Table 2. Predominant redox conditions at wells and piezometers, and ground-water geochemical data collected at Operable Unit 1, Naval Undersea Warfare Center, Division Keyport, Washington, 1996 to 2005.

[Shaded rows indicate newly published data. All other data were published in Dinicola and others (2002), Dinicola (2003), and Dinicola (2004); prior to 2000, bicarbonate was calculated from an unfiltered sample. Reported concentrations less than the detection limit usually are estimated. A range of dissolved hydrogen concentrations are shown when equilibration at a single value was never achieved. **Predominant redox conditions:** A, aerobic; An, anaerobic, but specific redox condition could not be determined; Fe, iron reducing; M, methanogenic; Mn, manganese reducing; S, sulfate reducing. **Abbreviations:** nM, nanomolar; mg/L, milligram per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; ORP, oxidation-reduction potential; mV, millivolt. **Symbols**: R, data rejected (selected 1996 dissolved-oxygen data were rejected because of inadequate well purging; selected 2002 dissolved-hydrogen data were rejected because of interference from downhole instruments); <, actual value is less than value shown; >, actual value is greater than value shown; –, not analyzed]

Study site No.	Date sampled	Predominant redox condition	Dissolved hydrogen (nM)	Dissolved oxygen (mg/L)	Unfiltered (total) organic carbon (mg/L)	Filtered (dissolved) organic carbon (mg/L)	Filtered nitrate + nitrite (mg/L as N)	Filtered manganese (mg/L)	Filtered iron (II) (mg/L)	Filtered sulfate (mg/L)
					Upgradient					
MW1–3	06-09-99	Fe	0.8	0.4	–	–	–	0.07	<0.01	–
	06-20-00	Fe	.2	.3	2.0	–	0.99	.08	<.01	13
	06-12-01	A	–	4.0	2.3	1.1	1.1	.04	.02	14
	06-10-02	S	2.7	.4	–	1.4	1.6	.10	.01	11
	06-17-03	A	–	4.3	–	1.7	1.8	.09	.05	12
	06-15-04	Mn/Fe	.2	.2	–	1.6	–	.09	<.01	12
	06-20-05	Mn/Fe	<.1	.1	–	1.4	1.6	.10	.01	15
MW1–20	06-08-99	Fe	.9	.3	–	–	–	.35	.03	–
	06-21-00	Fe	.4	<.1	2.2	–	<.05	.24	.11	16
	06-13-01	S	2.1	.2	3.0	1.4	<.05	.28	.01	20
	06-12-02	An	>100R	.1	–	1.4	<.05	.16	.01	17
	06-17-03	Fe	.5	.2	–	1.7	<.06	.24	.05	18
	06-15-04	Mn/Fe	.1	.9	–	1.6	–	.23	.03	18
	06-20-05	Mn/Fe	.1	.4	–	1.5	<.06	.25	.21	16
MW1–33	10-07-98	A	–	3.3	.1	–	–	.003	<.01	–
	06-21-00	A	–	3.8	.7	–	1.3	<.002	<.01	7.5
	06-11-01	A	–	3.8	1.5	1.4	1.1	<.003	<.01	8.2
	06-10-02	A	–	3.4		1.2	1.1	<.002	<.01	7.3
	06-17-03	A	–	3.0	–	.7	.98	<.004	<.01	7.4
	06-15-04	A	–	–	–	.6	–	<.008	<.01	6.6
	06-20-05	A	–	3.5	–	.5	1.7	<.006	<.01	6.3
					Northern plantation					
1MW-1	09-17-96	Fe	0.4	2.8R	7.0	–	<0.02	0.18	0.24	7.5
	04-16-97	Fe	.8	.4	–	–	.11	–	8.0	1.4
	03-05-98	Fe/S	.2	.1	8.3	–	–	.39	12	–
	10-09-98	Fe	.2	.5	–	–	–	.08	.39	–
	06-21-00	Mn/Fe	.1	.5	12	–	<.05	.96	13	.9
	06-11-01	Fe	.6	.7	13	12	<.05	.24	2.9	2.2
	06-10-02	Fe	.4	.2	–	14	<.05	.37	7.3	1.7
	06-17-03	Fe	.1	.1	–	10	<.06	.17	1.2	2.2
	06-16-04	Fe	.2	.1	–	7.7	–	.09	.38	2.0
	06-21-05	Fe	.1	.1	–	9.5	<.06	.12	1.8	1.7
MW1–2	09-17-96	A	.5	2.4R	6.0	–	<.02	.05	.23	4.6
	04-16-97	Fe	.7	.2	–	–	<.02	–	.13	4.6
	03-02-98	Fe	.3	–	–	–	–	–	.16	–
	10-07-98	Fe	.1	.1	–	–	–	.05	.14	–
	06-09-99	Fe	.9	.2	–	–	–	.08	.09	–
	06-21-00	Fe	.3	.1	6.0	–	<.05	.06	.10	4.3
	06-12-01	S	3.5	.3	5.3	5.0	<.05	.08	.29	5.4
	06-11-02	An	>20R	.1	–	45	<.05	.09	.27	4.2
	06-18-03	Fe	.2	.1	–	6.0	<.06	.10	.29	4.3
	06-17-04	Fe	.2	.2	–	6.7	–	.10	1.0	4.3
	06-22-05	Fe	<.1	<.1	–	20	<.06	.10	.44	4.4

Table 2. Predominant redox conditions at wells and piezometers, and ground-water geochemical data collected at Operable Unit 1, Naval Undersea Warfare Center, Division Keyport, Washington, 1996 to 2005—Continued

