



**Final**

**Sampling and Analysis Plan, Addendum #1  
Removal Site Evaluation  
Operable Unit 2C - Anomaly Area 3**

**FORMER MARINE CORPS AIR STATION  
EL TORO, CALIFORNIA**

**January 2007**

Prepared for:

**Base Realignment and Closure  
Program Management Office West  
San Diego, California**

Prepared under:

**Naval Facilities Engineering Command  
Contract Number N62742-94-D-0048  
Contract Task Order 0068**



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Prepared by:

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Prepared under:

**Naval Facilities Engineering Command  
Contract Number N62742-94-D-0048  
Contract Task Order 0068**

**Sampling and Analysis Plan Addendum #1  
(Includes Field Sampling Plan and Quality Assurance Plan)  
Removal Site Evaluation  
Operable Unit 2C - Anomaly Area 3  
MCAS El Toro, California**

Contract No. N62742-94-D-0048  
Contract Task Order No. 0068

**Reviews and Approvals:**



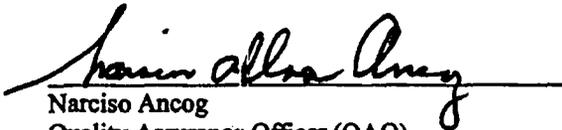
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## ACRONYMS AND ABBREVIATIONS

AA 3	Anomaly Area 3
BAI	Barajas and Associates, Inc.
BCT	BRAC Cleanup Team
BRAC	Base Realignment and Closure
CLEAN	Comprehensive Long-Term Environmental Action Navy
COPC	chemical of potential concern
CTO	contract task order
DON	Department of the Navy
DQO	data quality objectives
Earth Tech	Earth Tech, Inc.
ELAP	California State Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
ESI	expanded site inspection
FS	Feasibility study
FSP	field sampling plan
EWI	Environmental Work Instructions
IRCDQM	Navy Installation Restoration Chemical Data Quality Manual
LCS	laboratory calibration sample
MCAS	Marine Corps Air Station
MCL	maximum contaminant level
MDL	method detection limit
ml/min	milliliters per minute
MS	matrix spike
MSA	master services agreement
MSD	matrix spike duplicate
NFESC	Naval Facilities Engineering Service Center
NFEC SW SDIEGO	Southwest Division, Naval Facilities Engineering Command
PMO	program management office
PRG	preliminary remediation goal
QA	quality assurance
QAO	quality assurance officer
QAPP	quality assurance project plan
RI	remedial investigation
RPD	relative percentage of difference
RPM	remedial project manager
RSE	removal site evaluation
RWQCB	Regional Water Quality Control Board
SAP	sampling and analysis plan
SRA	screening risk assessment
SOP	standard operating procedure
SVOCs	semivolatile organic compounds
SWDIV	Naval Facilities Engineering Command, Southwest Division
TPH	total petroleum hydrocarbons

U.S.	United States
U.S. EPA	United States Environmental Protection Agency
VOCs	volatile organic compounds



## 1. Introduction

This Addendum to the Sampling and Analysis Plan (SAP), Appendix A of the Work Plan for the Removal Site Evaluation (RSE) (Final Work Plan, Removal Site Evaluation, Anomaly Area 3, Former Marine Corps Air Station, El Toro, California, August, 2002) (Earth Tech 2002), was prepared in response to regulatory agency requests to supplement the results of the RSE for Anomaly Area 3 (AA 3) at Former Marine Corps Air Station (MCAS), El Toro, California. **This Addendum is to be used in conjunction with the original Work Plan.**

This Addendum and the original WP were prepared by Earth Tech, Inc. (Earth Tech) on behalf of the United States (U.S.) Department of the Navy (DON), Southwest Division, Naval Facilities Engineering Command (NAVFAC SW; formerly abbreviated as Southwest Division [SWDIV]) and the Base Realignment and Closure (BRAC) Program Management Office (PMO) West, under Contract Task Order (CTO) numbers 0068 and 0078 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) II program, contract number N62742-94-D-0048.

The Regional Water Quality Control Board (RWQCB) indicated in comments on the Remedial Investigation (RI)/Feasibility Study (FS) (RI/FS) Report for AA 3 (Earth Tech, Inc. [Earth Tech] and Barajas and Associates, Inc. [BAI] 2005) that the sampling suite for groundwater at AA 3 should have included general minerals and common ions (general chemistry parameters). This SAP Addendum presents the revised field sampling plan (FSP), project data quality objectives (DQOs), and a quality assurance project plan (QAPP).

### 1.1 BACKGROUND AND PROJECT DESCRIPTION

Former MCAS El Toro is located in Orange County, California, approximately 8 miles southeast of Santa Ana and 12 miles northeast of Laguna Beach (Figure 1-1). Former MCAS El Toro covers approximately 4,738 acres. Land use around Former MCAS El Toro includes commercial, light industrial, and residential. Former MCAS El Toro closed on 2 July 1999, as part of the BRAC Act. AA 3 encompasses an area of approximately 9 acres and is located in the northwestern section of Former MCAS El Toro facility near Pusan Way, adjacent to the Agua Chinon Wash (Figure 1-2).

The WP for the RSE was issued in 2002 (Earth Tech 2002). The WP included the DQOs for the project and the SAP, which consisted of the FSP and the QAPP. A significant portion of the RSE investigation was performed between Fall 2002 and Winter 2003, with periodic groundwater sampling and well installation occurring through April 2005.

A Draft Expanded Site Inspection (ESI) Report (Earth Tech 2003) was prepared and submitted to regulatory agencies in 2003. The report presented results of previous investigations and the results of the RSE field investigation. The report also included results of a human health screening risk assessment (SRA) and an ecological SRA for AA 3. The DON received and responded to regulatory agency comments on the Draft ESI Report on 28 June 2004. Based on the comments received from the regulatory agencies and subsequent discussions during BRAC Cleanup Team (BCT) meetings, the DON agreed that additional site investigation and evaluation of AA 3 pursuant to a RI/FS was required and that a "no further action" determination of the Draft ESI Report was not appropriate at this stage of the process. Therefore, a RI/FS process was initiated.

Responses to regulatory agency comments on the Draft ESI Report (Earth Tech 2003) were incorporated into the Draft RI/FS Report (Earth Tech and BAI 2005) which was submitted to regulatory agencies in 2005.

The DON received regulatory agency comments on the Draft RI/FS Report and is presently formulating responses. This SAP Addendum has been prepared in response to RWQCB's comments regarding the adequacy of the groundwater characterization of groundwater at AA 3. This Addendum supplements the original groundwater sampling suite for AA 3 by adding general chemistry parameters including general minerals, common cations and anions, total dissolved solids (TDS), total alkalinity, and total hardness.

