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TABLE 3-3a

Summary of July 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW01A						
18_BGMW01B	07/22/92	395.25	393.19	survey	216.05	179.20
18_BGMW01C	07/22/92	394.30	392.62	survey	215.05	179.25
18_BGMW01D						
18_BGMW01E						
18_BGMW02A	07/22/92	392.58	391.12	survey	175.95	216.63
18_BGMW02C	07/22/92	392.71	391.12	survey	176.37	216.34
18_BGMW02D	07/22/92	392.56	390.77	survey	177.42	215.14
18_BGMW02E	07/22/92	392.32	390.97	survey	180.24	212.08
18_BGMW03A	07/22/92	280.70	279.60	survey	125.79	154.91
18_BGMW03B	07/22/92	281.73	279.58	survey	118.70	163.03
18_BGMW03C						
18_BGMW03E						
18_BGMW04A	07/22/92	244.22	242.65	survey	105.55	138.67
18_BGMW04B	07/22/92	243.97	242.88	survey	88.45	155.52
18_BGMW05A	07/22/92	273.73	270.23	survey	107.10	166.63
18_BGMW05B	07/22/92	274.20	270.41	survey	94.26	179.94
18_BGMW05C	07/22/92	272.90	270.11	survey	89.52	183.38
18_BGMW05D						
18_BGMW05E						
18_BGMW06A						
18_BGMW06B						
18_BGMW06C						
18_BGMW06D						
18_BGMW06E						
18_BGMW07						
18_BGMW8A						
18_BGMW8C						
18_BGMW8D						
18_BGMW8E						
18_BGMW9A						
18_BGMW9B						
18_BGMW9C						
18_BGMW9D						
18_BGMW9E						
18_BGMW9F						
02_UGMW10A						
18_BGMW12						
18_BGMW14	07/22/92	268.50	268.17	survey	73.16	195.34
18_BGMW15	07/22/92	319.90	319.98	survey	174.86	145.04
18_BGMW16	07/22/92	377.70	375.91	survey	227.34	150.36
18_BGMW17	07/22/92	379.80	376.07	survey	150.76	229.04
18_BGMW18	07/22/92	275.80	275.91	survey	137.04	138.76
18_BGMW19A						
18_BGMW19B						
18_BGMW19C						
18_BGMW19D						
18_BGMW19E						
18_BGMW22	07/22/92	429.60	425.66	survey	248.21	181.39

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TABLE 3-3a

Summary of July 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW23						
18_BGMW24						
02_UGMW25						
03_UGMW26						
05_UGMW27						
06_UGMW28						
08_UGMW29						
12_UGMW31	07/22/92	255.60	255.97	survey	103.47	152.13
13_UGMW32	07/22/92	288.90	285.37	survey	141.93	146.97
16_UGMW33						
19_UGMW35						
20_UGMW36	07/22/92	341.00	338.01	survey	196.61	144.39
21_UGMW37						
03_DBMW39						
04_DBMW40						
05_DBMW41						
07_DBMW43						
09_DBMW45	07/22/92	281.40	279.31	survey	126.14	155.26
22_DBMW47	07/22/92	277.50	277.25	survey	119.71	157.79
12_DBMW48						
13_DBMW49	07/22/92	283.90	280.08	survey	136.64	147.26
14_DBMW50						
15_DBMW51						
16_DBMW52						
19_DBMW54						
20_DBMW55						
21_DBMW56						
21_DBMW57						
01_DGMW58						
02_DGMW59						
02_DGMW60						
02_DGMW61						
04_DGMW63						
03_DGMW64						
03_DGMW65X						
04_DGMW66						
05_DGMW67						
05_DGMW68						
06_DGMW69						
07_DBMW70						
07_DGMW71						
07_DGMW72						
08_DGMW73						
08_DGMW74						
09_DGMW75						
10_DGMW77						
13_DGMW78						
14_DGMW79						
16_DGMW81						

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TABLE 3-3a

Summary of July 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
17_DGMW82						
19_DGMW85						
19_DGMW86						
20_DGMW88						
21_DGMW90						
07_DGMW91						
07_DBMW100						
18_BGMW101						
18_BGMW103						
PS-1	07/22/92	247.99		survey	92.23	155.76
PS-2	07/22/92	246.73		survey	104.71	142.02
PS-3	07/22/92	266.47		survey	89.14	177.33
PS-4						
PS-5	07/22/92	255.14		survey	92.14	163.00
PS-6						
PS-7	07/22/92	260.00		survey	91.28	168.72
PS-8	07/22/92	282.84		survey	107.98	174.86
RW-1	07/22/92	247.99		survey	103.82	144.17
RW-2	07/22/92	265.69		survey	82.96	182.73
DW-1	7/28/92	268.90		survey	123.30	145.60
DW-2						
DW-3						
DW-4						
DW-5						

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TABLE 3-3b

Summary of August 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW01A	8/28/92	394.55	392.79	survey	231.54	163.01
18_BGMW01B	8/28/92	395.25	393.19	survey	215.38	179.87
18_BGMW01C	8/28/92	394.30	392.62	survey	214.66	179.64
18_BGMW01D	8/28/92	393.15	392.53	survey	215.68	177.47
18_BGMW01E	8/28/92	393.20	391.48	survey	213.78	179.42
18_BGMW02A	8/28/92	392.58	391.12	survey	176.10	216.48
18_BGMW02C	8/28/92	392.71	391.12	survey	176.63	216.08
18_BGMW02D	8/28/92	392.56	390.77	survey	177.79	214.77
18_BGMW02E	08/28/92	392.32	390.97	survey	180.50	211.82
18_BGMW03A	09/01/92	280.70	279.60	survey	127.64	153.06
18_BGMW03B	09/01/92	281.73	279.58	survey	119.71	162.02
18_BGMW03C	09/01/92	283.40	279.72	survey	117.36	166.04
18_BGMW03E	09/01/92	282.10	279.45	survey	115.14	166.96
18_BGMW04A	09/01/92	243.36	242.65	survey	106.28	137.08
18_BGMW04B	09/01/92	243.58	242.88	survey	88.34	155.24
18_BGMW05A	09/01/92	273.73	270.23	survey	96.14	177.59
18_BGMW05B	09/01/92	274.20	270.41	survey	95.08	179.12
18_BGMW05C	09/01/92	272.90	270.11	survey	89.98	182.92
18_BGMW05D						
18_BGMW05E	09/01/92	270.60	270.02	survey	85.14	185.46
18_BGMW06A						
18_BGMW06B						
18_BGMW06C						
18_BGMW06D						
18_BGMW06E						
18_BGMW07	9/2/92	178.90	179.46	survey	24.15	154.75
18_BGMW8A						
18_BGMW8C						
18_BGMW8D						
18_BGMW8E	9/01/92	195.70	195.70	survey	64.74	130.96
18_BGMW9A						
18_BGMW9B						
18_BGMW9C						
18_BGMW9D						
18_BGMW9E						
18_BGMW9F						
02_UGMW10A						
18_BGMW12	09/01/92	306.50	304.68	survey	165.34	141.16
18_BGMW14	09/02/92	268.50	268.17	survey	73.34	195.16
18_BGMW15						
18_BGMW16	08/28/92	377.70	375.91	survey	226.66	151.04
18_BGMW17	09/01/92	379.80	376.07	survey	150.99	228.81
18_BGMW18	09/01/92	275.80	275.91	survey	138.06	137.74
18_BGMW19A	09/02/92	235.80	231.98	survey	127.60	108.20
18_BGMW19B	09/02/92	236.00	232.03	survey	123.68	112.32
18_BGMW19C	09/02/92	233.90	232.05	survey	110.12	123.78
18_BGMW19D	09/02/92	236.00	231.86	survey	99.60	136.40
18_BGMW19E	09/02/92	234.00	232.26	survey	97.28	136.72
18_BGMW22	08/28/92	426.60	425.66	survey	245.24	181.36

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TABLE 3-3b

Summary of August 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW23	09/02/92	190.30	189.54	survey	31.52	158.78
18_BGMW24						
02_UGMW25						
03_UGMW26	08/28/92	418.80	419.48	survey	230.10	188.70
05_UGMW27	08/28/92	437.86	436.87	survey	193.07	244.79
06_UGMW28	08/28/92	334.80	335.07	survey	142.96	191.84
08_UGMW29						
12_UGMW31	09/01/92	255.60	255.97	survey	101.65	153.95
13_UGMW32	09/01/92	288.90	285.37	survey	142.79	146.11
16_UGMW33	09/09/92	337.60	337.20	survey	182.41	155.19
19_UGMW35						
20_UGMW36						
21_UGMW37	09/01/92	259.80	258.32	survey	97.70	162.10
03_DBMW39	08/28/92	419.70	419.43	survey	240.26	179.44
04_DBMW40	09/02/92	404.10	400.04	survey	226.20	177.90
05_DBMW41	08/28/92	425.80	424.16	survey	184.67	241.13
07_DBMW43						
09_DBMW45	09/01/92	281.40	279.31	survey	124.83	156.57
22_DBMW47	09/01/92	277.50	277.25	survey	119.84	157.66
12_DBMW48						
13_DBMW49	09/01/92	282.20	280.08	survey	135.87	146.33
14_DBMW50	09/01/92	272.00	270.32	survey	125.88	146.12
15_DBMW51						
16_DBMW52	09/09/92	336.10	332.92	survey	182.86	153.24
19_DBMW54						
20_DBMW55	08/28/92	334.80	331.92	survey	188.71	146.09
21_DBMW56						
21_DBMW57						
01_DGMW58						
02_DGMW59						
02_DGMW60						
02_DGMW61						
04_DGMW63						
03_DGMW64						
03_DGMW65X						
04_DGMW66						
05_DGMW67						
05_DGMW68						
06_DGMW69						
07_DBMW70						
07_DGMW71						
07_DGMW72						
08_DGMW73	09/02/92	263.80	264.01	survey	88.24	175.56
08_DGMW74						
09_DGMW75						
10_DGMW77						
13_DGMW78	09/01/92	279.20	276.34	survey	135.19	144.01
14_DGMW79	09/01/92	270.20	268.93	survey	125.96	144.24
16_DGMW81						

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TABLE 3-3b

Summary of August 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
17_DGMW82						
19_DGMW85						
19_DGMW86						
20_DGMW88	08/28/92	330.05	331.68	survey	187.87	142.18
21_DGMW90						
07_DGMW91						
07_DBMW100						
18_BGMW101						
18_BGMW103						
PS-1						
PS-2	09/01/92	246.73		survey	104.96	141.77
PS-3						
PS-4						
PS-5						
PS-6		269.09		survey	117.04	152.05
PS-7						
PS-8	09/01/92	282.84		survey	108.02	174.82
RW-1						
RW-2						
DW-1	09/02/92	268.90		survey	123.50	145.40
DW-2	09/02/92	268.82		survey	129.00	139.82
DW-3	09/02/92	269.11		survey	146.16	122.95
DW-4	09/02/92	269.12		survey	146.06	123.06
DW-5	09/02/92	269.53		survey	143.43	126.10

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TABLE 3-3c

Summary of September 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW01A	9/24/92	394.55	392.79	survey	229.49	165.06
18_BGMW01B	9/24/92	395.25	393.19	survey	215.92	179.33
18_BGMW01C	9/24/92	394.30	392.62	survey	215.19	179.11
18_BGMW01D	9/24/92	393.15	392.53	survey	216.20	176.95
18_BGMW01E	9/24/92	393.20	391.48	survey	214.42	178.78
18_BGMW02A	9/23/92	391.81	391.12	survey	175.47	216.34
18_BGMW02C	9/23/92	391.75	391.12	survey	176.77	214.98
18_BGMW02D	9/23/92	391.45	390.77	survey	175.71	215.74
18_BGMW02E						
18_BGMW03A	09/22/92	280.70	279.60	survey	128.30	152.40
18_BGMW03B	09/22/92	281.73	279.58	survey	117.17	164.56
18_BGMW03C	09/22/92	283.40	279.72	survey	120.02	163.38
18_BGMW03E	09/22/92	282.10	279.45	survey	114.95	167.15
18_BGMW04A	09/22/92	243.36	242.65	survey	107.48	135.88
18_BGMW04B	09/22/92	243.58	242.88	survey	88.38	155.20
18_BGMW05A	9/23/92	273.73	270.23	survey	95.99	177.74
18_BGMW05B	9/23/92	274.20	270.41	survey	95.62	178.58
18_BGMW05C	9/23/92	272.90	270.11	survey	90.33	182.57
18_BGMW05D	9/23/92	272.80	270.90	survey	88.60	184.20
18_BGMW05E	09/23/92	270.60	270.02	survey	85.37	185.23
18_BGMW06A						
18_BGMW06B						
18_BGMW06C						
18_BGMW06D						
18_BGMW06E						
18_BGMW07	09/23/92	178.90	179.46	survey	23.45	155.45
18_BGMW8A						
18_BGMW8C						
18_BGMW8D						
18_BGMW8E						
18_BGMW9A						
18_BGMW9B						
18_BGMW9C						
18_BGMW9D						
18_BGMW9E						
18_BGMW9F						
02_UGMW10A						
18_BGMW12	09/22/92	306.50	304.68	survey	162.82	143.68
18_BGMW14						
18_BGMW15	09/22/92	319.90	319.98	survey	175.19	144.71
18_BGMW16	09/22/92	377.70	375.91	survey	227.17	150.53
18_BGMW17	09/23/92	375.68	376.07	survey	146.99	228.69
18_BGMW18	09/22/92	275.80	275.91	survey	138.43	137.37
18_BGMW19A	09/24/92	235.80	231.98	survey	128.27	107.53
18_BGMW19B	09/24/92	236.00	232.03	survey	124.13	111.87
18_BGMW19C	09/24/92	233.90	232.05	survey	109.60	124.30
18_BGMW19D	09/24/92	236.00	231.86	survey	99.35	136.65
18_BGMW19E	09/24/92	234.00	232.26	survey	97.18	136.82
18_BGMW22	09/24/92	426.17	425.66	survey	246.07	180.10

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TABLE 3-3c

Summary of September 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW23	09/24/92	190.30	189.54	survey	31.06	159.24
18_BGMW24	09/24/92	618.80	617.49	survey	50.07	568.73
02_UGMW25						
03_UGMW26	09/24/92	418.80	419.48	survey	231.89	186.91
05_UGMW27	09/23/92	437.86	436.87	survey	193.44	244.42
06_UGMW28	09/23/92	334.80	335.07	survey	143.92	190.88
08_UGMW29	09/23/92	272.20	272.68	survey	91.79	180.41
12_UGMW31	09/23/92	255.60	255.97	survey	101.62	153.98
13_UGMW32	09/23/92	288.90	285.37	survey	141.30	147.60
16_UGMW33	09/23/92	337.60	337.20	survey	182.48	155.12
19_UGMW35	09/23/92	341.60	344.39	survey	163.55	178.05
20_UGMW36	09/22/92	341.00	338.01	survey	195.10	145.90
21_UGMW37	09/22/92	259.80	258.32	survey	95.88	163.92
03_DBMW39	09/22/92	419.70	419.43	survey	240.53	179.17
04_DBMW40	09/22/92	404.10	400.04	survey	224.02	180.08
05_DBMW41	09/23/92	425.80	424.16	survey	185.24	240.56
07_DBMW43	09/23/92	295.30	293.42	survey	123.21	172.09
09_DBMW45	09/22/92	281.40	279.31	survey	124.64	156.76
22_DBMW47	09/22/92	277.50	277.25	survey	119.73	157.77
12_DBMW48	09/23/92	248.10	247.14	survey	97.98	150.12
13_DBMW49	09/22/92	282.20	280.08	survey	135.67	146.53
14_DBMW50	09/22/92	272.00	270.32	survey	125.86	146.14
15_DBMW51						
16_DBMW52	09/23/92	336.10	332.92	survey	181.55	154.55
19_DBMW54						
20_DBMW55	09/23/92	334.80	331.92	survey	189.42	145.38
21_DBMW56						
21_DBMW57	09/24/92	634.30		survey	62.91	571.39
01_DGMW58	09/24/92	624.40	621.94	survey	57.36	567.04
02_DGMW59						
02_DGMW60						
02_DGMW61						
04_DGMW63						
03_DGMW64						
03_DGMW65X						
04_DGMW66	09/23/92	402.20	401.10	survey	225.25	176.95
05_DGMW67						
05_DGMW68						
06_DGMW69	09/23/92	324.15	324.45	survey	142.90	181.25
07_DBMW70						
07_DGMW71						
07_DGMW72						
08_DGMW73	09/23/92	263.80	264.01	survey	88.57	175.23
08_DGMW74	09/23/92	265.70	264.11	survey	91.16	174.54
09_DGMW75						
10_DGMW77						
13_DGMW78	09/23/92	279.20	276.34	survey	132.62	146.58
14_DGMW79	09/23/92	270.20	268.93	survey	124.82	145.38
16_DGMW81						

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TABLE 3-3c

Summary of September 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
17_DGMW82						
19_DGMW85	09/23/92	329.10	329.08	survey	148.10	181.00
19_DGMW86						
20_DGMW88	09/22/92	330.05	331.68	survey	187.62	142.43
21_DGMW90	09/23/92	255.20	255.48	survey	94.80	160.40
07_DGMW91						
07_DBMW100						
18_BGMW101						
18_BGMW103						
PS-1						
PS-2	09/22/92	246.73		survey	104.83	141.90
PS-3	09/24/92	266.47		survey	89.29	177.18
PS-4	09/24/92	264.53		survey	81.69	182.84
PS-5	09/24/92	255.14		survey	92.46	162.68
PS-6	09/24/92	269.09		survey	116.76	152.33
PS-7	09/22/92	260.00		survey	91.59	168.41
PS-8	09/23/92	282.84		survey	108.37	174.47
RW-1	09/24/92	247.99		survey	107.36	140.63
RW-2	09/24/92	265.69		survey	83.88	181.81
DW-1	09/23/92	268.90		survey	123.83	145.07
DW-2	09/23/92	268.82		survey	129.61	139.21
DW-3	09/23/92	269.11		survey	147.20	121.91
DW-4	09/23/92	269.12		survey	144.58	124.54
DW-5	09/23/92	269.53		survey	144.70	124.83

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TABLE 3-3d

Summary of October 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW01A	10/20/92	394.55	392.79	survey	222.78	171.77
18_BGMW01B	10/20/92	395.25	393.19	survey	215.40	179.85
18_BGMW01C	10/20/92	394.30	392.62	survey	214.32	179.98
18_BGMW01D	10/20/92	393.15	392.53	survey	215.66	177.49
18_BGMW01E	10/20/92	393.20	391.48	survey	214.80	178.40
18_BGMW02A						
18_BGMW02C	10/20/92	391.75	391.12	survey	175.36	216.39
18_BGMW02D						
18_BGMW02E	10/20/92	391.72	390.97	survey	179.59	212.13
18_BGMW03A	10/20/92	280.70	279.60	survey	123.00	157.70
18_BGMW03B	10/20/92	281.73	279.58	survey	115.18	166.55
18_BGMW03C	10/20/92	283.40	279.72	survey	112.00	171.40
18_BGMW03E	10/20/92	279.16	279.45	survey	112.00	167.16
18_BGMW04A	10/20/92	243.36	242.65	survey	101.00	142.36
18_BGMW04B	10/20/92	243.58	242.88	survey	87.20	156.38
18_BGMW05A	10/20/92	273.73	270.23	survey	95.55	178.18
18_BGMW05B	10/20/92	274.20	270.41	survey	94.09	180.11
18_BGMW05C	10/20/92	272.90	270.11	survey	89.70	183.20
18_BGMW05D	10/20/92	272.80	270.90	survey	88.14	184.66
18_BGMW05E	10/20/92	270.60	270.02	survey	84.74	185.86
18_BGMW06A	10/10/92	176.49	176.49	survey	82.72	93.77
18_BGMW06B	10/10/92	176.50	176.49	survey	111.51	64.99
18_BGMW06C	10/10/92	176.50	176.49	survey	80.47	96.03
18_BGMW06D	10/10/92	176.50	176.49	survey	52.16	124.34
18_BGMW06E	10/10/92	176.50	176.49	survey	51.74	124.76
18_BGMW07	10/10/92	178.90	179.46	survey	23.25	155.65
18_BGMW8A	10/10/92	195.70	194.17	survey	71.13	124.57
18_BGMW8C	10/10/92	195.70	194.17	survey	64.75	130.95
18_BGMW8D	10/10/92	195.70	194.17	survey	44.81	150.89
18_BGMW8E	10/10/92	195.70	194.17	survey	46.11	149.59
18_BGMW9A	10/10/92	237.60	234.70	survey	57.92	179.68
18_BGMW9B	10/10/92	237.60	234.70	survey	56.90	180.70
18_BGMW9C	10/10/92	237.60	234.70	survey	29.44	208.16
18_BGMW9D	10/10/92	237.60	234.70	survey	52.27	185.33
18_BGMW9E	10/10/92	237.60	234.70	survey	51.81	185.79
18_BGMW9F	10/10/92	237.60	234.70	survey	51.82	185.78
02_UGMW10A						
18_BGMW12	10/21/92	306.50	304.68	survey	162.39	144.11
18_BGMW14	10/21/92	268.50	268.17	survey	73.06	195.44
18_BGMW15	10/21/92	319.90	319.98	survey	175.56	144.34
18_BGMW16	10/21/92	377.70	375.91	survey	227.18	150.52
18_BGMW17	10/20/92	375.68	376.07	survey		
18_BGMW18	10/21/92	275.80	275.91	survey	139.07	136.73
18_BGMW19A	10/21/92	235.80	231.98	survey	117.38	118.42
18_BGMW19B	10/21/92	236.00	232.03	survey	117.22	118.78
18_BGMW19C	10/21/92	233.90	232.05	survey	106.20	127.70
18_BGMW19D	10/21/92	236.00	231.86	survey	96.50	139.50
18_BGMW19E	10/21/92	234.00	232.26	survey	96.82	137.18
18_BGMW22	10/20/92	426.17	425.66	survey	245.42	180.75

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TABLE 3-3d

Summary of October 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW23	10/21/92	190.30	189.54	survey	31.54	158.76
18_BGMW24	10/20/92	618.80	617.49	survey	48.12	570.68
02_UGMW25						
03_UGMW26	10/20/92	418.80	419.48	survey	231.30	187.50
05_UGMW27	10/20/92	437.86	436.87	survey	192.74	245.12
06_UGMW28	10/20/92	334.80	335.07	survey	143.36	191.44
08_UGMW29	10/20/92	272.20	272.68	survey	91.30	180.90
12_UGMW31	10/20/92	255.60	255.97	survey	101.28	154.32
13_UGMW32	10/20/92	288.90	285.37	survey	140.76	148.14
16_UGMW33	10/21/92	337.60	337.20	survey	182.00	155.60
19_UGMW35	10/20/92	341.60	344.39	survey	158.50	183.10
20_UGMW36	10/21/92	341.00	338.01	survey	195.45	145.55
21_UGMW37	10/20/92	259.80	258.32	survey	95.68	164.12
03_DBMW39	10/20/92	419.70	419.43	survey	240.30	179.40
04_DBMW40	10/20/92	404.10	400.04	survey	222.48	181.62
05_DBMW41	10/20/92	425.80	424.16	survey	184.84	240.96
07_DBMW43	10/20/92	295.30	293.42	survey	122.56	172.74
09_DBMW45	10/20/92	281.40	279.31	survey	124.60	156.80
22_DBMW47	10/20/92	277.50	277.25	survey	119.72	157.78
12_DBMW48	10/20/92	248.10	247.14	survey	95.70	152.40
13_DBMW49	10/20/92	282.20	280.08	survey	135.70	146.50
14_DBMW50	10/20/92	272.00	270.32	survey	126.00	146.00
15_DBMW51	10/22/92	270.70	269.72	survey	126.59	144.11
16_DBMW52	10/21/92	336.10	332.92	survey	181.19	154.91
19_DBMW54	10/20/92	335.50	332.37	survey	152.60	182.90
20_DBMW55	10/21/92	334.80	331.92	survey	189.19	145.61
21_DBMW56	10/21/92	255.90	256.32	survey	96.81	159.09
21_DBMW57	10/20/92	634.30		survey	59.52	574.78
01_DGMW58	10/20/92	624.40	621.94	survey	54.96	569.44
02_DGMW59						
02_DGMW60	10/20/92	500.90	498.61	survey	73.70	427.20
02_DGMW61	10/20/92	516.30	514.25	survey	66.80	449.50
04_DGMW63	10/21/92	403.90	403.44	survey	224.10	179.80
03_DGMW64	10/20/92	418.20	418.71	survey	244.60	173.60
03_DGMW65X	10/21/92	413.40	409.08	survey	235.24	178.16
04_DGMW66	10/20/92	402.20	401.10	survey	224.60	177.60
05_DGMW67	10/20/92	429.30	427.94	survey	189.14	240.16
05_DGMW68	10/20/92	420.80	416.61	survey	189.16	231.64
06_DGMW69	10/20/92	324.45	324.45	survey	139.60	184.85
07_DBMW70	10/20/92	293.30	293.94	survey	129.12	164.18
07_DGMW71	10/20/92	283.40	284.02	survey	115.46	167.94
07_DGMW72	10/20/92	276.70	277.34	survey	107.70	169.00
08_DGMW73	10/20/92	263.80	264.01	survey	88.18	175.62
08_DGMW74	10/20/92	265.70	264.11	survey	89.70	176.00
09_DGMW75	10/20/92	273.40	270.35	survey	120.60	152.80
10_DGMW77	10/20/92	271.60	271.71	survey	109.50	162.10
13_DGMW78	10/20/92	279.20	276.34	survey	132.16	147.04
14_DGMW79	10/20/92	270.20	268.93	survey	124.50	145.70
16_DGMW81	10/21/92	321.60	232.74	survey	175.10	146.50

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TABLE 3-3d

Summary of October 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
17_DGMW82						
19_DGMW85	10/20/92	329.10	329.08	survey	147.78	181.32
19_DGMW86	10/20/92	334.80	333.34	survey	159.40	175.40
20_DGMW88	10/21/92	330.05	331.68	survey	187.80	142.25
21_DGMW90	10/20/92	255.17	255.48	survey	94.50	160.67
07_DGMW91	10/20/92	273.19	273.71	survey	107.00	166.19
07_DBMW100	10/21/92	290.20	286.60	survey	108.95	181.25
18_BGMW101	10/20/92	232.80	230.21	survey	85.50	147.30
18_BGMW103						
PS-1	10/21/92	247.99		survey	101.86	146.13
PS-2	10/20/92	246.73		survey	105.00	141.73
PS-3	10/21/92	266.47		survey	89.14	177.33
PS-4	10/21/92	264.53		survey	81.44	183.09
PS-5	10/21/92	255.14		survey	92.26	162.88
PS-6	10/20/92	269.09		survey	116.76	152.33
PS-7	10/21/92	260.00		survey	91.38	168.62
PS-8	10/20/92	282.84		survey	107.98	174.86
RW-1	10/21/92	247.99		survey	101.45	146.54
RW-2	10/21/92	265.69		survey	82.78	182.91
DW-1						
DW-2						
DW-3						
DW-4						
DW-5						

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TABLE 3-3e

Summary of December 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW01A	12/3/92	394.55	392.79	survey	249.86	144.69
18_BGMW01B	12/3/92	395.25	393.19	survey	215.68	179.57
18_BGMW01C	12/3/92	394.30	392.62	survey	215.00	179.30
18_BGMW01D	12/3/92	393.15	392.53	survey	216.56	176.59
18_BGMW01E	12/02/92	392.08	391.48	survey	214.98	177.10
18_BGMW02A	12/3/92	391.81	391.12	survey	175.72	216.09
18_BGMW02C	12/3/92	391.75	391.12	survey	175.82	215.93
18_BGMW02D	12/3/92	391.45	390.77	survey	176.96	214.49
18_BGMW02E	12/02/92	391.72	390.97	survey	180.42	211.30
18_BGMW03A	12/3/92	280.70	279.60	survey	123.35	157.35
18_BGMW03B	12/3/92	281.73	279.58	survey	115.82	165.91
18_BGMW03C	12/3/92	283.40	279.72	survey	112.16	171.24
18_BGMW03E	12/3/92	279.16	279.45	survey	112.24	166.92
18_BGMW04A	12/3/92	243.36	242.65	survey	104.36	139.00
18_BGMW04B	12/492	243.58	242.88	survey	87.28	156.30
18_BGMW05A	12/4/92	273.73	270.23	survey	90.94	182.79
18_BGMW05B	12/4/92	274.20	270.41	survey	89.37	184.83
18_BGMW05C	12/3/92	269.39	270.11	survey	85.83	183.56
18_BGMW05D	12/02/92	270.60	270.90	survey	85.88	184.72
18_BGMW05E	12/02/92	270.60	270.02	survey	84.42	186.18
18_BGMW06A						
18_BGMW06B						
18_BGMW06C						
18_BGMW06D						
18_BGMW06E						
18_BGMW07	12/02/92	178.90	179.46	survey	23.25	155.65
18_BGMW8A						
18_BGMW8C						
18_BGMW8D						
18_BGMW8E						
18_BGMW9A						
18_BGMW9B						
18_BGMW9C						
18_BGMW9D						
18_BGMW9E						
18_BGMW9F						
02_UGMW10A						
18_BGMW12	12/02/92	306.50	304.68	survey	162.99	143.51
18_BGMW14	12/02/92	268.50	268.17	survey	73.16	195.34
18_BGMW15	12/02/92	319.90	319.98	survey	176.22	143.68
18_BGMW16	12/02/92	377.70	375.91	survey	228.08	149.62
18_BGMW17	12/02/92	375.68	376.07	survey	147.06	228.62
18_BGMW18	12/02/92	275.80	275.91	survey	139.36	136.44
18_BGMW19A	12/4/92	232.61	231.98	survey	113.35	119.26
18_BGMW19B	12/4/92	236.00	232.03	survey	114.29	121.71
18_BGMW19C	12/4/92	233.90	232.05	survey	104.55	129.35
18_BGMW19D	12/4/92	236.00	231.86	survey	96.66	139.34
18_BGMW19E	12/02/92	234.00	232.26	survey	97.18	136.82
18_BGMW22	12/02/92	426.17	425.66	survey	246.56	179.61

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TABLE 3-3e

Summary of December 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW23	12/02/92	190.30	189.54	survey	31.40	158.90
18_BGMW24	12/02/92	618.80	617.49	survey	47.49	571.31
02_UGMW25	12/02/92	545.70	545.70	survey	56.03	489.67
03_UGMW26	12/02/92	418.80	419.48	survey	232.20	186.60
05_UGMW27	12/02/92	437.86	436.87	survey	193.18	244.68
06_UGMW28	12/02/92	334.86	335.07	survey	144.12	190.74
08_UGMW29	12/02/92	272.20	272.68	survey	91.16	181.04
12_UGMW31	12/02/92	255.60	255.97	survey	101.56	154.04
13_UGMW32						
16_UGMW33	12/02/92	337.60	337.20	survey	181.58	156.02
19_UGMW35	12/02/92	341.60	344.39	survey	158.42	183.18
20_UGMW36	12/02/92	341.00	338.01	survey	196.18	144.82
21_UGMW37	12/02/92	259.80	258.32	survey	95.95	163.85
03_DBMW39	12/02/92	419.70	419.43	survey	241.12	178.58
04_DBMW40	12/02/92	404.10	400.04	survey	223.40	180.70
05_DBMW41	12/02/92	425.80	424.16	survey	185.26	240.54
07_DBMW43	12/02/92	292.56	293.42	survey	119.88	172.68
09_DBMW45						
22_DBMW47	12/02/92	277.83	277.25	survey	120.15	157.68
12_DBMW48	12/02/92	248.10	247.14	survey	95.47	152.63
13_DBMW49	12/02/92	282.20	280.08	survey	136.04	146.16
14_DBMW50	12/02/92	272.00	270.32	survey	126.36	145.64
15_DBMW51	12/02/92	270.70	269.72	survey	126.59	144.11
16_DBMW52	12/02/92	332.46	332.92	survey	179.58	152.88
19_DBMW54	12/02/92	332.59	332.37	survey	150.02	182.57
20_DBMW55	12/02/92	334.80	331.92	survey	189.70	145.10
21_DBMW56	12/02/92	255.87	256.32	survey	94.54	161.33
21_DBMW57	12/02/92	634.30		survey	60.10	574.20
01_DGMW58	12/02/92	624.40	621.94	survey	55.05	569.35
02_DGMW59	12/02/92	506.20	506.19	survey	68.70	437.50
02_DGMW60	12/02/92	498.60	498.61	survey	72.47	426.13
02_DGMW61	12/02/92	514.30	514.25	survey	59.96	454.34
04_DGMW63	12/02/92	403.89	403.44	survey	223.41	180.48
03_DGMW64	12/02/92	418.20	418.71	survey	243.24	174.96
03_DGMW65X	12/02/92	413.40	409.08	survey	234.53	178.87
04_DGMW66	12/02/92	402.30	401.10	survey	224.64	177.66
05_DGMW67	12/02/92	429.30	427.94	survey	188.82	240.48
05_DGMW68	12/02/92	420.80	416.61	survey	187.06	233.74
06_DGMW69	12/02/92	324.45	324.45	survey	140.18	184.27
07_DBMW70	12/02/92	293.33	293.94	survey	127.66	165.67
07_DGMW71	12/02/92	283.44	284.02	survey	114.78	168.66
07_DGMW72	12/02/92	276.70	277.34	survey	107.78	168.92
08_DGMW73	12/02/92	263.80	264.01	survey	88.35	175.45
08_DGMW74	12/02/92	265.70	264.11	survey	89.92	175.78
09_DGMW75	12/02/92	273.40	270.35	survey	118.43	154.97
10_DGMW77	12/02/92	271.60	271.71	survey	110.36	161.24
13_DGMW78	12/02/92	279.20	276.34	survey	132.67	146.53
14_DGMW79	12/02/92	270.20	268.93	survey	124.98	145.22
16_DGMW81	12/02/92	321.60	232.74	survey	174.59	147.01

