PAGE NO. 8-8

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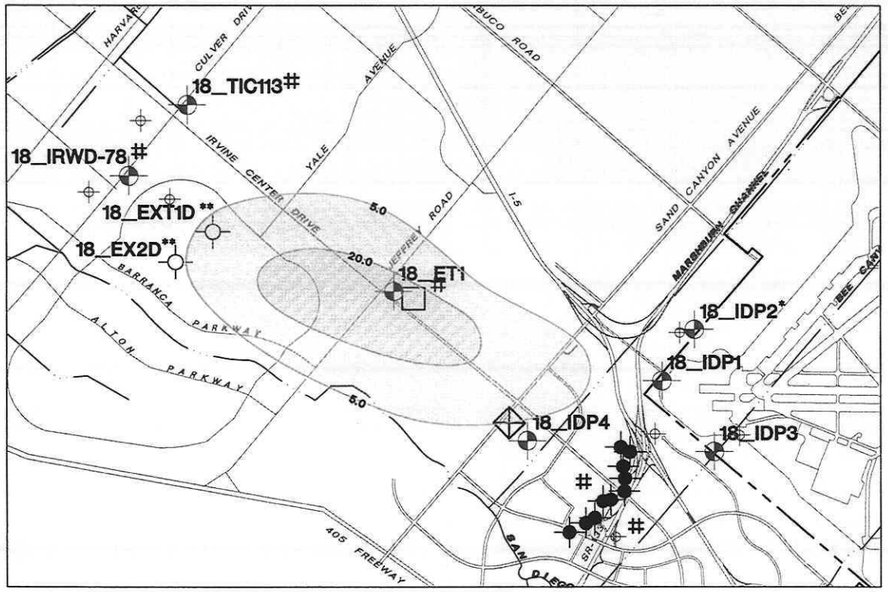
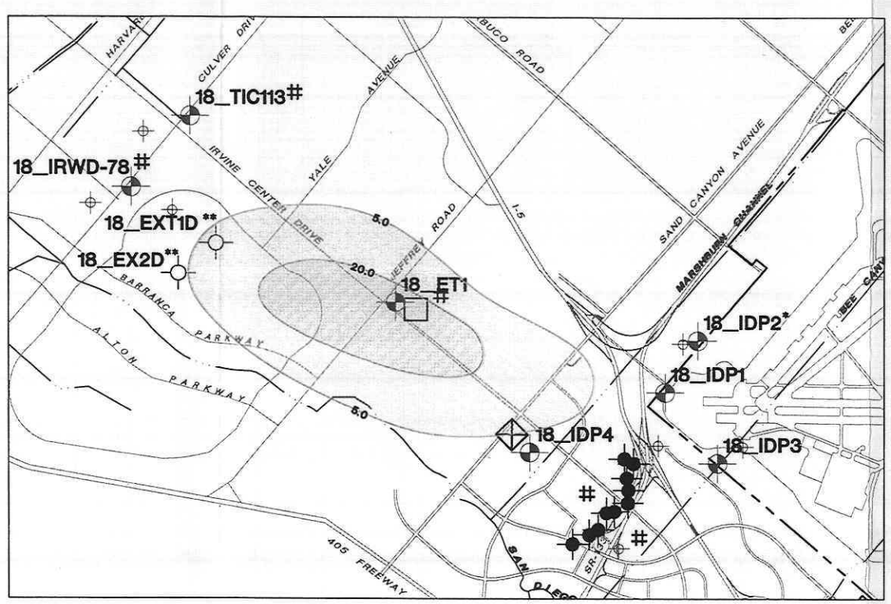
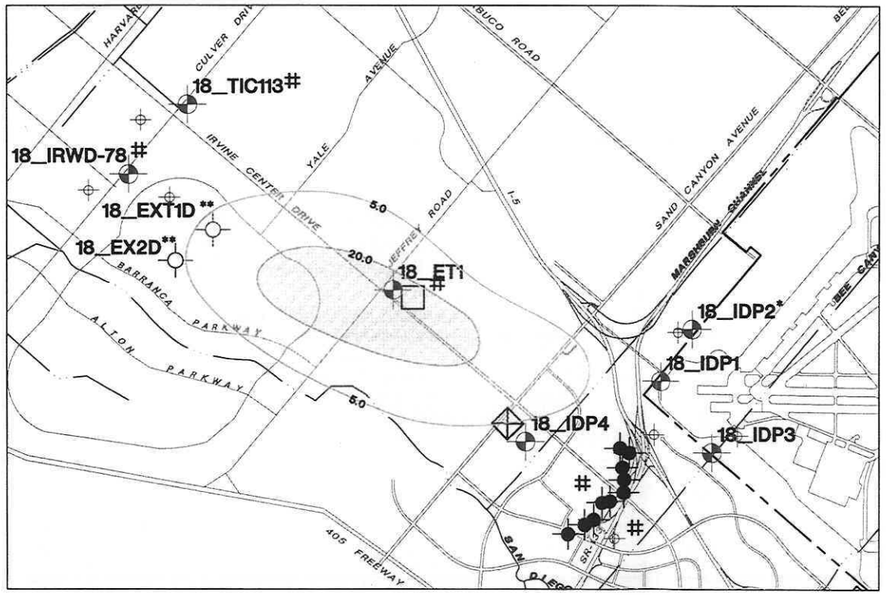


ALTERNATIVES 2A and 9



ALTERNATIVES 6A, 8, 10A and 10B



ALTERNATIVES 7A and 7B

LEGEND

- ROAD
- FREEWAY
- FORMER MCAS EL TORO BOUNDARY
- STREAM OR WASH
- PROPOSED MCAS EL TORO TREATMENT FACILITY LOCATION
- PROPOSED IDP TREATMENT FACILITY LOCATION

INJECTION WELLS

- FORMER MCAS EL TORO INJECTION WELL

EXTRACTION WELLS

- FORMER MCAS EL TORO EXTRACTION WELL
- OCWD/IRRIGATION WELL
- MONITORING WELL CLUSTER

TCE CONCENTRATIONS IN GROUNDWATER

- 5.0 TO 20.0 ug/L TCE
- GREATER THAN 20.0 ug/L TCE
- 5 INFERRED ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

WELL PLACEMENT BASED ON GROUNDWATER MODELLING CONDUCTED IN 1996 (JACOBS 1996e) AND BECHTEL NATIONAL INC. (BNI 1997b) AND GROUNDWATER SAMPLING DATA COLLECTED IN MARCH 1997.

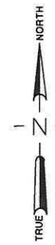
50 AND 500 ug/L CONCENTRATION CONTOURS REVISED TO REFLECT HYDROPUNCH SAMPLES COLLECTED BETWEEN JANUARY AND APRIL 1998.

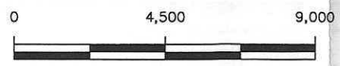
FOR MULTI-PORT OR CLUSTER WELL LOCATIONS THE HIGHEST CONCENTRATION WAS USED FOR CONTOURING THE PLUME.

*18_IDP2 IS A COMPONENT OF ALTERNATIVE 8 ONLY.

**18_EXT1D AND 18_EXT2D ARE NOT USED FOR ALTERNATIVE 8.

NAVY ACQUISITION OF EXTRACTION WELLS 18_IRWD-78 AND 18_TIC113, INSTALLATION OF TREATMENT FACILITY, INJECTION WELLS, AND INJECTION WELL MONITORING WELL IMPLEMENTED AFTER 10 YEARS. (ALTERNATIVE 7B ONLY)





Record of Decision

Figure 8-2

Principal Aquifer Extraction / Injection Wells

Former MCAS, El Toro, California

Bechtel National, Inc.
CLEAN II Program

Date: 5/1/02
File No: 164H7929
Job No: 22214-164
Rev No: D

PAGE NO. 8-10

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(primarily TCE) from a 2,000-gpm stream to nondetectable levels (0.5 µg/L for TCE) and would be completely independent of the treatment system for shallow groundwater.

After VOC treatment, groundwater would be injected upgradient into the principal aquifer through ten injection wells (Figure 8-2).

Well 18_ET1 is an existing extraction well located approximately in the middle of the TCE plume. The well is equipped with an air-stripping mechanism to remove VOCs before groundwater is used for irrigation. TDS levels in this well appear to be increasing, and its useful life for irrigation appears to be limited. Alternative 2A assumes 18_ET1 is not operating.

8.1.2.3 INSTITUTIONAL CONTROLS

Institutional controls for the off-Station portion of the groundwater plume are intended to protect residents from use of VOC-contaminated groundwater from the principal aquifer and shallow groundwater unit for domestic purposes until cleanup goals are achieved. The institutional controls for the off-Station portion of the VOC groundwater plume are based on local permit programs administered by two local governmental agencies regulating the installation and use of new groundwater extraction wells. The off-Station VOC groundwater plume lies within the jurisdictional areas of these two local permit programs.

The Orange County Health Care Agency (OCHCA) requires that any person planning to construct a water well must apply for and obtain from OCHCA a permit for construction of such well and authorizes OCHCA to include any necessary conditions in such permit to assure adequate protection of public health (*Orange County Code*, Article 2. Construction and Abandonment of Water Wells). The Irvine Ranch Water District (IRWD) also requires a permit for construction of water wells and authorizes IRWD to include any necessary conditions in such permits to assure adequate protection of public health (*IRWD Rules and Regulations*, Section 16. Water Wells).

The DON is continuing to work with OCHCA and IRWD to assure that any conditions that are necessary to assure adequate protection of public health (e.g., treatment to comply with federal and state drinking water standards) shall be included in any permits that they issue for construction of wells within the groundwater plume. Copies of the well permit form and applicable regulations are found in Appendix C. The DON has also received commitments by OCHCA and IRWD to provide the Navy with copies of any well permit applications received or permits issued within the geographic scope of the off-Station groundwater plume exceeding federal and state MCLs until remediation of the plume has been completed.

The DON has provided to OCHCA and IRWD copies of the maps in this ROD that delineate the off-Station groundwater plume. The DON shall provide annually to OCHCA and IRWD updated copies of the maps beginning 1 year from the date of issuance of this ROD and ending when remediation of the plume has been completed.

Monitoring and Reporting

Subject to their respective powers and jurisdictions, OCHCA and IRWD shall have the lead in assuring that appropriate permits are obtained for construction of new water wells in the VOC groundwater plume and taking any necessary enforcement action to assure that such permits are obtained and complied with. The DON shall provide annually U.S. EPA, DTSC, and RWQCB with copies of permit applications and permits that it has received from OCHCA and IRWD during the previous year beginning 1 year from the date of issuance of this ROD and ending when remediation of the plume has been completed. The DON will provide these copies to U.S. EPA, DTSC, and RWQCB within 60 days of receipt from OCHCA and IRWD.

8.1.2.4 GROUNDWATER MONITORING

Conceptual groundwater monitoring programs are described in this ROD. The final number and locations of monitoring wells, frequency of monitoring, and types of analyses would be determined during the engineering design phase. The purpose of the groundwater monitoring program would be to monitor remedial action performance, with the following specific objectives.

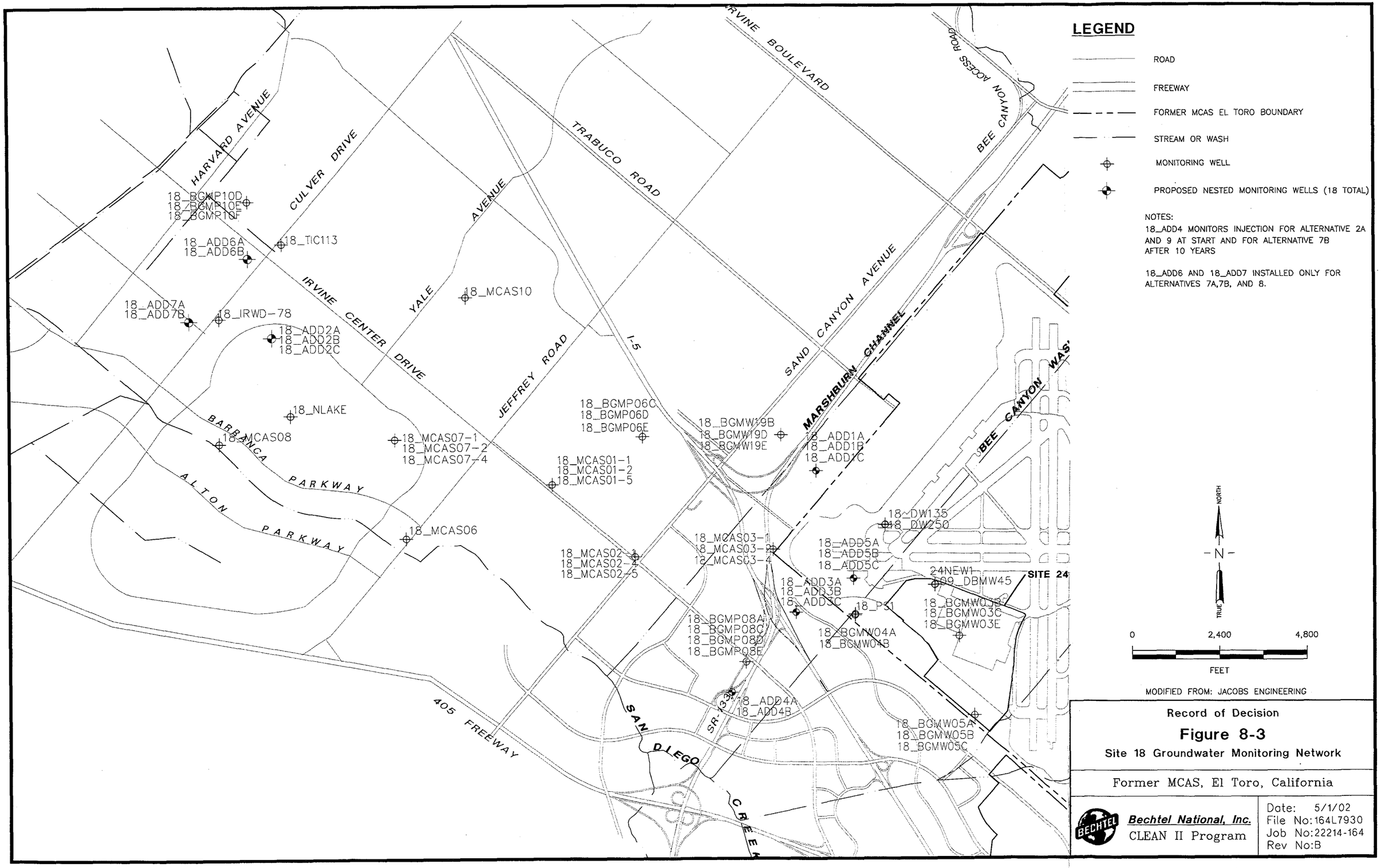
- Provide additional data on the groundwater flow regime to allow adjustments in pumping rates, groundwater treatment, and future placement of extraction, injection, and monitoring wells.

Monitor the decline of groundwater elevations in the shallow groundwater unit and principal aquifer.

- Evaluate the hydraulic containment of groundwater contamination, focusing on the horizontal and vertical distribution of TCE and benzene contamination.
- Evaluate potential contaminant migration from the shallow groundwater unit to the principal aquifer.
- Refine contaminant removal rates to allow enhancement of aquifer restoration.

The conceptual Alternative 2A monitoring well network would consist of 58 monitoring wells located in the principal aquifer (Figure 8-3). Forty-four existing wells would be used to measure groundwater elevation changes induced by the extraction and injection wells in the shallow groundwater unit and principal aquifer and to evaluate the vertical distribution of VOCs. Fourteen new cluster monitoring wells would be added to monitor groundwater level fluctuations, vertical contaminant concentration profiles near the proposed injection/extraction wells, and the lateral extent of VOCs.

Analytical results from groundwater monitoring wells at the outer edge of the groundwater contamination would indicate whether the selected remedial action has been effective in slowing or stopping the spread of contaminants from the Station. Results from deep and multiport wells at the edge of and within the contaminated area would indicate whether the selected remedial action is mitigating the downward migration of contaminants from the shallow groundwater unit to the principal aquifer.



Record of Decision

Figure 8-3

Site 18 Groundwater Monitoring Network

Former MCAS, El Toro, California

Bechtel National, Inc.
CLEAN II Program

Date: 5/1/02
File No: 164L7930
Job No: 22214-164
Rev No: B

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8.1.3 Alternative 6A: MCAS El Toro Project and Partial IDP With Discharge to IDP Only

Under Alternative 6A, groundwater would be extracted from the shallow groundwater unit using the same extraction well system as Alternative 2A (Figure 8-1) and from the principal aquifer using a combination of two Former MCAS El Toro wells and four IDP wells (Figure 8-2). Extracted groundwater from the shallow and principal aquifers would be combined and discharged to the IDP for treatment using air stripping followed by VGAC adsorption to remove VOCs. The approximate treatment rate is 4,700 gpm. After VOCs are removed, groundwater would be discharged to the remainder of the IDP treatment system for additional treatment (i.e., reduction of TDS and nitrate concentrations) and distribution for use as potable water; however, only those components of the IDP used to remediate VOCs are considered part of the CERCLA remedial action.

Institutional controls identical to those of Alternative 2A would be used to protect the remedy and prevent residents from inadvertent use of contaminated water. Groundwater monitoring is performed using a network of 44 existing and 12 new wells (Figure 8-3). Two monitoring wells (18_ADD4A and 18_ADD4B) that were to be added under Alternative 2A to measure the effects of injection would not be used under Alternative 6A because it does not include injection. Otherwise, groundwater monitoring is identical to that for Alternative 2A.

8.1.4 Alternative 7A: MCAS El Toro Shallow Groundwater Project

Alternative 7A would use the same system for shallow groundwater extraction, VOC treatment, and injection as Alternative 2A (Figure 8-1) but would rely on existing background production wells (Table 8-2) and natural attenuation for remediation of the principal aquifer (Figure 8-2). Twelve production wells were used to extract groundwater for irrigation at Site 18. In addition to natural attenuation processes, these wells are assumed to continue to operate during the early phases of remediation. However, two Culver Drive irrigation wells (18_IRWD78 and 18_TIC113) have a projected remaining life of only 10 years, after which it is assumed they will be abandoned.

Institutional controls identical to those of Alternative 2A would be used to protect the remedy and prevent residents from inadvertent use of contaminated water. To assure that plume movement is halted and remediation is occurring as expected, an enhanced well network would be used to monitor potential plume movement at the downgradient edge. If monitoring shows that the plume is moving or that natural attenuation is not remediating groundwater as expected, a contingency plan has been developed for Alternative 7A to protect the beneficial uses of the principal aquifer in the Irvine Subbasin.

8.1.4.1 NATURAL ATTENUATION

During natural attenuation, contaminant mass is reduced through naturally occurring processes, including nondestructive processes (e.g., advection, dispersion, and sorption)

and destructive processes (i.e., abiotic [chemical] and biotic [microbiological] processes). Nondestructive processes reduce the concentration and toxicity of VOCs but do not reduce the mass and generally increase the volume. Destructive processes decrease the mass, toxicity, mobility, and volume of contaminants.

The potential for naturally occurring destructive processes (reductive chlorination) was evaluated during the OU-1 IAFS. This evaluation included a review of site characterization data against four common indicators of degradation: reduction in chemical concentration, presence and uptake of organic substrate, production of daughter products, and oxidation-reduction conditions and the presence of electron receptors. The conclusion of the evaluation was that, although the presence of 1,2-DCE indicates that some reductive chlorination of TCE is occurring, the rate at which it is occurring is slow because of low starting concentrations of TCE, low organic content, presence of an overall aerobic environment, and available supply of alternate electron receptors.

8.1.4.2 MONITORING

Alternative 7A relies on natural processes for attenuation of VOC contamination in the principal aquifer over time. Therefore, additional monitoring would be used to allow consideration of actions necessary to protect beneficial uses of principal aquifer groundwater in the Irvine Subbasin.

The primary location where TCE contamination could reasonably come into contact with water users is at the downgradient edge of the plume in the principal aquifer. This is approximately 15,000 feet west-southwest of Former MCAS El Toro for the 5-µg/L isoconcentration contour and approximately 18,000 feet west-southwest of Former MCAS El Toro for the detection limit (0.5 µg/L).

In the principal aquifer, an additional set of monitoring well clusters (18_ADD6) would be installed upgradient of the 5-µg/L isoconcentration contour to monitor the potential movement of contamination from the shallow groundwater unit to the principal aquifer. Another set of monitoring well clusters installed downgradient of the 5-µg/L isoconcentration contour (18_ADD7) would allow further characterization of the plume in this area and monitoring of the attenuation of the plume over time.

The completion intervals of the monitoring wells in each cluster would be selected to allow consistent comparison between well clusters and to monitor primary intervals of the groundwater flow. The monitoring wells would be constructed to provide an appropriate compromise between an interest in vertical variation in contamination and the length of typical production wells that could be affected by contamination.

At the start of implementation of Alternative 7A, two existing irrigation wells at Culver Drive (18_IRWD78 and 18_TIC113) would be sampled quarterly for 1 year, and samples would be analyzed for VOCs. The sampling frequency would decrease to semiannually and eventually annually for as long as the wells are in operation. The newly installed monitoring well clusters downgradient of the 5-µg/L isoconcentration contour would be sampled quarterly during the first year and then semiannually or annually during

succeeding years. The sampling frequency will be determined on a well-specific basis during the initial phase of groundwater monitoring. Together, wells 18_IRWD78 and 18_TIC113 and the new monitoring well clusters downgradient of the 5-µg/L isoconcentration contour would be "sentinel wells" because they would be used to provide early warning of plume movement.

8.1.5 Alternative 7B: MCAS El Toro Project With Principal Aquifer Contingency Wells

Alternative 7B is identical to Alternative 7A except that for Alternative 7A, the two existing irrigation wells at Culver Drive (18_IRWD78 and 18_TIC113) are assumed to cease operations after 10 years due to either reduced demand for the water or increasing TDS concentrations (Figure 8-2). Under Alternative 7B, the DON would acquire these wells at that time (or replace them if acquisition is not feasible), treat the extracted groundwater (2,000 gpm on an annual average basis) at an Former MCAS El Toro treatment facility using air stripping and VGAC to remove VOCs, and inject the treated groundwater upgradient of the 5-µg/L isoconcentration contour using ten principal injection wells (Figure 8-2). In the principal aquifer, after 10 years, Alternative 7B is identical to Alternative 2A. In the shallow groundwater unit, groundwater would be also extracted, treated, and reinjected into the shallow unit using the same process as for Alternative 2A (Figure 8-1).

Institutional controls identical to those for Alternative 2A would be used to protect the remedy and prevent residents from inadvertent use of contaminated water. Monitoring would be the same as under Alternative 7A except that after 10 years, one new monitoring well cluster (18_ADD4) would be installed upgradient of the principal aquifer injection well field to monitor water levels and concentrations of chemicals associated with injection. The contingency plan for Alternative 7B is identical to that for Alternative 7A.

8.1.6 Alternative 8: MCAS El Toro Shallow Groundwater Project and Modified Partial IDP With Discharge Only to IDP

Alternative 8 combines Former MCAS El Toro shallow groundwater extraction (Figure 8-1) with six planned IDP extraction wells. Five wells are located upgradient of the VOC plume, and well 18_ET1 is approximately in the center of the plume (Figure 8-2). Groundwater extracted from the shallow groundwater unit and principal aquifer is discharged to the IDP at an approximate rate of 5,700 gpm for treatment and distribution. Well 18_TIC110, outside the boundaries of the TCE plume, is not considered part of the CERCLA response under Alternative 8, even though groundwater from this well is discharged to the IDP along with groundwater from the other wells discussed above. Downgradient of the IDP wells, natural attenuation would be used to remediate the principal aquifer.