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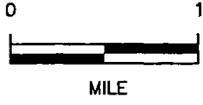
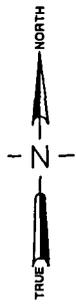
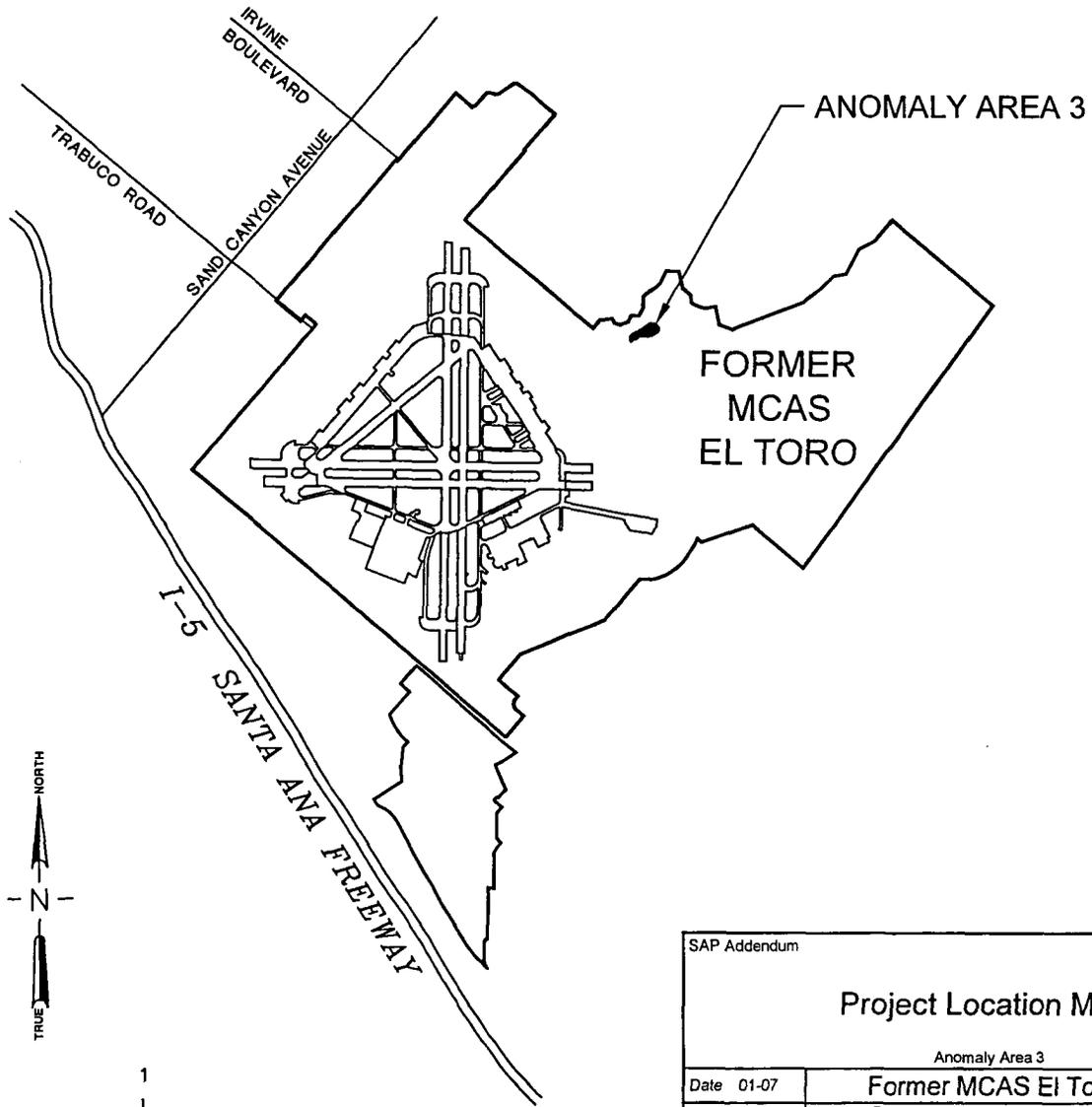
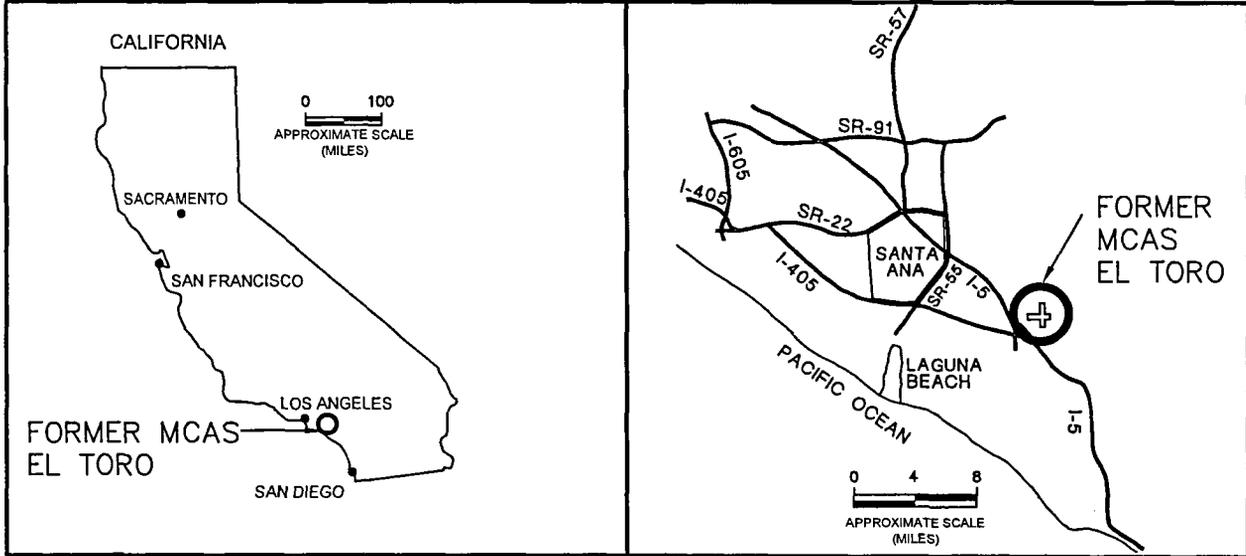
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AND ARE NOT AVAILABLE FOR PUBLIC VIEWING**

**FIGURES 1-1 AND 1-2**

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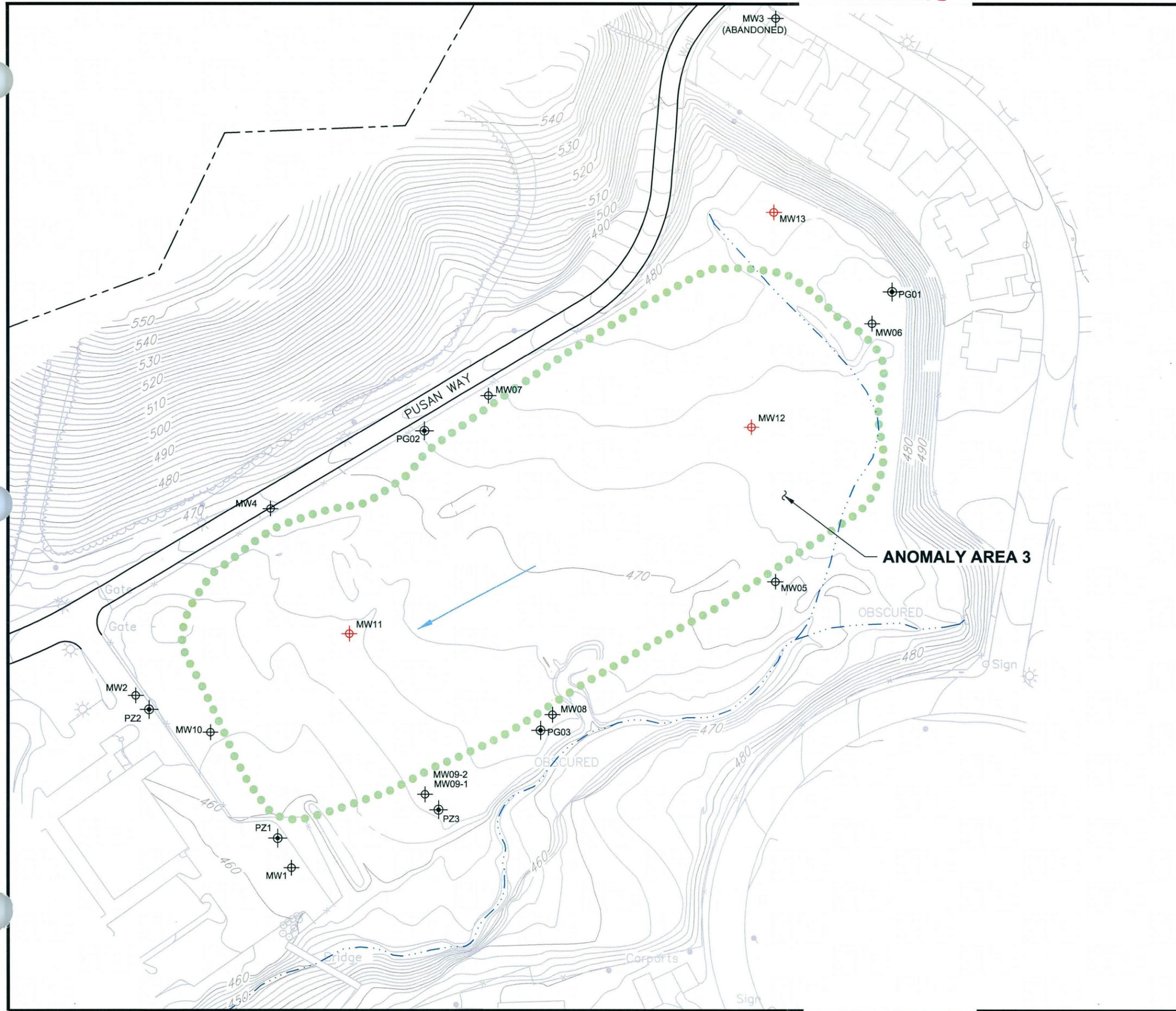