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TABLE 3-3e

Summary of December 1992 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
17_DGMW82						
19_DGMW85	12/02/92	328.50	329.08	survey	148.16	180.34
19_DGMW86	12/02/92	332.88	333.34	survey	158.22	174.66
20_DGMW88	12/02/92	332.31	331.68	survey	190.66	141.65
21_DGMW90	12/02/92	255.17	255.48	survey	94.80	160.37
07_DGMW91	12/02/92	273.19	273.71	survey	107.75	165.44
07_DBMW100	12/02/92	290.20	286.60	survey	108.95	181.25
18_BGMW101	12/02/92	232.80	230.21	survey	85.93	146.87
18_BGMW103						
PS-1	12/02/92	247.99		survey	92.41	155.58
PS-2	12/02/92	246.73		survey	105.32	141.41
PS-3	12/02/92	266.47		survey	89.18	177.29
PS-4	12/02/92	264.53		survey	81.54	182.99
PS-5	12/02/92	255.14		survey	92.42	162.72
PS-6	12/02/92	269.09		survey	117.12	151.97
PS-7	12/02/92	260.00		survey	91.52	168.48
PS-8	12/02/92	282.84		survey	108.32	174.52
RW-1	12/02/92	247.99		survey	101.45	146.54
RW-2	12/02/92	265.69		survey	82.52	183.17
DW-1	12/02/92	268.90		survey	123.82	145.08
DW-2	12/02/92	268.82		survey	123.82	145.00
DW-3	12/02/92	269.11		survey	142.49	126.62
DW-4	12/02/92	269.12		survey	138.72	130.40
DW-5	12/02/92	269.53		survey	135.88	133.65

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TABLE 3-3f

Summary of January 1993 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW01A	01/19/93	393.41	392.79	survey	248.64	144.77
18_BGMW01B	01/19/93	393.83	393.19	survey	215.20	178.63
18_BGMW01C	01/19/93	393.25	392.62	survey	214.55	178.70
18_BGMW01D	01/19/93	393.15	392.53	survey	215.80	177.35
18_BGMW01E	01/19/93	392.09	391.48	survey	215.18	176.91
18_BGMW02A	01/19/93	391.81	391.12	survey	175.65	216.16
18_BGMW02C	01/19/93	391.75	391.12	survey	176.06	215.69
18_BGMW02D	01/19/93	391.45	390.77	survey	177.17	214.28
18_BGMW02E	01/19/93	391.72	390.97	survey	180.80	210.92
18_BGMW03A	01/20/93	279.25	279.60	survey	118.03	161.22
18_BGMW03B	01/20/93	279.28	279.58	survey	110.65	168.63
18_BGMW03C	01/20/93	279.41	279.72	survey	112.40	167.01
18_BGMW03E	01/20/93	279.16	279.45	survey	112.40	166.76
18_BGMW04A	01/20/93	243.36	242.65	survey	93.61	149.75
18_BGMW04B	01/20/93	243.58	242.88	survey	85.45	158.13
18_BGMW05A	01/19/93	269.45	270.23	survey	87.62	181.83
18_BGMW05B	01/19/93	269.95	270.41	survey	87.84	182.11
18_BGMW05C	01/19/93	269.39	270.11	survey	85.30	184.09
18_BGMW05D	01/19/93	270.42	270.90	survey	86.15	184.27
18_BGMW05E	01/19/93	269.41	270.02	survey	84.54	184.87
18_BGMW06A						
18_BGMW06B						
18_BGMW06C						
18_BGMW06D						
18_BGMW06E						
18_BGMW07	01/21/93	179.94	179.46	survey	21.50	158.44
18_BGMW8A						
18_BGMW8C						
18_BGMW8D						
18_BGMW8E						
18_BGMW9A						
18_BGMW9B						
18_BGMW9C						
18_BGMW9D						
18_BGMW9E						
18_BGMW9F						
02_UGMW10A						
18_BGMW12	01/19/93	304.44	304.68	survey	162.60	141.84
18_BGMW14						
18_BGMW15	01/19/93	319.59	319.98	survey	176.09	143.50
18_BGMW16	01/19/93	376.67	375.91	survey	228.32	148.35
18_BGMW17	01/19/93	375.68	376.07	survey	147.86	227.82
18_BGMW18	01/19/93	276.49	275.91	survey	139.12	137.37
18_BGMW19A	01/21/93	232.49	231.98	survey	104.20	128.29
18_BGMW19B	01/21/93	232.51	232.03	survey	105.25	127.26
18_BGMW19C	01/21/93	232.56	232.05	survey	100.88	131.68
18_BGMW19D	01/21/93	232.35	231.86	survey	96.86	135.49
18_BGMW19E	01/21/93	232.91	232.26	survey	97.20	135.71
18_BGMW22	01/20/93	426.17	425.66	survey	246.20	179.97

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TABLE 3-3f

Summary of January 1993 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW23	01/21/93	190.22	189.54	survey	30.33	159.89
18_BGMW24	01/21/93	618.13	617.49	survey	44.66	573.47
02_UGMW25	01/21/93	546.36	545.70	survey	50.17	496.19
03_UGMW26	01/20/93	420.05	419.48	survey	232.54	187.51
05_UGMW27	01/19/93	437.86	436.87	survey	193.48	244.38
06_UGMW28	01/19/93	334.90	335.07	survey	144.44	190.46
08_UGMW29	01/19/93	271.94	272.68	survey	91.38	180.56
12_UGMW31	01/20/93	255.83	255.97	survey	104.20	151.63
13_UGMW32	01/20/93	285.22	285.37	survey	141.12	144.10
16_UGMW33	01/20/93	336.75	337.20	survey	181.36	155.39
19_UGMW35	01/19/93	343.66	344.39	survey	158.55	185.11
20_UGMW36	01/19/93	338.71	338.01	survey	196.20	142.51
21_UGMW37	01/20/93	257.87	258.32	survey	96.16	161.71
03_DBMW39	01/20/93	419.66	419.43	survey	240.80	178.86
04_DBMW40	01/20/93	400.64	400.04	survey	222.79	177.85
05_DBMW41	01/19/93	424.77	424.16	survey	185.43	239.34
07_DBMW43	01/21/93	292.56	293.42	survey	119.43	173.13
09_DBMW45	01/20/93	279.96	279.31	survey	125.06	154.90
22_DBMW47	01/20/93	277.83	277.25	survey	120.28	157.55
12_DBMW48	01/20/93	247.81	247.14	survey	95.65	152.16
13_DBMW49	01/20/93	280.63	280.08	survey	135.79	144.84
14_DBMW50	01/20/93	270.80	270.32	survey	126.37	144.43
15_DBMW51	01/19/93	269.26	269.72	survey	127.07	142.19
16_DBMW52	01/20/93	332.46	332.92	survey	179.03	153.43
19_DBMW54	01/19/93	332.59	332.37	survey	149.93	182.66
20_DBMW55	01/19/93	331.46	331.92	survey	189.75	141.71
21_DBMW56	01/20/93	256.06	256.32	survey	94.97	161.09
21_DBMW57	01/21/93	631.04		survey	58.08	572.96
01_DGMW58	01/21/93	621.94	621.94	survey	52.88	569.06
02_DGMW59	01/21/93	506.91	506.19	survey	52.88	454.03
02_DGMW60	01/21/93	499.28	498.61	survey	41.95	457.33
02_DGMW61	01/21/93	514.85	514.25	survey	54.40	460.45
04_DGMW63	01/19/93	404.11	403.44	survey	223.19	180.92
03_DGMW64	01/19/93	418.28	418.71	survey	242.96	175.32
03_DGMW65X	01/19/93	411.90	409.08	survey	234.27	177.63
04_DGMW66	01/19/93	401.77	401.10	survey	224.35	177.42
05_DGMW67	01/20/93	428.56	427.94	survey	189.10	239.46
05_DGMW68	01/20/93	417.45	416.61	survey	187.97	229.48
06_DGMW69	01/19/93	324.45	324.45	survey	140.37	184.08
07_DBMW70						
07_DGMW71	01/20/93	283.66	284.02	survey	115.08	168.58
07_DGMW72	01/20/93	276.85	277.34	survey	107.97	168.88
08_DGMW73	01/19/93	263.77	264.01	survey	88.56	175.21
08_DGMW74	01/19/93	264.75	264.11	survey	90.23	174.52
09_DGMW75	01/20/93	271.03	270.35	survey	118.65	152.38
10_DGMW77	01/20/93	271.40	271.71	survey	110.60	160.80
13_DGMW78	01/19/93	276.14	276.34	survey	132.80	143.34
14_DGMW79	01/19/93	268.74	268.93	survey	124.89	143.85
16_DGMW81	01/20/93	323.11	232.74	survey	173.90	149.21

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TABLE 3-3f

Summary of January 1993 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
17_DGMW82						
19_DGMW85	01/19/93	328.57	329.08	survey	148.34	180.23
19_DGMW86	01/19/93	332.87	333.34	survey	158.22	174.65
20_DGMW88	01/19/93	332.31	331.68	survey	190.69	141.62
21_DGMW90	01/19/93	255.35	255.48	survey	94.99	160.36
07_DGMW91	01/20/93	273.39	273.71	survey	107.94	165.45
07_DBMW100	01/20/93	286.44	286.60	survey	109.45	176.99
18_BGMW101	01/19/93	230.89	230.21	survey	86.20	144.69
18_BGMW103	01/20/93	252.08	251.18	survey	115.96	136.12
PS-1	01/20/93	247.99		survey	92.49	155.50
PS-2	01/20/93	246.73		survey	105.23	141.50
PS-3	01/20/93	266.47		survey	89.39	177.08
PS-4	01/20/93	264.53		survey	81.60	182.93
PS-5	01/20/93	255.14		survey	92.54	162.60
PS-6	01/20/93	269.09		survey	117.13	151.96
PS-7	01/20/93	260.00		survey	90.91	169.09
PS-8	01/20/93	282.84		survey	108.39	174.45
RW-1	01/20/93	247.99		survey	94.10	153.89
RW-2	01/20/93	265.69		survey	81.61	184.08
DW-1	01/20/93	268.90		survey	123.69	145.21
DW-2	01/20/93	268.82		survey	123.85	144.97
DW-3	01/20/93	269.11		survey	124.40	144.71
DW-4	01/20/93	269.12		survey	125.00	144.12
DW-5	01/20/93	269.53		survey	125.45	144.08

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TABLE 3-3g

Summary of February 1993 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW01A	2/24/93	393.41	392.79	survey	234.10	159.31
18_BGMW01B	2/24/93	393.83	393.19	survey	214.30	179.53
18_BGMW01C	2/24/93	393.25	392.62	survey	213.65	179.60
18_BGMW01D	2/24/93	393.15	392.53	survey	215.45	177.70
18_BGMW01E	2/24/93	392.09	391.48	survey	214.68	177.41
18_BGMW02A	2/24/93	391.81	391.12	survey	175.45	216.36
18_BGMW02C	2/24/93	391.75	391.12	survey	175.81	215.94
18_BGMW02D	2/24/93	391.45	390.77	survey	177.18	214.27
18_BGMW02E	2/24/93	391.72	390.97	survey	180.60	211.12
18_BGMW03A	2/23/93	279.25	279.60	survey	114.81	164.44
18_BGMW03B	2/23/93	279.28	279.58	survey	110.48	168.80
18_BGMW03C	2/23/93	279.41	279.72	survey	108.97	170.44
18_BGMW03E	2/23/93	279.16	279.45	survey	111.85	167.31
18_BGMW04A	2/23/93	243.36	242.65	survey	90.63	152.73
18_BGMW04B	2/23/93	243.58	242.88	survey	83.34	160.24
18_BGMW05A	2/24/93	269.45	270.23	survey	88.95	180.50
18_BGMW05B	2/24/93	269.95	270.41	survey	86.31	183.64
18_BGMW05C	2/24/93	269.39	270.11	survey	84.21	185.18
18_BGMW05D	2/24/93	270.42	270.90	survey	85.57	184.85
18_BGMW05E	2/24/93	269.41	270.02	survey	84.82	184.59
18_BGMW06A						
18_BGMW06B						
18_BGMW06C						
18_BGMW06D						
18_BGMW06E						
18_BGMW07	2/25/93	180.11	179.46	survey	20.48	159.63
18_BGMW8A						
18_BGMW8C						
18_BGMW8D						
18_BGMW8E						
18_BGMW9A						
18_BGMW9B						
18_BGMW9C						
18_BGMW9D						
18_BGMW9E						
18_BGMW9F						
02_UGMW10A						
18_BGMW12	2/24/93	304.44	304.68	survey	161.84	142.60
18_BGMW14	2/25/93	268.67	268.17	survey	72.44	196.23
18_BGMW15	2/24/93	319.59	319.98	survey	175.55	144.04
18_BGMW16	2/24/93	376.67	375.91	survey	227.99	148.68
18_BGMW17	2/24/93	375.68	376.07	survey	147.83	227.85
18_BGMW18	2/24/93	276.49	275.91	survey	138.18	138.31
18_BGMW19A	2/25/93	232.61	231.98	survey	98.92	133.69
18_BGMW19B	2/25/93	232.69	232.03	survey	99.93	132.76
18_BGMW19C	2/25/93	232.79	232.05	survey	97.69	135.10
18_BGMW19D	2/25/93	232.54	231.86	survey	96.13	136.41
18_BGMW19E	2/25/93	232.91	232.26	survey	96.35	136.56
18_BGMW22	2/25/93	426.36	425.66	survey	245.81	180.55

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TABLE 3-3g

Summary of February 1993 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
18_BGMW23	2/25/93	190.22	189.54	survey	28.94	161.28
18_BGMW24	2/25/93	618.13	617.49	survey	41.28	576.85
02_UGMW25	2/25/93	546.36	545.70	survey	39.97	506.39
03_UGMW26	2/25/93	420.05	419.48	survey	232.13	187.92
05_UGMW27	2/24/93	437.86	436.87	survey	192.85	245.01
06_UGMW28	2/24/93	334.90	335.07	survey	144.07	190.83
08_UGMW29	2/24/93	271.94	272.68	survey	90.90	181.04
12_UGMW31	2/23/93	255.83	255.97	survey	100.95	154.88
13_UGMW32	2/24/93	285.22	285.37	survey	140.13	145.09
16_UGMW33	2/24/93	336.75	337.20	survey	180.44	156.31
19_UGMW35	2/24/93	343.66	344.39	survey	157.85	185.81
20_UGMW36	2/24/93	338.71	338.01	survey	195.60	143.11
21_UGMW37	2/23/93	257.87	258.32	survey	95.32	162.55
03_DBMW39	2/24/93	419.66	419.43	survey	240.14	179.52
04_DBMW40	2/24/93	400.64	400.04	survey	222.25	178.39
05_DBMW41	2/24/93	424.77	424.16	survey	184.84	239.93
07_DBMW43	2/23/93	292.56	293.42	survey	118.35	174.21
09_DBMW45	2/23/93	279.96	279.31	survey	124.20	155.76
22_DBMW47	2/23/93	277.83	277.25	survey	119.51	158.32
12_DBMW48	2/23/93	247.81	247.14	survey	94.73	153.08
13_DBMW49	2/24/93	280.63	280.08	survey	134.82	145.81
14_DBMW50	2/24/93	270.80	270.32	survey	125.68	145.12
15_DBMW51	2/24/93	269.26	269.72	survey	126.37	142.89
16_DBMW52	2/24/93	332.46	332.92	survey	178.21	154.25
19_DBMW54	2/24/93	332.59	332.37	survey	149.32	183.27
20_DBMW55	2/24/93	331.46	331.92	survey	188.88	142.58
21_DBMW56	2/23/93	256.06	256.32	survey	94.11	161.95
21_DBMW57						
01_DGMW58	2/25/93	621.94	621.94	survey	49.77	572.17
02_DGMW59	2/25/93	506.91	506.19	survey	51.50	455.41
02_DGMW60	2/25/93	499.28	498.61	survey	44.83	454.45
02_DGMW61	2/25/93	514.85	514.25	survey	48.39	466.46
04_DGMW63	2/24/93	404.11	403.44	survey	223.00	181.11
03_DGMW64	2/24/93	418.28	418.71	survey	242.40	175.88
03_DGMW65X	2/24/93	411.90	409.08	survey	233.93	177.97
04_DGMW66	2/24/93	401.77	401.10	survey	223.53	178.24
05_DGMW67	2/24/93	428.56	427.94	survey	188.53	240.03
05_DGMW68	2/24/93	417.45	416.61	survey	187.77	229.68
06_DGMW69	2/24/93	324.33	324.45	survey	139.70	184.63
07_DBMW70	2/23/93	293.44	293.94	survey	127.77	165.67
07_DGMW71	2/24/93	283.66	284.02	survey	114.47	169.19
07_DGMW72	2/23/93	276.85	277.34	survey	107.20	169.65
08_DGMW73	2/23/93	263.77	264.01	survey	87.84	175.93
08_DGMW74	2/23/93	264.75	264.11	survey	89.57	175.18
09_DGMW75	2/23/93	271.03	270.35	survey	117.66	153.37
10_DGMW77	2/24/93	271.40	271.71	survey	109.95	161.45
13_DGMW78	2/24/93	276.14	276.34	survey	132.42	143.72
14_DGMW79	2/24/93	268.74	268.93	survey	124.29	144.45
16_DGMW81	2/24/93	323.11	232.74	survey	172.70	150.41

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TABLE 3-3g

Summary of February 1993 Water Level Elevations

MCAS El Toro Phase I RI Technical Memorandum

Well ID	Date	Top of Casing Elevation (ft msl)	Ground Elevation (ft msl)	Source of Elevation Information	Depth to Water from Top of Casing (ft. bgs)	Water Level Elevation (ft msl)
17_DGMW82	2/25/93	442.12	442.12	survey	201.97	240.15
19_DGMW85	2/24/93	328.57	329.08	survey	147.73	180.84
19_DGMW86	2/24/93	332.87	333.34	survey	157.47	175.40
20_DGMW88	2/24/93	332.31	331.68	survey	189.84	142.47
21_DGMW90	2/23/93	255.35	255.48	survey	94.17	161.18
07_DGMW91	2/24/93	273.39	273.71	survey	107.37	166.02
07_DBMW100	2/24/93	286.44	286.60	survey	108.86	177.58
18_BGMW101	2/24/93	230.89	230.21	survey	85.52	145.37
18_BGMW103	2/23/93	252.08	251.18	survey	110.86	141.22
PS-1	2/23/93	247.99		survey	91.63	156.36
PS-2	2/23/93	246.73		survey	104.51	142.22
PS-3						
PS-4	2/24/93	264.53		survey	81.04	183.49
PS-5	2/24/93	255.14		survey	91.69	163.45
PS-6	2/23/93	269.09		topo	116.13	152.96
PS-7	2/24/93	260.00		survey	90.57	169.43
PS-8	2/23/93	282.84		survey	107.81	175.03
RW-1	2/24/93	247.99		survey	90.58	157.41
RW-2	2/24/93	265.69		survey	80.08	185.61
DW-1	2/25/93	268.90		survey	123.05	145.85
DW-2	2/25/93	268.82		survey	121.93	146.89
DW-3	2/25/93	269.11		survey	121.05	148.06
DW-4	2/25/93	269.12		survey	121.06	148.06
DW-5	2/25/93	269.53		survey	121.43	148.10

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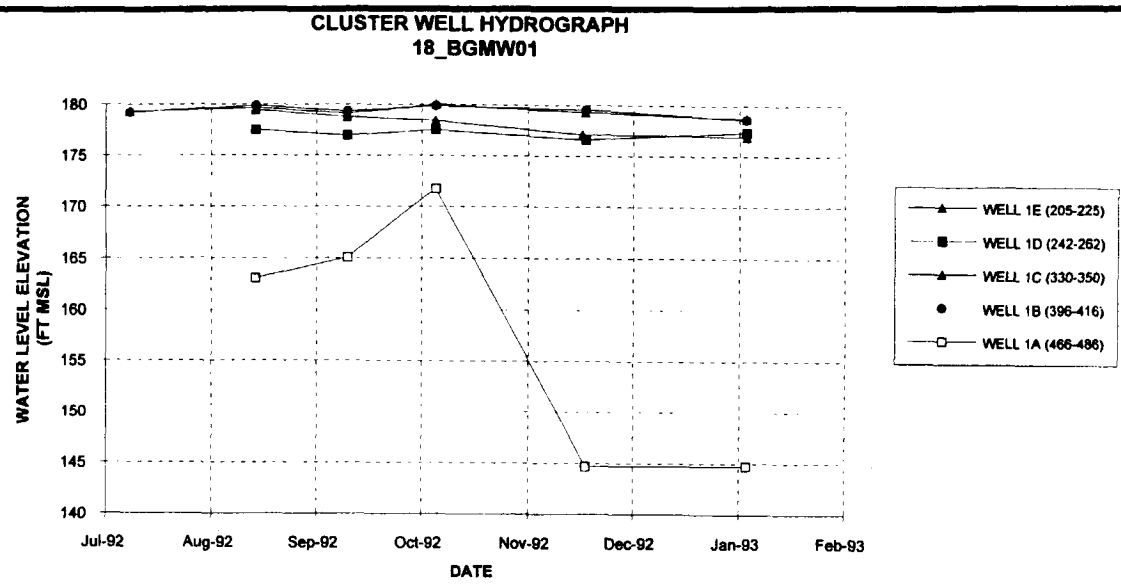

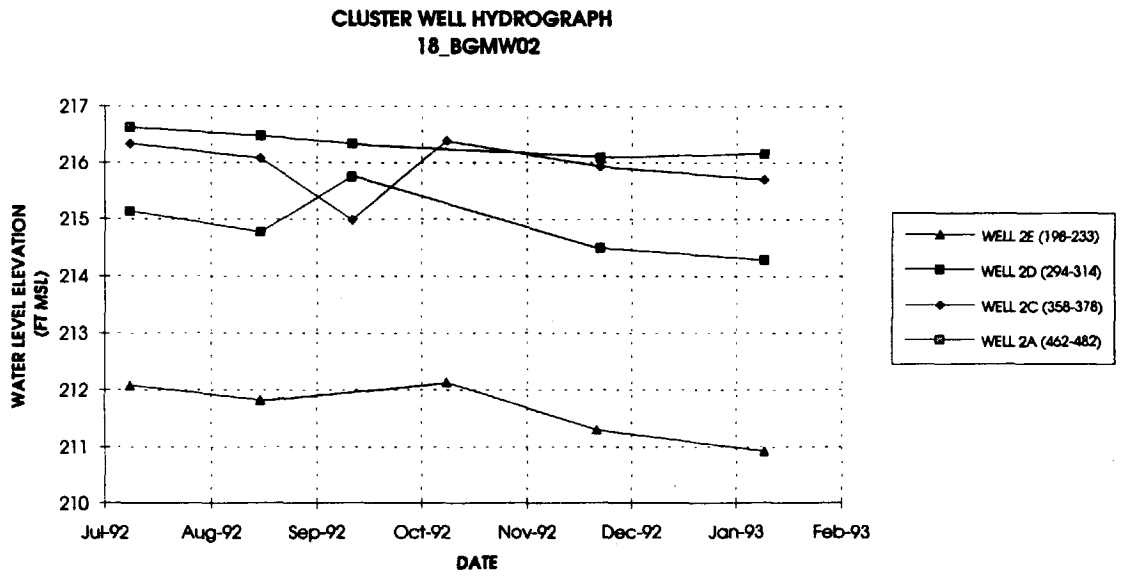

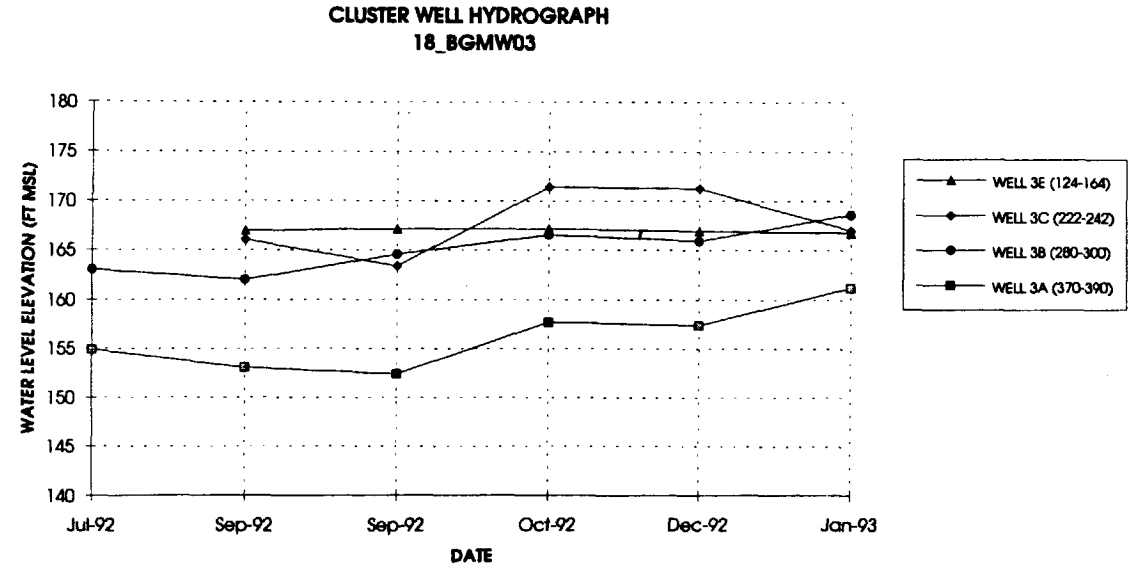

FIGURE 3-5
HYDROGRAPH OF WELL CLUSTERS 1, 2, AND 3
MCAS EL TORO PHASE I RI TECHNICAL MEMORANDUM

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Table 3-4
Calculated Average Linear Groundwater Velocities

Site (OU)	Site	Hydraulic Conductivity ft/day[a]	Groundwater Gradient (ft/ft)[b]	Average Linear Velocity (ft/day)[c]
1 (OU-3)	EOD Range	1.2	0.05	0.2
2 (OU-2)	Magazine Road Landfill	0.38 to 4.7	0.01 to 0.04	0.1 to 0.6
3 (OU-2)	Original Landfill	1.9 to 10.3	0.008	0.05 to 0.3
4 (OU-3)	Ferrocene Spill Area	4.0 to 11.3	0.008	0.1 to 0.3
5 (OU-2)	Perimeter Road Landfill	3.4 to 44.1	0.013	0.15 to 1.9
6 (OU-3)	Drop Tank Drainage Area 1	1.1	0.009	0.03
7 (OU-3)	Drop Tank Drainage Area 2	2.0 to 8.1	0.007	0.05 to 0.2
8 (OU-3)	DRMO Storage Yard	0.18 to 23.1	0.009	0.005 to 0.7
9 (OU-3)	Crash Crew Pit 1	65.1	0.007	1.5
10 (OU-2)	Petroleum Disposal Area	42.4	0.007	1.0
12 (OU-3)	Sludge Drying Beds	4.3 to 9.7	0.007	0.1 to 0.2
13 (OU-3)	Oil Change Area	1.1 to 21.4	0.008	0.03 to 0.6
15 (OU-3)	Suspended Fuel Tanks	0.52	0.008	0.01
16 (OU-3)	Crash Crew Pit 2	0.03 to 0.52	0.0045	0.0005 to 0.008
19 (OU-3)	ACER Site	0.37 to 0.86	0.009	0.02 to 0l04
20 (OU-3)	Hobby Shop	0.29 to 19.6	0.003	0.003 to 0.2
21 (OU-3)	Waste Management Building 320	10.6	0.007	0.25
22 (OU-3)	TAF Dispensing System	7.1	0.007	0.02

[a] Values from Table 3-1
[b] Values from Appendix B
[c] Assumes a porosity of 30 percent

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Velocities at individual sites are discussed in various sections in Appendix B. Average linear groundwater flow velocities in localized areas in the deeper coarse-grained portion of the aquifer that supplies groundwater to production wells are likely to be higher than that in the uppermost aquifer. An average linear groundwater velocity of 1.5 feet per day was calculated based on the hydraulic conductivity of 56.8 ft/day estimated from a 24-hour pumping test completed by OCWD, an average hydraulic gradient of 0.008, and a porosity of 0.3. The drawdown data for the aquifer test were monitored at observation well 18_BGMW103.

3.2 Surface Water, Sediments and Angle Borings

Section 3.2.1 describes the drainage channel configuration near and at the Station as well as the precipitation and flow rates associated with the three OU-1 surface water runoff sample events. Section 3.2.2 summarizes the general chemistry and field parameters of surface water samples. Section 3.3.3 summarizes the lithology beneath the washes based on angle boring logs. A discussion of the nature and extent of OU-1 surface water, sediment, and angle boring contamination is provided in Appendix A2; a summary of this information is provided in Section 6.2.

3.2.1 Precipitation and Stream Flow

Surface drainage near MCAS El Toro generally flows southwest, following the slope of the land perpendicular to the trend of the Santa Ana Mountains. Several washes originate in the hills northeast of the Station and flow through or adjacent to the Station en route to San Diego Creek. Off-Station drainage from the hills and upgradient irrigated farmlands combines with on-Station runoff generated from the Station's extensive paved surfaces, then flows through four main drainage channels (Figure A2-1). These drainage channels are continuous with natural washes that originate in the Santa Ana Mountains: Borrego Canyon, Marshburn Channel, Agua Chinon, and Bee Canyon.

The southernmost of these washes, the Borrego Canyon Wash, flows along the southeast boundary of MCAS El Toro. The wash is unlined in the Santa Ana

Mountains; downstream of Irvine Boulevard, it is lined. Borrego Canyon Wash crosses the Station's southern corner and joins Agua Chinon Wash about 1/4-mile from the Station's boundary. Borrego, Agua Chinon, and Bee Canyon washes are culverted after exiting the Station, until near where they join San Diego Creek.

Agua Chinon and the Bee Canyon Washes cross the central portion of the Station and receive runoff mainly through storm drains (designated "_CB" in Figure 3-6). Through most of their pathways across MCAS El Toro, their flow is contained in culverts. Both washes are unlined along several hundred feet at the southwest edge of the Station. Agua Chinon Wash flows into San Diego Creek just east of the intersection of the San Diego and Laguna Beach Freeways, about 1 mile downstream of its confluence with Borrego Canyon Wash. Bee Canyon Wash flows into San Diego Creek just northeast of the same intersection, about 1,500 feet north of Agua Chinon Wash.

Marshburn Channel is a lined drainage channel that runs along the northwestern boundary of MCAS El Toro and receives runoff from the western part of the Station. This channel flows into San Diego Creek about 3/4-mile northwest of Bee Canyon Wash. San Diego Creek flows into Upper Newport Bay about 7 miles downstream from its intersection with Marshburn Channel.

Parameters collected in the field for surface water include pH, electrical conductivity, and temperature. Flow rates for surface water runoff were estimated in the field by approximating the wash's cross-sectional area and flow velocity. Generally, the magnitude of the first and third storm flows are similar, with a smaller runoff observed during the second storm. Larger storms are a stronger mechanism for sediment transport, though surface water contaminant concentrations are often diluted. The later storms in a series, as with the second storm event, are expected to have lower surface water chemical concentrations because previous storms (25 days prior) have already "washed" much of the surface contamination.

