DEPARTMENT OF TOXIC SUBSTANCES CONTROL
Region 4
24[illegible] West Broadway, Suite 350
[illegible] Beach, CA 90802-4444

M60050.001154

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MCAS EL TORO
SSIC # 5090.3

August 27, 1993

Mr. Andy Piszkin
Remedial Project Manager
Southwest Division
Naval Facilities Engineering Command
Code 1811
1220 Pacific Coast Highway
San Diego, California 92132-5181

Dear Mr. Piszkin:

MARINE CORPS AIR STATION EL TORO: DATA QUALITY OBJECTIVES (DQOs)

This letter transmits comments by the California Department of Toxic Substances Control on the position papers listed in the enclosure. The comments were previously transmitted to CH2M Hill in accordance with the schedule discussed at the last DQO meeting.

If you have any questions regarding this matter, please contact me at (310) 590-4878.

Sincerely,

Joe J. Zarnoch

Joe J. Zarnoch
Associate Hazardous Materials Specialist
Site Mitigation Branch

Enclosure

cc: Mr. John Hamill
U.S. Environmental Protection Agency
Region IX
Hazardous Waste Management Division, H-7-5
75 Hawthorne Street
San Francisco, California 94105-3901

recycled paper

cc: Mr. John Broderick
Regional Water Quality Control Board
Santa Ana Region
2010 Iowa Avenue, Suite 100
Riverside, California 92507-2409

Mr. John P. Christopher, Ph.D, D.A.B.T.
Office of Scientific Affairs
400 P Street, 4th Floor
P.O. Box 806
Sacramento, California 95812-0806

Commanding General
Attn: LCDR L. Serafini
Environmental Department, 1AU
Marine Corps Air Station
El Toro, California 92709-5010

State of California | Department of Toxic Substances Control

Memorandum

To : Joe Zarnoch
Site Mitigation Branch (SMB)
Region 4
245 W. Broadway, Suite 350
Long Beach, California 90802-4444

Date: 23 August 1993

From : Office of Scientific Affairs (OSA)
400 P Street, 4th Floor
P. O. Box 806
Sacramento, CA 95812-0806
Voice: (916) 255-2058 Fax: (916) 255-2093 (ATSS 8-494-2058,2093)

Subject : Marine Corps Air Station El Toro: Data Quality Objectives
PCA Code: 14650 Site Code: 400055-43

Background

Region 4 SMB has asked OSA for continuing support on issues regarding risk assessment at El Toro Marine Corps Air Station (ETMCAS). This is an NPL site in Orange County. Remedial activities are being directed by Naval Facilities Engineering Command, Southwest Division (SOUTHWESTDIV). The base is scheduled for closure during the 1990's.

Documents Reviewed

Several position papers were prepared by CH2M/Hill and Jacobs Engineering, contractors to SOUTHWESTDIV. Each deals with an aspect of risk assessment with respect to the process of developing data quality objectives (DQO) for Phase II of the remedial investigation (RI) at the base. The position papers are all in the form of memoranda addressed to Mr. Andy Piszkin of SOUTHWESTDIV. The papers we reviewed and their dates are as follows:

1. "Establishment of Cutpoints During the Data Quality Objectives Process", 6 August 1993
2. "Establishment of Background for Inorganics in Groundwater, Sediments, and Surface Water", 6 August 1993
3. "Chemicals to be Investigated During Phase II", 11 August 1993
4. "Statistical Design for Phase II Sampling", 11 August 1993
5. "Phase II Ecological Issues", 6 August 1993

General Comments

1. The papers were reviewed for scientific content. Minor grammatical or

typographical errors that do not affect the interpretation have not been noted. However, these should be corrected in any future versions.

2. Papers 1 and 2 are acceptable. Specific comments are given below for Papers 3, 4, and 5.

Specific Comments

Paper 3

OSA agrees with USEPA Region 9 that it would be desirable to compare site concentrations of metals to risk-based criteria before comparing them to background levels. This order of approach would eliminate those metals which pose no apparent threat to human health and would leave few candidate metals to compare to background for any given site or stratum. We are aware, however, that USEPA guidance allows the Navy to perform these comparisons in the reverse order if they so choose. Therefore, we have no objection to performing the comparisons in the order given in Paper 3.

Paper 4

The method of determining the appropriate number of samples for any given stratum during the Phase II RI is stated clearly. This number will be zero if no chemicals of potential concern remain after screening procedures described for Phase I. It would be desirable to have a minimum of five values available to calculate an exposure point concentration. Therefore, if a stratum with three values from Phase I requires sampling during Phase II, it seems that a minimum value of 2 can be identified for N. It would be useful to identify this minimum number of samples in a rigorous way.

Paper 5

1. The Department has draft guidance dated October 1992 for the conduct of ecological risk assessments. A copy of this guidance will be provided at the DQO meeting scheduled for early September 1993. Please incorporate these concepts into the assessment for this base.

2. Sediment in dry washes at MCAS El Toro are mobilized during storm events and travel eventually to upper Newport Bay. Therefore, these sediments should be evaluated for potential exposures to both terrestrial and aquatic species.

This approach is being taken (at the Department's request) for sediments in washes at Marine Corps Base Camp Pendleton.

3. Examination of the Attached table led to reconsideration of Table 7-30 in the Technical Memorandum of 7 May 1993. A large number of the criteria said to be protective of mammals are based on lowest observed adverse effect levels (LOAELs). These levels are associated with toxicity in the test species. How were these values converted to levels thought to be protective of mammals?

Conclusion

Position papers 1, 2, and 3 are acceptable. Paper 4 can be improved with an identification of a minimum value for N. Paper 5 requires additional explanation.

John P. Christopher, PhD, DABT
Staff Toxicologist
Human and Ecological Risk Section (HERS)

Reviewed by: Deborah Oudiz, PhD
Senior Toxicologist, HERS

cc: Dr. J. Parker, HERS

JACOBS ENGINEERING GROUP INC.

MEMORANDUM

TO: Andy Piszkin - Code 1812.AP **DATE:** 6 August 1993

FROM: Chuck Elliott - CH2M HILL/SAC
John Dolegowski - CH2M HILL/SCO

SUBJECT: **MCAS El Toro RI/FS**
Establishment of Cutpoints for Inorganics in Groundwater, Sediments, and Surface Water
CLE-C01-01F145-G2-0163

A methodology for establishing background concentrations for inorganics in surface soil samples collected during the Phase I Remedial Investigation (RI) at Marine Corps Air Station (MCAS) El Toro has been described in a separate memorandum. This memorandum will discuss issues and make recommendations related to the establishment of background concentrations for inorganics in groundwater, sediment, and surface water.

Groundwater

It is important to establish what are the ambient concentrations of inorganics in groundwater in the vicinity of MCAS El Toro in order to evaluate whether these concentrations have increased as a result of MCAS El Toro activities. It has been known for a long time that ambient concentrations of certain inorganics have been elevated in groundwater in the Irvine area. These high levels have been variously attributed to the influx of groundwater from marine sedimentary rocks in the Santa Ana Mountains, groundwater associated with unconsolidated lagoonal deposits in the basin itself, and agricultural activities. Inorganics that have been commonly found at elevated concentrations in the Irvine area have included Total Dissolved Solids (TDS), nitrate, selenium, and others. The Orange County Water District (OCWD) initially proposed the Desalter Project as a means of reducing concentrations of these substances in the groundwater.

Data from the Phase I RI at MCAS El Toro showed a high degree of variability in inorganics in groundwater samples collected on- and off-Station. It is uncertain at this time whether MCAS El Toro activities, including agricultural activities, have incrementally increased the concentrations of various inorganics in groundwater, or whether high concentrations result from geochemical processes or off-Station anthropogenic sources.

Because of the complexity of the geochemistry and the high variability of the data, it does not appear to be feasible to establish regional background concentrations for inorganics in groundwater at this time. Statistical methods would most likely result in very high concentrations being established as background, which may obscure possible increases in concentrations that have resulted from on-Station activities. In addition, statistical methods are inadequate to describe the natural geochemical variation in the

basin. The few existing monitoring wells that can be labeled as upgradient from MCAS El Toro show so much variability that it is difficult to clearly document anthropogenic increases across the Station. Finally, the use of some outside standard to establish background, such as Basin Objectives established in the California Regional Water Quality Control Board (RWQCB) Basin Plan, is not appropriate because concentrations of certain inorganics exceed these standards throughout the Irvine area.

We recommend that all groundwater samples collected during the Phase II RI be analyzed for Target Analyte List metals and major anions, including nitrate. The Data Quality Objectives (DQO) process will evaluate the groundwater monitoring system at each site and make recommendations regarding which wells will be sampled and whether additional wells should be installed. Geochemical analyses will be performed on RI data as part of the RI Report. This analysis may include modelling, a comparison of soil and groundwater data, a review of the literature (particularly, investigations that have taken place in the Irvine area), and a comparison of upgradient and downgradient groundwater data at each site. The evaluation of whether MCAS El Toro activities have incrementally increased concentrations of inorganics in groundwater should then be made on a site-by-site basis. The results of these analyses will be utilized by the baseline risk assessment and the Feasibility Study (FS).

Sediment

Sediment in the washes and surface soil at MCAS El Toro are geologically equivalent, in that both consist of alluvium deposited during the Quaternary Period and derived from the same source areas in the Santa Ana Mountains. In addition, samples were collected from the same depths in both sediment and surface soil during the Phase I RI. Also, the washes were dry most of the time. Therefore, we propose that inorganics data collected during Phase I will be compared to the reference background concentrations developed for surface soil in order to develop a list of Chemicals of Potential Concern (COPC). Similarly, inorganics in sediments that exceed background soil concentrations will be compared to Risk Based Concentrations (RBC) developed for a "recreational" scenario to evaluate whether further investigation is needed during Phase II. Any additional upgradient sediment sampling will be evaluated as part of Site 26 (Washes) in order to assess concentrations of organic chemicals, particularly pesticides and herbicides, that may be migrating onto MCAS El Toro through surface drainage.

Surface Water

We propose that no background screening take place for surface water sample data collected during Phase I. In other words, all detected organic and inorganic compounds will be placed on the COPC list. These detected compounds will then be screened against RBCs to evaluate whether further investigation is needed during Phase II. National Pollutant Discharge Elimination System (NPDES) storm water runoff sample data collected at MCAS El Toro (RWQCB Order No. 93-16) will be obtained and evaluated as part of the determination of chemicals to be investigated during Phase II. Also, it is expected that screening Phase I surface water data against Ambient Water Quality Chronic Exposure Criteria for Ecological Risk Assessment will be a factor in planning a Phase II surface water sample program. Any additional upgradient surface water samples will be collected during the Phase II RI for Site 26 (Washes). These data will be combined with Phase I upgradient data to evaluate ambient concentrations of

inorganic and organic compounds that are flowing onto MCAS El Toro in surface drainage.