SAP Addendum		FINAL
<b>Project Location Map</b>		
Anomaly Area 3		
Date 01-07	<b>Former MCAS El Toro</b>	
Project No. 29307	 EarthTech <small>A Tyco International Ltd. Company</small>	Figure 1-1

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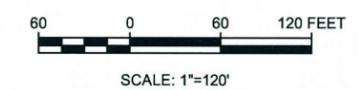


LEGEND

- MINOR SURFACE ELEVATION: 2-FOOT INTERVALS
- MAJOR SURFACE ELEVATION: 10-FOOT INTERVALS
- MCAS EL TORO BOUNDARY
- EXISTING STREAM OR WASH
- ESTIMATED EXTENT OF WASTE PLACEMENT BEFORE RSE INVESTIGATION (EARTH TECH 2001)
- RSE GROUNDWATER MONITORING WELL LOCATIONS
- ADDITIONAL GROUNDWATER MONITORING WELL LOCATIONS
- PERIMETER GAS MONITORING WELL/ VADOSE ZONE VAPOR WELL LOCATIONS
- GROUNDWATER GRADIENT DIRECTION - DECEMBER 2002
- UTILITY POLE
- STREET LIGHT
- FENCE

NOTES

1. TOPOGRAPHY COMPILED BY PHOTOGRAMMETRIC METHOD FROM AERIAL PHOTOGRAPHY DATED DECEMBER 2001 BY SAN-LO AERIAL SURVEYS.
2. COORDINATES ARE IN CALIFORNIA STATE PLANE COORDINATE SYSTEM, NAD 83, ZONE 6.
3. ELEVATIONS IN FEET; BENCHMARK BASED ON NORTH AMERICAN VERTICAL DATUM 1988.



SAP Addendum		FINAL
<b>Site Map</b>		
Anomaly Area 3		
Date: 01-07	<b>MCAS El Toro</b>	
Project No. 29307	<b>EarthTech</b> <small>A Tyco International Ltd. Company</small>	Figure 1-2

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## 2. Modifications

SAP Section	Text of Original SAP	Revised Text	Rationale
4.2.3 Decision Inputs	The Decision Inputs of the original SAP are not changed.	<p>Additional text: Data that will serve as inputs to the decisions are:</p> <ul style="list-style-type: none"> <li>• Groundwater monitoring results from wells in and around this site will be used to further define the groundwater characteristics and evaluate the presence of chemicals of potential concern (COPCs).</li> <li>• Previous soil, groundwater, and soil vapor sampling results have been incorporated into the data evaluation phase.</li> <li>• Regulations for groundwater monitoring of landfills described in California Title 22 and Title 27.</li> <li>• Background concentrations of metals and general chemistry parameters in groundwater as determined by upgradient wells AA3-MW06 and AA3-MW13 and selected stationwide groundwater monitoring wells (02NEW11, 02UGMW25, 17NEW02, 18BGMW02E, 18BGMW15, 18BGMW16, 18BGMW17, 18BGMW18, 18BGMW24, 19UGMW35, 19DBMW54, and 20DGMW88).</li> </ul> <p>The location of these stationwide groundwater monitoring wells is presented in Figure 3-1. These wells have been selected based on their location within the Station and are wells</p>	Additional work requested by the regulatory agency.

SAP Section	Text of Original SAP	Revised Text	Rationale
		<p>that apparently have not been impacted by the activities at the Station.</p> <p>Historical (1996 through 2005) total metal and common ion concentrations for these wells are compiled as part of the stationwide annual groundwater monitoring (CDM 2000a, 200b, 2001, and 2004).</p> <p>Additionally, if groundwater concentrations exceed background/ambient levels then, groundwater data will be evaluated against the following decision threshold:</p> <ul style="list-style-type: none"> <li>• Federal and California maximum contaminant levels (MCLs) or drinking water advisory thresholds for drinking water, as available. In absence of MCLs, U.S. EPA Region IX preliminary remediation goals (PRGs) for tap water will be used.</li> </ul>	
4.2.4 Study Boundaries	The study boundaries for the original SAP are not revised.	<p>Additional Text:</p> <p>The monitoring well network that will be used for evaluating the objectives of this Addendum include wells listed in Table 3-1.</p>	
4.2.5 Decision Rules	The decision rules of the original SAP remain in effect.	<p>Additional Text:</p> <p>The following decision rules will be applied to data collected from the monitoring well network,</p> <p><i>If</i> common ion concentrations at the point of compliance wells (as noted above) are comparable (within the prediction intervals described in Section 3.7.1) to common ion concentrations in</p>	

SAP Section	Text of Original SAP	Revised Text	Rationale
		<p>upgradient wells (as noted above) and other stationwide groundwater monitoring wells (as noted above), <i>then</i> the groundwater quality at the site has not been impacted by the wastes at the site and further assessment is not necessary.</p> <p><i>If</i> concentrations of common ions in point of compliance wells (as noted above) are not comparable (not within the prediction intervals) to concentrations in upgradient wells (as noted above) and other stationwide groundwater monitoring wells (as noted above), <i>then</i> the groundwater quality at the site may have been impacted by the wastes at the site and further assessment will be considered.</p> <p><i>If</i> metals concentrations at the point of compliance wells (as noted above) are within the station-wide background ranges (within the prediction intervals), <i>then</i> groundwater has not been impacted by wastes at the site.</p>	
4.2.6 Decision Error Limits	The discussion of the decision error limits remains the not changed.	In addition to the qualitative analysis of the potential for decision error provided in the Work Plan, decision error for the inter-well comparison will be the established prediction intervals of the individual analytes. The prediction intervals will be based on the analyte, the requirements of Title 22 and Title 27 regulations and discussions with regulatory agencies.	
4.2.7 Sampling Design	Description of the sampling design for the work in the original SAP is not changed.	The sampling design has by supplemented as described in Section 3.7 of this document.	Sampling design changes to be implemented by this document.

SAP Section	Text of Original SAP	Revised Text	Rationale
Figure 4-3 Sampling Locations	Sampling locations for work covered by the original SAP is not changed.	Figure 4-3 is updated with Figure 1-2 of this document.	Update of planned sampling locations.
Figure A-3-1 Organization Chart	The Organization Chart is changed.	Figure 5-1 of this document, Updated Organization Chart	Changes in Personnel
Table A-2-7 Planned Groundwater Sampling	The sampling described in the original SAP is unchanged.	Supplemented as shown in Tables 4-1a and 4-1b of this document.	
Table A-2-9 Requirements for Groundwater Sample Holding Times, Preservation and Containers	Table A-2-9	Table A-2-9 is replaced with Table 4-2 of this document.	Update of required sampling for these events.
A-3.2.3 Quality Control Requirements	All laboratory measurements will be performed in accordance with the Navy's IRCDQM (NFESC 1999) and the Earth Tech MSA. The laboratory is required to have an approved QA program with current SOPs for each method performed.	All laboratory measurements will be performed in accordance with the Navy's IRCDQM (NFESC 1999), including the DoD QSM (Version 3). The laboratory is required to have an approved QA program with current standard operating procedures (SOPs) for each method performed.	Update to current Navy requirements.
Table A-3-3 Project Quality Control Criteria for Groundwater Samples	Table A-3-3	Table A-3-3 is replaced with Table 5-1 of this document.	Update of current laboratory reporting limits and quality assurance criteria.

### 3. Data Quality Objectives

This Amendment supplements the original groundwater sampling suite for AA 3 by adding general chemistry parameters including general minerals, common cations and anions, TDS, total alkalinity, and total hardness. The original suite of analyses, described in the approved SAP, consisted of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPHs), perchlorate, and metals. The U.S. Environmental Protection Agency (U.S. EPA) DQO Process (U.S. EPA 2006) was used for the design of this supplemental evaluation. This DQO discussion supplements the original WP/SAP (Earth Tech 2002).

#### 3.1 PROBLEM STATEMENT

No changes to this section.

#### 3.2 PROJECT DECISION QUESTIONS

**RSE Study Question.** What is the risk posed by the site to human health and/or the environment? Are adequate data available to complete an RSE, including the design of a cover system?

In order to resolve the principal study question of the RSE investigation, the following additional project decision question will be considered.

1. Are adequate data available to confirm if there has been a release from the site to groundwater at point of compliance?

#### 3.3 DECISION INPUTS

Results from previous work conducted at this site were used in part to develop the scope of this investigation. Sampling performed at AA 3 during the course of this investigation will be used to resolve the project decision questions.

Data that will serve as inputs to the decisions are listed below.