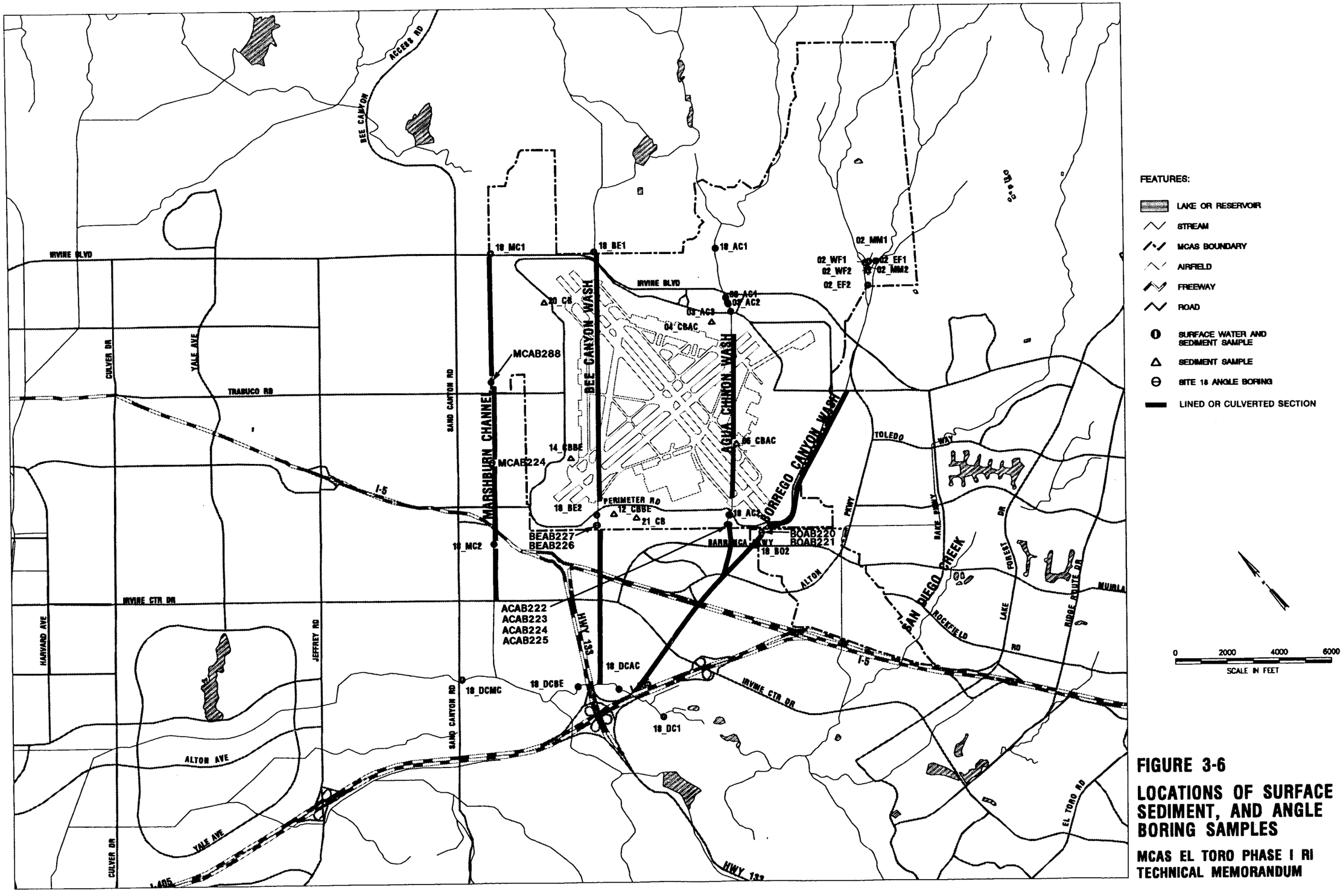

FIGURE 3-6

LOCATIONS OF SURFACE WATER SEDIMENT, AND ANGLE BORING SAMPLES

MCAS EL TORO PHASE I RI TECHNICAL MEMORANDUM

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3.2.2 General Chemistry and Field Parameters

The Borrego Canyon and Agua Chinon Wash surface water type is calcium sulfate; Bee Canyon Wash's water ranges from magnesium sulfate (Station 18_BE1) to calcium bicarbonate (Station 18_BE2). Water from Marshburn Channel is magnesium sulfate upstream (18_MC1) and calcium sulfate downstream (18_MC2). San Diego Creek water is characterized generally as calcium sulfate.

Field measured pH, temperature, and electrical conductivity are presented in Table A2-2. The pH readings ranged from 6.8 to 8.7. Temperatures ranged from 12.3°C in December to 24°C in March. The range for electrical conductivity was 72 to 1,090 micromhos per centimeter at 25°C.

3.2.3 Subsurface Lithology Beneath Washes

The subsurface geology consists of sands to silty sands intermixed with layers of clays. The angle borings on Borrego Canyon Wash and Marshburn Channel had the highest amount of most clays, with fat and lean clays and clayey sands comprising the upper 35 feet of depth. The four angle borings on Agua Chino Wash and two borings on Bee Canyon Wash are predominantly saNds, ranging from poorly graded to silty sands.

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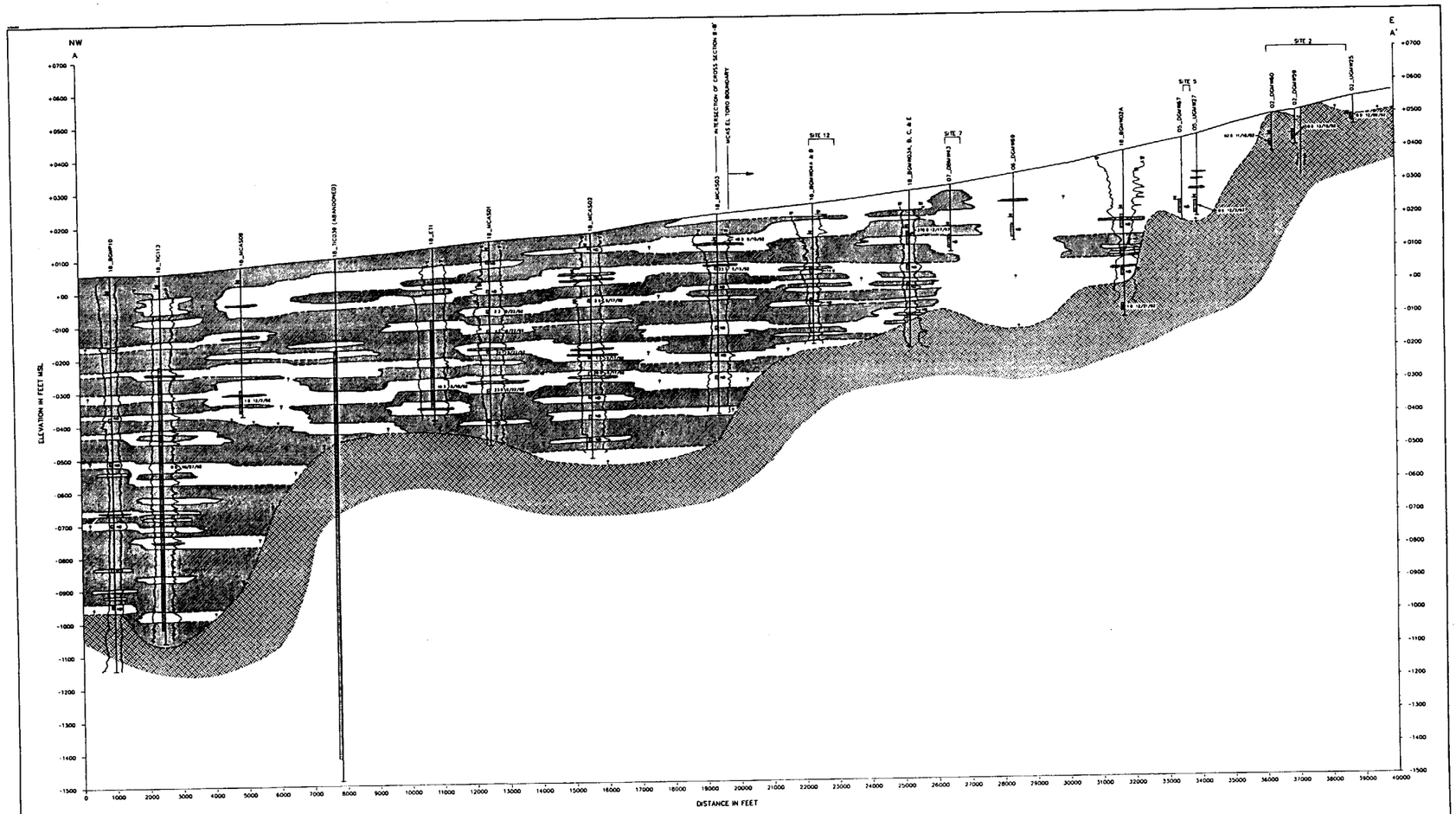

LOCATIONS OF GEOLOGIC CROSS SECTIONS ARE ON FIGURE 3-1

PLATE 3-1
REGIONAL GEOLOGIC CROSS SECTIONS A-A' AND B-B'
W.S.S.I., TORO PHASE I, IN
TECHNICAL MEMORANDUM

4.0 SUMMARY OF NATURE AND EXTENT OF CONTAMINATION: OU-2 AND OU-3 (SITES 1 THROUGH 17 AND SITES 19 THROUGH 22)

The following subsections summarize (for each OU-2 and OU-3 site) the results and conclusions of Phase I RI sampling and analysis. For detailed site descriptions, field investigation and sampling data, and results of analytical tests, please refer to Appendix B.

Results of groundwater analysis were compared against applicable drinking water standards. These Federal and California State drinking water standards, EPA Primary Maximum Contaminant Levels (MCLs), California MCLs, EPA Secondary MCLs, California EPA Action Levels, are described in Appendix A1. The most stringent of these standards were applied for the comparisons. However, only those exceeding EPA Primary MCLs are presented in this summary section and Appendix B.

The results of three VOCs, acetone, methylene chloride, and 2-butanone, should be reviewed with caution. All three compounds are demonstrated laboratory contaminants. The maximum detected concentrations of these compounds were 37 μg/L for acetone, 42 μg/L for methylene chloride,a d 33 μg/L for 2-butanone.

Additionally, phthalate compounds detected may be due to laboratory or field contamination. Phthalates are commonly found in plasticizers.

4.1 Site 1 (OU-3) - Explosive Ordnance Disposal Range

4.1.1 Background

Site 1 (OU-3), the Explosive Ordnance Disposal (EOD) Range, is located in the northeast portion of MCAS El Toro. The site consists of one stratum, the general disposal area in the northern part of the site. Disposal and detonation of small munitions have been conducted at this site for an unknown period of time, but at least since 1952. Suspected contaminants include metals, nitrated toluenes,

sulfates, and low-level radioactive isotopes. In 1982, approximately 2,000 gallons of sulfur trioxide chlorosulfonic acid was disposed of in trenches.

Field investigation activities consisted of the following:

- Installing two downgradient monitoring wells
- Collecting surface and near-surface soil samples

4.1.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Stratum 1: carbon tetrachloride (<CRDL) and toluene (<CRDL)
- Surface, upgradient: not analyzed for VOCs
- Vadose: none

SVOCs - Soil

- Stratum 1: none
- Surface, upgradient: not analyzed for SVOCs
- Vadose: none

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Stratum 1: TRPH (110 to 147 mg/kg), TFH-diesel (19.4 to 21.5 mg/kg), and TFH-gasoline (not detected to 0.079 mg/kg)
- Surface, upgradient: TRPH (not detected), TFH-diesel (61.6 mg/kg), and TFH-gasoline (0.219 mg/kg)
- Vadose: none detected

Chloromethane (below CRDL) was the only VOC detected in groundwater at Site 1.

No compounds were detected in groundwater above primary drinking water standards.

Site 1 does not appear to be a potential source of the regional groundwater VOC concentration plume. TCE was not detected in the groundwater samples or in any of the soil samples collected at the site.

4.2 Site 2 (OU-3) - Magazine Road Landfill

4.2.1 Background

Site 2 (OU-3), the Magazine Road Landfill, comprises approximately 22 acres between Borrego Canyon Wash and one of its tributaries. The site consists of two strata: Stratum 1, the area within the landfill boundary, and Stratum 2, an area of stained and disturbed soil. From 1960 to 1980, Site 2 served as a disposal landfill for all solid wastes from MCAS El Toro and for some wastes from MCAS Tustin. An estimated 800,000 to 1,000,000 cubic yards of waste were disposed of at this site, including construction debris, municipal waste, batteries, waste oils, hydraulic fluids, paint residues, transformers, and waste solvents.

Field investigation activities consisted of:

- Installing one upgradient monitoring well
- Drilling and sampling at one deep boring
- Installing three downgradient wells
- Collecting surface and near-surface soil samples
- Collecting surface water runoff samples
- Collecting sediment samples

4.2.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Sediment: benzene (<CRDL), carbon tetrachloride (11 μg/kg), methylene chloride (92 μg/kg), toluene (<CRDL), and trichloroethylene (<CRDL)
- Stratum 1: ethylbenzene (<CRDL), 2-hexanone (17 μg/kg), toluene (<CRDL to 12 μg/kg), and xylene (<CRDL)
- Stratum 2: toluene (<CRDL to 12 μg/kg)
- Surface, upgradient: not analyzed for VOCs
- Surface, deep boring: toluene (15 μg/kg)
- Vadose: acetone (72 and 90 μg/kg) and toluene (<CRDL)

SVOCs - Soil

- Sediment: benzyl butyl phthalate (1,200 μg/kg) and bis(2-ethylhexyl)phthalate (<CRDL)
- Stratum 1: none
- Stratum 2: benzyl butyl phthalate (<CRDL) and bis(2-ethylhexyl)phthalate (4,200 μg/kg)
- Surface, upgradient: not analyzed for SVOCs
- Surface, deep boring: none
- Vadose: bis(2-ethylhexyl)phthalate (<CRDL)

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Sediment: TRPH (not detected to 4,555 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.064 mg/kg)
- Stratum 1: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (0.311 to 0.734 mg/kg)
- Stratum 2: TRPH (not detected), TFH-diesel (not detected to 97.5 mg/kg), and TFH-gasoline (not detected to 0.958 mg/kg)
- Surface, upgradient: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected and 0.29 mg/kg)

- Surface, deep boring: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected)
- Vadose: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected)

Pesticides, PCBs, and Herbicides - Soil

- Sediment: miscellaneous pesticides/PCBs (<CRDL to 5.04 μg/kg); MCPP (140,000 μg/kg) and 2,4-DB (455 μg/kg)
- Stratum 1: no pesticides/PCBs; dalapon (50.8 μg/kg)
- Stratum 2: miscellaneous pesticides (<CRDLs); dichloroprop (507 μg/kg)
- Surface, upgradient: not analyzed for pesticides, PCBs, or herbicides
- Surface, deep boring: no pesticides/PCBs; dalapon (81.5 μg/kg) and MCPP (48,700 μg/kg)
- Vadose: no pesticides/PCBs; dalapon (82.7 μg/kg), 2,4-DB (198 μg/kg), and MCPA (225,000 μg/kg)

No VOCs were detected in the surface water samples.

The following VOCs were detected in groundwater at Site 2:

- Chloroform (<CRDL to 6 μg/L)
- 1,2 Dichloroethane (<CRDL)
- 1,2 Dichloroethene (<CRDL to 8 μg/L)
- Tetrachlorethene (<CRDL to 8 μg/L)
- Trichloroethylene (<CRDL to 82 μg/L)

The following compounds were detected in groundwater above primary drinking water standards: 1,2-dichloroethane, gross alpha, tetrachloroethylene, and trichloroethylene.

Site 2 may be a potential source of the regional groundwater VOC contamination. TCE, PCE, and 1,2-DCE were detected in the groundwater samples at levels above EPA drinking primary water standards.

4.3 Site 3 (OU-2) - Original Landfill

4.3.1 Background

Site 3 (OU-2), the Original Landfill, comprises a 20-acre area located between Perimeter Road and North Marine Way along the Agua Chinon Wash. The site consists of a single stratum. Site 3 was operated as a cut-and-fill landfill disposal facility in conjunction with burning to reduce waste volume, (1943-1955). An estimated 163,500 to 243,000 cubic yards of waste material were landfilled. Suspected wastes and contaminants include metals, incinerator ash, solvents, paint residues, hydraulic fluids, engine coolants, construction debris, oily wastes, municipal solid wastes, and various inert solid wastes.

Field investigation activities consisted of the following:

- Installing one upgradient monitoring well
- Drilling and sampling at one deep boring, completed as a monitoring well
- Installing two downgradient monitoring wells
- Collecting surface and near-surface soil samples
- Collecting surface water samples
- Collecting sediment samples.

4.3.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Sediment: acetone (210 µg/kg), 2-hexanone (<CRDL), and toluene (<CRDL)
- Stratum 1: toluene (<CRDL)
- Surface, upgradient: not analyzed for VOCs
- Surface, deep boring: toluene (<CRDL)
- Vadose: acetone (78 µg/kg), methylene chloride (50 µg/kg), and toluene (<CRDL)

SVOCs - Soil

- Sediment: bis(2-ethylhexyl)phthalate (<CRDL)
- Stratum 1: none
- Surface, upgradient: not analyzed for SVOCs
- Surface, deep boring: none
- Vadose: none

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Sediment: TRPH (not detected to 223 mg/kg), TFH-diesel (not detected to 79.9 mg/kg), and TFH-gasoline (not detected to 5.71 mg/kg)
- Stratum 1: TRPH (not detected to 202 mg/kg), TFH-diesel (not detected to 13.8 mg/kg), and TFH-gasoline (not detected to 13.8 mg/kg)
- Surface, upgradient: TRPH (not detected), TFH-diesel (12.5 mg/kg), and TFH-gasoline (0.127 mg/kg)
- Surface, deep boring: TRPH (99 mg/kg), TFH-diesel (14.3 mg/kg), and TFH-gasoline (0.19 mg/kg)
- Vadose: TRPH (not detected to 249 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.132 mg/kg)

Pesticides/PCBs, Herbicides, Dioxins/Furans - Soil

- Sediment: 4,4'-DDT (7 and 9.64 µg/kg), 4,4'-DDD (3.83 µg/kg), and 4,4'-DDE (3.47 and 4.46 µg/kg); no herbicides; and not analyzed for dioxins/furans
- Stratum 1: 4,4'-DDT (<CRDL), 4,4'-DDD (<CRDL), and 4,4'-DDE (<CRDL); 2,4,5-TP(silvex) (<CRDL); and not analyzed for dioxins/furans
- Surface, upgradient: not analyzed for pesticides/PCBs or dioxins/furans; 2,4,5-TP(silvex) (49.6 µg/kg)
- Surface, deep boring: 4,4'-DDT (<CRDL), 4,4'-DDD (<CRDL), and 4,4'-DDE (<CRDL); no herbicides detected; dioxins/furans (1 ng/g)
- Vadose: no pesticides/PCBs; MCPP (<CRDL to 62,700 µg/kg), 2,4,5-TP(silvex) (<CRDL), and 2,4,5-T (<CRDL); and not analyzed for dioxins/furans

VOCs detected in surface water samples include the following: acetone (39 μg/L), carbon disulfide (1 μg/L), chlorodibromomethane (<CRDL), and chloromethane (<CRDL to 3 μg/L).

The following VOCs were detected in groundwater at Site 3:

- Chloromethane (3 μg/L)
- Chloroform (<CRDL to 1μg/L)
- Xylene (<CRDL)

The following compounds were detected in groundwater above primary drinking water standards: dieldrin, gross alpha, heptachlor, nitrate/nitrite, and selenium.

Site 3 does not appear to be a potential source of the regional groundwater VOC contamination. TCE was not detected in the groundwater samples or in soil samples collected from the site.

4.4 Site 4 (OU-3) - Ferrocene Spill Area

4.4.1 Background

Site 4 (OU-3), the Ferrocene Spill Area, is located southeast of Building 658, an engine test facility. The site consists of two strata:

- Stratum 1: a stained area
- Stratum 2: a drainage ditch and catch basin

Approximately 5 gallons of ferrocene and hydrocarbon carrier solution spilled onto the ground during washing operations of a 500-gallon tank. Rinsate drained into a dirt ditch southwest of the spill, which discharges into a catch basin for Agua Chinon Wash. Suspected contaminants include ferrocene, hydrocarbon carrier solution, engine test hydrocarbons, oil discharges, and fuel-related VOCs and SVOCs.

Field investigation activities consisted of:

- Installing one upgradient monitoring well
- Drilling and sampling at one deep boring, completed as a monitoring well
- Installing one downgradient well
- Collecting surface and near-surface soil samples
- Collecting sediment samples

4.4.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Sediment: none
- Stratum 1: toluene (<CRDL to 17 µg/kg)
- Stratum 2: toluene (27 µg/kg) and xylene (100 µg/kg)
- Surface, upgradient: not analyzed for VOCs
- Surface, deep boring: toluene (<CRDL)
- Vadose: toluene (<CRDL)

SVOCs - Soil

- Sediment: none
- Stratum 1: none
- Stratum 2: 2-methylnaphthalene (2,900 µg/kg), naphthalene (23,000 µg/kg), and miscellaneous SVOCs below CRDLs
- Surface, upgradient: not analyzed for SVOCs
- Surface, deep boring: miscellaneous below CRDLs
- Vadose: bis(2-ethylhexyl)phthalate (<CRDL)

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Sediment: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected)

- Stratum 1: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected)
- Stratum 2: TRPH (not detected), TFH-diesel (not detected to 16,400 mg/kg), and TFH-gasoline (not detected to 3.11 mg/kg)
- Surface, upgradient: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected)
- Surface, deep boring: TRPH (not detected), TFH-diesel (56.8 mg/kg), and TFH-gasoline (not detected)
- Vadose: TRPH (not detected to 249 mg/kg). TFH-diesel (not detected), and TFH-gasoline (not detected to 0.829 mg/kg)

The following VOCs were detected in groundwater at Site 4:

- Benzene (<CRDL to 3 μg/L)
- 2-Hexanone (<CRDL to 7 μg/L)

The following compounds were detected in groundwater above primary drinking water standards: benzene, nitrate/nitrite, and selenium.

Site 4 does not appear to be a potential source of the regional groundwater VOC contamination. TCE was not detected in the groundwater samples or in soil samples collected from the site.

4.5 Site 5 (OU-2) - Perimeter Road Landfill

4.5.1 Background

Site 5 (OU-2), the Perimeter Road Landfill, is located in the southeast quadrant of the Station, north of Gate 3 along the Station boundary, approximately 800 feet north-northwest of Borrego Canyon Wash. Site 5 was used as a cut-and-fill operation, burning wastes prior to burial to reduce volume, with landfilled waste volumes estimated at 50,000-60,000 cubic yards, (1955-late 1960s). The site, which encompasses a disposal area of approximately 72,000 square feet, comprises a single stratum. Suspected wastes and contaminants include

burnable trash, municipal solid waste, cleaning fluids, scrap metals, paint residues and unspecified fuels, oils, and solvents.

Field investigation activities consisted of the following:

- Drilling and sampling at one deep boring, completed as a monitoring well
- Installing one upgradient monitoring well
- Installing two downgradient monitoring wells
- Collecting surface and near-surface soil samples

4.5.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Stratum 1: toluene (<CRDL)
- Surface, upgradient: not analyzed for VOCs
- Surface, deep boring: none
- Vadose: none

SVOCs - Soil

- Stratum 1: none
- Surface, upgradient: not analyzed for SVOCs
- Surface, deep boring: none
- Vadose: bis(2-ethylhexyl)phthalate (<CRDL)

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Stratum 1: TRPH (not detected to 877 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.083 mg/kg)
- Surface, upgradient: TRPH (28 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected)
- Surface, deep boring: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected)

- Vadose: TRPH (not detected to 76 mg/kg), TFH-diesel (not detected to 21.8 mg/kg), and TFH-gasoline (not detected)

Pesticides, PCBs, and Herbicides - Soil

- Stratum 1: 4,4'-DDT (<CRDL to 239 µg/kg), methoxychlor (<CRDL to 122 µg/kg), and 2,4,5-TP(silvex) (<CRDL)
- Surface, upgradient: not analyzed for pesticides/PCBs; 2,4,5-TP(silvex) (55.6 µg/kg)
- Surface, deep boring: no pesticides/PCBs; not analyzed for herbicides
- Vadose: 4,4'-DDT (<CRDL to 7.24 µg/kg) and MCPP (<CRDL to 261,000 µg/kg)

The following VOCs were detected in groundwater at Site 5:

- Benzene (<CRDL)
- Chloromethane (<CRDL)
- Tetrachlorethene (<CRDL)
- Trichloroethylene (<CRDL)

The following compounds were detected in groundwater above primary drinking water standards: gross alpha and gross beta.

Site 5 does not appear to be a potential source of the regional groundwater VOC contamination. TCE was identified below the CRDL in the groundwater; it was not detected in the soil samples collected from the site.

4.6 Site 6 (OU-3) - Drop Tank Drainage Area No. 1

4.6.1 Background

Site 6 (OU-3), Drop Tank Drainage Area No. 1, consists of a concrete apron, bordered by a grassy area southwest of Building 727 in the southern quadrant of the Station. Aircraft drop tanks were drained and rinsed of residual JP-5 fuel at this site (1969-1983). Rinsate and surface water runoff from these operations

flowed west of the tank drainage area into a ditch connected to a catch basin that discharges into Agua Chinon Wash. The site comprises three strata:

- Stratum 1: The soil around the edge of the pad
- Stratum 2: The drainage area from the pad to the catch basin
- Stratum 3: The former drum storage areas

Field investigations at Site 6 consisted of the following:

- Installing one upgradient monitoring well
- Drilling and sampling at one deep boring
- Installing one downgradient well
- Collecting surface and near-surface soil samples

4.6.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Sediment: toluene (<CRDL)
- Stratum 1: carbon tetrachloride (<CRDL) and toluene (<CRDL)
- Stratum 2: acetone (49 μg/kg), carbon tetrachloride (<CRDL) and toluene (<CRDL)
- Stratum 3: carbon tetrachloride (<CRDL) and toluene (<CRDL)
- Surface, upgradient: not analyzed for VOCs
- Surface, deep boring: carbon tetrachloride (<CRDL) and toluene (<CRDL)
- Vadose: 2-hexanone (<CRDL to 13 μg/kg), toluene (<CRDL), and xylene (<CRDL)

SVOCs - Soil

- Sediment: bis(2-ethylhexyl)phthalate (<CRDL)

- Stratum 1: benzyl butyl phthalate (<CRDL) and bis(2-ethylhexyl)phthalate (<CRDL to 1,100 µg/kg)
- Stratum 2: miscellaneous SVOCs below CRDLs
- Stratum 3: bis(2-ethylhexyl)phthalate (<CRDL to 14,000 µg/kg)
- Surface, upgradient: not analyzed for SVOCs
- Surface, deep boring: benzyl butyl phthalate (<CRDL) and bis(2-ethylhexyl)phthalate (<CRDL)
- Vadose: none

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Sediment: TRPH (24 mg/kg), TFH-diesel (16.6 mg/kg), and TFH-gasoline (315 mg/kg)
- Stratum 1: TRPH (not detected to 1,297 mg/kg), TFH-diesel (not detected to 59.6 mg/kg), and TFH-gasoline (not detected to 0.094 mg/kg)
- Stratum 2: TRPH (not detected to 458 mg/kg), TFH-diesel (not detected to 37.6 mg/kg), and TFH-gasoline (not detected to 0.258 mg/kg)
- Stratum 3: TRPH (not detected to 124 mg/kg), TFH-diesel (not detected to 239 mg/kg), and TFH-gasoline (not detected to 0.224 mg/kg)
- Surface, upgradient: TRPH (not detected and 1,041 mg/kg), TFH-diesel (not detected to 37.7 mg/kg), and TFH-gasoline (not detected)
- Surface, deep boring: TRPH (71 mg/kg), TFH-diesel (31.9 mg/kg), and TFH-gasoline (0.066 mg/kg)
- Vadose: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected)

The following VOCs were detected in groundwater at Site 6:

- Chloromethane (<CRDL)
- 1,1,1-Trichloroethane (<CRDL)

The following compounds were detected in groundwater above primary drinking water standards: cadmium, nitrate/nitrite, phenol, and selenium.

Site 6 does not appear to be a potential source of the regional groundwater VOC contamination. TCE was not detected in the groundwater samples or in soil samples collected from the site.

4.7 Site 7 (OU-3) - Drop Tank Drainage Area No. 2

4.7.1 Background

Site 7 (OU-3), Drop Tank Drainage Area No. 2, is located in the southwest quadrant of the Station, north and east of Hangar Buildings 295 and 296. From 1969 to 1983, aircraft drop tanks reportedly were drained of residual JP-5 fuel in this area.

Field investigations for Site 7 (OU-3), Drop Tank Drainage Area No. 2, focused on:

- Stratum 1 (edge of concrete pad north of Buildings 295 and 296), site of drop tank drainage (approximately 7,000 gallons of JP-5 and lubrication oil, 1969-1983)
- Stratum 2 (former edge of concrete pad east of Buildings 295 and 296 where approximately 11,000 gallons of lubrication oil and 4,000 gallons of JP-5 was applied for dust control, 1972-1983)
- Stratum 3, concrete pad east of Buildings 295 and 296 to the edge of the new pavement
- Stratum 4, drainage area east of the concrete pad that flows to the ditch, then eventually to Agua Chinon Wash
- Stratum 5, the open unpaved area south of Building 296.

Sampling activities were conducted as follows:

- Collecting surface and near-surface soil samples
- Drilling and sampling at three deep borings, completed as monitoring wells.
- Installing three downgradient monitoring wells

4.7.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Stratum 1: benzene (<CRDL), carbon tetrachloride (<CRDL) and toluene (<CRDL)
- Stratum 2: none
- Stratum 3: toluene (<CRDL to 13 µg/kg)
- Stratum 4: toluene (<CRDL to 14 µg/kg)
- Stratum 5: acetone (64 µg/kg), toluene (<CRDL to 14 µg/kg), and xylene (<CRDL)
- Surface, deep boring: carbon tetrachloride (<CRDL) and toluene (<CRDL)
- Vadose: acetone (74 µg/kg), 1,1-dichloroethene (<CRDL), toluene (<CRDL), and trichloroethylene (27 and 74 µg/kg)

SVOCs - Soil

- Stratum 1: fluoranthene (1,500 µg/kg) and miscellaneous SVOCs below CRDLs
- Stratum 2: none
- Stratum 3: miscellaneous SVOCs (<CRDLs to 4,100 µg/kg)
- Stratum 4: none
- Stratum 5: miscellaneous SVOCs (<CRDL to 6,900 µg/kg)
- Surface, deep boring: miscellaneous SVOCs (<CRDLs to 2,800 µg/kg)
- Vadose: benzyl butyl phthalate (<CRDL to 1,100 µg/kg)

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Stratum 1: TRPH (not detected to 3,329 mg/kg), TFH-diesel (not detected to 686 mg/kg), and TFH-gasoline (not detected to 2.68 mg/kg)
- Stratum 2: TRPH (not detected to 94 mg/kg), TFH-diesel (not detected to 43.3 mg/kg), and TFH-gasoline (not detected to 0.378 mg/kg)
- Stratum 3: TRPH (not detected), TFH-diesel (not detected to 110 mg/kg), and TFH-gasoline (not detected to 0.124 mg/kg)
- Stratum 4: TRPH (not detected to 206 mg/kg), TFH-diesel (not detected to 37 mg/kg), and TFH-gasoline (not detected to 0.066 mg/kg)
- Stratum 5: TRPH (145 to 32,091 mg/kg), TFH-diesel (not detected to 426 mg/kg), and TFH-gasoline (not detected to 0.111 mg/kg)
- Surface, deep boring: TRPH (3,060 mg/kg), TFH-diesel (53.7 mg/kg), and TFH-gasoline (0.548 mg/kg)
- Vadose: TRPH (not detected to 138 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.233 mg/kg)

Pesticides and PCBs - Soil

- Stratum 1: miscellaneous (38.7 to 200 μg/kg)
- Stratum 2: none
- Stratum 3: miscellaneous (<CRDLs to 4.52 μg/kg)
- Stratum 4: none
- Stratum 5: miscellaneous (6.54 to 115 μg/kg)
- Surface, deep boring: 4,4'-DDD (39.9 μg/kg) and 4,4'-DDT (65.1 μg/kg)
- Vadose: none

The following VOCs were detected in groundwater at Site 7:

- Carbon tetrachloride (<CRDL to 3 μg/L)
- Chloroform (<CRDL to 4 μg/L)
- 1,1 Dichloroethene (<CRDL)

- Tetrachlorethene (<CRDL to 3 μg/L)
- Trichloroethylene (<CRDL to 120 μg/L)

The following compounds were detected in groundwater above primary drinking water standards: cadmium, carbon tetrachloride, nitrate/nitrite, selenium, and trichloroethylene.

Site 7 appears to be contributing to the chlorinated-VOC groundwater plume. TCE was not detected in the deep borings converted to wells. Concentrations of TCE in three downgradient wells (23, 48, and 120 μg/L) are all above drinking water standards.

