

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

GROUND WATER QUALITY MONITORING RESULTS

WELL NO.: T15S/R1E-15N3 WELL NAME: MSC - Shallow

Date DWS 1	Specific Conductance (micromhos/cm) 900 1600 2200 ²	Total Alkalinity (as CaCO ₃)	pH (pH units)	Chloride 250 500 60230 500 600	Sulfate	Ammonia Nitrogen (as NO ₃)	Nitrate Nitrogen (as NO ₃)	Total Organic Carbon	Calcium	Sodium	Magnesium	Potassium	Iron	Manganese	Orthophosphate	Boron
5/31/1990	1190	96	7.2	210	271	<0.4	<0.5	0.3	34	138	62	7.8	<0.05	<0.02		
4/26/1991	400	97	7.9	58	22	<0.5	0.5	0.3	25	44	6.8	3.7				
7/24/1991	500	108	8.0	70					31	55	8.0	4.5	<0.10	<0.03		
10/23/1991	642	146	7.7	88					36	74						
4/27/1992	490	130	7.4	77	23	1.0			36	68	9.2	5.5	<0.01			
6/4/1992									40	77	10.4	6.2	<0.01			
10/20/1992	595	140	8.4	90	57	<0.10	<0.5	0.2	37	72	9.0	5.6	<0.1	<0.05		
4/28/1993	630	150	8.3	96	26	<0.10	<0.5	0.1	37	74	10.0	5.8	<0.1	<0.05		
10/28/1993	542	118	8.1	74	29	<0.10	2.0	0.2	30	59	8.0	4.9	1.1	0.09		
4/29/1994	560	128	8.2	230	28	<0.05	2.0	0.1	33	65	9.0	5.3	0.8	0.04		
10/28/1994	560	128	8.2	86	28	<0.05	2.0	0.2	36	68	9.0	5.2	0.4	0.04		
5/3/1995	325	66	8.3	48	10	<0.05	2.0	0.3	21	35	5.0	2.7	0.24	<0.03		
11/30/1995	350	78	7.7	50	14	<0.05	1.0	1.0	18	39	6.0	3.3	0.40	0.08	0.03	
4/25/1996	331	65	7.1	40	21	<0.05	1.0	1.1	16	39	5.0	3.1	0.19	0.07	0.03	
10/11/1996	306	61	7.8	43	19	<0.05	1.0	0.4	15	38	4.0	3.1	0.10	<0.03	0.11	
4/24/1997	311	63	8.0	46	14	<0.05	2.0	0.2	17	34	5.0	2.9	0.20	<0.03	<0.03	
11/19/1997	301	64	7.9	43	17	<0.05	<1	0.3	18	33	5.3	2.9	0.21	<0.03	<0.03	
10/27/1998	306	64	7.7	40	18	<0.05	<1	<0.2	17	36	5.0	3.5	<0.1	<0.03	0.03	
11/2/1999	309	63	8.1	40	17	0.07	<1	na	16	35	5.0	3.3	<0.1	<0.03	<0.03	
11/1/2000	308	64	8.0	41	16	0.11	<1	<0.2	16	36	5.0	3.4	<0.1	<0.03	0.24	
10/26/2001	308	66	8.1	44	17	0.06	<1	<0.2	21	37	4.0	3.8	0.05	<0.03	<0.03	
11/1/2002	313	70	8.0	47	18	0.08	<1	0.3	16	35	5.0	2.5	<0.1	<0.03	<0.03	
11/6/2003	318	66	7.2	45	17	0.10	<1	0.5	17	36	4.6	3.3	<0.05	<0.0005	0.03	
11/8/2004	340	71	7.9	48	18	0.11	<1	<0.2	17	36	4.0	3.1	<0.05	<0.0005	<0.03	0.21
11/2/2005	345	74	7.9	51	18	0.09	<1	<0.2	17	40	4.6	3.5	<0.05	<0.0005	0.04	0.32
10/25/2006	320	72	7.8	46	17	0.06	<1	<0.2	17	39	4.8	3.8	<0.10	<0.0005	0.04	0.39

NOTES: 1 DWS = Drinking Water Standard; maximum contaminant levels are from California Domestic Water Quality and Monitoring Regulations, Title 22, 1977.
 2 The three values for each constituent refer to the "recommended" level, the "upper" level and the "short-term use" level, respectively.