[Shaded rows indicate newly published data. All other data were published in Dinicola and others (2002), Dinicola (2003), and Dinicola (2004); prior to 2000, bicarbonate was calculated from an unfiltered sample. Reported concentrations less than the detection limit usually are estimated. A range of dissolved hydrogen concentrations are shown when equilibration at a single value was never achieved. **Predominant redox conditions:** A, aerobic; An, anaerobic, but specific redox condition could not be determined; Fe, iron reducing; M, methanogenic; Mn, manganese reducing; S, sulfate reducing. **Abbreviations:** nM, nanomolar; mg/L, milligram per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; ORP, oxidation-reduction potential; mV, millivolt. **Symbols**: R, data rejected (selected 1996 dissolved-oxygen data were rejected because of inadequate well purging; selected 2002 dissolved-hydrogen data were rejected because of interference from downhole instruments); <, actual value is less than value shown; >, actual value is greater than value shown; –, not analyzed]

Study site No.	Date sampled	Predominant redox condition	Unfiltered sulfide (mg/L)	Dissolved methane (mg/L)	Dissolved carbon dioxide (mg/L)	Filtered bicarbonate (mg/L)	pH (units)	Specific conductance (µS/cm)	ORP (mV)	Filtered chloride (mg/L)
					Upgradient					
MW1-3	06-09-99	Fe	<0.01	–	–	81	6.0	202	–	–
	06-20-00	Fe	<.01	0.02	–	82	5.9	205	180	8.4
	06-12-01	A	<.01	.12	–	90	6.1	203	220	10
	06-10-02	S	<.01	.06	140	80	5.8	182	400	9.7
	06-17-03	A	–	.02	80	–	6.0	199	200	10
	06-15-04	Mn/Fe	<.01	.01	–	73	5.7	205	195	9.1
	06-20-05	Mn/Fe	<.01	–	<50	–	6.0	192	–	7.5
MW1-20	06-08-99	Fe	<.01	–	–	260	6.7	546	–	–
	06-21-00	Fe	<.01	.01	–	240	6.8	530	79	14
	06-13-01	S	<.01	.27	–	260	6.4	544	250	33
	06-12-02	An	<.01	.06	97	250	7.0	701	180	29
	06-17-03	Fe	–	.09	90	–	6.3	491	290	32
	06-15-04	Mn/Fe	<.01	.03	–	260	6.4	552	98	35
	06-20-05	Mn/Fe	<.01	–	80	–	6.3	520	87	28
MW1-33	10-07-98	A	<.01	–	–	78	6.6	177	–	–
	06-21-00	A	<.01	.05	–	74	6.7	164	160	4.0
	06-11-01	A	<.01	.07	–	71	6.2	154	300	3.6
	06-10-02	A	<.01	.004	31	81	6.5	138	360	3.4
	06-17-03	A	<.01	.01	25	–	6.3	156	110	3.7
	06-15-04	A	–	<.005	13	–	6.7	165	–	4.0
	06-20-05	A	–	–	18	–	6.6	154	–	4.1
					Northern plantation					
1MW-1	09-17-96	Fe	<0.01	10	-	640	7.9	–	–	43
	04-16-97	Fe	.01	29	–	1,100	7.2	–	–	–
	03-05-98	Fe/S	.06	–	–	–	–	–	–	–
	10-09-98	Fe	.01	–	–	660	7.7	1,080	–	–
	06-21-00	Mn/Fe	<.01	.39	–	590	7.0	1,070	-92	44
	06-11-01	Fe	<.01	5.6	–	550	7.1	974	-110	50
	06-10-02	Fe	<.01	14	77	520	7.7	835	-160	54
	06-17-03	Fe	<.01	7.1	50	–	7.3	847	-	54
	06-16-04	Fe	.03	1.8	18	–	7.0	843	-184	57
	06-21-05	Fe	.02	-	20	–	7.1	827	-108	48
MW1-2	09-17-96	A	<.01	1.2	–	510	6.9	–	–	50
	04-16-97	Fe	<.01	2.5	–	1,100	6.7	–	–	–
	03-02-98	Fe	–	–	–	–	–	–	–	–
	10-07-98	Fe	<.01	–	–	300	6.7	868	–	–
	06-09-99	Fe	<.01	–	–	490	6.8	901	–	–
	06-21-00	Fe	<.01	.04	–	460	6.8	870	37	36
	06-12-01	S	<.01	.78	–	470	6.5	853	27	48
	06-11-02	An	<.01	.92	200	500	6.6	829	200	37
	06-18-03	Fe	<.01	.98	160	–	6.4	870	62	41
	06-17-04	Fe	–	.33	50	–	6.6	858	-	40
	06-22-05	Fe	<.01	–	75	–	6.3	720	-14	35

Table 2. Predominant redox conditions at wells and piezometers, and ground-water geochemical data collected at Operable Unit 1, Naval Undersea Warfare Center, Division Keyport, Washington, 1996 to 2005.—Continued

[Shaded rows indicate newly published data. All other data were published in Dinicola and others (2002), Dinicola (2003), and Dinicola (2004); prior to 2000, bicarbonate was calculated from an unfiltered sample. Reported concentrations less than the detection limit usually are estimated. A range of dissolved hydrogen concentrations are shown when equilibration at a single value was never achieved. **Predominant redox conditions:** A, aerobic; An, anaerobic, but specific redox condition could not be determined; Fe, iron reducing; M, methanogenic; Mn, manganese reducing; S, sulfate reducing. **Abbreviations:** nM, nanomolar; mg/L, milligram per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; ORP, oxidation-reduction potential; mV, millivolt. **Symbols**: R, data rejected (selected 1996 dissolved-oxygen data were rejected because of inadequate well purging; selected 2002 dissolved-hydrogen data were rejected because of interference from downhole instruments); <, actual value is less than value shown; >, actual value is greater than value shown; –, not analyzed]