An enhanced monitoring network identical to Alternative 7A (Figure 8-3) would be used to assess the effectiveness of this alternative, and a contingency plan identical to the plan for Alternatives 7A and 7B would be used if trigger levels are exceeded in the monitoring wells. Institutional controls would be identical to those for Alternative 2A.

8.1.7 Alternative 8A: MCAS El Toro Shallow Groundwater Project and CERCLA Principal Aquifer Wells With Treatment at IDP and Distribution for Nonpotable Use

Alternative 8A is a relatively new alternative developed by OCWD/IRWD in 1999 after the OU-1 IAFS had concluded. This alternative was developed to address public concern regarding domestic use of treated groundwater from contaminated portions of the shallow groundwater unit and principal aquifer. Alternative 8A assumes that the IDP would consist of two separate systems designed to treat groundwater from two sources in the principal aquifer and from the shallow groundwater unit at Site 24. Groundwater from the shallow groundwater unit and from areas within the 5-µg/L isoconcentration contour in the principal aquifer VOC plume (which is contaminated at levels above drinking water standards) would be extracted, treated at the IDP, and discharged for use as recycled water.

Groundwater from areas outside the principal aquifer VOC plume (which already meets water quality standards) would be extracted, treated at the IDP to remove trace amounts of VOCs and remove TDS and nitrates. This treated water would then be released for domestic purposes. Groundwater from both sources would be kept separate at all times. An enhanced monitoring network would be used to assess the effectiveness of this alternative, and a contingency plan would be used in the event that trigger levels are exceeded in the monitoring wells.

Only the VOC-related portion of the IDP that treats water from Site 24 and areas inside the principal aquifer VOC plume for nonpotable purposes would be considered part of the CERCLA remedy. The discussion that follows is limited to the CERCLA remedy.

None of the assets of the potable system are included in, associated with, or related to the Former MCAS El Toro groundwater CERCLA actions. Certain specific assets of the nonpotable system are also not associated with or related to the Former MCAS El Toro groundwater CERCLA actions.

The primary components of the Modified IDP are as follows:

CERCLA Component of the Modified IDP

The CERCLA component of the Modified IDP consists of the following assets of the nonpotable system:

- Extraction Wells IRWD-78, ET-1, and ET-2, and Injection Well IDP-1 which are located within the VOC plume in the principal aquifer;
- pumping and pipeline conveyance system from Wells IRWD-78, ET-1, and ET-2 to the separate nonpotable VOC treatment system located at the Central

Treatment Plant (see red line on Figure 8-4); and pumping and pipeline conveyance system from the nonpotable VOC treatment system located at the Central Treatment Plant to Injection Well IDP-1 (see dark blue line on Figure 8-4;.

- separate nonpotable VOC treatment system (including air strippers and off-gas granular-activated carbon units) located at the Central Treatment Plant for VOC-contaminated groundwater extracted from both shallow groundwater unit and principal aquifer groundwater;
- the DON's extraction wells for interception and removal or VOC-contaminated groundwater in the shallow groundwater unit; and the DON's pumping and pipeline conveyance from these extraction wells to the nonpotable pipeline conveyance system's point of connection at the Former MCAS El Toro Station boundary; and
- the DON's monitoring wells associated with the remediation of the VOC plume in the shallow groundwater unit and principal aquifer.

Non-CERCLA Component of the Modified IDP

The following potable system and nonpotable system assets of the modified IDP are non-CERCLA:

- the entire potable system of the Modified IDP, including:
  - Extraction Wells TIC-110, IRWD-75, IRWD-76, and IRWD-77 located outside and cross gradient of the VOC plume in the principal aquifer;
  - pumping and pipeline conveyance system from the extraction wells outside and cross gradient of the VOC plume in the principal aquifer to the separate potable system water treatment system (including treatment for VOCs) located at the Central Treatment Plant;
  - the potable water treatment system (including treatment for VOCs) located at the Central Treatment Plant for groundwater extracted from outside and cross gradient of the VOC contaminant plume in the principal aquifer;
  - the potable system desalination treatment assets (including prefilters, chemical feed units, pumps, reverse osmosis units, degassifiers, and controls) and peripheral facilities that include product water delivery/discharge system pumps and pipelines and brine disposal; and
  - monitoring wells associated with the operation and performance of the potable system.
- the nonpotable system desalination treatment assets (including prefilters, chemical feed units, pumps, reverse osmosis units, de-gassifiers, and controls) and peripheral facilities that include product water delivery/discharge system pumps and pipelines and brine disposal

Shared CERCLA/non-CERCLA Component of the Modified IDP Component Assets at the Central Treatment Plant (The costs of the following assets were allocated proportionally in the Settlement Agreement.)

- Central Treatment Plant site real property, buildings, site improvements, telemetry, transformers and other electrical improvements, and central monitoring and control systems

The discussion that follows is limited to the CERCLA remedy.

8.1.7.1 REMEDIATION OF THE SHALLOW GROUNDWATER UNIT

Alternative 8A has the same shallow groundwater unit extraction well configuration as Alternative 2A (Figure 8-1). Following extraction, groundwater from the shallow groundwater unit would be blended with groundwater from within the VOC plume in the principal aquifer and discharged to the IDP for treatment.

8.1.7.2 REMEDIATION OF THE PRINCIPAL AQUIFER

Groundwater from contaminated portions of the principal aquifer would be extracted using three extraction wells (Figure 8-4). Together, these wells would extract approximately 2,500 gpm:

Well Number	Extraction Rate (gpm)
18_IRWD78	800
18_ET1	1,000
18_ET2	700
Total	**2,500**

The extracted groundwater from the principal aquifer would be blended with groundwater from the shallow groundwater unit and discharged to the IDP for treatment.

8.1.7.3 INSTITUTIONAL CONTROLS

Institutional controls would be identical to those for Alternative 2A.

8.1.7.4 MONITORING

The number and location of the monitoring wells would be determined during remedial design. It is anticipated that sentinel wells, similar to those used for Alternative 7A, would be used to provide early detection of any downgradient movement of the plume or movement toward the extraction wells used for domestic water.

8.1.7.5 CONTINGENCY PLAN

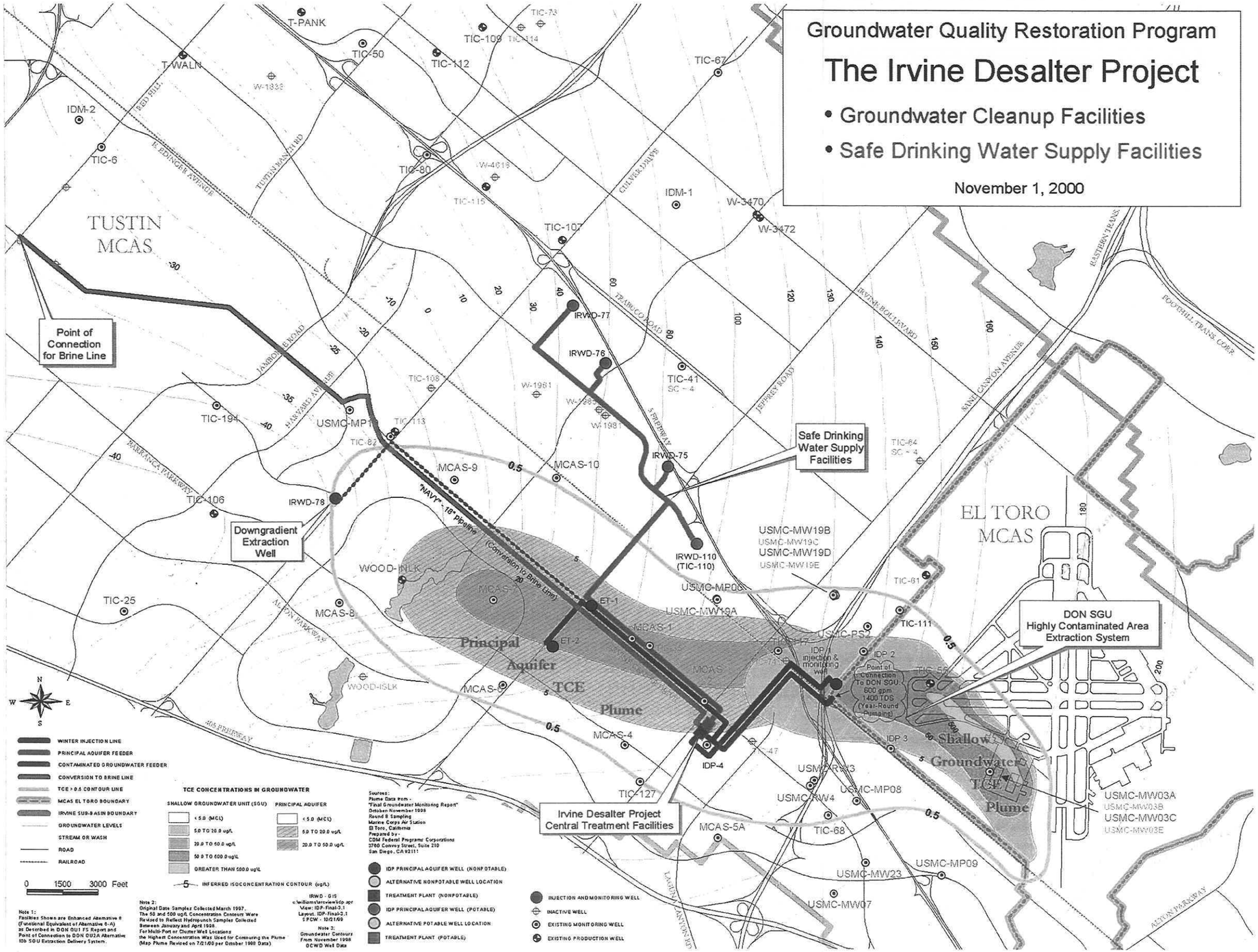
A contingency plan would be developed during remedial design to address response actions in the event of unanticipated plume movement.

Groundwater Quality Restoration Program

The Irvine Desalter Project

- Groundwater Cleanup Facilities
- Safe Drinking Water Supply Facilities

November 1, 2000



Record of Decision

Figure 8-4

Alternative 8A

Principal Aquifer Well Confirmation

Former MCAS, El Toro, California

Bechtel National, Inc.

CLEAN II Program

Date: 4/25/02
File No.: -
Job No.: 22214-164
Rev No.: A

PAGE NO. 8-22

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8.2 SITE 24 ALTERNATIVES

Eighteen remedial action alternatives were evaluated during the FS for Site 24. To expedite remediation of contaminated soil at Site 24 and reduce further contamination of groundwater, the Site 24 remediation was subsequently separated by media, and separate draft final FS reports were issued for soil and groundwater.

Using the presumptive remedy approach, two alternatives were developed for soil remediation at Site 24: a no action alternative, required by U.S. EPA, and SVE, the U.S. EPA presumptive remedy for VOC-contaminated soil. These alternatives were presented in the Interim ROD for the Site 24 vadose zone (SWDIV 1997a), and SVE was selected as the remedial alternative in September 1997. Remediation of soil took place in 1999 and 2000 and is now considered complete.

Nine remedial action alternatives were presented in the draft final FS Report for Site 24 groundwater. Because the draft final FS Report for groundwater was issued after the Interim ROD for soil had been signed, all nine alternatives assumed that soil would be remediated by SVE. Several of the nine alternatives were eliminated based on preliminary screening, leaving only the following alternatives for a more detailed evaluation using NCP criteria:

- **No Action:** A no action alternative (Alternative 1) was developed as required by U.S. EPA as a baseline for comparing the performance of all other alternatives.
- **Former MCAS El Toro Project:** Alternative 9 is identical to IAFS Alternative 2A but considers that SVE is also operated to reduce future mass loading from the vadose zone to groundwater.
- **Irvine Desalter Project:** Alternatives 10A and 10B extract groundwater from the shallow groundwater unit and principal aquifer and discharge the water to the IDP for treatment. These alternatives differ in the type, number, and placement of wells in the shallow groundwater unit. Alternative 10A is identical to IAFS Alternative 6A but includes SVE to reduce future mass loading from the vadose zone to groundwater. In Alternative 10B, extraction wells in the shallow groundwater unit are located in the areas of highest groundwater contamination. In these locations, the extraction wells not only minimize migration into the principal aquifer but also actively reduce the contaminant mass in the shallow groundwater unit.
- **Alternative 11:** Alternative 11 consists of extraction, treatment, and injection into the shallow groundwater unit coupled with natural attenuation of the principal aquifer. Extraction wells are placed in the areas of highest groundwater contamination to maximize VOC mass removal, and SVE reduces future mass loading from the vadose zone to groundwater.

To simplify the discussion in this ROD, only the groundwater alternatives that were retained after preliminary screening (i.e., Alternatives 1, 9, 10A, 10B, and 11) are

addressed. A complete discussion of all Site 24 alternatives is found in the draft final FS reports for soil and groundwater (BNI 1997b,c).

8.2.1 Alternative 1: No Action

Alternative 1, no action, is required by CERCLA to provide a basis from which to develop and evaluate the other alternatives. Under Alternative 1, no remedial measures or access or land-use controls would be initiated at Site 24. The no action alternative would have no effect on the physical, biological, or chemical processes controlling the fate and transport of existing contamination at the site. Because remediation of VOCs in soil is complete, VOCs in the soil beneath Site 24 will no longer continue to contaminate the shallow groundwater at levels exceeding the federal MCLs for drinking water. However, VOCs in the shallow groundwater unit could continue to migrate to the principal aquifer.

8.2.2 Alternative 9: MCAS El Toro Project With SVE

Alternative 9 consists of the following main components:

- soil remediation using SVE (complete)
- shallow groundwater remediation using extraction, treatment, and injection
- principal aquifer remediation using extraction, treatment, and injection
- institutional controls
- groundwater monitoring

Each component of Alternative 9 is discussed briefly below. Additional details are available in the draft final FS Reports for soil and groundwater (BNI 1997b,c).

8.2.2.1 GROUNDWATER REMEDIATION

Groundwater remediation in Alternative 9 consists of extraction, treatment, and injection in the shallow groundwater unit and extraction, treatment, and injection in the principal aquifer. Groundwater remediation in the shallow groundwater unit and principal aquifer is identical to IAFS Alternative 2A (Figures 8-1 and 8-2, respectively).

8.2.2.2 INSTITUTIONAL CONTROLS

Institutional controls in the form of land-use restrictions will be used to limit the exposure of future landowner(s) and/or user(s) of the property to hazardous substances and to maintain the integrity of the remedial action until remediation is complete and federal and state cleanup levels have been met. Monitoring and inspections will be conducted to assure that the land-use restrictions are being followed. Land-use control objectives to be achieved through the land-use restrictions include:

- preventing the use of VOC-contaminated groundwater until cleanup objectives have been achieved; and

- protecting the groundwater extraction, injection, and monitoring wells and associated piping and equipment.

Institutional controls will also be used to assure access to the site by the DON and regulatory agencies to assure that construction, operation and maintenance, and monitoring of the final remedy and any further investigation and response action are implemented. Land-use restrictions will be applied to the property and included in findings of suitability to transfer (FOSTs), findings of suitability for early transfer (FOSETs), findings of suitability to lease (FOSLs), covenant agreement(s) between the DON and DTSC, and any quitclaim deeds or leases conveying or leasing real property containing the Site 24 Shallow Groundwater Plume.

Land-Use Restrictions on Property Overlying the Site 24 Shallow Groundwater Plume

The following are land-use restrictions on property overlying the Site 24 Shallow Groundwater Plume.

1. No new wells of any type shall be installed within the Site 24 Shallow Groundwater Plume or buffer zone without prior review and written approval from the DON, DTSC, U.S. EPA, and RWQCB. The transferee/lessee shall also obtain permits for such wells as required by OCHCA and IRWD as described in Section 8.1.2.3.
2. Extraction, injection, and monitoring wells and associated piping and equipment that are included in the remedial action shall not be altered, disturbed, or removed without the prior review and written approval from the DON, DTSC, U.S. EPA, and RWQCB.
3. The DON, U.S. EPA, DTSC, RWQCB and their authorized agents, employees, contractors and subcontractors shall have the right to enter upon the premises to conduct investigations, tests, or surveys; inspect field activities; or construct, operate, and maintain the remedial action described in this ROD or undertake any other remedial response or remedial action as required or necessary under the cleanup program, including but not limited to monitoring well, pumping wells, and treatment facilities.

Additional Specific Requirements

The DON will also include the following specific requirements in the FOST, FOSET, and/or FOSL covenant agreement(s), and quitclaim deed(s) or lease(s).

- The transferee/lessee and future transferees/lessees must comply with all terms and conditions relating to land-use restrictions set forth in this ROD.
- The transferee/lessee and future transferees/lessees must notify subsequent future transferees/lessees of all land-use restrictions and access provisions set forth herein.
- The transferee must notify the DON, DTSC, U.S. EPA, and RWQCB of any transfer of all or a portion of that property by the transferee not later than 30 days after the conveyance.

8.2.2.3 IMPLEMENTATION OF INSTITUTIONAL CONTROLS

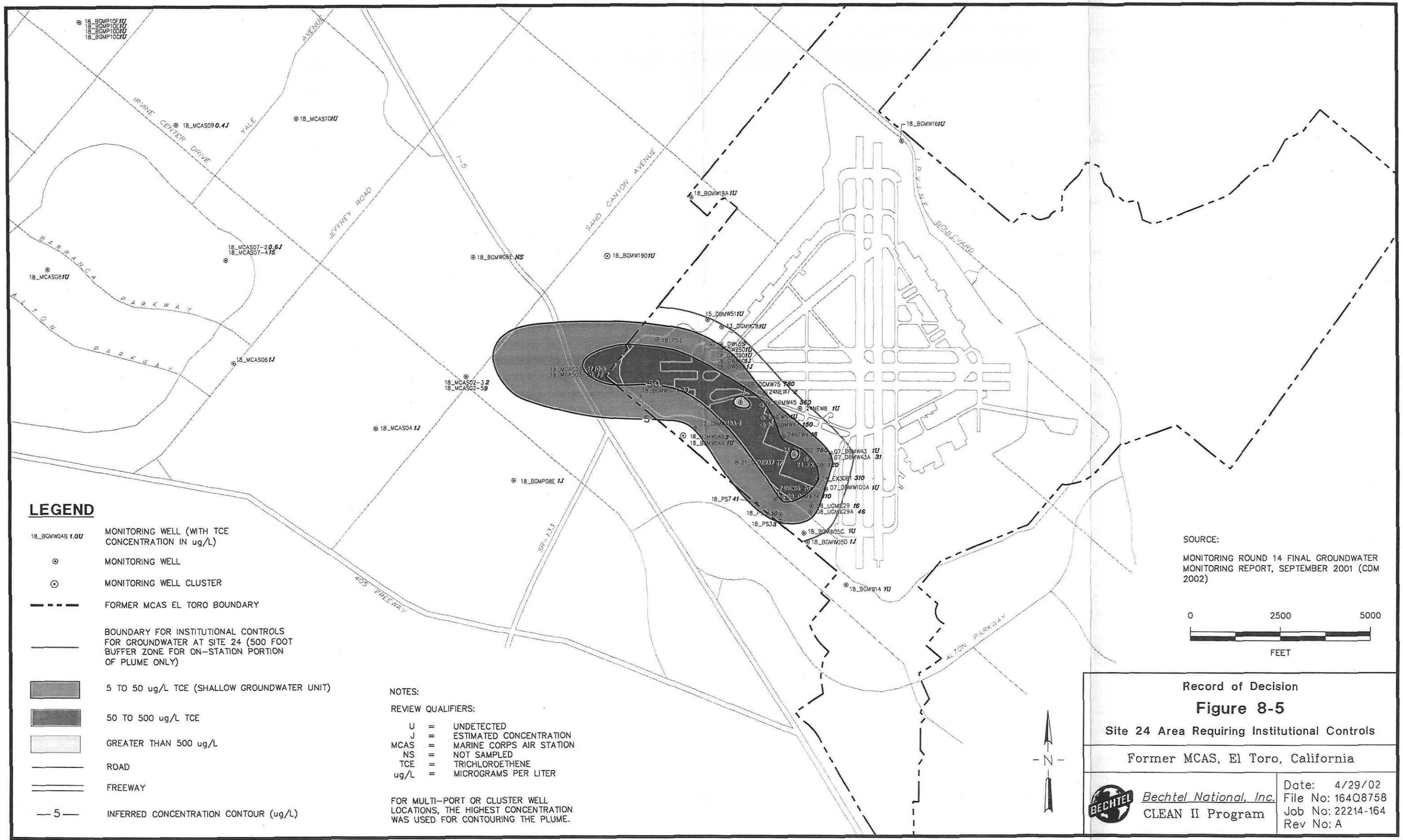
The on-Station land-use restrictions set forth in this ROD will be incorporated into and implemented through two separate legal instruments: 1) one or more covenant agreements with DTSC addressing on-Station real property containing the Site 24 Shallow Groundwater Plume and associated buffer zone and 2) one or more quitclaim deeds/leases between transferee(s)/lessee(s) and the DON conveying/leasing on-Station real property containing the Site 24 Shallow Groundwater Plume and associated buffer zone. The covenant agreement(s) will incorporate the land-use restrictions into restrictive covenants that run with the land and that are enforceable by DTSC against future transferees. The Deed(s) will include the identical land-use restrictions in environmental restrictive covenants that run with the land and that will be enforceable by the DON against future transferees. In essence, the DON and DTSC will each have the legal authority to enforce the land-use restrictions and will share responsibility for their enforcement.

The on-Station Site 24 Shallow Groundwater Plume and associated buffer zone that are the areas requiring institutional control are shown on Figure 8-5.

Environmental Restriction Covenant and Agreement (Chapters 6.5 and 6.8 of Division 20 of the California Health and Safety Code and California Civil Code Section 1471)

The DON and DTSC shall enter into good-faith negotiations to enter into an Environmental Restriction Covenant and Agreement(s) pursuant to the substantive requirements of *California Health and Safety Code* (Cal. Health & Saf. Code) division 20 chapters 6.5 and 6.8 and *California Civil Code* (Cal. Civ. Code) § 1471 regarding environmental land-use restrictions, restrictive covenants, and access provisions. A sample of such an agreement is included in Attachment D. The Environmental Restriction Covenant and Agreement(s) will be consistent with and serve as a mechanism to implement the restrictions set forth in Section 8.2.2.2 of this ROD in accordance with DON policy. Once the Environmental Restriction Covenant and Agreement(s) is finalized, it will be executed and recorded immediately prior to the recordation of a quitclaim deed for conveyance of the property pursuant to the Defense Base Closure and Realignment Act of 1990, 10 U.S.C. § 2687.