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

GROUND WATER QUALITY MONITORING RESULTS

WELL NO.: T15S/R1E-15F2 WELL NAME: PCA West - Deep

Date	Specific Conductance (micromhos/cm) (as CaCO3) 900 1600 22C2	Total Alkalinity (as CaCO3) NA	pH NA	Chloride 250 500 600 250 500 600	Sulfate NA	Ammonia Nitrogen (as NO3) NA	Nitrate Nitrogen (as NO3) 45	Total Organic Carbon NA	Calcium NA	Sodium NA	Magnesium NA	Potassium NA	Iron 0.3	Manganese 0.05	Orthophosphate NA	Boron NA
4/26/1990	1080	200	7.2	144	214	<0.40	51	81	64	24.0	0.08	0.06				
4/26/1991	978	236	7.7	156	60	<0.5	1.3	1.2	63	114	17	6.8				
7/24/1991	1034	244	7.9	150					57	110	18	6.7	<0.10	<0.03		
10/21/1991	1065	252	7.9	153					68	114						
4/29/1992	900	247	7.5	135	38	0.5			76	117	18	5.9				
6/2/1992									73	113	18	6.1	<0.01			
10/20/1992	926	204	8.1	152	68	<0.1	<0.5	0.6	66	113	17	5.9	<0.1	<0.05		
4/28/1993	1012	238	8.0	150	42	<0.1	<0.5	0.6	64	108	19	6.0	<0.1	<0.05		
10/28/1993	1033	202	7.8	148	41	<0.1	<1.0	0.3	65	108	17	5.5	0.2	0.07		
10/28/1994	1011	238	7.9	152	71	<0.05	<1	0.5	72	107	17	5.6	0.8	0.11		
5/3/1995	1016	186	7.9	162	44	0.12	<1	0.4	73	112	18	5.3	0.98	0.14		
11/30/1995	992	228	8.0	154	42	0.10	<1	0.6	68	102	18	5.4	0.40	0.10	0.05	
4/25/1996	1003	247	7.8	144	46	<0.05	<1	1.0	66	107	18	5.3	0.11	0.08	<0.03	
10/11/1996	967	232	7.6	150	39	0.08	<1	0.5	63	107	17	5.6	<0.10	0.07	0.34	
5/21/1997	916	251	6.9	158	42	<0.05	<1	0.5	64	109	17	5.4	0.20	0.06	0.04	
11/19/1997	969	256	7.7	150	46	0.10	<1	0.3	71	106	20	5.3	0.18	0.05	<0.03	
10/30/1998	970	237	7.7	146	42	0.06	<1	0.4	79	109	18	5.4	<0.1	0.08	<0.03	
11/2/1999	964	234	8.0	145	43	0.13	4	na	75	105	12	5.8	0.49	0.11	<0.03	
11/1/2000	976	241	7.9	149	43	0.09	<1	<0.2	76	103	18	5.1	<0.1	0.09	0.21	
10/25/2001	960	224	8.2	146	42	<0.05	<1	0.5	90	103	17	5.2	1.25	0.11	<0.03	
10/31/2002	960	252	7.9	159	44	0.12	<1	0.7	75	98	17	4.1	0.88	0.11	<0.03	
11/6/2003	972	242	7.8	149	43	0.14	<1	1.1	75	102	16	5.3	0.49	0.08	0.23	
11/9/2004	1020	266	7.9	158	44	0.10	<1	0.90	78	104	16	5.0	1.192	0.131	0.47	0.28
11/3/2005	920	240	7.9	168	43	0.11	<1	0.54	76	111	17	4.9	0.200	0.088	<0.03	0.41
10/24/2006	960	246	7.7	150	42	0.08	<1	0.27	77	109	18	5.4	0.541	0.083	<0.03	0.34

NOTES:

- 1 DWS - Drinking Water Standard; maximum contaminant levels are from California Domestic Water Quality and Monitoring Regulations, Title 22, 1977.
- 2 The three values for each constituent refer to the "recommended" level, the "upper" level and the "short-term use" level, respectively.

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

GROUND WATER QUALITY MONITORING RESULTS

WELL NO.: T15S/R1E-15F1 WELL NAME: PCA West - Shallow

Units are milligrams per liter unless otherwise noted.

