from each waste management, treatment, or disposal facility.
- b. Evaluate the effectiveness of present waste management/treatment units and operational procedures, and identify needed changes of contingency plans.
- c. Predict the effectiveness of the proposed changes in waste management/treatment facilities and procedures and provide an implementation schedule containing interim and final dates when changes will be implemented.

The Board, after review of the plan, may establish conditions that it deems necessary to control leakages and minimize their effects.

3. All reports shall be signed by persons identified below:
 - a. For a corporation: by a principal executive officer of at least the level of senior vice-president.
 - b. For a partnership or sole proprietorship: by a general partner or the proprietor.
 - c. For a municipality, state, federal or other public agency: by either a principal executive officer or ranking elected or appointed official.
 - d. A duly authorized representative of a person designated in 3a, 3b or 3c of this requirement if;
 - (1) the authorization is made in writing by a person described in 3a, 3b or 3c of this provision;
 - (2) the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a waste management unit, superintendent, or position of equivalent responsibility. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and
 - (3) the written authorization is submitted to the Board

Waste Discharge to Land

Any person signing a document under this Section shall make the following certification:

“I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of the those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.”

4. Technical and monitoring reports specified in this Order are requested pursuant to Section 13267 of the Water Code. Failing to furnish the reports by the specified deadlines and falsifying information in the reports, are misdemeanors that may result in assessment of civil liabilities against the discharger.
5. The discharger shall mail a copy of each monitoring report and any other reports required by this Order to:

California Regional Water Quality Control Board
Central Valley Region
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670-6114

Note: Current addresses for all three Regional Board offices may be found on the Central Valley Waterboard website (http://www.waterboards.ca.gov/centralvalley/about_us/contact_us) or the current address if the office relocates.

C. Provisions for Monitoring:

1. All analyses shall be made in accordance with the latest edition of: (1) *Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater* (EPA 600 Series) and (2) *Test Methods for Evaluating Solid Waste* (SW 846-latest edition). The test method may be modified subject to application and approval of alternate test procedures under the Code of Federal Regulations (40 CFR 136).
2. Chemical, bacteriological, and bioassay analysis shall be conducted at a laboratory certified for such analyses by the State Department of Health Services. In the event a certified laboratory is not available to the discharger, analyses performed by a noncertified laboratory will be accepted provided a Quality Assurance-Quality Control Program is instituted by the laboratory. A manual containing the steps followed in this program must be kept in the laboratory and shall be available for inspection by Board staff. The Quality Assurance-Quality Control Program must conform to EPA guidelines or to procedures approved by the Board.

Unless otherwise specified, all metals shall be reported as Total Metals.

3. The discharger shall retain records of all monitoring information, including all calibration and maintenance records, all original strip chart recordings of continuous monitoring instrumentation, copies of all reports required by this Order, and records of all data used to

Waste Discharge to Land

complete the application for this Order. Records shall be maintained for a minimum of three years from the date of the sample, measurement, report, or application. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the Regional Board Executive Officer.

Record of monitoring information shall include:

- a. the date, exact place, and time of sampling or measurements,
 - b. the individual(s) who performed the sampling of the measurements,
 - c. the date(s) analyses were performed,
 - d. the individual(s) who performed the analyses,
 - e. the laboratory which performed the analysis,
 - f. the analytical techniques or methods used, and
 - g. the results of such analyses.
4. All monitoring instruments and devices used by the discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated at least yearly to ensure their continued accuracy.
 5. The discharger shall maintain a written sampling program sufficient to assure compliance with the terms of this Order. Anyone performing sampling on behalf of the discharger shall be familiar with the sampling plan.
 6. The discharger shall construct all monitoring wells to meet or exceed the standards stated in the State Department of Water Resources *Bulletin 74-81* and subsequent revisions, and shall comply with the reporting provisions for wells required by Water Code Sections 13750 through 13755.22

D. Standard Conditions for Facilities Subject to California Code of Regulations, Title 23, Division 3, Chapter 15 (Chapter 15)

1. All classified waste management units shall be designed under the direct supervision of a California registered civil engineer or a California certified engineering geologist. Designs shall include a Construction Quality Assurance Plan, the purpose of which is to:
 - a. demonstrate that the waste management unit has been constructed according to the specifications and plans as approved by the Board.
 - b. provide quality control on the materials and construction practices used to construct the waste management unit and prevent the use of inferior products and/or materials which do not meet the approved design plans or specifications.
2. Prior to the discharge of waste to any classified waste management unit, a California registered civil engineer or a California certified engineering geologist must certify that the waste management unit meets the construction or prescriptive standards and performance goals in Chapter 15, unless an engineered alternative has been approved by the Board. In the case of an engineered alternative, the registered civil engineer or a certified engineering geologist must

Waste Discharge to Land

certify that the waste management unit has been constructed in accordance with Board-approved plans and specifications.

