

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. R5-2008-XXXX
GROUNDWATER REMEDIATION
WASTE DISCHARGE REQUIREMENTS

FOR
FORMER BALTIMORE AIRCOIL COMPANY, INC.
TRACK FOUR, INC.,
A WHOLLY OWNED SUBSIDIARY OF AMSTED INDUSTRIES INC.,
AND
A FORMER OWNER, MERCK & CO., INC.,
MERCED COUNTY

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

1. The 40.5-acre former Baltimore Aircoil Company (BAC) facility is located at 3058 Beachwood Drive, two miles northwest of Merced (see site location map as Attachment A). The former BAC facility was used from 1961 to 1994 for cooling tower fabrication. In 1969, a pressure wood treatment system was installed at the facility that used treatment solutions containing arsenic, copper, and chromium. During the operations of the wood treatment system, waste treatment solution was discharged to soils and groundwater at the facility, creating a condition of pollution or nuisance.
2. In 1975, BAC, then a subsidiary of Merck & Co., Inc. (Merck), purchased the cooling tower fabrication operation. Merck sold BAC to Amsted Industries, Inc. (Amsted), in 1985. Amsted ceased cooling tower manufacturing operations and closed the facility in February 1994. BAC, Amsted, and Merck are hereafter collectively referred to as the Discharger.
3. Chromium is the primary constituent of concern at the facility. A chromium groundwater plume currently extends in groundwater from the facility to about 800 feet to the southwest, and to about a 1,000 feet to the northwest. Total chromium concentrations are highest in the onsite well MW-8, with recent detections as high as 9,800 micrograms per liter (ug/l).
4. Geology at the facility consists of Older Alluvium underlain by a topmost clay unit of the Upper Turlock Lake Formation. Sediments of the Older Alluvium are present from about zero to 90 feet below ground surface (bgs). These sediments consist of inter-bedded alluvial deposits, which are composed of clay, silty clay, silt, silty sand, and gravelly sand. Iron-silica-cemented layers form thin, discontinuous hardpan locally within the upper 40 feet bgs and below 55 feet bgs. A shallow aquifer lies within the Older Alluvium from about 40 to 50 feet bgs to about 90 feet bgs. The shallow aquifer consists of two water-bearing units; an upper sand unit and a lower sand unit, separated by a silt/hardpan interval located from about 55 to 80 feet bgs.
5. Soil and groundwater remediation activities at the facility have included (a) excavation and off-site disposal soils from the primary wood treatment area that contained the highest concentrations of arsenic and chromium; (b) excavation and off-site disposal of arsenic and chromium-impacted soils from a storm water retention basin located on the south side of the facility; (c) installation and operation of a 300 gallon-per-minute (gpm) groundwater extraction and treatment system (GETS),

which began operation in 1994; and (d) installation and operation of a soil flushing system beneath the primary wood treatment area.

6. In September 2000, the Regional Water Board issued a Cleanup & Abatement Order for the former BAC facility that required (1) continued operation and maintenance of the GETS; (2) maintenance of hydraulic control over the chromium plume; and (3) additional soil and groundwater investigation to further define the extent of pollution at the facility. To date, about 3,000 tons of contaminated soil have been removed from the facility, and about 5,400 pounds of chromium have been removed from groundwater.
7. The groundwater extraction and treatment system is currently extracting about 42 gpm from nine of 14 extraction wells, both onsite and off-site. The groundwater extraction wells operate at pumping rates varying from one to 20 gpm depending on effective capture of the groundwater contamination plume. The extracted groundwater is treated at an onsite plant that uses flocculation tanks to precipitate out chromium, arsenic, and other dissolved solids. Treated groundwater is pumped into an onsite infiltration gallery.
8. In December 2006, a groundwater treatment pilot study was performed at the site to evaluate the effectiveness of in situ chemical and biological reduction as a means to address the mobile chromium pollution. The study involved the injection of chemical amendments (methanol and ethanol) into groundwater to stimulate chemical and biological processes for the permanent reduction of chromium to its insoluble form (Chromium III). The study, which concluded in June 2007, successfully demonstrated the efficacy of in situ chromium reduction as implemented at the facility. The use of this treatment method could greatly accelerate the clean up of chromium in groundwater when compared to using the groundwater pump and treat system that is currently operating at the site. This Order authorizes the implementation of full-scale in situ groundwater treatment for chromium.