Study site No.	Date sampled	Predominant redox condition	Dissolved hydrogen (nM)	Dissolved oxygen (mg/L)	Unfiltered (total) organic carbon (mg/L)	Filtered (dissolved) organic carbon (mg/L)	Filtered nitrate + nitrite (mg/L as N)	Filtered manganese (mg/L)	Filtered iron (II) (mg/L)	Filtered sulfate (mg/L)
Northern plantation—Continued										
MW1–15	09-16-96	Fe	0.2	<0.1	50	–	<0.02	5.7	68	0.1
	04-16-97	Fe/S	.8	<.1	–	–	<.02	–	77	.1
	03-05-98	S	1.2	<.1	33	–	–	18	51	–
	10-09-98	S	2.9	<.1	–	–	–	5.8	64	–
	06-15-04	S	3.2	.8	–	27	–	6.3	36	<.2
MW1–17	09-17-96	Fe	.7	<.1	23	–	<.02	1.3	62	4.3
	04-16-97	Fe	.6	<.1	–	–	<.02	–	37	68
	10-09-98	Fe	–	<.1	–	–	–	.80	56	–
	06-22-00	S	1.2	<.1	11	–	–	1.2	68	–
	06-12-01	S	2.0–2.7	.4	9.2	8.0	<.05	1.2	48	12
	06-17-04	S	2.5	<.1	–	7.5	–	.68	>10	18
	06-20-05	S	1.5	<.1	–	6.1	<.06	.43	27	7.8
MW1–18	09-17-96	Fe/S	1.0	<.1	28	–	<.02	4.0	12	4.6
	04-16-97	Fe	.5	<.1	–	–	.05	–	23	8.2
	10-07-98	Fe	–	.2	–	–	–	.77	3.3	–
	06-16-04	Fe	.7	.2	–	23	–	4.1	>10	.2
MW1–41	06-09-99	S	1.0	.3	–	–	–	2.2	60	–
	06-21-00	S	1.2	.1	22	–	<.05	3.5	55	<.3
	06-11-01	S	2.0	.3	14	14	<.05	3.7	66	30
	06-10-02	S	2.2	.8	–	20	<.05	3.6	52	.4
	06-18-03	S	1.9	<.1	–	19	<.06	3.9	50	<.2
	06-17-04	S	2.2	.1	–	19	–	4.0	57	<.2
	06-20-05	Fe/S	.8	.1	–	17	<.06	3.9	73	<2
P1–1	06-09-99	Fe	.7	.4	–	–	–	4.0	59	–
	06-11-02	S	1.4	<.1	–	17	<.05	2.7	40	<.1
	06-18-03	S	1.5	<.1	–	18	<.06	3.4	32	<.2
	06-17-04	S	1.9	.1	–	16	–	3.1	39	<.2
	06-22-05	Fe/S	.6	<.1	–	15	<.06	3.1	68	<.2
P1–3	06-09-99	Fe	.4	.2	–	–	–	1.0	19	–
	06-11-02	Fe	.3	<.1	–	45	<.05	2.6	39	1.0
	06-18-03	Fe	.3	.1	–	19	<.06	2.0	29	1.8
	06-17-04	Fe	.7	<.1	–	21	–	2.8	>10	.55
	06-22-05	Fe	.2	<.1	–	20	<.06	2.8	60	.38
P1–4	06-09-99	Fe	.7	.3	–	–	–	.34	2.6	–
	06-13-01	Fe	.1	.5	9.8	8.7	<.05	.38	3.4	3.8
	06-11-02	Fe	.2	.1	–	8.0	<.05	2.6	3.7	3.5
	06-18-03	Fe	.2	.1	–	7.0	<.06	.43	4.1	4.0
	06-17-04	Fe	.1	.1	–	7.6	–	.42	3.0	4.0
	06-21-05	Fe	.1	.1	–	6.7	<.06	.38	2.3	4.6
P1–5	06-08-99	S	3.0	.3	–	–	–	3.1	72	–
	06-10-02	S	1.7	.1	–	25	<.05	2.6	62	<.6
	06-18-03	S	2.2	.1	–	24	<.06	3.1	54	<.2
	06-17-04	S	2.1	<.1	–	23	–	3.1	>10	<.2
	06-21-05	Fe/S	.8	.1	–	22	<.06	3.5	74	E.1

Table 2. Predominant redox conditions at wells and piezometers, and ground-water geochemical data collected at Operable Unit 1, Naval Undersea Warfare Center, Division Keyport, Washington, 1996 to 2005—Continued