3. Materials used to construct liners shall have appropriate physical and chemical properties to ensure containment of discharged wastes over the operating life, closure, and post-closure maintenance period of the waste management units.
4. Closure of each waste management unit shall be performed under the direct supervision of a California registered civil engineer or a California certified engineering geologist.

E. Conditions Applicable to Discharge Facilities Exempted from Chapter 15 Under Section 2511

1. If the discharger's wastewater treatment plant is publicly owned or regulated by the Public Utilities Commission, it shall be supervised and operated by persons possessing certificates of appropriate grade according to California Code of Regulations, Title 23, Division 4, Chapter 14.
2. By-pass (the intentional diversion of waste streams from any portion of a treatment facility, except diversions designed to meet variable effluent limits) is prohibited. The Board may take enforcement action against the discharger for by-pass unless:
 - a. (1) By-pass was unavoidable to prevent loss of life, personal injury, or severe property damage. (Severe property damage means substantial physical damage to property, damage to the treatment facilities that causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a by-pass. Severe property damage does not mean economic loss caused by delays in production); and
 - (2) There were no feasible alternatives to by-pass, such as the use of auxiliary treatment facilities or retention of untreated waste. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a by-pass that would otherwise occur during normal periods of equipment downtime or preventive maintenance; or
 - b. (1) by-pass is required for essential maintenance to assure efficient operation; and
 - (2) neither effluent nor receiving water limitations are exceeded; and
 - (3) the discharger notifies the Board ten days in advance.

The permittee shall submit notice of an unanticipated by-pass as required in paragraph B.1. above.

3. A discharger that wishes to establish the affirmative defense of an upset (see definition in E.6 below) in an action brought for noncompliance shall demonstrate, through properly signed, contemporaneous operating logs, or other evidence, that:

Waste Discharge to Land

- a. an upset occurred and the cause(s) can be identified;
- b. the permitted facility was being properly operated at the time of the upset;
- c. the discharger submitted notice of the upset as required in paragraph B.1. above; and
- d. the discharger complied with any remedial measures required by waste discharge requirements.

In any enforcement proceeding, the discharger seeking to establish the occurrence of an upset has the burden of proof.

4. A discharger whose waste flow has been increasing, or is projected to increase, shall estimate when flows will reach hydraulic and treatment capacities of its treatment, collection, and disposal facilities. The projections shall be made in January, based on the last three years' average dry weather flows, peak wet weather flows and total annual flows, as appropriate. When any projection shows that capacity of any part of the facilities may be exceeded in four years, the discharger shall notify the Board by **31 January**.
5. Effluent samples shall be taken downstream of the last addition of wastes to the treatment or discharge works where a representative sample may be obtained prior to disposal. Samples shall be collected at such a point and in such a manner to ensure a representative sample of the discharge.
6. Definitions
 - a. Upset means an exceptional incident in which there is unintentional and temporary noncompliance with effluent limitations because of factors beyond the reasonable control of the Discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper action.
 - b. The monthly average discharge is the total discharge by volume during a calendar month divided by the number of days in the month that the facility was discharging. This number is to be reported in gallons per day or million gallons per day.

Where less than daily sampling is required by this Order, the monthly average shall be determined by the summation of all the measured discharges by the number of days during the month when the measurements were made.

- c. The monthly average concentration is the arithmetic mean of measurements made during the month.
- d. The "daily maximum" **discharge** is the total discharge by volume during any day.

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- e. The “daily maximum” **concentration** is the highest measurement made on any single discrete sample or composite sample.
- f. A “grab” sample is any sample collected in less than 15 minutes.
- g. Unless otherwise specified, a composite sample is a combination of individual samples collected over the specified sampling period;
 - (1) at equal time intervals, with a maximum interval of one hour
 - (2) at varying time intervals (average interval one hour or less) so that each sample represents an equal portion of the cumulative flow.

The duration of the sampling period shall be specified in the Monitoring and Reporting Program. The method of compositing shall be reported with the results.