Date	Specific Conductance (micromhos/cm) 900 1600 2200 ²	Total Alkalinity (as CaCO ₃) (pH units)		pH	Chloride 250 500 600 750 1000		Sulfate 500 600 750 1000	Ammonia Nitrogen (as NO ₃)		Nitrate Nitrogen (as NO ₃)	Total Organic Carbon	Calcium		Sodium		Magnesium	Potassium	Iron	Manganese	Orthophosphate	Boron
		NA	NA		NA	NA		45	NA			NA	NA	NA	NA						
4/26/1990	340	28	7.3	68	57	4.0	19	16	23.0	7.7	<0.01										
6/14/1990	340			50																	
6/17/1990	330			50																	
4/26/1991	311	68	7.8	48	21	>.5	4.0	>0.2	19	33	5.4	2.7									
7/24/1991	321	66	7.9	44					21	33	5.2	2.5									
10/21/1991	326	66	8.2	53					19	36											
4/29/1992	280	65	7.7	44	11				4.4												
6/3/1992																					
10/20/1992	302	66	8.2	50	16	<0.10	4.6		20	36	5.0	2.3									
4/28/1993	311	68	8.2	46	13	<0.10	4.6	0.3	19	34	5.0	2.2									
10/28/1993	327	64	8.2	42	20	<0.10	6.0	0.2	19	32	5.0	2.3									
10/28/1994	338	66	8.2	46	20	<0.05	5.0	0.3	23	35	5.0	2.0									
5/3/1995	317	68	8.6	48	12	0.12	6.0	0.3	21	34	5.0	2.7									
11/30/1995	315	64	8.3	52	6	<0.05	4.0	1.0	20	33	5.0	2.2									
4/25/1996	319	61	7.9	44	11	<0.05	5.0	1.3	19	33	5.0	2.2									
10/11/1996	315	63	7.8	44	9	<0.05	4.0	0.5	17	32	4.0	2.2									
5/21/1997	314	65	6.3	44	10	<0.05	4.0	0.3	18	34	5.0	2.1									
11/19/1997	311	65	8.0	50	12	<0.05	4.0	0.2	20	33	6.0	2.2									
10/30/1998	316	68	8.0	44	13	0.06	4.0	<0.2	20	35	5.0	2.3									
11/2/1999	315	66	8.2	43	11	<0.05	4	na	20	33	5.0	2.3									
11/1/2000	311	63	8.2	45	10	<0.05	4.0	<0.2	19	34	5.0	2.2									
10/25/2001	308	66	8.1	46	11	<0.05	4.0	0.3	24	34	5.0	2.7									
10/31/2002	307	66	8.0	48	11	0.12	<1	0.4	18	28	5.0	1.6									
11/6/2003	310	64	7.3	47	11	0.36	4	0.6	20	31	5	2.2									
11/9/2004	320	70	8.1	50	11	<0.05	5	<0.2	19	32	5	2.1									
11/3/2005	320	72	8.1	61	11	<0.05	4	<0.2	19	34	5.0	2.3									
10/24/2006	300	68	7.8	46	10	<0.05	4	<0.20	19	33	5.6	2.5									

NOTES: 1 DWS = Drinking Water Standard; maximum contaminant levels are from California Domestic Water Quality and Monitoring Regulations, Title 22, 1977.

2 The three values for each constituent refer to the "recommended" level, the "upper" level and the "short-term use" level, respectively.

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

GROUND WATER QUALITY MONITORING RESULTS

WELL NO.: T15S/R1E-11Pb WELL NAME: FO-09 - Deep

Units are milligrams per liter unless otherwise noted.