CLE-C01-01F145-G2-0163
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cc: C. Mitchell - MCAS El Toro
J. Hamill - U.S. EPA, Region 9
S. Tindall - Bechtel
J. Zarnock - Cal-EPA/DTSC
J. Broderick - CRWQCB, Santa Ana

File - PMO
File - CTO Notebook/PMO
File - CH2M HILL

JACOBS ENGINEERING GROUP INC.

MEMORANDUM

TO: Andy Piszkin - Code 1812.AP **DATE:** 6 July 1993

FROM: Bruce Peterson/CH2M HILL/SEA
Chuck Elliott/CH2M HILL/SAC
John Dolegowski/CH2M HILL/SAC

SUBJECT: **MCAS El Toro RI/FS**
Chemicals to be Investigated During Phase II
Document Control #CLE-C01-01F145-G2-0161

The Chemicals of Potential Concern (COPC) list identifies chemicals that were detected during the Phase I Remedial Investigation (RI) at MCAS El Toro. Each of these COPC will be evaluated during the Baseline Risk Assessment. However, not all of the chemicals will be investigated during Phase II of the RI. The approach developed to identify chemicals for Phase II investigation is based on the use of risk-based concentration (RBC) criteria. This process provides assurance that chemicals that may contribute risk to human health are investigated during Phase II. Other parameters will also be investigated during Phase II that are selected based on environmental risk and physical parameters for the evaluation of potential remedial actions.

RBCs were developed for chemicals detected during the El Toro Phase I investigation. The methodology used to calculate RBCs is discussed in a seperate position paper. The RBC for each chemical is the chemical concentration that would present a 10^{-6} excess lifetime risk for carcinogens or a hazard index of 1 for non-carcinogens based on the MCAS El Toro assessment scenerio. The ratio of the chemical concentration found in a sample to the RBC represents the fraction of the risk presented by that sample.

By using the risk ratio for each compound for each sample the relative contribution to the risk can be estimated for each sample by adding the risk ratios across chemicals. Chemicals that make an insignificant contribution to risk can be safely deleted from investigation in Phase II. Because laboratories do not analyze samples for individual chemicals but rather classes of chemicals, risk is aggregated across chemical classes to evaluate the need for Phase II analysis of the class.

The identification of chemicals for investigation in Phase II is a seven-step process:

1. Begin with the list of COPC.

2. Link the RBCs for each chemical with the COPC list so that the appropriate RBC is associated with each chemical in the COPC list.

3. Calculate the risk ratio as the ratio of detected chemical concentration to the RBC for each chemical.

4. For each sample add the risk indices by chemical group (e.g. semi-volatiles, pesticides, etc.)

5. Find the maximum risk index (i.e., the sum of ratios for each chemical) for each chemical group across all samples in each stratum.

6. List the maximum risk indices by chemical group for each stratum.

7. Identify all chemical groups for each strata that have a maximum risk index greater than or equal to 1. Calculate the residual risk from the remaining chemical groups. If the residual risk is greater than 1, then add the chemical group that is the largest contributor to the residual risk to the investigation list. Continue this process until the residual risk is less than 1. The final investigation list contains all of the chemical groups to be investigated during Phase II as contributors to the overall risk at MCAS El Toro.

Table 1 provides a summary of this calculation for each RI site and presents a list of classes of chemicals that will be investigated during Phase II.

cc: H. Nezafati - CH2M HILL/SCO
M. Bitner - CH2M HILL/ABQ
J. Martinson - CH2M HILL/CVO
File - PMO
File - CTO Notebook/PMO
File - CH2M HILL

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

Table 1
Chemicals to be Investigated During the Phase II RI by Class

Site	Strata	Matrix	Analysis Class	Maximum Risk Ratio	Maximum Hazard ratio
00		GW	GENL		.0294
			PEST	13.53	.0395
			SVOL	3.62	.0301
			TOTM	41.10	3.8588
			VOL	151.36	.3602
				209.60	4.3180
	BGA	SS	HERB		1.9346
			PEST	10.75	.0357
				10.75	1.9703
	BGC	SS	PEST	.54	.0024
				.54	.0024
	BGN	SB	TOTM		.0000
				0.00	.0000
	BGR	SS	PEST	1.50	.0045
				1.50	.0045
01		GW	GENL		.0016
			TOTM	28.77	.6862
				28.77	.6878
		SB	VOL		.0000
				0.00	.0000
		SS	TOTM		.0000
				0.00	.0000
	GN	SS	VOL	.00	.0002
				.00	.0002

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

02		GW	GENL		.0017
			TOTM	128.89	1.5552
			VOL	63.95	2.0764
				192.84	3.6333
		SB	HERB		3.4276
			SVOL	.02	.0001
			TOTM	.02	.0000
			VOL		.0000
				.03	3.4278
02	EF	SD	TOTM	.00	
				.00	0.0000
		SR	DISM	.07	
			TOTM	2.49	
				2.56	0.0000
	LF	SB	HERB		.0000
			TOTM		.0000
			VOL		.0000
				0.00	.0001
		SS	HERB		.3709
			TOTM		.0000
			VOL		.0000
				0.00	.3710
	MM	SD	PEST	.00	
			SVOL	.00	
			TOTM	.00	
			VOL	.00	
				.00	0.0000
	SA	SS	PEST	.03	.0003
			SVOL	.19	.0016
			TOTM		.0000
			VOL		.0000
				.22	.0019

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

	WF	SD	PEST	.00	
			TOTM	.00	
			VOL	.00	
				---	---
				.00	0.0000
		SR	DISM	.06	
			TOTM	1.70	
				---	---
				1.75	0.0000
03		GW	GENL		.0042
			PEST	26.06	.0764
			SVOL	.33	.0027
			TOTM	123.29	2.0861
03		GW	VOL	3.62	.0131
				---	---
				153.29	2.1825
		SB	HERB		.2666
			VOL	.00	.0000
				---	---
				.00	.2666
	AC	SD	PEST	.00	
			SVOL	.00	
			TOTM	.00	
				---	---
				.00	0.0000
		SR	DISM	.12	
			PEST	.00	
			SVOL	.02	
			TOTM	.78	
				---	---
				.92	0.0000
	LF	GW	GENL		.0016
			TOTM	219.86	1.3241
			VOL	2.17	.0078
				---	---
				222.03	1.3335
		SB	HERB		.4776
			VOL	.00	.0000
					.0000
				---	---
				.00	.4776

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

		SS	DIOXF	.50	
			PEST	.51	.0032
			TOTM		.0002
			VOL		.0000
				1.01	.0033
04		GW	GENL		.0032
			TOTM	57.53	3.1127
			VOL	4.86	
				62.39	3.1159
		SB	SVOL	.01	.0001
			VOL		.0000
				.01	.0001
		SD	TOTM	.00	
				.00	0.0000
04	DD	SS	GENL		.0000
			PEST	1.81	.0070
			SVOL	12.32	.0058
			TOTM		.0005
			VOL		.0000
				14.13	.0132
	SA	GW	GENL		.0035
			TOTM	55.48	.5523
				55.48	.5558
		SB	TOTM		.0000
			VOL		.0000
					.0000
				0.00	.0000
		SS	PEST	.01	.0000
			TOTM		.0001
			VOL		.0000
				.01	.0001

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

05		GW	GENL		.0024
			TOTM	82.19	1.8020
			VOL	.85	.0247
				83.04	1.8292
		SB	HERB		1.6071
					1.9879
			PEST	.01	.0001
			SVOL	.02	.0002
			VOL		.0000
				.03	3.5953
	LF	SS	PEST	.27	.0036
			TOTM		.0001
			VOL		.0000
				.27	.0037
06		GW	GENL		.0052
			SVOL		.0006
			TOTM		4.0487
				0.00	4.0545
06		SB	VOL		.0000
				0.00	.0000
		SD	SVOL	.00	
			TOTM	.00	
			VOL	.00	
				.00	0.0000
		SS	TOTM		.0000
				0.00	.0000
	DD	SS	SVOL	.01	.0001
			TOTM		.0003
			VOL	.01	.0005
				.02	.0009
	GN	SS	SVOL	.64	.0053
			TOTM	.00	.0032
			VOL	.00	.0003
				.64	.0088

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

	ST	SB	TOTM		.0002
			VOL		.0000
				.00	.0000
				.00	.0002
		SS	SVOL	.05	.0004
			TOTM		.0001
			VOL	.01	.0006
				.06	.0011
07		GW	GENL		.0116
			TOTM	14.38	3.4796
			VOL	74.54	3.2386
				88.92	6.7297
		SB	SVOL		.0000
			VOL	.01	.0004
				.01	.0004
	DD	SS	TOTM		.0001
07	DD	SS	VOL		.0000
				0.00	.0001
	GN	GW	GENL		.0026
			TOTM	48.75	2.0078
			VOL	2.30	.1115
				51.05	2.1220
		SB	TOTM		.0000
			VOL		.0000
				0.00	.0000
		SS	PEST	1.48	.0058
			SVOL	8.82	.0016
			TOTM		.0019
			VOL	.00	.0000
				10.29	.0092
	NP	SS	PEST	.01	.0001
			SVOL	95.21	.0018
			TOTM		.0007
			VOL		.0000
				95.22	.0025

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

	OP	GW	GENL		.0041
			TOTM		.9396
			VOL	1.15	.0558
				1.15	.9995
		SB	VOL		.0000
				0.00	.0000
	ST	GW	GENL		.0047
			TOTM		1.7893
			VOL	3.84	.1859
				3.84	1.9799
		SB	SVOL		.0000
					.0000
			TOTM		.0003
					.0000
			VOL	.00	.0000
				.00	.0003
07	ST	SS	PEST	.39	.0030
			SVOL	79.24	.0013
			TOTM		.0003
			VOL	.00	.0002
				79.63	.0048
08		GW	GENL		.0096
			TOTM	39.04	.9713
			VOL	102.73	3.4771
				141.77	4.4580
		SB	PEST		.0000
			SVOL	.04	.0003
			VOL		.0000
				.04	.0004
	ESY	SB	SVOL	.03	.0002
			TOTM		.0000
			VOL	.00	.0000
				.00	.0000
				.03	.0002

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

	GN	SS	SVOL		.0000
			VOL		.0000
				---	---
				0.00	.0000
	PCB	SS	PEST	81.38	.0172
			SVOL	.02	.0002
			TOTM		.0005
			VOL		.0000
				---	---
				81.40	.0178
	RE	SB	SVOL		.0000
					.0000
			VOL		.0000
					.0000
				---	---
				0.00	.0001
		SS	PEST	1006.18	.1964
			SVOL	.54	.0046
			TOTM	.00	.0034
			VOL	.01	.0001
				---	---
				1006.73	.2045
	ST	SB	SVOL		.0000
				---	---
				0.00	.0000
08	ST	SS	PEST	43.93	.0083
			SVOL	4.00	.0006
			TOTM		.0030
			VOL		.0000
				---	---
				47.92	.0119
09		GW	GENL		.0065
			TOTM		1.4060
			VOL	122.57	6.3438
				---	---
				122.57	7.7563
		SB	TOTM		.0000
				---	---
				0.00	.0000