- Groundwater monitoring results from wells in and around this site will be used to further define the groundwater characteristics and evaluate the presence of chemicals of potential concern (COPCs).
- Previous soil, groundwater, and soil vapor sampling results have been incorporated into the data evaluation phase.
- Regulations for groundwater monitoring of landfills described in California Title 22 and Title 27.
- Background concentrations of metals and general chemistry parameters in groundwater as determined by upgradient wells AA3-MW06 and AA3-MW13 and selected stationwide groundwater monitoring wells (02NEW11, 02UGMW25, 17NEW02, 18BGMW02E, 18BGMW15, 18BGMW16, 18BGMW17, 18BGMW18, 18BGMW24, 19UGMW35, 19DBMW54, and 20DGMW88).

The location of these stationwide groundwater monitoring wells is presented in Figure 3-1. These wells have been selected based on their location within the Station and are wells that apparently have not been impacted by the activities at the Station.

Historical (1996 through 2005) total metal and common ion concentrations for these wells are compiled as part of the stationwide annual groundwater monitoring (CDM 2000a, 200b, 2001, and 2004).

Additionally, if groundwater concentrations exceed background/ambient levels then, groundwater data will be evaluated against the following decision threshold:

- Federal and California maximum contaminant levels (MCLs) or drinking water advisory thresholds for drinking water, as available. In absence of MCLs, U.S. EPA Region IX preliminary remediation goals (PRGs) for tap water will be used.

### 3.4 STUDY BOUNDARIES

The study boundaries for the work specified in this document are the same as the boundaries specified in the RSE WP (Earth Tech 2002). Specifically, the monitoring well network that will be used for evaluating the objectives of this Addendum include wells listed in Table 3-1.

These monitoring wells are installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater entering the site from upgradient locations, within the waste, at cross gradient locations, and passing the point of compliance at the downgradient edge of the site. These wells are sufficient to provide the data needed to evaluate changes in groundwater quality due to a potential release from the wastes at the site.

Table 3-1: SAP Addendum #1 Monitoring Well Network

Well ID	Primary Purpose	Reason for Inclusion
<b>Downgradient Wells</b>		
MW01	Downgradient	Downgradient – Point of Compliance
MW02	Downgradient	Downgradient – Point of Compliance
MW04	Downgradient	Downgradient – Point of Compliance
MW10	Downgradient	Downgradient – Point of Compliance
<b>Upgradient Wells</b>		
MW06	Upgradient	Upgradient - Background
MW13	Upgradient - Replacement for MW03	Upgradient - Background
<b>Wells within Waste</b>		
MW11	Possible release location	First evidence of release
MW12	Possible release location	First evidence of release
MW14	Possible release location	First evidence of release
<b>Other Wells</b>		
MW08	Near Wash; Cross gradient	Transport Evaluation
MW09A	Near Wash; Cross gradient	Transport Evaluation
MW09B	Near Wash; Cross gradient	Transport Evaluation

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**PORTIONS OF THIS RECORD ARE CONSIDERED SENSITIVE  
AND ARE NOT AVAILABLE FOR PUBLIC VIEWING**

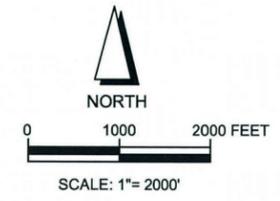
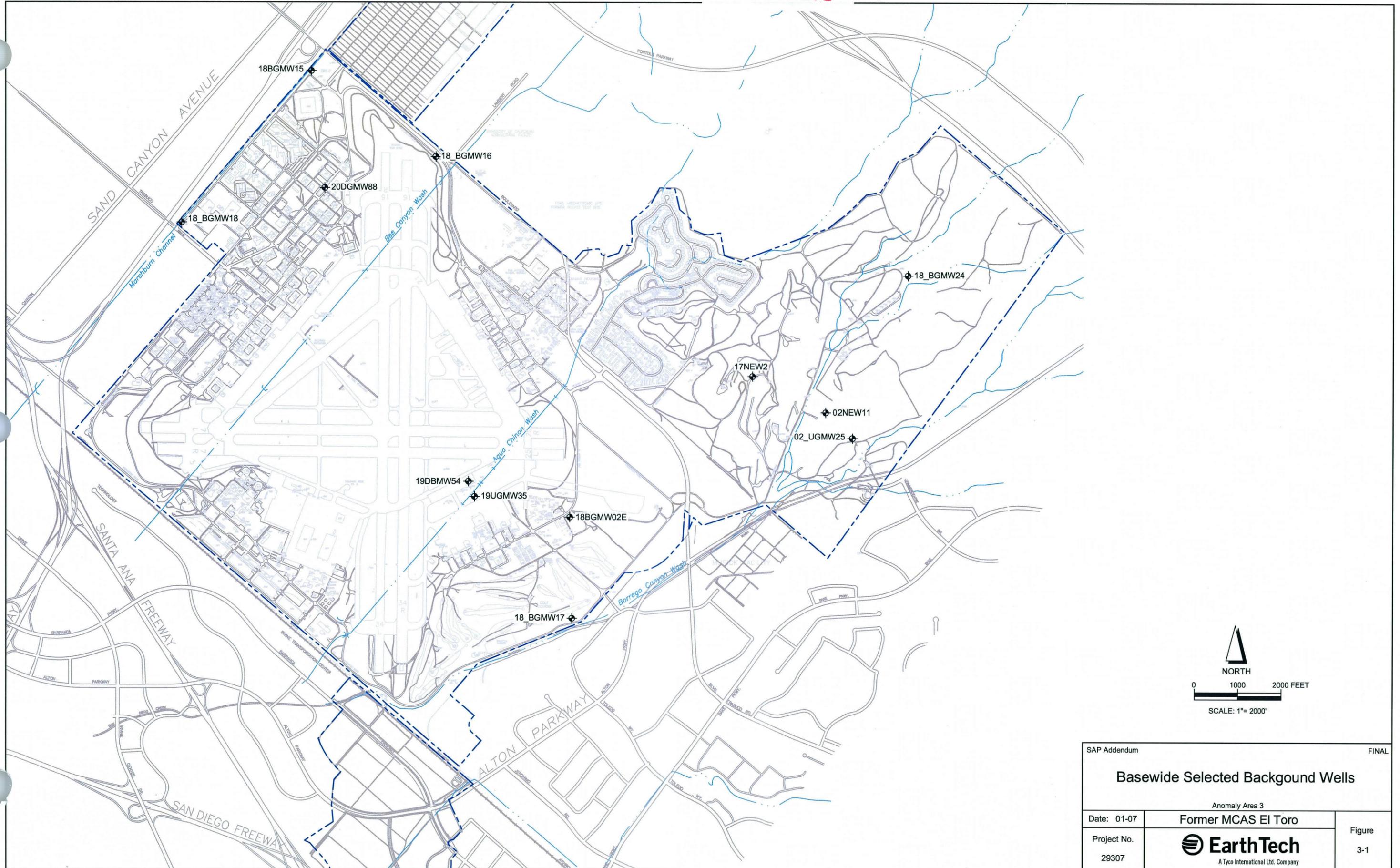
**FIGURE 3-1 – BASEWIDE SELECTED  
BACKGROUND WELLS**

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SAP Addendum		FINAL
Basewide Selected Background Wells		
Anomaly Area 3		
Date: 01-07	Former MCAS EI Toro	
Project No. 29307	 A Tyco International Ltd. Company	Figure 3-1

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### 3.5 DECISION RULES

The following decision rules will be applied to data collected from the monitoring well network,

*If* common ion concentrations at the point of compliance wells (as noted above) are comparable (within the prediction intervals described in Section 3.7.1) to common ion concentrations in upgradient wells (as noted above) and other stationwide groundwater monitoring wells (as noted above), *then* the groundwater quality at the site has not been impacted by the wastes at the site and further assessment is not necessary.

*If* concentrations of common ions in point of compliance wells (as noted above) are not comparable (not within the prediction intervals) to concentrations in upgradient wells (as noted above) and other stationwide groundwater monitoring wells (as noted above), *then* the groundwater quality at the site may have been impacted by the wastes at the site and further assessment will be considered.

*If* metals concentrations at the point of compliance wells (as noted above) are within the station-wide background ranges (within the prediction intervals), *then* groundwater has not been impacted by wastes at the site.