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Study site No.	Date sampled	Predominant redox condition	Unfiltered sulfide (mg/L)	Dissolved methane (mg/L)	Dissolved carbon dioxide (mg/L)	Filtered bicarbonate (mg/L)	pH (units)	Specific conductance (µS/cm)	ORP (mV)	Filtered chloride (mg/L)
Northern plantation—Continued										
MW1–15	09-16-96	Fe	<0.01	8.8	–	1,200	–	–	–	18
	04-16-97	Fe/S	.03	44	–	1,600	6.3	–	–	–
	03-05-98	S	<.01	–	–	–	–	–	–	–
	10-09-98	S	<.01	–	–	750	6.3	1,110	–	–
	06-15-04	S	<.01	.22	760	–	6.3	1,200	–	16
MW1–17	09-17-96	Fe	<.01	8.9	–	760	6.5	–	–	61
	04-16-97	Fe	.02	23	–	1,200	6.6	–	–	–
	10-09-98	Fe	.02	–	–	510	6.4	1,740	–	–
	06-22-00	S	.02	2.8	–	450	6.5	1,260	-41	160
	06-12-01	S	.01	9.4	–	500	6.5	1,200	-280	120
	06-17-04	S	–	.37	70	–	6.5	318	–	150
	06-20-05	S	.04	–	80	–	6.3	563	-144	74
MW1–18	09-17-96	Fe/S	<.01	11	–	880	7.0	–	–	86
	04-16-97	Fe	<.01	52	–	1,500	6.8	–	–	–
	10-07-98	Fe	<.01	-	–	920	6.6	1,780	–	–
	06-16-04	Fe	<.01	5.3	70	–	7.1	945	–	47
MW1–41	06-09-99	S	0.01	–	–	860	6.6	1,260	–	–
	06-21-00	S	<.01	1.9	–	1,000	6.5	1,500	-75	8.3
	06-11-01	S	.02	25	–	980	6.3	1,330	-89	9.9
	06-10-02	S	.04	21	540	830	6.3	1,190	-68	7.9
	06-18-03	S	.03	14	500	–	6.3	1,280	93	9.5
	06-17-04	S	.02	7.4	450	–	6.1	1,300	-165	11
	06-20-05	Fe/S	.01	–	500	–	6.4	1,300	–	8.7
P1–1	06-09-99	Fe	<.01	–	–	930	6.4	1,350	–	–
	06-11-02	S	<.01	29	400	650	6.3	987	-80	9.3
	06-18-03	S	.02		450	–	6.2	1,030	78	11
	06-17-04	S	.02	3.7	430	–	6.0	987	-153	9.2
	06-22-05	Fe	<.01	10	370	–	6.3	847	-72	7.1
P1–3	06-09-99	Fe	.04	–	–	730	6.8	1,470	–	–
	06-11-02	Fe	.03	24	400	820	6.4	1,340	-73	61
	06-18-03	Fe	.03	–	350	–	6.4	1,400	73	90
	06-17-04	Fe	<.01	5.7	330	–	6.5	1,350	–	57
	06-22-05	Fe	.03	8.4	320	–	6.4	1,200	-88	68
P1–4	06-09-99	Fe	.02	–	–	450	6.9	867	–	–
	06-13-01	Fe	<.01	.93	–	390	6.6	761	-78	53
	06-11-02	Fe	<.01	5.9	90	380	6.7	734	-86	56
	06-18-03	Fe	.01	4.2	70	–	6.6	778	65	59
	06-17-04	Fe	.02	1.8	60	–	6.4	782	-163	48
	06-21-05	Fe	<.01	1.8	42	–	6.6	750	-83	47
P1–5	06-08-99	S	.01	–	–	850	6.2	1,320	–	–
	06-10-02	S	.02	23	400	730	6.2	1,200	-59	17
	06-18-03	S	.02	18	650	–	6.2	1,150	65	16
	06-17-04	S	–	5.8	450	–	6.4	1,160	–	14
	06-21-05	Fe/S	.04	9.4	400	–	6.3	1,150	-65	13

Table 2. Predominant redox conditions at wells and piezometers, and ground-water geochemical data collected at Operable Unit 1, Naval Undersea Warfare Center, Division Keyport, Washington, 1996 to 2005.—Continued

[Shaded rows indicate newly published data. All other data were published in Dinicola and others (2002), Dinicola (2003), and Dinicola (2004); prior to 2000, bicarbonate was calculated from an unfiltered sample. Reported concentrations less than the detection limit usually are estimated. A range of dissolved hydrogen concentrations are shown when equilibration at a single value was never achieved. **Predominant redox conditions:** A, aerobic; An, anaerobic, but specific redox condition could not be determined; Fe, iron reducing; M, methanogenic; Mn, manganese reducing; S, sulfate reducing. **Abbreviations:** nM, nanomolar; mg/L, milligram per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; ORP, oxidation-reduction potential; mV, millivolt. **Symbols**: R, data rejected (selected 1996 dissolved-oxygen data were rejected because of inadequate well purging; selected 2002 dissolved-hydrogen data were rejected because of interference from downhole instruments); <, actual value is less than value shown; >, actual value is greater than value shown; –, not analyzed]

Study site No.	Date sampled	Predominant redox condition	Dissolved hydrogen (nM)	Dissolved oxygen (mg/L)	Unfiltered (total) organic carbon (mg/L)	Filtered (dissolved) organic carbon (mg/L)	Filtered nitrate + nitrite (mg/L as N)	Filtered manganese (mg/L)	Filtered iron (II) (mg/L)	Filtered sulfate (mg/L)
					Southern plantation					
MW1–4	09-17-96	Fe	0.5	2.8R	2.0	–	<0.02	0.28	1.8	7.1
	04-16-97	Fe	.6	.4	–	–	.24	–	<.01	8.6
	03-03-98	S	1.7	.2	4.0	–	–	.10	.01	–
	10-08-98	Fe	.2	.5	–	–	–	–	.28	–
	06-07-99	Fe	.9	.1	–	–	–	.20	1.2	–
	06-22-00	Fe	.2	.1	8.6	–	–	.70	–	5.5
	06-14-01	S	0.9–3.2	.5	2.9	2.5	.08	.54	1.6	5.4
	06-13-02	S	2.4	.1	–	3.8	.08	.47	1.2	5.5
	06-20-03	Fe	.8	.1	–	2.5	<.06	.53	.22	5.7
	06-18-04	Fe	.2	.1	–	2.7	–	.61	.12	5.9
	06-23-05	Mn/Fe	.3	.1	–	.7	<.06	.14	.03	8.8
MW1–5	09-17-96	S	1.2	<.1	15	–	<.02	1.6	19	6.4
	04-16–97	Fe	.5	<.1	–	–	.08	–	3.1	2.8
	03-04-98	Fe	.7	<.1	12	–	–	1.3	4.5	–
	10-08-98	S	2.4	<.1	–	–	–	1.5	11	–
	06-08-99	Fe	.6	.3	–	–	–	1.2	31	–
	06-22-00	Fe	–	<.1	17	–	–	1.5	39	6.4
	06-13-01	Fe	.8	.3	10	9.6	.12	1.5	25	6.0
	06-13-02	S	3.4	.5	–	11	.14	1.5	20	6.3
	06-20-03	Fe	.1	.1	–	11	<.06	1.5	30	6.8
	06-18-04	Fe	.1	.4	–	7.2	–	1.8	>10	5.6
	06-22-05	Fe	<.1	.0	–	8.2	.16	1.2	27	6.7
MW1–6	09-17-96	S	1.1	<.1	33	–	1.2	1.2	30	.1
	04-16-97	Fe/S	.5	<.1	–	–	.07	–	36	4.1
	10-08-98	Fe	.2	<.1	–	–	–	1.1	32	–
	06-22-04	Fe	–	.2	–	26	–	1.1	>10	.1
MW1–16	09-17-96	S	2.1	<.1	480	–	<.02	3.9	130	.2
	04-16-97	Fe/S	.8	<.1	–	–	<.02	–	120	2.2
	03-04-98	Fe	.7	.3	350	–	–	18	100	–
	10-08-98	M	9.6	<.1	–	–	–	5.4	180	–
	06-07-99	M	6.8	.6	–	–	–	>5	140	–
	06-22-00	S	–	.1	61	–	–	1.9	60	1.2
	06-14-01	S	1.7	.2	64	66	.33	2.4	56	1.1
	06-13-02	M	4.6–7.6	.9	–	71	<.05	3.2	38	.4
	06-20-03	S	2.2	.2	–	29	<.6	2.1	37	.6
	06-22-04	–	–	.1	–	36	–	2.1	>10	.1
	06-23-05	Fe/S	.5	.1	–	20	<.06	2.0	66	.39
P1–6	06-08-99	S	1.8	.1	–	–	–	.12	.02	–
	06-14-01	S	1.8	.2	34	34	.23	.45	.95	4.9
	06-13-02	S	1.6	<.1	–	26	<.05	.88	1.0	4.3
	06-20-03	Fe	.3	.2	–	4.1	<.06	.08	.13	7.5
	06-18-04	S	1.5	.1	–	10	–	.11	1.0	7.2
	06-23-05	Fe/S	.3	.1	–	5.8	<.06	.17	.15	6.3