Full-Scale In situ Treatment Implementation

9. A successful field demonstration was conducted at two onsite areas. In both areas, groundwater was extracted from a down-gradient extraction well. The groundwater was then combined with methanol or ethanol solutions (chemical amendments) and injected into up-gradient wells. This extraction/injection method was used to create groundwater recirculation cells that enhanced amendment delivery and formed chromium-reducing in situ reactive zones. The field demonstration showed that injecting dilute concentrations of either methanol or ethanol resulted in effective cleanup of chromium-impacted groundwater.
10. The full-scale in situ treatment remedy is to be implemented in phases. The first phase will involve installation of about 24 amendment injection wells at about 120-foot intervals, and in locations that target the source and toe areas of the plume. The second phase will involve installation of about 13 amendment injection wells at the same intervals, and in locations that target the central plume area. The third phase is an optional phase that may involve installation of additional injection wells for the delivery of amendment to areas within the central plume that require more treatment. The layout of the amendment delivery system is shown in Attachment B.

11. During full-scale in situ treatment implementation, groundwater will be monitored for hexavalent chromium, total chromium, arsenic, total dissolved solids, and total organic carbon by laboratory analysis. Iron and sulfate will be monitored if ferrous sulfate is used as an amendment during the full-scale treatment implementation. Electrical conductivity, pH, and water level will be measured in the field. Monitoring specific to the full-scale treatment implementation will begin prior to amendment injection, and will continue at semiannual intervals after injection until this monitoring is no longer deemed necessary (in accordance with the attached MRP No. R5-2008-XXXX).
12. The designated water quality compliance wells for the full-scale in situ groundwater remedy are MW-14, MW-15, MW-60, MW-61, and a new monitoring well to be installed about 350 feet east of MW-61. These wells, the locations of which are shown in Attachment B, roughly define the down-gradient boundaries of the groundwater treatment zone.
13. Background groundwater concentrations for key parameters were established using data from up-gradient monitoring wells. The established background values are:

Constituent	Units	Concentration
Arsenic	ug/l	4
Chromium (total)	ug/l	6
Chromium (hexavalent)	ug/l	2.84
Copper	ug/l	6
Total Dissolved Solids	mg/l	500

The Discharger will perform additional monitoring to establish background concentrations for dissolved oxygen, oxidation-reduction potential, total organic carbon, iron, manganese, and sulfate. The background concentrations will be subject to Regional Water Board staff review, and established as specified in Section V of the attached Monitoring and Reporting Program (MRP) No. R5-2008-XXXX. Pursuant to Provision D.2, this MRP is a part of this Order.

14. The Discharger will continue to pump groundwater using the existing extraction system to maintain hydraulic capture of the chromium plume associated with the site.

Basin Plan, Beneficial Uses, and Regulatory Considerations

15. *The Water Quality Control Plan, Fourth Edition, for the Sacramento and San Joaquin River Basins, Fourth Edition*, (hereafter Basin Plan) designates beneficial uses, establishes water quality objectives (WQOs), contains implementation plans and policies for protecting waters of the basin, and incorporates by reference plans and policies adopted by the State Water Resources Control Board (State Board). Pursuant to Section 13263(a) of the California Water Code (CWC), waste discharge requirements must implement the Basin Plan.
16. The Basin Plan designates the beneficial uses of the groundwater underlying the former BAC facility as municipal and domestic supply, industrial service supply, industrial process supply, and agricultural supply.

