STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION

ORDER NO. R4-2002-0193

WASTE DISCHARGE REQUIREMENTS
FOR
BOEING REALTY CORPORATION - C-1 FACILITY
IN-SITU REMEDIATION OF HEXAVALENT CHROMIUM CONTAMINATED SOIL AND GROUNDWATER BY CHEMICAL REDUCTION AND VOLATILE ORGANIC COMPOUND CONTAMINATED GROUNDWATER BY DECHLORINATION
(FILE NO. 95-034)

The California Regional Water Quality Control Board, Los Angeles Region, (hereafter Regional Board) herein finds that:

1. The Boeing Realty Company (hereafter Discharger) has filed a Report of Waste Discharge and applied for Waste Discharge Requirements to use a calcium polysulfide and corn syrup solution to remediate hexavalent chromium in soil and groundwater and volatile organic compounds (VOCs) in groundwater at the site (Site) identified below.

2. The Site encompasses approximately 343 acres and is located at 3855 Lakewood Boulevard, Long Beach (Latitude 33°50'00", Longitude 118°09'00," see Figure 1) and was formerly used by the Discharger for Aircraft manufacturing operations, which began in about 1941, producing various aircraft for military and civilian use. The Discharger is in the process of closing about 230 acres of the Site located west of Lakewood Boulevard, but may retain about 13 acres of this area (West Ramp Area) to support the remaining aircraft production operations, which will continue at the remaining 100 acres east of Lakewood Boulevard. As part of the closure process, the Discharger will remove all equipment, buildings and all associated above- and belowground infrastructure from the portion of the Site it is closing.

3. In 1987, the Discharger began soil and groundwater investigations at the Site and discovered soil and groundwater pollution at the West Ramp, Building 5 and Building 10 areas. The Discharger submitted soil and groundwater investigation reports to the City of Long Beach, Los Angeles County Department of Public Works and this Regional Board.

4. Shallow groundwater beneath the Site is first encountered at depths ranging from approximately 28 to 42 feet below ground surface. Groundwater is unconfined and occurs within the Bellflower Aquitard. The Artesia and Gage Aquifers are present beneath the Bellflower Aquitard. The Bellflower Aquitard comprises the upper portion of the Lakewood Formation and generally occurs from land surface to depths of approximately 140 feet beneath the Site and appears to be laterally continuous across the Site. The Bellflower Aquitard is comprised primarily of a heterogeneous mixture of low permeability silts and clays, with lenses of sandy or gravelly clays identified in some areas. The Bellflower

Aquitard is known to have relatively low hydraulic conductivities and groundwater supply wells within the City of Long Beach are not screened in and do not produce from this unit.

5. In 1995, the Regional Board issued Cleanup and Abatement Order 95-048 directing the Discharger to conduct additional soil and groundwater characterization, soil and groundwater remediation and groundwater monitoring.

6. The Discharger has conducted a comprehensive Site-wide soil and groundwater investigation. The investigation consisted of drilling more than 2,000 soil borings, collecting and analyzing over 3,700 soil samples, collecting and analyzing 1,100 soil gas samples, installation of 237 groundwater monitoring wells (192 conventional monitor recovery wells and 45 direct-push monitor wells), and collection and analysis of over 1,400 groundwater samples.

7. The Site-wide investigation shows that the primary contaminants detected in soil and groundwater are trichloroethene (TCE), 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethene (1,1-DCE) tetrachloroethene (PCE), methylene chloride (MC), jet fuel, and hexavalent chromium. Concentrations of VOCs range from non-detect up to 130,000,000 micrograms per liter (µg/l) of TCE, up to 45,000,000 µg/l of 1,1,1 –TCA, up to 6,000,000 µg/l of 1,1-DCE, up to 3,300 µg/l of PCE, up to 790,000,000 µg/l of MC and hexavalent chromium up to 794,000 µg/l. A free product plume of jet fuel is present beneath a portion of the West Ramp Area.

8. The Discharger has implemented various soil and groundwater remedial programs. From 1989 to 1999 approximately 20,000 gallons of free product has been recovered from the groundwater through the implementation of a product recovery system and manual bailing of wells in the West Ramp Area. In December 2001, a second remedial system was implemented to begin soil remediation and conduct additional groundwater remediation via a dual-phase extraction system constructed to recover vapor-phase hydrocarbons in soil vapor and additional free-phase and dissolved-phase hydrocarbons in groundwater.