Table 2. Predominant redox conditions at wells and piezometers, and ground-water geochemical data collected at Operable Unit 1, Naval Undersea Warfare Center, Division Keyport, Washington, 1996 to 2005.—Continued

[Shaded rows indicate newly published data. All other data were published in Dinicola and others (2002), Dinicola (2003), and Dinicola (2004); prior to 2000, bicarbonate was calculated from an unfiltered sample. Reported concentrations less than the detection limit usually are estimated. A range of dissolved hydrogen concentrations are shown when equilibration at a single value was never achieved. **Predominant redox conditions:** A, aerobic; An, anaerobic, but specific redox condition could not be determined; Fe, iron reducing; M, methanogenic; Mn, manganese reducing; S, sulfate reducing. **Abbreviations:** nM, nanomolar; mg/L, milligram per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; ORP, oxidation-reduction potential; mV, millivolt. **Symbols**: R, data rejected (selected 1996 dissolved-oxygen data were rejected because of inadequate well purging; selected 2002 dissolved-hydrogen data were rejected because of interference from downhole instruments); <, actual value is less than value shown; >, actual value is greater than value shown; –, not analyzed]

Study site No.	Date sampled	Predominant redox condition	Unfiltered sulfide (mg/L)	Dissolved methane (mg/L)	Dissolved carbon dioxide (mg/L)	Filtered bicarbonate (mg/L)	pH (units)	Specific conductance (µS/cm)	ORP (mV)	Filtered chloride (mg/L)
					Southern plantation					
MW1–4	09-17-96	Fe	<0.01	1.2	–	130	6.9	–	–	15
	04-16-97	Fe	<.01	.70	–	270	7.3	–	–	–
	03-03-98	S	<.01	–	–	–	–	–	–	–
	10-08-98	Fe	<.01	–	–	170	6.7	368	–	–
	06-07-99	Fe	<.01	–	–	180	6.6	350	–	–
	06-22-00	Fe	<.01	.56	–	230	6.8	412	-26	19
	06-14-01	S	<.01	3.7	–	180	6.5	360	-8	22
	06-13-02	S	<.01	5.2	60	190	6.6	442	-14	20
	06-20-03	Fe	<.01	3.7	40	–	6.7	324	–	17
	06-18-04	Fe	<.01	1.1	50	–	6.0	320	91	23
	06-23-05	Fe	<.01	–	<10	–	7.9	203	45	7.3
MW1–5	09-17-96	S	<.01	2.4	–	410	6.7	–	–	21
	04-16–97	Fe	.03	18	–	1,400	6.6	–	–	–
	03-04-98	Fe	<.01	–	–	–	–	–	–	–
	10-08-98	S	<.01	–	–	410	6.4	1,740	–	–
	06-08-99	Fe	.01	–	–	510	6.5	855	–	–
	06-22-00	Fe	<.01	1.1	–	460	6.6	790	-80	19
	06-13-01	Fe	.01	2.4	–	470	6.4	766	-70	12
	06-13-02	S	.02	7.4	180	740	6.5	608	-77	9.6
	06-20-03	Fe	.03	4.9	180	–	6.4	711	–	10
	06-18-04	Fe	–	2.4	200	–	6.5	795	–	9.8
	06-22-05	Fe	.02	-	70	-	6.3	520	-95	9.5
MW1–6	09-17-96	S	<.01	7.0	–	840	6.7	–	–	27
	04-16-97	Fe/S	.15	15	–	1,100	6.5	–	–	–
	10-08-98	Fe	.01	–	–	720	6.4	1,170	–	–
	06-22-04	Fe	-	3.7	250	-	6.2	945	-	11
MW1–16	09-17-96	S	<.01	4.3	–	1,400	6.5	–	–	150
	04-16-97	Fe/S	.06	29	–	1,800	6.5	–	–	–
	03-04-98	Fe	.01	–	–	–	–	–	–	–
	10-08-98	M	<.01	–	–	1,600	6.3	3,370	–	–
	06-07-99	M	.01	–	–	1,200	6.7	1,820	–	–
	06-22-00	S	.02	1.2	–	510	6.7	902	-130	43
	06-14-01	S	.08	10	–	610	6.4	953	–	40
	06-13-02	M	.04	24	270	700	6.5	1,400	-140	17
	06-20-03	S	.06	9.7	240	–	6.5	835	–	6.8
	06-22-04	-	.50	4.3	230	–	6.3	817	–	6.9
	06-23-05	Fe/S	.12	–	225	–	6.6	767	-110	3.8
P1–6	06-08-99	S	.04	–	–	300	6.8	574	–	–
	06-14-01	S	.12	6.3	–	350	6.4	657	-38	47
	06-13-02	S	.11	11	170	380	6.4	604	-11	37
	06-20-03	Fe	.07	4.8	40	–	8.1	278	–	13
	06-18-04	S	.10	.37	<10	–	8.6	268	–	18
	06-23-05	Fe/S	.12	1.4	24	–	7.1	332	-53	24