### 3.6 DECISION ERROR LIMITS

In addition to the qualitative analysis of the potential for decision error provided in the Work Plan, decision error for the inter-well comparison will be the established prediction intervals of the individual analytes. The prediction intervals will be based on the analyte, the requirements of Title 22 and Title 27 regulations and discussions with regulatory agencies.

### 3.7 SAMPLING DESIGN - GROUNDWATER

Twelve groundwater wells (Table 3-1) will be sampled during a monitoring round for parameters shown in Table 4-1a and 4-1b. Water level measurements will be recorded in monitoring logs prior to sample collection. These levels will assist in documenting groundwater flow directions and gradients at the site. If warranted, an additional round will be performed.

Groundwater samples will be collected from all 12 wells at the site for petroleum hydrocarbons, VOCs, SVOCs, metals (filtered), and general chemistry parameters. Additionally, during each round of sampling, field parameters (temperature, electrical conductivity, turbidity, dissolved oxygen, ORP, and pH) will be recorded.

After groundwater monitoring, data will be evaluated and incorporated into the RI/FS Report and submitted to the regulatory agencies for review and concurrence.

Using the point of compliance concept for evaluating whether releases at AA3 have occurred, the background well network used for the DUMPStat evaluation is AA3-MW03, AA3-MW06, and AA3-MW13 (upgradient wells) and other stationwide groundwater monitoring wells (02NEW11, 02UGMW25, 17NEW02, 18BGMW02E, 18BGMW15, 18BGMW16, 18BGMW17, 18BGMW18, 18BGMW24, 19UGMW35, 19DBMW54, and 20DGMW88). The downgradient point of compliance wells selected were AA3-MW01, AA3-MW02, AA3-MW04 and AA3-MW10.

### 3.7.1 Data Evaluation

Statistical evaluation of the data will be in accordance with the U.S. EPA *Interim Final Guidance Document - Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities* (1989), the addendum to that guidance (EPA 1992) and *The Statistical Methods for Evaluating Groundwater Monitoring From Hazardous Waste Facilities; Final Rule* (EPA 1988). This guidance is consistent and the requirements established in the California Code of Regulations (CCR) Title 22 and 27.

The historical background data set will be examined for outliers, anomalies, and trends that might confound the evaluation. To remove the possibility of outliers creating false statistical limits, the data will be tested for the existence of outliers, using the DUMPStat software. Outliers will be removed from consideration during the establishment of statistical limits.

The statistical evaluation will include inter-well monitoring to provide indication of a release from the facility. Wells and constituents that show similar variability in upgradient and downgradient monitoring zones will be compared by computing limits based on historical upgradient data. These limits will be used to compare new downgradient monitoring measurements to determine whether a statistically significant event has occurred. The decision factors for determining the most appropriate statistical methodology for use at the site are based on detection frequency and distributional form of the upgradient data, as discussed below.

### 3.7.2 DUMPStat Evaluation

DUMPStat is a statistical groundwater monitoring analyses system introduced by Discerning Systems in collaborative effort with R. D. Gibbons that is consistent with the USEPA Subtitle C, and D(40 CFR Part 258), all USEPA guidance, ASTM D6312-98 guidance and meets the intent of CCR Title 22 and 27.

Three cases can be assessed using the multiple group version of the Shapiro–Wilk test (Wilk and Shapiro 1968). These cases are: 1) compounds quantified in all background samples, 2) compounds quantified in at least 50% of all background samples, and 3) compounds quantified in less than 50% of all background samples. This approach allows for the calculation of normal, lognormal, nonparametric, and Poisson prediction limits depending on the detection frequency and distribution of the data. At least four quarters of background samples in at least two upgradient wells are required for the parametric tests and at least 20 to 30 background measurements are needed if nonparametric limits are used. Inter-well prediction limits are normally updated following each sampling event. The specific calculations are summarized in Gibbons and Discerning Systems (April 1994).

DUMPStat performs inter-well (upgradient and downgradient well) comparison and provides results in both graphical and tabular formats showing intermediate calculations. Appropriate prediction limits distribution testing, treatment of non-detects, trend analysis, and outlier detection are automatically generated by the program. DUMPStat:

- Determines whether there is a statistically significant evidence of release.
- Establishes a prediction interval that is constructed from the data on background wells.
- Uses the prediction interval to evaluate one or more future observations from the same population with a specified confidence.
- The concentrations from the compliance wells are then compared with prediction interval.
- If the compliance well concentrations do not fall in the prediction interval, this provides statistically significant evidence of release.

## 4. Field Sampling Plan

### 4.1 GROUNDWATER/SURFACE WATER

Filtered groundwater samples will be collected from monitoring wells shown on Figure 1-2 in accordance with procedures cited in the original SAP. The groundwater sampling and analysis summary is provided in the Tables 4-1a and b.

**Table 4-1a: Planned Groundwater Sampling and Analysis Summary**

Well ID	Planned Analyses
MW01	VOCs, SVOCs, Metals, Petroleum Hydrocarbons-extractable, Petroleum Hydrocarbons-volatile, General Chemistry
MW02	VOCs, SVOCs, Metals, Petroleum Hydrocarbons-extractable, Petroleum Hydrocarbons-volatile, General Chemistry
MW04	VOCs, SVOCs, Metals, Petroleum Hydrocarbons-extractable, Petroleum Hydrocarbons-volatile, General Chemistry
MW10	VOCs, SVOCs, Metals, Petroleum Hydrocarbons-extractable, Petroleum Hydrocarbons-volatile, General Chemistry
MW06	VOCs, SVOCs, Metals, Petroleum Hydrocarbons-extractable, Petroleum Hydrocarbons-volatile, General Chemistry
MW13	VOCs, SVOCs, Metals, Petroleum Hydrocarbons-extractable, Petroleum Hydrocarbons-volatile, General Chemistry
MW11	VOCs, SVOCs, Metals, Petroleum Hydrocarbons-extractable, Petroleum Hydrocarbons-volatile, General Chemistry
MW12	VOCs, SVOCs, Metals, Petroleum Hydrocarbons-extractable, Petroleum Hydrocarbons-volatile, General Chemistry
MW14	VOCs, SVOCs, Metals, Petroleum Hydrocarbons-extractable, Petroleum Hydrocarbons-volatile, General Chemistry
MW08	VOCs, SVOCs, Metals, Petroleum Hydrocarbons-extractable, Petroleum Hydrocarbons-volatile, General Chemistry
MW09A	VOCs, SVOCs, Metals, Petroleum Hydrocarbons-extractable, Petroleum Hydrocarbons-volatile, General Chemistry
MW09B	VOCs, SVOCs, Metals, Petroleum Hydrocarbons-extractable, Petroleum Hydrocarbons-volatile, General Chemistry

**Table 4-1b: Planned Groundwater Sampling and Analysis Summary**

Analysis	Groundwater Samples/Round (including duplicates and QA/QC samples)	Total No. of Samples (including duplicates and QA/QC samples)
VOCs	22	44
SVOCs	16	32
Metals	16	32
Petroleum Hydrocarbons (extractable/volatile)	16	32
General chemistry parameters	16	32

**Notes:**

SVOCs = semivolatile organic compounds

VOCs = volatile organic compounds

## 4.2 SAMPLE CONTAINERS AND PRESERVATION

Table 4-2 lists the chemical parameters to be tested and the types of containers and preservation methods to be used. These may be modified to accommodate selected laboratory preferences, but will meet the essential requirements of the method.

**Table 4-1: Requirements for Groundwater Sample Preservation, Maximum Holding Time, and Containers**

Analyte	Analytical Method(s)	Preservation	Maximum Holding Time	Number x Sample Container Type <sup>b</sup>
Total Volatile Petroleum Hydrocarbons	SW5030B/ SW8015B	HCl to pH<2 Cool to 4°C	14 days <sup>a</sup>	Three 40-ml VOC w/ Teflon-lined septa
Volatile Organic Compounds	SW5030B/ SW8260B	HCl to pH<2 Cool to 4°C	14 days <sup>a</sup>	Three 40-ml VOC w/ Teflon-lined septa
Total Extractable Petroleum Hydrocarbons	SW3520C/ SW8015B	Cool to 4°C	7 days <sup>b</sup> /40 days <sup>c</sup>	Two 1-L amber glass
Semivolatile Organic Compounds	SW3520C/ SW8270C	Cool to 4°C	7 days <sup>b</sup> /40 days <sup>c</sup>	Two 1-L amber glass
Semivolatile Organic Compounds – (SIM)	SW3520C/ SW8270C SIM	Cool to 4°C	7 days <sup>b</sup> /40 days <sup>c</sup>	Two 1-L amber glass
Metals (filtered)	SW3010A/ SW6010/ 7000	HNO <sub>3</sub> to pH<2	6 months <sup>a</sup> (28 days for mercury)	1-L plastic
pH	SW9045C	Cool to 4°C	immediately	250-mL plastic
Total Dissolved Solids	E160.1	Cool to 4°C	7 days <sup>a</sup>	500-mL polyethylene bottle w/ Teflon-lined cap
Chloride	E300.0	Cool to 4°C	28 days <sup>a</sup>	
Fluoride	E300.0	Cool to 4°C	28 days <sup>a</sup>	
Total Nitrate	E300.0	Cool to 4°C	28 days <sup>a</sup>	
Sulfate	E300.0	Cool to 4°C	28 days <sup>a</sup>	
Alkalinity (Bicarbonate, carbonate, hydroxide)	SM2320	Cool to 4°C	immediately <sup>a</sup>	250-mL polyethylene bottle w/ Teflon-lined cap

**Notes:**

°C = degrees Celsius

HNO<sub>3</sub> = nitric acid

L = Liter; ml = milliliter

<sup>a</sup> From sample collection to analysis.