9. From 1992 to 1999, the Discharger initiated groundwater remediation at the Building 10 areas by recovering approximately 600 gallons of dense non-aqueous phase liquids (DNAPL) with submersible pumps and by manually bailing wells. Soil remediation was initiated at the Building 1D, 5, and 6 areas by using vapor extraction systems (VES). VES has been operating at the Building 5 and 6 areas since October 2001, and at the Building 1D area since January 2002. The Discharger is currently conducting VES pilot tests at the Building 36 and Western Triangle areas to evaluate the feasibility of soil remediation in these areas.

10. The nearest water supply wells are located approximately 1,000 feet southeast of the Site, approximately 1,200 feet southwest of the Site and approximately 600 feet north of the Site. The nearest active water supply wells to the Site are the City of Long Beach's municipal water supply wells, 10 of which are located within an approximate 1-mile radius of the Site (Figure 2). The municipal water supply wells are screened in the deep aquifer system. There are several aquitards between the groundwater containing VOCs and/or hexavalent chromium above respective drinking water maximum contaminant levels (MCLs) within the Bellflower aquitard and the deep aquifer system from which water is produced for municipal supply.

11. The Discharger conducted a pilot study to evaluate the effectiveness of in-situ remediation of dissolved hexavalent chromium and volatile organic compounds in the groundwater beneath

Building 5. The pilot study was conducted in two phases; First, by introducing a solution of calcium polysulfide and corn syrup (Solution) through an existing well; and Second, by introducing the Solution through temporary wells created by direct-push technology to demonstrate the delivery method was effective. The composition of the Solution was chosen to reduce dissolved hexavalent chromium to trivalent chromium and promote reductive dechlorination of chlorinated VOCs. The results of the pilot study showed that chromium was reduced to non-detectable levels (reduced from the hexavalent to trivalent state) in nearly all wells in the 20-foot-radius test area, and, that reducing conditions were sustained for up to 100 days after the start of the test promoting a condition of dechlorination for VOCs.

12. The Discharger proposes to remediate hexavalent chromium in soil and groundwater and VOCs commingled with hexavalent chromium in groundwater using a calcium polysulfide and corn syrup solution within the remediation area, as defined by the outlined area presented in Figure 3.

13. The Discharger submitted a "Remediation Plan for Reduction of Hexavalent Chromium at the African Queen, Building 5, and Building 6 North" (Remediation Plan) prepared by Montgomery Watson Harza dated January 9, 2002. The Remediation Plan was approved by the Executive Officer on June 5, 2002. The Remediation Plan presents the rationale and procedures for full-scale implementation of hexavalent chromium remediation at the Site (see Figures 4 and 5).

14. The Remediation Plan also presents the procedures for monitoring the remediation program and evaluating the injection volume and concentrations. The frequency of injection will be adjusted based on the results of field monitoring. There is an existing network of groundwater monitoring wells located up-gradient, within the treatment areas, and downgradient of the treatment and remediation areas. Groundwater conditions will be monitored during the operation to determine the efficiency of the injection. The Discharger proposes to inject up to 2.9 million gallons of Solution into the groundwater at the Building 5, Building 6 North and African Queen remediation areas.

15. Groundwater will be extracted from four groundwater extraction wells located within the African Queen area, treated to remove VOCs and stored in above ground storage tanks located onsite. Calcium polysulfide will then be added to the groundwater to convert the dissolved hexavalent chromium to trivalent chromium and precipitate out the trivalent chromium. The treated groundwater will then be sent to an infiltration basin and percolated down through the underlying soils to remediate soils containing hexavalent chromium (See Figure 9). If additional water is needed to create the polysulfide solution for infiltration, potable water from on onsite fire hydrant will be used. The Discharger proposes to include control measures for the source area remediation. Control measures would provide hydraulic containment of groundwater containing amendments or by-products that may potentially threaten to adversely affect the beneficial use of groundwater outside the remediation area. Monitoring will consist of gauging and sampling the wells for the indicated analytes, as submitted in the Remediation Plan. In addition, depth to water measurements will be utilized to evaluate the groundwater gradient and flow direction. The low groundwater flow rates allow sufficient time to install and implement a hydraulic containment system based on groundwater monitoring at the Site.