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

	PT	GW	GENL		.0052
			TOTM		.1254
			VOL	824.92	44.6391
				824.92	44.7697
		SB	SVOL	.02	.0002
				.30	.0025
			TOTM		.0004
			VOL		.0000
					.0000
				.32	.0031
		SS	SVOL		.0000
			TOTM		.0002
			VOL	.00	.0003
				.00	.0004
10		GW	GENL		.0043
			SVOL		.0026
			TOTM	30.82	.4848
			VOL	30.49	1.2481
				61.31	1.7398
		SB	VOL	.00	.0000
				.00	.0000
	GN	SB	TOTM		.0000
			VOL		.0000
				0.00	.0000
10	GN	SS	SVOL	17.06	.0005
			TOTM		.0000
			VOL	.00	.0002
				17.07	.0007
11	DD	SS	PEST	90.08	.0019
				90.08	.0019
	GN	SS	PEST	124.78	.0016
				124.78	.0016

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

12		GW	GENL		.0062
			HERB		287.9551
			TOTM		1.9021
			VOL	4.20	.1570
				4.20	290.0203
		SB	VOL		.0000
			—	0.00	.0000
		SD	PEST	.02	
			SVOL	.00	
			TOTM	.00	
			VOL	.00	
				.02	0.0000
	1SL	GW	GENL		.0063
			TOTM		2.0192
			VOL	14.46	.3446
				14.46	2.3700
		SB	TOTM		.0000
					.0000
			VOL		.0000
					.0000
				0.00	.0001
		SS	HERB		.7160
			PEST	9.23	.0100
			SVOL	33.76	.0005
			TOTM		.0002
			VOL	.01	.0004
				43.00	.7271
12	2SL	SB	PEST	.06	.0004
			TOTM		.0000
					.0000
			VOL		.0000
				.06	.0004

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

		SS	GENL		.0000
			HERB		.2948
			PEST	3.22	.0038
			SVOL	.01	.0001
			TOTM		.0000
			VOL	.01	.0005
				3.24	.2992
	DD	SS	GENL		.0000
			HERB		1.1653
			PEST	74.04	.0932
			SVOL	24.00	.0005
			TOTM	.01	.0011
			VOL	.02	.0009
				98.07	1.2611
	SLUDGE	SS	GENL		.0000
			HERB		.2399
			TOTM		.0002
			VOL		.0000
				0.00	.2401
13		GW	GENL		.0079
			SVOL	4.27	.0356
			TOTM		12.8848
			VOL	1182.32	.0058
				1186.60	12.9341
		SB	VOL	.00	.0000
					.0000
				.00	.0000
	2SL	SS	SVOL	4.84	.0002
			TOTM		.0005
			VOL		.0000
				4.84	.0007
13	GN	SB	TOTM		.0000
					.0000
			VOL		.0000
				0.00	.0000

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

	SS	SVOL		10.75	.0001
		TOTM			.0001
		VOL			.0000
				---	---
				10.75	.0002
SA	GW	GENL			.0032
		TOTM			2.0983
		VOL		37.25	.0003
				---	---
				37.25	2.1019
	SB	PEST		.02	.0002
		SVOL		.01	.0001
				.01	.0001
		TOTM			.0000
		VOL			.0000
					.0000
				---	---
				.04	.0004
	SS	TOTM			.0001
		VOL			.0000
				---	---
				0.00	.0002
14	GW	GENL			.0071
		TOTM			5.4648
		VOL		106.26	3.6928
				---	---
				106.26	9.1647
	SB	SVOL		1.28	.0107
		TOTM			.0000
		VOL			.0000
					.0000
				---	---
				1.28	.0107
	SD	SVOL		.02	
		TOTM		.00	
				---	---
				.02	0.0000
	SS	TOTM			.0001
		VOL			.0000
				---	---
				0.00	.0001

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

14	DD	SS	SVOL	31.16	.0005
			TOTM		.0004
			VOL	.00	.0002
				31.16	.0010
	GN	SS	SVOL	181.78	.0025
			TOTM		.0019
			VOL		.0000
				181.78	.0044
15		SS	SVOL	.05	
			VOL		.0000
				.05	.0000
	GN	GW	GENL		.0174
			TOTM		5.3431
			VOL	194.35	.0023
				194.35	5.3628
		SB	TOTM		.0000
					.0000
			VOL		.0000
					.0000
				0.00	.0001
		SS	SVOL	.02	.0002
			TOTM		.0001
			VOL	.00	.0000
				.02	.0003
16		GW	GENL		.0069
			TOTM	349.32	3.4170
			VOL	1.45	.0052
				350.76	3.4290
		SB	SVOL		.0062
					.0041
			TOTM		.0000
					.0000
			VOL	.06	.0012
				.05	.0014
				.11	.0130

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

16	DD	SS	TOTM		.0000
			VOL	.01	.0003
				.01	.0004
	GN	SB	TOTM		.0000
			VOL		.0000
				0.00	.0000
		SS	SVOL		.0005
			TOTM		.0006
			VOL	.00	.0000
				.00	.0011
	PT	GW	GENL		.0061
			TOTM		3.4694
				0.00	3.4755
		SB	TOTM		.0000
					.0000
				0.00	.0000
		SS	SVOL	.02	.0122
			TOTM		.0000
			VOL	.01	.0011
				.04	.0133
17		GW	GENL		.0002
			TOTM	115.07	1.1589
			VOL	55.44	.1449
				170.50	1.3040
		SB	TOTM		.0001
			VOL		.0000
				0.00	.0001
	LF	SS	PEST	.18	.0021
			SVOL	10.39	.0001
			TOTM	.00	.0002
			VOL		.0000
				10.57	.0025

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

17	SA	SB	HERB		1.5036
					1.0709
			TOTM	.02	.0000
			VOL		.0000
					.0000
				.02	2.5745
		SS	HERB		.0004
			PEST	.31	.0027
			SVOL		.0075
			TOTM		.0007
			VOL	.00	.0001
				.31	.0113
18		GW	GENL		.0183
			HERB		7.8904
			PEST	30.52	.0913
			SVOL	3.12	.0260
			TOTM	2506.85	13.1235
			VOL	437.30	11.6745
				2977.79	32.8241
		SB	PEST	.07	.0004
				1.75	.0088
			TOTM		.0000
					.0000
			VOL	.00	.0001
				1.82	.0093
		SD	PEST	.00	
			SVOL	.00	
			TOTM	.00	
			VOL	.00	
				.00	0.0000
		SR	DISM	.30	
			PEST	.03	
			SVOL	.03	
			TOTM	1.59	
			VOL	.07	
				2.01	0.0000

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

	X	SB	PEST	1.03	.0026
			SVOL	.01	.0004
			TOTM		.0001
			VOL	.00	.0001
					.0000
				1.04	.0033
19		GW	GENL		.0035
			TOTM	20.55	2.7616
			VOL	.68	.0174
				21.23	2.7825
		SB	SVOL	159.59	.0033
			TOTM		.0000
			VOL		.0000
				159.59	.0034
		SS	VOL		.0000
				0.00	.0000
	1FB	SB	SVOL	.03	.0002
			VOL		.0000
					.0000
				.03	.0002
		SS	SVOL	64.37	.0018
			TOTM		.0000
				64.37	.0018
	2FB	SB	TOTM		.0000
			VOL		.0000
					.0000
				0.00	.0000
		SS	TOTM	.01	.0000
			VOL		.0000
				.01	.0000
	EXC	GW	GENL		.0033
			TOTM	20.55	1.3788
			VOL	.68	.0130
				21.23	1.3952

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

		SB	SVOL		.0006
				.02	.0001
			VOL		.0000
					.0000
				.02	.0007
19	EXC	SS	VOL		.0000
				0.00	.0000
20		AQ	VOL	.00	
				.00	0.0000
		GW	GENL		.0053
			TOTM		1.5177
				0.00	1.5230
		SB	VOL	.00	.0000
				.00	.0000
		SD	SVOL	.07	
			TOTM	.00	
				.07	0.0000
	DD	GW	GENL		.0042
			TOTM	16.44	3.1935
			VOL	.20	.0108
				16.64	3.2086
		SB	TOTM		.0000
					.0000
			VOL		.0000
				0.00	.0001
		SS	PEST	1.12	.0057
			SVOL	1.01	.0108
			TOTM		.0007
			VOL		.0000
				2.12	.0172

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

	GN	SS	SVOL	.21	.0031
			TOTM		.0001
			VOL		.0002
				---	---
				.21	.0034
	SA	SS	SVOL	18.82	.0001
			TOTM		.0058
			VOL	.01	.0004
				---	---
				18.83	.0062
21		AQ	VOL	.00	
				---	---
				.00	0.0000
		GW	GENL		.0119
			TOTM		2.3364
			VOL	12.70	.3427
				---	---
				12.70	2.6910
		SB	TOTM		.0000
			VOL		.0000
				---	---
				0.00	.0000
		SD	PEST	.03	
			SVOL	2.20	
			TOTM	.00	
			VOL	.00	
				---	---
				2.22	0.0000
	GN	GW	GENL		.0062
			TOTM		.4746
				---	---
				0.00	.4808
		SB	PEST		.0000
			TOTM		.0000
				.01	.0000
				---	---
				.01	.0000
		SS	HERB		.0002
			PEST	.15	.0017
			VOL		.0000
				---	---
				.15	.0019

TABLE 1
CHEMICALS TO BE INVESTIGATED
DURING THE PHASE II RI (BY CLASS)

22	1FB	GW	GENL		.0051
			TOTM	34.93	1.5601
			VOL	428.14	22.7492
				---	---
				463.07	24.3144
		SB	PEST	.02	.0001
			SVOL		.0000
				.08	.0007
			VOL	.00	.0000
					.0000
				---	---
				.10	.0008
22	1FB	SS	SVOL	15.74	.0004
			TOTM		.0001
			VOL		.0000
				---	---
				15.74	.0005
	2FB	SB	TOTM		.0000
			VOL	.00	.0000
					.0000
				---	---
				.00	.0001
		SS	SVOL	.02	.0016
			TOTM		.0000
			VOL		.0000
				---	---
				.02	.0016
WP		GW	TOTM	41.10	.2977
			VOL	8.41	.0952
				---	---
				49.51	.393

JACOBS ENGINEERING GROUP INC.