The Environmental Restriction Covenant and Agreement(s) will be executed by the DON on behalf of the United States and assigns (the covenantor) and DTSC and its successors and assigns, who shall be identified in the Environmental Restriction Covenant and Agreement(s) as the covenantee, pursuant to Cal. Civ. Code § 1471. The Environmental Restriction Covenant and Agreement(s) will provide for access as set forth in Section 8.2.2.2 of this ROD. The Environmental Restriction Covenant and Agreement(s) will include the legal description of the property overlying the on-Station Site 24 Shallow Groundwater Plume and associated buffer zone and the location of extraction, injection, and monitoring wells that are included in the remedial action. The Environmental Restriction Covenant and Agreement(s) will be binding upon all future owners and/or occupants until legally terminated; that is, it will run with the land. The Environmental Restriction



LEGEND

- 18_BGMW04B 1.0U — MONITORING WELL (WITH TCE CONCENTRATION IN ug/L)
- ⊙ MONITORING WELL
- ⊙ MONITORING WELL CLUSTER
- FORMER MCAS EL TORO BOUNDARY
- BOUNDARY FOR INSTITUTIONAL CONTROLS FOR GROUNDWATER AT SITE 24 (500 FOOT BUFFER ZONE FOR ON-STATION PORTION OF PLUME ONLY)
- 5 TO 50 ug/L TCE (SHALLOW GROUNDWATER UNIT)
- 50 TO 500 ug/L TCE
- GREATER THAN 500 ug/L
- ROAD
- FREEWAY
- —5— INFERRED CONCENTRATION CONTOUR (ug/L)

NOTES:

REVIEW QUALIFIERS:

U	=	UNDETECTED
J	=	ESTIMATED CONCENTRATION
MCAS	=	MARINE CORPS AIR STATION
NS	=	NOT SAMPLED
TCE	=	TRICHLOROETHENE
ug/L	=	MICROGRAMS PER LITER

FOR MULTI-PORT OR CLUSTER WELL LOCATIONS, THE HIGHEST CONCENTRATION WAS USED FOR CONTOURING THE PLUME.

Record of Decision

Figure 8-5

Site 24 Area Requiring Institutional Controls

Former MCAS, El Toro, California

Bechtel National, Inc.
CLEAN II Program

Date: 4/29/02
File No: 164Q8758
Job No: 22214-164
Rev No: A

PAGE NO. 8-28

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Covenant and Agreement(s) will include information summarizing the remedial actions at Site 24 and provisions for terminating or modifying the Environmental Restriction Covenant and Agreement(s) when cleanup levels established in this ROD have been achieved and the remedial equipment has been removed. The Environmental Restriction Covenant and Agreement(s) will be recorded by the DON in the office of the county recorder for the county of Orange. The DON will provide a copy to DTSC following recordation.

Environmental Restrictive Covenants in the Quitclaim Deed (California Civil Code Section 1471)

Pursuant to Cal. Civ. Code § 1471, the DON shall include in the quitclaim deed(s) between the United States and the transferee(s) the same land-use restrictions and equivalent access provisions that are set forth in Section 8.2.2.2 of this ROD and the Environmental Restriction Covenant and Agreement(s). All such provisions shall use the language contained herein.

The deed(s) will include the legal description of the property overlying the Site 24 shallow groundwater plume and associated buffer zone and associated buffer zone and the location of the extraction, injection, and monitoring wells required for the remedial action. The land-use restrictions and access provisions in the deed(s) will be binding upon all future owners and/or occupants until legally terminated; that is, they will run with the land. The deed(s) will include information summarizing the remedial actions at Site 24 and provisions for terminating or modifying the restrictive covenants in the deed(s) when cleanup levels established in this ROD have been achieved and the remedial equipment has been removed.

The DON would provide DTSC, U.S. EPA, and RWQCB with a copy of the relevant language for the proposed deed for DTSC's, U.S. EPA's, and RWQCB's review and comment in connection with DTSC's and U.S. EPA's review of the FOST or FOSET documents, as appropriate. The scope of DTSC's and U.S. EPA's review of the deed would be to evaluate whether the use restrictions set forth in the Environmental Covenant and Agreement(s) and Section 8.2.2.2 of this ROD have been incorporated into the deed language in accordance with the DON's commitments in the ROD. The deed will be recorded in the office of the county recorder for the county of Orange. A copy of the recorded deed will be provided to DTSC, U.S. EPA, and RWQCB following recordation.

Monitoring and Reporting

Subject to their respective powers and jurisdictions, OCHCA and IRWD shall have the lead in assuring that appropriate permits are obtained for construction of new water wells in the VOC groundwater plume and taking any necessary enforcement action to assure that such permits are obtained and complied with. The DON shall annually provide U.S. EPA, DTSC, and RWQCB with copies of permit applications and permits that it has received from OCHCA and IRWD during the previous year beginning 1 year from the date of issuance of this ROD and ending when remediation of the plume has

been completed. The DON will provide these copies to U.S. EPA, DTSC, and RWQCB within 60 days of receipt from OCHCA and IRWD.

The DON shall monitor and inspect the status of compliance with the land-use restrictions in the Environmental Restriction Covenant and Agreement(s) and quitclaim deed(s) protecting on-Station extraction, injection, and drinking water wells, monitoring wells, and associated piping and equipment concurrently with inspections of such engineering controls and equipment as provided in the operations and maintenance plan. The DON shall report the results of the inspections to the U.S. EPA, DTSC, and RWQCB. The operations and maintenance plan shall address the frequency of such reporting and the contents of the reports of the inspections.

If a violation of such an on-Station land-use restriction is identified and/or documented by either the DON or DTSC, the entity identifying the violation will notify the others within 10 working days of identifying the violation. The DON, U.S. EPA, DTSC, and RWQCB shall then consult to determine what, if any, action(s) should be taken, which of them shall undertake the action(s), and when it/they shall be undertaken. The results of such a consultation shall be formally documented in writing. DTSC may enforce the Environmental Restriction Covenant and Agreement provisions.

8.2.2.4 MONITORING

The groundwater monitoring well network for Alternative 9 consists of the same 58 groundwater monitoring wells used for Site 18 Alternative 2A plus an additional 38 groundwater monitoring wells screened in the shallow groundwater unit and intermediate zone at Site 24. Site 18 monitoring wells are shown on Figure 8-3; Site 24 monitoring wells are shown on Figure 8-6.

Thirty-two Phase I and Phase II RI groundwater monitoring wells are already included in the sampling program for Site 24. Six additional groundwater monitoring wells are proposed to complete the monitoring network at Site 24. The six additional wells are intended to monitor VOC concentrations at the downgradient edge of the 5-μg/L contour at Site 24 (three locations with two well clusters each). The actual number and locations of the groundwater monitoring network would be finalized during the engineering design phase.

8.2.3 Alternative 10A: Irvine Desalter Project With SVE

In Alternative 10A, groundwater is extracted from the shallow groundwater unit and from the principal aquifer, combined, and discharged to the IDP central treatment system for removal of VOCs and subsequent treatment and distribution. The configurations of the extraction system in the shallow groundwater unit and principal aquifer are identical to those in Alternative 6A. SVE is used to remediate contaminated soil and minimize future groundwater loading. Institutional controls are used to protect equipment, allow access for monitoring and maintenance, and prevent residents from inadvertent use of contaminated water at Site 24. Institutional controls are identical to those of Alternative 9. Groundwater monitoring is performed using a network of 56 wells at Site 18 and 38 wells at Site 24. The monitoring well configuration would identical to Alternative 6A.

Covenant and Agreement(s) will include information summarizing the remedial actions at Site 24 and provisions for terminating or modifying the Environmental Restriction Covenant and Agreement(s) when cleanup levels established in this ROD have been achieved and the remedial equipment has been removed. The Environmental Restriction Covenant and Agreement(s) will be recorded by the DON in the office of the county recorder for the county of Orange. The DON will provide a copy to DTSC following recordation.

Environmental Restrictive Covenants in the Quitclaim Deed (California Civil Code Section 1471)

Pursuant to Cal. Civ. Code § 1471, the DON shall include in the quitclaim deed(s) between the United States and the transferee(s) the same land-use restrictions and equivalent access provisions that are set forth in Section 8.2.2.2 of this ROD and the Environmental Restriction Covenant and Agreement(s). All such provisions shall use the language contained herein.

The deed(s) will include the legal description of the property overlying the Site 24 shallow groundwater plume and associated buffer zone and associated buffer zone and the location of the extraction, injection, and monitoring wells required for the remedial action. The land-use restrictions and access provisions in the deed(s) will be binding upon all future owners and/or occupants until legally terminated; that is, they will run with the land. The deed(s) will include information summarizing the remedial actions at Site 24 and provisions for terminating or modifying the restrictive covenants in the deed(s) when cleanup levels established in this ROD have been achieved and the remedial equipment has been removed.

The DON would provide DTSC, U.S. EPA, and RWQCB with a copy of the relevant language for the proposed deed for DTSC's, U.S. EPA's, and RWQCB's review and comment in connection with DTSC's and U.S. EPA's review of the FOST or FOSET documents, as appropriate. The scope of DTSC's and U.S. EPA's review of the deed would be to evaluate whether the use restrictions set forth in the Environmental Covenant and Agreement(s) and Section 8.2.2.2 of this ROD have been incorporated into the deed language in accordance with the DON's commitments in the ROD. The deed will be recorded in the office of the county recorder for the county of Orange. A copy of the recorded deed will be provided to DTSC and U.S. EPA following recordation.

Monitoring and Reporting

Subject to their respective powers and jurisdictions, OCHCA and IRWD shall have the lead in assuring that appropriate permits are obtained for construction of new water wells in the VOC groundwater plume and taking any necessary enforcement action to assure that such permits are obtained and complied with. The DON shall annually provide U.S. EPA, DTSC, and RWQCB with copies of permit applications and permits that it has received from OCHCA and IRWD during the previous year beginning 1 year from the date of issuance of this ROD and ending when remediation of the plume has been completed.

The DON shall monitor and inspect the status of compliance with the land-use restrictions in the Environmental Restriction Covenant and Agreement(s) and quitclaim deed(s) protecting on-Station extraction, injection, and drinking water wells, monitoring wells, and associated piping and equipment concurrently with inspections of such engineering controls and equipment as provided in the operations and maintenance plan. The DON shall report the results of the inspections to the U.S. EPA, DTSC, and RWQCB. The operations and maintenance plan shall address the frequency of such reporting and the contents of the reports of the inspections.

If a violation of such an on-Station land-use restriction is identified and/or documented by either the DON or DTSC, the entity identifying the violation will notify the others within 10 working days of identifying the violation. The DON, U.S. EPA, DTSC, and RWQCB shall then consult to determine what, if any, action(s) should be taken, which of them shall undertake the action(s), and when it/they shall be undertaken. The results of such a consultation shall be formally documented in writing. DTSC may enforce the Environmental Restriction Covenant and Agreement provisions.

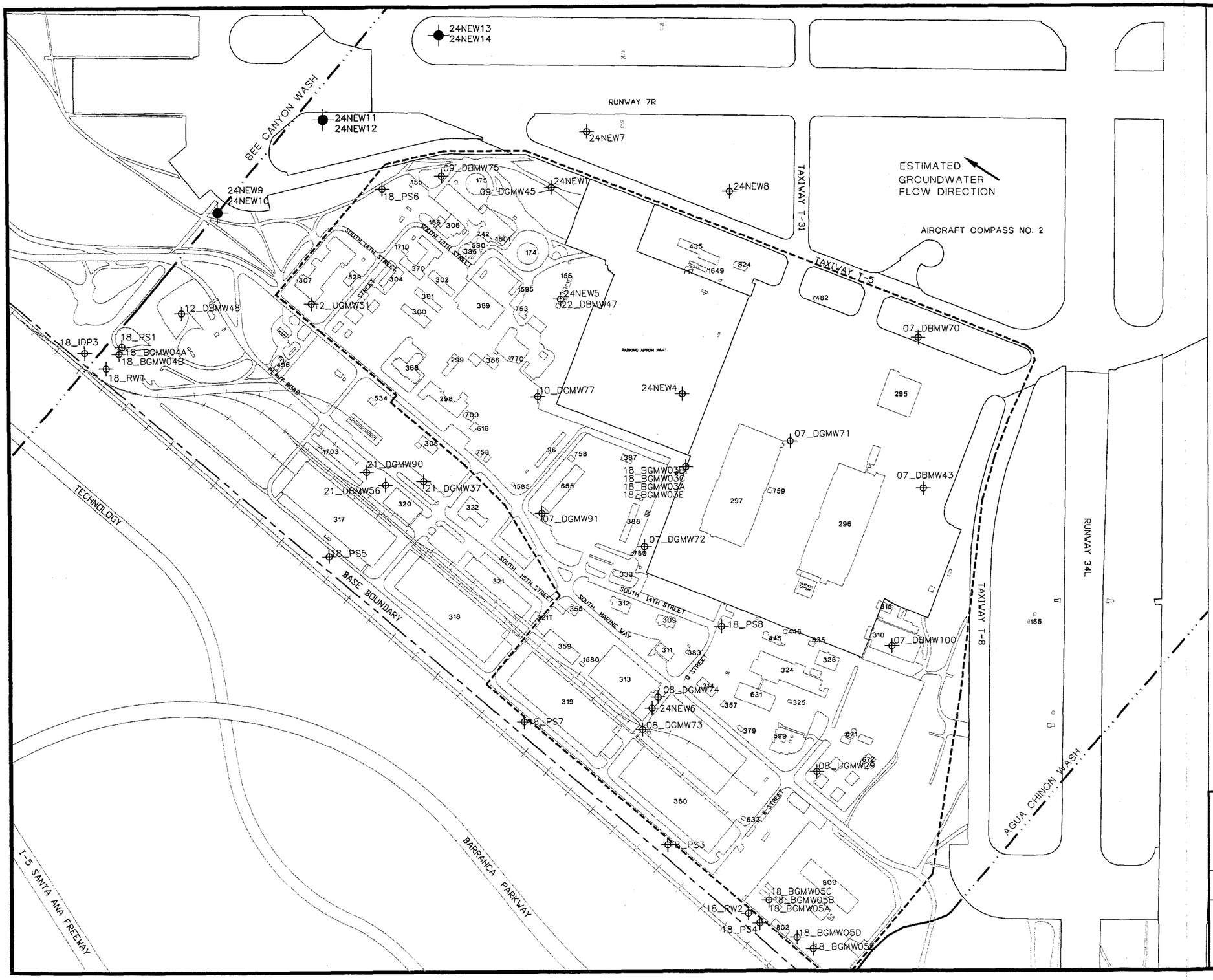
8.2.2.4 MONITORING

The groundwater monitoring well network for Alternative 9 consists of the same 58 groundwater monitoring wells used for Site 18 Alternative 2A plus an additional 38 groundwater monitoring wells screened in the shallow groundwater unit and intermediate zone at Site 24. Site 18 monitoring wells are shown on Figure 8-3; Site 24 monitoring wells are shown on Figure 8-6.

Thirty-two Phase I and Phase II RI groundwater monitoring wells are already included in the sampling program for Site 24. Six additional groundwater monitoring wells are proposed to complete the monitoring network at Site 24. The six additional wells are intended to monitor VOC concentrations at the downgradient edge of the 5-µg/L contour at Site 24 (three locations with two well clusters each). The actual number and locations of the groundwater monitoring network would be finalized during the engineering design phase.

8.2.3 Alternative 10A: Irvine Desalter Project With SVE

In Alternative 10A, groundwater is extracted from the shallow groundwater unit and from the principal aquifer, combined, and discharged to the IDP central treatment system for removal of VOCs and subsequent treatment and distribution. The configurations of the extraction system in the shallow groundwater unit and principal aquifer are identical to those in Alternative 6A. SVE is used to remediate contaminated soil and minimize future groundwater loading. Institutional controls are used to protect equipment, allow access for monitoring and maintenance, and prevent residents from inadvertent use of contaminated water at Site 24. Institutional controls are identical to those of Alternative 9. Groundwater monitoring is performed using a network of 56 wells at Site 18 and 38 wells at Site 24. The monitoring well configuration would identical to Alternative 6A.



LEGEND

- BUILDING OR PAD
- STREAMS OR WASH
- IMPROVED ROADS
- UNIMPROVED ROADS
- RAILROAD
- SITE 24 BOUNDARY
- FENCE
- BASE BOUNDARY

EXISTING:

- EXISTING MONITORING WELL

ADDITIONAL:

- PROPOSED NESTED MONITORING WELLS, ONE IN SHALLOW GROUNDWATER UNIT, ONE IN INTERMEDIATE ZONE.

NORTH
TRUE

0 500 1,000
FEET

Record of Decision
Figure 8-6
Site 24 Conceptual Groundwater Monitoring Network

Former MCAS, El Toro, California

Bechtel National, Inc.
CLEAN II Program

Date: 4/26/02
File No: 164L7932
Job No: 22214-164
Rev No: B

PAGE NO. 8-32

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8.2.4 Alternative 10B/10B′: Modified Irvine Desalter Project With SVE

Alternatives 10B and 10B′ are similar to Alternative 10A except that the extraction wells for the shallow groundwater unit are relocated to extract groundwater from the VOC hot spot where concentrations of contaminants are highest (Figure 8-1). Extraction of contaminated groundwater within the shallow groundwater unit is accomplished using 49 extraction wells (Figure 8-1). Thirty-seven core extraction wells are planned to be placed within the central portion of the plume where TCE concentrations exceed 500 µg/L. For Alternative 10B, the assumed pumping rate for core extraction wells is approximately 18 gpm. Twelve perimeter extraction wells are located farther out, near the 50-µg/L TCE concentration contour. The assumed pumping rate for perimeter extraction wells is approximately 12 gpm. Both core extraction wells and perimeter wells are screened in the top 50 feet of the shallow groundwater unit where TCE concentrations are highest. By relocating wells to this area, mass removal is optimized and time to remediate the shallow groundwater unit is reduced. Alternative 10B′ differs from Alternative 10B only in the total pumping rate. Alternative 10B has a total pumping rate of approximately 800 gpm; Alternative 10B′ has a total pumping rate of approximately 440 to 550 gpm.

In Alternatives 10B and 10B′, the extraction rates for the core extraction wells are higher than the extraction rates for the perimeter extraction wells to produce an overall capture zone within the core of the plume, thereby enhancing the extraction of contaminated groundwater. The core extraction wells can also be operated in the vacuum-enhanced mode to remove adsorbed-phase VOCs from the partially dewatered shallow groundwater. In addition to VOC removal, the groundwater capture zone also serves to limit the horizontal migration of VOCs. As groundwater extraction continues for this alternative, the TCE plume will shrink, and some of the wells can be taken out of service as they begin to pump clean water. As a result, the pumping rate will decline over time and the cost of system operation and maintenance will decline.

The total pumping rate for the shallow groundwater unit in Alternative 10B was assumed to be 800 gpm. However, based on Phase II aquifer testing (BNI 1996c, 1998b) and groundwater model simulations (BNI 1997b), the sustainable pumping rate for the shallow groundwater unit may be less. Sensitivity runs performed during the FS indicated that reducing the pumping rate to as low as 400 gpm would not adversely impact operation of the remediation system.

Monitoring would be performed using the same Site 18 monitoring well network as IAFS Alternative 6A (Figure 8-3) and the same Site 24 monitoring well network as Alternative 9 (Figure 8-5). Institutional controls are identical to those of Alternative 9.

8.2.5 Alternative 11: Extraction/Treatment/Injection in the Shallow Groundwater Unit With SVE

Under Alternative 11, groundwater would be extracted from the shallow groundwater unit using 49 extraction wells in the same configuration as Alternative 10B and 10B' (Figure 8-1). The groundwater would be treated on-Station using air stripping with VGAC and injected back into the shallow groundwater unit. Groundwater in the principal aquifer and in the shallow groundwater unit past the Site 24 boundary would be remediated using natural attenuation.

Treated groundwater would be injected back into the shallow groundwater unit through a network of 44 injection wells. Two types of injection wells will be used: short-screen injection wells and full-screen injection wells. The short-screen injection wells are located near the present 50-µg/L TCE concentration contour. Considering that the TCE plume is concentrated mainly within the upper 50 feet of the shallow groundwater unit, the short-screen wells are designed to contain the horizontal migration of the TCE plume. In areas with relatively high TCE concentrations, injection over the entire thickness of the shallow groundwater unit may lead to cross-contamination of the lower portion of the shallow groundwater unit.

The full-screen injection wells are located near the 5-µg/L TCE concentration contour. These wells are designed to inject treated water into the entire thickness (100 feet) of the shallow groundwater unit. Injection of treated water near the edges of the TCE plume serves to limit the horizontal and vertical migration of TCE-contaminated groundwater. Groundwater injection forms hydraulic barriers that limit the horizontal and vertical migration of TCE. Injection also replenishes groundwater while providing a viable discharge and disposal option.

Groundwater monitoring in the shallow groundwater unit for Alternative 11 is identical to Alternative 9 (Figure 8-5). Principal aquifer monitoring is identical to Alternative 7A (Figure 8-3). Institutional controls are identical to Alternative 9.

8.3 PERIODIC REVIEWS

As required by CERCLA Section 121(c), periodic reviews would occur at least every 5 years. Five-year reviews of federal facilities are a federal agency function intended to evaluate whether immediate threats have been addressed, whether the remedial action remains protective of public health and the environment, whether the remedy is functioning as designed, and that necessary operation and maintenance (O&M) is being performed. The review at Sites 18 and 24 is expected to focus on whether the institutional controls are in place and are sufficient to assure protection and whether groundwater remediation is reducing contaminant concentrations and preventing migration of VOCs.

The 5-year review will be conducted by the DON, which will prepare and submit a report to the regulatory agency members of the BCT for review. The review will 1) clearly state whether the remedy is expected to be protective, 2) document any deficiencies identified

during the review, and 3) recommend specific actions to assure that the remedy will continue to be protective (DON 2001). If necessary, the 5-year review report will include descriptions of follow-up actions needed to achieve, or to continue to assure, protectiveness along with a timetable for these actions.

8.4 OPERATION AND MAINTENANCE PLAN

An operation and maintenance plan will be developed during the remedial design phase. The plan will establish the exact number and location of monitoring wells. It will also outline sampling and analysis methods, periods and frequency for each well, and major decision points to be made during monitoring (e.g., adding or removing wells, or changing sampling frequency or analytical parameters). The criteria for assessing the effectiveness of the remedial action will also be included in the operation and maintenance plan.

Each extraction well will remain in operation until it has been demonstrated that cleanup goals have been achieved or the extraction well is no longer effective in contributing to the restoration of the aquifer. Criteria for shutoff will be developed during the remedial design phase and incorporated into the operation and maintenance plan. Once all extraction wells have met the established cleanup goals or it is demonstrated that the remedy is no longer effective in meeting the remedial action objectives, extraction will be discontinued.

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Section 9
SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

This section summarizes the comparative analyses conducted to evaluate the relative advantages and disadvantages of each remedial alternative in relation to the nine evaluation criteria outlined in CERCLA § 121(b), as amended. The original Site 18 alternatives were evaluated in the OU-1 IAFS Addendum (JEG 1996g). Alternative 8A, added after completion of the Phase I IAFS, was evaluated against the original Site 18 alternatives by the DON in 2001 (BNI 2001). Site 24 alternatives were evaluated in the FS report for groundwater (BNI 1997b).

The CERCLA evaluation of nine criteria is categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The threshold criteria must be satisfied in order for an alternative to be eligible for selection. The primary balancing criteria are used to weigh major tradeoffs among alternatives. Generally, the modifying criteria are taken into account after public comment is received on the proposed plan.

Threshold Criteria

- overall protection of human health and the environment
- compliance with ARARs

Primary Balancing Criteria

- long-term effectiveness and permanence
- reduction of toxicity, mobility, or volume
- short-term effectiveness
- implementability
- cost

Modifying Criteria

- state acceptance
- community acceptance

Computer modeling supported the comparative analysis by assessing the effect of each alternative on VOC contamination. The modeling was used primarily to evaluate long-term effectiveness; short-term effectiveness (i.e., time to achieve cleanup objectives); and reduction of toxicity, mobility, or volume of contaminants.

Modeling at Site 18 was performed using the coupled fluid energy and solute transport model and considered only groundwater. Modeling at Site 24 was performed using three separate but linked computer codes (MODFLOW, MT3D, and MODPATH) and considered both soil and groundwater. Because different models with different input parameters were used for Site 18 and Site 24, a comparison of alternatives for Site 18 conditions with alternatives for Site 24 conditions is not meaningful.