16. Injection of a solution of calcium polysulfide and corn syrup into the groundwater is a discharge of waste as defined by the California Water Code. However, the discharge of calcium polysulfide and corn syrup is intended to provide more efficient remediation of hexavalent chromium and VOCs polluted groundwater and may significantly reduce the anticipated cleanup time as compared to pump-and-treat technology should it be used to remediate the groundwater contamination.

17. The application of calcium polysulfide and corn syrup to groundwater may result in temporary adverse impacts to groundwater quality, but these impacts that may result will be localized, or short-term duration, and will not impact any existing or prospective beneficial uses of groundwater.

18. On January 24, 2002, This Regional Board adopted Order No. R4-2002-0030 "General Waste Discharge Requirements for Groundwater Remediation at Petroleum Hydrocarbon Fuel and/or Volatile Organic Compound Impacted Sites"(General WDR). The General WDR permits the injection of calcium polysulfide and corn syrup, the same chemicals proposed for use at this Site, but does not provide for the use of these chemicals for the remediation of hexavalent chromium. Therefore, these individual waste discharge requirements have been developed for the remediation of hexavalent chromium and VOCs.

19. This Regional Board adopted a revised Water Quality Control Plan for the Los Angeles Region on June 13, 1994. The Plan contains beneficial uses and water quality objectives for the West Coast Groundwater Basin. The requirements contained in this Order, as they are met, will be in conformance with the goals of the Plan.

20. The beneficial uses for the West Coast Groundwater Basin are municipal and domestic water supply, industrial service supply, industrial process supply, and agricultural supply.

21. The permitted discharge is consistent with the anti-degradation provisions of State Water Resources Control Board Resolution No. 68-16 (Anti-degradation Policy). The discharge may result in some localized temporary exceedence of background concentrations of total organic carbon, VOCs, and TDS. However, any parameter change resulting from the discharge:

    a. Will be consistent with maximum benefit to the people of the State.
    b. Will not unreasonably affect present and anticipated beneficial uses of such water, and
    c. Will not result in water quality less than that prescribed in the Water Quality Control Plan for West Coast Groundwater Basin.

22. This Regional Board has assumed lead-agency role for this project under the California Environmental Quality Act (Public Resources Code section 21000 et seq.) and has conducted an Initial Study in accordance with section 15063 of the "State CEQA Guidelines" at California Code of Regulations, title 14, section 15000 et seq. Based upon the Initial Study, the Regional Board staff prepared a Mitigated Negative Declaration that the project, as mitigated, will not have a significant adverse effect on the environment.

23. This Regional Board has notified the Discharger and interested agencies and 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 recommendations. This Regional

Board, in a public meeting, heard and considered all comments pertaining to the discharge and to the tentative requirements.

IT IS HEREBY ORDERED that Boeing Realty Corporation, 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:

A. Discharge Limits

1. The Discharger shall not cause the groundwater outside of the remediation area to exceed background concentrations of chloride and TDS established prior to start of the remediation.

2. The discharge of calcium polysulfide and corn syrup solution into the groundwater shall be only performed while this Order is in force.

3. During this remediation, the injection volume of calcium polysulfide and corn syrup solution shall not exceed 2.9 million gallons, unless approved by this Regional Board through the Executive Officer.

4. Discharge duration shall not exceed more than two years, unless approved by the Executive Officer.

5. Solution shall be limited to potable water, extracted groundwater and corn syrup, calcium polysulfide. The maximum concentration of Solution shall not exceed 5 % (by volume) calcium polysulfide and 2% corn syrup.

B. Discharge Specifications

1. The Discharger shall provide hydraulic control and complete containment of injected chemicals and any by-products of the chemical reduction process if any VOCs (including by-products of the treatment process) or calcium polysulfide and corn syrup solution are observed to be migrating off-site.

2. The Discharger shall not cause the by-products of the chemical reduction process to migrate outside of the calcium polysulfide and corn syrup solution treatment area established by the Discharger and approved by the Executive Officer.