4.8 Site 8 (OU-3) - DRMO Storage Yard

4.8.1 Background

Site 8 (OU-3), the Defense Reutilization and Marketing Office (DRMO) Storage Yard, is a storage area for unknown containerized liquids and various scrap materials. Located on the southwest corner of Marine Way and "R" Street, the site comprises two primary areas of concern: the Old Salvage Yard (eastern portion); and the current Storage Yard (western portion). Site 8 consists of four strata:

- Stratum 1: the east portion of the current Storage Yard
- Stratum 2: the west portion of the current Storage Yard
- Stratum 3: a refuse pile
- Stratum 4: an area of PCB spillage, 1984

The following field investigation activities were conducted:

- Installing one upgradient monitoring well
- Installing two downgradient monitoring wells
- Drilling and sampling at five deep borings
- Collecting surface and near-surface soil samples

4.8.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Stratum 1: 2-hexanone (13 μg/kg) and toluene (<CRDL)
- Stratum 2: ethylbenzene (<CRDL), toluene (<CRDL), and xylene (16 μg/kg)
- Stratum 3: methylene chloride (66 μg/kg), tetrachloroethylene (<CRDL), and toluene (<CRDL)
- Stratum 4: none
- Surface, upgradient: not analyzed for VOCs
- Surface, deep boring: toluene (<CRDL)
- Vadose: acetone (76 and 210 μg/kg), carbon disulfide (<CRDL), 2-hexanone (<CRDL), and toluene (<CRDL)

SVOCs - Soil

- Stratum 1: bis(2-ethylhexyl)phthalate (<CRDL to 1,500 μg/kg) and miscellaneous other SVOCs below CRDLs
- Stratum 2: benzyl butyl phthalate (<CRDL)
- Stratum 3: miscellaneous SVOCs (<CRDL to 8,800 μg/kg)
- Stratum 4: miscellaneous SVOCs (<CRDL)
- Surface, upgradient: not analyzed for SVOCs
- Surface, deep boring: bis(2-ethylhexyl)phthalate (<CRDL)
- Vadose: bis(2-ethylhexyl)phthalate (<CRDL to 900 μg/kg) and benzyl butyl phthalate (<CRDL)

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Stratum 1: TRPH (not detected to 7,730 mg/kg), TFH-diesel (not detected to 91.3 mg/kg), and TFH-gasoline (not detected to 0.351 mg/kg)
- Stratum 2: TRPH (not detected to 1,698 mg/kg), TFH-diesel (not detected to 74.8 mg/kg), and TFH-gasoline (not detected to 2.26 mg/kg)
- Stratum 3: TRPH (not detected to 1,806 mg/kg), TFH-diesel (not detected to 231 mg/kg), and TFH-gasoline (not detected to 0.441 mg/kg)
- Stratum 4: TRPH (not detected to 6,001 mg/kg), TFH-diesel (not detected to 1,060 mg/kg), and TFH-gasoline (not detected to 1.25 mg/kg)
- Surface, upgradient: TRPH (not detected and 512 mg/kg), TFH-diesel (not detected to 13.7 mg/kg), and TFH-gasoline (not detected to 0.056 µg/kg)
- Surface, deep boring: TRPH (2,144 mg/kg), TFH-diesel (43.7 mg/kg), and TFH-gasoline (0.327 mg/kg)
- Vadose: TRPH (not detected to 596 mg/kg), TFH-diesel (not detected to 39.1 mg/kg), and TFH-gasoline (not detected to 2.4 mg/kg)

Pesticides and PCBs - Soil

- Stratum 1: miscellaneous pesticides (<CRDL to 170 µg/kg); PCB-1254 (<CRDL to 1,060 µg/kg [estimated]); PCB-1260 (<CRDL to 599 µg/kg [estimated])
- Stratum 2: none
- Stratum 3: Miscellaneous pesticides (<CRDL to 836 µg/kg); PCB-1248 (CRDL to 17,800 µg/kg); PCB-1254 (<CRDL to 20,400 µg/kg)
- Stratum 4: miscellaneous pesticides (<CRDL to 150 µg/kg [estimated] µg/kg); PCB-1254 (<CRDL to 3,020 µg/kg [estimated]); PCB-1260 (<CRDL to 1,820 µg/kg [estimated])
- Surface, upgradient: not analyzed for pesticides/PCBs
- Surface, deep boring = miscellaneous pesticides (<CRDL to 19.9 µg/kg); PCB-1254 (<CRDL to 739 µg/kg)
- Vadose: BHC-delta (<CRDL) and endosulfan sulfate (<CRDL)

The following VOCs were detected in groundwater at Site 8:

- Benzene (<CRDL)
- Carbon tetrachloride (<CRDL to 6 µg/L)
- Chloroform (<CRDL to 9 µg/L)
- Chloromethane (<CRDL)

- 1,1-Dichloroethene (<CRDL to 8 μg/L)
- Tetrachlorethene (<CRDL to 8 μg/L)
- Toluene (<CRDL)
- 1,1,2-Trichloroethane (<CRDL)
- Trichloroethylene (20 to 140 μg/L)
- Xylene (<CRDL)

The following compounds were detected in groundwater above primary drinking water standards: carbon tetrachloride, nitrate/nitrite, tetrachloroethylene, and trichloroethylene.

Site 8 may be contributing to the chlorinated-VOC groundwater plume. TCE concentration in groundwater increased from 20 to 140 μg/L between the upgradient and downgradient wells.

4.9 Site 9 (OU-3) - Crash Crew Pit No. 1

4.9.1 Background

Site 9 (OU-3), Crash Crew Pit No. 1, comprises a single stratum that has two separate but proximate pits that lie west of Building 435 and north of the Transformer Storage Area. The west pit was used for fire-fighting training (1965-1971), receiving an estimated 123,700 gallons of waste liquids (JP-5, avgas, and crankcase oil). It is unknown when the east test pit was operational, and what liquid volumes may have been used there and infiltrated into the subsurface soil.

The following field investigation activities were conducted:

- Collecting surface and near-surface soil samples
- Drilling and sampling at two deep borings, one completed as a monitoring well
- Installing one downgradient monitoring well

4.9.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Stratum 1: carbon tetrachloride (<CRDL), toluene (<CRDL), and 1,1,1-trichloroethane (<CRDL)
- Vadose: acetone (48 µg/kg) and toluene (<CRDL)

SVOCs - Soil

- Stratum 1: dimethyl phthalate (<CRDL)
- Vadose: benzyl butyl phthalate (<CRDL) and bis(2-ethylhexyl)phthalate (<CRDL to 6,500 µg/kg)

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Stratum 1: TRPH (65 to 259 mg/kg), TFH-diesel (not detected to 51.1 µg/kg), and TFH-gasoline (0.11 to 0.89 mg/kg)
- Vadose: TRPH (not detected to 228 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.55 µg/kg)

The following VOCs were detected in groundwater at Site 9:

- Carbon tetrachloride (2 to 7 µg/L)
- Chloroform (<CRDL to 2 µg/L)
- Chloromethane (<CRDL)
- 1,2 Dichloroethane (<CRDL)
- 1,1 Dichloroethene (<CRDL to 4 µg/L)
- 1,2 Dichloroethene (<CRDL to 1 µg/L)
- Tetrachlorethene (5 to 8 µg/L)
- Trichloroethylene (270 to 2,000 µg/L)

The following compounds were detected in groundwater above primary drinking water standards: carbon tetrachloride, nitrate/nitrite, selenium, tetrachloroethylene, and trichloroethylene.

Site 9 appears to be located downgradient of a source of the regional groundwater VOC contamination. The highest concentrations of TCE in the RI/FS (i.e., 270 to 2,000 μg/L) are seen in the wells at this site. TCE was not detected in any of the soil samples collected at this site.

4.10 Site 10 (OU-2) - Petroleum Disposal Area

4.10.1 Background

Site 10 (OU-2), the Petroleum Disposal Area, is located directly south of Building 435 and east of Building 369, and comprises an area approximately 1,200 by 800 feet. The site is covered with aircraft matting and a concrete apron, and consists of two strata: Stratum 1, the concrete apron, installed around 1971 and Stratum 2, the aircraft matting, installed around 1973. From 1952 through the mid-1960s, an estimated 52,000 gallons of waste crankcase oil, antifreeze, hydraulic and transmission fluids, motor oils, and solvents were applied to an area of approximately 960,000 square feet for dust control.

The field investigation activities were conducted:

- Collecting surface and near-surface soil samples
- Drilling and sampling at two deep borings
- Installing one downgradient monitoring well

4.10.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Stratum 1: toluene (<CRDL to 13 µg/kg)
- Stratum 2: acetone (130 µg/kg), 1,2-dichloroethene (<CRDL), tetrachloroethylene (<CRDL to 19 µg/kg), and toluene (<CRDL to 18 µg/kg)
- Vadose: acetone (70 and 76 µg/kg)

SVOCs - Soil

- Stratum 1: miscellaneous SVOCs (<CRDLs to 780 µg/kg)
- Stratum 2: none
- Vadose: none

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Stratum 1: TRPH (not detected to 293 mg/kg), TFH-diesel (not detected to 38.3 mg/kg), and TFH-gasoline (not detected to 0.117 mg/kg)
- Stratum 2: TRPH (not detected to 532 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected)
- Vadose: TRPH (not detected to 529 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.357 mg/kg)

The following VOCs were detected in groundwater at Site 10:

- Carbon tetrachloride (2 µg/L)
- Chloroform (1 µg/L)
- Chloromethane (<CRDL)
- 1,1-Dichloroethene (<CRDL)
- Tetrachloroethylene(8 µg/L)
- Trichloroethylene (35 µg/L)

The following compounds were detected in groundwater above primary drinking water standards: carbon tetrachloride, nitrate/nitrite, selenium, tetrachloroethylene, and trichloroethylene.

Site 10 does not appear to be a potential source of the regional groundwater VOC contamination. Although TCE was detected in the groundwater samples, it was not detected in any of the soil samples collected at the site.

4.11 Site 11 (OU-3) - Transformer Storage Area

4.11.1 Background

Site 11 (OU-3) the Transformer Storage Area, is a 30-foot concrete pad located northeast of Building 369, where approximately 50 to 75 transformers were stored (1968-1983). It has been estimated that approximately 60 gallons of PCB transformer oil may have leaked onto the pad and subsequently flowed to an adjacent drainage ditch and surrounding soil. The site consists of two strata: Stratum 1, an area around the pad where spilled fluids may have drained and Stratum 2, an asphalt-lined drainage ditch running parallel to Building 369. Suspected contaminants are PCBs.

Field investigation activities consisted of collecting 17 surface and near-surface soil samples.

4.11.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples:

Pesticides and PCBs - Soil

- Stratum 1: 4,4'-DDD (<CRDL to 9.89 µg/kg), 4,4'-DDE (<CRDL to 3.76 µg/kg), 4,4'-DDT (<CRDL to 105 µg/kg), endrin aldehyde (<CRDL to 73.2 µg/kg), endosulfan II (<CRDL to 134 µg/kg), and PCB-1260 (<CRDL to 4,960 µg/kg)
- Stratum 2: 4,4'-DDD (<CRDL to 137 µg/kg), 4,4'-DDT (<CRDL to 85.1 µg/kg), endrin aldehyde (<CRDL to 145 µg/kg), endrin (<CRDL to 24.9 µg/kg), endosulfan II (<CRDL to 81 µg/kg), and PCB-1260 (<CRDL to 3,580 µg/kg)

Site 11 has some pesticide/PCB contamination. Since these are not very mobile compounds, it seems unlikely that groundwater has been impacted.

4.12 Site 12 (OU-3) - Sludge Drying Beds

4.12.1 Background

Site 12 (OU-3), the Sludge Drying Beds, is located in the southwest corner of the facility, west of Building 307 near Plant Road, South Marine Way, and Bee Canyon Wash. The site comprises wastewater treatment plant sludge dewatering areas (1943-1972). The site consists of three strata:

- Stratum 1: the West Sludge Drying Beds, between Bee Canyon Wash and Plant Road, south of S. Marine Way (abandoned around 1965)
- Stratum 2: the East Sludge Drying Beds, east of Plant Road and west of South Marine Way, a potential site of wastewater plant impoundments or additional sludge beds, (abandoned around 1972)
- Stratum 3: a drainage ditch running east-west around the "east" beds perimeter, south of the west beds, and into Bee Canyon Wash

The following field investigation activities were conducted:

- Collecting sediment samples
- Collecting surface and near-surface soil samples
- Drilling and sampling at one 25-foot deep boring
- Installing one upgradient monitoring well
- Installing one downgradient monitoring well

4.12.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Sediment: toluene (<CRDL)
- Stratum 1: 2-butanone (79 μg/kg), carbon tetrachloride (<CRDL), and toluene (<CRDL)

- Stratum 2: carbon tetrachloride (<CRDL) and toluene (<CRDL)
- Stratum 3: carbon tetrachloride (<CRDL to 11 μg/kg), carbon disulfide (<CRDL) toluene (<CRDL to 10 μg/kg), and xylene (<CRDL)
- Surface, upgradient: not analyzed for VOCs
- Surface, deep boring: toluene (<CRDL)
- Vadose: acetone (69 μg/kg)

SVOCs - Soil

- Sediment: bis(2-ethylhexyl)phthalate (<CRDL)
- Stratum 1: none
- Stratum 2: bis(2-ethylhexyl)phthalate (<CRDL)
- Stratum 3: miscellaneous SVOCs (<CRDLs to 1,700 μg/kg)
- Surface, upgradient: not analyzed for SVOCs
- Surface, deep boring: miscellaneous SVOCs (<CRDLs to 1,100 μg/kg)
- Vadose: di-n-octyl phthalate (<CRDL)

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Sediment: TRPH (30 mg/kg), TFH-diesel (not detected), and TFH-gasoline (0.102 mg/kg)
- Stratum 1: TRPH (not detected to 372 mg/kg), TFH-diesel (not detected to 13.1 mg/kg), and TFH-gasoline (not detected to 0.207 mg/kg)
- Stratum 2: TRPH (not detected to 314 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.349 mg/kg)
- Stratum 3: TRPH (not detected to 42,529 mg/kg), TFH-diesel (not detected to 1,970 mg/kg), and TFH-gasoline (not detected to 24.7 mg/kg)
- Surface, upgradient: TRPH (not detected and 6,770 mg/kg), TFH-diesel (65.4 and 86.8 mg/kg), and TFH-gasoline (not detected and 0.062 mg/kg)
- Surface, deep boring: TRPH (68 mg/kg), TFH-diesel (20.6 mg/kg), and TFH-gasoline (not detected)
- Vadose: TRPH (not detected to 192 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.113 mg/kg)

Pesticides, PCBs, and Herbicides - Soil

- Sediment: miscellaneous pesticides (<CRDL to 418 µg/kg); not analyzed for herbicides
- Stratum 1: miscellaneous pesticides (<CRDL to 240 µg/kg), PCB-1254) (<CRDL to 725 µg/kg [estimated]); dalapon (<CRDL) and MCPP (94,000 µg/kg)
- Stratum 2: miscellaneous pesticides (<CRDL to 764 µg/kg [estimated]), PCB-1254 (<CRDL to 725 µg/kg [estimated]); dalapon (<CRDL) and MCPP (38,700 µg/kg)
- Stratum 3: miscellaneous pesticides (<CRDL to 3,650 µg/kg [estimated]), PCB-1254, (<CRDL to 2,490 µg/kg [estimated] µg/kg); dalapon (<CRDL), MCPP (<CRDL to 153,000 µg/kg), and 2,4-dichlorophenoxy acetic acid (<CRDL to 140 µg/kg)
- Surface, upgradient: not analyzed for pesticides, PCBs, or herbicides
- Surface, deep boring: miscellaneous pesticides (<CRDL to 145 µg/kg); not analyzed for herbicides
- Vadose: 4,4'-DDT (<CRDL to 29.1 µg/kg) and 4,4'-DDE (<CRDL to 24.4 µg/kg)

The following VOCs were detected in groundwater at Site 12:

- Carbon tetrachloride (<CRDL)
- Chloroform (<CRDL)
- Chloromethane (<CRDL)
- Tetrachlorethene (18 µg/L)
- Trichloroethylene (<CRDL and 7 µg/L)

The following compounds were detected in groundwater above primary drinking water standards: nitrate/nitrite, selenium, tetrachloroethylene, and trichloroethylene.

Site 12 does not appear to be a potential source of the regional groundwater VOC contamination. Although TCE and PCE were detected in the groundwater, they were not detected in soil samples collected from the site.

4.13 Site 13 (OU-3) - Oil Change Area

4.13.1 Background

Site 13 (OU-3), the Oil Change Area, comprises two sampling strata:

- Stratum 1: an area southeast of the Tank Farm No.2 fence line
- Stratum 2: an area between the tank farm and Building 242

From 1977 to 1983, approximately 7,000 gallons of heavy equipment waste crankcase oil were drained onto the ground at Stratum 1. Oily soils subsequently were removed to a pile at the north end of the site, and no visible evidence of contamination remains. Review of aerial photographs, (1952-1986) revealed additional stained areas, (Sampling Stratum 2). Underground storage tanks (USTs) at Tank Farm No. 2 may contain waste oil and JP5.

Types of contamination under investigation at this site include VOCs and SVOCs, petroleum compounds, PCBs, and heavy metals.

Field investigation activities consisted of the following:

- Installing one upgradient monitoring well
- Installing one downgradient monitoring well
- Drilling and sampling at one deep boring, completed as a monitoring well
- Drilling and sampling of one 25-foot boring
- Collecting surface and near-surface soil samples

4.13.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Stratum 1: toluene (<CRDL)
- Stratum 2: acetone (43 μg/kg) and toluene (<CRDL)

- Surface, upgradient: not analyzed for VOCs
- Surface, 25-ft boring: toluene (<CRDLs)
- Surface, deep boring: toluene (<CRDL)
- Vadose: acetone (48 to 120 μg/kg) and benzene (<CRDL)

SVOCs - Soil

- Stratum 1: miscellaneous below CRDLs
- Stratum 2: miscellaneous below CRDLs
- Surface, upgradient: not analyzed for SVOCs
- Surface, 25-ft boring: miscellaneous below CRDLs
- Surface, deep boring: miscellaneous below CRDLs
- Vadose: bis(2-ethylhexyl)phthalate (<CRDL)

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Stratum 1: TRPH (not detected to 457 mg/kg), TFH-diesel (not detected to 52.1 mg/kg), and TFH-gasoline (not detected to 0.319 mg/kg)

- Stratum 2: TRPH (not detected to 328 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.196 mg/kg)

- Surface, upgradient: TRPH (not detected and 936 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected)

- Surface, 25-ft boring: TRPH (54 mg/kg), TFH-diesel (not detected), and TFH-gasoline (0.149 mg/kg)

- Surface, deep boring: TRPH (3,340 mg/kg), TFH-diesel (490 mg/kg), and TFH-gasoline (0.264 mg/kg)

- Vadose: TRPH (not detected to 1,605 mg/kg), TFH-diesel (not detected to 109 mg/kg), and TFH-gasoline (not detected to 0.241 mg/kg)

Pesticides and PCBs - Soil

- Stratum 1: not analyzed for pesticides/PCBs
- Stratum 2: not analyzed for pesticides/PCBs
- Surface, upgradient: not analyzed for pesticides/PCBs
- Surface, 25-ft boring: not analyzed for pesticides/PCBs
- Surface, deep boring: not analyzed for pesticides/PCBs
- Vadose: miscellaneous pesticides (5.2 to 12.5 μg/kg)

The following VOCs were detected in groundwater at Site 13:

- Benzene (23 to 730 μg/L)
- Chloromethane (<CRDL to 6 μg/L)
- Ethylbenzene (<CRDL to 2 μg/L)
- Toluene (<CRDL to 2 μg/L)
- Xylene (5 to 58 μg/L)

The following compounds were detected in groundwater above primary drinking water standards: benzene, cadmium, nitrate/nitrite, and selenium.

Site 13 does not appear to be a potential source of the regional groundwater VOC contamination. TCE was not detected in the groundwater samples or in any of the soil samples collected at the site.

Significant benzene contamination was detected in groundwater at Site 13; its source may be nearby Tank Farm 2.

4.14 Site 14 (OU-3) - Battery Acid Disposal Area

4.14.1 Background

Site 14 (OU-3), the Battery Acid Disposal Area, is located approximately 50 feet southwest of Building 245, which was formerly a heavy equipment maintenance shop. The site comprises two strata: Stratum 1, an L-shaped strip of land of approximately 225 square feet, reportedly used as a disposal location for battery acid from Station vehicles and miscellaneous paints, (1977-1983), and Stratum 2, a drainage ditch and catch basin. An estimated 210 gallons of battery acid may have been disposed of at this site. The catch basin, located west of this site, discharges into the Bee Canyon Wash. Suspected contaminants include lead and other priority pollutant metals, waste oils, methylene chloride and other solvents from paint products, and phenols from paint strippers.

Field investigation activities consisted of the following:

- Drilling/sampling one deep boring, completed as a monitoring well
- Installing one downgradient monitoring well
- Collecting surface and near-surface soil samples
- Collecting sediment samples

4.14.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Sediment: none
- Stratum 1: acetone (66 µg/kg) and toluene (<CRDL)
- Stratum 2: carbon tetrachloride (<CRDL) and toluene (<CRDL)
- Surface, deep boring: toluene (<CRDL)
- Vadose: 1,1,1 trichloroethane (<CRDL)

SVOCs - Soil

- Sediment: miscellaneous SVOCs (<CRDLs to 7,400 µg/kg)
- Stratum 1: miscellaneous SVOCs (<CRDLs to 5,800 µg/kg)
- Stratum 2: miscellaneous SVOCs (<CRDLs to 970 µg/kg)
- Surface, deep boring: none
- Vadose: bis(2-ethylhexyl)phthalate (28,000 µg/kg)

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Sediment: TRPH (7,364 mg/kg), TFH-diesel (11,100 mg/kg), and TFH-gasoline (0.108 mg/kg)

- Stratum 1: TRPH (not detected to 1,367 mg/kg), TFH-diesel (not detected to 383 mg/kg), and TFH-gasoline (not detected to 1.64 mg/kg)

- Stratum 2: TRPH (not detected to 960 mg/kg), TFH-diesel (not detected to 198 mg/kg), and TFH-gasoline (not detected to 1.64 mg/kg)

- Surface, deep boring: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (0.264 mg/kg)

- Vadose: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected)

The following VOCs were detected in groundwater at Site 14:

- Carbon tetrachloride (5 and 19 μg/L)
- Chloroform (9 and 12 μg/L)
- Trichloroethylene (2 and 2 μg/L)

The following compounds were detected in groundwater above primary drinking water standards: carbon tetrachloride, nitrate/nitrite, and selenium.

Site 14 does not appear to be a potential source of the regional groundwater VOC contamination. Although TCE was detected in the groundwater, it was not detected in soil samples collected from the site.

4.15 Site 15 (OU-3) - Suspended Fuel Tanks Area

4.15.1 Background

Site 15 (OU-3), the Suspended Fuel Tanks Area, is located north of Building 31 and west of Building 29. The site consists of a single stratum, comprising stained areas beneath and in the general area around the fuel tanks. Two 500-gallon above-ground diesel fuel tanks were located here from 1979 to 1984, and an estimated 500 gallons of diesel fuel leaked onto the ground. The tanks were removed in 1984.

Field investigation activities consisted of the following:

- Drilling and sampling at one deep boring completed as a monitoring well
- Collecting surface and near-surface soil samples

4.15.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Stratum 1: acetone (55 and 59 μg/kg), methylene chloride (45 and 52 μg/kg), and toluene (<CRDL)
- Surface, upgradient: toluene (<CRDL)
- Surface, deep boring: acetone (87 μg/kg), methylene chloride (58 μg/kg), and toluene (<CRDL)
- Vadose: carbon disulfide (<CRDL to 14 μg/kg), toluene (<CRDL), and xylene (<CRDL)

SVOCs - Soil

- Stratum 1: benzyl butyl phthalate (1,200 μg/kg) and bis(2-ethylhexyl)phthalate (<CRDL)
- Surface, upgradient: chrysene (<CRDL)
- Surface, deep boring: phenanthrene (<CRDL)
- Vadose: none

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Stratum 1: TRPH (not detected to 2,694 mg/kg), TFH-diesel (not detected to 2,780 mg/kg), and TFH-gasoline (not detected to 0.129 mg/kg)
- Surface, upgradient: TRPH (71 and 3,751 mg/kg), TFH-diesel (not detected and 63.2 mg/kg), and TFH-gasoline (not detected and 0.374 mg/kg)
- Surface, deep boring: TRPH (23,034 mg/kg), TFH-diesel (8,530 mg/kg), and THF-gasoline (21.1 mg/kg)
- Vadose: TRPH (not detected to 1,377 mg/kg), TFH-diesel (not detected to 2,540 mg/kg), and TFH-gasoline (not detected to 4.44 mg/kg)

The following VOCs were detected in groundwater at Site 15:

- Benzene (120 μg/L)
- Xylene (36 μg/L)
- TFH-gasoline (348 μg/L), TFH-diesel (3,370 μg/L)

The following compounds were detected in groundwater above primary drinking water standards: benzene, nitrate/nitrite, and selenium.

Site 15 does not appear to be a potential source of the regional groundwater VOC contamination. TCE was not detected in the groundwater samples or in any of the soil samples collected at the site.

Significant benzene contamination was detected in groundwater at Site 15.

4.16 Site 16 (OU-3) - Crash Crew Pit No. 2

4.16.1 Background

Site 16 (OU-3), Crash Crew Pit No. 2, is located near the center of the Station near the intersection of Runways 34-16 and 25-07. A drainage ditch runs along Runway 21-30 to the northwest and discharges into Bee Canyon Wash. From 1972 to about 1985, the site, which served as a training area for Crash Crew practice in extinguishing fires.

- A main pit, which was filled with water and a mixture of JP-5 fuel, leaded aviation gasoline, hydraulic fluid, and crankcase oil
- A secondary holding pit, for storing residual liquids from the main pit
- A shallow, smaller pit used for practicing with handheld fire extinguisher

An estimated 275,000 gallons of residual fluids may have been placed in the Site's three pits. The site comprises three strata:

- Stratum 1, a disturbed earth area including two filled-in pits

- Stratum 2, the main pit
- Stratum 3, the drainage channel

Contaminants of concern include JP-5 fuel, leaded aviation gasoline, hydraulic fluid, and crankcase oils and other waste oils

Field investigation activities consisted of the following:

- Drilling and sampling at one deep boring completed as a monitoring well
- Collecting surface and near-surface soil samples

4.16.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Stratum 1: methylene chloride (50 µg/kg) and toluene (<CRDL)
- Stratum 2: acetone (<CRDL to 1,100 µg/kg), 2-butanone (3,500 to 13,000 µg/kg), benzene (<CRDL), carbon tetrachloride (<CRDL), ethylbenzene (<CRDL to 3,600 µg/kg), toluene (<CRDL to 3,400 µg/kg), and xylene (3,000 to 23,000 µg/kg)
- Stratum 3: carbon tetrachloride (<CRDL), 2-hexanone (<CRDL), and toluene (<CRDL)
- Surface, upgradient: not analyzed for VOCs
- Vadose: acetone (<CRDL), 2-butanone (7,200 to 14,000 µg/kg), ethylbenzene (<CRDL), methylene chloride (<CRDL), toluene (<CRDL), and xylene (<CRDL to 13,000 µg/kg)

SVOCs - Soil

- Stratum 1: miscellaneous SVOCs (<CRDL to 2,000 µg/kg)
- Stratum 2: miscellaneous (<CRDLs to 33,000 µg/kg)
- Stratum 3: miscellaneous SVOC (<CRDLs)
- Surface, upgradient: not analyzed for SVOCs

- Vadose: 2-methylnaphthalene (<CRDL) and naphthalene (<CRDL to 26,000 µg/kg)

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Stratum 1: TRPH (not detected to 17,486 mg/kg), TFH-diesel (24.6 to 54,000 mg/kg), and TFH-gasoline (0.171 to 12.4 mg/kg)
- Stratum 2: TRPH (2,844 to 39,101 mg/kg), TFH-diesel (838 to 75,200 µg/kg), and TFH-gasoline (14.9 to 3,120 mg/kg)
- Stratum 3: TRPH (not detected to 575 mg/kg), TFH-diesel (not detected to 65.9 mg/kg), and TFH-gasoline (not detected to 0.212 mg/kg)
- Surface, upgradient: TRPH (not detected to 85 mg/kg), TFH-diesel (not detected to 28.4 mg/kg), and TFH-gasoline (not detected to 0.213 mg/kg)
- Vadose: TRPH (not detected to 5,524 mg/kg), TFH-diesel (not detected to 40,000 mg/kg), and TFH-gasoline (not detected to 7,040 mg/kg)

Chloroform (<CRDL) was the only VOC identified in groundwater at Site 16.

The following compounds were detected in groundwater above primary drinking water standards: cadmium, nitrate/nitrite, and selenium.

Site 16 does not appear to be a potential source of the regional groundwater VOC contamination. TCE was not detected in the groundwater samples or in any of the soil samples collected at the site.

4.17 Site 17 (OU-3) - Communication Station Landfill

4.17.1 Background

Site 17 (OU-3), the Communication Station Landfill, comprises an approximate 26-acre area in a small canyon west of the Magazine Road Landfill. The site consists of two strata: Stratum 1, the landfill and Stratum 2, a stained area. The landfill was actively used from 1981-1983 as a stationwide disposal facility. Suspected

contamination includes domestic waste and rubble, cooking grease, oils and fuels form sumps, and empty drums.

Field investigation activities consisted of the following:

- Drilling and sampling at one deep boring
- Installing one downgradient well
- Collecting surface and near-surface soil samples

4.17.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Stratum 1: toluene (<CRDL)
- Stratum 2: acetone (86 μg/kg), methylene chloride (47 μg/kg), and toluene (<CRDL to 180 μg/kg)
- Surface, deep boring: none
- Vadose: acetone (38 μg/kg) and toluene (<CRDL)

SVOCs - Soil

- Stratum 1: miscellaneous SVOCs (<CRDLs)
- Stratum 2: 4-methylphenol (<CRDL to 34,000 μg/kg) and miscellaneous SVOCs (<CRDLs)
- Surface, deep boring: none
- Vadose: none

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Stratum 1: TRPH (not detected to 402 mg/kg), TFH-diesel (not detected to 51.4 mg/kg), and TFH-gasoline (not detected to 0.125 mg/kg)
- Stratum 2: TRPH (not detected to 2,733 mg/kg), TFH-diesel (not detected to 1,010 mg/kg), and TFH-gasoline (not detected to 0.526 mg/kg)
- Surface, deep boring: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected)
- Vadose: TRPH (not detected to 1,886 mg/kg), TFH-diesel (not detected to 106 mg/kg), and TFH-gasoline (not detected to 0.584 mg/kg)

Pesticides, PCBs, and Herbicides - Soil

- Stratum 1: miscellaneous (<CRDL)
- Stratum 2: miscellaneous (<CRDL)
- Surface, deep boring: none
- Vadose: miscellaneous pesticides (2.9 to 7.29 μg/kg) and miscellaneous herbicides (38.8 to 70,300 μg/kg)

The following VOCs were detected in groundwater at Site 17:

- Bromodichloromethane (7 μg/L)
- Chlorodibromomethane (6 μg/L)
- Chloroform (7 μg/L)

No compounds were detected in groundwater above primary drinking water standards.

Site 17 does not appear to be a potential source of the regional groundwater VOC contamination. TCE was not detected in the groundwater or in soil samples collected from the site.

4.18 Site 18 (OU-1) - Regional Groundwater Investigation

Please refer to Section 6.0 for a summary of the Phase I RI at Site 18.

4.19 Site 19 (OU-3) - Aircraft Expeditionary Refueling (ACER) Site

4.19.1 Background

Site 19 (OU-3), the Aircraft Expeditionary Refueling (ACER) Site, is located in the southeast region of the facility, southwest of Buildings 404 and 415. The site comprises three strata:

- Stratum 1, a stained area in the northeast area of the site where fuels were stored
- Stratum 2, an excavated fuel bladder revetment (FBR) area to the west
- Stratum 3, a stained area surrounding Stratum 2

Site 3 was operated as a fuel storage area, served with six 20,000-gallon JP-5 FBRs: 1964-1987. During this period, at least one FBR tank was known to rupture and released an estimated 15,000 gallons of JP-5. Soil sampled following the rupture indicated a maximum hydrocarbon concentration 11,300 mg/kg. Additional suspected wastes and contaminants include heavy metals, VOCs, and SVOCs.

Field investigation activities consisted of the following:

- Drilling and sampling three 25-foot borings and two 60-foot angle borings
- Drilling and sampling at one deep boring, completed as a monitoring well
- Installing three downgradient monitoring wells
- Collecting surface and near-surface soil samples

4.19.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Stratum 1: none
- Stratum 2: toluene (<CRDL to 11 μg/kg)
- Stratum 3: toluene (<CRDL)
- Surface, upgradient: not analyzed for VOCs
- Vadose: acetone (45 and 47 μg/kg) and toluene (<CRDL to 11 μg/kg)

SVOCs - Soil

- Stratum 1: miscellaneous SVOCs (<CRDL to 5,900 μg/kg)
- Stratum 2: none
- Stratum 3: none
- Surface, upgradient: not analyzed for SVOCs
- Vadose: miscellaneous SVOCs (<CRDL to 8,000 μg/kg)

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Stratum 1: TRPH (not detected to 230 mg/kg), TFH-diesel (not detected to 162 mg/kg), and TFH-gasoline (not detected to 0.488 mg/kg)
- Stratum 2: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected)
- Stratum 3: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.128 mg/kg)
- Surface, upgradient: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected)
- Vadose: TRPH (not detected to 200 mg/kg), TFH-diesel (not detected to 31.4 mg/kg), and TFH-gasoline (not detected to 1.68 mg/kg)

The following VOCs were detected in groundwater at Site 19:

- 4-Methyl-2-pentanone (<CRDL)
- Tetrachlorethene (1 μg/L)
- Trichloroethylene (<CRDL)

The following compounds were detected in groundwater above primary drinking water standards: nitrate/nitrite and selenium.

Site 19 does not appear to be a potential source of the regional groundwater VOC contamination. TCE was identified below the CRDL in groundwater samples; it was not detected in any of the soil samples collected at the site.

4.20.1 Background

Site 20 (OU-3), the Hobby Shop, is located in Building 626 near the intersection of North Ninth Street and West Marine Way, in the northwest section of the Station. Since 1967, military personnel have used the Hobby Shop to service their privately owned vehicles. The site comprises four strata:

- Stratum 1, a drainage ditch to the east
- Stratum 2, a drainage ditch to the south
- Stratum 3, a stained area west of the building
- Stratum 4, a courtyard and front slope area

The site has a 600-gallon underground waste oil tank, three 700-gallon oil/water separators, and three 50-gallon solvent parts tanks. Prior to 1976, kerosene was used to wash down the asphalt pavement in the area (a task now accomplished with biodegradable soap), and drained into the separators.