17. The Basin Plan establishes numerical and narrative WQOs for surface and groundwater within the basin, and recognizes that WQOs are achieved primarily through the Regional Water Board's adoption of waste discharge requirements and enforcement orders. Where numerical WQOs are listed, these are limits necessary for the reasonable protection of beneficial uses of the water. Where compliance with narrative WQOs is required, the Regional Water Board will, on a case-by-case basis, adopt numerical limitations in orders, which will implement the narrative objectives to protect beneficial uses of the waters of the state.
18. The Basin Plan identifies numerical WQOs 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 Plan's incorporation of these provisions by reference is prospective, and includes future changes to the incorporated provisions as the changes take effect. The Basin Plan recognizes that the Regional Water Board may apply limits more stringent than MCLs to ensure that waters do not contain chemical constituents in concentrations that adversely affect beneficial uses.
19. The Basin Plan contains narrative WQOs 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. 22. State Board Resolution No. 92-49 (hereafter Resolution No. 92-49) requires the Regional Water Board to require actions for cleanup and abatement of discharges that cause or threaten to cause pollution or nuisance to conform to the provisions of State Board Resolution No. 68-16 (hereafter Resolution No. 68-16) and the Basin Plan. Pursuant to Resolution No. 92-49, the Regional Water 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.
20. Section 13241 of the Water Code requires the Regional Water Board to consider various factors, including economic considerations, when adopting WQOs into its Basin Plan. Water Code Section 13263 requires the Regional Water Board to address the factors in Section 13241 in adopting waste discharge requirements. The State Board, however, has held that a Regional Water Board need not specifically address the Section 13241 factors when implementing existing WQOs in waste discharge requirements because the factors were already considered in adopting WQOs. These waste discharge requirements implement adopted WQOs. Therefore, no additional analysis of Section 13241 factors is required.
21. Resolution No. 68-16 requires the Regional Water Board in regulating discharges to maintain high quality waters of the State until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and potential beneficial uses, and will not result in water quality less than that described in plans and policies

(e.g., quality that exceeds WQOs). Temporal degradation of groundwater may occur at this site within the defined treatment zone due to the injection of the amendments and resulting reactions. 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 hydraulic control to assure protection of water quality, are required; and (5) the discharge will not cause WQOs to be exceeded beyond the treatment zone. A slight residual increase in TDS may occur, but will be limited to concentrations defined in the Groundwater Limitations of this Order.

22. These waste discharge requirements deal with water quality as it relates to the chemicals being injected, as well as the byproducts and breakdown products produced by the reactions of the amendments, chemicals being treated and geological materials. As discussed above, chemicals are injected to stimulate reduction in concentrations of the target pollutants. The target pollutant may undergo a series of transformations to other pollutants as it degrades. The injected chemical itself may leave residuals of its components or cause changes in groundwater chemistry that liberate metals found in the formation materials. Background/baseline concentrations of metals and total dissolved solids have been established or will be established pursuant to the attached MRP No. R5-2008-XXXX. The applicable WQOs are the narrative toxicity objective, Primary and Secondary Maximum Contaminant Levels, and the taste and odor objective as found in the Basin Plan. Numerical limits in this Order implement those Objectives. The following are the numerical WQOs for potential pollutants of concern that may be byproducts of the full-scale groundwater treatment:

Constituent	WQO (ug/l)	Reference
Arsenic	4*	CA public health goal (PHG)
Copper	170	CA public health goal
Iron	300	CA secondary MCL
Total Dissolved Solids	450,000	CA agricultural water quality goal
Sulfate	250,000	CA secondary MCL

* This is the established background concentration.

23. Section 13267(b) of California Water Code provides that: “In conducting an investigation specified in subdivision (a), the Regional Water Board may require that any person who has discharged, discharges, or is suspected of 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 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 Water 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 those reports, the Regional Water Board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports.” The technical reports required by this Order and the attached MRP No. R5-2008-XXXX are necessary to assure compliance with these waste discharge requirements.