MEMORANDUM

TO: Andy Piszkin - Code 1812.AP **DATE:** 6 August 1993

FROM: Bruce Peterson - CH2M HILL/SEA
Chuck Elliott - CH2M HILL/SAC
John Dolegowski - CH2M HILL/SCO

SUBJECT: **MCAS El Toro RI/FS**
Chemicals to be Investigated During Phase II (Surface Soils)
CLE-C01-01F145-G2-0161

The Chemicals of Potential Concern (COPC) list identifies chemicals that were detected during the Phase I Remedial Investigation (RI) at MCAS El Toro. Each of these COPC will be evaluated during the Baseline Risk Assessment. However, not all of the chemicals will be investigated during Phase II or the RI. The approach developed to identify chemicals for the Phase II investigation is based on the use of risk-based concentration (RBC) criteria. This process provides assurance that chemicals that may contribute risk to human health are investigated during Phase II. Other parameters will also be investigated during Phase II that are selected based on environmental risk and physical parameters for the evaluation of potential remedial actions.

RBCs were developed for chemicals detected during the El Toro Phase I investigation The methodology used to calculate RBCs is discussed in a separate position paper. The RBC for each chemical is the chemical concentration that would present a 10^{-6} excess lifetime risk for carcinogens or a hazard index of 1 for noncarcinogens based on the MCAS El Toro assessment scenario. The ratio of the chemical concentration found in a sample to the RBC represents the fraction of the risk presented by that sample.

By using the risk ratio for each compound for each sample the relative contribution to the risk can be estimated for each sample by adding the risk ratios across chemicals. Chemicals that make an insignificant contribution to risk can be safely deleted from investigation in Phase II. Because laboratories do not analyze samples for individual chemicals but rather classes of chemicals, risk is aggregated across chemical classes to evaluate the need for Phase II analysis of the class.

The identification of chemicals for investigation in Phase II is a seven-step process:

1. Begin with the list of COPC. The preparation of this list includes a comparison to background for inorganics.

2. Match the appropriate RBC to each chemical on the COPC list.

3. Calculate the risk ratio as the ratio of detected chemical concentration to the RBC for each chemical.

4. For each sample add the risk ratios within each chemical group (e.g., semi-volatiles, pesticides, etc.)

5. Find the maximum risk index (i.e., the sum of risk ratios) for each chemical group across all samples in each stratum.

7. Identify for further investigation all chemical groups for each strata that have a maximum risk index greater than or equal to 1. Calculate the residual risk from the remaining chemical groups. If the residual risk is greater than 1, then add the chemical group that is the largest contributor to the residual risk to the investigation list. Continue this process until the residual risk is less than 1. The resulting investigation list contains all of the chemical groups to be investigated during Phase II as contributors to the overall risk at MCAS El Toro.

COPC that are not identified for investigation at a particular site or stratum by the process described above may still be investigated during Phase II. For example, RBCs reflect risk to human health. A separate method will be used to select COPC that may pose an environmental risk. In addition, other chemical or physical parameters may be analyzed to support the selection of potential remedial alternatives.

Finally, the Data Quality Objectives team may elect to retain certain chemicals for further investigation during Phase II, even though they did not survive the screening process described above. Factors that may affect this decision include the consideration of whether the chemical poses a risk at other sites or strata, or whether the chemical is known to have been in general use at MCAS El Toro.

CLE-C01-01F145-G2-0161
mm/100206A9.SCO\93\JD

cc: H. Nezafati - CH2M HILL/SCO
M. Bitner - CH2M HILL/ABQ
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C. Mitchell - MCAS El Toro
J. Hamill - U.S. EPA, Region 9
S. Tindall - Bechtel
J. Zarnock - Cal-EPA/DTSC
J. Broderick - CRWQCB, Santa Ana

File - PMO
File - CTO Notebook/PMO
File - CH2M HILL

PREPARED FOR: MCAS El Toro RI/FS

PREPARED BY: Bruce Peterson/CH2M HILL SEA

DATE: August 20, 1993

SUBJECT: Statistical Design for phase II sampling

PROJECT: SCO31981.DQ.10

This memorandum discusses the approach proposed for the design of phase II sampling at MCAS El Toro. There are two objectives for the Phase II study. The first is to collect sufficient samples at each strata identified as potentially contaminated in phase I to conduct a baseline risk assessment. The second is to delineate patterns of contamination in potentially contaminated strata where the remediation of the entire strata may not be cost effective.

The second objective will be accomplished by using field instruments to identify contaminated area and progressively refining the search by sampling on successively finer grids. The minimum grid spacing will be determined by a cost benefit analysis of the value of further delineation of contamination versus the cost of potential remedial actions.

Risk Assessment Sampling Design

The number of samples required for the base line risk assessment will be developed using the hypothesis testing approach based on the mean risk presented by each strata. The Risk Assessment Guidance for Superfund (RAGS) specifies the upper 95th percent confidence limit on the mean risk estimated from samples to be used to estimate risk. If this risk is less than 10^{-6} then the presumption is that risk managers will conclude that the area poses acceptable risks. If this risk is greater 10^{-4} the presumption is that risk managers may find that the area posses unacceptable residential risk.

One objective of the phase II design is to provide sufficient sample data for the baseline risk assessment so that the risk managers have an acceptable range of uncertainty in the risk estimates. The risk managers would also like to control the number of false positive (over-estimating risk) and false negative (under estimating risk) indications provided by the analysis of sample data. Such erroneous indications arise because the true distribution of contaminants at a site can only be estimated.

Based on the sample values from a stratum, a distribution of values of the entire population of potential samples from a stratum is hypothesized. Since the number of samples collected from a stratum is relatively small, there is uncertainty associated with

this estimate. In fact an alternate population distribution of values could have yielded a similar set of sample values.

Figure 1 shows two such distributions. The solid line depicts the distribution of population values hypothesized based on sample values. The dashed line depicts an alternate distribution of population values that may have yielded the sample values. Both depicted distributions are lognormal. While the differences between the two distributions are apparent, the figure does not suggest how to measure the degree of difference.

Figure 2 presents the same two distributions after transforming the data by taking the logarithm of the values. The logarithm of the values is normally distributed. In this depiction of the distributions, it is apparent that the difference between the two distributions can be measured as the difference between the means (which is also the mode or the highest point in the probability plots shown here).

The distributions shown in figure 2 show the frequency with which individual values may occur in the two distributions. Since the mean is estimated from a small number of samples, there is uncertainty as to how close the sample mean is to the population mean. Luckily the relationship between the uncertainty of the individual values and the uncertainty of the sample mean is simple. The uncertainty of the mean (measured as the standard error) on the mean is the uncertainty of the sample values (measured as the standard deviation) divided by the square root of the sample size: $S_e = \frac{S_d}{\sqrt{N}}$.

Figure 3 shows the uncertainty in sample means expected if the true population mean is either the hypothesized value (solid curve) or the alternative value (dashed curve). When a decision is to be made based on a criterion of the population mean being greater or less than a critical value, the figure indicates the probability of the sample mean being greater or less than the critical value.

A false positive error is made when the sample mean is greater than the critical value and the population mean is the mean of the solid curve (the hypothesized distribution). The probability of a false positive is denoted as alpha (as shown on the figure, this is 1-confidence) and is the area of the solid curve greater than the critical value.

A false negative error is made when the sample mean is less than the critical value and the population mean is the mean of the dashed curve (the alternative distribution). The probability of a false negative is denoted as beta (shown on the figure, this is 1-power) and is the area of the dashed curve less than the critical value.

The difference between the hypothesized mean value and the alternative mean value is the minimum detectable difference. Since these comparisons are being conducted in log space where differences correspond to ratios in arithmetic space, the difference is shown as the minimum detectable relative difference.

The five parameters of the comparison, the sample size N, the variability CV, the minimum detectable relative difference (MDRD), and the probability of false negatives (beta) and false positives (alpha) are all inter-related. Any one of the values can be calculated from the other four if their values are known. A formula used to calculate the sample size illustrates this relation: $N = \frac{\sigma_{\log}^{2}(t_{\alpha(1)} + t_{\beta(1)})^2}{MDD_{\log}^{2}}$

The value $\sigma_{\log}$ is the standard deviation of the log values. It is related to the coefficient of variation (CV) by $CV = \sqrt{e^{\sigma_{\log}^2} - 1}$. The $MDD_{\log}$ is the log of the MDRD of the arithmetic values.

The sample size N is the parameter that is to be estimated for the Phase II sampling. The CV is either known or estimated from prior sampling data. The rates of false positives and false negatives are typically selected from a few standard values or are specified by regulation. The remaining parameter, MDRD, is selected on the basis of the desired precision of the decision. The precision desired for estimating risk in phase II can be found by examining the sample specific risk for samples collected in phase I.

The statistical distribution of sample specific risks from phase I data can be use to estimate the variability (as CV) of the risks and to select the appropriate target MDRD for the design.

The sample specific risk was calculated for each surface soil sample collected during the phase I sampling. The sample specific risk represents the risk of a site if all locations on the site had the same mix of contaminants and the same concentrations as found in the sample. A probability plot of the sample specific risks for surface soil samples shows the distribution of risks across the MCAS El Toro base.

The plot, shown in figure 4, appears to indicate at least three and possible four different risk distributions. The distribution of risk above 10^{-5} appears to be different from the distribution of risks between 10^{-7} and 10^{-5}. One or more additional distributions appear to characterize risk values less than 10^{-7}.

The risk range of 10^{-7} to 10^{-5} is the range where many of the risk management decisions will need to be made. The upper end of this range is a cutpoint at which it will be important to distinguish risks not exceeding 10^{-4} from those that do exceed 10^{-4}. An MDRD of less than a factor of 10 will be required to allow these distinctions to be made.

The variability of the sample specific risk in the range of 10^{-7} to 10^{-5} was estimated using an Analysis of Variance. This is a statistical method that allows the within strata

variability to be estimated without the influence of between strata variability. The results of this analysis on the log sample specific risk are shown in the table.

Strata Analyzed for Risk Variability

00-BGA	00-BGC	00-BGR	03-LF	04-DD	05-LF
06-GN	07-GN	07-NP	07-ST	08-PCB	08-RE
08-ST	09-PT	11-GN	12-1SL	12-2SL	12-DD
13-2SL	13-GN	14	14-DD	14-GN	17-SA
18	19-1FB	20-DD	20-GN	21-GN	

ANALYSIS OF VARIANCE (N=44)

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
Strata	56.630	28	2.023	1.349	0.275
ERROR	22.486	15	**1.499**		

The mean square error (in bold in the table) is the estimate of the variance of the log sample specific risk. This corresponds to a CV of 186% in the arithmetic risk. With an MDRD of 5 the previous equation can be use to calculate the sample sizes required for phase II sampling.

For example with an alpha of 0.05 (95% confidence), beta of 0.10 (90% power), σ_{log} is 1.5, and a MDD of 1.6, the sample size would be 7. Conversely the MDRD for a given sample size can be calculated. Several sample sizes and the associated MDRDs are shown in the following table.