Field investigation activities consisted of the following:

- Installing one downgradient monitoring well
- Installing one upgradient monitoring well
- Drilling/sampling at one deep boring completed as a monitoring well
- Collecting surface and near-surface soil samples
- Collecting sediment samples

4.20.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Sediment: acetone (98 μg/kg) and methylene chloride (44 μg/kg)
- Stratum 1: toluene (<CRDL)
- Stratum 2: 2-hexanone (13 μg/kg) and toluene (<CRDL to 12 μg/kg)
- Stratum 3: carbon tetrachloride (<CRDL) and toluene (<CRDL)
- Stratum 4: 2-butanone (8,000 μg/kg), toluene (<CRDL), and xylene (6,000 μg/kg)
- Surface, upgradient: not analyzed for VOCs
- Vadose: carbon disulfide (<CRDL) and toluene (<CRDL)

SVOCs - Soil

- Sediment: bis(2-ethylhexyl)phthalate (<CRDL)
- Stratum 1: none
- Stratum 2: bis(2-ethylhexyl)phthalate (<CRDL to 22,000 μg/kg), pyrene (<CRDL), and benzo(ghi)perylene (<CRDL)
- Stratum 3: benzo(a)pyrene (790 μg/kg), benzo(ghi)perylene (980 to 4,000 μg/kg), and bis(2-ethylhexyl)phthalate (<CRDL)
- Stratum 4: miscellaneous SVOCs below CRDLs
- Surface, upgradient: not analyzed for SVOCs
- Vadose: none

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Sediment: TRPH (35,706 mg/kg), TFH-diesel (4,830 mg/kg), and TFH-gasoline (0.083 mg/kg)
- Stratum 1: TRPH (not detected to 83 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.159 mg/kg)
- Stratum 2: TRPH (not detected to 84,590 mg/kg), TFH-diesel (not detected to 59.8 mg/kg), and TFH-gasoline (not detected to 0.301 mg/kg)

- Stratum 3: TRPH (not detected to 12,572 mg/kg), TFH-diesel (<CRDL), and TFH-gasoline (not detected to 0.341 mg/kg)
- Stratum 4: TRPH (not detected to 4,186 mg/kg), TFH-diesel (not detected to 16,700 mg/kg), and TFH-gasoline (not detected to 423 mg/kg)
- Surface, upgradient: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (0.092 and 0.148 mg/kg)
- Vadose: TRPH (not detected to 18 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected)

Pesticides and PCBs - Soil

- Sediment: not analyzed for pesticides/PCBs
- Stratum 1: not analyzed for pesticides/PCBs
- Stratum 2: miscellaneous below CRDLs
- Stratum 3: not analyzed for pesticides/PCBs
- Stratum 4: none
- Surface, upgradient: not analyzed for pesticides/PCBs
- Vadose: not analyzed for pesticides/PCBs

The following VOCs were detected in groundwater at Site 20:

- Chloromethane (<CRDL)
- Trichloroethylene (<CRDL)

The following compounds were detected in groundwater above primary drinking water standards: nitrate/nitrite and selenium.

Site 20 does not appear to be a potential source of the regional groundwater VOC contamination. TCE was identified below the CRDL in groundwater; it was not detected in any of the soil samples collected at the site.

4.21 Site 21 (OU-3) - Materials Management Group, Building 320

4.21.1 Background

Site 21 (OU-3), the Materials Management Group (in Building 320) is a supply distribution center for MCAS El Toro and other Marine facilities. The site consists of one stratum; the main area of concern is the outside storage area northwest of the building where drums of chemicals were stored (1964-1986). No documented leakage or spillage has occurred at this site.

Field investigation activities consisted of the following:

- Drilling and sampling at one deep boring, completed as a monitoring well
- Installing one upgradient monitoring well
- Installing one downgradient monitoring well
- Collecting surface and near-surface soil samples
- Collecting sediment samples

4.21.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Sediment: acetone (460 μg/kg), methylene chloride (380 μg/kg), and toluene (<CRDL)
- Stratum 1: toluene (<CRDL)
- Surface, upgradient: not analyzed for VOCs
- Vadose: none

SVOCs - Soil

- Sediment: miscellaneous (<CRDL to 14,000 μg/kg)
- Stratum 1: none

- Surface, upgradient: not analyzed for SVOCs
- Vadose: none

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Sediment: TRPH (160 mg/kg), TFH-diesel (192 mg/kg), and TFH-gasoline (0.168 mg/kg)
- Stratum 1: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.099 mg/kg)
- Surface, upgradient: TRPH (56 and 2,556 mg/kg), TFH-diesel (not detected and 34.6 mg/kg), and TFH-gasoline (not detected and 0.073 mg/kg)
- Vadose: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (0.107 mg/kg)

Pesticides and PCBs - Soil

- Sediment: miscellaneous (<CRDL to 557 µg/kg)
- Stratum 1: miscellaneous (<CRDL to 50.9 µg/kg)
- Surface, upgradient: not analyzed for pesticides/PCBs
- Vadose: methoxychlor (<CRDL to 25.4 µg/kg)

The following VOCs were detected in groundwater at Site 21:

- Chloroform (<CRDL to 1 µg/L)
- Chloromethane (<CRDL to 4 µg/L)
- Tetrachloroethylene (<CRDL to 7 µg/L)
- Trichloroethylene (<CRDL to 11 µg/L)

The following compounds were detected in groundwater above primary drinking water standards: nitrate/nitrite, selenium, tetrachloroethylene, and trichloroethylene.

Site 21 does not appear to be a potential source of the regional groundwater VOC contamination. Although TCE was detected in the groundwater, there is not a significant change in concentration across the site. In addition, TCE was not detected in any of the soil samples from the site.

4.22 Site 22 (OU-3) - Tactical Air Fuel Dispensing System

4.22.1 Background

Site 22 (OU-3) the Tactical Air Fuel Dispensing System (TAFDS), consists of two strata:

- Stratum 1: an eastern fuel dispensing area, originally located east of the Petroleum Disposal Area (Site 10)

- Stratum 2: a western dispensing area, relocated west of Site 10, south of Building 435 and east of Building 369 (1980-1986)

Heavy staining was observed at both TAFDS locations. Reportedly, the sites had a history of spillage and leaks of petroleum-based fuels during routine operation. A particular spill was cited as occurring in 1983 or 1984 after which an unknown quantity of fuel and soils was cleaned up.

The field investigation consisted of the following:

- Drilling and sampling at one deep boring, completed as a monitoring well
- Drilling and sampling at one 25-foot boring
- Collecting and near-surface soil samples

4.22.2 Results and Conclusions

The following compounds were detected in surface and near-surface soil samples and in the vadose zone samples:

VOCs - Soil

- Stratum 1: 2-hexanone (<CRDL) and toluene (<CRDL)
- Stratum 2: 2-hexanone (<CRDL) and toluene (<CRDL)

- Surface, deep boring: toluene (<CRDL)

- Vadose: acetone (44 to 73 μg/kg), toluene (<CRDL), and trichloroethylene (<CRDL)

SVOCs - Soil

- Stratum 1: miscellaneous SVOCs (<CRDLs to 1,200 μg/kg)
- Stratum 2: miscellaneous SVOCs (<CRDLs to 29,000 μg/kg)
- Surface, deep boring: none
- Vadose: benzyl butyl phthalate (<CRDL) and bis(2-ethylhexyl)phthalate (1,100 and 1,800 μg/kg)

Petroleum Hydrocarbons (TRPH, TFH-diesel, TFH-gasoline) - Soil

- Stratum 1: TRPH (not detected to 393 mg/kg), TFH-diesel (not detected to 32.2 mg/kg), and TFH-gasoline (not detected to 0.126 mg/kg)

- Stratum 2: TRPH (not detected to 4,666 mg/kg), TFH-diesel (not detected to 9,140 mg/kg), and TFH-gasoline (not detected to 916 mg/kg)

- Surface, deep boring: TRPH (87 mg/kg), TFH-diesel (not detected), and TFH-gasoline (not detected)

- Vadose: TRPH (not detected), TFH-diesel (not detected), and TFH-gasoline (not detected to 0.386 mg/kg)

Pesticides and PCBs - Soil

- Stratum 1: none
- Stratum 2: none
- Surface, deep boring: none
- Vadose: 4,4'-DDE (7.46 μg/kg), 4,4'-DDD (5.71 μg/kg), and 4,4'-DDT (4.37 μg/kg)

The following VOCs were detected in groundwater at Site 22:

- Carbon disulfide (<CRDL)
- Carbon tetrachloride (5 μg/L)
- Chloroform (3 μg/L)
- Tetrachlorethene (7 μg/L)
- Trichloroethylene (1,000 μg/L)

The following compounds were detected in groundwater above primary drinking water standards: carbon tetrachloride, nitrate/nitrite, selenium, tetrachloroethylene, and trichloroethylene.

Site 22 has a high concentration of TCE in groundwater. It is a possible contributor to the regional groundwater VOC contamination.

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5.0 SUMMARY OF INFORMATION FROM CONCURRENT RCRA FACILITY ASSESSMENT (RFA)

5.1 RFA Objectives

A Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) for MCAS El Toro has been performed, as documented by the *Draft RFA Report* dated 18 March 1993 (NAVFACENGCOM, 1993). A Preliminary Review (PR), a Visual Site Inspection (VSI), and a Sampling Visit (SV) for the RFA have been completed.

The objectives of the RFA were:

- To identify and gather information on releases or potential releases of hazardous substances at the Station.
- To evaluate solid waste management units (SWMUs) and other areas of concern (AOCs) with respect to releases of hazardous wastes or hazardous waste constituents to the environment.
- To assess the need for further action on the SWMUs/AOCs.
- To identify potential sites for a fourth operable unit (OU-4) for the ongoing RI/FS at the Station.

The RFA identified 304 SWMUs/AOCs, of which 140 were sampled during the SV to determine if a release had occurred. Figure 5-1 shows the RFA sites with detected trichloroethylene (TCE) and tetrachloroethylene (PCE). Determining the extent of any potential contamination was not an objective of the RFA.

5.2 RFA Sampling and Analytical Results

The only medium sampled was soil at depths ranging from 2 to 60 feet below ground surface (bgs). Nearly 1,300 soil samples were collected during the SV. Chemical analyses for each soil sample were specified on the basis of the types of wastes at each SWMU/AOC. Samples from each SWMU/AOC were analyzed for volatile organic compounds (VOCs) to assess whether the SWMU/AOC might be a potential source of

the VOC contamination in the regional groundwater, which is being investigated under the RI/FS (Site 18, OU-1).

The RFA sampling visit results indicate that contamination found at the SMWUs/AOCs, when present, consists primarily of petroleum hydrocarbons. When evaluating SWMUs/AOCs sampled in the SV for further action, those SWMUs/AOCs with only petroleum hydrocarbon contamination were not considered for inclusion in a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program such as the ongoing RI/FS.

The RFA did not encounter a significant number of samples with chlorinated VOCs; in the few samples containing chlorinated VOCs, the concentrations were not significantly high. Table 5-1 summarizes the PCE and TCE detected (or estimated below contract-required detection limits [CRDLs]) in the RFA soil samples. This table also lists the RI/FS site or sites nearest to each SWMU/AOC. Only 36 samples (of the nearly 1,300 analyzed for VOCs) show PCE or TCE as detected or tentatively identified; of these 36, only 5 are above CRDLs. The highest value detected is 130 μg/kg of PCE at SWMU/AOC 194 (the former incinerator site).

Table 5-2 summarizes the chlorinated VOCs other than PCE and TCE detected (or estimated to be below CRDLs). The nearest RI/FS sites are also listed in this table. Only nine samples (of the nearly 1,300) fall into this category. Two of these nine are above the CRDL: 68 and 130 μg/kg of 1,1,2,2-tetrachloroethane (PCA) at SWMU/AOC 188 (the oil/water separator at Agua Chinon Wash).

5.3 RFA Conclusions

Twenty-two SWMUs/AOCs from the RFA are recommended for further action. Twenty-one of these sites have predominantly petroleum hydrocarbon contamination and are recommended for further action in a program other than CERCLA (e.g., evaluation under a state or local program, excavation of contaminated soil, etc.). One SWMU/AOC (194, the former incinerator site) is recommended for further action in a CERCLA program because it had PCE concentrations that exceeded the screening criteria (U.S.

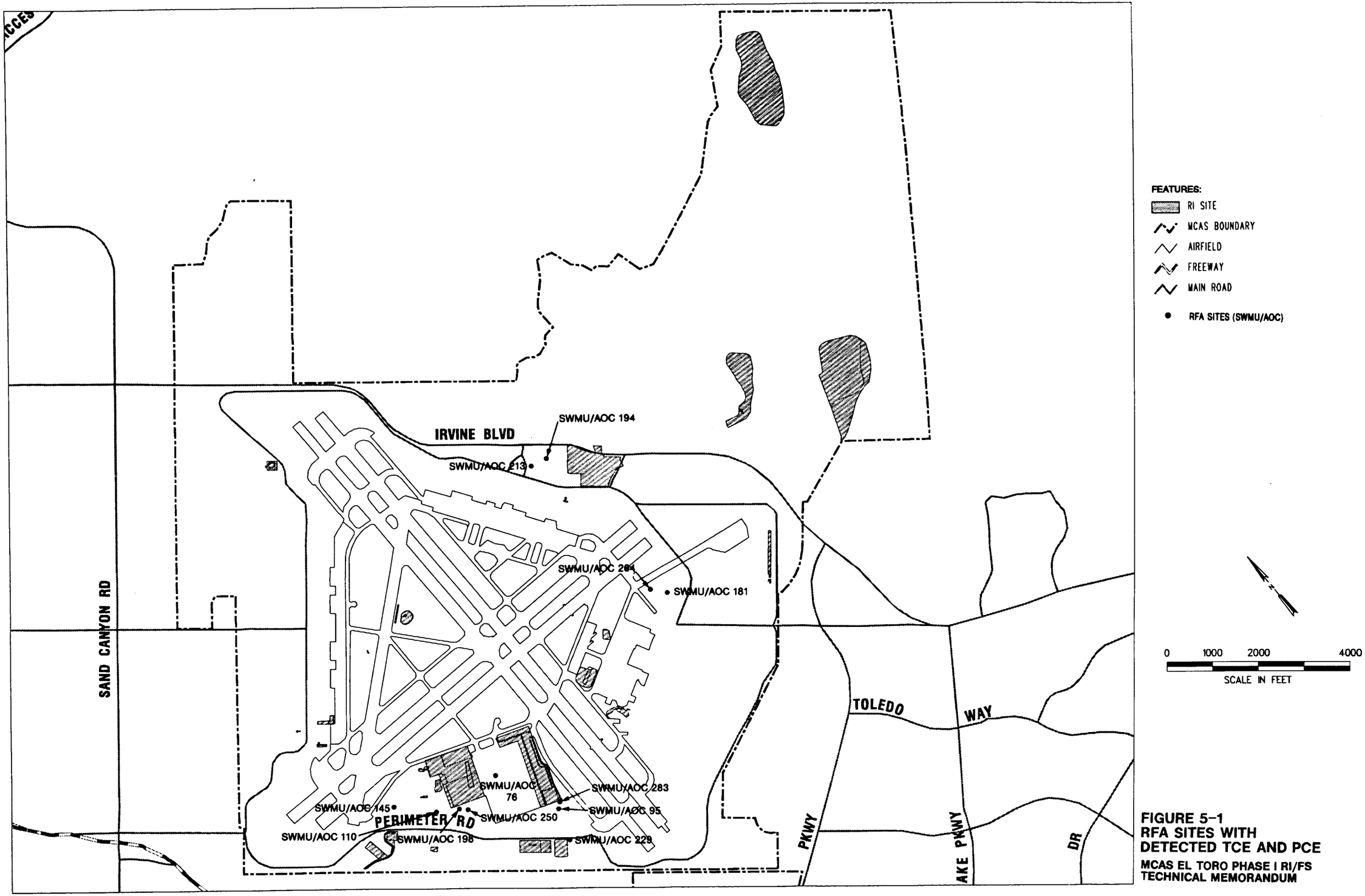

FIGURE 5-1
RFA SITES WITH DETECTED TCE AND PCE
MCAS EL TORO PHASE I RI/FS TECHNICAL MEMORANDUM

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Table 5-1
SWMUs/AOCs with PCE/TCE
MCAS El Toro Phase I RI Technical Memorandum

SWMU/AOC Number	Type	Nearest RI/FS Site	Compound	Number of Detects/Number of Samples	Concentration of PCE/TCE (µg/kg)
194	Former Incinerator	3	PCE	5/6	3J, 9J, 14, 76, 130
			TCE	2/6	3J, 5J
213	Wash Rack	3	PCE	4/9	1J, 2J, 2J, 8J
181	Landfarm Site	NA	PCE	1/15	2J
264	Equipment Storage Area	NA	PCE	1/9	1J
76	Oil/Water Separator	7	TCE	1/5	3J
95	Engine Test Cell	7	PCE	2/6	2J, 3J
110	Wash Rack	10/22	PCE	1/9	11J
145	Underground Storage Tank	10/22	PCE	1/14	4J
188	Oil/Water Separator	18	TCE	2/7	8J, 26
			PCE	1/7	7J
198	Wash Rack	10	PCE	8/9	1J, 2J, 2J, 2J, 3J, 5J, 9J, 16
229	Hazardous Waste Storage Area	7/18	TCE	1/6	4J
250	Underground Storage Tank	7	PCE	2/6	2J, 9J
283	Underground Storage Tank	7	TCE	4/6	1J, 2J, 2J, 3J

Table Summary:

PCE and TCE were identified at 13 SWMUs/AOCs.
5 samples > detection limits (CRDLs).
31 samples are estimated values below PCE/TCE detection limits (CRDLs).
NA=Not Applicable (i.e., SWMU/AOC is not near a particular RI/FS site).

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Table 5-2
SWMUs/AOCs with Chlorinated VOCs Other Than PCE/TCE
MCAS El Toro RI/FS Phase I RI Technical Memorandum

SWMU/AOC Number	Type	Nearest RI/FS Site	Compound	Number of Detects/Number of Samples	Concentration (µg/kg)
7	Transformer Storage Area	NA	1,1,2,2-Tetrachloroethane	1/3	2J
39	Hazardous Waste Storage Area	NA	1,1,1-Tetrachloroethane	3/17	2J, 2J, 2J
179	Oil/Water Separator	NA	Carbon Tetrachloride	1/5	2J
188	Oil/Water Separator	18	1,1,2,2-Tetrachloroethane	3/7	4J, 68, 130
271	Hazardous Waste Storage Area	NA	1,1,1-TCA	1/7	3J

Table Summary:

5 SWMUs identified with chlorinated VOCs other than PCE/TCE
2 samples > CRDLs
7 samples are estimated values below CRDLs (indicated by "J")
NA=Not Applicable (i.e., location of SWMU/AOC is not near a particular RI/FS site.

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Environmental Protection Agency [EPA] Preliminary Remedial Goals [PRGs], source, 1 March 1992). At this SWMU/AOC, six soil samples were collected (including one duplicate) at 2 and 5 feet bgs from three 5-foot borings. PCE was detected or identified below the CRDL in five of the six samples. Two soil samples had PCE concentrations that exceeded the PRG for PCE of 65 µg/kg: 130 µg/kg at 2 feet bgs in Hand Auger 1, and 76 µg/kg at 4 feet bgs in Hand Auger 3. These samples also showed total recoverable petroleum hydrocarbons (TRPH) concentrations of 1,650 and 2,680 mg/kg, respectively. This SWMU/AOC is recommended for further action under a CERCLA program (RI/FS). The following are options for incorporating SWMU/AOC 194 into the RI/FS:

- Include SWMU/AOC 194 in the existing RI/FS Site 3 by expanding the Site 3 boundaries.
- Include SWMU/AOC 194 in OU-4.

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6.0 SUMMARY OF THE NATURE AND EXTENT OF CONTAMINATION: SITE 18 (OU-1) REGIONAL GROUNDWATER AND SURFACE WATER AND SEDIMENTS

Operable Unit 1 (OU-1) consists of groundwater on- and off-Station that contains contaminants that have migrated from sites at MCAS El Toro. OU-1 sampling sites include, in addition to groundwater, surface water, sediments, and soils beneath unlined washes that are upstream, within the Station boundaries, and downstream from the Station. This section summarizes the data, evaluation, and conclusions from Appendix A (Nature and Extent of Contamination), OU-1 (Site 18), Regional Groundwater Contamination. (See Appendix A1, Groundwater, and Appendix A2, Surface Water, Sediments and Angle Borings.)

6.1 Contaminants in Regional Groundwater

This subsection reviews the hydrogeologic information, site-specific chemical data, and regional groundwater quality data, and presents one of three assessments for each of the 21 OU-2 and OU-3 sites:

- The site does not appear to be contributing to groundwater contamination.
- The site does appear to be contributing to groundwater contamination.
- The data are inconclusive.

An expanded discussion of regional groundwater quality and the nature and extent of contamination in OU-1 (Site 18) is in Appendix A.

6.1.1 Types and Extent of Contaminants

Table 3-2 of the *MCAS El Toro Work Plan* listed 17 potential contaminants of concern as identified in the *Federal Facilities Agreement* (31 August 1990). The contaminants, the number of occurrences in regional groundwater in summer and fall of 1992, and the range of detected values are in Table 6-1. From July 1992 through January 1993, water-quality samples were collected and analyzed for the MCAS El Toro Phase I RI. During the same period, the Orange County Water

District (OCWD) was also collecting groundwater samples to monitor concentrations of VOCs and general chemistry. The OCWD data were incorporated into the RI database and are also summarized in Table 6-1.

In addition to the VOCs listed in Table 6-1, TFH-gasoline and TFH-diesel were detected in groundwater in localized areas, as were several pesticides and herbicides. The only SVOCs observed in regional groundwater were phthalates.

6.1.2 Volatile Organic Compounds (VOCs)

When the individual VOC areas of concern are compared, two different groups of VOCs in groundwater are apparent:

- PCE-TCE Group: PCE, TCE, 1,2-DCE (Total), 1,1-DCE, carbon tetrachloride, chloroform, and TFH-gasoline or TFH-diesel
- Benzene Group: Benzene, TFH-gasoline and TFH-diesel

6.1.2.1 PCE-TCE Group of VOC Contaminants

The maps in this subsection showing the locations of PCE-TCE Group contaminant concentrations during July 1992 through January 1993 are contoured to show the highest concentration observed at any depth at each well, well cluster, or multiple-port well location. The contour lines are dashed where inferred. The majority of the on-Station monitoring wells are completed in the shallow zone. The regional geologic cross sections (Plate 3-1) show TCE concentrations by depths during the same period.

The PCE-TCE group includes the highest concentrations of carbon tetrachloride (Site 9, greater than 5 μg/L) and chloroform (Site 14, 14 μg/L) along with detectable amounts of TFH (gasoline or diesel). These combined VOCs indicate

Table 6-1
Contaminants of Concern as Listed in the Work Plan
MCAS El Toro Phase I RI Technical Memorandum

Contaminant, CAS Number	Regulatory Value (µg/L)	Detection Value (µg/L)[a]	Orange County Data, 43 samples			Phase I RI Data (150 samples)		
			Number of Detects[b]	Maximum Value (µg/L)	Well with the highest value	Number of Detects	Maximum Value (µg/L)	Well with the Highest Value
Acetone, 67-64-1		2	NR[c]	--	--	5	15[d]	18_BGMW01E
Benzene, 71-43-2	1	1	NR	--	--	10	730	13_UGMW32
Carbon tetrachloride, 67-66-3	0.5	1	0	--	--	24	19	14_DBMW50
Chlorobenzene, 108-90-7	30	1	1	0.5	MCAS-1 (545)	NONE	--	--
Chloroform, 67-66-3	100	1	6	1.2	MCAS-5	37	12[e]	14_DGMW79
1,1-Dichloroethane, 75-34-3	5	1	NR	--	--	2	0.9J[f]	02_DGMW60
1,1-Dichloroethene, 75-34-4	6	1	NR	--	--	7	8.0	08_DGMW79
cis-1,2-Dichloroethylene, 156-59-2		1	4	5.4	MCAS-7 (354)	2	0.9J	02_DGMW60
trans-1,2-Dichloroethylene, 156-60-5								
Ethyl benzene, 100-41-4		1	3	0.9	MCAS-7 (1104)	2	2.0	13_DGMW78 18_BGMP10@ 1001 feet
Methyl ethyl ketone (2-Butanone), 78-93-3		2	NR	--	--	1	1.0J	05_BGMW05D
Tetrachloroethylene (PCE), 127-18-4	5	1	2	0.7	MCAS-3 (165)	28	58	18_PS3
Toluene, 108-88-55-6	1,000	1	1	0.9	MCAS-7 (1104)	19	15	18_BGMW5A
1,1,1-Trichloroethane (TCA), 75-55-6	200	1	0	--	--	1	0.4J	06_DGMW69
1,1,2-Trichloroethane, 79-00-5	32	1	NR	--	--	4	2	02_DGMW60 08_DGMW73
Trichloroethylene (TCE), 79-01-6	5	1	21	25.0	MCAS-7 (444)	52	2,000	09_DGMW45
Xylenes, 1330-20-7	1750	1	NR	--	--	15	58	13_UGMW32 18_BGMW01E

[a] Detection limit known for MCAS El Toro analyses only
[b] Includes groundwater samples reported by Orange County Water District since July 1992.
[c] NR indicates Not Reported.
[d] Acetone, a demonstrated lab contaminant, had a maximum concentration of 37 µg/L in trip blanks.
[e] Higher values were detected in potable water used for drilling.
[f] J indicates that the value is estimated.

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a limited source area containing the majority of contaminants, both in number and in concentration.

Trichloroethylene (TCE). Trichloroethylene (also called trichloroethene) was detected in groundwater at 49 locations beneath MCAS El Toro. OCWD reported TCE in 21 samples of groundwater collected since July 1992. The approximate areal extent of the TCE concentration contours is on Figure 6-1a.

The source of the regional TCE groundwater contamination is the south-western portion of MCAS El Toro, as postulated in previous studies by OCWD (Herndon, 1990; OCWD and BV, 1992). The highest concentrations are in groundwater from Well 09_DBMW45, but additional sources may exist beneath the broad area encompassing Sites 7 (Drop Tank Drainage Area No. 2), Site 8 (DRMO Storage Yard), Site 10 (Petroleum Disposal Area), and Site 22 (Tactical Air Fuel Dispensing System).

A second area of TCE occurs in groundwater at Site 2. The concentrations from upgradient Well 02_UGMW25 are below the contract-required detection limits (CRDL). The TCE concentration contour map appears to be discontinuous through Site 5 (Perimeter Road Landfill) to Site 19 (ACER Site).

TCE at a concentration of 1 μg/L, the CRDL, was detected in Well 18_BGMW01A (screened from 466 to 486 feet bgs) and Well 18_BGMW02A (screened from 462 to 482 feet bgs). The geology and groundwater quality from these wells indicate that these wells are screened, at least in part, in the semiconsolidated low-permeability "bedrock" aquifer.

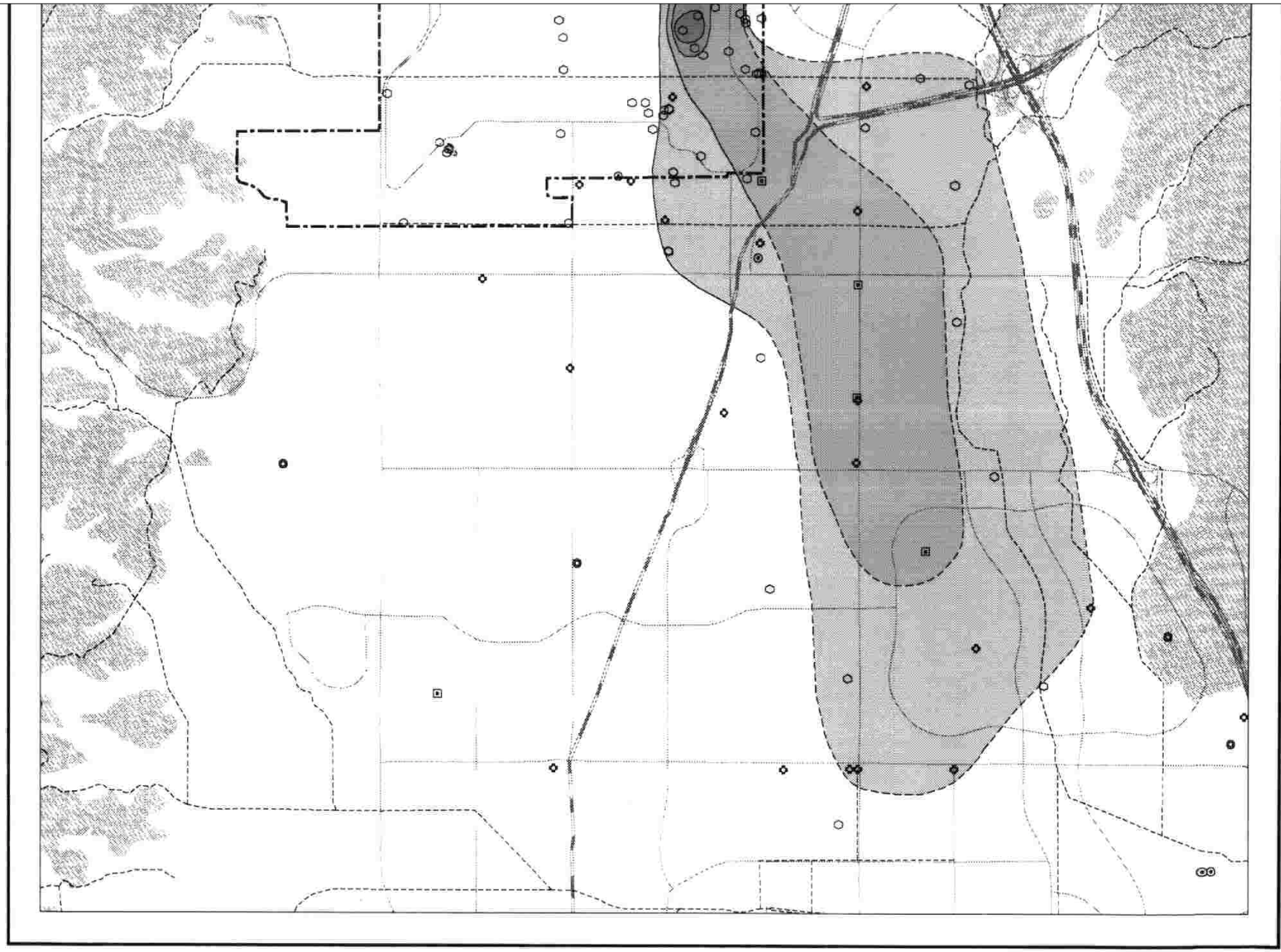
A trace of TCE was detected in groundwater from Well 20_DBMW52 at Site 20 (Hobby Shop). The site does not appear to a source of TCE; the detected concentration may be from cross-contamination. Additional groundwater sampling is needed at this site.

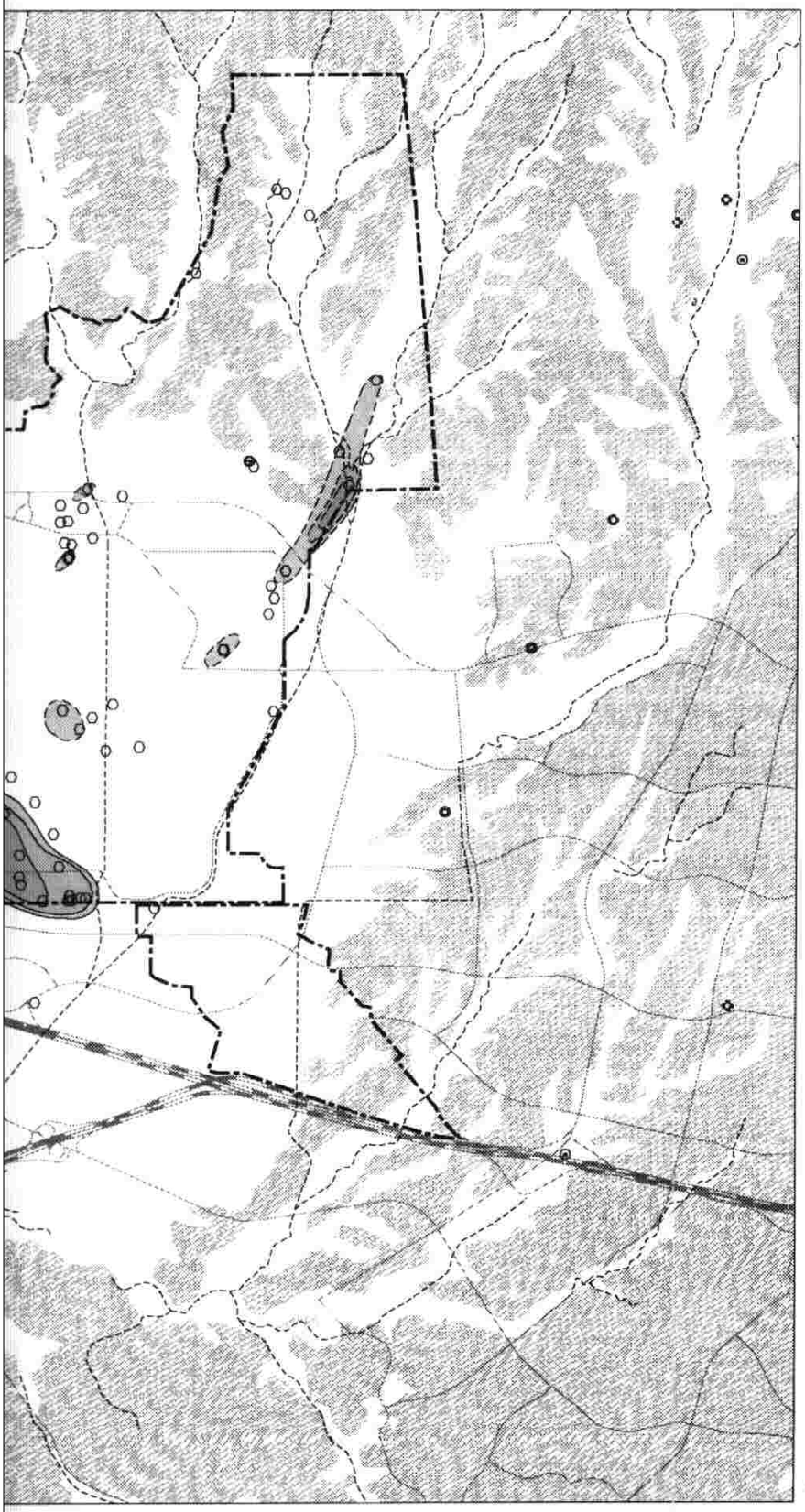
Tetrachloroethylene (PCE). Two apparent sources of tetrachloroethylene (also called tetrachloroethene or perchloroethylene) seem to have impacted the

groundwater underlying MCAS El Toro (Figure 6-1b). One extensive area of PCE occurs in groundwater beneath the southwestern portion of the Station. The area showing detectable concentrations of PCE begins west of Agua Chinon Wash and extends beneath Sites 8, 7, 10, 9, 21, 12, 22, and off-Station (Figure 6-1b). The data suggest that there may be two sources, one along the southwestern border (near Site 8) and one in the center of the Station (Sites 9, 7, and 10).