Section 9.1 presents a comparison of Site 18 alternatives, and Section 9.2 presents a comparison of Site 24 alternatives. Table 9-1 summarizes the comparative analyses for both sites. The selected alternative is a combination of a Site 18 alternative for remediation of the principal aquifer and a Site 24 alternative for remediation of groundwater in the shallow groundwater unit. (Remediation of soil is addressed in a separate ROD.)

9.1 COMPARISON OF SITE 18 ALTERNATIVES

Table 9-2 compares Alternatives 1, 2A, 6A, 7A, 7B, 8, and 8A in terms of TCE mass removed in 20 years, simulated time to clean up the principal aquifer to achieve TCE concentrations less than the MCL, and cost. The information from this table and additional information provided in the OU-1 IAFS and the Alternative 8A technical memorandum (BNI 2001) provide the basis for the comparative analysis presented below.

9.1.1 Threshold Criteria

Threshold criteria include overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements. An alternative must meet both threshold criteria to be eligible for selection.

9.1.1.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Assesses whether a cleanup remedy provides adequate public health protection and describes how health risks posed by the site will be eliminated, reduced, or controlled through treatment, engineering controls, or institutional and regulatory controls.

Alternative 1 (no action) would not substantially alter the current or potential future risks to human health or the environment. The HHRA performed in the OU-1 RI/FS showed that the risks based on results from two wells in the principal aquifer exceeded the U.S. EPA guideline of 10^{-4} because of the presence of benzene or TCE. Noncarcinogenic risks in the principal aquifer also exceeded U.S. EPA guidelines because of the presence of TCE in five wells and the presence of carbon tetrachloride in two wells.

Alternative 1 would not reduce these risks significantly, nor would it reduce the potential for further migration of VOCs from the shallow groundwater unit to the principal aquifer. Because it does not reduce risks or provide source control measures to prevent migration from the shallow groundwater unit to the principal aquifer, Alternative 1 is not considered protective of human health and the environment.

Alternatives 2A, 6A, 7A, 7B, 8, and 8A would reduce risks by inhibiting contaminant migration from on-Station source areas and by reducing the VOC concentrations in the principal aquifer to MCLs. These measures would assist in restoring the principal aquifer to allow its designated beneficial uses. Although the time required to remediate the principal aquifer is significant (Table 9-2), Alternatives 2A, 6A, 7A, 7B, 8, and 8A would be more effective than Alternative 1. Until cleanup goals are achieved, Alternatives 2A, 6A, 7A, 7B, 8, and 8A would use institutional controls to prevent inadvertent use of contaminated groundwater.

Table 9-1
Comparative Analysis of Remedial Alternatives[a]

U.S. EPA Criteria	No Action 1	Site 18 Alternatives 2A	6A	7A	7B	8	8A	Site 24 Alternatives 9	10A	10B	11	Preferred Remedy 8A/10B'
1 Overall Protection of Human Health and the Environment	X	4	4	4	4	4	4	4	4	4	4	4
2 Compliance with Applicable or Relevant and Appropriate Requirements	NA	4	4	4	4	4	4	4	4	4	4	4
3 Long-Term Effectiveness and Permanence	○	◕	●	◒	◒	●	●	●	◕	●	●	●
4 Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment	○	◕	●	◒	◒	●	●	●	◒	◕	●	●
5 Short-Term Effectiveness	○	●	●	◕	●	◒	◕[b]	◕	◒	●	◕	◕
6 Implementability	●	◒	NAF	◕	◕	NAF	●	◒	NAF	◕	◕	●
7 Cost	●	○	◒	◕	◒	◕	◕	◒	◒	◒	●	◕
8 State Acceptance – State concurs with the preferred remedy.												●
9 Community Acceptance – This criteria will be addressed in the Record of Decision.												

Notes:
[a] in this analysis, remedial alternatives for each site are only evaluated against each other; thus, Site 18 Alternatives are not to be compared with Site 24 Alternatives
[b] by further optimizing the placement of extraction wells in the remedial design phase, remediation time may be significantly shortened
X – does not meet criteria
4 – meets criteria

Relative Performance in Satisfying Criteria

○ Least Acceptable Performance
◒ Fair Performance
◕ Moderate Performance
● Good Performance

Acronyms/Abbreviations:
NA – not applicable
NAF – not administratively feasible
U.S. EPA – United States Environmental Protection Agency

Table 9-2
Summary of Modeling Results for Site 18 Alternatives

Alternative	TCE Mass Removed from Shallow Groundwater Unit and Principal Aquifer in 20 years (lb)	Simulated Time to Clean Up Principal Aquifer (years)	Present Worth Cost[a,b] ($ million)
1	3,110	> 100	0
2A	12,540	43	56.4
6A	13,750	49	40.3
7A	11,830	60	34.0
7B	11,750	54	48.2
8	13,200	70	32.3
8A	14,000	95[c]	33.6

Notes:
[a] cost estimates are taken from the OU-1 IAFS and are presented in 1995 dollars
[b] for comparison purposes, indemnification costs from the settlement agreement are not included in any of the IDP alternatives
[c] computer modeling shows that Alternative 8A is the most effective alternative during the first 20 years of operation at removing the initial mass of VOC contamination; by further optimizing placement of the extraction wells in the remedial design phase, remediation time may be significantly shortened

Acronyms/Abbreviations:
IAFS – interim-action feasibility study
IDP – Irvine Desalter Project
lb – pound
OU – operable unit
TCE – trichloroethene
VOC – volatile organic compound

Because Alternatives 2A, 6A, 7A, 7B, 8, and 8A would inhibit migration of contaminated groundwater from the source area, remediate groundwater to MCLs within a reasonable time period, and prevent use of groundwater until it is remediated, these alternatives are considered protective of human health and the environment.

9.1.1.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Addresses whether a cleanup remedy will meet all federal, state, and local environmental statutes or requirements.

CERCLA § 121(d)(1) (42 U.S.C. § 9621[d]) specifies that remedial actions must attain a degree of cleanup that assures protection of human health and the environment. Additionally, remedial actions that leave hazardous substances, pollutants, or contaminants on-site must meet standards, requirements, limitations, or criteria that are ARARs. Federal ARARs for any site may include requirements under any federal environmental laws. State ARARs include promulgated requirements under state environmental or facility-siting laws that are more stringent than federal ARARs and that have been identified by the state in a timely manner.

CERCLA § 121 states that, at the completion of a remedial action, a level or standard of control required by an ARAR will be attained for wastes that remain on-site. In addition, the NCP, 40 C.F.R. § 300.435(b)(2), requires compliance with ARARs during the remedial design/remedial action. Because ARARs are triggered only when a remedial action is taken, no discussion of ARARs is needed for Alternative 1.

Alternatives 2A, 6A, 7A, 7B, 8, and 8A are expected to comply with all ARARs for Site 18, meeting the remedial goals for the principal aquifer and thereby complying with the requirements of the Water Quality Control Plan (WQCP), federal or state MCLs for organic compounds, and RCRA groundwater protection standards. The time needed to meet the remedial goals would be significant (Table 9-2). In the interim, these alternatives would rely on institutional controls to prevent exposure to contamination in groundwater.

Alternatives 2A, 6A, 7A, 7B, 8, and 8A would also comply with RCRA hazardous waste management requirements for managing extracted groundwater (as needed) and other potentially hazardous waste such as drill cuttings from well installations (as needed) and would comply with the executive orders on floodplain protection, National Archaeological and Historical Preservation Act, Clean Air Act, and substantive portions of the South Coast Air Quality Management District (SCAQMD) rules for VOCs in emissions from the air stripper.

The state of California interprets State Water Resources Control Board (SWRCB) Resolution (Res.) 68-16 as prohibiting migration of existing groundwater contamination. The DON has considered this position and has determined that further migration of already contaminated groundwater is not a discharge governed by the language of the resolution. That is, the resolution is intended to apply to new discharges to maintain existing high-quality waters and is not intended to apply to restoration of waters that have already been degraded. Therefore, the DON accepts Resolution 68-16 as an ARAR for new discharges only.

For alternatives involving injection (Alternatives 2A, 7A, and 7B), extracted groundwater would be treated to remove VOCs to a concentration at or below the analytical detection limits before injection into the shallow groundwater unit or the principal aquifer. The treated groundwater would be injected into an area of the same aquifer where it would not exceed the background levels of TDS and nitrates.

9.1.2 Primary Balancing Criteria

Primary balancing criteria include long-term effectiveness and permanence, reduction of toxicity, mobility or volume, short-term effectiveness, implementability, and cost. These are used to weigh trade-offs among alternatives and identify the most favorable.

9.1.2.1 LONG-TERM EFFECTIVENESS AND PERMANENCE

Refers to the ability of a remedy to continue protecting human health and the environment over time after the cleanup action is completed.

Alternative 1 would have little long-term effectiveness at reducing risk from VOC contamination in the groundwater or lessening VOC migration from the shallow groundwater unit to the principal aquifer. As shown in Table 9-2, Alternatives 2A, 6A, 7A, 7B, 8, and 8A would remove TCE mass more effectively than Alternative 1, and this removal would be permanent. The VOC contamination would be captured by GAC and destroyed when the carbon is regenerated. Alternatives 6A, 8, and 8A would be the most effective in reducing contaminant mass in the first 20 years of remediation because these alternatives each contain one or more extraction wells located in the area of highest TCE concentrations in the principal aquifer.

The residual risk remaining when Alternatives 2A, 6A, 7A, 7B, 8, and 8A attain cleanup levels would be represented by MCLs and risk-based concentrations for VOCs, which U.S. EPA has determined are acceptable risk levels. Because of the chemical interactions among organic compounds, soil, and water, VOC contamination may never be eliminated completely. In an aquifer, TCE is in equilibrium between the soil and water phases. As contaminated groundwater is extracted, it is replaced by cleaner groundwater, and the concentration of TCE is lowered. TCE is sorbed to the solid phase then dissolves into the groundwater to recover the equilibrium, thereby raising the concentration, although theoretically to a lower level. This cycle continues as long as groundwater continues to be extracted. However, the process of desorption is not rapid and gradually slows over time, especially in aquifers where the contamination is not recent. Also, sorbed organics may become trapped in pore spaces that are not in contact with the free water available for extraction. For these reasons, while groundwater extraction is initially effective in removing VOCs, at some point a minimal concentration (i.e., an asymptotic condition) would be reached and continued extraction would produce negligible reduction.

9.1.2.2 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

Refers to the degree to which a cleanup alternative uses treatment technologies to reduce 1) harmful effects to human health and the environment (toxicity), 2) the contaminant's ability to move (mobility), and 3) the amount of contamination (volume).

Alternative 1 would provide no treatment or other active approach for the reduction of toxicity, mobility, or volume of the contaminants. Based on simulation, a small amount of TCE mass (about 3 percent of the total) would be removed after 20 years by the background water pumping through the irrigation wells at the downgradient edge of the plume, and about 13 percent would biodegrade during 20 years. However, this would be substantially less reduction of TCE mass than any of the other Site 18 alternatives would achieve.

Alternatives 2A, 6A, 7A, 7B, 8, and 8A provide a significant reduction in toxicity, mobility, and volume. Groundwater extraction and treatment using GAC are demonstrated remedial technologies that are permanently effective in removing VOCs. VOCs are pulled to the surface through extraction wells where the VOC-laden stream is treated with GAC to reduce concentrations to levels below detection limits. During this treatment, the VOCs are temporarily transferred to the carbon. Once the GAC capacity has been

attained, the activated carbon is removed from the site and transported to a regeneration facility where the VOCs are desorbed and thermally destroyed.

Groundwater modeling indicates that for Alternative 1, the plume of TCE in the principal aquifer exceeding 5 µg/L would increase in extent after 20 years to cover an 1,428-acre area (Table 9-3). In contrast, the plume area under Alternative 8A would be 1,073 acres (a 25 percent reduction over Alternative 1). Under Alternatives 6A and 8, the plume area would be 939 and 979 acres, respectively, representing a 34 percent and 31 percent reduction over Alternative 1. Alternatives 6A and 8 would be the most effective alternatives at reducing the areal extent of the TCE plume. Alternative 8A would be moderately effective at reducing the areal extent of the plume but the most effective at reducing the mass of TCE in the principal aquifer (Table 9-3).

Table 9-3
Plume Area in Principal Aquifer After 20 Years
(in acres)

Alternative	TCE Plume Area Exceeding MCL in Principal Aquifer
1	1,428
2A	1,080
6A	939
7A	1,308
7B	1,303
8	979
8A	1,073

Acronyms/Abbreviations:
MCL – maximum contaminant level
TCE – trichloroethene

9.1.2.3 SHORT-TERM EFFECTIVENESS

Assesses how well human health and the environment will be protected from impacts due to construction and implementation of a remedy. Also considers time to reach cleanup goals.

Alternative 1 would not entail any on-site remedial activities and, therefore, would not impact the surrounding community, workers, or the environment. The time required for Alternative 1 to be protective of human health and the environment would be controlled by background pumping and the rate of natural attenuation processes and is expected to exceed 100 years.

Short-term impacts associated with the implementation of Alternatives 2A, 6A, 7A, 7B, 8, and 8A include the increased risk of exposure to workers through the handling of contaminated soils and groundwater. An additional short-term impact of these alternatives is the risk of vehicular accidents and releases during transport of contaminated GAC.

Potential on-site exposures and risks from these activities would be controlled through use of personal protective equipment, monitoring, and compliance with a site-specific safety and health plan. Transport risks would be minimized to the extent feasible by using a licensed commercial hauler, and impacts on the surrounding community or the environment are expected to be negligible. None of the actions taken in Alternatives 2A, 6A, 7A, 7B, 8, and 8A are expected to cause adverse short-term health effects.

The time to achieve remediation goals (Table 9-2) is highly dependent on well location and subsurface conditions. Alternative 1 requires the most time (100 years) to achieve cleanup because this alternative uses no containment wells to prevent movement of contaminated groundwater from the shallow groundwater unit to the principal aquifer and no extraction wells to remove and treat contaminated groundwater.

Alternatives 8 and 8A also require a considerable time to reach cleanup goals (70 and 95 years, respectively). These alternatives use containment wells to prevent migration from the source area and one (Alternative 8) or two (Alternative 8A) wells within the hot spot in the principal aquifer to extract contaminated groundwater. The extraction wells within the hot spot reduce the gradient between the center and toe of the plume, slowing down the flow of contaminated groundwater and extending the cleanup time.

Alternative 7A, which requires approximately 60 years to reach cleanup goals, uses containment wells to prevent migration from the source area but allows the plume to attenuate naturally once it reaches the principal aquifer.

Alternatives 6A and 7B reduce the cleanup time over Alternatives 7A, 8, and 8A by adding two extraction wells at the toe of the plume.

Alternative 2A requires the least time to reach cleanup goals (43 years) because treated groundwater is injected back into the principal aquifer to flush the aquifer and increase movement of groundwater toward the extraction wells at the toe of the plume.

9.1.2.4 IMPLEMENTABILITY

Refers to the technical feasibility (how difficult the remedy is to construct and operate) and administrative feasibility (coordination with other agencies) of a remedy. Factors such as availability of materials and services needed are considered.

Alternative 1 is the most easily implemented alternative from a technical perspective because it would involve no on-site construction or other remediation activities.

Alternatives 2A, 6A, 7A, 7B, 8 and 8A would include the construction of extraction and monitoring wells, conveyance piping, and treatment facilities, as well as operation, maintenance, and performance monitoring. Construction and operation of these components entail standard, proven practices known to be readily implementable. Difficulties regarding feasibility, availability of equipment and services, or schedule are not anticipated.

The monitoring program used by these alternatives would provide early warning of changes in contaminant concentrations or groundwater flow that may require modification of extraction rates, well locations, or treatment methods to attain remedial objectives.

Wells located off-Station require acquisition of property or easements for the construction of extraction wells and conveyance facilities. Coordination with California Department of Transportation or local transportation authorities would be sought if the installation of conveyance facilities were to affect transportation rights-of-way.

Alternatives 6A, 8, and 8A require the DON and OCWD/IRWD to agree on and resolve operational, financial, and liability concerns, including responsibility for capital investments and use of shared facilities for the IDP, before implementation. Such a settlement agreement has been reached and is discussed further in Section 10. A copy of the agreement is included as an attachment to this ROD and in the administrative record for Former MCAS El Toro.

9.1.2.5 COST

Evaluates the estimated capital costs and present worth in today's dollars required for design and construction and long-term operation and maintenance costs of a remedy.

Table 9-2 lists cost estimates for the Site 18 alternatives. There are no costs associated with Alternative 1. Alternative 8 is the least costly of the other alternatives, followed closely by Alternatives 8A and 7A.

9.1.3 Modifying Criteria

Modifying criteria include state and community acceptance. State acceptance is taken into account during development of the proposed plan and ROD. Public acceptance is considered through comments received during the public comment period.

9.1.3.1 STATE ACCEPTANCE

Reflects whether the state of California's environmental agencies agree with, oppose, or have no objection to or comment on the Marine Corps' preferred alternative.

DTSC and RWQCB have reviewed the Site 18 Interim Action RI/FS Report and the Proposed Plan and concur with the selected remedy for groundwater remediation at Site 18.

9.1.3.2 COMMUNITY ACCEPTANCE

Evaluates whether community concerns are addressed by the remedy and if the community has a preference for a remedy. Although public comment is an important part of the final decision, the Marine Corps is compelled by law to balance community concerns with the other criteria.

The Proposed Plan has been presented to the community and discussed at a public meeting. The responsiveness summary portion of this ROD addresses the public's comments and concerns about the selected remedy.

9.2 COMPARISON OF SITE 24 ALTERNATIVES

Table 9-4 compares Alternatives 1, 9, 10A, 10B/10B', and 11 in terms of TCE mass removed in 20 years, simulated time to clean up the shallow groundwater unit, and present worth cost. The information from this table and additional information provided in the Site 24 FS Report (BNI 1997c) provide the basis for the comparative analysis presented below.

Table 9-4
Summary of Modeling Results for Site 24 Alternatives

Alternative	TCE Mass Removed from the Shallow Groundwater Unit in 20 years (pounds)	Simulated Time to Clean Up Shallow Groundwater Unit (years)	Present Worth Cost* ($ million)
1	0	>80	0
9	1,860	44	41.7
10A	1,340	80	46.2
10B/10B'	1,550	19/20	47.6
11	1,830	38	23.8

Note:
* cost estimates are taken from the Site 24 FS Report and are presented in 1997 dollars

Acronyms/Abbreviations:
FS – feasibility study
TCE – trichloroethene

9.2.1 Threshold Criteria

Threshold criteria include overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements. An alternative must meet both threshold criteria to be eligible for selection.

9.2.1.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Assesses whether a cleanup remedy provides adequate public health protection and describes how health risks posed by the site will be eliminated, reduced, or controlled through treatment, engineering controls, or institutional and regulatory controls.

The excess upper-bound cancer risk presented by exposure to VOCs in the shallow groundwater unit based on a residential exposure scenario was on the order of 2 in 1,000 (2×10^{-3}), which exceeds U.S EPA guidelines for generally acceptable carcinogenic risks. The HHRA also indicated that the VOC concentrations in groundwater of the shallow groundwater unit were high enough to potentially cause noncarcinogenic effects to receptors.

Alternative 1 would not reduce these risks significantly, nor would it reduce the potential for further migration of VOCs from the shallow groundwater unit to the principal aquifer and thus would not provide for the protection of human health or the environment.

Alternatives 9, 10A, 10B/10B′, and 11 would reduce risks by minimizing VOC migration from the shallow groundwater unit to the principal aquifer. The alternatives would, over time, also reduce VOC concentrations in the shallow groundwater unit to MCLs. These measures would assist in the restoration of both the shallow groundwater unit and principal aquifer to their designated beneficial uses. Until cleanup goals are achieved, Alternatives 9, 10A, 10B/10B′, and 11 would use institutional controls (land-use restrictions) to prevent domestic use of contaminated groundwater.

Because Alternatives 9, 10A, 10B/10B′, and 11 would inhibit migration of VOCs from the shallow groundwater unit to the principal aquifer, remediate groundwater to MCLs within a reasonable time, and prevent domestic use of contaminated groundwater until remediation has been accomplished, these alternatives are considered protective of human health and the environment.

9.2.1.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Addresses whether a cleanup remedy will meet all federal, state, and local environmental statutes or requirements.

Because ARARs are only triggered when a remedial action is conducted, they are not applicable for Alternative 1.

Alternatives 9, 10A, 10B/10B′, and 11 are expected to comply with all ARARs for Site 24, meeting the remedial goals for the shallow groundwater unit and thereby complying with the requirements of the WQCP, federal and state MCLs for organic compounds, and RCRA groundwater protection standards. The time required to meet the remedial goals would be significant (Table 9-4); in the interim, these alternatives would rely on institutional controls to prevent exposure to contamination in groundwater.

Alternatives 9, 10A, 10B/10B′, and 11 also comply with the RCRA hazardous waste management requirements for managing extracted groundwater and other potentially hazardous waste such as drill cuttings from well installations and spent GAC.

Characterization of groundwater extracted from the shallow groundwater unit will be performed during the remedial design phase to evaluate whether RCRA design standards apply.

Alternatives 9, 10A, 10B/10B′, and 11 would also comply with the executive orders on floodplain protection, National Archaeological and Historical Preservation Act, Clean Air Act, and substantive requirements of the SCAQMD for VOCs in emissions from the SVE treatment facility. Alternatives 9 and 11 would comply with SWRCB Res. 68-16 in that groundwater would be extracted, treated to reach a concentration at or below the

analytical detection limit, and injected into an area of the shallow groundwater unit where the background levels of TDS and nitrates are not exceeded.

9.2.2 Primary Balancing Criteria

Primary balancing criteria include long-term effectiveness and permanence, reduction of toxicity, mobility or volume, short-term effectiveness, implementability, and cost. These are used to weigh trade-offs among alternatives and identify the most favorable.

9.2.2.1 LONG-TERM EFFECTIVENESS AND PERMANENCE

Refers to the ability of a remedy to continue protecting human health and the environment over time after the cleanup action is completed.

Alternative 1 would have little long-term effectiveness at reducing risk from VOC contamination in the groundwater. Alternative 1 is assumed to have no impact on the mass of TCE in the shallow groundwater unit (Table 9-4).

Alternatives 9, 10A, 10B/10B', and 11 would remove TCE mass from groundwater much more effectively than Alternative 1, and removal would be permanent. The VOC contamination would be captured by GAC and destroyed when the carbon is regenerated. Alternatives 9 and 11 would be the most effective in removing contaminant mass in the first 20 years of remediation (Table 9-4).

The extraction and treatment technology used to remediate groundwater is expected to achieve MCLs. However, VOC contamination in groundwater is not likely to be completely eliminated through extraction and treatment (see Section 9.1.2.1).

9.2.2.2 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

Refers to the degree to which a cleanup alternative uses treatment technologies to reduce 1) harmful effects to human health and the environment (toxicity), 2) the contaminant's ability to move (mobility), and 3) the amount of contamination (volume).

Alternative 1 would provide no treatment or other active approach for the reduction of toxicity, mobility, or volume of the contaminants.

Alternatives 9, 10A, 10B/10B', and 11 would reduce toxicity, mobility, and volume of TCE. Groundwater extraction and treatment with GAC are well-demonstrated technologies for removing VOCs from groundwater. The VOCs present in groundwater are drawn to the surface through extraction wells, piped to a treatment unit, and passed through GAC. Once the GAC capacity is attained, the activated carbon is removed from the site and transported to a regeneration facility where the VOCs are desorbed and thermally destroyed.