Table 2. Predominant redox conditions at wells and piezometers, and ground-water geochemical data collected at Operable Unit 1, Naval Undersea Warfare Center, Division Keyport, Washington, 1996 to 2005.—Continued

[Shaded rows indicate newly published data. All other data were published in Dinicola and others (2002), Dinicola (2003), and Dinicola (2004); prior to 2000, bicarbonate was calculated from an unfiltered sample. Reported concentrations less than the detection limit usually are estimated. A range of dissolved hydrogen concentrations are shown when equilibration at a single value was never achieved. **Predominant redox conditions:** A, aerobic; An, anaerobic, but specific redox condition could not be determined; Fe, iron reducing; M, methanogenic; Mn, manganese reducing; S, sulfate reducing. **Abbreviations:** nM, nanomolar; mg/L, milligram per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; ORP, oxidation-reduction potential; mV, millivolt. **Symbols**: R, data rejected (selected 1996 dissolved-oxygen data were rejected because of inadequate well purging; selected 2002 dissolved-hydrogen data were rejected because of interference from downhole instruments); <, actual value is less than value shown; >, actual value is greater than value shown; –, not analyzed]

Study site No.	Date sampled	Predominant redox condition	Dissolved hydrogen (nM)	Dissolved oxygen (mg/L)	Unfiltered (total) organic carbon (mg/L)	Filtered (dissolved) organic carbon (mg/L)	Filtered nitrate + nitrite (mg/L as N)	Filtered manganese (mg/L)	Filtered iron (II) (mg/L)	Filtered sulfate (mg/L)
					Southern plantation—Continued					
P1–7	06-08-99	S	1.2	0.1	–	–	–	0.61	2.1	–
	06-22-00	Mn/Fe	–	.1	19	–	–	2.6	3.2	24
	06-14-01	Mn/Fe	.2	.2	11	11	<0.05	2.3	2.0	18
	06-14-02	Mn/Fe	.2	1.3	–	8.9	<.05	2.2	1.9	12
	06-20-03	Mn/Fe	.1	.1	–	5.6	<.06	1.9	1.3	7.5
	06-18-04	Mn/Fe	.1	<.1	–	6.9	–	2.4	2.0	9.8
	06-22-05	Mn/Fe	<.1	.1	–	8.8	<.06	2.1	1.9	26
P1–8	06-07-99	S	1.8	<.1	–	–	–	.20	.08	–
	06-14-01	Fe	.7	.1	5	4.7	.06	.16	.22	.1
	06-13-02	Fe	.6	.3	–	8.8	<.05	.21	.38	.3
	06-20-03	Fe	.6	.1	–	2.3	<.06	.09	.12	.4
	06-18-04	Mn/Fe	.3	.4	–	3.0	–	.13	.01	.4
	06-23-05	Mn/Fe	.2	.2	–	14	<.06	.12	.12	<.2
P1–9	06-08-99	M	19	.3	–	–	–	.90	.03	–
	06-22-00	S/M	–	.1	10	–	–	.69	.20	6.6
	06-14-01	M	6.7	.1	2.3	1.7	<.05	.19	.05	7.6
	06-13-02	An	–	.6	–	9.8	<.05	1.2	.42	5.6
	06-20-03	Fe	.2	.1	–	3.7	<.06	.24	<.01	7.0
	06-18-04	Mn/Fe	.2	.1	–	4.0	–	.26	.14	7.3
	06-23-05	Mn	<.1	.1	–	1.4	<.06	.11	.01	8.7
P1–10	06-07-99	Fe	.7	.3	–	–	–	.10	.11	–
	06-22-00	Fe	–	<.1	7.2	–	–	.07	.25	<.3
	06-13-01	S	2.0	.2	3.0	4.2	<.05	.07	.20	.06
	06-12-02	Fe	.3	.1	–	3.5	<.05	.05	.41	<.1
	06-19-03	Fe	.2	.1	–	3.5	<.06	.42	.34	2.6
	06-18-04	Mn/Fe	.1	.1	–	3.5	–	.58	.35	<.2
	06-22-05	Mn/Fe	.1	.1	–	3.3	<.06	.74	.24	<.2
					Intermediate aquifer					
1MW–4	09-17-96	Fe	0.6	1.6R	23	–	<0.02	0.77	1.5	0.04
	04-16-97	S	1.8	<.1	–	–	.03	–	1.7	.4
	06-17-04	S	2.7	.1	–	15	–	.97	2.0	.8
MW1–25	09-17-96	Fe	.4	2.7R	7.4	–	.14	.16	.74	16
	04-17-97	Fe	.8	.1	–	–	<.02	–	.88	15
	03-05-98	Fe	.3	.3	7.9	–	–	.20	.73	–
	10-05-98	Fe	.2	.1	–	–	–	.19	.99	–
	06-22-00	Fe	.4	.2	6.5	–	–	.16	.80	13
	06-12-01	S	2.8–4.3	.2	7.1	6.8	<.05	.16	.99	13
	06-14-02	S	0.7–2.4	.1	–	6.2	<.05	.18	1.1	9.7
	06-19-03	Fe	.3	.1	–	6.5	<.06	.18	1.1	11
	06-16-04	Fe	.2	.1	–	6.2	–	.17	1.0	10
	06-21-05	Fe	.1	.1	–	5.9	<.06	.16	1.0	9.5

Table 2. Predominant redox conditions at wells and piezometers, and ground-water geochemical data collected at Operable Unit 1, Naval Undersea Warfare Center, Division Keyport, Washington, 1996 to 2005.—Continued