The second area of PCE originates from Site 2 (Magazine Road Landfill) and appears to extend through Site 5 (Perimeter Road Landfill) to Site 19 (ACER Site) (Figure 6-1b). The highest value of PCE is 8.0 μg/L in Well 02_DGMW60. The value of PCE is at the detection limit in groundwater in Site 19 wells. PCE was detected in groundwater in both Well 18_BGMW02A, screened at 198 to 218 bgs, and in Well 18_BGMW02A, screened from 462 to 482 feet bgs. One of the samples was at the detection limit of 1.0 μg/L; a duplicate of this sample from 18_BGMW02E and the sample from the deeper well were tentatively detected below the CRDL. The two wells screened between these two zones contained groundwater with no detectable PCE. The presence of low concentrations detected in the shallow groundwater and in the semiconsolidated, low-permeability unit suggests either the presence of a local source and an upgradient source (Site 2) cross-contamination during monitoring well construction. Future groundwater monitoring is needed to provide additional information.

1,2-Dichloroethylene (Total). Table 6-1 lists both the trans- and cis- isomers of 1,2-dichloroethylene (also known as 1,2-dichloroethene, or 1,2-DCE). The two isomers were not separated in the laboratory analyses (nor in the OCWD data); thus, all data is reported as total 1,2-dichloroethylene. A long, thin area of detected total 1,2-DCE extends to the western corner of MCAS El Toro (Figure 6-1c). This area extends from Well 18_BGMW04B, which also serves as a downgradient well for Site 12, (Sludge Drying Beds) to Well 18_MCAS07. A smaller area of total 1,2-DCE extends downgradient from Site 2 (Magazine Road Landfill). A third area occurs along the southern part of the southwest border of





FEATURES:

- BEDROCK
- 0.5 TO 5.0 ug/l TCE
- 5.0 TO 50.0 ug/l TCE
- 50.0 TO 500.0 ug/l TCE
- GREATER THAN 500.0 ug/l TCE
- MONITORING WELL
- DEEP, 25-FOOT, OR ANGLE BORING
- SEDIMENT SAMPLE
- SURFACE WATER AND SEDIMENT SAMPLE
- SURFACE AND NEAR-SURFACE SOIL SAMPLE
- IRRIGATION SUPPLY WELL
- PRODUCTION WELL
- MUNICIPAL SUPPLY WELL
- INDUSTRIAL SUPPLY WELL
- FREEWAY
- ROAD
- MCAS EL TORO BOUNDARY
- WASH OR STREAM
- ISOCONCENTRATION CONTOUR
- INFERRED ISOCONCENTRATION CONTOUR

0 2000 4000 6000

SCALE IN FEET

FIGURE 6-1a

SITE 18 (OU-1): TRICHLOROETHYLENE (TCE) CONCENTRATION IN REGIONAL GROUNDWATER

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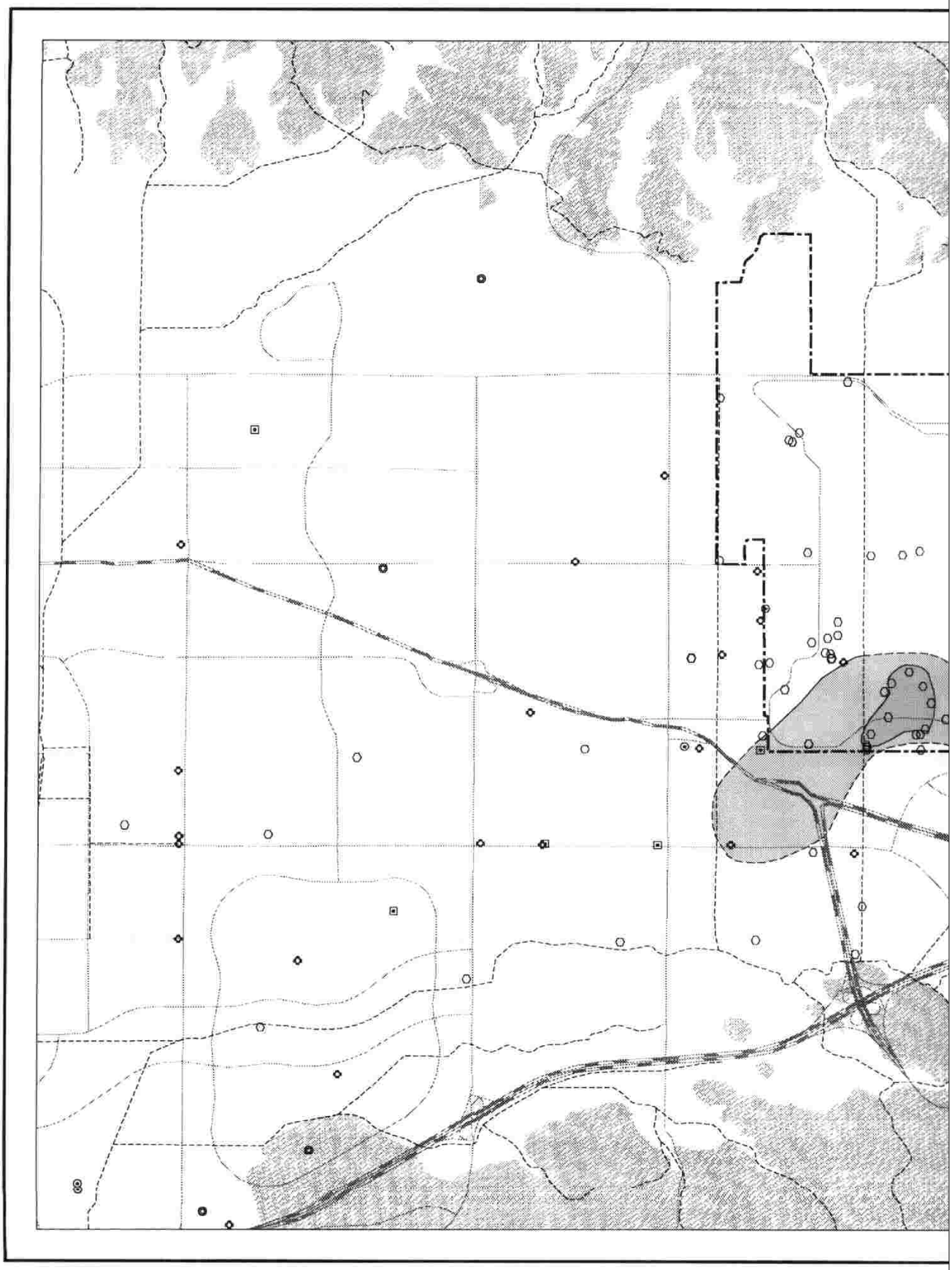

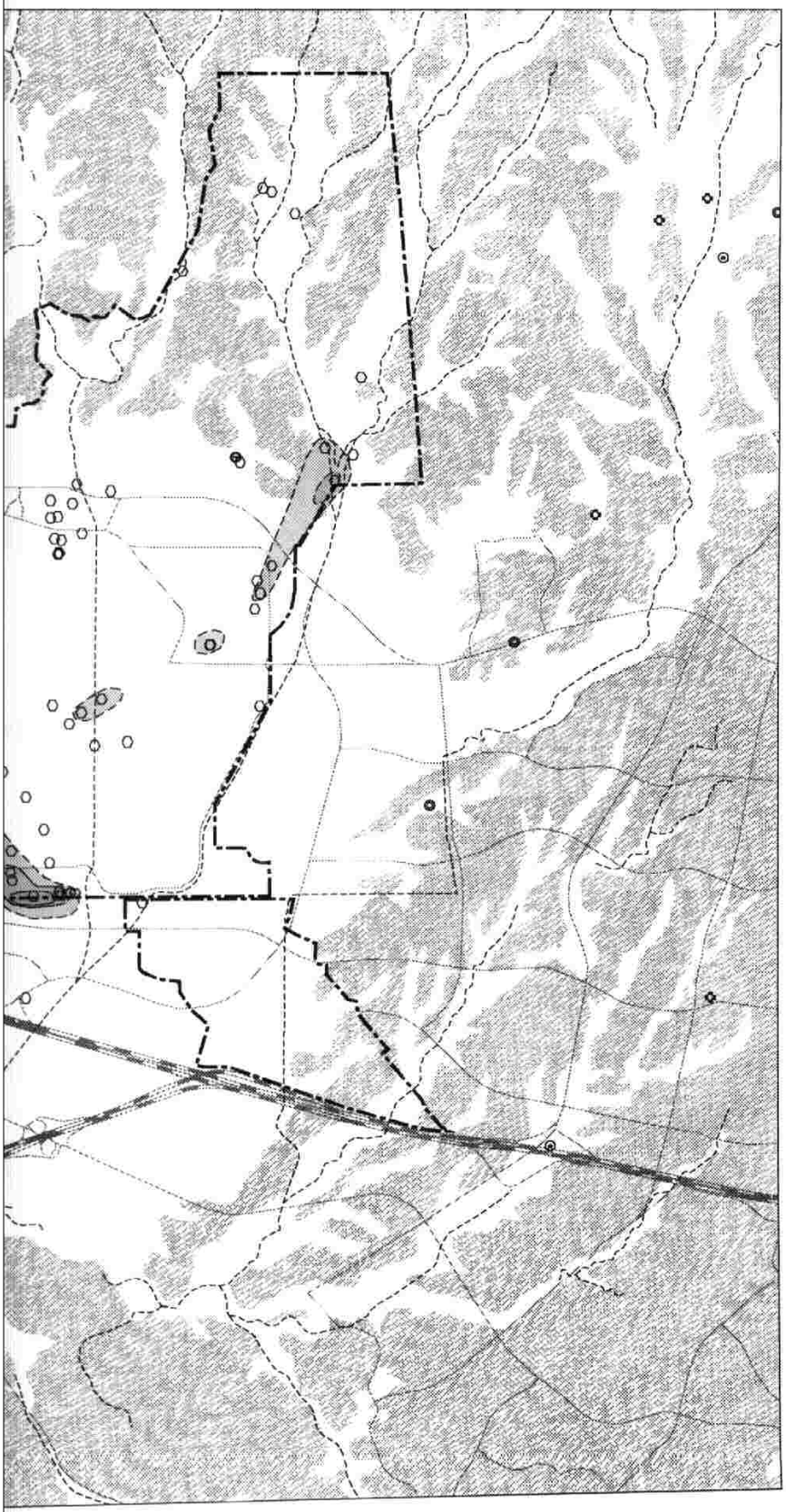

FEATURES:

- BEDROCK
- 0.5 TO 5.0 ug/l PCE
- 5.0 TO 50.0 ug/l PCE
- GREATER THAN 50.0 ug/l PCE
- MONITORING WELL
- DEEP, 25-FOOT, OR ANGLE BORING
- SEDIMENT SAMPLE
- SURFACE WATER AND SEDIMENT SAMPLE
- SURFACE AND NEAR-SURFACE SOIL SAMPLE
- IRRIGATION SUPPLY WELL
- PRODUCTION WELL
- MUNICIPAL SUPPLY WELL
- INDUSTRIAL SUPPLY WELL
- FREEWAY
- ROAD
- MCAS EL TORO BOUNDARY
- WASH OR STREAM
- ISOCONCENTRATION CONTOUR
- INFERRED ISOCONCENTRATION CONTOUR

0 2000 4000 6000

SCALE IN FEET

FIGURE 6-1b

SITE 18 (OU-1): TETRACHLOROETHYLENE (PCE) CONCENTRATION IN REGIONAL GROUNDWATER

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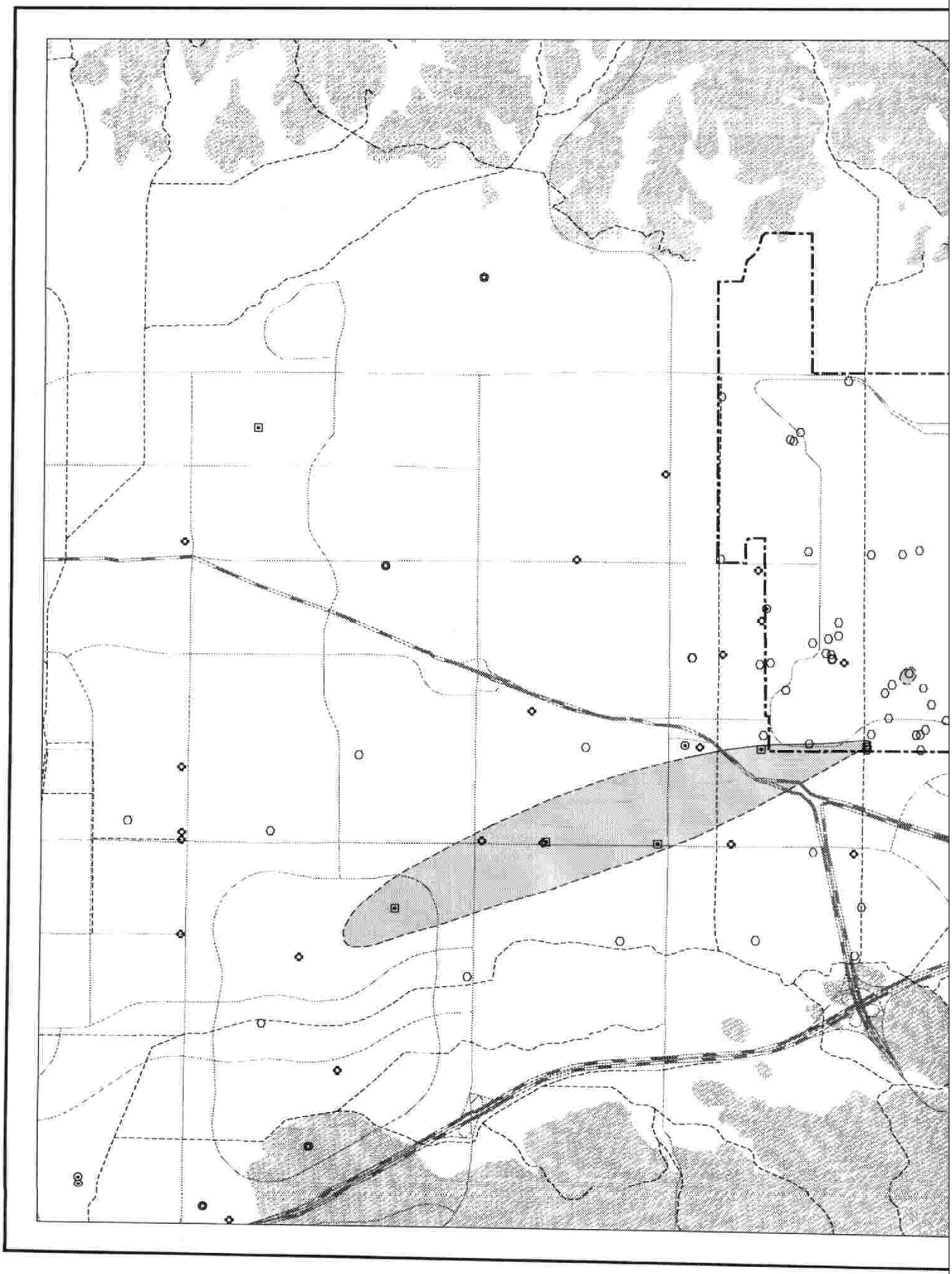

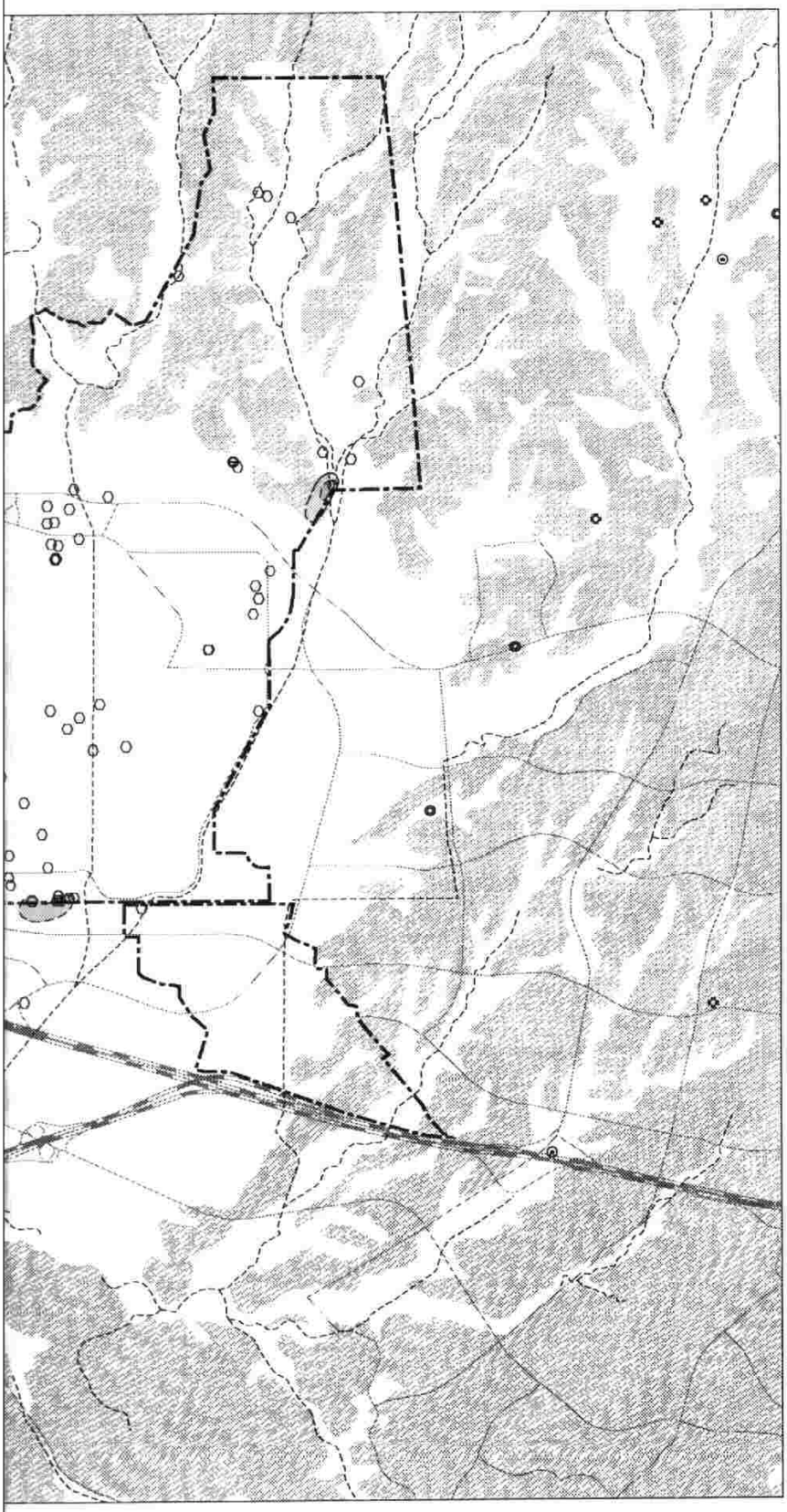

FEATURES:

- BEDROCK
- 0.5 TO 5.0 ug/l 1,2 DCE (TOTAL)
- GREATER THAN 5.0 ug/l 1,2 DCE (TOTAL)
- MONITORING WELL
- DEEP, 25-FOOT, OR ANGLE BORING
- SEDIMENT SAMPLE
- SURFACE WATER AND SEDIMENT SAMPLE
- SURFACE AND NEAR-SURFACE SOIL SAMPLE
- IRRIGATION SUPPLY WELL
- PRODUCTION WELL
- MUNICIPAL SUPPLY WELL
- INDUSTRIAL SUPPLY WELL
- FREEWAY
- ROAD
- MCAS EL TORO BOUNDARY
- WASH OR STREAM
- ISOCONCENTRATION CONTOUR
- INFERRED ISOCONCENTRATION CONTOUR

0 2000 4000 6000

SCALE IN FEET

FIGURE 6-1c

SITE 18 (OU-1): 1,2 DICHLOROETHYLENE TOTAL (1,2 DCE) CONCENTRATION IN REGIONAL GROUNDWATER

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MCAS El Toro. The wells affected do not pinpoint a specific site as the source, but the area is south of Site 8. An isolated occurrence of 1,2-DCE is at Well 09-DBMW45; this chemical is a degradation product of TCE and PCE.

1,1-Dichloroethylene. Two areas of detectable 1,1-dichloroethylene (also called 1,1-dichloroethene or 1,1-DCE) occur beneath MCAS El Toro (Figure 6-1d). 1,1-DCE has not been detected in groundwater from off-Station monitoring wells. The larger area with detectable concentrations underlies Sites 7, 9, and 10. The highest concentrations of 1,1-DCE in this area are from groundwater in Well 09_DBMW45, where the highest concentration of TCE in groundwater was detected. Duplicate samples indicated values of 2.0 and 4.0 μg/L. The second area centers on the downgradient wells at Site 8 (DRMO Storage Yard). The highest concentration of 1,1-DCE (8 μg/L) is in groundwater from well 08_DGMW73. These areas correspond with the highest concentrations of TCE and PCE in groundwater, indicating that 1,2-DCE and 1,1-DCE may be biodegradation products.

Carbon Tetrachloride. Carbon tetrachloride occurs in groundwater from 14 wells, all in the southwestern quadrant of the Station (Figure 6-1e). The highest concentrations in groundwater occur in groundwater from Well 14_DBMW50 Site 14, (Battery Acid Disposal Area), and in the shallow-most two of the DW cluster wells next to Site 14. No carbon tetrachloride was detected in the three deeper wells in the DW cluster or in the pumping well TIC-055. All four wells are screened at depths greater than 300 feet bgs. No carbon tetrachloride has been detected off-Station.

Chloroform. The compound that was detected most often after TCE was chloroform, a trihalomethane (common in potable water). During chlorination of drinking water for disinfection, chlorine reacts with dissolved organic matter (such as fulvic and humic acids) to form trihalomethanes. The maximum contaminant level (MCL) for chloroform is 100 μg/L. The health-based guidance level for human ingestion, however, is 5.7 μg/L. Chloroform was detected in 37 groundwater samples, with the highest value at 12 μg/L in well 14_DGMW79. Sites 2, 3, 7, 8, 9, 12, 14, 17, 18, and 21 contain low-level detectable amounts of

chloroform. Groundwater from wells at Site 2 (7.0 µg/L), Site 8 (maximum concentration 9 µg/L), Site 14 (cited above), and Site 17 (7 µg/L) exceeded the health-based guidance level.

Chloroform, however, was detected at concentrations to 14 µg/L in potable water from the fire hydrants used by the drilling contractor for makeup water, and a sample of the deionized water used for cleaning sampling equipment contained a concentration of 4.0 µg/L of chloroform. Some of the detected chloroform in groundwater may be the result of the field activities. The second round of groundwater monitoring will provide additional information on this topic.

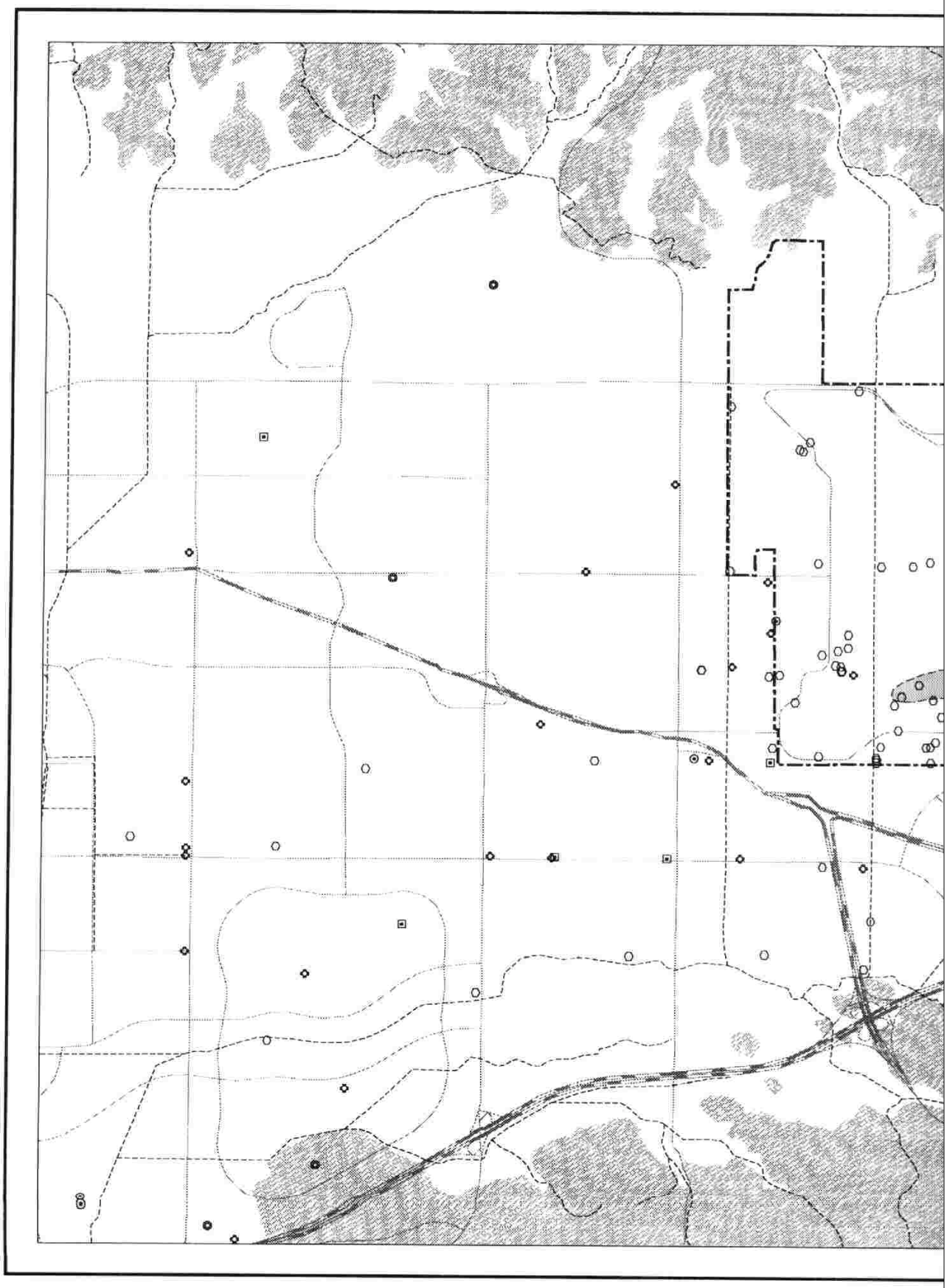
Other VOCs. Acetone, chlorobenzene, 1,1,2-trichloroethane, 1,1-dichloroethane, 1,2-dichloroethane, methyl ethyl ketone (2-butanone), ethyl benzene, and xylenes were not detected in groundwater samples beneath MCAS El Toro or were detected at low concentrations. Acetone and 2-butanone are demonstrated laboratory contaminants for Phase I samples.

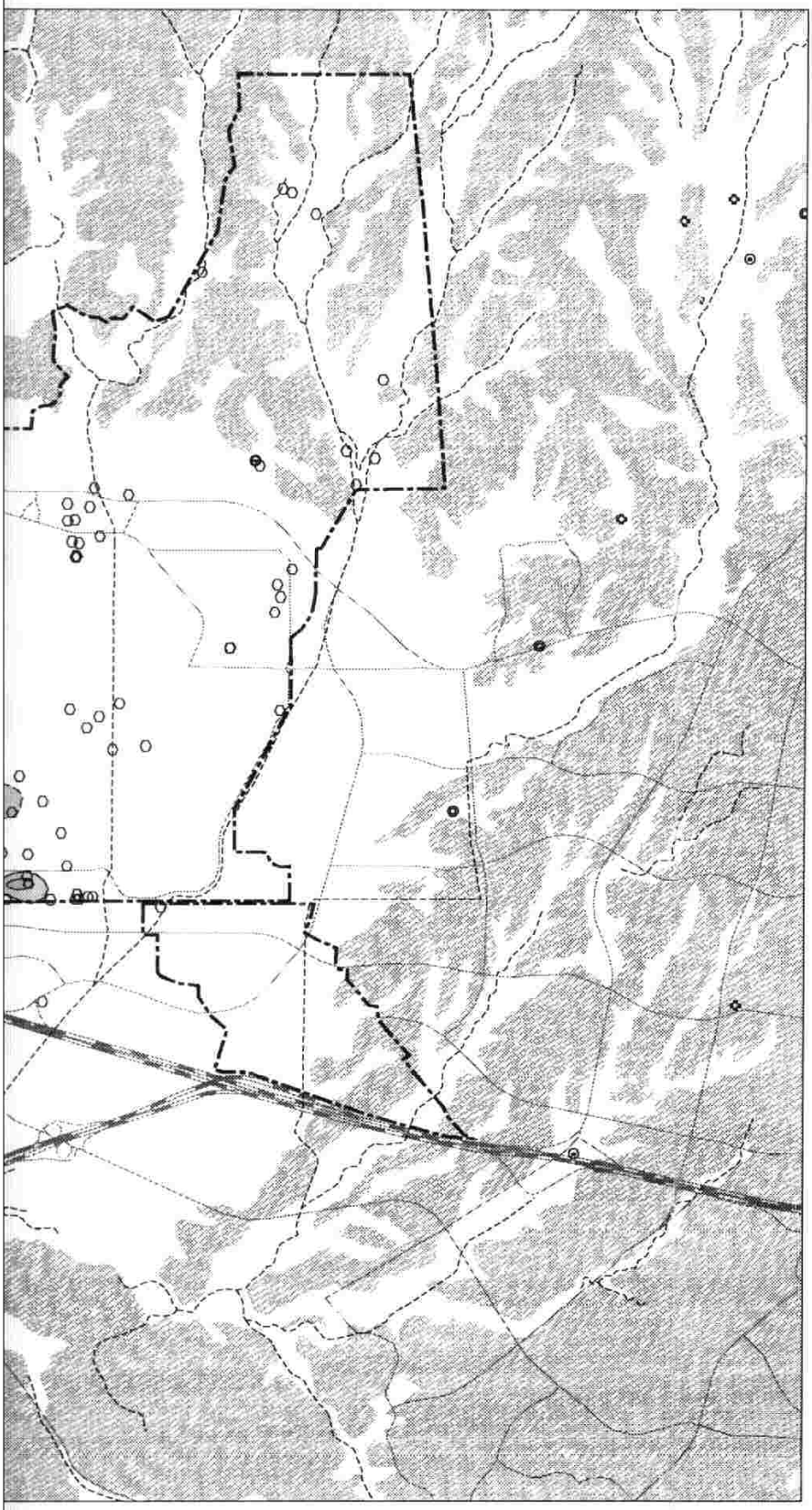
The compound 1,1,2-trichloroethane was detected in groundwater from three wells. Two of the values were below the CRDL of 1 µg/L. The third value, 2.0 µg/L was in groundwater from Station 08_DGMW73.

6.1.2.2 Benzene-TFH Group of Contaminants

Two areas of detected benzene concentrations in groundwater were identified on-Station. No benzene was detected in groundwater samples collected from off-Station wells.