<sup>b</sup> Sample container volumes may be modified to meet laboratory specific procedures.

## 5. Quality Assurance Project Plan

The QAPP for the investigation at AA 3 at Former MCAS El Toro has been prepared in accordance with the requirements and specifications of the following:

- U.S. Navy Engineering Command, Southwest Division, *Environmental Work Instructions* (EWI) (SWDIV 2001)

EWI #1 “Chemical Data Validation” (November 2001)

EWI #2 “Review, Approval, Revision, and Amendment of Sampling and Analysis Plans (SAPs)” (April 2006)

EWI #3 “Laboratory Quality Assurance Program” (November 2001)

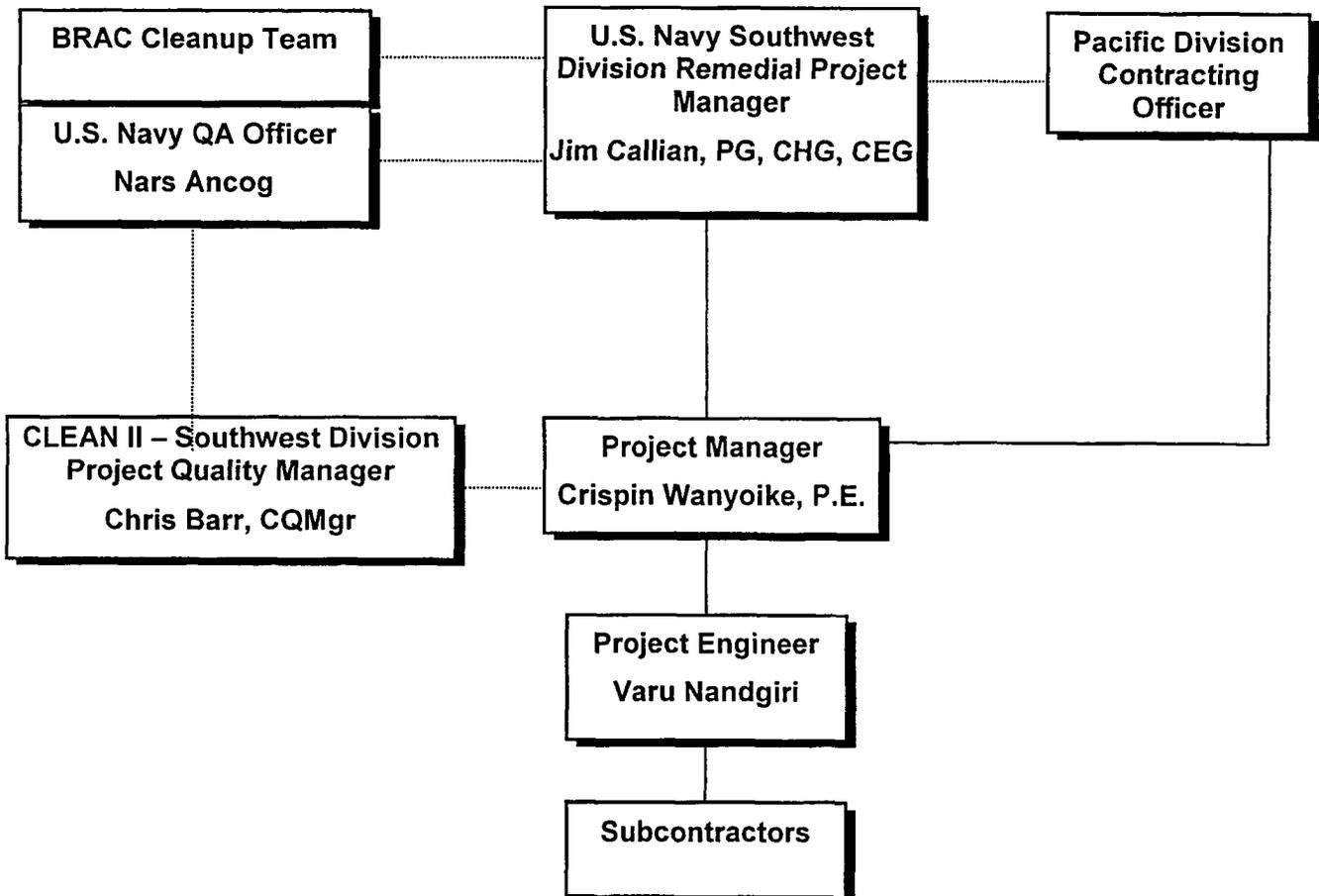
EWI #6 “Environmental Data Management and Required Electronic Data Delivery Standards” (April 2005)

- *Navy Installation Restoration Chemical Data Quality Manual (IRCDQM)*, October 1999

### 5.1 PROJECT MANAGEMENT

The project organization chart (Figure 5-1) identifies project team members.

Figure 5-1 Organization Chart



**5.2 SCHEDULE**

The field investigation will span approximately six months.

**5.3 LABORATORY ANALYTICAL METHODS AND REQUIREMENTS**

Laboratory services will be contracted under the Pacific Division Navy CLEAN II subcontracting system, which has master services agreements (MSAs) with Naval Facilities Engineering Service Center (NFESC)-evaluated (and approved) laboratories qualified to perform work for this project. The MSAs specify the work to be performed, which shall be done in accordance with the referenced method and the most recent version of the Department of Defense (DOD) Quality System Manual (DoD QSM, Version 3, January 2006). The target analyte list is presented in Table 5-1.

**Table 5-1: Project Quality Control Criteria for Groundwater Samples**

Analyte	Project Decision Threshold <sup>a</sup>	Reporting Limit Required	Precision (RPD)	Accuracy (%R) <sup>b</sup>	
				MS/MSD	LCS
<b>Total Volatile Petroleum Hydrocarbons (Extraction: SW 5030B. Analysis: SW8015B) (mg/L)</b>					
Volatile Petroleum Hydrocarbons	1	1	25	70-130	75-125
<b>Total Extractable Petroleum Hydrocarbons (Extraction: SW 3520C. Analysis: SW8015B) (mg/L)</b>					
Extractable Petroleum Hydrocarbons	1	1	50	50-150	60-140
<b>Volatile Organic Compounds (Extraction: SW5030B. Analysis: SW8260B) (µg/L)</b>					
1,1,1,2-Tetrachloroethane	0.43	0.2	30	65-135	65-135
1,1,1-Trichloroethane	200	1	20	70-130	75-125
1,1,2,2-Tetrachloroethane	1	1	20	70-130	75-125
1,1,2-Trichloroethane	5	1	20	70-130	75-125
1,1,2-Trichlorotrifluoroethane (F113)	1,200	5	50	50-150	50-150
1,1-Dichloroethane	5	1	20	70-130	75-125
1,1-Dichloroethene	7	1	20	70-130	75-125
1,2-Dichlorotetrafluoroethane (F114)	--	5	50	50-150	50-150
1,2-Dichloroethane	0.5	0.2	20	70-130	75-125
cis-1,2-Dichloroethene	61	1	20	70-130	75-125
trans-1,2-Dichloroethene	120	1	20	70-130	75-125
1,2-Dichloropropane	5	1	20	70-130	75-125
2-Butanone (MEK)	1,900	100	40	50-150	60-140
2-Hexanone	--	50	40	50-150	60-140
4-Methyl-2-pentanone (MIBK)	160	50	40	50-150	60-140
Acetone	610	100	40	50-150	60-140
Benzene	0.35	0.2	20	70-130	75-125
Bromodichloromethane	0.18	0.2	20	70-130	75-125
Bromoform	8.5	1	20	70-130	75-125
Bromomethane	8.7	1	20	70-130	75-125
Carbon disulfide	1,000	1	20	70-130	75-125
Carbon tetrachloride	0.17	0.2	20	70-130	75-125
Chlorobenzene	70	1	20	70-130	75-125