7. Annual Pretreatment Report Requirements:

Applies to dischargers required to have a Pretreatment Program as stated in waste discharge requirements.)

The annual report shall be submitted **by 28 February** and include, but not be limited to, the following items:

- a. A summary of analytical results from representative, flow-proportioned, 24-hour composite sampling of the influent and effluent for those pollutants EPA has identified under Section 307(a) of the Clean Water Act which are known or suspected to be discharged by industrial users.

The discharger is not required to sample and analyze for asbestos until EPA promulgates an applicable analytical technique under 40 CFR (Code of Federal Regulations) Part 136. Sludge shall be sampled during the same 24-hour period and analyzed for the same pollutants as the influent and effluent sampling analysis. The sludge analyzed shall be a composite sample of a minimum of 12 discrete samples taken at equal time intervals over the 24-hour period. Wastewater and sludge sampling and analysis shall be performed at least annually. The discharger shall also provide any influent, effluent or sludge monitoring data for nonpriority pollutants which may be causing or contributing to Interference, Pass Through or adversely impacting sludge quality. Sampling and analysis shall be performed in accordance with the techniques prescribed in 40 CFR Part 136 and amendments thereto.

- b. A discussion of Upset, Interference, or Pass Through incidents, if any, at the treatment plant which the discharger knows or suspects were caused by industrial users of the system. The discussion shall include the reasons why the incidents occurred, the corrective actions taken and, if known, the name and address of the industrial user(s) responsible. The discussion shall also include a review of the applicable pollutant limitations to determine whether any

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additional limitations, or changes to existing requirements, may be necessary to prevent Pass Through, Interference, or noncompliance with sludge disposal requirements.

- c. The cumulative number of industrial users that the discharger has notified regarding Baseline Monitoring Reports and the cumulative number of industrial user responses.
- d. An updated list of the discharger's industrial users including their names and addresses, or a list of deletions and additions keyed to a previously submitted list. The discharger shall provide a brief explanation for each deletion. The list shall identify the industrial users subject to federal categorical standards by specifying which set(s) of standards are applicable. The list shall indicate which categorical industries, or specific pollutants from each industry, are subject to local limitations that are more stringent than the federal categorical standards. The discharger shall also list the noncategorical industrial users that are subject only to local discharge limitations. The discharger shall characterize the compliance status through the year of record of each industrial user by employing the following descriptions:
 - (1) Complied with baseline monitoring report requirements (where applicable);
 - (2) Consistently achieved compliance;
 - (3) Inconsistently achieved compliance;
 - (4) Significantly violated applicable pretreatment requirements as defined by 40 CFR 403.8(f)(2)(vii);
 - (5) Complied with schedule to achieve compliance (include the date final compliance is required);
 - (6) Did not achieve compliance and not on a compliance schedule;
 - (7) Compliance status unknown.

A report describing the compliance status of any industrial user characterized by the descriptions in items (d)(3) through (d)(7) above shall be **submitted quarterly from the annual report date** to EPA and the Board. The report shall identify the specific compliance status of each such industrial user. This quarterly reporting requirement shall commence upon issuance of this Order.

- e. A summary of the inspection and sampling activities conducted by the discharger during the past year to gather information and data regarding the industrial users. The summary shall include but not be limited to, a tabulation of categories of dischargers that were inspected and sampled; how many and how often; and incidents of noncompliance detected.

Waste Discharge to Land

- f. A summary of the compliance and enforcement activities during the past year. The summary shall include the names and addresses of the industrial users affected by the following actions:
- (1) Warning letters or notices of violation regarding the industrial user's apparent noncompliance with federal categorical standards or local discharge limitations. For each industrial user, identify whether the apparent violation concerned the federal categorical standards or local discharge limitations;
 - (2) Administrative Orders regarding the industrial user's noncompliance with federal categorical standards or local discharge limitations. For each industrial user, identify whether the violation concerned the federal categorical standards or local discharge limitations;
 - (3) Civil actions regarding the industrial user's noncompliance with federal categorical standards or local discharge limitations. For each industrial user, identify whether the violation concerned the federal categorical standards or local discharge limitations;
 - (4) Criminal actions regarding the industrial user's noncompliance with federal categorical standards or local discharge limitations. For each industrial user, identify whether the violation concerned the federal categorical standards or local discharge limitations.
 - (5) Assessment of monetary penalties. For each industrial user identify the amount of the penalties;
 - (6) Restriction of flow to the treatment plant; or
 - (7) Disconnection from discharge to the treatment plant.
- g. A description of any significant changes in operating the pretreatment program which differ from the discharger's approved Pretreatment Program, including, but not limited to, changes concerning: the program's administrative structure; local industrial discharge limitations; monitoring program or monitoring frequencies; legal authority of enforcement policy; funding mechanisms; resource requirements; and staffing levels.
- h. A summary of the annual pretreatment budget, including the cost of pretreatment program functions and equipment purchases.
- i. A summary of public participation activities to involve and inform the public.
- j. A description of any changes in sludge disposal methods and a discussion of any concerns not described elsewhere in the report.