[Shaded rows indicate newly published data. All other data were published in Dinicola and others (2002), Dinicola (2003), and Dinicola (2004); prior to 2000, bicarbonate was calculated from an unfiltered sample. Reported concentrations less than the detection limit usually are estimated. A range of dissolved hydrogen concentrations are shown when equilibration at a single value was never achieved. **Predominant redox conditions:** A, aerobic; An, anaerobic, but specific redox condition could not be determined; Fe, iron reducing; M, methanogenic; Mn, manganese reducing; S, sulfate reducing. **Abbreviations:** nM, nanomolar; mg/L, milligram per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; ORP, oxidation-reduction potential; mV, millivolt. **Symbols**: R, data rejected (selected 1996 dissolved-oxygen data were rejected because of inadequate well purging; selected 2002 dissolved-hydrogen data were rejected because of interference from downhole instruments); <, actual value is less than value shown; >, actual value is greater than value shown; –, not analyzed]

Study site No.	Date sampled	Predominant redox condition	Unfiltered sulfide (mg/L)	Dissolved methane (mg/L)	Dissolved carbon dioxide (mg/L)	Filtered bicarbonate (mg/L)	pH (units)	Specific conductance (µS/cm)	ORP (mV)	Filtered chloride (mg/L)
					Southern plantation—Continued					
P1-7	06-08-99	S	<0.01	–	–	310	6.7	627	–	–
	06-22-00	Mn/Fe	<.01	1.5	–	400	6.8	851	-35	55
	06-14-01	Mn/Fe	<.01	4.0	–	320	6.5	666	-32	41
	06-14-02	Mn/Fe	<.01	6.0	87	300	6.6	601	-41	60
	06-20-03	Mn/Fe	<.01	4.8	50	–	6.6	498	–	42
	06-18-04	Mn/Fe	<.01	1.7	40	–	6.7	613	–	56
	06-22-05	Mn/Fe	<.01	2.3	37	–	6.5	637	-20	55
P1-8	06-07-99	S	.01	–	–	210	7.6	381	–	–
	06-14-01	Fe	.02	6.9	–	200	7.0	363	-73	18
	06-13-02	Fe	.02	11	40	104	6.9	482	-46	35
	06-20-03	Fe	<.01	9.6	<10	–	7.2	285	–	3.3
	06-18-04	Mn/Fe	.01	1.7	<10	–	7.4	336	-218	5.9
	06-23-05	Mn/Fe	<.01	3.4	<10	–	7.5	308	-147	4.2
P1-9	06-08-99	M	<.01	–	–	270	6.6	680	–	–
	06-22-00	S/M	<.01	1.7	–	250	6.8	548	-17	59
	06-14-01	M	<.01	1.4	–	200	7.8	289	-120	14
	06-13-02	An	<.01	7.5	91	280	6.5	601	17	71
	06-20-03	Fe	.01	2.5	27	–	7.0	353	–	23
	06-18-04	Mn/Fe	<.01	.71	35	–	6.7	330	-97	26
	06-23-05	Mn	<.01	.02	<10	–	8.3	202	22	12
P1-10	06-07-99	Fe	<.01	–	–	300	6.7	560	–	–
	06-22-00	Fe	<.01	1.3	–	290	7.1	500	-19	15
	06-13-01	S	<.01	4.9	–	290	7.2	476	-24	15
	06-12-02	Fe	<.01	18	51	270	6.8	438	8	14
	06-19-03	Fe	<.01	8.2	30	–	6.6	425	–	16
	06-18-04	Mn/Fe	<.01	.33	45	–	6.3	422	-69	9.5
	06-23-05	Mn/Fe	<.01	.71	40	–	6.6	420	4	11
					Intermediate aquifer					
1MW-4	09-17-96	Fe	<0.01	16	–	780	7.3	–	–	25
	04-16-97	S	.02	47	–	1,300	7.3	–	–	–
	06-17-04	S	.06	4.5	120	-	6.5	1,200	-	25
MW1-25	09-17-96	Fe	<.01	3.6	–	360	7.1	–	–	140
	04-17-97	Fe	<.01	7.9	–	1,000	7.0	–	–	–
	03-05-98	Fe	<.01	–	–	–	–	–	–	–
	10-05-98	Fe	<.01	–	–	450	6.9	1,240	–	–
	06-22-00	Fe	<.01	.79	–	380	6.9	1,230	-49	170
	06-12-01	S	<.01	4.7	–	440	6.7	1,180	-36	160
	06-14-02	S	<.01	7.0	83	370	6.7	1,030	-60	170
	06-19-03	Fe	<.01	8.1	65	–	6.7	1,180	-17	170
	06-16-04	Fe	<.01	1.4	40	–	7.1	1,210	-	160
	06-21-05	Fe	<.01	2.1	33	–	6.9	1,150	-9	160

Table 2. Predominant redox conditions at wells and piezometers, and ground-water geochemical data collected at Operable Unit 1, Naval Undersea Warfare Center, Division Keyport, Washington, 1996 to 2005.—Continued