Date	Specific Conductance (micromhos/cm) 900 1600 220 2	Total Alkalinity (as CaCO3) NA	pH (pH units) NA	Chloride 250 500 600 500 600	Sulfate	Ammonia Nitrogen (as NO3) NA	Nitrate Nitrogen (as NO3) 45	Total Organic C	Calcium NA	Sodium NA	Magnesium NA	Potassium NA	Iron 0.3	Manganese 0.05	Orthophosphate NA	Boron NA
8/19/1994	822	190	8.1	102	62	<0.05	6.0	51	88	10.0	4.5	0.57	0.07	0.05		
5/3/1995	442	103	8.3	72	12	<0.05	<1.0	0.3	27	52	4.0	<0.10	<0.03			
11/30/1995	427	80	8.3	70	17	<0.05	<1.0	1.1	27	51	4.0	3.6	<0.03	0.03		
4/25/1996	443	89	8.0	66	15	<0.05	<1.0	0.6	25	51	4.0	3.5	<0.03	0.03		
10/11/1996	436	91	7.7	66	13	<0.05	<1.0	1.3	27	53	4.0	3.9	<0.03	0.35		
4/21/1997	436	91	7.3	73	15	<0.05	<1.0	0.3	26	51	4.0	3.5	0.19	<0.03	0.05	
11/19/1997	429	90	8.0	69	15	<0.05	<1.0	0.1	28	50	4.0	3.6	<0.10	<0.03	<0.03	
10/27/1998	432	88	7.4	66	16	<0.05	<1.0	<0.2	27	49	4.0	3.6	<0.10	<0.03	0.04	
11/2/1999	432	92	8.2	64	14	<0.05	<1.0	na	26	50	4.0	3.5	<0.10	<0.03	<0.03	
11/2/2000	425	87	8.1	66	14	<0.05	1.0	<0.2	26	50	4.0	3.5	<0.10	<0.03	0.18	
10/25/2001	425	92	8.2	68	14	<0.05	<1.0	0.2	32	49	4.0	3.8	<0.10	<0.03	<0.03	
11/1/2002	426	92	8.1	71	15	0.06	<1.0	0.4	25	45	4.0	2.7	<0.10	<0.03	<0.03	
12/6/2003	428	88	8.4	71	15	<0.05	<1.0	0.5	26	50	4.5	3.4	<0.05	<0.0005	<0.03	0.19
11/8/2004	450	94	8.1	72	15	<0.05	<1.0	<0.2	25	50	3.0	3.3	0.100	<0.0005	<0.03	0.35
11/2/2005	450	94	8.2	76	15	<0.05	<1.0	0.29	27	54	3.7	3.6	<0.05	<0.0005	0.06	0.35
10/25/2006	420	92	7.9	70	14	<0.05	<1.0	0.31	26	53	3.7	3.7	<0.10	<0.0005	<0.03	0.31

NOTES: 1 DWS = Drinking Water Standard; maximum contaminant levels are from California Domestic Water Quality and Monitoring Regulations, Title 22, 1977.

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

GROUND WATER QUALITY MONITORING RESULTS

WELL NO.: T15S/R1E-11Pa WELL NAME: FO-09 - Shallow

Date	Units are milligrams per liter unless otherwise noted.															
	Specific Conductance (micromhos/cm) 900 1600 22C	Total Alkalinity (as CaCO3) NA	pH (pH units) NA	Chloride 250 500 600 500 600	Sulfate	Ammonia Nitrogen (as NO3) NA	Nitrate Nitrogen (as NO3) 45	Total Organic Carbon	Calcium NA	Sodium NA	Magnesium NA	Potassium NA	Iron 0.3	Manganese 0.05	Orthophosphate NA	Boron NA
8/19/1994	315	154	9.5	55	47	0.11	2.0	57	12	57	4.0	5.8	0.31	<0.03	<0.03	
5/3/1995	348	62	8.4	56	19	0.08	<1.0	0.3	23	34	4.0	3.6	<0.10	<0.30		
11/30/1995	334	62	8.4	54	12	0.05	<1.0	0.8	23	35	4.0	3.7	<0.10	<0.03	0.07	
4/25/1996	343	63	7.9	53	11	<0.05	<1.0	0.5	22	33	4.0	3.7	<0.10	<0.03	0.05	
10/11/1996	336	61	7.8	53	13	<0.05	<1.0	0.4	22	35	4.0	4.0	<0.10	<0.03	0.29	
4/21/1997	333	59	6.9	56	13	<0.05	<1.0	0.4	22	35	4.0	3.7	<0.10	<0.03	0.06	
11/19/1997	330	60	8.0	56	13	<0.05	<1.0	0.2	23	33	5.0	3.7	<0.10	<0.03	0.05	
10/27/1998	334	60	7.4	51	16	<0.05	<1.0	0.2	23	36	4.0	3.9	<0.10	<0.03	0.03	
11/2/1999	333	61	8.1	51	13	<0.05	<1.0	na	21	32	4.0	3.6	<0.10	<0.03	0.05	
11/2/2000	322	59	8.1	52	12	<0.05	<1.0	<0.2	22	34	4.0	3.7	<0.10	<0.03	0.28	
10/25/2001	325	64	8.1	54	12	<0.05	<1.0	0.3	23	40	4.0	3.6	<0.10	<0.03	0.05	
11/1/2002	328	66	8.1	57	13	0.12	<1.0	0.4	21	30	4.0	2.9	<0.10	<0.03	0.04	
12/6/2003	330	62	7.6	56	13	0.06	<1	0.5	22	33	4.2	3.7	<0.05	<0.0005	<0.03	
11/8/2004	350	67	7.9	58	13	0.08	<1	0.20	21	33	4.0	3.4	<0.05	<0.0005	<0.03	0.24
11/2/2005	340	66	8.1	60	12	<0.05	<1	0.29	23	36	4.4	3.7	<0.05	<0.0005	0.05	0.31
10/25/2006	330	64	7.8	56	12	<0.05	<1	0.42	22	34	4.5	4.1	<0.10	<0.0005	0.04	0.28