Duplicate signed copies of these reports shall be submitted to the Board and:

Regional Administrator
U.S. Environmental Protection Agency W-5
75 Hawthorne Street
San Francisco, CA 94105

and

State Water Resource Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA 95812

Revised January 2004 to update addresses and phone numbers

ATTACHMENT C

**Monitoring and Reporting Program
Order No. R5-2015-0012-078**

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM ORDER NO. R5-2015-0012-078
FOR
IN-SITU GROUNDWATER REMEDIATION

SITE OT017/PLUME CG041-017
BEALE AIR FORCE BASE, YUBA COUNTY

The Air Force Civil Engineering Center (AFCEC) plans to remediate groundwater impacted by historical releases of volatile organic compounds (VOCs) from drums disposed between Best Slough and Dry Creek south of Gavin Mandery Drive (Site OT017/Plume CG041-017) at Beale Air Force Base (AFB) in Yuba County California. Plume CG041-017 represents groundwater underlying Site OT017. The U.S. Air Force (Discharger) proposes to inject emulsified vegetable oil (EVO) into the subsurface to promote enhanced reductive dechlorination (ERD) of VOCs in groundwater, primarily trichloroethene (TCE).

The final remedy for Plume CG041-017 includes an in-situ injection system, construction of two bioreactors in the primary source area, and construction of a supplemental permeable reactive barrier (PRB). Thirty injection wells (17C170IW through 17C199IW) and two bioreactors will be installed at the locations shown in Figure 1. Four new monitoring wells (17C205MW through 17C208MW) will be installed for performance monitoring purposes. Two bioreactor trenches will be excavated at former disposal Trenches 2 and 3. The bioreactor excavations will be approximately 4 feet wide and 15 feet deep each. The length of the bioreactors will correspond to the length of the disposal trenches. Trench 2 is believed to be about 75 feet long and the trench excavation will be about 60 feet long to avoid trenching in the site access road. Trench 3 is believed to be approximately 40 feet long. One monitoring well (17C203MW and 17C204MW) equipped with a water level transducer will be installed within each bioreactor to monitor groundwater levels during bioreactor operation. The Discharger has operated a groundwater extraction and treatment system (GETS) at Plume CG041-017 since 2001. The existing GETS will be modified to allow recirculation of EVO in groundwater at the site. Groundwater extracted from existing lateral drains will be mixed with EVO and injected into the injection wells and bioreactors.

This Monitoring and Reporting Program (MRP) describes requirements for monitoring compliance with groundwater limitations and the progress of groundwater remediation for Site OT017/Plume CG041-509 at Beale AFB. This MRP is issued pursuant to Water Code Section 13267. The Discharger shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer. As appropriate, California Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board) staff shall approve specific sample station locations prior to implementation of sampling activities.

Sample collection and analysis shall follow standard EPA protocol and sample analyses shall be completed by a California State-certified laboratory. All samples should be representative of the volume and nature of the discharge or matrix of material sampled. The time, date, and location of each grab sample shall be recorded on the sample chain of custody form.

GROUNDWATER MONITORING

EVO will be mixed with groundwater extracted from the lateral drains and injected into an array of injection wells and two bioreactors installed in the primary and secondary source areas. The groundwater recirculation system will be used to reinject groundwater in the bioreactors and injection wells to promote distribution of EVO in the subsurface. As listed in Table 1, the monitoring well network consists of thirteen treatment zone wells, three compliance wells, three surface water compliance sample locations, and one background well. These thirteen (13) monitoring wells associated with the treatment area are shown on Figure 1. The monitoring well network and surface water sampling locations are shown on Figure 2. The groundwater monitoring program for these wells and surface water sampling locations shall follow the schedule in Table 1. Monitoring wells with free phase petroleum product or visible sheen shall be monitored, at a minimum, for product thickness and depth to water.