185% C.V. LogNormal Distribution	95% confidence 90% Power	90% confidence 90% Power
Sample Size	MDRD as factor	MDRD as factor
3	29.5	14.2
4	11.4	7.4
5	7.4	5.3
6	5.7	4.3
7	4.8	3.8
8	4.2	3.4
9	3.8	3.1
10	3.5	2.9

For example in phase II sampling for completing the baseline risk assessment, a total of 7 locations to be sampled could be identified for each strata with indications of potential risk. Each location sampled at 3 depths, surface, 5 and 10 feet. This would provide 4 additional randomly selected locations for previously sampled strata. Based on the phase I sampling results these samples will allow the baseline risk assessment to estimate strata specific risk with 95% confidence and 90% power that the "true" risk will be within a factor of 5 of the estimated risk.

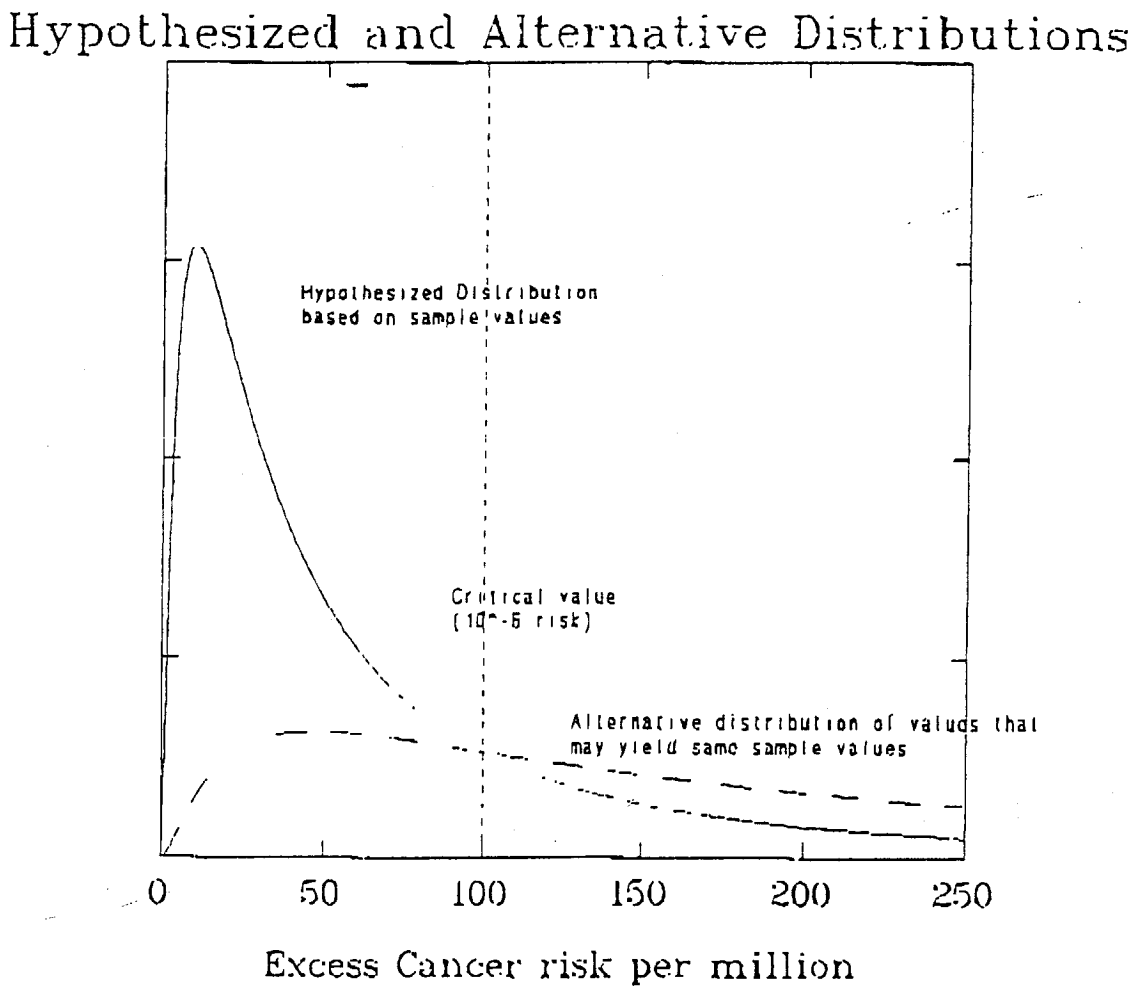
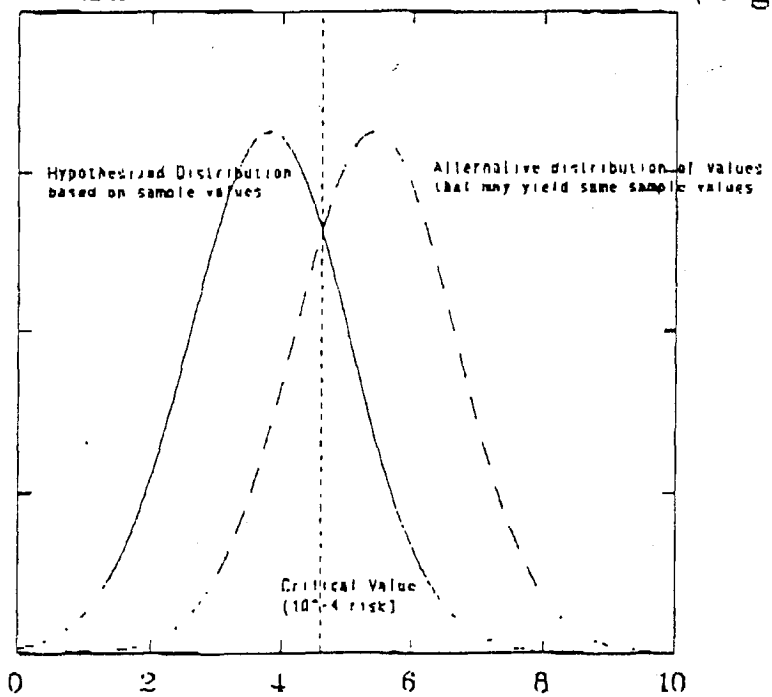

Hypothesized and Alternative Distributions
Hypothesized Distribution based on sample values
Critical value (10^-6 risk)
Alternative distribution of values that may yield same sample values
0
50
100
150
200
250
Excess Cancer risk per million

Figure 1

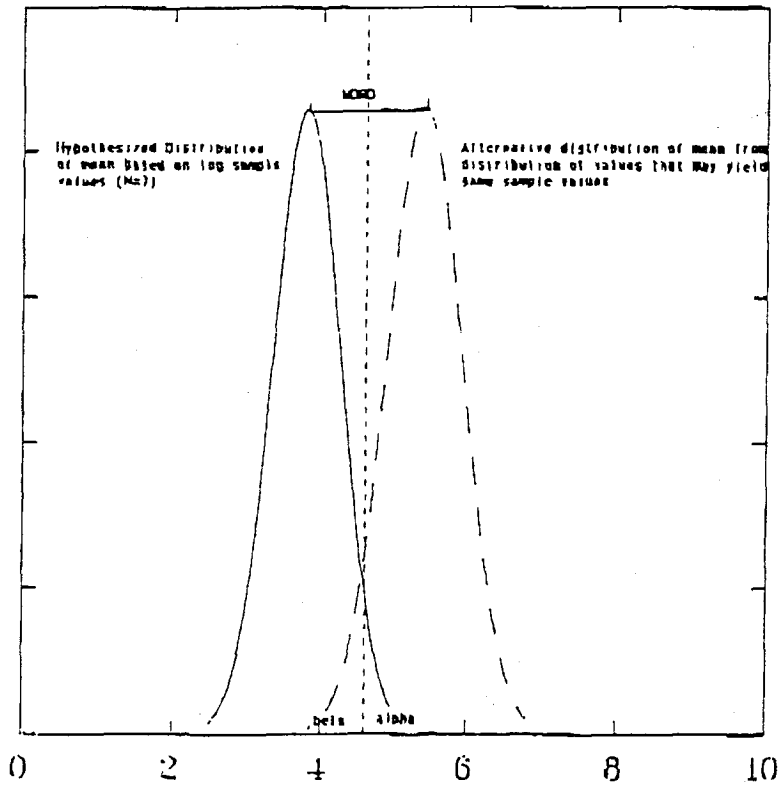
Hypothesized and Alternative Distributions (Log values)



Log Cancer risk (10 −6)

Figure 2

Hypothesized and Alternative Mean Distributions



Log Cancer risk (10^ −6)