Benzene. The first benzene group area is defined by groundwater in four wells in Sites 13 (Oil Change Area) and 15 (Suspended Fuel Tank Area). The highest concentrations are from groundwater in Well 13_UGMW32 (Figure 6-1f). This well is "cross-gradient" from the site because it was drilled prior to recognizing the direction of groundwater flow. Benzene was not detected in soil samples from borings drilled directly into the sites being investigated. The Site 13 map (Appendix B13) shows a buried tank farm (Tank Farm 2) in the same area. The





FEATURES:

- BEDROCK
- 0.5 TO 5.0 ug/l 1,1 DCE
- GREATER THAN 5.0 ug/l 1,1 DCE
- MONITORING WELL
- DEEP, 25-FOOT, OR ANGLE BORING
- SEDIMENT SAMPLE
- SURFACE WATER AND SEDIMENT SAMPLE
- SURFACE AND NEAR-SURFACE SOIL SAMPLE
- IRRIGATION SUPPLY WELL
- PRODUCTION WELL
- MUNICIPAL SUPPLY WELL
- INDUSTRIAL SUPPLY WELL
- FREEWAY
- ROAD
- MCAS EL TORO BOUNDARY
- WASH OR STREAM
- ISOCONCENTRATION CONTOUR
- INFERRED ISOCONCENTRATION CONTOUR

0 2000 4000 6000

SCALE IN FEET

FIGURE 6-1d

SITE 18 (OU-1): 1,1 DICHLOROETHYLENE (1,1 DCE) CONCENTRATION IN REGIONAL GROUNDWATER

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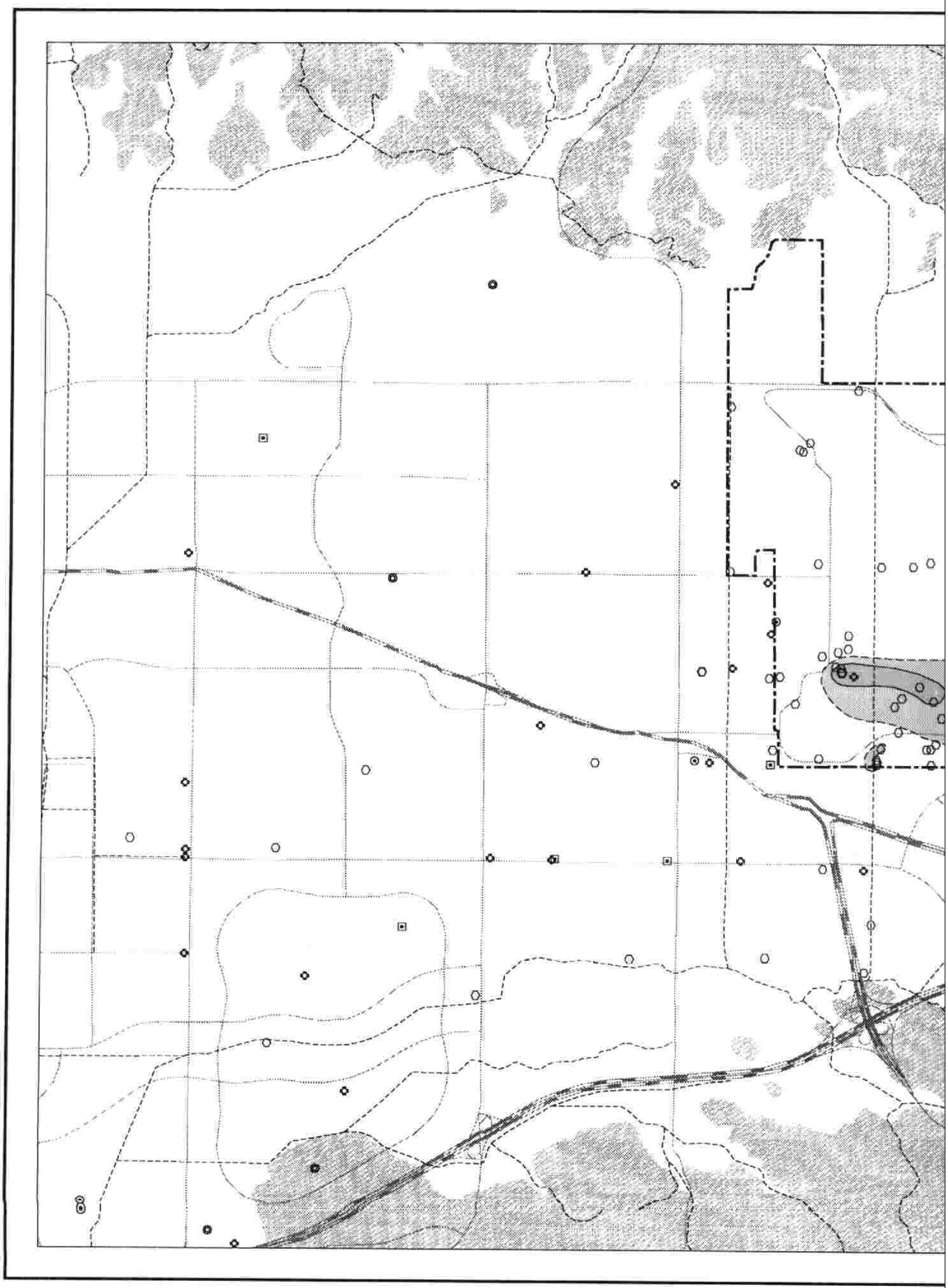

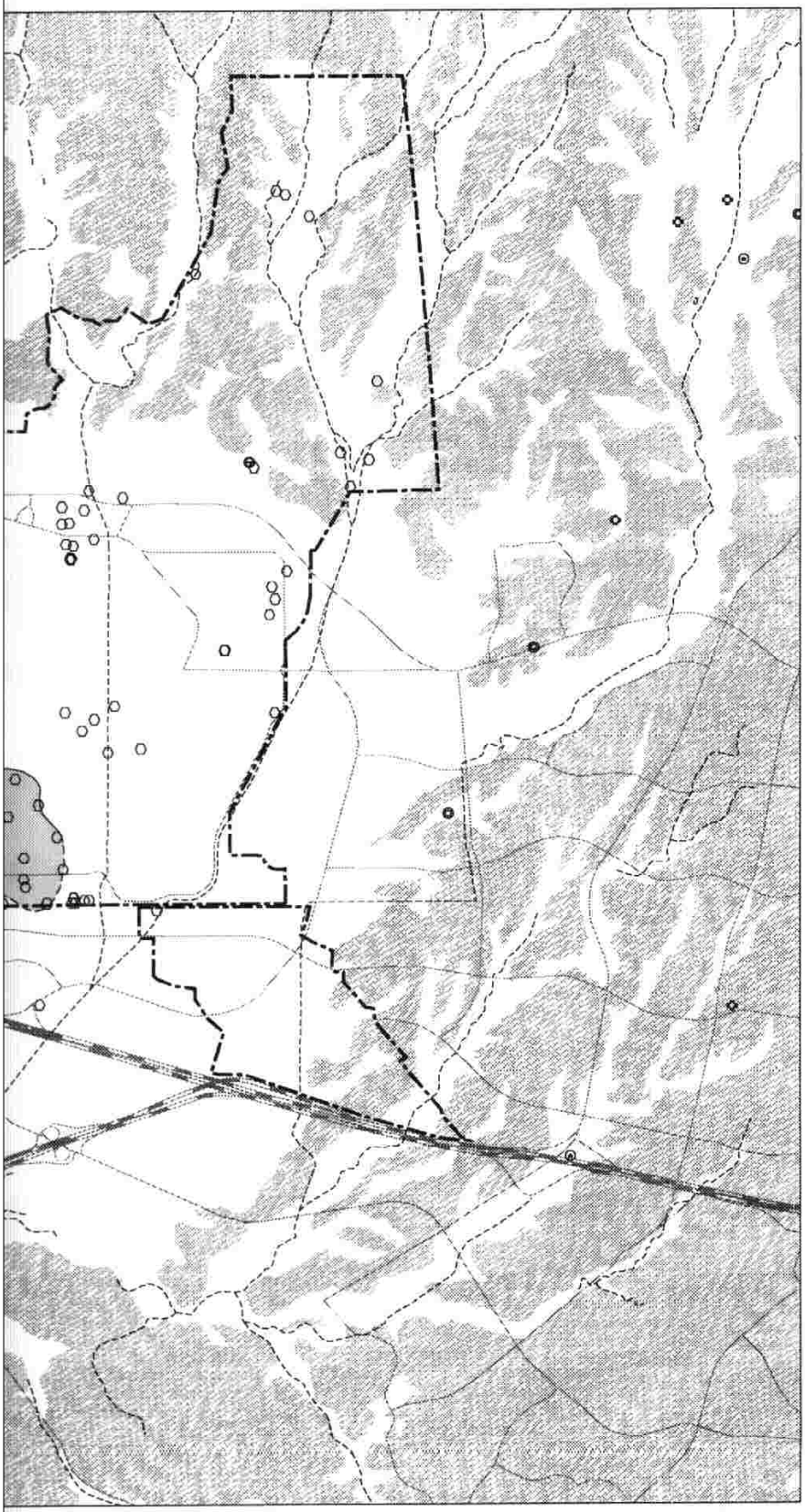

FEATURES:

- BEDROCK
- 0.5 TO 5.0 ug/l CARBON TETRACHLORIDE
- GREATER THAN 5.0 ug/l CARBON TETRACHLORIDE
- MONITORING WELL
- DEEP, 25-FOOT, OR ANGLE BORING
- SEDIMENT SAMPLE
- SURFACE WATER AND SEDIMENT SAMPLE
- SURFACE AND NEAR-SURFACE SOIL SAMPLE
- IRRIGATION SUPPLY WELL
- PRODUCTION WELL
- MUNICIPAL SUPPLY WELL
- INDUSTRIAL SUPPLY WELL
- FREEWAY
- ROAD
- MCAS EL TORO BOUNDARY
- WASH OR STREAM
- ISOCONCENTRATION CONTOUR
- INFERRED ISOCONCENTRATION CONTOUR

0 2000 4000 6000

SCALE IN FEET

FIGURE 6-1e

SITE 18 (OU-1): CARBON TETRACHLORIDE CONCENTRATION IN REGIONAL GROUNDWATER

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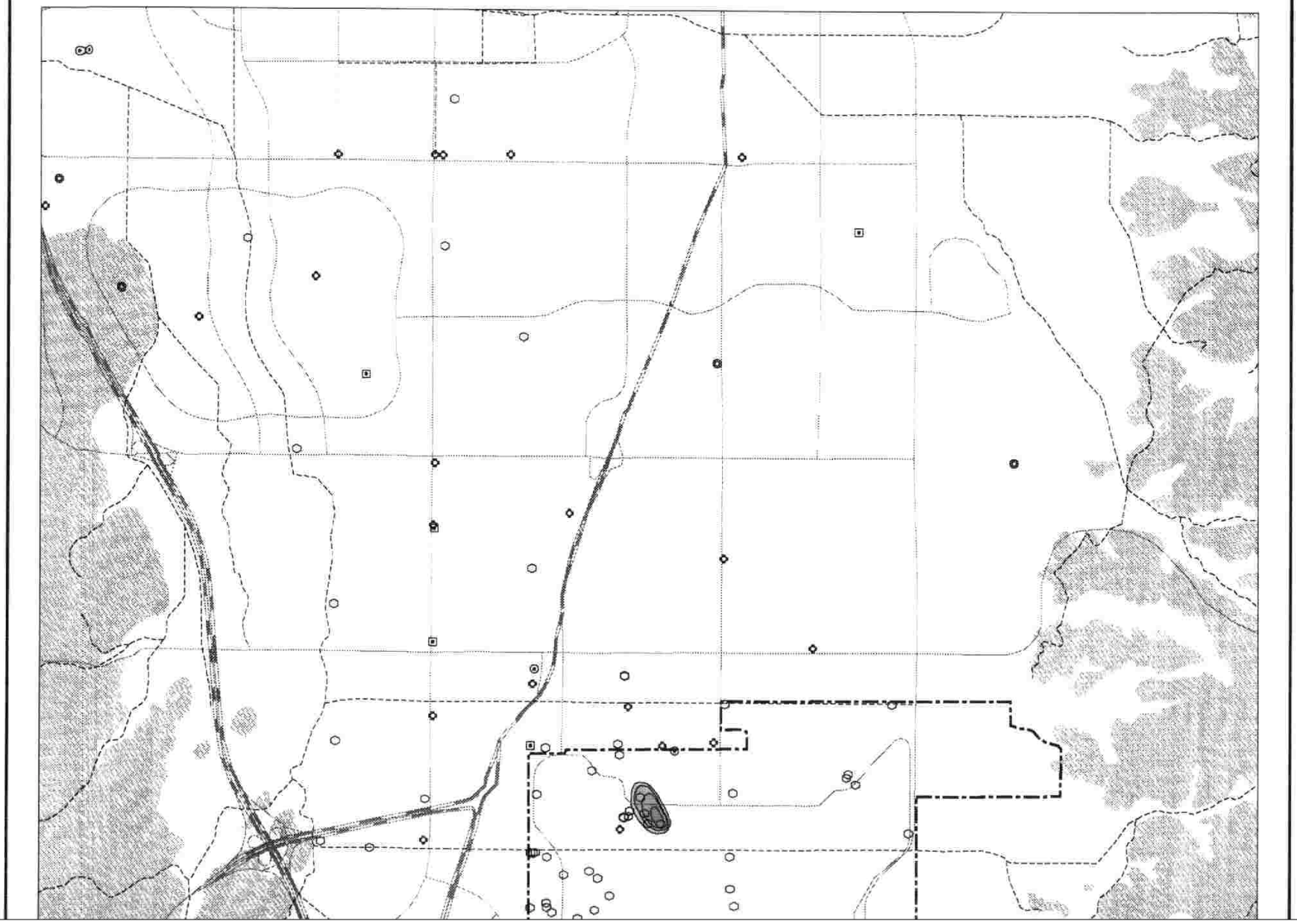

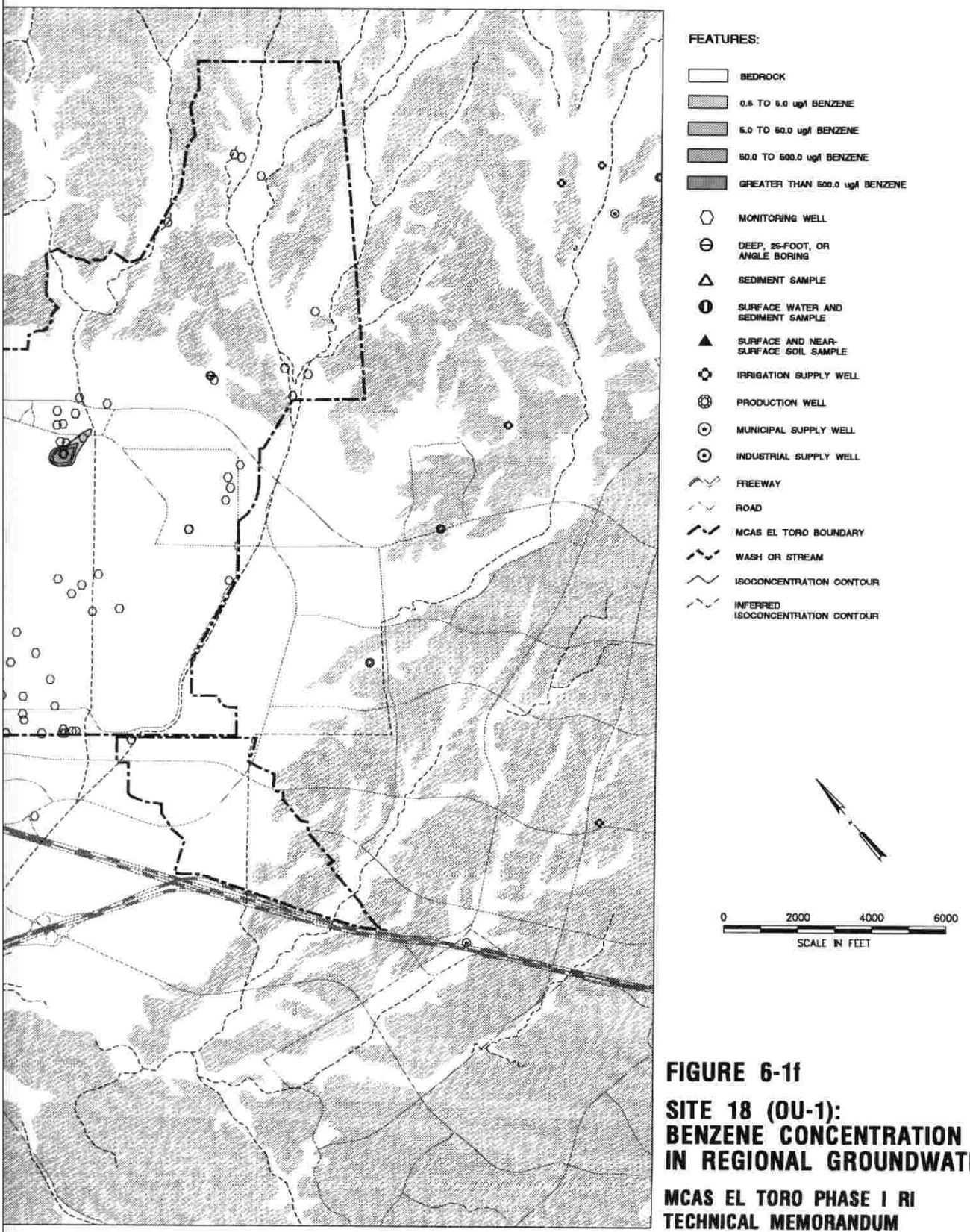

FIGURE 6-1f

SITE 18 (OU-1): BENZENE CONCENTRATION IN REGIONAL GROUNDWATER

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benzene concentrations appear to be of local origin, and Tank Farm 2 is a suspected source area.

The northern area, defined by groundwater in the upgradient Well (04_UGMW63, 3.0 μg/L) at Site 4 (Ferrocene Spill Area) and the uppermost screen in cluster well 1 (18_BGMW01E). Tank Farm 5 is in this area, and the benzene and TFH (gasoline and diesel) may have a source from tank farm operations.

Hydrocarbons (TRPH, TFH). No free hydrocarbons were detected in the regional groundwater or at any of the 21 sites investigated for this study. No TRPH were detected in any groundwaters.

Twenty-four of the 54 groundwater and potable water samples tested for TFH contained gasoline or diesel. Only four of the groundwater samples contained both gasoline and diesel. These samples also contained benzene and were discussed above.

TFH-diesel only was detected in groundwater from multiport wells 8, 9, and 10. It is possible that this chemical represents contamination from drilling operations. Two potable water samples, obtained from fire hydrants connected to the public water system on-Station, contained diesel above 1,000 μg/L.

6.1.3 Semivolatile Organic Compounds (SVOCs)

Groundwater samples were tested for 34 SVOCs. Only five SVOCs, (ethyl butyl phthalate, bis(2-ethylhexyl)phthalate, diethyl phthalate, dimethyl phthalate and phenol) were detected in groundwater samples. Dimethyl phthalate was detected only in the 18_DW well cluster. It is possible that the compound came from the pumps and drop pipe that were removed before the field sampling.

Diethyl phthalate was detected only in Well 18_BGMW15, in the north corner of MCAS El Toro. Benzyl butyl phthalate was detected at two sites and in water used for drilling at Rig 9. Bis(2-ethylhexyl)phthalate was detected at 11 locations;

the second highest value was from one sample of potable water from the hydrant at Site 3.

Phthalates are used to manufacture plastics and pump fluids. Low concentrations are widely distributed in the environment. Phthalates are also commonly occurring laboratory contaminants.

6.1.4. Pesticides and Polychlorinated Biphenyls (PCBs)

Pesticides were detected in 8 of the 153 groundwater and potable water samples tested. One sample was a duplicate. Multiple pesticides were detected in groundwater from 03_DGMW64 and from 18_BGMW19E. The latter well is in the SeaTree Nursery and obtains groundwater from the most shallow aquifer. Dieldrin was detected in the potable water hydrant at Site 3 (the primary source of drilling water), and endosulfan sulfate was detected in potable water from the fire hydrant near Well 18_BGMW103, both in addition to being detected in groundwater samples.

6.1.5 Herbicides

Fourteen samples out of 92 contained detectable amounts of herbicides. Ten of the samples were of groundwater. Only groundwater from Well 12_UGMW31 had detectable values of more than one type of herbicide; this sample had detectable concentrations of 9 of the 11 analytes. Three samples of the water from the hydrant at Site 3 (the primary source of drilling water) contained detectable amount of dalapon.

6.1.6 Regional Groundwater Quality

Regional groundwater quality is generally poor in this area, with high concentrations of total dissolved solids (TDS), sulfate, and nitrate, and selenium. Local groundwater areas may be high in magnesium, chloride, manganese, cadmium, and aluminum.

The major ions indicate that most of the groundwater is a mixed geochemical type in which no single cation or anion dominates (Figures A1-1 and A1-2, Appendix A1). Most of the water is a mixed calcium-sodium-magnesium-bicarbonate-chloride-sulfate type. There are a limited number of calcium-bicarbonate, sodium-bicarbonate (Site 3) and calcium-chloride (Site 15) types of groundwaters.

The cations are largely controlled by ion exchange of calcium and sodium. The groundwater has a trend toward calcium replacing sodium with depth and distance along groundwater flow paths. Anions are largely a mixture of bicarbonate and chloride with little sulfate influence. Additional information on regional groundwater quality is in Appendix A1.

6.1.6.1 Major Cations and Other General Chemistry

The occurrence and concentrations in groundwater of sodium, calcium, and magnesium, bicarbonate, sulfate, and chloride, appear to represent background water quality. Additional information on general chemistry is in Appendix A1.

6.1.6.2 Nitrate

Nitrate (as nitrogen [N]) concentrations above the MCL of 10 mg/L were found beneath the western half MCAS El Toro. The area in which nitrates occur in both the uppermost and the deeper alluvial aquifer extends further to the east than shown in the *Irvine Desalter Facility Plan* (OCWD and B&V, 1992). The highest concentration of nitrate (as N) is 63.4 mg/L at Site 15. Concentrations off-Station range up to 66.7 mg/L in groundwater from Site 18 cluster Well 19 (second screen from the surface, Well 18-BGMW19D) in the nursery northwest of MCAS El Toro. Previous studies have indicated that the high nitrate is related to agricultural practices and unsewered development activities for a longer period of time (Banks, 1984). Current irrigated agriculture on MCAS El Toro does not seem to contribute significantly. The groundwater beneath the golf course and the areas with irrigated agriculture contains some of the lowest values of nitrate in the region.

6.1.6.3 Metals

Concentrations of selenium, aluminum, and manganese above the MCL are common in the groundwater beneath MCAS El Toro (Appendix B). The concentration of these metals appear to represent naturally occurring groundwater quality and is not related to on-Station sites. As noted by Banks (1984), concentrations of selenium, the most common of the metal contaminants, roughly parallel TDS concentrations in groundwater. Additional discussion is in Appendix A1.

6.1.7 Suspected Sources of Contaminants Contributing to OU-1

Groundwater contamination beneath and west of MCAS El Toro has four potential sources:

- Naturally occurring sources
- Sources that are related to human activity before the activation of MCAS El Toro
- Sources that are off-Station
- Sources from activities related to operations of the Station (RI or RFA sites)

The high levels of TDS, sulfate, nitrates, and selenium appear to be caused by natural sources or previous land uses within the area. The regional groundwater quality is discussed in more detail in Appendix A1.

Table 6-2 summarizes the information from Appendixes A and B on site-specific contributions, or potential contributions, of the Phase I RI sites to the OU-1 regional groundwater contamination areas.

The PCE-TCE group of VOC contaminants is the major source of groundwater contamination. Three sources areas appears to be contributing to the regional groundwater VOC contamination. The broad area encompassing RI Sites 7, 9, 10, 22, and 8 appears to be the primary source area (Figures 6-1a and 6-1b). The

Table 6-2
Summary of MCAS El Toro RI/FS Sites Contributing or Potentially Contributing To Regional Groundwater Contamination (Site 18, OU-1)

Site (OU)	Designation	Possible Contaminants	Discussion
1 (OU-3)	Explosive Ordnance Disposal Range	(None)	Change in groundwater quality between wells 01_DGMW57 and 01_DGMW58, as well as water-level data that indicate a hydrogeologic barrier.
2 (OU-2)	Magazine Road Landfill	VOCs	Site 2 appears to be a major contributor to a newly defined groundwater plume on Station.
3 (OU-2)	Original Landfill	VOCs	The landfill at Site 3 does not appear to be contributing to groundwater contamination. The RFA incinerator site may be contributing.
4 (OU-3)	Ferrocene Spill Area	Benzene, other VOCs, diesel	Contaminants believed to be related to those in the Tank 398 study or to ongoing operations at Tank Farm 5.
5 (OU-2)	Perimeter Road Landfill	(None)	Contaminants in groundwater beneath this site appear to be migrating from Site 2.
6 (OU-3)	Drop Tank Drainage Area No. 1	(None)	Changes in groundwater quality appear to be unrelated to activities at MCAS El Toro.
7 (OU-3)	Drop Tank Drainage Area No. 2	VOCs	General source area, along with Sites 8, 9, 10, and 22 of major concentrations of TCE and PCE. Exact locations unknown between upgradient and downgradient wells.
8 (OU-3)	DRMO Storage Yard	VOCs	Source of VOCs is in this area, as defined by the groundwater plume. Exact locations are unknown but may be northeast of Site 8 beneath the motorpool area.
9 (OU-3)	Crash Crew Pit No. 1	VOCs	Highest values of TCE on Station. No TCEs in the soil samples. Source of groundwater "hot spot" unknown but probably just upgradient in Site 9 or 10.
10 (OU-2)	Petroleum Disposal Area	VOCs	General source area, along with Sites 7, 8, 9, and 11 of major concentrations of TCE and PCE.
11 (OU-3)	Transformer Storage Area	(None detected)	No wells at Site 11. Regional change in groundwater quality appears to be from natural sources or upgradient VOCs.
12 (OU-3)	Sludge Drying Beds	(None)	VOCs appear to be part of regional plume, not from sources at Site 12. Herbicides in the upgradient well are probably not from sludge operations.
13 (OU-3)	Oil Change Area	Benzene, hydrocarbons	Upgradient (actually, off-gradient) well has highest values; source of contamination most likely Tank Farm 2, adjacent to Site 13.
14 (OU-3)	Battery Acid Disposal Area	(None)	Groundwater changes appear to be from regional changes or upgradient VOCs.
15 (OU-3)	Suspended Fuel Tanks	Benzene, high TDS	Unknown source of contaminants. Benzene plume appears to be continuous with plume at Site 13. Tank Farm 2 most likely source.
16 (OU-3)	Crash Crew Pit No. 2	(None detected)	Change in groundwater quality appears to be from natural sources.
17 (OU-3)	Communication Station Landfill	(None detected)	Only one well. General chemistry and changes in quality unknown because of the landfill.

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Table 6-2
Summary of MCAS El Toro RI/FS Sites Contributing or Potentially Contributing To Regional Groundwater Contamination (Site 18, OU-1)

Site (OU)	Designation	Possible Contaminants	Discussion
18-Surface	Surface Water and Sediment	Minor contaminants	The washes, both above and below ground, may provide a conduit for contaminant transport in an oblique direction from the regional groundwater hydraulic gradient.
19 (OU-3)	Aircraft Expeditionary Refueling (ACER) Site	VOCs	Low levels detected that may have a local source. Study inconclusive.
20 (OU-3)	Hobby Shop	Trace of TCE	General chemistry changes are regional. Trace of TCE is inconclusive; additional groundwater sampling needed.
21 (OU-3)	Materials Management Group Building 320	VOCs	Groundwater changes appear to be from regional changes or upgradient VOCs.
22 (OU-3)	Tactical Air Fuel Dispensing System	VOCs	General source area, along with Sites 7, 8, 9, and 10 of major concentrations of TCE and PCE.

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highest concentrations of PCE (greater than 50 μg/L) are centered in the areas encompassed by Sites 7 and 8, and the highest concentrations of TCE are centered in the area encompassed by Sites 9 and 22. Both of these centers coalesce, overlap, and form the area of concern that extends off-Station to the west. A minor source area is Site 2 (Magazine Road Landfill).

PCE, TCE, 1,2-DCE and 1,1-DCE form a microbial degradation suite that is commonly exhibited when these VOCs are present in groundwater. These VOCs further degrade to vinyl chloride and chloroethane. Vinyl chloride is not detected in the site groundwater, therefore either the degradation to vinyl chloride is not taking place or the concentrations of PCE-TCE group compounds are not high enough to form vinyl chloride in sufficient amount to be detected at 1 g/L. The concentration of vinyl chloride is probably not detectable because of low concentrations of precursor VOCs and dilution along the groundwater flow path.

The second group of contaminants, which includes only benzene and TFHs, is localized in two areas north of and separated from the PCE-TCE group areas. Benzene is a common component of TFH-gasoline. The TFHs include both gasoline and diesel fractions; both fractions may be present or either fraction may dominate in groundwater at specific wells. Concentrations of benzene of up to 730 μg/L were detected in Well 13_UGMW32, which is directly adjacent to Tank Farm 2. No benzene has been detected in off-Station monitoring wells.

6.1.8 Hydrogeologic Conceptual Model

As postulated in the Phase I RI SAP, potential migration pathways for off-Station contaminant migration are surface water and sediment transport and subsurface groundwater flow. Two primary pathways are described below. Potential transport of wind-borne contaminated soil/sediments was not investigated in the Phase I RI.

- On-Station infiltration of contaminants to groundwater and lateral flow of contaminated groundwater off-Station

- Flow of contaminated surface water and sediments from on-Station source areas to off-Station locations through unlined washes; infiltration into groundwater and subsequent migration of contaminated groundwater

The first pathway is present at MCAS El Toro. The location of the highest concentrations of VOCs (primarily TCE, PCE, and their degradation products) in groundwater indicate that the general source areas are in the southwestern quadrant of the Station. The area of VOC groundwater contamination can be traced from the Station westward for approximately three miles.

The second pathway may have previously existed, but is difficult to substantiate. Borrego Canyon, Agua Chinon, Bee Canyon, and Marshburn Channel Washes provide a potential recharge pathway. The streambeds consist of coarse-grained material and surface runoff is concentrated in these areas. The longer contact time and larger amounts of water maximize the recharge potential. Contaminants can be carried into these washes, then moved downward with succeeding recharge. The soil samples beneath Agua Chinon contain TFH-gasoline that could be leaching to the groundwater. Although groundwater from the nearby well (18_BGMW05D) did not contain TFH-gasoline, the uppermost screen at Multiple-port Well 18_BGMP09 downstream (off-Station) along Agua Chinon Wash, did show 71 μg/l of TFH-gasoline. Although not proof, the finding is indicative that the washes may be a pathway for contaminant migration.

6.2 Contaminants in Surface Water, Sediments, and Angle Borings

Section 6.2.1 summarizes the field work completed and the contaminants in OU-1 surface water, sediment, and angle borings. Section 6.2.2 summarizes the potential pathways for surface water, sediment, and angle boring contamination to groundwater. An expanded discussion of the nature and extent of OU-1 surface water, sediment, and angle boring contamination is in Appendix A2. A discussion of the physical characteristics of OU-1 surface water, sediment, and angle borings is presented in Section 3.2.

6.2.1 Observed Contaminants in Surface Water, Sediments, and Angle Borings

Samples were collected from:

- 11 surface water (runoff) sampling locations (35 samples)
- 11 stream sediment locations (26 samples)
- 10 angle borings drilled and sampled beneath washes (66 samples)

Surface water samples were collected during three storm events: two rounds of samples were collected in March 1992, and one round was collected in December 1992. The 10 angle borings (shown in Figure 3-6) were drilled at a 30-degree angle from vertical to collect samples of wash subsurface soils.

In general, the surface water contained a limited variety of contaminant compounds at relatively low concentrations. Stream sediment concentrations are slightly higher than surface water concentrations, although the overall concentrations are still considered low. Contaminant values detected in the surface water were scattered, with no single station or wash exhibiting a consistent trend. Sediment data exhibit some trends in pesticides and acetone (acetone is a demonstrated lab contaminant). For both compounds, higher concentrations were detected upstream of the station than downstream.

Chemical concentrations in the subsurface soils in the angle borings are significantly higher than in either surface water or wash sediments. TFH is the most significant contaminant detected, with concentrations of 131,000 mg/kg of TFH-gasoline detected in Station 18_ACAB223 and 2,270 mg/kg of TFH-diesel detected at 18_ACAB224. Acetone was detected at all washes at concentrations ranging from 9 to 99 μg/kg (acetone is a demonstrated lab contaminant). A peak acetone concentration of 530 μg/kg was detected at 18_ACAB224. SVOCs detections were isolated in angle borings at Bee Canyon Wash, with peak concentrations of 2-methylnaphthalene and naphthalene of 4,300 and 640 μg/kg, respectively. Detected contaminants are summarized in Appendix A2.

The detected contaminant levels in both the surface water and sediments are considered low. At these concentrations, it is unlikely that these media are contributing significantly to the groundwater contamination. Higher concentrations detected in the angle borings in the soils beneath the washes are believed to have a greater potential than surface sediments for contributing to groundwater contamination. Contaminants detected in the angle boring soils suggest active downward transport by infiltrating water.

Surface water may be important in contaminant transport. Selected compounds, such as pesticides have been found at higher concentrations upstream of the Station, indicating that those contaminants may be coming from upstream. Agricultural activities, particularly upstream of Marshburn Channel and Bee Canyon Wash monitoring stations (18_MC1 and 18_BE1, respectively), are potentially a source of the pesticides. Agricultural activities occurring on-Station are potential sources of herbicides and pesticides. Herbicides in the sediments were detected only just downstream of the Station.