The monitoring wells and surface water sampling locations shall be sampled according to the schedule in Table 1 and the samples analyzed by the methods in Table 2, as follows:

Table 1: Sampling Frequency and Constituent Suite

Well Number or Sample Location¹	Constituent²	Frequency³	Monitoring Objective
17C018MW, 17C203MW, 17C204MW, 17C205MW, 17C206MW, 17C207MW, 17C208MW, 17L005MW, 17L006MW, 17L008MW, 17U12AMW, 17U12BMW, 17V012MW	Volatile Organic Compounds (VOCs), Sulfate, Total Organic Carbon (TOC), Total Dissolved Solids (TDS), Dissolved iron	Semiannual	Treatment Zone ⁴
17C168MW, 17H015AMW, 17H015BMW, 17L008SW, 17008SW, SWPARKS	VOCs, TOC, TDS, Dissolved iron	Semiannual	Compliance ⁵
17V004MW	VOCs, TOC, TDS, Dissolved iron	Semiannual	Background ⁶

¹ Well numbers and surface water sample locations as shown on Figure 2.

² Constituent analytical methods are listed in Table 2.

³ Semi-annual sampling occurs 1st and 3rd quarters.

⁴ Wells used to evaluate in-situ remediation progress inside the treatment zone.

⁵ Wells and surface water samples used to determine compliance with groundwater limitations.

⁶ Well used to develop background concentrations.

Table 2: Analytical Methods

Constituent	Method ⁷	Maximum Practical Quantitation Limit (µg/L) ⁸
VOCs	EPA SW8260B	0.5
Sulfate	EPA SW9056	10
TOC	EPA SW9060	500
Total Dissolved Solids	EPA SM2540C	10,000
Dissolved Iron	EPA SW6010B	200

FIELD SAMPLING

In addition to the above sampling and laboratory analyses, field sampling and analysis shall be conducted each time a monitor well or extraction well is sampled. The sampling and analysis of field parameters shall be as specified in Table 3.

Table 3: Field Sampling Requirements

Parameters	Units	Practical Quantitation Limit	Analytical Method
Groundwater Elevation	Feet, Mean Sea Level	0.01 foot	Measurement
Oxidation-Reduction Potential	Millivolts	10 millivolts	Field Meter
Electrical Conductivity	uhmos/cm	50 umhos/cm	Field Meter
Dissolved Oxygen	mg/L	0.2 mg/L	Field Meter
pH	pH Units (to 0.1 units)	0.1 units	Field Meter
Temperature	°F/°C	0.1 °F/°C	Field Meter

uhmos/cm = micromhos per centimeter

mg/L = milligrams per liter

°F = degrees Fahrenheit

°C = degrees Celsius

All wells that are purged shall be purged until pH, temperature, conductivity, and dissolved oxygen are within 10% of the previous value.

Field test instruments (such as those used to test pH and dissolved oxygen) may be used provided that:

1. The operator is trained in proper use and maintenance of the instruments;
2. The instruments are calibrated prior to each monitoring event;

⁷ Or an equivalent EPA Method that achieves the maximum Practical Quantitation Limit.

⁸ All concentrations between the Method Detection Limit and the Practical Quantitation Limit shall be reported as an estimated value. µg/L = micrograms per liter

3. Instruments are serviced and/or calibrated by the manufacturer at the recommended frequency; and
4. Field calibration reports are submitted as described in item (b) of the "Reporting" section of this MRP.

IN-SITU DISCHARGE MONITORING

The Discharger shall monitor daily the discharge of water and amendments that are injected into the groundwater according to the requirements specified in Table 4. Each amendment addition shall be recorded individually, along with information regarding the time period over which the amendment was injected into the aquifer.

Table 4: Discharge Monitoring Requirements

Parameters	Units	Type of Sample
Injected Volume	gallons per day	Meter
Amendment(s) Added	pounds per day	Measured

AMENDMENT ANALYSIS

Prior to use, amendments shall be analyzed for the constituents listed in Table 5. The analysis should be done on a mixture of the amendment and deionized water at the estimated concentration that would be injected during the project.

Table 5: Amendment Analytical Requirements

Constituent	Method ⁹	Maximum Practical Quantitation Limit (µg/L) ¹⁰
Volatile Organic Compounds	EPA Method 8260B	0.5
General Minerals ¹¹		
Metals, Total and Dissolved ¹²	EPA Method 6010B	Various
Semi-Volatile Organic Compounds	EPA Method 8270	5.0
TDS	EPA Method SM2540C	10,000
pH	meter	NA
Electrical Conductivity	meter	NA

⁹ Or an equivalent EPA method that achieves the maximum Practical Quantitation Limit.