3. The discharge of calcium polysulfide and corn syrup solution or any by-products into any surface water or surface water drainage course is prohibited.

4. The Discharger shall not cause the groundwater to contain taste or odor producing substances in concentrations that cause nuisance or adversely affect beneficial uses outside the treatment area.

5. The Discharger shall not cause the groundwater to contain concentrations of chemical constituents, including calcium polysulfide and corn syrup solution and its by-products in amounts that adversely affect groundwater beneficial uses as a result of the injection of solution.

C. Provisions:

1. This Order includes the attached "Standard Provisions Applicable to Discharge Requirements," which are incorporated herein by reference. If there is any conflict between provisions stated hereinbefore and the attached "Standard Provisions," those provisions stated hereinbefore prevail.

2. Discharge of wastes to any point other than specifically described in this Order is prohibited and constitutes a violation thereof.

3. In the event of any change in name, ownership, or control of this Site, the Discharger shall notify this Regional Board in writing and shall notify any succeeding owner or operator of the existence of this Order by a letter, a copy of which shall be forwarded to this Regional Board.

4. A copy of these requirements shall be maintained at an on-site office and be available at all times to operating personnel.

5. In accordance with section 13260 of the Water Code, the Discharger shall file a report of any material change or proposed change in the character, location or volume of discharge.

6. The Discharger shall notify this Regional Board immediately by telephone of any adverse condition resulting from this discharge or from operations producing this waste discharge, such notifications to be affirmed in writing within one week from the date of such occurrence.

7. This Regional Board considers the property operator and owner to have continuing responsibility for correcting any problem that may arise in the future as a result of this discharge.

8. The Discharger shall submit a Summary Report detailing the results of the remediation six months after injection has been completed. The report should include an evaluation of the effectiveness of using calcium polysulfide and corn syrup solution to remediate hexavalent chromium and VOC-contaminated groundwater at the Site, the impact of any by-products on the receiving groundwater quality, and any other effects the in-situ treatment may have.

9. All work must be performed by or under the direction of a registered civil engineer or registered geologist. A statement is required in all technical submittals that the registered professional in direct responsible charge actually supervised or personally conducted all the work associated with the project.

10. The use of a calcium polysulfide and corn syrup solution shall not cause a condition of pollution or nuisance as defined by California Water Code section 13050.

11. The Discharger shall comply with all conditions of this Order, including timely submittal of technical and monitoring reports as specified in the attached Monitoring and Reporting Program No. CI-8517, which is incorporated herein by reference. Violations may result in

enforcement action, including Regional Board or Court Order requiring corrective action or imposition of civil monetary liability, or revision, or rescission of the Order.

12. This Order does not exempt the Discharger from compliance with any other laws, regulations, or ordinances which may be applicable. This Order does not legalize the waste treatment Site, and leaves unaffected any further restraints on the Site that may be contained in other statutes or required by other agencies.

13. The Discharger shall cleanup and abate the effects of injecting calcium polysulfide and corn syrup solution, including extraction of any by-products which adversely affect beneficial uses, and shall provide an alternate water supply source for municipal, domestic or other water use wells that become contaminated in exceedance of water quality objectives as a result of using corn syrup solution.

14. In accordance with section 13263 of the California Water Code, these requirements are subject to periodic review and revision by this Regional Board.

15. 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 all relevant facts.
    c. A change in any condition that requires either a temporary or permanent reduction or elimination of authorized discharge.

16. The Regional Board, through its Executive Officer, will modify the Monitoring and Reporting Program, as necessary. The California Environmental Quality Act (CEQA) initial study and associated public comment were conducted once as part of the initial Waste Discharge Requirements (WDR) permit application process and will not be required for the expansion or modification of this remediation program.

D. Expiration Date

This Order expires on December 12, 2007.

The Discharger must file a Report of Waste Discharge in accordance with sections 13260 and 13264 of the California Water Code not later than 180 days in advance of such date as application for issuance of new waste discharge requirements.

I, Dennis A. Dickerson, 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, Los Angeles Region, on December 12, 2002.

_____ December 19, 2002
Dennis a. Dickerson Date
Executive Officer