Under Alternative 1, the length of the TCE plume in the shallow groundwater unit exceeding 5 μg/L would be 5,900 feet, and its area would be 9,800,000 square feet (Table 9-5). In contrast, the plume length and area for Alternative 10B/10B' would be

Table 9-5
Length and Area of TCE Plume Exceeding MCL in Shallow Groundwater Unit

Alternative	TCE Plume Length Exceeding MCL (feet)	TCE Plume Area (1,000 square feet)
1	5,900	9,800
9	870	209
10A	2,900	2,200
10B/10B′	0	0
11	480	8

Acronyms/Abbreviations:
MCL – maximum contaminant level
TCE – trichloroethene

reduced to zero because this alternative would achieve cleanup goals in less than 20 years. Alternatives 9 and 11 are more effective for mass removal than Alternative 10B/10B′ (Table 9-4) because they involve injecting water into the shallow groundwater unit to flush out residual contamination from the pore spaces. Alternatives 10A and 10B/10B′, which would not involve injection, may dewater portions of the shallow groundwater unit over time.

9.2.2.3 SHORT-TERM EFFECTIVENESS

Assesses how well human health and the environment will be protected from impacts due to construction and implementation of a remedy. Also considers time to reach cleanup goals.

Alternative 1 would not entail any on-site remedial activities and, therefore, would not impact the surrounding community, workers, or the environment. The time required for this alternative to be protective of human health and the environment would be controlled by the rate of natural attenuation processes and is expected to exceed 80 years (Table 9-4).

Short-term impacts of Alternatives 9, 10A, 10B/10B′, and 11 include the increased risk of exposure to workers from handling contaminated soils, vapors, and groundwater. An additional short-term impact of these alternatives is the risk of vehicular accidents and releases during transport of contaminated GAC. Potential on-site exposures and risks from these activities would be controlled through use of personal protective equipment, monitoring, and compliance with a site-specific safety and health plan. Transport risks would be minimized to the extent feasible by using a licensed commercial hauler. Impacts on the surrounding community or the environment are expected to be negligible, because any inadvertent releases to the atmosphere would be diluted before reaching the closest communities. None of the actions in Alternatives 9, 10A, 10B/10B′, or 11 would cause adverse short-term health effects.

Groundwater is expected to reach MCLs in 19/20 (Alternative 10B/10B') to 80 years or longer (Alternatives 1 and 10A) (Table 9-4). Alternative 10B would require the shortest time to remediate the shallow groundwater unit.

9.2.2.4 IMPLEMENTABILITY

Refers to the technical feasibility (how difficult the remedy is to construct and operate) and administrative feasibility (coordination with other agencies) of a remedy. Factors such as availability of materials and services needed are considered.

Technically, Alternative 1 is the easiest to implement because it would involve no on-site construction or other remedial activities.

Implementation of Alternatives 9, 10A, 10B/10B', and 11 would include construction of extraction wells, treatment facilities, interconnecting piping, and, for Alternatives 9 and 11, injection wells and associated piping. The groundwater extraction and treatment portion of Alternatives 9, 10A, 10B/10B', and 11 would be readily implementable. Extraction and injection wells, piping, and treatment facilities are readily constructed, and treatment of groundwater using GAC is a proven, reliable technology. Implementation of Alternatives 10A and 10B/10B' would require the DON and OCWD/IRWD to reach agreement on operational, financial, and liability concerns, including responsibility for capital investments and use of shared facilities for the IDP. However, as noted in Section 10.4, such an agreement has already been reached, so there are no anticipated technical or administrative barriers to implementation of any of the active Site 24 alternatives.

9.2.2.5 COST

Evaluates the estimated capital costs and present worth in today's dollars required for design and construction and long-term operation and maintenance costs of a remedy.

Table 9-4 shows cost estimates for groundwater remediation at Site 24. There are no costs associated with Alternative 1. Alternatives 9 and 11 are the least costly alternatives for remediation of groundwater at Site 24.

9.2.3 Modifying Criteria

Modifying criteria include state and community acceptance. State acceptance is taken into account during development of the proposed plan and ROD. Public acceptance is considered through comments received during the public comment period.

9.2.3.1 STATE ACCEPTANCE

Reflects whether the state of California's environmental agencies agree with, oppose, or have no objection to or comment on the DON's preferred alternative.

DTSC and RWQCB have reviewed the Site 24 RI report for soil and groundwater, the Site 24 FS Report for groundwater, and the Proposed Plan for Site 18 and Site 24; both

concur with the selected remedy for remediation of groundwater at Site 24. The state has also reviewed the closure report for vadose zone remediation at Site 24.

9.2.3.2 COMMUNITY ACCEPTANCE

Evaluates whether community concerns are addressed by the remedy and if the community has a preference for a remedy. Although public comment is an important part of the final decision, the DON is compelled by law to balance community concerns with the other criteria.

The Proposed Plan has been presented to the community and discussed at a public meeting. The responsiveness summary (located at the end of this ROD) addresses public comments and concerns about the selected remedy.

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Section 10
SELECTED REMEDY

Based on the RI/FS reports for Sites 18 and 24, the administrative record for these sites, as well as an evaluation of comments submitted by interested parties during the public comment period, the DON has selected Alternative 8A as the remediation method for the principal aquifer at Site 18 and Alternative 10B′ (pronounced 10B prime) as the remediation method for the shallow groundwater unit at Site 24. This represents the final remedy for groundwater at Sites 18 and 24. Remediation of soil is addressed in a separate ROD.

The selected remedy for groundwater includes:

- construction, operation, and maintenance of a groundwater extraction system to remove VOCs from groundwater;
- performance monitoring throughout the remedial action;
- treatment of VOC-contaminated groundwater using air stripping and treatment of VOC vapors with activated carbon filters to meet air quality standards before discharge to the atmosphere;
- confirmatory groundwater sampling at the end of the remediation to confirm that VOC concentrations meet federal and state cleanup levels; and
- institutional controls to prevent use of contaminated groundwater, protect equipment, and allow access to the DON, OCWD/IRWD, and regulatory agency personnel.

10.1 GROUNDWATER REMEDIATION

The CERCLA component of Alternative 8A consists of three extraction wells within the TCE plume in the principal aquifer (ET-1, ET-2, and IRWD-78) (Figure 10-1 and Section 10.2). The extract number and locations of the wells will be established by OCWD/IRWD and regulatory agencies during the remedial design phase. Groundwater is extracted from wells ET-1 and ET-2 and conveyed to the IDP treatment plant where it is treated to remove VOCs (CERCLA treatment) and reduce dissolved solids (non-CERCLA treatment). The treated groundwater is then distributed for nonpotable uses. Initial extractions from well IRWD-78 will be conveyed to IRWD's nonpotable water system. If the VOCs exceed their respective MCLs in this well, the extracted groundwater will be conveyed to the IDP treatment plant for VOC removal.

Alternative 10B′ consists of 49 extraction wells within the areas of highest TCE concentration in the shallow groundwater unit at Site 24 (Figure 10-2). The exact number and locations of the wells will be established by the DON and regulatory agencies during the remedial design phase. Alternative 10B′ differs from Alternative 10B (as described in Section 8) in that the total extraction rate is reduced from 800 gpm to 440 to 550 gpm. Alternative 10B′ was evaluated by means of a sensitivity run during groundwater modeling for the Site 24 FS. Even though the total pumping rate is reduced, the time to remediate TCE in groundwater in the shallow groundwater unit to the MCL is approximately the same for Alternative 10B′ as for Alternative 10B (i.e., 20 years for

Alternative 10B' and 19 years for Alternative 10B). A schematic process flow diagram of Alternative 8A and Alternative 10B' is included as Figure 10-3. Groundwater from the shallow groundwater unit is blended with groundwater from the principal aquifer prior to treatment at the IDP.

The conceptual groundwater monitoring well network consists of approximately 58 groundwater monitoring wells in the principal aquifer plus an additional 38 groundwater monitoring wells screened in the shallow groundwater unit and intermediate zone at Site 24. The number of wells and configuration of the monitoring well network will be established by the DON and regulatory agencies during the remedial design phase.

10.2 CERCLA COMPONENTS OF THE IDP

CERCLA groundwater remediation components in the principal aquifer consist of the following:

- extraction wells IRWD-78, ET-1, and ET-2, and injection well IDP-1 located within the VOC plume in the principal aquifer
- piping and pipeline conveyance system from wells IRWD-78, ET-1, and ET-2 to the CERCLA VOC treatment system located at the Central Treatment Plant (reference red line on Figure 10-1), and the piping and pipeline conveyance system from the CERCLA nonpotable VOC treatment system located at the Central Treatment Plan to injection well IDP-1 (reference blue line on Figure 10-1)
- separate CERCLA nonpotable VOC treatment system (including air strippers and off-gas granular-activated carbon units) located at the Central Treatment Plant for VOC-contaminated groundwater extracted from both the shallow groundwater unit and principal aquifer
- shared component assets at the Central Treatment Plant including site real property, buildings, site improvements, telemetry, transformers, and other electrical improvements and central monitoring and control systems
- groundwater monitoring wells associated with remediation of the VOC plume

CERCLA groundwater remediation components in the shallow groundwater unit consist of the following:

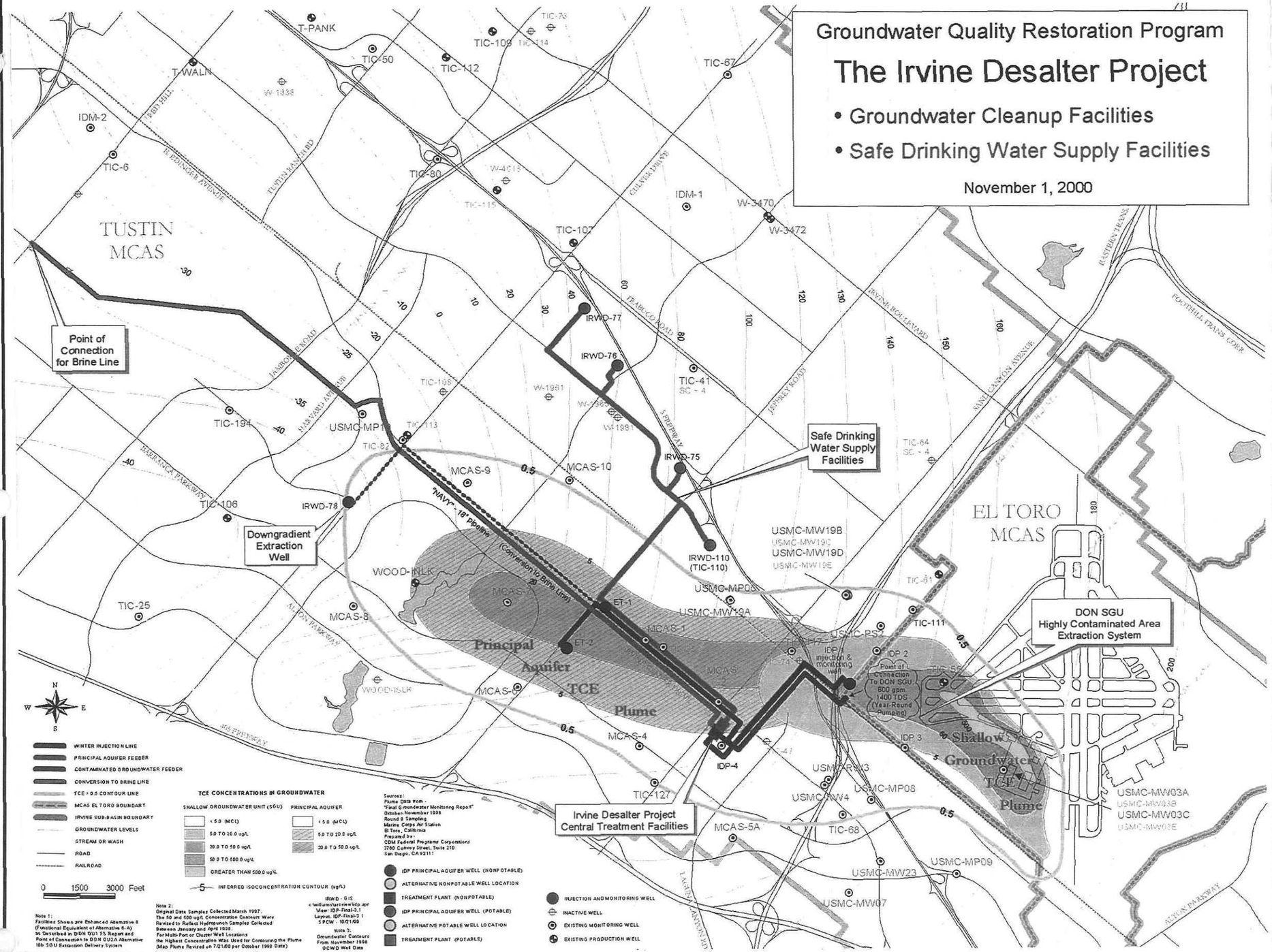
- DON's extraction wells for interception and removal of VOC-contaminated groundwater in the shallow groundwater unit
- DON's pumping and pipeline conveyance from those extraction wells to the IDP nonpotable pipeline feedwater conveyance system's point of connection at the Former MCAS El Toro boundary
- groundwater monitoring wells associated with remediation of the VOC plume

Groundwater Quality Restoration Program

The Irvine Desalter Project

- Groundwater Cleanup Facilities
- Safe Drinking Water Supply Facilities

November 1, 2000



Record of Decision

Figure 10-1

Alternative 8A

Principal Aquifer Well Confirmation

Former MCAS, El Toro, California

Bechtel National, Inc.

CLEAN II Program

Date: 4/25/02
File No.: -
Job No.: 22214-164
Rev No.: A

PAGE NO. 10-4

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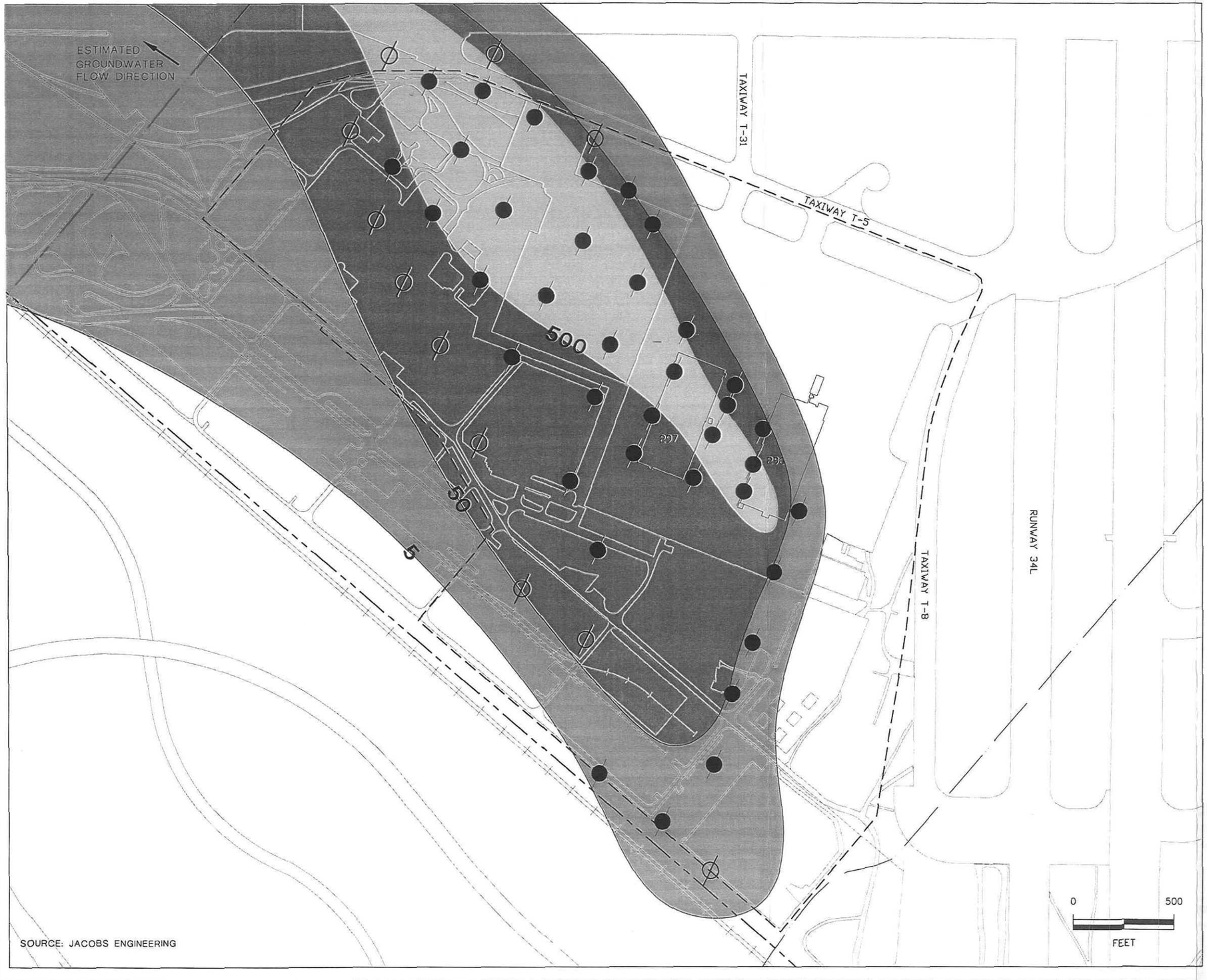

SOURCE: JACOBS ENGINEERING

LEGEND

- ROAD
- FREEWAY
- FORMER MCAS EL TORO BOUNDARY
- SITE 24 BOUNDARY
- STREAM OR WASH

NORTH
TRUE

PROPOSED

- CORE EXTRACTION WELL SCREENED IN UPPER 50 FEET OF SHALLOW GROUNDWATER UNIT
- PERIMETER EXTRACTION WELLS SCREENED IN UPPER 50 FEET OF SHALLOW GROUNDWATER UNIT

TCE CONCENTRATIONS IN GROUNDWATER

- 5.0 TO 50.0 ug/L TCE
- 5.0 TO 500.0 ug/L TCE
- GREATER THAN 500.0 ug/L TCE
- 5 — INFERRED ISOCONCENTRATION CONTOUR (ug/L)

NOTES:

WELL PLACEMENT BASED ON GROUNDWATER MODELLING CONDUCTED IN 1996 (JACOBS 1996e) AND BECHTEL NATIONAL INC. (BNI 1997b) AND GROUNDWATER SAMPLING DATA COLLECTED IN MARCH 1997.

50 AND 500 ug/L CONCENTRATION CONTOURS REVISED TO REFLECT HYDROPUNCH SAMPLES COLLECTED BETWEEN JANUARY AND APRIL 1998.

FOR MULTI-PORT OR CLUSTER WELL LOCATIONS THE HIGHEST CONCENTRATION WAS USED FOR CONTOURING THE PLUME.

Record of Decision
Figure 10-2
Alternative 10B'
Shallow Groundwater Unit Well Configuration

Former MCAS, El Toro, California

Bechtel National, Inc.
CLEAN II Program

Date: 4/29/02
File No: 164H8762
Job No: 22214-164
Rev No: C

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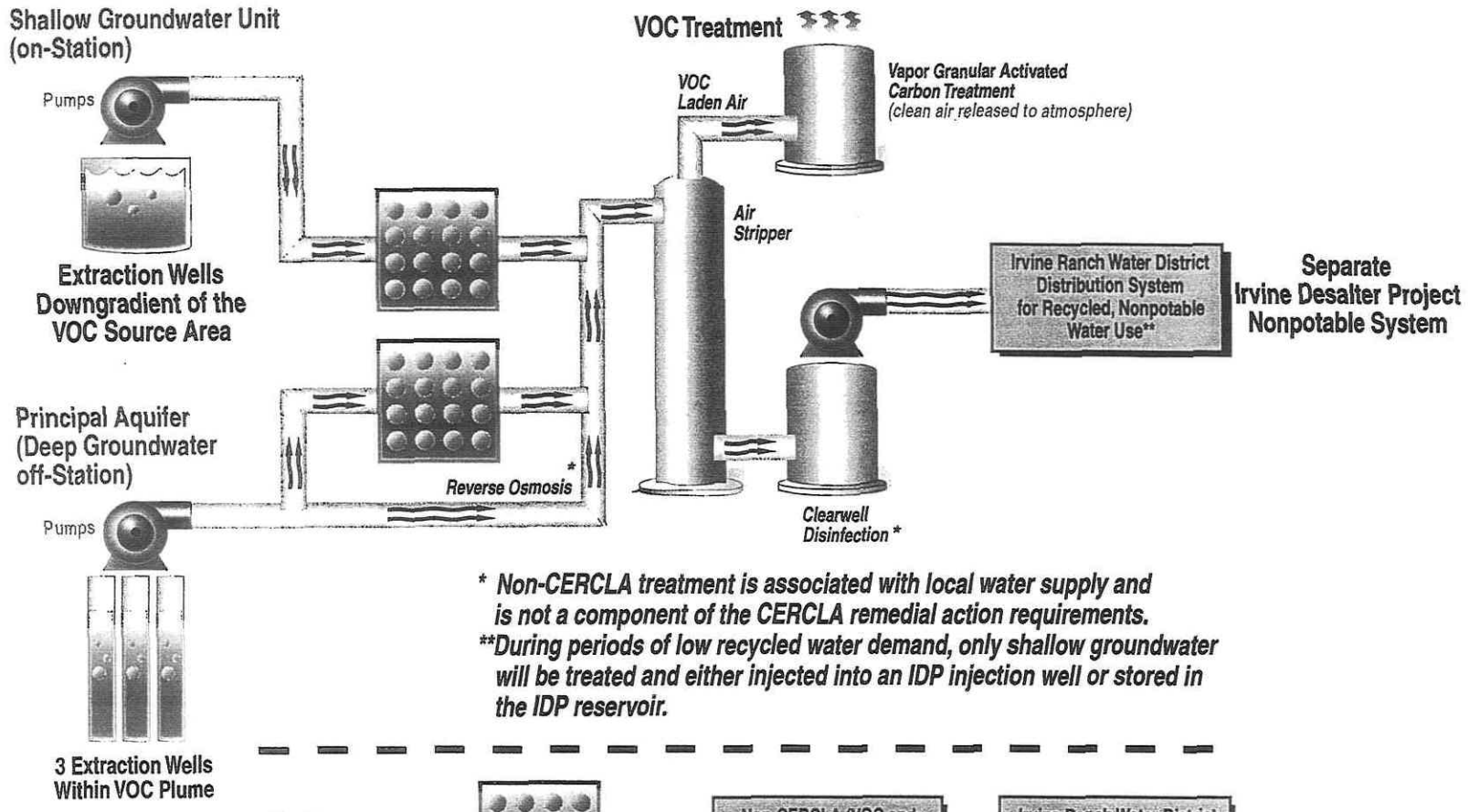
Alternative 8A/10B[1] Conceptual Design



Record of Decision

Figure 10-3

Alternative 8A/10B[1] Conceptual Design

Former MCAS, El Toro, California

Bechtel National, Inc.
CLEAN II Program

Date: 01/04/02
File No: 164F7959
Job No: 22214-164
Rev No: B

10.3 NON-CERCLA COMPONENTS OF THE IDP

The DON is obligated under CERCLA and the NCP to remediate releases of hazardous substances at Former MCAS El Toro. Groundwater in the vicinity of the Station contains inorganic compounds, including TDS, sulfate, nitrate, and chloride, at concentrations exceeding the drinking water standards and the applicable water quality objectives in the WQCP, Santa Ana River Basin (RWQCB 1995).