¹⁰ All concentrations between the Method Detection Limit and Practical Quantitation Limit shall be reported as an estimated value.

¹¹ General Minerals include alkalinity, bicarbonate, potassium, chloride, sulfate, total hardness, nitrate, nitrite, and ammonia

¹² Metals include arsenic, barium, cadmium, calcium, total chromium, copper, iron, lead, manganese, magnesium, mercury, molybdenum, nickel, selenium, and silica

ESTABLISHMENT OF BASELINE CONCENTRATION VALUES

The Discharger shall develop baseline values for concentrations of total dissolved solids (TDS), dissolved iron, and vinyl chloride in groundwater following the procedures found in CCR Section 20415(e)(10). The 95 percent upper prediction limit will be used as the baseline concentration for determination of a trigger concentration for each analyte. If an analyte is not detected above the reporting limit during baseline sampling, the reporting limit will be used as the baseline concentration. Well 17V004MW will serve as a background well to account for changes unrelated to remedial actions at Plume CG041-017. The Discharger shall include a comparison of the baseline data and associated trigger values in the Remedial Action Summary Report.

REPORTING

When reporting the data, the Discharger shall arrange the information in tabular form so that the date, the constituents, and the concentrations are readily discernible. The data shall be summarized in such a manner as to clearly illustrate the compliance with this Order. The results of any monitoring done more frequently than required at the locations specified in the Monitoring and Reporting Program shall also be reported to the Central Valley Water Board.

As required by the California Business and Professions Code Sections 6735, 7835, and 7835.1, all reports shall be prepared by a registered professional Civil Engineer or Geologist or their subordinate and signed by the registered professional.

After completion of injection activities, the Discharger shall submit a Remedial Action Summary Report which includes a comparison to the baseline monitoring results. Post-injection monitoring results will be submitted in semiannual reports under the Beale AFB basewide groundwater monitoring program. All reports shall be submitted electronically and shall conform to the requirements of the California Code of Regulations, Title 23, Division 3, Chapter 30.

The semiannual reports shall be submitted electronically by the 1st day of the second month following the end of each semiannual event (**1 April and 1 October**) or a date approved in writing by Central Valley Water Board staff, until such time as the Executive Officer determines that the reports are no longer necessary.

Each semiannual report shall include the following minimum information:

- (a) a description and discussion of the groundwater sampling event and results, including trends in the concentrations of pollutants and groundwater elevations in the wells, how and when samples were collected, and whether the pollutant plume(s) is delineated;
- (b) field logs that contain, at a minimum, water quality parameters measured before, during, and after purging, method of purging, depth of water, volume of water purged, etc.;
- (c) groundwater contour maps for all groundwater zones, if applicable;

- (d) pollutant concentration maps for all groundwater zones, if applicable;
- (e) a table showing well construction details such as well number, groundwater zone being monitored, coordinates (longitude and latitude), ground surface elevation, reference elevation, elevation of screen, elevation of bentonite, elevation of filter pack, and elevation of well bottom;
- (f) a table showing historical lateral and vertical (if applicable) flow directions and gradients;
- (g) cumulative data tables containing the water quality analytical results and depth to groundwater;
- (h) a copy of the laboratory analytical data report;
- (i) the status of any ongoing remediation, including an estimate of the cumulative mass of pollutant removed from the subsurface, system operating time, the effectiveness of the remediation system, and any field notes pertaining to the operation and maintenance of the system; and
- (j) if applicable, the reasons for and duration of all interruptions in the operation of any remediation system, and actions planned or taken to correct and prevent interruptions.

An Annual Report shall be submitted to the Central Valley Water Board by **1 October** of each year. This report shall contain an evaluation of the effectiveness and progress of the investigation and remediation. The Annual Report may be substituted for the second semi-annual monitoring report if it contains all the information required for that report plus that required for the Annual Report. The Annual Report shall contain the following minimum information:

- (a) both tabular and graphical summaries of all data obtained during the year;
- (b) groundwater contour maps and pollutant concentration maps containing all data obtained during the previous year;
- (c) a discussion of the long-term trends in the concentrations of the pollutants in the groundwater monitoring wells;
- (d) an analysis of whether the pollutant plume is being effectively treated;
- (e) a description of all remedial activities conducted during the year, an analysis of their effectiveness in removing the pollutants, and plans to improve remediation system effectiveness;
- (f) an identification of any data gaps and potential deficiencies/redundancies in the monitoring system or reporting program; and
- (g) if desired, a proposal and rationale for any revisions to the groundwater sampling plan frequency and/or list of analytes.