Figure 3

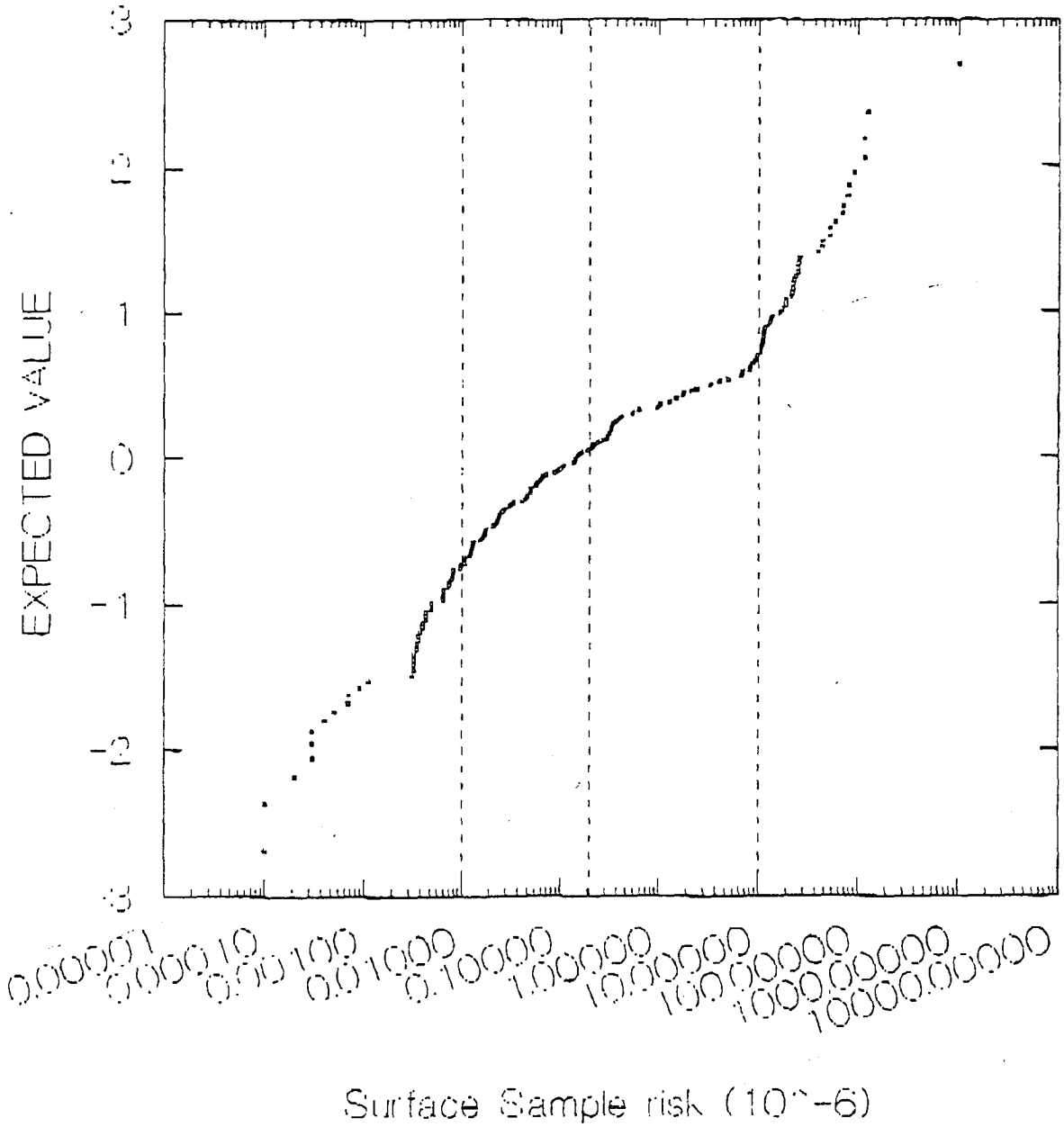

EXPECTED VALUE
3
2
1
0
-1
-2
-3
0.000001
0.000010
0.00100
0.01000
0.10000
1.00000
10.00000
100.00000
1000.00000
10000.00000
Surface Sample risk (10^-6)

Figure 4

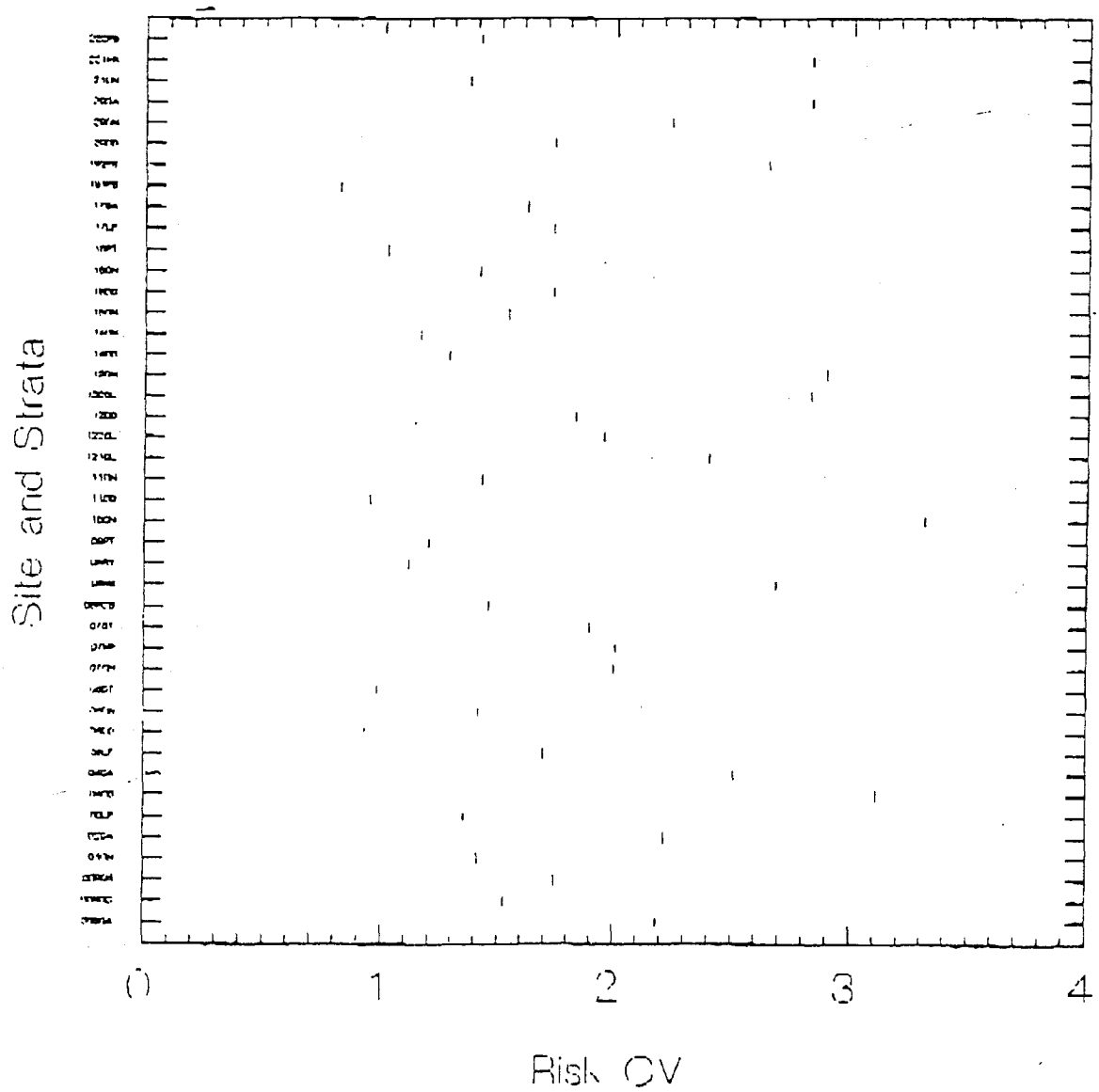


Figure 5 Risk Variability in El Toro Strata

Design unit Sr for Phase II Sampling
Strata to be inv ited and analyses types

Site	Strata	Strata (GIS)	Area (sq yds)	Vol (10ft)	# of 100 Sq Ft units	Vol	Svol	Herb	Pest	PCB	Totm	Dioxf	Max Risk (10^-6)	Mean Risk (10^-6)	Additional Random Locations	Additional Grid Locations	Total Clashes	Total Analyses
Site 1	GN		162980	543268	146.7													
Site 2	LF		123689	412297	111.3													
Site 2	SA		54312	181041	48.9													
Site 3	LF	3LF	82020	273399	73.8				1			1	1.014	0.3	5		2	30
Site 4	DD	4DD	285	949	0.3		1		1				8.3	0.95	5		2	30
Site 4	SA		238	792	0.2													
Site 5	LF		6489	21630	5.8													
Site 6	DD		2174	7246	2.0													
Site 6	GN	6GN	3819	12729	3.4		1						1	0.26	5	9	1	42
Site 6	ST		526	1752	0.5													
Site 7			66457	221525	59.8													
Site 7	1ST	7ST	1523	5075	1.4		1						51.8	10.3	2	9	1	33
Site 7	2ST		3432	11439	3.1													
Site 7	DD		2509	8364	2.3													
Site 7	GN	7GN	10091	33636	9.1		1		1				10.3	2.1	4	9	2	78
Site 7	NP	7NP	2184	7279	2.0		1						69.5	16.5	2	9	1	33
Site 8	GN		12798	42661	11.5													
Site 8	PCB	8PCB	173	575	0.2				1	1			81.4	19.7	2		2	12
Site 8	RE	8RE	392	1308	0.4				1	1			1007	108	1		2	6
Site 8	ST	8ST	6286	20952	5.7		1		1	1			48	16.2	2	9	3	99
Site 9			820	2734	0.7													
Site 9	PT		1118	3727	1.0													
Site 10	GN1	10GN	60896	202987	54.8		1						12	1.2	4	64	1	204
Site 10	GN2		46467	154891	41.8													
Site 11			491	1637	0.4													
Site 11	DD	11DD	20	66	0.0					1			90.1	47.7	2		1	6
Site 11	GN	11GN	90	299	0.1					1			125	33	2		1	6
Site 12			9839	32795	8.9													
Site 12	DD	12DD	1725	5748	1.6		1		1	1	1		99	13	2	9	4	132
Site 12	SL1	12-1SL	7009	23365	6.3		1		1	1			31.4	2.8	4	9	3	117
Site 12	SL2	12-2SL	3367	11222	3.0					1			3.2	0.57	5	9	1	42
Site 13	GN	13GN	1940	6468	1.7		1						6.7	1.4	4	9	1	39
Site 13	SA		1937	6458	1.7													
Site 14			1139	3796	1.0													
Site 14	DD	14DD	129	429	0.1		1						19	9	3		1	9
Site 14	GN	14GN	167	557	0.2		1						115	45	2		1	6
Site 15	GN		264	879	0.2													
Site 16	DD		1137	3790	1.0													

Site 16			227	757	0.2													
Site 17		17LF	55883	186276	50.3		1						11	5.4	3		1	9
Site 17	SA		455	1517	0.4													
		18SS							1				1.7	0.44	5		1	15
Site 19	2FB	19-2FB	13656	45519	12.3						1		10.4	1.7	4	9	1	39
site 19	AB	19-1FB	2496	8319	2.2		1						44	10.2	2	9	1	33
Site 20			3264	10881	2.9													
Site 20	DD	20DD	260	866	0.2		1		1				2.1	0.35	5		2	30
Site 20	GN		1218	4059	1.1													
Site 20	SA	20SA	184	614	0.2		1						18.8	2.1	4		1	12
Site 21	GN	21GN	1549	5165	1.4						1		10	1.3	4	9	1	39
Site 22	FB1	21-1FB	3386	11288	3.0		1						11	1.1	4	9	1	39
Site 22	FB2		5694	18982	5.1													
			Area	Volume	10000 cu ft units	Vol	SVOL	HERB	PEST	PCB	TOTM	DIOXF			Random Locs.	Grid Locs		Lab Analyses
	Totals		775377	2584590	698		17	0	10	8	3	1			87	181		1140

Screening Sampling Design

Strata investigated in Phase II will be screened using a grid sampling pattern and field (Level II) analysis methods. The grid will be designed to examine the limits of the strata and identify patterns of contamination within the strata. The limit to the density of the grid will be determined by the trade-off in cost of additional sampling and the cost of remediation.

In order to save on the cost of sampling grid locations when a pattern of contamination is detected a system of progressive refinement of samples collected will be adopted. This system only samples locations were additional information is likely to be available. Locations between two contaminated or two uncontaminated locations would not be sampled. Locations between a contaminated location and an uncontaminated location would be sampled. Field samples collected with this method are used to focus in on the boundaries of the contaminated area.