Former MCAS El Toro is located in an area where the historically predominant land uses have been for citrus orchards, field crops, and grazing. The observed concentrations of inorganic parameters in groundwater, particularly TDS and nitrate, are generally considered to be the result of naturally occurring subsurface conditions and past and current land uses, particularly past agricultural practices.

The Interim Action OU-1 RI Report Appendices (JEG 1996d) provide the following conclusions on the occurrence of TDS and nitrate contamination in groundwater in the Irvine Subbasin.

- The widespread occurrence of elevated TDS concentrations in groundwater near Former MCAS El Toro has been documented for more than 100 years.
- Former MCAS El Toro is not the source of the regional TDS concentrations in the Irvine Subbasin. The principal sources of TDS appear to be marine sediments; fine-grained materials, specifically clays, in the sediments of the Irvine Subbasin; subsurface inflow of groundwater through marine sedimentary rocks of the Santa Ana Mountains and San Joaquin Hills; and accumulated salts in irrigation return flow.
- The widespread occurrence of nitrate contamination near former MCAS El Toro has been documented for the past 25 years.
- Former MCAS El Toro is not the source of the regional nitrate groundwater contamination. Nitrate contamination is attributed to past agricultural use, farm animal waste, landscaping, domestic septic tank wastewater disposal, and industrial operation discharges.

Because elevated concentrations of TDS and nitrate result from naturally occurring subsurface conditions and past and current land uses not associated with the Former MCAS El Toro, the remedial objectives do not include cleanup goals for TDS and nitrates. Cleanup of these substances at the IDP is considered outside the scope of the CERCLA action for Sites 18 and 24 and is being separately addressed by OCWD/IRWD.

In addition to the three CERCLA extraction wells located within the VOC groundwater plume, OCWD/IRWD also plan to extract groundwater from four wells (IRWD 75, 76, 77, and 110) located outside the VOC plume in the principal aquifer. This water will be conveyed to the IDP treatment plant via a separate conveyance line for treatment to remove dissolved solids and nitrates. Treated groundwater from areas outside the VOC plume will be distributed to the public for domestic purposes. Because groundwater in

the potable system is extracted from areas that already meet cleanup standards for VOCs, treatment of this groundwater is not considered part of the CERCLA remedy.

10.4 SETTLEMENT AGREEMENT

Groundwater extracted from the shallow groundwater unit and from areas within the VOC plume in the principal aquifer will be blended and transported to the IDP for treatment. The DON, DOJ, OCWD, and IRWD have reached a Settlement Agreement regarding modification of the IDP to accept and treat groundwater from Sites 18 and 24 for VOC removal. According to this agreement, the United States will bear the VOC treatment costs, and OCWD/IRWD will continue to bear the normal costs associated with reclaimed water supply treatment requirements, including those for TDS and nitrates. The conceptual IDP that is modified to receive and treat VOCs is referred to in the Settlement Agreement as the modified IDP.

Under terms of the Settlement Agreement, OCWD and IRWD have agreed that they shall not permanently terminate operation of the nonpotable portion of the IDP unless it has been demonstrated, and the DON has approved and U.S. EPA, DTSC, Cal/EPA Department of Health Services (DHS), and RWQCB have concurred in writing, that either a Force Majeure condition exists (as set forth in Section 10 of the FFA [1990]) or, in the alternative, that treatment of extracted groundwater to meet federal and state drinking water standards and adequately protect human health and the environment is technically impracticable from an engineering perspective consistent with the substantive criteria of 40 C.F.R. § 300.430(f)(1)(ii)(C)(3) and the NCP preamble at 55 *Federal Register* (Fed. Reg.) 8748 (08 March 1990). (40 C.F.R. § 300.430[f][2][ii][C][3] provides that an alternative that does not meet an ARAR under federal environmental or state environmental facility citing laws may be selected when compliance with the requirement is technically impracticable from an engineering perspective.) The availability of water from sources other than the principal aquifer and IDP at a lower cost to OCWD/IRWD and its customers (taking into account groundwater treatment costs) shall not be considered in evaluating technical impracticability.

Temporary shutdown of the IDP is allowed:

- for short-term routine maintenance;
- in the event that contaminants not listed in Appendix 3 of the Settlement Agreement are reported in extracted groundwater during area groundwater monitoring or at extraction well locations; or
- in the event that concentrations or equivalent mass levels are reported in excess of the concentrations for the contaminants listed in Appendix 2 of the Settlement Agreement at the point of connection of the DON's shallow groundwater unit conveyance pipeline or the IDP central VOC treatment plant intake.

The party discovering the contaminants or concentrations shall promptly notify in writing the other parties, FFA signatories, DTSC, DHS, and the Santa Ana RWQCB; in this case, OCWD/IRWD may, without further notice, temporarily shut down the IDP.

Within 7 calendar days following such initial notification, the parties, FFA signatories, and DHS will determine whether through adjusting flow rates, blending, or similar measures the Modified IDP can continue to adequately treat extracted groundwater to assure compliance with applicable federal and state drinking water standards at the point of distribution into the water supply infrastructure following treatment. If the standards can be met, OCWD/IRWD shall immediately resume operations.

If OCWD/IRWD determine that the drinking water standards cannot be met at the point of distribution into the water supply infrastructure following treatment, OCWD/IRWD may continue temporary shutdown of the modified IDP and shall develop a response plan. This plan must be submitted to the DON, U.S. EPA, and Cal/EPA (including DTSC, DHS, and RWQCB) within 60 days and shall propose all practicable means to minimize the extent and duration of interruption of all or part of the groundwater extraction and treatment activities. The response plan shall also specify a schedule for resumption of operations.

Under the Settlement Agreement, the DON will provide OCWD/IRWD a copy of analytical data reports of all the validated analytical data collected by the DON and its authorized representatives and contractors from groundwater monitoring wells and on-Station extraction wells within 60 calendar days after such reports become available to the DON. OCWD/IRWD will provide the DON with copies of analytical data reports of all analytical data they have collected from groundwater monitoring wells and Modified IDP production wells within 60 calendar days after the reports become available to OCWD/IRWD.

A copy of the Settlement Agreement is included as Attachment E to this ROD. The copy is attached for informational purposes only. Contents of this agreement are not subject to comment nor deemed to be an enforceable component of this ROD.

10.5 REMEDIAL DESIGN OF THE MODIFIED IDP

In accordance with the Settlement Agreement (Attachment E), OCWD/IRWD will develop remedial design and remedial action deliverables for the Modified IDP and provide them to the DON so that the DON can review and submit them to U.S. EPA, DTSC, and RWQCB in accordance with the FFA schedule.

Except with regard to the DON's obligations as provided in the FFA, OCWD/IRWD is responsible for obtaining all locally issued licenses, permits, and approvals for construction and operation of the Modified IDP.

10.6 CONTRACT FOR SHALLOW GROUNDWATER UNIT

The DON, OCWD, and IRWD have entered into a separate contract to accept, treat, and take ownership of up to 440 to 550 gpm of groundwater extracted by the DON from the

shallow groundwater unit and delivered to OCWD/IRWD for VOC treatment. OCWD/IRWD is required to provide VOC remediation services regardless of whether the groundwater can be used for a reclaimed water supply. If OCWD/IRWD determines that the groundwater cannot be used for the reclaimed water supply after treatment, OCWD/IRWD will be responsible for otherwise disposing of the treated groundwater at no additional cost to the DON. One option being considered for disposal is injection into the principal aquifer via well IDP-1 (BNI 2001).

The contract between the DON and OCWD/IRWD will remain in effect until U.S. EPA, DTSC, and RWQCB agree that the requirements of this ROD for cleanup of the shallow groundwater unit have been met. At that time, remediation will be complete, the DON will discontinue extraction from the shallow groundwater unit and delivery to OCWD/IRWD, and the contract will be terminated.

Permanent termination by OCWD/IRWD of the shallow groundwater treatment activities before completion of remediation will be considered a breach of contract unless the DON is relieved of its obligation to U.S. EPA, DTSC, and RWQCB to remediate VOC contamination in the shallow groundwater unit by an amendment of the ROD.

The contract with OCWD/IRWD to accept, treat, and take ownership of groundwater from the shallow groundwater unit will continue even if the Modified IDP is terminated.

10.7 BACKUP REMEDY FOR PRINCIPAL AQUIFER

Based on currently available information, it is anticipated that the backup, contingency remedial action for the VOC contamination in the principal aquifer will consist of monitored natural attenuation if the IDP is terminated for any reason. Natural attenuation was modeled in the OU-1 IAFS Addendum (Alternative 7A) and is discussed in Section 8.1.4. An enhanced monitoring well network would be used to assure that plume movement is halted and remediation is occurring as expected. Modeling in the OU-1 IAFS showed that this alternative will achieve the cleanup goals in the principal aquifer in approximately 60 years, which is shorter than the 95 years required for Alternative 8A (as currently designed) to achieve these goals.

The U.S. EPA, DTSC, and RWQCB have indicated that they require the effectiveness of natural attenuation to be demonstrated before this technology may be selected as a remedial action alternative. An evaluation of biodegradation at Site 18 (in Attachment A-2 of the OU-1 IAFS) concluded that if any TCE degradation were occurring, reductive dechlorination would be the principal degradation pathway, and the presence of 1,2-DCE appears to indicate that such degradation is occurring. After the IAFS, the U.S. Air Force Center for Environmental Excellence issued a technical protocol for evaluating natural attenuation (Wiedemeier et al. 1996). This protocol was used to assess whether natural attenuation is occurring at Site 2, the Magazine Road Landfill (BNI 1998c). Should termination of the modified IDP become an issue, the DON will use a similar methodology to evaluate monitored natural attenuation as a backup remedy for Site 18.

A contingent remedial action is not necessary for the shallow groundwater unit because the DON, OCWD, and IRWD have entered into a contract stipulating that OCWD/IRWD

accept, treat, and take ownership of groundwater extracted by the DON from the shallow groundwater unit. The contract will remain in effect until U.S. EPA, DTSC, and RWQCB agree that the requirements of this ROD for cleanup of the shallow groundwater unit have been met. At that time, remediation will be complete, and the DON will discontinue groundwater extraction from the shallow groundwater unit.

10.8 INSTITUTIONAL CONTROLS

Institutional controls for the off- and on-Station portions of the groundwater plume are discussed in Sections 8.1.2.3, 8.2.2.2, and 8.2.2.3 and summarized below.

10.8.1 Off-Station Groundwater Plume

Institutional controls for the off-Station portion of the groundwater plume are intended to protect residents from use of VOC-contaminated groundwater from the principal aquifer and shallow groundwater unit for domestic purposes until cleanup goals are achieved. The institutional controls for the off-Station portion of the VOC groundwater plume are based on local permit programs administered by the OCHCA and IRWD. These agencies require that any person planning to construct a water well must apply for and obtain a permit for construction of such well. The agencies are also authorized to include any necessary conditions in the permit to assure adequate protection of public health (*Orange County Code*, Article 2. Construction and Abandonment of Water Wells, and *IRWD Rules and Regulations*, Section 16. Water Wells). The DON has received commitments from OCHCA and IRWD to provide the DON with copies of any well permit applications received or permits issued within the geographic scope of the off-Station groundwater plume exceeding federal and state MCLs until remediation of the plume has been completed.

The DON has provided OCHCA and IRWD with copies of the maps in this ROD that delineate the off-Station groundwater plume. The DON shall provide annually to OCHCA and IRWD updated copies of the map(s) beginning 1 year from the date of issuance of this ROD and ending when remediation of the plume has been completed.

The OCHCA and IRWD shall have the lead in assuring that appropriate permits are obtained for construction of new water wells in the VOC groundwater plume and taking any necessary enforcement action to assure that such permits are obtained and complied with. The DON shall provide annually U.S. EPA, DTSC, and RWQCB with copies of permit applications and permits that it has received from OCHCA and IRWD during the previous year, beginning 1 year from the date of issuance of this ROD and ending when remediation of the plume has been completed.

10.8.2 On-Station Groundwater Plume

Institutional controls for the on-Station portion of the groundwater plume are intended to prevent use of VOC-contaminated groundwater until cleanup goals are achieved in the shallow groundwater unit; protect the groundwater extraction, injection, and monitoring wells and associated piping and equipment; and assure access to the site by the DON and

regulatory agencies to assure that construction, O&M, and monitoring of the final remedy and any further investigation and response action are implemented.

OCWD/IRWD will require access to Station property to implement the IDP. The DON has agreed to provide reasonable access to the Station, including necessary rights-of-way or easements, for as long as the DON owns the property. If the DON sells or leases property associated with this remedial action, the sale or lease agreements will contain provisions for continuing access, rights-of-way licenses, and easements as necessary. The DON will inform all prospective purchasers and lessees that a treatment system will be operating in accordance with this ROD and that the operator has the right (with reasonable notice and so as not to unreasonably interfere with the purchaser's or lessee's operations) to take soil samples on the property to confirm that current operations have not released hazardous substances that could impact the treatment system.

OCWD/IRWD will also provide reasonable access to the DON, U.S. EPA, and Cal/EPA during normal business hours to sample pretreated and treated groundwater and groundwater collected in groundwater monitoring wells.

On-Station institutional controls will consist of land-use restrictions that will be implemented through two separate legal instruments: 1) one or more Environmental Restriction Covenant and Agreements with DTSC addressing on-Station real property containing the Site 24 Shallow Groundwater Plume and associated buffer zone and 2) one or more quitclaim deeds/leases between transferee(s)/lessee(s) and the DON conveying/leasing on-Station real property containing the Site 24 Shallow Groundwater Plume and associated buffer zone. The area requiring institutional controls at Site 24 is shown on Figure 10-4. The Environmental Restriction Covenant and Agreement(s) will incorporate the land-use restrictions into restrictive covenants that run with the land and that are enforceable by DTSC against future transferees. The Deed(s) will include the identical land-use restrictions in environmental restrictive covenants that run with the land and that will be enforceable by the DON against future transferees. In essence, the DON and DTSC will each have the legal authority to enforce the land-use restrictions and will share responsibility for their enforcement.

The OCHCA and IRWD shall have the lead in assuring that appropriate permits are obtained for construction of new water wells in the on-Station VOC groundwater plume and taking any necessary enforcement action to assure that such permits are obtained and complied with. The DON shall provide annually U.S. EPA, DTSC, and RWQCB with copies of permit applications and permits that it has received from OCHCA and IRWD during the previous year beginning 1 year from the date of issuance of this ROD and ending when remediation of the plume has been completed.

The DON shall monitor and inspect the status of compliance with the land-use restrictions in the Environmental Restriction Covenant and Agreement(s) and quitclaim deed(s)/leases protecting on-Station extraction, injection, and drinking water wells, monitoring wells, and associated piping and equipment concurrently with inspections of such engineering controls and equipment as provided in the operations and maintenance plan. The DON shall report the results of the inspections to the U.S. EPA, DTSC, and

RWQCB. The operations and maintenance plan shall address the frequency of such reporting and the contents of the reports of the inspections.

If a violation of such on-Station land-use restrictions is identified and/or documented by either the DON or DTSC, the entity identifying the violation will notify the others within 10 working days of identifying the violation. The DON, U.S. EPA, DTSC, and RWQCB shall then consult to determine what, if any, action(s) should be taken, which of them shall undertake the action(s), and when it/they shall be undertaken. The results of such a consultation shall be formally documented in writing. DTSC may enforce the Environmental Restriction Covenant and Agreement provisions.

10.9 MONITORING

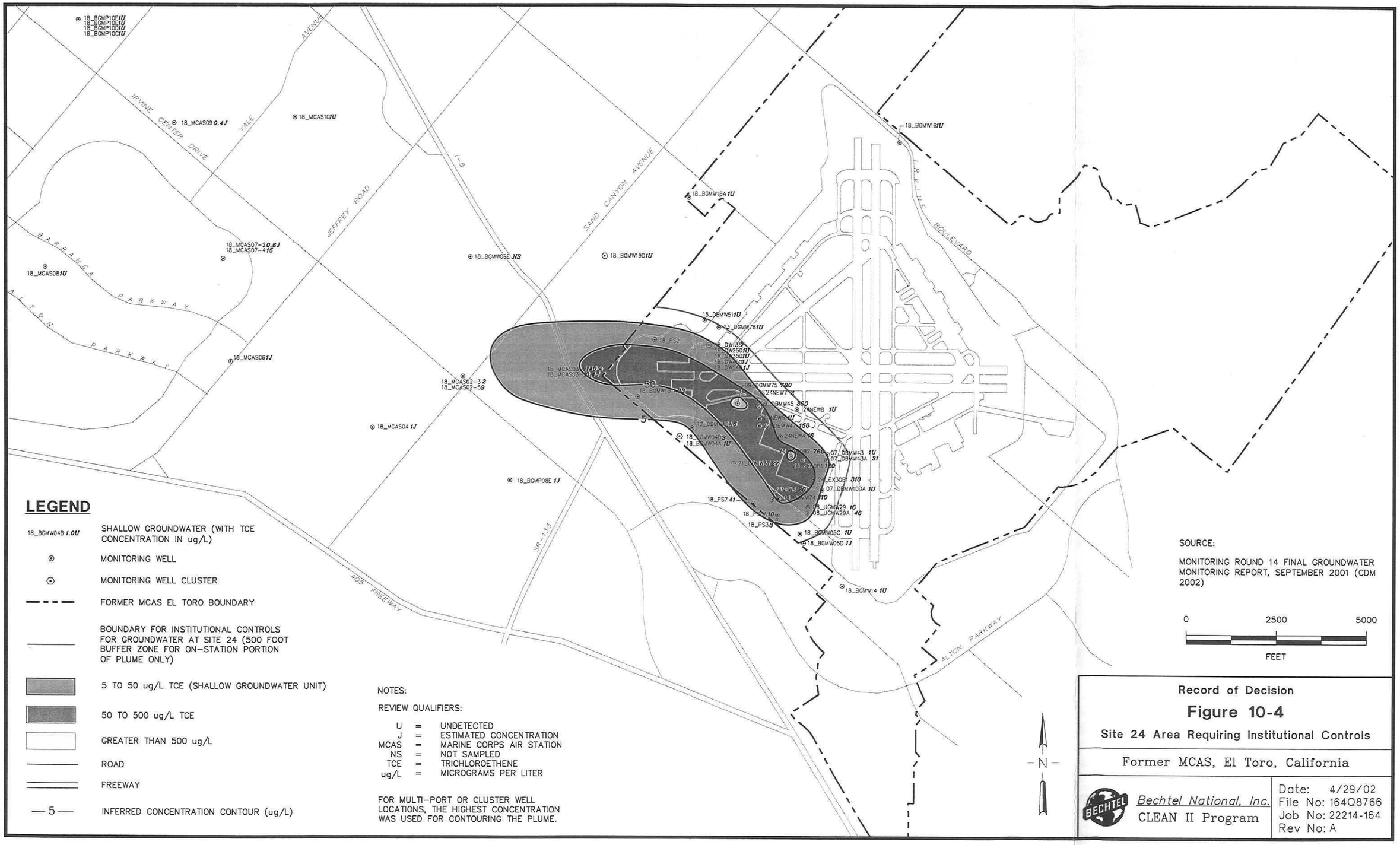
Groundwater monitoring will be performed to assess the effectiveness of groundwater remediation and to provide early notice of potential groundwater plume movement. The monitoring well configuration will be designed to assess changes in VOC concentrations and plume configuration and to determine whether downgradient plume migration or migration toward the non-CERCLA potable extraction wells is occurring. Parameters to be monitored at the Site 18 and Site 24 monitoring wells/ports include water level, VOCs, general chemistry/TDS, and natural attenuation parameters. The monitoring frequency and parameters and the exact number of monitoring wells, well locations, and well construction details will be finalized during the remedial design phase. Based on sampling results, it is anticipated that groundwater sampling at each monitoring well/port will then be conducted quarterly, semiannually, and/or annually in accordance with the groundwater monitoring frequency decision tree (Figure 10-5) until the remedial action objectives for groundwater have been met. Water-level monitoring is expected to be conducted quarterly. Water-level monitoring will be used to confirm the hydrogeologic model for the shallow groundwater unit. The quarterly water-level data will also be used to evaluate changes in the groundwater flow direction and the hydraulic gradients (horizontal and vertical) throughout the year.

10.10 RATIONALE FOR REMEDY SELECTION

The selected alternative provides the best balance with respect to the NCP evaluation criteria. Based on the information available at this time, the preferred alternative offers:

- a high level of performance when assessed against the following NCP evaluation criteria: short-term effectiveness, long-term effectiveness and permanence, implementability, compliance with ARARs, and overall protection of human health and the environment; and
- a cost-effective means of accomplishing the remedial action objectives for the site.

Table 10-1 summarizes the cost estimate for the selected alternative, including capital costs and O&M costs assumed to extend for 20 to 40 years. The 20- to 40-year time frame does not necessarily reflect the duration of the O&M activities at the site; the



LEGEND

- 18_BGMW04B 1.0U — SHALLOW GROUNDWATER (WITH TCE CONCENTRATION IN ug/L)
- MONITORING WELL
- MONITORING WELL CLUSTER
- FORMER MCAS EL TORO BOUNDARY
- BOUNDARY FOR INSTITUTIONAL CONTROLS FOR GROUNDWATER AT SITE 24 (500 FOOT BUFFER ZONE FOR ON-STATION PORTION OF PLUME ONLY)
- 5 TO 50 ug/L TCE (SHALLOW GROUNDWATER UNIT)
- 50 TO 500 ug/L TCE
- GREATER THAN 500 ug/L
- ROAD
- FREEWAY
- —5— INFERRED CONCENTRATION CONTOUR (ug/L)

NOTES:

REVIEW QUALIFIERS:

U	=	UNDETECTED
J	=	ESTIMATED CONCENTRATION
MCAS	=	MARINE CORPS AIR STATION
NS	=	NOT SAMPLED
TCE	=	TRICHLOROETHENE
ug/L	=	MICROGRAMS PER LITER

FOR MULTI-PORT OR CLUSTER WELL LOCATIONS, THE HIGHEST CONCENTRATION WAS USED FOR CONTOURING THE PLUME.