Table 5-1: Project Quality Control Criteria for Groundwater Samples

Analyte	Project Decision Threshold <sup>a</sup>	Reporting Limit Required	Precision (RPD)	Accuracy (%R) <sup>b</sup>	
				MS/MSD	LCS
Chloroethane	4.6	1	20	70-130	75-125
Chloroform	0.17	0.2	20	70-130	75-125
Chloromethane	1.5	1	20	70-130	75-125
cis-1,3-Dichloropropene	0.4	0.2	20	70-130	75-125
Dibromochloromethane	0.13*	0.2	20	70-130	75-125
Dichlorodifluoromethane (F12)	1	1	40	50-150	60-140
di-Isopropyl Ether (DIPE)	--	5	40	50-150	60-140
Ethyl tert-butyl ether (ETBE)	--	5	40	50-150	60-140
Ethylbenzene	10	1	20	70-130	75-125
Methyl tertiary butyl ether (MTBE)	5	3	20	70-130	75-125
Methylene chloride	4.3	3	20	70-130	75-125
Styrene	1,600	1	20	70-130	75-125
Tertiary amyl methyl ether (TAME)	--	5	40	50-150	60-140
Tertiary butyl alcohol (TBA)	12	2	20	70-130	75-125
Tetrachloroethene	1.1	1	20	70-130	75-125
Toluene	720	1	20	70-130	75-125
trans-1,3-Dichloropropene	0.4	0.2	20	70-130	75-125
Trichlorofluoromethane (F11)	1,300	5	40	50-150	60-140
Trichloroethene (TCE)	1.4	1	20	70-130	75-125
Vinyl Chloride	0.5	0.2	20	70-130	75-125
Xylenes (total)	210	2	20	70-130	75-125
<b>Semivolatile Organic Compounds (Extraction: SW3520C. Analysis: SW8270C) (µg /L)</b>					
1,2,4-Trichlorobenzene	190	10	30	44-142	44-142
1,2-Dichlorobenzene	370	10	30	42-155	42-155
1,3-Dichlorobenzene	5.5	5	30	36-125	36-125
1,4-Dichlorobenzene	5	5	30	30-125	30-125
2,2'-oxybis(1-Chloropropane)	0.96*	10	30	35-135	35-135
2,4,5-Trichlorophenol	3,600	10	30	25-175	25-175
2,4,6-Trichlorophenol	3.6*	10	30	39-128	39-128
2,4-Dichlorophenol	110	10	30	46-125	46-125
2,4-Dimethylphenol	730	10	30	45-139	45-139
2,4-Dinitrophenol	73	10	30	30-151	30-151
2,4-Dinitrotoluene	73	10	30	39-139	39-139
2,6-Dinitrotoluene	36	10	30	51-125	51-125
2-Chloronaphthalene	490	10	30	60-125	60-125
2-Chlorophenol	30	10	30	41-125	41-125
2-Methylphenol	1,800	10	30	25-125	25-125

Table 5-1: Project Quality Control Criteria for Groundwater Samples

Analyte	Project Decision Threshold <sup>a</sup>	Reporting Limit Required	Precision (RPD)	Accuracy (%R) <sup>b</sup>	
				MS/MSD	LCS
2-Nitroaniline	110	10	30	50-125	50-125
2-Nitrophenol	--	10	30	44-125	44-125
3,3'-Dichlorobenzidine	0.15*	10	30	29-175	29-175
3-Nitroaniline	--	50	30	51-125	51-125
4,6-Dinitro-2-methylphenol	--	50	30	26-134	26-134
4-Bromophenyl-phenylether	--	10	30	53-127	53-127
4-Chloro-3-methylphenol	--	10	30	44-125	44-125
4-Chloroaniline	150	10	30	45-136	45-136
4-Chlorophenyl-phenyl ether	--	10	30	51-132	51-132
4-Methylphenol	180	10	30	33-125	33-125
4-Nitroaniline	--	50	30	40-143	40-143
4-Nitrophenol	290	50	30	25-131	25-131
bis(2-Chloroethoxy)methane	--	10	30	49-125	49-125
Butylbenzylphthalate	7,300	10	30	26-125	26-125
Carbazole	3.4*	10	30	29-135	29-135
Di-n-butylphthalate	3,600	10	30	34-126	34-126
Di-n-octylphthalate	730	10	30	38-127	38-127
Dibenzofuran	24	10	30	52-125	52-125
Diethylphthalate	29,000	10	30	37-125	37-125
Dimethylphthalate	360,000	10	30	25-175	25-175
Hexachlorobutadiene	0.86*	10	30	25-125	25-125
Hexachlorocyclopentadiene	260	50	30	41-125	41-125
Hexachloroethane	4.8	5	30	25-153	25-153
Isophorone	71	10	30	26-175	26-175
N-Nitroso-diphenylamine	140	10	30	27-125	27-125
Nitrobenzene	3.4*	10	30	46-133	46-133
Pentachlorophenol	0.56*	10	30	28-136	28-136
Phenol	22,000	10	30	25-125	25-125
<b>Semivolatile Organic Compounds – SIM (Extraction: SW3520C. Analysis: SW8270C-SIM) (µg /L)</b>					
2-Methylnaphthalene	--	1	30	41-125	41-125
Acenaphthene	360	1	30	49-125	49-125
Acenaphthylene	--	1	30	47-125	47-125
Anthracene	1,800	1	30	45-165	45-165
Benzo(a)anthracene	0.09*	1	30	51-133	51-133
Benzo(a)pyrene	0.2	0.2	30	41-125	41-125
Benzo(b)fluoranthene	0.09*	1	30	37-125	37-125
Benzo(g,h,i)perylene	--	1	30	34-149	34-149

Table 5-1: Project Quality Control Criteria for Groundwater Samples

Analyte	Project Decision Threshold <sup>a</sup>	Reporting Limit Required	Precision (RPD)	Accuracy (%R) <sup>b</sup>	
				MS/MSD	LCS
Benzo(k)fluoranthene	0.92	0.2	30	37-125	37-125
bis(2-Ethylhexyl)phthalate	4.8	2	30	33-129	33-129
bis-(2-Chloroethyl)ether	0.01*	1	30	44-125	44-125
Chrysene	9.2	1	30	55-133	55-133
Dibenz(a,h)-anthracene	0.01*	1	30	50-125	50-125
Fluoranthene	1,500	1	30	47-125	47-125
Fluorene	240	1	30	48-139	48-139
Hexachlorobenzene	1	1	30	46-133	46-133
Indeno(1,2,3-cd)-pyrene	0.09*	1	30	27-160	27-160
N-Nitroso-di-n-propylamine	0.0036*	1	30	37-125	37-125
Naphthalene	6.2	1	30	50-125	50-125
Phenanthrene	--	1	30	54-125	54-125
Pyrene	180	1	30	47-136	47-136
<b>Metals (Preparation: SW 3010B; Analysis: Mercury SW7471, all other metals SW6020) (µg/L)</b>					
Aluminum	36,000	100	20	75-125	80-120
Antimony	6	10	20	75-125	80-120
Arsenic	50	1	20	75-125	80-120
Barium	2,000	10	20	75-125	80-120
Beryllium	4	4	20	75-125	80-120
Cadmium	5	2	20	75-125	80-120
Calcium	--	200	20	75-125	80-120
Chromium	50	5	20	75-125	80-120
Cobalt	730	5	20	75-125	80-120
Copper	1,000	10	20	75-125	80-120
Iron	11,000	50	20	75-125	80-120
Lead	15	5	20	75-125	80-120
Magnesium	--	100	20	75-125	80-120
Manganese	880	5	20	75-125	80-120
Mercury	2	0.5	20	75-125	80-120
Nickel	100	1	20	75-125	80-120
Potassium	--	400	20	75-125	80-120
Selenium	10	10	20	75-125	80-120
Silver	180	10	20	75-125	80-120
Sodium	--	2,000	20	75-125	80-120
Thallium	2	2	20	75-125	80-120
Vanadium	36	10	20	75-125	80-120
Zinc	11,000	10	20	75-125	80-120

**Table 5-1: Project Quality Control Criteria for Groundwater Samples**

Analyte	Project Decision Threshold <sup>a</sup>	Reporting Limit Required	Precision (RPD)	Accuracy (%R) <sup>b</sup>	
				MS/MSD	LCS
<b>Miscellaneous analytes (mg/L)</b>					
pH (units) (Method: SW9045C)	6.5-8.0	n.a.	20	0.5 units	0.10 units
Total Dissolved Solids (E160.1)	n.a.	100	20	75-125	80-120
Chloride (E300.0)	n.a.	10	20	75-125	80-120
Flouride (E300.0)	n.a.	1	20	75-125	80-120
Total Nitrate (E300.0)	45	0.5	20	75-125	80-120
Sulfate (E300.0)	n.a.	10	20	75-125	80-120
Alkalinity(bicarbonate, carbonate, hydroxide) (SM2320)	n.a.	10	20	75-125	80-120

**Notes:**

mg/L = milligrams per liter

µg/L = micrograms per liter

LCS = laboratory control sample

EPA = U.S. Environmental Protection Agency

-- = none established

MS = matrix spike

mdl = Method Detection Limit

\* Best possible laboratory reporting limits are greater than the project decision thresholds.