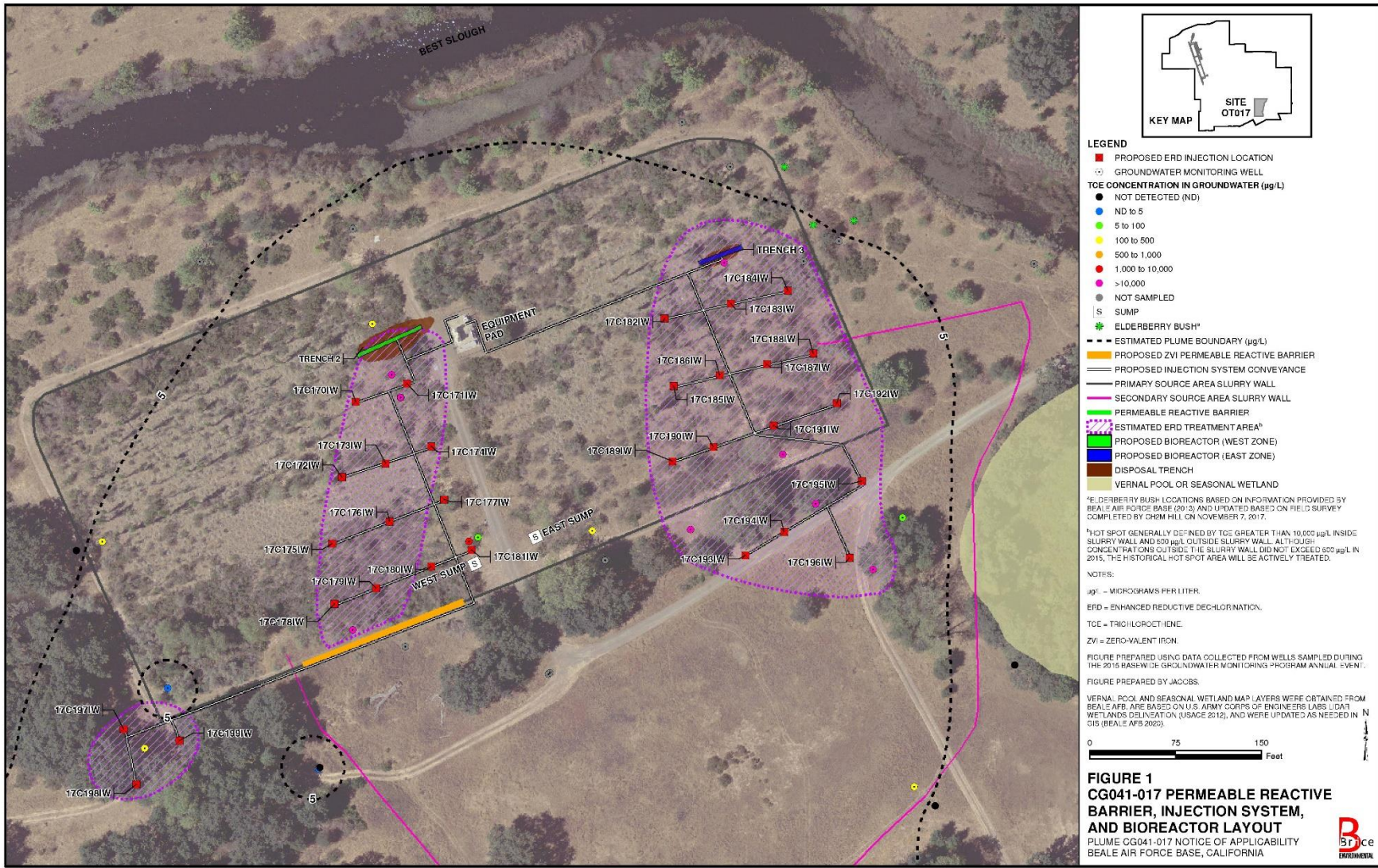
A letter transmitting the monitoring reports shall accompany each report. Such a letter shall include a discussion of requirement violations found during the reporting period, and actions taken or planned for correcting noted violations, such as operation or facility modifications. If the Discharger has previously submitted a report describing corrective actions and/or a time schedule for implementing the corrective actions, reference to the previous correspondence will be satisfactory. The transmittal letter shall contain the penalty of perjury statement by the Discharger, or the Discharger's authorized agent, as described in the Standard Provisions General Reporting Requirements Section B.3.