SOURCE:

MONITORING ROUND 14 FINAL GROUNDWATER MONITORING REPORT, SEPTEMBER 2001 (CDM 2002)

0 2500 5000

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Record of Decision

Figure 10-4

Site 24 Area Requiring Institutional Controls

Former MCAS, El Toro, California

Bechtel National, Inc.
CLEAN II Program

Date: 4/29/02
File No: 164Q8766
Job No: 22214-164
Rev No: A

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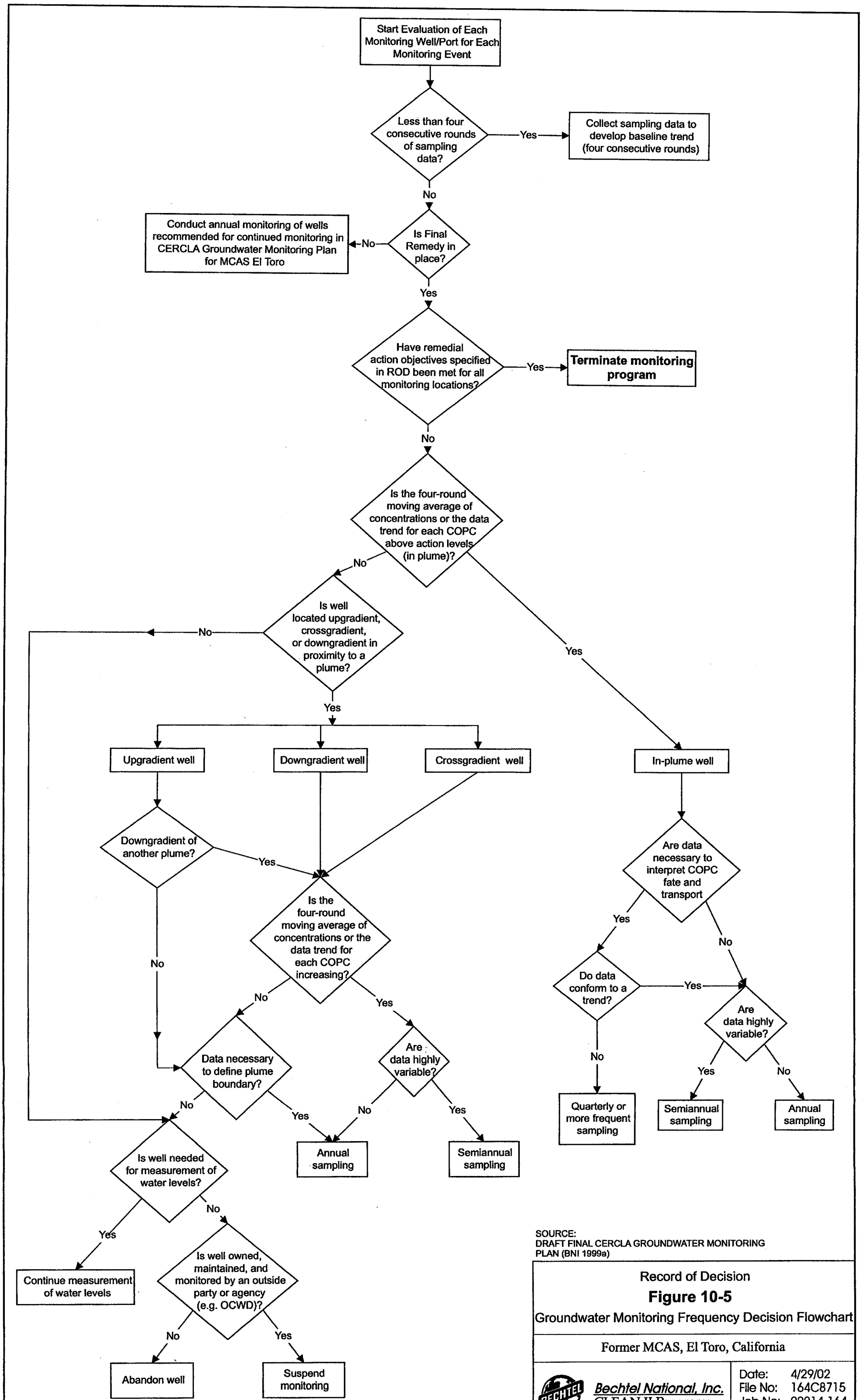

SOURCE:
DRAFT FINAL CERCLA GROUNDWATER MONITORING PLAN (BNI 1999a)

Record of Decision

Figure 10-5

Groundwater Monitoring Frequency Decision Flowchart

Former MCAS, El Toro, California

Bechtel National, Inc.
CLEAN II Program

Date: 4/29/02
File No: 164C8715
Job No: 22214-164
Rev No: B

PAGE NO. 10-18

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Table 10-1
Estimated Costs for Remediation of Groundwater at Sites 18 and 24[a]

Cost Category	Net Present Worth Cost ($ million)
Capital Costs	
SGU well and conveyance system installation[b]	$ 5,869,000
DON contribution to capital costs of IDP[c]	7,572,000
Installation of principal aquifer monitoring wells[d]	1,846,000
Savings from production of FFA deliverables[e]	(500,000)
Subtotal, capital costs	**14,787,000**
Operation, Maintenance, and Monitoring Costs	
SGU VOC service contract to OCWD[f]	2,121,000
Shallow groundwater unit monitoring costs[g]	1,159,000
SGU maintenance of wells and extraction system[h]	959,700
DON contribution to O&M costs of modified IDP[i]	7,339,000
Maintenance and monitoring of principal aquifer monitoring wells[j]	4,272,000
Subtotal, operation, maintenance, and monitoring costs	**15,850,700**
Total Net Present Worth Costs	**$30,637,700**

Notes:
[a] for comparative purposes, indemnification costs are not included in any of the IDP alternatives
[b] includes capital costs to install 38 new monitoring wells and 49 new groundwater extraction wells and associated piping (taken from Site 24 Groundwater FS Report, Table C5-7)
[c] taken from Settlement Agreement
[d] includes capital costs to install 12 new monitoring wells (taken from OU-1 Interim Action Feasibility Study Report, Volume IX, Table E-8)
[e] estimated value based on FFA deliverables identified in Section III.C of Settlement Agreement
[f] taken from service contract; assumes that groundwater extraction system in shallow groundwater unit is operated 20 years
[g] assumes that groundwater in SGU is monitored for 20 years (taken from the Site 24 Groundwater FS Report, Table C5-9)
[h] assumes that groundwater extraction system in SGU is operated 20 years (taken from the Site 24 Groundwater FS Report, Table C5-8)
[i] taken from Settlement Agreement
[j] assumes that groundwater extraction and treatment system in principal aquifer is operated 40 years (taken from OU-1 Interim Action Feasibility Study Report, Volume IX, Table E-8)

Acronyms/Abbreviations:
DON – Department of the Navy
FFA – federal facilities agreement
IDP – Irvine Desalter Project
O&M – operation and maintenance
OCWD – Orange County Water District
OU – operable unit
SGU – shallow groundwater unit
VOC – volatile organic compound

discontinuation or extension of O&M activities will be determined based on the results of sampling designed to evaluate the effectiveness of remediation.

Other advantages of the selected remedy include its ease of implementation (it uses readily available, proven technologies to extract and treat vapors), compatibility with current and future land uses, and inclusion of provisions for future assessments at the conclusion of groundwater remediation. Impact on the existing infrastructure at Site 18 and Site 24 will be minimized to the extent practical provided that remedial action efforts are not compromised.

Some modifications to the selected remedy (e.g., locations and number of extraction and monitoring wells pumping rate) may be necessary as a result of the remedial design and construction processes. Detailed design specifications, performance evaluations, and schedule will be determined during the remedial design phase.

Section 11
STATUTORY DETERMINATIONS

Under CERCLA, the DON's primary responsibility is to undertake remedial actions that achieve adequate protection of human health and the environment. Section 121 of CERCLA establishes several additional statutory requirements and preferences specifying that, when complete, the selected remedial action must comply with ARARs established under federal and state laws unless a statutory waiver is justified. The selected remedy also must be cost-effective and use permanent solutions and alternative treatment technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that, as their principal element, permanently and significantly reduce the volume, toxicity, or mobility of hazardous waste. The following sections discuss how the selected remedy meets these statutory requirements and preferences. Complete discussions are found in the IAFS report for groundwater at Site 18 (JEG 1996b,d,f,g) and the FS report for groundwater at Site 24 (BNI 1997b).

11.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Remedial action objectives for Sites 18 and 24 are concerned with limiting future contaminant migration and exposures to contaminated media and restoring the beneficial use of the groundwater at Sites 18 and 24. The selected remedy protects human health and the environment by preventing use of contaminated groundwater for domestic purposes until remediation is complete. Although groundwater is currently not used for potable purposes, contaminated groundwater is a potential future threat to human health if it is used for domestic purposes. Remediation of groundwater will eliminate this threat in time; in the interim, institutional controls at Sites 18 and 24 will prevent inadvertent exposure to VOCs at levels above MCLs by controlling new well drilling and prohibiting the domestic use of untreated groundwater. Deed restrictions will also be used at Site 24 during remediation to prevent disturbance of extraction, injection, and monitoring wells and equipment for treatment of groundwater.

There are no short-term threats associated with the selected remedy that cannot be readily controlled. In addition, no adverse cross-media impacts are expected from the remedy.

11.2 COMPLIANCE WITH ARARs

The selected remedy will comply with the substantive portions of all ARARs. Section 121(e) of CERCLA, U.S.C. § 9621(e), states that no federal, state, or local permit is required for remedial actions conducted entirely on-site. Therefore, actions conducted entirely on-site must meet only the substantive, not the administrative, requirements of the ARARs. Any action conducted off-site is subject to the full requirements of federal, state, and local regulations. The non-VOC treatment aspects of the modified IDP are considered off-site actions. The chemical-, location-, and action-specific ARARs for the selected remedy for Site 18 and Site 24 are listed in Tables 11-1, 11-2, and 11-3, respectively, and discussed below.

Table 11-1
Chemical-Specific ARARs for Selected Remedy

Action/Requirement	Citation	ARAR[a] Determination	Comments
FEDERAL			
Safe Drinking Water Act, 42 U.S.C. § 300[b]			
National primary drinking water standards are health-based standards for public water systems (MCLs).	40 C.F.R. § 141.61	Relevant and appropriate	The NCP defines MCLs as relevant and appropriate for groundwater determined to be a current or potential source of drinking water, in cases where MCLGs are not ARARs. MCLs are relevant and appropriate for Class II aquifers such as the Irvine Forebay I aquifer. The Santa Ana RWQCB has designated the Irvine Forebay I aquifer for municipal/domestic use (potential drinking water) in addition to other uses. Only the primary standards for organic chemicals (40 C.F.R. § 141.61), specifically VOCs, are ARARs for this action. MCLs for inorganics specified in 40 C.F.R. § 141.11 and 40 C.F.R. § 141.62 are not identified as ARARs because inorganics are outside the scope of this action. Furthermore, it has been determined that Former MCAS El Toro has not contributed to regional groundwater inorganics contamination.
Resource Conservation and Recovery Act[b]			
TCLP regulatory levels; persistent and bioaccumulative toxic substances TTLCs and STLCs.	Cal. Code Regs. tit. 22, § 66261.24(a)(1)	Applicable	Using the RCRA definition of hazardous waste, groundwater extracted from Site 24 extraction wells would not be a listed waste or contain a listed waste. However, there is the potential for groundwater from some of the on-Station extraction wells to exceed TCLP limits for TCE, making it a characteristic hazardous waste. None of the off-Station extraction wells could exceed TCLP limits. Also, the maximum estimated influent concentrations for both the on-Station and off-Station treatment systems are below TCLP limits. In addition, there is the potential for some of the spent carbon to exceed TCLP limits for TCE, making it a characteristic hazardous waste.

(table continues)

Table 11-1 (continued)

Action/Requirement	Citation	ARAR[a] Determination	Comments
FEDERAL			
Resource Conservation and Recovery Act[b] (continued)			
Groundwater and vadose zone protection standards: owners/operators of RCRA treatment, storage, or disposal facilities must comply with conditions in this section designed to assure that hazardous constituents entering the groundwater from a regulated unit do not exceed the concentration limits for contaminants of concern set forth under § 66264.94 in the uppermost aquifer underlying the waste management area.	Cal. Code Regs. tit. 22, § 66264.94, except § 66264.94(a)(2) and 94(b)	Relevant and appropriate	Applicable for hazardous waste TSD facilities; potentially relevant and appropriate in site-specific circumstances, such as when the source of the waste is unknown but the waste is similar in composition to listed waste or when waste constituents have released or have the potential to release to groundwater. Sites 18 and 24 are not TSD facilities. However, because the waste in groundwater, in particular TCE, is similar in composition to listed waste, this requirement is determined to be relevant and appropriate.
STATE			
Cal/EPA Department of Toxic Substances Control			
Definition of "non-RCRA hazardous waste."	Cal. Code Regs. tit. 22, §§ 66261.22(a)(3) and (4), 66261.24(a)(2) to (a)(8), 66261.101, 66261.3(a)(2)(C), or 66261.3(a)(2)(F)	Applicable	Using the state definition for hazardous waste, groundwater extracted from Site 24 wells and soil removed during well construction are determined not to be listed non-RCRA hazardous waste but will be tested to determine if they meet the criteria for characteristic non-RCRA hazardous waste. If the waste is found to be characteristic non-RCRA hazardous waste, generator requirements are applicable.

(table continues)

Table 11-1 (continued)

Action/Requirement	Citation	ARAR[a] Determination	Comments
		STATE	
Cal/EPA Department of Toxic Substances Control (continued)			
State MCL list for drinking water.	Cal. Code Regs. tit. 22, § 64444	Relevant and appropriate	Like federal MCLs, state MCLs are tap water standards that are relevant and appropriate for Class II aquifers like the Irvine Forebay I. Only the primary standards for organic chemicals (Cal. Code Regs. tit. 22, § 64444), specifically VOCs, which are more stringent than primary federal standards, are ARARs for this action. MCLs for inorganics specified in Cal. Code Regs. tit. 22, § 64431 are not identified as ARARs because Former MCAS El Toro has not contributed to the regional groundwater inorganics contamination.
State and Regional Water Quality Control Board			
Authorizes SWRCB and RWQCB to establish, in water quality control plans, beneficial uses and numerical and narrative standards to protect both surface and groundwater quality. Authorizes regional water boards to issue permits for discharges to land or surface or groundwater that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.	Cal. Water Code, div. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter-Cologne Water Quality Act)	Applicable	The DON accepts the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Water Quality Act enabling legislation, as implemented through the beneficial uses, WQOs, and promulgated policies of the Basin Plan for the Santa Ana Region as ARARs.

(table continues)

Table 11-1 (continued)

Action/Requirement	Citation	ARAR[a] Determination	Comments
		STATE	
State and Regional Water Quality Control Board (continued)			
Describes water basins in the Santa Ana region; establishes beneficial uses of ground and surface waters; establishes water quality objectives; including narrative and numerical standards; establishes implementation plans to meet water quality objectives and protect beneficial uses; and incorporates statewide water quality control plans and policies.	Comprehensive Water Quality Control Plan for the Santa Ana Basin (Cal. Water Code § 13240)	Applicable	Substantive provisions of Chapters 2 through 4 (Plans and Policies, Beneficial Uses, Water Quality Objectives) are applicable. The beneficial uses for the Irvine Forebay I aquifer designated in the Water Quality Control Plan are municipal/domestic use (potential drinking water), agricultural supply, industrial service supply, and industrial process supply.
Incorporated into all regional board basin plans. Designates all ground and surface waters of the state as drinking water except where the TDS is greater than 3,000 ppm, the well yield is less than 200 gpd from a single well, the water is a geothermal resource or in a water-conveyance facility, or the water cannot reasonably be treated for domestic use by either best management practices or best economically achievable treatment practices.	SWRCB Res. No. 88-63 (Sources of Drinking Water Policy)	Applicable	Substantive provisions are ARARs. The Irvine Forebay I aquifer has been identified as a source of drinking water.

Notes:

[a] where MCLs were not available, chemical-specific concentrations used to establish cleanup levels may be based upon the following:
Human health risk-based concentrations (40 C.F.R. § 300.430[e][A][1] and [2])
Ecological risk-based concentrations (40 C.F.R. § 300.430 [e][G])
Practical quantitation limits of contaminants (40 C.F.R. § 300.430[e][A][3]);
many potential action-specific ARARs contain chemical-specific limitations and are addressed in the action-specific ARAR tables

[b] statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the DON accepts the entire statute or policy as a potential ARAR; specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs

(table continues)

Table 11-1 (continued)

Acronyms/Abbreviations:
§ – section
ARAR – applicable or relevant and appropriate requirement
Cal/EPA – California Environmental Protection Agency
Cal. Code Regs. – *California Code of Regulations*
Cal. Water Code – *California Water Code*
C.F.R. – *Code of Federal Regulations*
DON – Department of the Navy
gpd – gallons per day
MCAS – Marine Corps Air Station
MCL – maximum contaminant level
MCLG – maximum contaminant level goal
NCP – National (Oil and Hazardous Substances Pollution) Contingency Plan
NPDES – National Pollutant Discharge Elimination System
ppm – parts per million
RCRA – Resource Conservation and Recovery Act
RWQCB – (California) Regional Water Quality Control Board
STLC – soluble threshold limit concentration
SWRCB – (California) State Water Resources Control Board
TCE – trichloroethene
TCLP – toxicity characteristic leaching procedure
TDS – total dissolved solids
tit. – title
TSD – treatment, storage, and disposal
TTLC – total threshold limit concentration
U.S.C. – *United States Code*
VOC – volatile organic compound
WQO – water quality objective

11.2.1 Chemical-Specific ARARs

Chemical-specific ARARs are health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. If a chemical has more than one cleanup level, the most stringent level will be identified as an ARAR for this remedial action. The selected remedial action can be implemented to comply with chemical-specific ARARs.

The substantive provisions of the following requirements were identified as the most stringent of the potential federal and state groundwater ARARs for remedial actions at Sites 18 and 24:

- WQCP for the Santa Ana Region, 1995 (specifying water quality objectives and beneficial use)
- federal MCLs listed in the Safe Drinking Water Act (SDWA)
- state primary MCLs in Title 22 *California Code of Regulations* (Cal. Code Regs.)

Table 11-2
Location-Specific ARARs for Selected Remedy

Location/Requirement	Citation	ARAR Determination	Comments
		FEDERAL	
Hazardous Waste Control Act*			
Facility within 100-year floodplain must be designed, constructed, operated, and maintained to avoid washout.	Cal. Code Regs. tit. 22, § 66264.18(b)	Applicable	This requirement is applicable because some groundwater extraction and monitoring wells may be located within the 100-year floodplain.
Executive Order No. 11988, Protection of Floodplains*			
Actions taken within a floodplain should avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values.	40 C.F.R. § 6, Appendix A; excluding §§ 6(a)(2), 6(a)(4), 6(a)(6); 40 C.F.R. § 6.302(b)	Applicable	As indicated previously, this requirement is applicable because some of the proposed groundwater extraction and monitoring wells may be located within the floodplain.
National Archaeological and Historical Preservation Act*			
Construction within area where action may cause irreparable harm, loss, or destruction of significant artifacts.	Substantive requirements of 36 C.F.R. § 65, 40 C.F.R. § 6.301(c), 16 U.S.C. § 469	Applicable	Construction on previously undisturbed land would require records searches for cultural resources information or an archaeological survey of the area. Further evaluations of compliance with these requirements will be conducted when exact locations of wells are identified during engineering design work.

Note:
* statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader; listing the statutes and policies does not indicate that the DON accepts the entire statute or policy as a potential ARAR; specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs

Acronyms/Abbreviations:
§ – section
ARAR – applicable or relevant and appropriate requirement
Cal. Code Regs. – *California Code of Regulations*
C.F.R. – *Code of Federal Regulations*
DON – Department of the Navy
tit. – title
U.S.C. – *United States Code*

Table 11-3
Action-Specific ARARs for Selected Remedy

Action/Requirement	Citation	ARAR Determination	Comments
FEDERAL			
Resource Conservation and Recovery Act, 42 U.S.C. § 6901 et seq.*			
Person who generates waste shall determine whether waste is a hazardous waste.	Cal. Code Regs. tit. 22, § 66262.10(a), 66262.11	Applicable	Applicable for any operation where waste is generated. The determination of whether wastes generated during remedial activities, such as soil cuttings from well installation and treatment residues, are hazardous will be made when the wastes are generated.
Monitoring Requirements			
Requires that constituents of concern be identified.	Cal. Code Regs. tit. 22, § 66264.93	Relevant and appropriate	Relevant and appropriate for Sites 18 and 24. Not applicable because these sites are not regulated units. Table 8-1 identifies constituents of concern at Sites 18 and 24.
Requires that a groundwater monitoring system be established and provides requirements the system must meet.	Cal. Code Regs. tit. 22, § 66264.97(b) and (e)(1)–(5)	Relevant and appropriate	Relevant and appropriate for Sites 18 and 24. Not applicable because these sites are not regulated units. A groundwater monitoring plan will be developed during the remedial design phase.
Requires that the owner or operator of a regulated unit develop a detection monitoring program that will provide reliable indication of a release.	Cal. Code Regs. tit. 22, § 66264.98	Relevant and appropriate	Relevant and appropriate for Sites 18 and 24. Not applicable because these sites are not regulated units. A groundwater monitoring plan will be developed during the remedial design phase.
Requires that the owner or operator of a regulated unit develop an evaluation monitoring program that can be used to assess the nature and extent of a release from the unit.	Cal. Code Regs. tit. 22, § 66264.99	Relevant and appropriate	Relevant and appropriate for Sites 18 and 24. Not applicable because these sites are not regulated units. A groundwater monitoring plan will be developed during the remedial design phase.
Provides requirements for a corrective action program for a regulated unit.	Cal. Code Regs. tit. 22, § 66264.100(a), (b), (c), (d), (f), and (g)(1) and (3)	Relevant and appropriate	Relevant and appropriate for Sites 18 and 24. Not applicable because these sites are not regulated units. A groundwater monitoring plan will be developed during the remedial design phase.

(table continues)

Table 11-3 (continued)

Action/Requirement	Citation	ARAR Determination	Comments
		FEDERAL	
Pretransport Requirements			
Hazardous waste must be packaged in accordance with DOT regulations before transport.	Cal. Code Regs. tit. 22, § 66262.30	Applicable	Applicable for any operation where hazardous waste is generated and transported. The determination of whether wastes generated during remedial activities, such as soil cuttings from well installation at treatment residues, are hazardous will be made when the wastes are generated.
Hazardous waste must be labeled in accordance with DOT regulations before transport.	Cal. Code Regs. tit. 22, § 66262.31	Applicable	Applicable for any operation where hazardous waste is generated and transported. The determination of whether wastes generated during remedial activities, such as soil cutting from well installation at treatment residues, are hazardous will be made when the wastes are generated.
Provides requirements for marking hazardous waste before transport.	Cal. Code Regs. tit. 22, § 66262.32	Applicable	Applicable for any operation where hazardous waste is generated and transported. The determination of whether wastes generated during remedial activities, such as soil cutting from well installation at treatment residues, are hazardous will be made when the wastes are generated.
A generator must assure that the transport vehicle is correctly placarded before transport of hazardous waste.	Cal. Code Regs. tit. 22, § 66262.33	Applicable	Applicable for any operation where hazardous waste is generated and transported. The determination of whether wastes generated during remedial activities, such as soil cutting from well installation at treatment residues, are hazardous will be made when the wastes are generated.

(table continues)

Table 11-3 (continued)

Action/Requirement	Citation	ARAR Determination	Comments
FEDERAL			
Pretransport Requirements (continued)			
Establishes requirements for a generator to accumulate hazardous waste on-site for 90 days or less without a permit or grant of interim status.	Cal. Code Regs. tit. 22, § 66262.34	Applicable	Applicable for any operation where hazardous waste is generated and transported. The determination of whether wastes generated during remedial activities, such as soil cutting from well installation at treatment residues, are hazardous will be made when the wastes are generated.
Clean Air Act, 40 U.S.C. § 7401 et seq.*			
All new sources of air pollution that may result in a net emission increase of any nonattainment air contaminant or any halogenated hydrocarbons are to employ BACT.	SCAQMD Rule 1303	Applicable	Applicable to emissions from the air stripper system. Current SCAQMD policy requires BACT only when the net emissions increase exceeds 1 pound per day of any nonattainment air contaminant for a given unit. The SCAQMD BACT guidelines generally require the use of a carbon absorber as BACT to control off-gas. Treatment facilities will be equipped with carbon absorbers.
STATE			
State Water Resources Control Board and Regional Water Quality Control Board			
The sampling method and frequency of sampling shall be appropriate for the medium from which the samples are taken.	Cal. Code Regs. tit. 27, § 20415(e)(12)(b)	Relevant and appropriate	A groundwater monitoring plan will be developed during the remedial design phase.
South Coast Air Quality Management District			
Applies to stationary source, constructed or modified after effective date of requirement, that emits carcinogenic air contaminants.	SCAQMD Rule 1401	Applicable	Requires that applicant demonstrate that the cumulative impact of emissions from new or modified source and all other permitted units owned or operated by the applicant within 100 meters of the source are below a maximum individual cancer risk of 10^{-6}.