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Study site No.	Date sampled	Predominant redox condition	Dissolved hydrogen (nM)	Dissolved oxygen (mg/L)	Unfiltered (total) organic carbon (mg/L)	Filtered (dissolved) organic carbon (mg/L)	Filtered nitrate + nitrite (mg/L as N)	Filtered manganese (mg/L)	Filtered iron (II) (mg/L)	Filtered sulfate (mg/L)
Intermediate aquifer—Continued										
MW1–28	09-16-96	Fe	0.3	2.1R	7.2	–	<0.02	0.20	1.0	48
	04-17-97	Fe	1.0	<.1	–	–	.04	–	.99	51
	03-05-98	Fe	.4	.5	7.7	–	–	.20	.67	–
	10-07-98	Fe	.6	<.1	–	–	–	.19	1.0	–
	06-22-00	Fe	.3	<.1	13	–	–	.16	.66	44
	06-12-01	S/M	4.1–5.7	.5	10	6.9	<.05	.16	.90	45
	06-14-02	An	>100R	.1	–	7.0	<.05	.16	.92	39
	06-19-03	S	2.5	.1	–	6.8	<.06	.16	.66	39
	06-16-04	Mn/Fe	.2	.1	–	5.9	–	.18	<.01	36
	06-21-05	Fe	.1	.2	–	6.3	<.06	.16	.98	37
MW1–29	09-16-96	Mn/Fe	.0	1.9R	–	–	<.02	.86	2.0	1.8
	04-17-97	Fe	.7	<.1	–	–	.29	–	2.1	1.1
	06-16-04	Fe	.9	<.1	–	3.2	–	.99	3.0	<.09
MW1–38	10-09-98	Fe	–	.1	–	–	–	.20	.08	–
	06-20-00	Fe	.1	.2	5.6	–	<.05	.08	.10	2.3
	06-12-02	S	1.4	<.1	5.0	–	<.05	.08	.42	2.9
	06-16-04	Mn/Fe	.2	.1	–	4.9	–	.06	.04	1.2
	06-24-05	Fe	.3	.1	–	4.4	<.06	.06	.09	3.3
MW1–39	09-16-96	Fe/S	.6	2.0R	4.4	–	<.02	.02	<.01	.7
	04-17-97	S	4.5	<.1	–	–	<.02	–	.05	13
	03-03-98	Fe/S	.3	.3	3.7	–	–	.10	.03	–
	10-09-98	Fe/S	.5	<.1	–	–	–	<.01	.04	–
	06-07-99	Fe/S	1.0	.3	–	–	–	.10	.02	–
	06-20-00	Fe/S	.5	.1	2.4	–	<.05	.01	.07	.2
	06-12-01	S	1.4	.3	3.4	3.3	<.05	.01	<.01	.1
	06-12-02	M	>30R	<.1	–	2.8	<.05	.01	.1	.1
	06-19-03	S	1.8	.1	–	2.5	<.06	.01	<.01	1.2
	06-16-04	S	2.0	.1	–	2.4	–	.01	.05	.1

Table 2. Predominant redox conditions at wells and piezometers, and ground-water geochemical data collected at Operable Unit 1, Naval Undersea Warfare Center, Division Keyport, Washington, 1996 to 2005.—Continued

[Shaded rows indicate newly published data. All other data were published in Dinicola and others (2002), Dinicola (2003), and Dinicola (2004); prior to 2000, bicarbonate was calculated from an unfiltered sample. Reported concentrations less than the detection limit usually are estimated. A range of dissolved hydrogen concentrations are shown when equilibration at a single value was never achieved. **Predominant redox conditions:** A, aerobic; An, anaerobic, but specific redox condition could not be determined; Fe, iron reducing; M, methanogenic; Mn, manganese reducing; S, sulfate reducing. **Abbreviations:** nM, nanomolar; mg/L, milligram per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; ORP, oxidation-reduction potential; mV, millivolt. **Symbols**: R, data rejected (selected 1996 dissolved-oxygen data were rejected because of inadequate well purging; selected 2002 dissolved-hydrogen data were rejected because of interference from downhole instruments); <, actual value is less than value shown; >, actual value is greater than value shown; –, not analyzed]

Study site No.	Date sampled	Predominant redox condition	Unfiltered sulfide (mg/L)	Dissolved methane (mg/L)	Dissolved carbon dioxide (mg/L)	Filtered bicarbonate (mg/L)	pH (units)	Specific conductance (µS/cm)	ORP (mV)	Filtered chloride (mg/L)
Intermediate aquifer—Continued										
MW1–28	09-16-96	Fe	<0.01	1.7	–	350	–	–	–	380
	04-17-97	Fe	<.01	5.3	–	1,100	7.4	–	–	–
	03-05-98	Fe	<.01	–	–	–	–	–	–	–
	10-07-98	Fe	.02	–	–	320	6.6	2,630	–	–
	06-22-00	Fe	<.01	.45	–	480	7.3	2,460	-87	510
	06-12-01	S/M	<.01	4.1	–	480	7.4	2,200	-220	490
	06-14-02	An	<.01	3.9	40	470	7.2	2,580	-110	460
	06-19-03	S	<.01	1.7	32	–	7.1	2,440	-40	490
	06-16-04	Mn/Fe	<.01	.77	21	–	7.2	2,280	–	450
	06-21-05	Fe	<.01	1.0	23	–	6.9	2,210	-124	472
MW1–29	09-16-96	Mn/Fe	.02	8.1	–	300	–	–	–	500
	04-17-97	Fe	<.01	18	–	710	7.3	–	–	–
	06-16-04	Fe	<.01	–	18	-	7.3	2,660	–	660
MW1–38	10-09-98	Fe	.02	–	–	310	7.8	1,460	–	–
	06-20-00	Fe	.03	.10	–	300	7.8	1,240	-130	230
	06-12-02	S	.04	1.1	7.7	310	7.6	1,350	-160	230
	06-16-04	Mn/Fe	.03	.13	11	–	7.4	1,130	–	200
	06-24-05	Fe	.03	.05	<10	–	7.7	1,210	-116	230
MW1–39	09-16-96	Fe/S	.04	1.6	–	140	–	–	–	85
	04-17-97	S	.06	6.1	–	360	7.9	–	–	–
	03-03-98	Fe/S	.05	–	–	–	–	–	–	–
	10-09-98	Fe/S	.07	–	–	170	8.1	502	–	–
	06-07-99	Fe/S	<.01	–	–	180	8.0	512	–	–
	06-20-00	Fe/S	.08	.41	–	180	8.0	481	-130	61
	06-12-01	S	.05	2.7	–	170	7.8	472	-130	61
	06-12-02	M	.06	4.8	2.4	180	7.9	464	-120	60
	06-19-03	S	.05	5.4	<10	–	7.7	456	32	58
	06-16-04	S	.07	.72	<10	–	7.4	451	-216	58