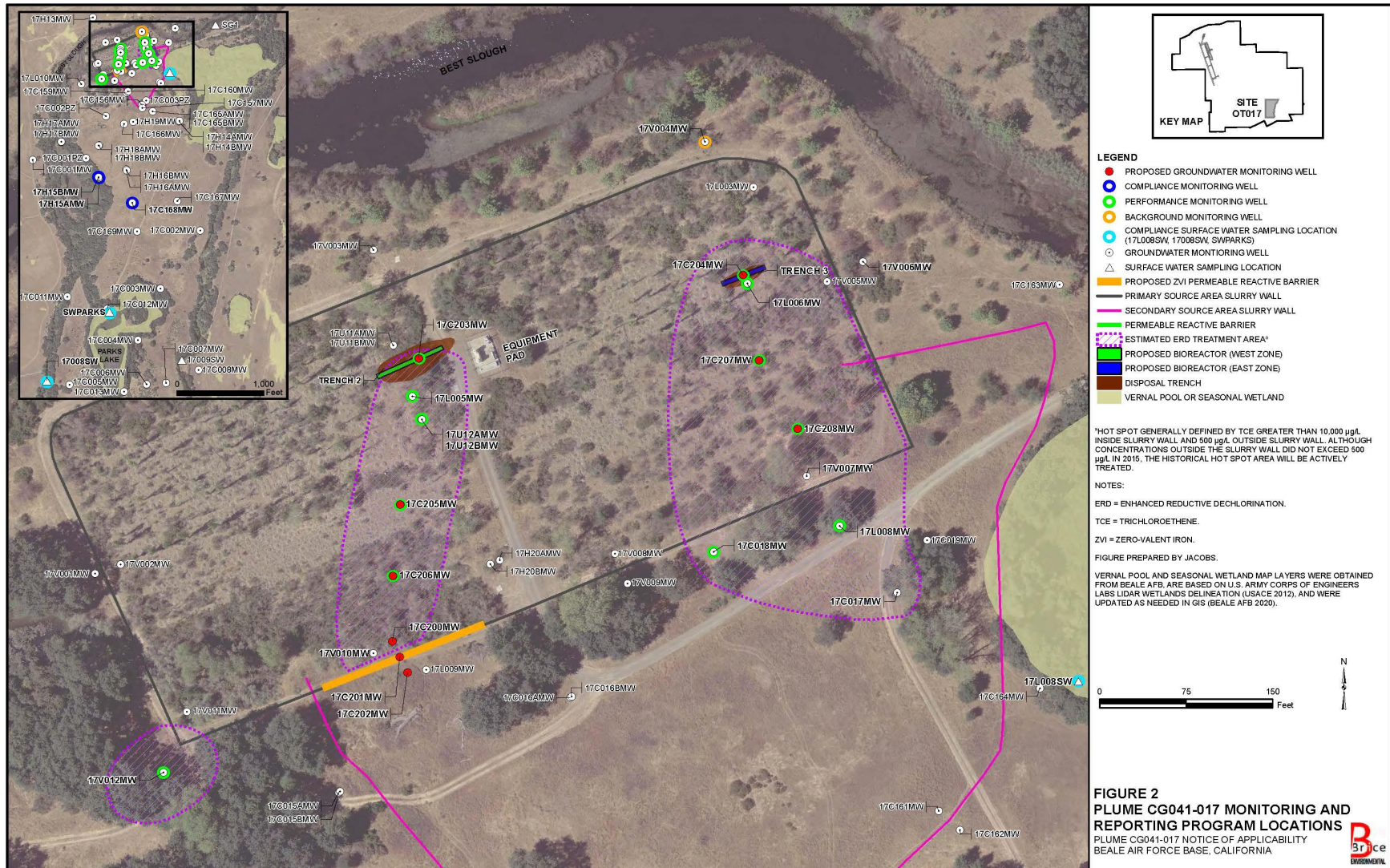
The Discharger shall implement the above monitoring program on the first day of the month following adoption of this Order.

Ordered by:

**Original Signed by JOHN J. BAUM for
Date: 03-16-2023**

PATRICK PULUPA, Executive Officer





ATTACHMENT D

Schematic Map