Contamination in the surface water and sediments, particularly in pesticides, was detected more often in Marshburn Channel than in other washes. This channel is along the northwest border of MCAS El Toro and is potentially subject to contamination from both on- and off-Station. In the angle borings, higher contamination was detected in the borings taken at Agua Chinon Wash and Bee Canyon Wash than at other locations. In particular, concentrations of petroleum hydrocarbons (TFH-gasoline up to 131,000 mg/kg) and acetone (530 μg/kg) (a demonstrated lab contaminant) detected at Agua Chinon Wash and 2-methylnaphthalene (4,300 μg/kg) and naphthalene (1,800 μg/kg) at Bee Canyon Wash could be more significant sources of contamination.

6.2.2 Potential Pathways for Surface Water, Sediments, and Angle Borings to Regional Groundwater

The surface water runoff and sediments contain a limited number of contaminants, at relatively low concentrations. Surface water runoff is a potential pathway for contaminant migration, with contaminants being transported as suspended

sediments or dissolved in the liquid phase. Surface water, infiltrating through the wash subsurface soils, may leach contaminants out of the soils and transport them to the groundwater. Previous investigations have concluded that the unlined portions of Marshburn Channel, Bee Canyon Wash, Agua Chinon Wash, and Borrego Canyon Wash (shown in Figure A2-1) are locations in which contaminated water may have percolated through the vadose zone to groundwater (JMM, 1989; JMM, 1990; Work Plan; SAP). Extensive culverting and lining of the creeks have limited the infiltration areas (see Figure A2-1 and Subsection A2.1.2).

Cracks and joints in the concrete channels or culverts are also potential pathways, as contaminated water may leak water to the subsurface. Angle borings detected high contaminants in every wash, but particularly high concentrations of hydrocarbons were found at Agua Chinon Wash (18_ACAB223-225), of SVOCs at Bee Canyon Wash (18_BEAB226-227), and of pesticides at Marshburn Channel (18_MCAB228-229).

Although surface flow and sediment samples, in particular those from angle borings, show detected levels of varying contaminants (mostly petroleum hydrocarbons), it does not appear that they are contributing to the regional groundwater VOC contamination (OU-1).

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Insert Figure 6-1a (TCE Plume)

Insert Figure 6-1b (PCE Plume)

Insert Figure 6-1c (1,2-DCE)

Insert Figure 6-1d (1,1-DCE)

Insert Figure 6-4e (Carbon Tet)

Insert Figure 6-1f (Benzene)

Insert Table 6-1 (Groundwater Contaminants of Concern)

Insert Table 6-2 (Site-Specific Contributions)

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7.0 PRELIMINARY BASELINE ASSESSMENT

This section presents, for the 22 sites in OUs 1, 2, and 3, the results of the preliminary baseline risk assessment, which includes both a human health assessment and an ecological assessment. The objective of the preliminary baseline risk assessment is to evaluate qualitatively and/or quantitatively potential human health and ecological risks resulting from exposure to contaminated media, assuming that no action has been taken to control or mitigate sources of contamination (i.e., the no-action alternative).

As discussed in Section 1.0, this Phase I RI report has been limited to the presentation and preliminary interpretation of data. The results of the preliminary risk assessment are risk-based concentrations expected to be protective of human health a nd a screening level evaluation for ecological impacts. These results will be used during the DQO process to refine the list of chemicals of potential concern, to identify populations and exposure pathways of potential concern, and to help determine the need for further data collection during Phase II sampling and/or remedial action at the sites.

7.1 Human Health Evaluation

7.1.1 Introduction

This section presents the results of the preliminary human health baseline risk assessment for MCAS El Toro. This preliminary risk assessment characterizes the potential human health risks from the site if no remedial actions occur (i.e., the no-action alternative). Site-specific data such as chemicals of concern, potentially exposed populations, and potential exposure pathways are used in this preliminary risk assessment to develop risk-based concentrations that are expected to be protective of human health. The risk-based concentrations, along with other applicable standards and criteria, will be compared to site contaminant concentrations during the DQO process to help determine whether further site investigation or remediation is necessary.

7.1.1.1 Section Organization

The preliminary human health baseline risk assessment for MCAS El Toro is organized into five subsections:

Identification of Chemicals of Potential Concern. The first step in the preliminary risk assessment is to identify the chemicals of potential concern (COPC). This process evaluates the chemicals present at each site that may be of potential concern to human health in order to focus subsequent efforts in the risk assessment process.

Exposure Assessment. The exposure assessment identifies potential pathways by which exposures could occur, characterizes the potentially exposed populations (e.g., current workers, future residents), and estimates the frequency and duration of exposure.

Toxicity Assessment. The toxicity assessment identifies the types of hazards or health effects associated with exposure to the COPC. It also describes the relationships between the magnitude of exposure and the occurrence of adverse health effects.

Development of Risk-Based Concentrations. The development of risk-based concentrations integrates the results of the exposure and toxicity assessments. The process provides chemical-specific risk-based concentrations for specific media and land use scenarios that are expected to be protective of human health.

Summary of Uncertainties and Assumptions. The final subsection summarizes the basic assumptions used in the risk assessment and limitations of the data and methodology.

Information used to support the preliminary human health risk assessment is presented in the accompanying appendixes. The methodology used to develop risk-based concentrations is outlined in Appendix H1. The spreadsheet calculations are presented in Appendix H2.

7.1.1.2 Risk Assessment Guidance

This preliminary risk assessment was performed in accordance with the following guidance:

- *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A.* Interim Final. December, 1989 (EPA, 1989a).
- *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part B.* Interim. December, 1991 (EPA, 1991a).
- *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual,* Supplemental Guidance, "Standard Default Exposure Factors". Interim Final. March, 1991 (EPA, 1991b).
- U.S. EPA Region IX - *Recommended Procedures for Implementation of Superfund Risk Assessment Guidelines* (EPA, 1989b).

7.1.2 Data Use

The preliminary risk assessment is based on chemicals detected in groundwater, surface/shallow soil, soil boring, sediment, and surface water runoff data during the Phase I site investigation (see Appendices A and B). The analytical data collected for the Phase I site investigation underwent data validation procedures described in Section 2.6. After validation, the data were reviewed to eliminate results that could represent laboratory or field contamination that failed to meet quality control guidelines (e.g., insufficient surrogate spike recovery).

In addition, chemicals detected in the Orange County Water District (OCWD) groundwater samples collected in the study area from 1985 through 1992, the James M. Montgomery Engineers, Inc. (JMM) groundwater samples collected in the study area from 1988 through 1989, and the landfill air solid waste assessment tests (SWATs) conducted on-Station during previous investigations (Strata, 1990) were included in this assessment. The data from these investigations, which are described in Section 1.5.1, were not independently validated by CH2M HILL.

7.1.3 Identification of Chemicals of Potential Concern

Twenty-two sites located within OUs 1, 2, and 3 are currently under investigation at MCAS El Toro. These sites, which are described in Section 1.6 and Appendix B, are listed below:

Site 1: Explosive Ordnance Disposal Range
Site 2: Magazine Road Landfill
Site 3: Original Landfill
Site 4: Ferrocene Spill Area
Site 5: Perimeter Road Landfill
Site 6: Drop Tank Drainage Area No. 1
Site 7: Drop Tank Drainage Area No. 2
Site 8: DRMO Storage Area
Site 9: Crash Crew Pit No. 1
Site 10: Petroleum Disposal Area
Site 11: Transformer Storage Area
Site 12: Sludge Drying Beds
Site 13: Oil Change Area
Site 14: Battery Acid Disposal Area
Site 15: Suspended Fuel Tanks
Site 16: Crash Crew Pit No. 2
Site 17: Communication Station Landfill
Site 18: Regional Groundwater Volatile Organic Compound (VOC) Contamination
Site 19: Aircraft Expeditionary Refueling (ACER) Site
Site 20: Hobby Shop
Site 21: Waste Management Group, Building 320
Site 22: Tactical Air Fuel Dispensing System

A total of 122 chemicals were detected during the investigations of these 22 sites. Chemicals detected include 93 organic chemicals, 27 inorganic chemicals, gross alpha and gross beta particle activity. Essential nutrients (i.e., calcium, iron, magnesium, potassium, and sodium) and major cations/anions (i.e., chloride and sulfate) were eliminated from the preliminary risk assessment. The remaining 115 chemicals are summarized in Table 7-1.

Tables 7-2 through 7-7 list chemicals detected by site in groundwater, surface/shallow soil (0-4 feet), soil borings (5-10 feet), sediment, surface water runoff, and soil-gas, respectively. Two chemicals, chlorobenzene and 1,2-dichloroethane, were not detected in groundwater during the Phase I investigation but were detected during the OCWD and JMM (chlorobenzene only) groundwater

Table 7-1
Chemicals Detected On-Station and Off-Station
MCAS El Toro Phase I RI Technical Memorandum

ORGANICS		
1,1,1-Trichloroethane	Benzo(a)pyrene	Endrin aldehyde
1,1,2-Trichloroethane	Benzo(b)fluoranthene	Endrin ketone
1,1-Dichloroethane	Benzo(g,h,i)perylene	Ethylbenzene
1,1-Dichloroethane	Benzo(k)fluoranthene	Fluoranthene
1,2-Dichloroethane	Benzyl butyl phthalate	Fluorene
1,2-Dichloroethene (total)	Beta chlordane	Gamma chlordane
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	Beta-BHC	Heptachlor
2,4,5-Trichlorophenoxy proprionic acid	Bis(2-ethylhexyl)phthalate	Heptachlor epoxide
2,4-Dichlorophenoxy acetic acid (2,4-D)	Bromodichloromethane	Hexachloroethane
2,4-Dimethylphenol	Bromoform	Indeno(1,2,3-cd)pyrene
2-Butanone	Carbazole	Isophorone
2-Hexanone	Carbon disulfide	Lindane (Gamma BHC)
2-Methylnaphthalene	Carbon tetrachloride	Methane
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	Chlorobenzene	Methoxychlor
2-(2-Methyl-4-chlorophenoxy) proprionic acid (MCPP)	Chlorodibromomethane	Methyl chloride
4',4'-DDD	Chloroform	Methylene chloride
4',4'-DDE	Chrysene	Naphthalene
4',4'-DDT	Dalapon	Octachlorodibenzo-p-dioxin
4-Methyl-2-pentanone	Delta-BHC	PCB 1248
4-Methylphenol	Dibenzofuran	PCB 1254
4-Nitrophenol	Dibenzo(a,h)anthracene	PCB 1260
4-(2,4-Dichlorophenoxy)butric acid (2,4-DB)	Dicamba	Petroleum hydrocarbons (total recoverable)
Acenaphthene	Dichloroprop 2-(2,4-Dichlorophenoxy) propionic acid	Phenanthrene
Acenaphthylene	Dieldrin	Phenol

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Table 7-1
Chemicals Detected On-Station and Off-Station
MCAS El Toro Phase I RI Technical Memorandum

Acetone	Diethyl phthalate	Pyrene
Aldrin	Dimethyl phthalate	Tetrachloroethene
Alpha chlordane	Di-n-butyl phthalate	TFH-diesel
Alpha-BHC	Endosulfan I	TFH-gasoline
Anthracene	Endosulfan II	Toluene
Benzene	Endosulfan sulfate	Trichloroethylene
Benzo(a)anthracene	Endrin	Xylenes (total)
INORGANICS		
Aluminum	Cobalt	Nitrate/Nitrite
Antimony	Copper	Selenium
Arsenic	Cyanide	Silver
Barium	Lead	Thallium
Beryllium	Manganese	Vanadium
Cadmium	Mercury	Zinc
Chromium	Nickel	
RADIONUCLIDES		
Gross alpha		
Gross beta		

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Table 7-2
Chemicals of Potential Concern in Groundwater
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]																				
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22
ORGANICS																					
1,1,1-trichloroethane						•															
1,1,2-Trichloroethane		•						•													
1,1-Dichloroethane		•															•				
1,1-Dichloroethene							•	•	•	•							•				
1,2-Dichloroethane[b]									•								•				
1,2-Dichloroethene (total)		•							•								•				
2,4,5-T				•	•						•						•				
2,4,5-Trichlorophenoxy proprionic acid											•										
2,4-D											•										
2,4-DB											•										
2-Hexanone				•													•				
4',4'-DDT			•														•				
4-methyl-2-pentanone																		•			
Acetone																	•				
Benzene				•	•			•				•		•			•				
Benzyl butyl phthalate						•				•											
Bis(2-ethylhexyl)phthalate			•									•					•				
Bromodichloromethane																•	•				
Carbon disulfide																	•				•
Carbon tetrachloride							•	•	•	•	•		•				•				•
Chlorobenzene[b]																	•				
Chlorodibromomethane																•	•				
Chloroform		•	•				•	•	•	•	•		•		•	•	•			•	

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Table 7-2
Chemicals of Potential Concern in Groundwater
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]																				
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22
Dalapon			•								•						•				
Dicamba											•										
Dichloroprop											•						•				
Dieldrin			•														•				
Dimethyl phthalate																	•				
Ethylbenzene												•					•				
Heptachlor			•														•				
Lindane			•														•				
MCPA											•										
MCPP											•						•				
Methyl chloride	•		•		•	•				•	•	•					•		•	•	
Methylene chloride			•	•	•		•	•	•						•		•			•	
Phenol						•															
Tetrachloroethene		•			•		•	•	•	•	•						•	•		•	•
Toluene								•				•					•				
TFH-diesel				•			•					•		•			•				
TFH-gasoline				•					•			•		•			•				•
Trichloroethylene		•			•		•	•	•	•	•		•				•	•	•	•	•
Vinyl chloride[c]																	•				
Xylenes (total)			•					•				•		•			•				
INORGANICS																					
Aluminum		•	•	•	•	•	•	•	•		•	•	•		•	•	•	•		•	
Antimony				•	•	•	•		•		•	•	•	•	•		•	•	•	•	•
Arsenic	•	•	•	•	•		•	•		•					•	•	•	•	•		•

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Table 7-2
Chemicals of Potential Concern in Groundwater
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]																				
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22
Barium	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Beryllium		•					•								•		•				
Cadmium	•		•	•		•	•	•			•	•	•	•	•		•	•	•	•	
Chromium																	•	•			
Cobalt			•			•	•								•		•	•			
Copper	•	•	•		•			•		•		•	•		•	•	•	•	•		
Cyanide							•	•					•				•			•	
Lead																	•				
Manganese	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Mercury				•	•	•	•	•	•		•	•	•		•		•				
Nickel	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	
Nitrate/nitrite	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Selenium	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Silver	•	•			•		•						•		•		•	•			
Thallium																•	•			•	
Vanadium	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Zinc		•				•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
RADIONUCLIDES																					
Gross alpha	•	•	•		•		•		•									•			•
Gross beta	•	•	•	•	•		•		•									•			

Notes:
[a]Groundwater samples were not taken at Site 11.
[b]Detected in OCWD and/or JMM groundwater samples.
[c]Due to high detection limits, vinyl chloride has been selected as COPC for this assessment.

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Table 7-3
Chemicals of Potential Concern in Surface and Shallow Soils (0—4 feet)
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	20	21	22
ORGANICS																					
1,1,1-Trichloroethane									•												
1,2-Dichloroethene (total)										•											
2,4,5-T																				•	
2,4,5-Trichlorophenoxy proprionic acid			•		•																
2,4-D												•									
2,4-DB		•															•				
2,4-Dimethyl phenol																	•				
2-Butanone		•	•					•	•			•				•			•		•
2-Hexanone		•	•					•								•			•		•
2-Methylnaphthalene				•												•		•	•	•	•
4,4'-DDD		•	•	•			•	•			•	•					•		•	•	
4,4'-DDE		•	•	•			•	•			•	•					•		•	•	
4,4'-DDT		•	•	•	•		•	•			•	•					•		•	•	
4-Methyl-2-pentanone		•																			
4-Methylphenol																	•				
Acenaphthene																		•		•	
Acenapthylene																		•		•	
Acetone		•	•	•		•	•	•		•		•	•	•	•	•	•	•	•	•	•
Aldrin		•																			
Alpha chlordane		•		•				•				•					•			•	

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Table 7-3
Chemicals of Potential Concern in Surface and Shallow Soils (0–4 feet)
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	20	21	22
Alpha BHC								•											•		
Anthracene														•				•		•	
Benzene		•					•									•					
Benzo(a)anthracene							•			•		•		•			•	•		•	•
Benzo(a)pyrene				•			•	•		•		•	•	•			•	•	•	•	•
Benzo(b)fluoranthene				•			•			•		•	•	•				•		•	•
Benzo(g,h,i)perylene							•	•		•		•	•	•			•	•	•	•	
Benzo(k)fluoranthene				•			•			•		•	•	•				•		•	•
Benzyl butyl phthalate		•		•		•		•					•		•					•	
Bis(2-ethylhexyl)phthalate		•	•	•		•	•	•		•		•	•	•	•	•		•	•	•	•
Carbazole							•							•				•		•	•
Carbon disulfide												•									
Carbon tetrachloride	•	•				•	•		•			•		•		•			•		
Chrysene				•			•	•		•		•	•	•	•		•	•		•	•
Dalapon		•																		•	
Delta BHC				•													•		•		
Dibenzo(a,h)anthracene							•					•		•				•		•	
Dibenzofuran																•		•		•	
Dichloroprop		•																			
Dieldrin				•			•	•				•					•		•	•	
Diethyl phthalate							•			•											

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Table 7-3
Chemicals of Potential Concern in Surface and Shallow Soils (0–4 feet)
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	20	21	22
Dimethyl phthalate								•	•												
Di-n-butyl phthalate								•													
Endosulfan I				•				•											•		
Endosulfan II				•				•			•									•	
Endosulfan sulfate				•			•	•				•					•		•	•	
Endrin				•			•	•			•								•	•	
Endrin aldehyde				•				•			•	•									
Endrin ketone				•			•	•				•					•		•	•	
Ethylbenzene		•						•								•					
Fluoranthene				•		•	•	•		•		•	•	•		•	•	•		•	•
Fluorene																•		•		•	
Gamma chlordane		•		•				•				•					•			•	
Heptachlor epoxide																	•				
Hexachloroethane								•													
Indeno(1,2,3-cd)pyrene							•	•		•		•	•	•			•	•		•	•
Isophorone																					•
Lindane (gamma BHC)																				•	
MCPP		•										•									
Methoxychlor				•	•			•				•					•			•	
Methylene chloride		•	•			•	•	•				•			•	•	•		•	•	
Naphthalene				•												•		•	•		•

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Table 7-3
Chemicals of Potential Concern in Surface and Shallow Soils (0–4 feet)
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	20	21	22
Octachlorodibenzo-p-dioxins			•																		
PCB 1248								•													
PCB 1254								•				•									
PCB 1260								•			•										
Petroleum hydrocarbons (total recoverable)	•		•		•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Phenanthrene							•					•	•	•	•	•		•		•	•
Phenol				•																	
Pyrene				•		•	•	•		•		•	•	•		•	•	•	•	•	•
Tetrachloroethene								•		•											
Toluene	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
TFH-diesel	•	•	•	•		•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
TFH-gasoline	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Trichloroethylene		•																			
Xylenes (total)		•		•			•	•				•				•			•		
INORGANICS																					
Aluminum	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Antimony		•		•		•		•					•	•		•	•	•	•		•
Arsenic		•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Barium	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Beryllium		•	•	•	•	•	•	•		•		•	•	•	•	•	•	•	•	•	•

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Table 7-3
Chemicals of Potential Concern in Surface and Shallow Soils (0–4 feet)
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	20	21	22
Cadmium		•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Chromium	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Cobalt	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Copper	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Cyanide												•									
Lead	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Manganese	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Mercury	•	•	•	•	•	•	•	•		•		•	•	•	•		•	•	•	•	•
Nickel		•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Nitrate/nitrite				•																	
Selenium	•	•			•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Silver		•	•	•	•	•		•		•		•	•	•	•	•	•	•	•		
Thallium		•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•		•	•
Vanadium	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Zinc	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•

Notes:
[a]Surface soil samples were not taken at Site 18 locations.

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Table 7-4
Chemicals of Potential Concern in Soil Borings (5—10 feet)
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]																		
	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22
ORGANICS																				
1,1,1-Trichloroethane												•								
2-Butanone										•	•		•	•		•				•
2-Hexanone					•		•													
2-methylnaphthalene														•						
4',4'-DDD											•					•				•
4',4'-DDE										•						•				•
4',4'-DDT				•						•	•					•				•
Acetone			•			•	•	•						•	•	•	•			•
Beta chlordane																				
Benzyl butyl phthalate							•	•												
Bis(2-ethylhexyl)phthalate								•			•	•								•
Bromodichloromethane																				
Bromoform																				
Carbon disulfide													•							
Chlorodibromomethane																				
Chloroform																				
Dalapon															•					
Delta BHC											•									
Dieldrin																				
Endosulfan II																				

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Table 7-4
Chemicals of Potential Concern in Soil Borings (5—10 feet)
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]																			
	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22
Endosulfan sulfate							•				•				•	•				
Endrin																•				
Endrin aldehyde																				
Endrin ketone											•				•					
Ethylbenzene														•						
MCPA															•					
MCPP				•																
Methylene chloride					•		•							•						
Naphthalene														•						
PCB 1254																				
PCB 1260																				
Petroleum hydrocarbons (total recoverable)						•	•	•	•		•		•	•	•	•		•		
Toluene		•			•		•						•	•	•	•				•
TFH-diesel							•				•		•	•	•	•	•			
TFH-gasoline						•	•	•	•				•	•	•	•	•			•
Xylenes (total)					•								•	•						
INORGANICS																				
Aluminum	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Antimony					•	•				•			•	•		•		•		•
Arsenic	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

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Table 7-4
Chemicals of Potential Concern in Soil Borings (5—10 feet)
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]																			
	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22
Barium	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Beryllium			•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•
Cadmium	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Chromium	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Cobalt	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Copper	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Lead	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Manganese	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•
Mercury			•				•				•			•		•	•	•	•	•
Nickel	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Selenium		•			•			•	•			•			•	•		•		
Silver							•	•		•	•	•		•					•	
Thallium				•	•	•	•	•		•	•	•	•			•		•	•	•
Vanadium	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Zinc	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Notes:
[b]Soil boring samples were not taken at Sites 1 and 11.

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Table 7-5
Chemicals of Potential Concern in Sediment
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]								
	2	3	4	6	12	14	18	20	21
ORGANICS									
2,4-DB	•						•		
2,4,5-Trichlorophenoxy proprionic acid							•		
2-Butanone							•		
2-Hexanone		•							
2-Methylnaphthalene									•
4',4'-DDD		•			•				•
4',4'-DDE		•			•		•		•
4',4'-DDT	•	•			•		•		•
4-Methylphenol							•		
Acenaphthene									•
Acenaphthylene									•
Acetone	•	•	•		•	•	•	•	•
Alpha chlordane	•				•				•
Anthracene									•
Benzene	•								
Benzo(a)anthracene									•
Benzo(a)pyrene					•				•
Benzo(b)fluoranthene					•				•
Benzo(g,h,i)perylene									•
Benzo(k)fluoranthene					•				•
Benzyl butyl phthalate	•								•
Beta chlordane									•
Bis(2-ethylhexyl)phthalate	•	•		•	•	•	•	•	•

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Table 7-5
Chemicals of Potential Concern in Sediment
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]								
	2	3	4	6	12	14	18	20	21
Carbazole									•
Carbon Tetrachloride	•				•				
Chrysene					•				•
Dalapon					•		•		
Delta-BHC							•		
Dibenzo(a,h)anthracene					•				•
Dibenzofuran									•
Dichloroprop							•		
Dieldrin					•				•
Endosulfan II									•
Endosulfan sulfate					•		•		•
Endrin									•
Endrin ketone									•
Fluoranthene					•	•			•
Fluorene									•
Gamma chlordane	•				•				•
Indeno(1,2,3-cd)pyrene					•	•			•
MCPP	•								
Methoxychlor									•
Methylene chloride	•			•	•		•	•	•
Petroleum Hydrocarbons (total recoverable)	•	•		•	•	•	•	•	•
Phenanthrene					•				•
Pyrene					•	•			•

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Table 7-5
Chemicals of Potential Concern in Sediment
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]								
	2	3	4	6	12	14	18	20	21
TFH-diesel		•		•	•	•		•	•
TFH-gasoline	•	•		•	•	•	•	•	•
Trichloroethylene	•								
INORGANICS									
Aluminum	•	•	•	•	•	•	•	•	•
Antimony	•		•				•	•	
Arsenic	•	•	•	•	•	•	•	•	•
Barium	•	•	•	•	•	•	•	•	•
Beryllium	•	•					•		
Cadmium	•	•	•	•	•	•	•	•	•
Chromium	•	•	•	•	•	•	•	•	•
Cobalt	•	•	•	•	•	•	•	•	•
Copper	•	•	•	•	•	•	•	•	•
Lead	•	•	•	•	•	•	•	•	•
Manganese	•	•	•	•	•	•	•	•	•
Mercury			•		•	•	•		•
Nickel	•	•	•	•	•	•	•	•	•
Selenium	•							•	•
Silver			•	•	•		•		
Thallium		•			•		•		•
Vanadium	•	•	•	•	•	•	•	•	•
Zinc	•	•	•	•	•	•	•	•	•

Notes:
[a]Sediment samples were not taken at Sites 1, 5, 7, 8, 9, 10, 11, 13, 15, 16, 17, 19, and 22.

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Table 7-6
Chemicals of Potential Concern in Surface Water Runoff
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]		
	2	3	18
ORGANICS			
1,1,1-Trichloroethane			•
2-Butanone			•
2-Methylnaphthalene			•
4',4'-DDE			•
4,4'-DDT			•
4-Nitrophenol			•
Acetone	•	•	•
Benzyl batyl phthalate			•
Beta-BHC			•
Bis(2-ethylhexyl)phthalate		•	•
Chloroform			•
Delta-BHC			•
Endosulfan sulfate			•
Gamma chlordane		•	•
Methylene chloride		•	
Toluene			•
TPH-diesel	•		•
INORGANICS			
Aluminum	•	•	•
Antimony	•	•	•
Arsenic	•	•	•
Barium	•	•	•
Beryllium	•	•	•

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Table 7-6
Chemicals of Potential Concern in Surface Water Runoff
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]		
	2	3	18
Cadmium	•	•	•
Chromium	•	•	•
Cobalt	•	•	•
Copper	•	•	•
Cyanide		•	•
Lead	•	•	•
Manganese	•	•	•
Mercury			•
Nickel	•	•	•
Nitrate/nitrite	•	•	•
Selenium	•	•	•
Thallium	•		•
Vanadium	•	•	•
Zinc	•	•	•
RADIONUCLIDES			
Gross alpha	•		
Gross beta	•		

Notes:

[a]Surface runoff samples were collected at Sites 2, 3, and 18 only.

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Table 7-7
Chemicals of Potential Concern in Landfill Gas
MCAS El Toro Phase I RI Technical Memorandum

Chemical	Site Number[a]			
	2	3	5	17
ORGANICS				
Benzene	•			
Chloroform	•	•		
Methane	•			
Methylene chloride	•	•	•	•
Tetrachloroethene			•	
Trichloroethylene	•	•	•	

[a]Landfill gas samples were only taken at the four landfill sites noted.

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investigations. Subsurface soil samples below a depth of 10 feet were not considered in this preliminary risk assessment.

All chemicals detected in media at the 22 sites have been selected as COPC for the preliminary risk assessment. In addition, two chemicals analyzed for in groundwater during the Phase I investigation had detection limits above their corresponding state Maximum Contaminant Levels for drinking water. These two chemicals were carbon tetrachloride and vinyl chloride. Carbon tetrachloride was detected in groundwater samples; however, vinyl chloride was not detected above its detection limit. Because of the detection limit for this chemical, vinyl chloride has been selected as COPC for this assessment.

Most inorganic chemicals and gross alpha/gross beta are expected to be present in naturally occurring (i.e., background) levels in site media. A statistical comparison of site chemical concentrations to background inorganic and gross alpha/gross beta concentrations will be conducted during the DQO process. Chemicals detected at a site that are determined to be below background levels will be removed from the COPC list for that site.

In addition, since the Station was built on land formerly used for agricultural purposes, onsite pesticide concentrations may not reflect MCAS El Toro activities but may instead be representative of regional pesticide contamination. During the DQO process, concentrations of pesticides detected in soils on-Station will be statistically compared with concentrations detected in off-Station agricultural, commercial and residential soil samples randomly selected to represent regional pesticide contamination.

7.1.4 Exposure Assessment

This section of the preliminary risk assessment identifies the potentially exposed human populations and the means by which people can come into contact with COPC from MCAS El Toro. It addresses exposures under current site conditions and exposures that could result from potential uses of MCAS El Toro and the surrounding area in the future.

7.1.4.1 Potentially Exposed Populations

This section identifies receptor groups that could be exposed to site COPC. The current activity patterns of potentially exposed populations are largely determined by the land uses for which the areas have been zoned. A map of the current land use in the vicinity of the Station is shown in Figure 1-8.

Current On-Station Populations

Access to MCAS El Toro is limited. A boundary fence surrounds the Station and access is permitted through four gates. Most of the land on-Station is currently used for operations, primarily consisting of runways and taxiways. Additional uses of on-Station land includes maintenance, supply, ordnance, administration, medical, family housing, bachelor quarters, and community support. Land on the periphery of the site has been outleased for agricultural purposes, including nurseries, livestock grazing, and crop production.

None of the 21 on-Station sites is currently being used for residential or recreational purposes. Three of the sites have no known current onsite activities. These three sites are Site 2 (Magazine Road Landfill), Site 13 (Oil Change Area) and Site 17 (Communication Station Landfill). However, due to the proximity of Site 17 to on-Station housing, there is a potential for trespassing onsite.

Occupational activities occurring on the remaining 19 sites range from maintenance landscape work to full-time worker activities. Activities for these 19 sites are summarized in Table 7-8.

Groundwater in the region of MCAS El Toro is not directly used for drinking water on-Station. Drinking water is supplied to MCAS El Toro through the Irvine Ranch Water District (IRWD) which receives its water from the Metropolitan Water District (MWD). The IRWD also supplies non-potable water to the Station which is used for agricultural purposes. On-Station well TIC-55 pumps into the agricultural distribution system operated by IRWD.

Table 7-8
Current On-Station Activities[a]
MCAS El Toro Phase I RI Technical Memorandum

Site Number and Description	Activity (no. of persons)	Frequency (hr/day, day/wk, wk/yr)
1: Explosive Ordnance Range	Disking grass (1)	3-8 hr/d, 12 d/yr
	Staff (12 ±)	7-8 hr/d, 5 d/wk, 50 wk/yr, 3 yr
	Classes (10-45)	variable
2: Magazine Road Landfill	No current activity	--
3: Original Landfill	Mowing grass (1)	0.5 hr every 3.5 wks
4: Ferrocine Spill Area	Mowing grass (1)	0.5 hr every 3.5 wks
	Staff at nearby engine testing facility (10)	8-9 hr/d, 5 d/wk, 3-4 yr
5: Perimeter Road Landfill	Mowing grass (1)	0.5 hr every 3.5 wks
6: Drop Tank Drainage Area-1	Maintenance (30)	8 hr/d, 5 d/wk, 3 yr
	Mowing grass (1)	0.5 hr every 3.5 wks
7: Drop Tank Drainage Area-2	Maintenance-Active (140)	5 hr/d, 260 d/yr
	Maintenance-Reservists (102)	5 hr/d, 38 d/yr
	Pilots-Active (10)	2 hr/d, 182 d/yr
	Pilots-Reservists (44)	2 hr/d, 86 d/yr
	Mowing grass (1)	0.5 hr every 3.5 wks
8: DRMO Storage Area	Weeding (1)	7 hr/d, 5 d/wk, 2-3 mos.
9: Crash Crew Pit-1	Mowing grass (1)	15 min every 3.5 wks
10: Petroleum Disposal Area	Crash Crew (3 groups of 24)	24 hour rotation/group, 4 d/wk
	A/C Training (variable)	1 hr/d, 2 d/wk

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Table 7-8
Current On-Station Activities[a]
MCAS El Toro Phase I RI Technical Memorandum

Site Number and Description	Activity (no. of persons)	Frequency (hr/day, day/wk, wk/yr)
11: Transformer Storage Area	Staff (variable)	0.5-1 hr/d, 5 d/wk, 5-10 yr
12: Sludge Drying Beds	Contractors (3-4)	8 hr/d, 5 d/wk, contract dependant
	Mowing grass (1)	0.5 hr every 3.5 wks
13: Oil Change Area	No current activity	--
14: Battery Acid Disposal Area	Mowing grass (1)	0.5 hr every 3.5 wks
15: Suspended Fuel Tanks	Maintenance (40)	8 hr/d, 5 d/wk, 3 yr
16: Crash Crew Pit-2	Mowing grass (1)	0.5 hr every 3.5 wks
	Training events (20)	2 hr/event, 6 events/mo, 2 yr
17: Communication Station Landfill	No current activity	--
19: ACER (Fuel Bladder) Site	Fueling-civilians (1)	8 hr/d, 5 d/yr, 20 yr
	Fueling-military (3)	8 hr/d, 5 d/yr, 3 yr
	Mowing grass (1)	0.5 hr every 3.5 wks
20: Hobby Shop	Auto repair work (200)	1-2 hr/wk
	Mowing grass (1)	1 hr every 3.5 wks
21: Materials Management Center	Supply (2)	4 hr/d, 5 d/wk, 1.5-2 yr
22: Tactical Air Fueling System	(Part of site 10. Activities may vary)	variable

[a]MCAS El Toro, 1993.