NOTES: 1 DWS = Drinking Water Standard; maximum contaminant levels are from California Domestic Water Quality and Monitoring Regulations, Title 22, 1977.
 2 The three values for each constituent refer to the "recommended" level, the "upper" level and the "short-term use" level, respectively.

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

GROUND WATER QUALITY MONITORING RESULTS

WELL NO.: T15S/R1E-12Fc WELL NAME: FO-10 - Deep

Units are milligrams per liter unless otherwise noted.

Date	Specific Conductance (micromhos/cm)	Total Alkalinity (as CaCO ₃)	pH (pH units)	Chloride 250 500 600	Sulfate 250 500 600	Ammonia Nitrogen (as NO ₃)	Nitrate Nitrogen (as NO ₃)	Total Organic Carbon	Calcium	Sodium	Magnesium	Potassium	Iron	Manganese	Orthophosphate	Boron
DWS 1	900 1600 2200	NA	NA	500 600	500 600	NA	45	NA	NA	NA	NA	NA	0.3	0.05	NA	NA
9/20/1996	1447	467	7.8	138	27	0.12	<1	NA	148	107	25	7.2	1.22	0.84	0.04	NA
4/24/1997	652	169	7.7	78	12	0.77	<1	1.1	41	55	8	4.2	<0.10	0.20	<0.03	NA
11/19/1997	469	130	7.9	70	12	0.31	<1	0.5	36	46	10	3.1	0.76	0.15	0.03	NA
10/27/1998	442	108	7.5	66	46	0.09	<1	0.3	30	46	8	4.2	<0.10	0.20	<0.03	NA
11/2/1999	394	84	8.2	61	11	0.10	<1	na	24	39	6	2.6	0.97	0.09	0.04	NA
11/2/2000	380	77	8.1	60	16	0.09	1	0.5	23	41	6	2.6	0.84	0.04	0.20	NA
10/26/2001	372	80	8.2	60	13	<0.09	1	0.4	25	46	6	2.6	0.48	0.09	0.04	NA
11/1/2002	372	78	8.2	64	13	0.17	<1	0.7	21	36	6	1.8	0.33	0.04	<0.03	NA
12/16/2003	374	74	8.2	63	13	<0.05	<1	0.6	22	40	5.9	2.6	0.41	0.11	<0.03	NA
11/8/2004	400	86	8.0	62	15	0.07	<1	0.50	23	40	6.0	2.4	0.573	0.139	<0.03	0.33
11/3/2005	380	80	8.1	66	13	0.06	<1	0.41	23	42	5.6	3.0	0.560	0.053	0.05	0.33
10/25/2006	360	78	7.8	55	17	<0.05	<1	<0.20	22	40	5.5	2.8	<0.10	0.034	<0.03	0.32

NOTES:

(1) Maximum contaminant levels are from California Domestic Water Quality and Monitoring Regulations, Title 22, 1977.

(2) The three values listed for certain constituents refer to the "recommended" level, the "upper" level, and "short-term use" level, respectively.