24. The California Department of Water Resources sets standards for the construction and destruction of groundwater wells (hereafter DWR Well Standards), as described in *California Well Standards Bulletin 74-90* (June 1991) and *Water Well Standards: State of California Bulletin 94-81* (December 1981). These standards, and any more stringent standards adopted by the Discharger or county pursuant to CWC Section 13801, apply to all extraction and monitoring wells.
25. Issuance of this Order is an action to assure the restoration of the environment and is, therefore, exempt from the provisions of the California Environmental Quality Act (Public Resources Code, Section 21000, et seq.), in accordance with Section 15308 and 15330, Title 14, California Code of Regulations (CCR).
26. This discharge is exempt from the requirements of *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste*, as set forth in Title 27, CCR, Division 2, Subdivision 1, Section 20005, et seq., (hereafter Title 27). The exemption pursuant to Section 20090(b), is based on the following:
 - a. The Regional Water Board is issuing waste discharge requirements,
 - b. The requirements implement the Basin Plan, and
 - c. The wastewater does not need to be managed according to Title 22 CCR, 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 release of waste based on the following:

- d. The discharge 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 release of pollutants.
 - e. Wastes removed from the immediate place of release will be discharged according to the Title 27 regulations; and
 - f. The remedial actions intended to contain wastes at the place of release shall implement the Title 27 regulations to the extent feasible.
27. 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 re-injection, and the subsequent in situ bioremediation achieves a substantial reduction of hazardous constituents the remedy would satisfy Section 3020(b)(2)." Therefore, the injection of groundwater within the treatment zone, with or without the treatment for VOCs, complies with Section 3020(2)(b) of RCRA.31.
 28. The injection of ethanol, methanol, and ferrous sulfate into the groundwater is a discharge of waste as defined by the California Water Code.
 29. 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.

Public Notice

30. The Regional Water Board considered all the above and the supplemental information and details in the attached Information Sheet, which is incorporated by reference herein, in establishing the following conditions of discharge.
31. The Regional Water Board has notified the Discharger and interested persons of its intent to prescribe waste discharge requirements for this discharge, and has provided them with an opportunity to submit their written views and comments.
32. The Regional Water Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED, that the Discharger, its agents, successors and assigns, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted there under, shall comply with the following:

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

A. Discharge Prohibitions:

1. Discharge of wastes to surface waters or surface water drainage courses is prohibited.
2. 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.
3. The discharge of waste at any location or in a manner different from that described in Finding No. 10 is prohibited.
4. The discharge of materials into groundwater is prohibited, except for the following: ethanol; methanol; ferrous sulfate; Regional Water Board-approved chemicals to control bio-fouling or to act as tracers for chemical amendments; and water.
5. Creation of a pollution, contamination, or nuisance, as defined by Section 13050 of the California Water Code (CWC), is prohibited.

B. Discharge Specifications

1. The Discharger shall not cause the permeability of the aquifer, either inside or outside of the in situ treatment area, to be affected to such a degree that the Discharger is unable to effectively operate extraction wells for the purpose of containing the amendment(s) or its byproducts.
2. The Discharger will limit the injection of amendments to the extent practicable.

3. The discharge shall not cause the high quality groundwater unaffected by the current plume under going cleanup to be degraded by the treatment amendments listed in Discharge Prohibition A.4.

C. Groundwater Limitations:

1. The Discharger shall not cause the groundwater to contain taste and odor producing substances in concentrations that cause nuisance or adversely affect beneficial uses.
2. The discharge shall not cause the groundwater at the compliance wells listed in Finding 12 to contain concentrations of chemical constituents (i.e., the amendments and by-products of the in situ treatment process, including arsenic, iron, manganese, nitrate, sulfate, total dissolved solids, and total organic carbon) in amounts that exceed 10 percent above the background concentration or the WQOs listed in Finding 13, whichever is lower.
3. Within one year of the conclusion of the in situ treatment, the Discharger shall not cause the groundwater to contain concentrations of chemical constituents, including the injected substance, and any breakdown products or by-products of the in situ treatment process, in amounts that adversely affect beneficial uses, exceed the Water Quality Objectives listed in Finding 13, nor exceed more than 10 percent greater than their respective background concentrations.