(table continues)

Table 11-3 (continued)

Action/Requirement	Citation	ARAR Determination	Comments
STATE			
South Coast Air Quality Management District (continued)			
Requires that T-BACT be employed for new stationary equipment when the operation of that equipment results in a higher-than-allowable maximum individual cancer risk.			T-BACT is required if maximum individual cancer risk exceeds this limit. Off-gas control for air stripper discharge is to be below the 10^{-6} threshold.
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land.	Cal. Civ. Code § 1471	Relevant and appropriate	Substantive provisions are the following general narrative standard: "to do or refrain from doing some act on his or her own land . . . where (c) Each such act relates to the use of land and each such act is reasonably necessary to protect present or future human health or safety or the environment as a result of the presence of hazardous materials, as defined in Section 25260 of the California Health and Safety Code." This narrative standard would be implemented through incorporation of restrictive covenants in the deed at the time of transfer.
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health & Safety Code § 25202.5	Relevant and appropriate	The substantive provisions of Cal. Health & Safety Code § 25202.5 are the general narrative standards to restrict "present and future uses of all or part of the land on which the . . . facility . . . is located . . . "
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property.	Cal. Health & Safety Code § 25222.1	Relevant and appropriate	Cal. Health & Safety Code § 25222.1 provides the authority for the state to enter into voluntary agreements to establish land-use covenants with the owner of the property. The substantive provision of Cal. Health & Safety Code § 25222.1 is the general narrative standard: "restricting specified uses of the property."

(table continues)

Table 11-3 (continued)

Action/Requirement	Citation	ARAR Determination	Comments
		STATE	
California Health and Safety Code (continued)			
Provides a process for obtaining a written variance from a land-use restriction.	Cal. Health & Safety Code § 25233(c)	Relevant and appropriate	Cal. Health & Safety Code § 25233(c) sets forth substantive criteria for granting variances based upon specified environmental and health criteria.

Note:
* statutes and policies, and their citations, are provided as headings to identify general categories of potential applicable or relevant and appropriate requirements; specific potential applicable or relevant and appropriate requirements are addressed in the table below each general heading

Acronyms/Abbreviations:
§ – section
ARAR – applicable or relevant and appropriate requirement
BACT – best available control technology
Cal. Civ. Code – *California Civil Code*
Cal. Code Regs. – *California Code of Regulations*
Cal. Health & Safety Code – *California Health and Safety Code*
C.F.R. – *Code of Federal Regulations*
DOT – Department of Transportation
DTSC – (California Environmental Protection Agency) Department of Toxic Substances Control
SCAQMD – South Coast Air Quality Management District
SVE – soil vapor extraction
T-BACT – best available control technology – toxics
tit. – title
U.S.C. – *United States Code*

- RCRA groundwater protection standards in Cal. Code Regs. tit. 22, § 66264.94(a)(1), (a)(3), (c), (d), and (e)

The most stringent of these requirements are the RCRA groundwater protection standards and Cal. Code Regs. tit. 22, § 66264.94 requirements to restore affected groundwater to background conditions, if possible, or else attain the best water quality that is technically and economically feasible.

The DON has determined that the substantive provisions of Cal. Code Regs. tit. 22, § 66264.94(a)(1), (a)(3), (c), (d), and (e) constitute relevant and appropriate federal ARARs for groundwater at Sites 18 and 24. These provisions are considered a federal ARAR because this requirement was approved by U.S. EPA in its 23 July 1992 authorization of the state of California's RCRA program and is federally enforceable. The state of California disagrees with the DON; this regulation is a part of the state's authorized hazardous waste control program, so the state contends that the regulation is a state ARAR and not a federal ARAR. See 55 Fed. Reg. 8765, 08 March 1990, and *United States v. State of Colorado*, 990 F.2d 1565 (1993).

11.2.1.1 WATER QUALITY CONTROL PLAN

Under SDWA and RCRA, a significant issue in identifying ARARs for groundwater is whether the groundwater can be classified as a source of drinking water. The U.S. EPA groundwater policy set forth in the NCP preamble uses the system in the U.S. EPA Guidelines for Groundwater Classification under the U.S. EPA Groundwater Protection Strategy (NCP, 55 Fed. Reg. 8752–8756). Under this policy, groundwater is classified in one of three categories (Class I, II, or III) based on ecological importance, its ability to be replaced, and vulnerability. Class I is irreplaceable groundwater currently used by a substantial population, or groundwater that supports a vital habitat. Class II consists of groundwater currently used or that might be used as a source of drinking water in the future. Class III is groundwater that cannot be used for drinking water because of its unacceptable quality (e.g., high salinity or widespread naturally occurring contamination) or insufficient quantity. The U.S. EPA guidelines define Class III as groundwater with TDS concentrations over 10,000 mg/L. The aquifer underlying Former MCAS El Toro is classified as a Class II aquifer and is designated by RWQCB Santa Ana Region as a potential source of drinking water, along with other beneficial uses such as agricultural and industrial.

11.2.1.2 SAFE DRINKING WATER ACT

MCLs under the SDWA are potential relevant and appropriate requirements for aquifers with Class I and II characteristics and, therefore, are potential federal ARARs. The point of compliance for MCLs under the SDWA is at the tap. The non-CERCLA components of the modified IDP comply with the SDWA by achieving MCLs at the tap. For CERCLA remedies, however, U.S. EPA indicates that MCLs should be attained throughout the contaminated plume, or at and beyond the edge of the waste management area when the waste is left in place (55 Fed. Reg. 8753). In this case, MCLs are cleanup goals throughout the VOC plume.

11.2.1.3 RCRA GROUNDWATER PROTECTION STANDARDS

Cal. Code Regs. tit. 22, § 66264.94 states that concentration limits for RCRA groundwater protection standards are set for RCRA-regulated units. These regulations provide that compounds must not exceed their background levels in groundwater or some higher concentration limit set as part of the corrective action program. A limit greater than background may be approved if the owner can demonstrate that it is not technologically or economically feasible to achieve the background value and that the constituent at levels below the concentration limit will not pose a hazard to human health or the environment. A concentration limit greater than background must never exceed MCLs established under the federal SDWA (Cal. Code Regs. tit. 22, § 66264.94[e]).

A discussion of the technical and economic infeasibility of remediating groundwater to background is presented in Appendix H of the OU-1 IAFS report (JEG 1996f). This document was reviewed and accepted by U.S. EPA, DTSC, and RWQCB. Therefore, as

provided for in Cal. Code Regs. tit. 22, § 66264.94, concentration limits based on MCLs and health-based criteria are considered remedial goals for Site 18 and Site 24.

The RCRA groundwater protection standards are applicable only to RCRA-regulated units, and Sites 18 and 24 are not considered RCRA-regulated units. However, the DON has concluded that substantive provisions of Cal. Code Regs. tit. 22, § 66264.94(a)(1), (a)(3), (c), (d), and (e) are relevant and appropriate federal ARARs for groundwater potentially affected by releases from these sites because the constituents being addressed are similar or identical to those found in RCRA hazardous wastes.

11.2.1.4 PRIMARY AND SECONDARY MCLs

Primary and secondary state MCLs are set forth in Cal. Code Regs. tit. 22, §§ 64431 (Maximum Contaminant Levels—Inorganic Chemicals), 64444 (Maximum Contaminant Levels—Organic Chemicals), and 64449 (Secondary Maximum Contaminant Levels and Compliance). MCLs for inorganics are not ARARs for Site 18 and Site 24 because there is evidence that exceedances for these chemicals result from naturally occurring subsurface conditions and past and current land uses not associated with the Former MCAS El Toro and the exceedances are being addressed separately by OCWD/IRWD.

11.2.1.5 THE DON's POSITION REGARDING SWRCB RESOLUTIONS 92-49 AND 68-16

The DON and the state of California have not agreed whether SWRCB Res. 92-49 and Res. 68-16 are ARARs for the remedial action at Site 18 and Site 24. Therefore, this ROD documents each party's position but does not attempt to resolve the issue.

The DON recognizes that the key substantive requirements of Cal. Code Regs. tit. 22, § 66264.94 (and the identical requirements of Cal. Code Regs. tit. 23, § 2550.4 and Section III.G of SWRCB Res. 92-49) require cleanup of constituents to background levels unless that is technologically or economically infeasible and an alternative cleanup level will not pose a substantial present or potential hazard to human health or the environment. In addition, the DON recognizes that these provisions are more stringent than the corresponding provisions of 40 C.F.R. § 264.94 and, although they are federally enforceable under RCRA, they are also independently based on state law to the extent that they are more stringent than the federal regulations.

The DON has also determined that SWRCB Res. 68-16 is not a chemical-specific ARAR for determining remedial action goals, but it is an action-specific ARAR for regulating discharged treated groundwater back into the aquifer should OCWD/IRWD elect to inject treated groundwater into the principal aquifer via well IDP-1. OCWD/IRWD would comply with 68-16 by injecting the treated groundwater into areas of the aquifer where TDS and nitrate levels are not markedly different. The DON has determined that further migration of VOCs through groundwater is not a discharge governed by the language in Res. 68-16. More specifically, the language of SWRCB Res. 68-16 indicates that it is prospective in intent, applying to new discharges in order to maintain existing high-quality waters. It is not intended to apply to restoration of waters that are already degraded.

The DON's position is that SWRCB Res. 68-16 and Res. 92-49 and Cal. Code Regs. tit. 23, § 2550.4 do not constitute chemical-specific ARARs for this remedial action because they are state requirements and are not more stringent than the federal ARAR provisions of Cal. Code Regs. tit. 22, § 66264.94. The NCP set forth in 40 C.F.R. § 300.400(g) provides that only state standards more stringent than federal standards may be ARARs (see also § 121[d][2][A][ii] of CERCLA).

The substantive technical standard in the equivalent state requirements (i.e., Cal. Code Regs. tit. 23, div. 3, ch. 15 and SWRCB Res. 92-49 and Res. 68-16) is identical to the substantive technical standard in Cal. Code Regs. tit. 22, § 66264.94. This section of Cal. Code Regs. tit. 22 will likely be applied in a manner consistent with equivalent provisions of other regulations, including SWRCB Res. 92-49 and Res. 68-16.

11.2.1.6 STATE OF CALIFORNIA'S POSITION REGARDING SWRCB RESOLUTIONS 68-16 AND 92-49

The state does not agree with the DON determination that SWRCB Res. 92-49 and Res. 68-16 and certain provisions Cal. Code Regs. tit. 23, div. 3, ch. 15 are not ARARs for this response action. SWRCB has interpreted the term "discharges" in the California Water Code to include the movement of waste from soils to groundwater and from contaminated to uncontaminated water (SWRCB 1994). However, the state agrees that the proposed action would comply with SWRCB Res. 92-49 and Res. 68-16, and compliance with Cal. Code Regs. tit. 22 provisions should result in compliance with Cal. Code Regs. tit. 23 provisions. The state does not intend to dispute the ROD, but reserves its rights if implementation of the Cal. Code Regs. tit. 22 provisions is not as stringent as state implementation of Cal. Code Regs. tit. 23 provisions. Because Cal. Code Regs. tit. 22 regulation is part of the state's authorized hazardous waste control program, it is also the state's position that Cal. Code Regs. tit. 22, § 66264.94 is a state ARAR and not a federal ARAR (*United States v. State of Colorado*, 990 F.2d 1565 [1993]).

Whereas the DON and the state of California have not agreed on whether SWRCB Res. 92-49 and Res. 68-16 and Cal. Code Regs. tit. 23, § 2550.4 are ARARs for this response action, this ROD documents each of the parties' positions on the resolutions but does not attempt to resolve the issue.

11.2.1.7 CLEANUP LEVELS

Cleanup levels for groundwater are set at health-based levels, reflecting current and potential use and exposure. Chemicals of concern in groundwater at Sites 18 and 24 are VOCs, several of which exceed federal or state MCLs. The remediation goals for these chemicals are based on federal and state MCLs and risk-based concentrations. Table 8-1 shows the remediation goals for chemicals of concern in groundwater.

11.2.2 Location-Specific ARARs

Location-specific ARARs are restrictions on the concentrations of hazardous substances or on activities solely because they are in specific locations such as floodplains, wetlands,

historic places, and sensitive ecosystems or habitats. The selected remedial action will be implemented to comply with location-specific ARARs.

Because some of the proposed groundwater extraction or monitoring wells may be located within a 100-year floodplain, Cal. Code Regs. tit. 22, § 66264.18(b) and substantive provisions of Executive Order (Exec. Order No.) 11988 are applicable as shown in Table 11-2. Exec. Order No. 11988 (Protection of Floodplains) (40 C.F.R. § 6, Appendix A, excluding § 6[a][2], [4], and [6]; 40 C.F.R. § 6.302) requires that actions within floodplains should avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values. None of the planned activities should have adverse effects on the floodplain.

The National Archaeological and Historical Preservation Act requires federally funded projects to identify and mitigate the effects of project activities on significant scientific, prehistoric, historic, or archaeological data. No prehistoric or historic sites were identified in existing data for the area that could be affected by the remedial action. Sites 18 and 24 are heavily disturbed, and it is unlikely that archeological surveys will be required for the groundwater extraction wells and monitoring wells. However, evaluation of this need will be made when the wells are located.

11.2.3 Action-Specific ARARs

Action-specific ARARs are technology- or activity-based requirements or limitations for remedial activities and apply to particular remediation activities. The selected remedial action can be implemented to comply with action-specific ARARs.

11.2.3.1 FEDERAL

Federal laws that give rise to potential ARARs for actions to be undertaken as part of the selected alternative include RCRA and the Clean Air Act. These regulations are discussed in the following paragraphs.

RCRA

Waste streams created during remedial action are subject to RCRA requirements for determining whether the wastes are hazardous.

Hazardous waste determinations for the soil cuttings from monitoring well installation and the spent carbon from the off-gas treatment would be made when the waste is generated. If these wastes are determined to be hazardous, then the appropriate requirements outlined in Table 11-3 for packaging, labeling, marking, placarding, and accumulating these materials for final disposal need to be followed.

Characterization of groundwater extracted from the shallow groundwater unit will be performed during the remedial design phase to evaluate whether RCRA design standards apply.

A groundwater monitoring program will be developed during the remedial design phase. The monitoring program will comply with the substantive requirements of Cal. Code

Regs. tit. 22, §§ 66264.93 and 66264.97 through 66264.100. These requirements are considered relevant and appropriate for Sites 18 and 24. They are not applicable because the sites are not RCRA-regulated units.

Clean Air Act

Off-gas from the air stripper must comply with substantive air emissions requirements of the SCAQMD. Requirements that have been incorporated in the State Implementation Plan (SIP) and are therefore considered to be potential federal ARARs include Rule 212 (the Standard for Approving Permits) and Rule 1303. These requirements and their applicability to the selected alternative are discussed below.

- Equipment should be designed, controlled, or equipped with air pollution control equipment that enables it to operate without emitting air contaminants in violation of Division 26 of the State of California Health and Safety Code or the SCAQMD rules.
- Public notification is required for significant projects, defined as having any of the following conditions:
  - units are located within 1,000 feet of the outer boundary of a school
  - the increase in on-site emissions exceeds any of the daily maximums specified in subdivision (g) of Rule 212
  - the resulting individual cancer risk equals or exceeds 1 in 1,000,000

Based on preliminary conceptual design estimates, the air stripper, which uses VGAC filters to remove VOCs and control TCE emissions, would not qualify as a significant project; therefore, public notification would not be required and Rule 212 is not an ARAR. In addition, public notification requirements are not ARARs because they are not environmental standards of control.

SCAQMD Rule 1303 requires that all new sources of air pollution that result in a net increase of any nonattainment air contamination or any halogenated hydrocarbons employ the BACT. Current SCAQMD policy (SCAQMD 1990) sets the threshold of net emissions increase at 1 pound per day of any nonattainment air contaminant, including reactive organic gases such as TCE, for any permitted unit when BACT is required. Current SCAQMD guidelines list carbon adsorption as the BACT for air strippers for groundwater treatment (SCAQMD 1990). Because carbon adsorption will be used to treat VOCs from the air stripper, the remediation will comply with BACT guidelines. Therefore, SCAQMD Rule 1303 is applicable for the remedial action at Sites 18 and 24.

11.2.3.2 STATE

California state requirements that are potential ARARs for actions to be undertaken as part of the selected alternative are described in the following subsections.

California Civil Code Section 1471 and California Health and Safety Code Sections 25202.5, 25222.1, and 25238(c)

State statutes that have been accepted by the DON as ARARs for implementing institutional controls and entering into an Environmental Restriction Covenant and Agreement with DTSC include substantive provisions of the Cal. Civ. Code § 1471 and the Cal. Health & Safety Code §§ 25202.5, 25222.1, and 25233(c).

The substantive provisions of Cal. Civ. Code § 1471 are the following general narrative standard: ". . . to do or refrain from doing some act on his or her own land . . . where . . . : (c) Each such act relates to the use of land and each such act is reasonably necessary to protect present or future human health or safety or the environment as a result of the presence on the land of hazardous materials, as defined in § 25260 of the Health and Safety Code." This narrative standard would be implemented through incorporation of restrictive environmental covenants in the deed at the time of transfer. These covenants would be recorded with the Environmental Restriction Covenant and Agreement and run with the land.

The substantive provision of Cal. Health & Safety Code § 25202.5 is the general narrative standard to restrict "present and future uses of all or part of the land on which the . . . facility . . . is located . . . ." This substantive provision will be implemented by incorporation of restrictive environmental covenants in the Environmental Restriction Covenant and Agreement at the time of transfer for purposes of protecting present and future public health and safety.

Cal. Health & Safety Code § 25222.1 provides the authority for the state to enter into voluntary agreements to establish land use covenants with the owner of property. The Cal. Health & Safety Code § 25222.1 Land Use Covenant Agreement, itself, is in the form of an agreement, and this procedural form does not qualify as a legally binding "applicable or relevant and appropriate" requirement under CERCLA because it is administrative (procedural) in nature. The substantive provision of Cal. Health & Safety Code § 25222.1 is the general narrative standard: "restricting specified uses of the property." Cal. Health & Safety Code § 25233(c) sets forth substantive criteria for granting variances from prohibited uses. The DON will comply with the substantive requirements of Cal. Health & Safety Code § 25222.1 by incorporating the CERCLA use restrictions described in Section 8.2.2.2 into the DON's deed of conveyance in the form of restrictive covenants under the authority of Cal. Civ. Code § 1471 and into the Environmental Restriction Covenant and Agreement. The substantive provisions of Cal. Health & Safety Code § 25222.1 may be interpreted in a manner that is consistent with the substantive provisions of Cal. Civ. Code § 1471. The covenants would be recorded with the deed and run with the land.

In addition to being implemented through the Environmental Restriction Covenant and Agreement between the DON and DTSC, the appropriate and relevant portions of the Cal. Health & Safety Code §§ 25202.5, 25221.1, and 25233(c) and Cal. Civ. Code § 1471 shall also be implemented through the deed between the DON and the transferee.

The U.S. EPA does not agree with the DON and DTSC that the sections of the Cal. Civ. Code and Cal. Health & Safety Code cited above are ARARs. These state regulations fail to meet the criteria for ARARs pursuant to U.S. EPA guidance (i.e., they are administrative, not substantive, requirements that establish a discretionary way to implement land-use restrictions). However, while U.S. EPA does not agree that these state regulations require the DON to enter into a land-use covenant with DTSC, U.S. EPA believes that, if necessary for the protection of human health and the environment, it may be appropriate for the DON to elect to enter into an enforceable written agreement with DTSC to enforce land-use restrictions at a site.

South Coast Air Quality Management District

The off-gas from the air stripper needs to comply with substantive SCAQMD requirements for air emissions. Requirements that have not been incorporated into the SIP and are therefore considered to be state ARARs include Rules 402 and 1401.

Rule 402. Rule 402 prohibits the discharge of any air emissions in quantities that may cause injury, detriment, nuisance, or annoyance to the public. The DON has determined that a "nuisance" condition does not exist at Site 18 or Site 24 and is not posed by the selected alternatives. In addition, other federal and state ARARs addressing actual and potential air emissions will assure adequate protection of human health and the environment.

Rule 1401. Rule 1401 involves new source review of carcinogenic air contaminants. It requires applicants to substantiate that the cumulative impacts of emissions from new, relocated, or modified permit units and from all other permit units within 100 meters that are owned or operated by the applicant, and for which applications were submitted on or after 01 June 1990, will not result in any of the following:

a. a maximum individual cancer risk (MICR) of greater than 1 in 1,000,000 (1×10^{-6}) at any receptor location, if the permit unit is constructed without toxics using best available control technology-toxics (T-BACT);

b. an increased MICR of greater than 10 in 1,000,000 (1×10^{-5}) at any receptor location, if the permit unit is constructed with T-BACT; and

c. more than 0.5 excess cancer cases in the population that is subject to a risk of greater than 1 in 1,000,000 (1×10^{-6}).

Furthermore, the MICR may not exceed 1/70 of the maximum allowable risk specified in item a or b above in any 1 year at receptor locations within residential areas.

Rule 1401 applies to the remedial action at Site 18 and Site 24 because the air stripper units represent new stationary sources of emission. Rule 1401 specifies the risk assessment and emission calculation procedures to be used in determining compliance with the requirements. An evaluation of whether the air emissions from the air stripper comply with Rule 1401 would be made during design of the IDP.

11.3 COST-EFFECTIVENESS

The selected remedy has been determined to provide overall effectiveness proportional to its costs; it is therefore considered cost-effective. The estimated net present-worth cost for this remedial action is approximately $30.6 million. This total includes capital costs of approximately $14.8 million, and O&M and monitoring costs of approximately $15.9 million. Capital and O&M costs include costs associated with construction and operation of monitoring wells, shallow groundwater unit extraction wells and conveyance pipelines, and costs associated with the VOC-related portion of the IDP nonpotable system (i.e., the CERCLA portion of the IDP delineated in Section 10.2). Technologies included in Alternative 8A and Alternative 10B′ are readily implementable and have been widely used and demonstrated to be effective. The cost of the selected alternative, although higher than the cost of the no action alternative, represents a low-cost, effective, permanent solution for groundwater remediation.

The preferred remedy and the proposed settlement agreement together benefit the DON, OCWD/IRWD, and the public. The DON benefits through avoidance of costs for groundwater injection or disposal. OCWD/IRWD benefits because the United States pays for a portion of the costs associated with the modified IDP. The public benefits from being able to reclaim a valuable water resource.

11.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT PRACTICABLE

The DON and the state of California have determined that the selected remedy represents the maximum extent practicable to which permanent solutions and alternative treatment technologies can be used cost-effectively at Sites 18 and 24. This alternative is protective of human health and the environment and complies with the ARARs for both sites. VOC contaminants within groundwater will be extracted and permanently destroyed. Although some residual contamination may remain in groundwater, the concentration should not be high enough to present a risk to human health. The selected alternative is readily implementable using standard equipment and methods. Remediation of groundwater is expected to take several decades.

The most decisive factors in the selection of Alternative 8A and Alternative 10B′ are that these alternatives will permanently reduce the toxicity and volume of VOC contaminants and will assist in restoration of the groundwater to its designated beneficial uses.

11.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

CERCLA Section 121(b) identifies a statutory preference for alternatives that use treatment to reduce the toxicity, mobility, or volume of contamination. The selected alternative complies with this requirement.