Initially a minimum of 9 field samples will be collected at strata larger than 100 feet on a side. Additional field samples will be collected when warranted by the results of these samples.

The table on the previous page summarizes the preliminary design for Phase II sampling. Strata with a maximum carcinogenic risk level greater than 10^{-6} will be sampled in Phase II. Each Strata will be sampled for classes of compounds contributing to the risk. The classes of analyses for each strata are indicated with a 1 in the column.

Samples will be collected randomly from the strata for use in the baseline risk assessment. Each sample location will be sampled at 0,5 and 10 foot depths. The number of locations allocated to each strata depends on the likelihood that the strata may not present a risk. Strata with low estimated risks are allocated more sample locations than strata with greater estimated risks.

The last four columns of the tables summarize the number of random sample locations, grid sample locations, and numbers of analytical classes for each. Assuming that each location will be sampled at three depths, the last column summarizes the total number of analyses in the strata.

JACOBS ENGINEERING GROUP INC.

MEMORANDUM

TO: Andy Piszkin - Code 1812.AP **DATE:** 6 August 1993

FROM: John Dolegowski - CH2M HILL/SCO
Harry Ohlendorf - CH2M HILL/SAC
Susan Keydel - CH2M HILL/SFO

SUBJECT: **MCAS El Toro RI/FS**
Phase II; Ecological Issues
CLE-C01-01F145-G2-0164

This memo summarizes the preliminary ecological risk assessment conducted as part of the Phase I Remedial Investigation (RI) Technical Memorandum (7 May 1993) identifies tasks currently being conducted to refine the list of chemicals of potential ecological concern (COPEC) by site, and identifies some general data needs for the Phase II field work. Site specific data needs will be developed separately.

Preliminary Ecological Risk Assessment

A preliminary ecological risk assessment was prepared for the Phase I RI Draft Technical Memorandum (7 May 1993) for the Marine Corps Air Station (MCAS) El Toro facility. This ecological risk assessment was a conservative screening intended to identify COPEC and areas or sites where habitat or receptors could be affected. Surface soil, sediment, and surface water data from the Phase I investigation were used in this effort. For the preliminary ecological risk assessment, surface soil data were not screened against background values because the methodology for comparison had not yet been agreed to by the Navy and agencies. The following methodology was used for evaluating surface soil, sediment, and surface water:

- **Surface soil evaluation.** Chemical concentrations in near-surface soil (0 to 4 feet below ground surface) were used to evaluate potential threats to terrestrial mammals, invertebrates, and plants. To evaluate risks to terrestrial mammals, exposure doses were derived and compared to literature toxicity values such as reported no observable adverse effect levels (NOAELs), if available, or lowest observable adverse effect levels (LOAELs) in the tested animal. The rat was considered to be a representative terrestrial mammal, and literature values for the rat were used when ever available. To evaluate potential for plant and invertebrate effects, Phase I reported soil concentrations were compared to literature reported effect levels for various species. Concentrations exceeding either the derived acceptable dose (for terrestrial mammals), or plant or invertebrate criteria were identified as presenting a potential threat to the habitat or species present.

- **Surface water evaluation.** Maximum concentrations detected in surface runoff samples for Sites 2, 3, and 18 were compared to chronic ambient water quality criteria for the protection of aquatic life. This approach was conservative in two ways. First, the maximum concentrations detected in San Diego Creek were compared to chronic criteria; because chronic criteria are more appropriately compared to an average concentration, using the maximum concentration detected resulted in a conservative evaluation. Second, the dry washes contain water infrequently and when surface water is present, an acute exposure is more likely; therefore, using chronic water quality criteria instead of acute criteria resulted in a conservative evaluation of the washes.

- **Sediment evaluation.** Deposits sampled at Sites 2, 3, 4, 6, 12, 14, and 18 were evaluated for those exceeding sediment criteria; this included dry runoff deposits in the catch basins, perennially wet sediments in San Diego Creek, and deposits in the four dry washes (Borrego Canyon, Agua Chinon, Bee Canyon, and Marshburn Channel). For each site, the maximum value detected for each chemical was compared to sediment criteria. Criteria for organic compounds were derived from ambient water quality criteria; criteria for inorganic compounds were lowest effect levels (LELs). Chemicals exceeding criteria were identified as chemicals of potential ecological concern (COPEC) for sediment.

The results from this preliminary risk assessment were used to identify sites where ecological receptors could be affected and the chemicals of potential ecological concern corresponding to that site.

Pre-Phase II Work Plan Tasks

Since the RI Technical Memorandum was submitted, several activities have been conducted to refine the lists of COPEC and re-evaluate sites identified as needing further investigation. These activities include:

- Screening surface soil data against background data

- Conducting a reconnaissance survey to better characterize habitat at sites recommended for additional investigation in the Preliminary Ecological Risk Assessment in order to better focus Phase II efforts.

- Re-evaluating chemicals found in stormwater runoff in the dry washes using acute criteria instead of chronic criteria

- Re-evaluating deposits in dry catchbasins and dry washes using terrestrial criteria instead of sediment criteria

- Developing a revised list of COPEC for the Phase II Work Plan based on the results of the above four tasks

Each of these activities is described in greater detail below.

Comparison to Background Data

Since the Technical Memorandum was submitted in May 1993, statistical methodology for evaluating background soil data was agreed to by the Navy and agencies (Jacobs Engineering Group Inc. 1993. MCAS El Toro Phase I RI/FS, Data Quality Objectives Position Paper, Background Concentrations in Surface Soils: Metals, Pesticides, and Herbicides, Document Control #CLE-C01-01F145-G2-0162. July 6.). Background soil values for inorganic chemicals were developed using site specific MCAS El Toro data according to the agreed upon statistical methodology. These values were then used to evaluate surface soil data for each site at the MCAS El Toro. For each inorganic chemical detected at a site, the maximum concentration detected was compared to the 99th percentile value of the background data. Only those inorganic chemicals having maximum values exceeding the background criteria were considered further in the re-evaluation of COPEC. All organic chemicals were retained.

Reconnaissance Survey

Ecological habitat at each of the MCAS El Toro sites was briefly characterized during the spring of 1992. Information from this visit and from literature and regulatory agencies was used to:

- Generate a list of expected species at the MCAS El Toro (presented in Appendix H4 of the Technical Memorandum)
- Identify areas of potential ecological concern based on having both COPEC present and ecological receptors on or near the individual sites

Follow-up reconnaissance surveys of particular sites will be conducted during August or September 1993. This effort is intended to provide additional information on areas having special status (or other) species present or areas of concern based on the Phase I Preliminary Ecological Risk Assessment. In addition, the September reconnaissance will provide insight into differences in habitat uses in Spring versus Fall. Sites 1 through 9, 13, 14, 16, 17, 18, 20, and 21 were identified as potentially having occurrences of ecological receptors. However, only sites 1, 2, 6, 17, and 18 have had special status species identified there. The follow-up reconnaissance will better distinguish areas of ecological concern from those providing little or no habitat. Areas to be evaluated in the site reconnaissance are identified in Table 1.

Re-evaluation of Surface Water

A secondary, less conservative screening of surface water COPEC has been performed. Chemicals detected in storm water runoff samples from the dry washes were re-evaluated using acute criteria. This applies to samples collected in Borrego Canyon, Agua Chinon, Bee Canyon, and Marshburn Channel. San Diego Creek was not re-evaluated using acute criteria because it contains water a majority of the year and aquatic receptors could potentially be chronically exposed.

Re-evaluation of Dry Wash and Catchbasin Deposits

Deposits in catchbasins and dry washes were initially evaluated as sediments in the Phase I Ecological Risk Assessment. These areas do not represent aquatic environments and using sediment criteria derived from Ambient Water Quality Criteria is somewhat erroneous. These dry deposits are more appropriately evaluated assuming potential exposure by terrestrial animals. Therefore, terrestrial criteria have been used to re-evaluate the deposits previously identified as aquatic sediments. This approach is consistent with the approach used in the MCB Camp Pendleton ecological risk evaluation.

Specifically, samples collected from the dry washes (labelled as 18_AC, 18_BE, 18_MC, 18_BO, 02_WF, 02_EF, 02_MM and 03_AC) were evaluated using terrestrial exposure criteria; similarly, deposits from the catch basins (labelled 04_CBAC, 06_CBAC, 12_CBBE, 14_CBBE, 20_CB and 21_CB) were re-evaluated for potential terrestrial exposure. Data from the dry washes were evaluated separately from the catchbasin data to provide a more refined level of characterization. COPEC for each of these areas will be used in preparing the Phase II Work Plan.

Revised list of COPEC for the Phase II Work Plan

Based on the results of the above four tasks, a revised list was developed for sites needing further characterization during Phase II. COPECs (for soil, catch basin deposits, dry washes, sediments, and surface water) for each site are presented in Table 1. A revised list of sites needing further evaluation (based on potential ecological concerns) will be developed following the site reconnaissance to be conducted in September.

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cc: C. Mitchell - MCAS El Toro
J. Hamill - U.S. EPA, Region 9
S. Tindall - Bechtel
J. Zarnock - Cal-EPA/DTSC
J. Broderick - CRWQCB, Santa Ana

File - PMO
File - CTO Notebook/PMO
File - CH2M HILL

Table 1
Chemicals of Potential Ecological Concern
Based on Exceeding Background Soil Values (a) and Ecological Criteria
for Phase II Investigation
MCAS El Toro

Site	Ecological Habitat Evaluation (b)	Terrestrial			Sediment	Surface Runoff (a)	Media Specific COPEC
		Mammals	Inverts	Plants			
1	SSS/Other	none	none	none	NA	NA	none
2	SSS/Other	Soil- Mercury	Soil- none	Soil- Mercury	NA	Borrego Canyon- (acute criteria) Aluminum Cadmium Copper Selenium Zinc	Soil- Mercury Surface Water - Aluminum Cadmium Copper Selenium Zinc
		Dry Wash (Borrego Canyon) none	Dry Wash (Borrego Canyon) none	Dry Wash (Borrego Canyon) none			
3	Other	Soil - 4,4'-DDE Lead Mercury	Soil - Lead	Soil - Lead Mercury	NA	Agua Chinon - (acute criteria) gamma Chlordane Aluminum Cadmium Copper Selenium Zinc	Soil - 4,4'-DDE Lead Mercury Surface Water - gamma Chlordane Aluminum Cadmium Copper Selenium Zinc
		Dry Wash (Agua Chinon) none	Dry Wash (Agua Chinon) none	Dry Wash (Agua Chinon) none			

Table 1
Chemicals of Potential Ecological Concern
Based on Exceeding Background Soil Values (a) and Ecological Criteria
for Phase II Investigation
MCAS El Toro