D. Provisions:

1. The Discharger shall notify the Regional Water Board a minimum of two weeks prior to the start of full-scale injection of chemical amendments.
2. The Discharger shall comply with the attached MRP No. R5-2008-XXXX, which is part of this Order, and any revisions thereto as ordered by the Executive Officer.
3. The Discharger shall obtain Regional Water Board approval prior to implementing Phase II and Phase III of the full-scale in situ groundwater treatment remedy (see Finding 10 for a description of the implementation process). This is to ensure that the treatment remedy is not causing adverse water quality impacts. If such impacts occur, the treatment remedy will be postponed until the impacts are remediated.
4. The Discharger shall operate the existing groundwater extraction system to control the chromium plume until system shutdown is approved by the Executive Officer.
5. The Discharger shall provide an alternate water supply source for any municipal, domestic or other water use, if affected by the Discharger's wastes.
6. The Discharger shall comply with the "Standard Provisions and Reporting Requirements for Waste Discharge Requirements," dated 1 March 1991, which are by reference, a part of this Order. This attachment and its individual paragraphs are commonly referenced as "Standard Provision(s)."

7. The Discharger shall comply with all conditions of this Order, including timely submittal of technical and monitoring reports as directed by the Executive Officer. Violations may result in enforcement action, including Regional Water Board or court order requiring corrective action or imposing civil monetary liability, or in revision or rescission of this Order.
8. Should the evaluation of the implementation data for the full-scale groundwater treatment reveal adverse effects on groundwater quality at the points of compliance due to chemical amendment injection, the Discharger shall notify the Regional Water Board within 24 hours, followed by a written summary within two weeks. Within 60 days following notification, the Discharger shall submit a corrective action plan, including a time schedule for implementation, for Executive Officer approval. The corrective action plan shall detail how the Discharger will clean up and abate these effects, including extraction of any byproducts.
9. Prior to any modifications at the site that would result in material change in the quality or quantity of the chemical amendments, or any material change in the character, location, or volume of the discharge, the Discharger shall report all pertinent information in a Report of Waste Discharge to the Regional Water Board for review. This Order may be revised prior to implementation of any modifications.
10. The Discharger shall maintain records of all monitoring information including all calibration and maintenance records, copies of all reports required by this Order, and records of all data used to complete the application for this Order. Records shall be maintained for a minimum of three years from the date of the sample, measurement, or report. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the Executive Officer.
11. While this Order is in effect, and prior to any change in ownership of the Site or management of this operation, the Discharger shall transmit a copy of this Order to the succeeding Owner/Operator, and forward a copy of the transmittal letter and proof of transmittal to the Regional Water Board.
12. The Discharger shall allow the Regional Water Board, or an authorized representative, upon presentation of credentials and other documents as may be required by law, to:
 - a. Enter upon the premises regulated by the Regional Water Board, or the place where records must be kept under the conditions of this Order;
 - b. Have access to and copy, at reasonable times, any records that shall be kept under the conditions of this Order;
 - c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order; and
 - d. Sample or monitor, at reasonable times, for the purpose of assuring compliance with this Order or as otherwise authorized by the California Water Code, any substances or parameters at this Site.
13. A copy of this Order shall be kept at the discharger facility for reference by operating personnel. Key operating personnel shall be familiar with its contents.

14. The Regional Water Board may review this Order periodically and may revise requirements when necessary.

I, PAMELA C. CREEDON, Executive Officer, do hereby certify 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 14 March 2008.

PAMELA C. CREEDON, Executive Officer