<sup>a</sup> The lower of California Modified PRGs, EPA Region 9 PRGs for residential tap water (October 2004 Update), or the drinking water MCL have been used. If the PRG is below the reporting limit for the laboratory method, the MCL was selected at the decisions threshold.

<sup>b</sup> Laboratory-specific performance criteria.

n.a. = not applicable

RPD = relative percentage of difference

% R = percent recovery

SW = Test Method Solid Waste (EPA 1997b)

WW = Water and Waste (EPA 1983)

MSD = matrix spike duplicate

**5.4 QUALITY CONTROL REQUIREMENTS**

All laboratory measurements will be performed in accordance with the Navy's *IRCDQM* (NFESC 1999), including the DoD QSM (Version 3). The laboratory is required to have an approved QA program with current standard operating procedures (SOPs) for each method performed.

Appendix A  
Regulatory Concurrence on Draft SAP Addendum #1 - Letters

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION IX  
75 Hawthorne Street  
San Francisco, CA 94105

21 November 2006

Mr. Darren Newton  
BRAC Environmental Coordinator  
Base Realignment and Closure  
Marine Corps Air Station El Toro  
7040 Trabuco Road  
Irvine, CA 92618

RE: Draft Sampling and Analysis Plan (SAP) Addendum #1, Removal Site Evaluation,  
Operable Unit 2C, Anomoly Area 3  
Former Marine Corps Air Station (MCAS) El Toro, California

Dear Mr. Newton:

The U.S. Environmental Protection Agency (EPA) has completed its review of the subject document. EPA has found the SAP Addendum #1 to be well-prepared and the information provided to acceptable. EPA has no comments on the SAP Addendum #1.

If you should have any questions, please feel free to call me at 415-972-3349.

Sincerely,

Rich Muza  
Remedial Project Manager  
Federal Facility and Site Cleanup Branch

cc. Content Arnold, NFECSW SDIEGO  
James Callian, NFECSW SDIEGO  
Quang Than, DTSC  
John Broderick, RWQCB  
Bob Woodings, RAB Co-Chair  
Marcia Rudolph, RAB Subcommittee Chair



## Department of Toxic Substances Control

---

Maureen F. Gorsen, Director  
5796 Corporate Avenue  
Cypress, California 90630



Arnold Schwarzenegger  
Governor



Linda S. Adams  
Secretary for  
Environmental Protection

December 15, 2006

Mr. Darren Newton  
BRAC Environmental Coordinator  
Marine Corps Air Station El Toro  
7040 Trabuco Road  
Irvine, California 92618

DRAFT SAMPLING AND ANALYSIS PLAN ADDENDUM NO. 1, REMOVAL SITE  
EVALUATION, OPERABLE UNIT 2C - ANOMALY AREA 3, FORMER MARINE CORPS  
AIR STATION EL TORO, IRVINE, CALIFORNIA

Dear Mr. Newton:

The California Department of Toxic Substances Control (DTSC) has completed the review of the subject document (SAP Addendum) which is dated November 2006 and prepared by Earth Tech, Inc. The SAP Addendum appears to be consistent with previously approved sampling plans at the site, but includes additional analyses requested by the Regional Water Quality Control Board. These analyses include general minerals, common cations and anions, total dissolved solids, total alkalinity, and total hardness. These analytes are necessary since Anomaly Area 3 has been found to meet some of the monitoring requirements for a landfill.

In addition, the SAP Addendum appears to add statistical analysis of groundwater data following U.S. EPA's "Interim Final Guidance Document - Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities" (EPA 1989) and "Statistical Methods for Evaluation Groundwater Monitoring from Hazardous Waste Facilities: Final Rule" (EPA 1988). The SAP proposes the use of a software package titled DUMPStat that is designed for this type of evaluation.

**SENSITIVE RECORD**

**PORTIONS OF THIS RECORD ARE CONSIDERED SENSITIVE  
AND ARE NOT AVAILABLE FOR PUBLIC VIEWING**

**ADDRESS OF PRIVATE CITIZEN**

**FOR ADDITIONAL INFORMATION, CONTACT:**

**DIANE C. SILVA, RECORDS MANAGER  
NAVAL FACILITIES ENGINEERING COMMAND, SOUTHWEST  
1220 PACIFIC HIGHWAY  
SAN DIEGO, CA 92132**

**TELEPHONE: (619) 556-1280  
E-MAIL: [diane.silva@navy.mil](mailto:diane.silva@navy.mil)**

**SENSITIVE**

Mr. Newton  
December 15, 2006  
Page 2 of 2

DTSC has no objection to these proposed changes as well as no comments on the SAP Addendum. If you have any questions about this letter, please contact me at (714) 484-5352 or qthan@dtsc.ca.gov.

Sincerely,



Quang Than  
Hazardous Substances Engineer  
Base Closure and Reuse Unit  
Office of Military Facilities  
Southern California Branch

cc: Content Arnold  
Naval Facilities Engineering Command Southwest  
1220 Pacific Highway  
San Diego, California 92132

Marcia Rudolph  
Restoration Advisory Board Subcommittee Chair  
24922 Muirlands #139  
Lake Forest, California 92630

Robert Woodings  
Restoration Advisory Board Co-chair  
25550 Commercentre Drive  
Lake Forest, California 92630

Richard Muza  
U.S. Environmental Protection Agency Region IX  
75 Hawthorne Street, Mail Code SFD-H8  
San Francisco, California 94105-3901

John Broderick  
California Regional Water Quality Control Board  
3737 Main Street, Suite 500  
Riverside, California 92501-3339

Manny Alonzo/David Murchison  
Department of Toxic Substances Control  
5796 Corporate Avenue  
Cypress, California 90630

**SENSITIVE**



**California Regional Water Quality Control Board**  
**Santa Ana Region**



**Linda S. Adams**  
Secretary for  
Environmental Protection

3737 Main Street, Suite 500, Riverside, California 92501-3348  
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[www.waterboards.ca.gov/santaana](http://www.waterboards.ca.gov/santaana)

**Arnold Schwarzenegger**  
Governor

December 26, 2006

Base Realignment and Closure  
Attn: Mr. Darren Newton  
BRAC Environmental Coordinator  
7040 Trabuco Road  
Irvine, California 92618

**COMMENTS ON DRAFT SAMPLING AND ANALYSIS PLAN, ADDENDUM #1,  
REMOVAL SITE EVALUATION, OPERABLE UNIT 2C, ANOMALY AREA 3,  
FORMER MARINE CORPS AIR STATION, EL TORO, GEOTRACKER No.  
DOD100131500**

Dear Mr. Newton:

We have reviewed the above referenced document, dated November 2006, which we received on November 9, 2006. We have no comments.

Please submit an electronic copy of the plan, the subsequent report(s), and the soil and groundwater analytical data to the State Water Resources Control Board's Geotracker website. For any questions, please call me at (951) 782-4494, or send email to [jbroderick@waterboards.ca.gov](mailto:jbroderick@waterboards.ca.gov).

Sincerely,

  
John Broderick  
SLIC/DoD Section

cc via email: Richard Muza, U.S. EPA, Region 9  
Quang Than, DTSC, Office of Military Facilities  
Content Arnold, BRAC PMO WEST

**California Environmental Protection Agency**