Site	Ecological Habitat Evaluation (b)	Terrestrial			Sediment	Surface Runoff (a)	Media Specific COPEC
		Mammals	Inverts	Plants			
4	Other	Soil - Aluminum Lead Mercury	Soil - Aluminum Lead	Soil - Benzo(a)pyrene Aluminum Lead Mercury Zinc	NA	NA	Soil - Benzo(a)pyrene Aluminum Lead Mercury Zinc Catch basin (Agua Chinon) Lead
		Catch basin (Agua Chinon) Lead	Catch basin (Agua Chinon) Lead	Catch basin (Agua Chinon) Lead			
5	no further action	Soil - Lead	Soil - Lead	Soil - Lead	NA	NA	none
6	SSS/Other	Soil - Barium Chromium Lead Zinc	Soil - Chromium Lead	Soil - Antimony Chromium Lead Zinc	NA	NA	Soil - Antimony Barium Chromium Lead Zinc Catch basin (Agua Chinon) Lead
		Catch basin (Agua Chinon) Lead	Catch basin (Agua Chinon) Lead	Catch basin (Agua Chinon) Lead			

Table 1
Chemicals of Potential Ecological Concern
Based on Exceeding Background Soil Values (a) and Ecological Criteria
for Phase II Investigation
MCAS El Toro

Site	Ecological Habitat Evaluation (b)	Terrestrial			Sediment	Surface Runoff (a)	Media Specific COPEC
		Mammals	Inverts	Plants			
7	Other	Soil - 4,4'-DDE Benzo(a)anthracene Barium Cobalt Lead Mercury	Soil - Lead	Soil - Benzo(a)pyrene Cobalt Lead Mercury	NA	NA	Soil - 4,4'-DDE Benzo(a)anthracene Barium Cobalt Lead Mercury
8	Other	Soil - 4,4'-DDE alpha Chlordane Dieldrin Aluminum Barium Cadmium Copper Lead Mercury Zinc	Soil - Aluminum Cadmium Copper Lead Mercury Zinc	Soil - Benzo(a)pyrene PCB 1254 Aluminum Cadmium Copper Lead Mercury Zinc	NA	NA	Soil - 4,4'-DDE alpha Chlordane Benzo(a)pyrene Dieldrin PCB 1254 Aluminum Barium Cadmium Copper Lead Mercury Zinc
9	Other	Soil - Barium Lead	Soil - Lead	Soil - Lead	NA	NA	Soil - Barium Lead
10	no further action	Soil - Benzo(a)anthracene	Soil - none	Soil - Benzo(a)anthracene	NA	NA	none
11	no further action	none	none	none	NA	NA	none

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Table 1
Chemicals of Potential Ecological Concern
Based on Exceeding Background Soil Values (a) and Ecological Criteria
for Phase II Investigation
MCAS El Toro

Site	Ecological Habitat Evaluation (b)	Terrestrial			Sediment	Surface Runoff (a)	Media Specific COPEC
		Mammals	Inverts	Plants			
12	no further action	Soil - 4,4'-DDD 4,4'-DDE 4,4'-DDT Benzo(a)anthracene Dieldrin Aluminum Barium Lead Mercury Vanadium Zinc	Soil - 4,4'-DDT Aluminum Lead Vanadium	Soil - Benzo(a)pyrene PCB 1254 Aluminum Lead Mercury Vanadium Zinc	NA	NA	none
		Catch basin (Bee Canyon) 4,4'-DDE Barium Lead Mercury	Catch basin (Bee Canyon) Lead	Catch basin (Bee Canyon) Lead Mercury			
13	Other	Soil - Lead Mercury	Soil - Lead	Soil - Benzo(a)pyrene Lead Mercury	NA	NA	Soil - Benzo(a)pyrene Lead Mercury

Table 1
Chemicals of Potential Ecological Concern
Based on Exceeding Background Soil Values (a) and Ecological Criteria
for Phase II Investigation
MCAS El Toro

Site	Ecological Habitat Evaluation (b)	Terrestrial			Sediment	Surface Runoff (a)	Media Specific COPEC
		Mammals	Inverts	Plants			
14	Other	Soil - Benzo(a)anthracene Barium Lead	Soil - Lead	Soil - Benzo(a)pyrene Lead Zinc	NA	NA	Soil - Benzo(a)anthracene Benzo(a)pyrene Barium Lead Zinc Catch basin (Bee Canyon) Mercury
		Catch basin (Bee Canyon) Mercury	Catch basin (Bee Canyon) none	Catch basin (Bee Canyon) Mercury			
15	no further action	Soil - Lead	Soil - Lead	Soil - Lead	NA	NA	none
16	other	Soil - Lead Zinc	Soil - Lead	Soil - Lead Zinc	NA	NA	Soil - Lead Zinc
17	SSS/Other	Soil - Benzo(a)anthracene Chromium Lead Zinc	Soil - Chromium Lead	Soil - Benzo(a)pyrene Chromium Lead Zinc	NA	NA	Soil - Benzo(a)anthracene Benzo(a)pyrene Chromium Lead Zinc
18 - Borrego Canyon dry wash - downstream	SSS/Other	none	none	none	NA	(acute criteria) Aluminum Cadmium Copper Zinc	Surface Water - Aluminum Cadmium Copper Zinc

Table 1
Chemicals of Potential Ecological Concern
Based on Exceeding Background Soil Values (a) and Ecological Criteria
for Phase II Investigation
MCAS El Toro

Site	Ecological Habitat Evaluation (b)	Terrestrial			Sediment	Surface Runoff (a)	Media Specific COPEC
		Mammals	Inverts	Plants			
18 - Agua Chinon dry wash upstream	SSS/Other	none	none	none	NA	(Acute criteria) Aluminum Copper	Surface Water - Aluminum Copper
18 - Agua Chinon dry wash downstream	SSS/Other	none	none	none	NA	(Acute criteria) Aluminum Cadmium Copper	Surface Water - Aluminum Cadmium Copper
18 - Bee Canyon dry wash upstream	SSS/Other	none	none	none	NA	(Acute criteria) Aluminum Cadmium Copper Zinc	Surface Water - Aluminum Cadmium Copper Zinc
18 - Bee Canyon dry wash downstream	SSS/Other	none	none	none	NA	(Acute criteria) Aluminum Cadmium Copper Zinc	Surface Water - Aluminum Cadmium Copper Zinc
18 - Marshburn Channel dry wash upstream	SSS/Other	none	none	none	NA	(Acute criteria) Aluminum Copper Zinc	Surface Water - Aluminum Copper Zinc

Table 1
Chemicals of Potential Ecological Concern
Based on Exceeding Background Soil Values (a) and Ecological Criteria
for Phase II Investigation
MCAS El Toro

Site	Ecological Habitat Evaluation (b)	Terrestrial			Sediment	Surface Runoff (a)	Media Specific COPEC
		Mammals	Inverts	Plants			
18 - Marshburn Channel dry wash downstream	SSS/Other	Soil - Mercury Dry wash (Marshburn Channel) none	Soil - none Dry wash (Marshburn Channel) none	Soil - none Dry wash (Marshburn Channel) Mercury	NA	(Acute criteria) Aluminum Copper Cyanide	Soil - Mercury Surface Water - Aluminum Copper Cyanide
18 - San Diego Creek upstream	SSS/Other	NA	NA	NA	none	(Chronic criteria) Aluminum Cadmium Copper Lead Mercury	Surface Water - Aluminum Cadmium Copper Lead Mercury
18 - San Diego Creek - Agua Chinon	SSS/Other	NA	NA	NA	none	(Chronic criteria) Aluminum Beryllium Cadmium Copper Lead Zinc	Surface Water - Aluminum Beryllium Cadmium Copper Lead Zinc

Table 1
Chemicals of Potential Ecological Concern
Based on Exceeding Background Soil Values (a) and Ecological Criteria
for Phase II Investigation
MCAS El Toro

Site	Ecological Habitat Evaluation (b)	Terrestrial			Sediment	Surface Runoff (a)	Media Specific COPEC
		Mammals	Inverts	Plants			
18 - San Diego Creek - Bee Canyon	SSS/Other	NA	NA	NA	none	(Chronic criteria) gamma Chlordane Aluminum Cadmium Copper Lead	Surface Water - gamma Chlordane Aluminum Cadmium Copper Lead
18 - San Diego Creek - Marshburn Channel	SSS/Other	NA	NA	NA	none	(Chronic criteria) Aluminum Cadmium Copper Lead Silver Zinc	Surface Water - Aluminum Cadmium Copper Lead Silver Zinc
19	no further action	Soil - Benzo(a)anthracene Cobalt	Soil - none	Soil - Benzo(a)pyrene Cobalt	NA	NA	none

Table 1
Chemicals of Potential Ecological Concern
Based on Exceeding Background Soil Values (a) and Ecological Criteria
for Phase II Investigation
MCAS El Toro

Site	Ecological Habitat Evaluation (b)	Terrestrial			Sediment	Surface Runoff (a)	Media Specific COPEC
		Mammals	Inverts	Plants			
20	Other	Soil - 4,4'-DDE Cobalt Lead Mercury Zinc	Soil - Cobalt Lead Zinc	Soil - Benzo(a)pyrene Cobalt Lead Mercury Zinc	NA	NA	Soil - 4,4'-DDE Benzo(a)pyrene Cobalt Lead Mercury Zinc Catch basin - Antimony Barium Copper Lead Zinc
		Catch basin - Barium Copper Lead Zinc	Catch basin - Copper Lead Zinc	Catch basin - Antimony Copper Lead Zinc			
21	Other	Soil - none	Soil - none	Soil - none	NA	NA	Soil - none Catch basin - 4,4'-DDE 4,4'-DDT Benzo(a)anthracene Benzo(a)pyrene Lead Mercury Zinc
		Catch basin- 4,4'-DDE 4,4'-DDT Benzo(a)anthracene Lead Mercury Zinc	Catch basin- Lead	Catch basin- Benzo(a)pyrene Lead Mercury Zinc			

Table 1
Chemicals of Potential Ecological Concern
Based on Exceeding Background Soil Values (a) and Ecological Criteria
for Phase II Investigation
MCAS El Toro

Site	Ecological Habitat Evaluation (b)	Terrestrial			Sediment	Surface Runoff (a)	Media Specific COPEC
		Mammals	Inverts	Plants			
22	no further action	Soil - Benzo(a)anthracene Lead	Soil - Lead	Soil - Benzo(a)pyrene Lead	NA	NA	none

(a) Not screened against background soil criteria. All soil, dry wash deposits, catch basin deposits, and sediments were screened against background surface soil values.
(b) Ecological Habitat Evaluation is based on the Spring 1992 reconnaissance. This table will be revised, if needed, following the Fall 1993 reconnaissance.
SSS Special Status Species have been observed at this site.
Other Habitat is present and will be further evaluated during the Fall 1993 reconnaissance. SSS were not observed during the first reconnaissance.