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

GROUND WATER QUALITY MONITORING RESULTS

WELL NO.: T15S/R1E-12Fa WELL NAME: FO-10 - Shallow

Date	Units are milligrams per liter unless otherwise noted.															
	Specific Conductance (micromhos/cm) 900 1600 22.4	Total Alkalinity (as CaCO3) NA	pH (pH units)	Chloride 250 500 62650 500 6	Sulfate	Ammonia Nitrogen (as NO3) NA	Nitrate Nitrogen (as NO3) 45	Total Organic Carbon	Calcium	Sodium	Magnesium	Potassium	Iron	Manganese	Orthophosphate	Boron
DWS 1 9/20/1996	910	303	7.7	73	9	<0.05	<1	NA	91	NA	45	18	4.4	4.69	1.01	0.41
4/24/1997	430	95	7.5	71	25	0.13	<1	0.7	28	43	8	8	2.4	0.15	0.06	<0.03
11/19/1997	386	74	7.9	72	14	<0.05	1	0.5	24	40	8	8	2.2	<0.1	<0.03	<0.03
10/27/1998	389	74	7.5	64	14	<0.05	<1	0.2	24	40	7	7	2.3	<0.1	<0.03	<0.03
11/2/1999	387	72	8.1	64	13	<0.05	1	na	23	38	7	7	2.2	<0.1	<0.03	<0.03
11/2/2000	375	69	8.1	62	12	<0.05	2	<0.2	23	40	7	7	2.3	<0.1	<0.03	0.16
10/26/2001	365	72	8.1	57	16	<0.05	1	0.2	24	44	6	6	2.0	<0.1	<0.03	<0.03
11/1/2002	353	72	8.2	58	17	<0.05	1	0.5	20	34	5	5	2.1	<0.1	<0.03	<0.03
12/16/2003	340	62	8.2	58	13	<0.05	1	0.5	22	35	5.8	5.8	2.6	<0.03	<0.0005	<0.03
11/8/2004	370	75	7.9	57	17	0.06	<1	0.20	21	38	5.0	5.0	1.8	0.106	<0.0005	<0.03
11/3/2005	350	70	8.1	65	12	<0.05	<1	0.20	21	39	5.2	5.2	2.0	<0.03	<0.0005	<0.03
10/25/2006	350	76	7.9	53	19	<0.05	<1	<0.20	22	40	5.7	5.7	2.2	<0.10	<0.0005	<0.03

NOTES:

(1) Maximum contaminant levels are from California Domestic Water Quality and Monitoring Regulations, Title 22, 1977.

(2) The three values listed for certain constituents refer to the "recommended" level, the "upper" level, and "short term use" level, respectively.

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

GROUND WATER QUALITY MONITORING RESULTS

WELL NO.: T15S/R1E-15K4 WELL NAME: PCA East - Deep

Date	DWS	Specific Conductance (micromhos/cm)	Total Alkalinity (as CaCO ₃)	pH	Units are milligrams per liter unless otherwise noted.												
					Chloride 250 500 6	Sulfate 250 500 6	Ammonia Nitrogen (as NO ₃)	Nitrate Nitrogen (as NO ₃)	Total Organic Carbon	Calcium	Sodium	Magnesium	Potassium	Iron	Manganese	Orthophosphate	Boron
4/27/1990		1080	216	7.4	142	214		<0.4	59	81	60	24.0	<0.05	0.30			
4/28/1992		900	241	7.2	135	41	0.3		77	114	16	5.0	<0.08				
6/2/1992									75	110	15	4.9					
6/4/1992					134	40		<0.1	74	114	16	5.3	<0.08				
11/30/1995		968	236	8.0	142	45	0.05	<1.0	65	109	15	4.7	0.10	0.11	0.07		
4/21/1999		no access															
11/19/1999		no access															
10/27/1999		no access															
11/2/1999		941	230	8.1	132	44	0.06	<1	na	73	103	15	4.8	0.50	0.15	<0.03	
11/1/2000		900	225	8.0	130	42	0.08	<1	<0.2	72	102	14	4.6	0.87	0.13	0.22	
10/26/2001		880	224	8.3	126	43	<0.05	<1	0.4	78	99	13	4.6	0.46	0.12	<0.03	
10/31/2002		not sampled															
11/6/2003		845	224	7.6	118	40	0.06	<1	1.7	64	93	12	4.6	1.13	0.06	0.32	
11/9/2004		880	236	8.1	115	40	0.06	<1	0.70	60	93	12	4.1	0.812	0.124	0.13	0.28
11/2/2005		800	222	8.2	126	38	0.07	<1	0.57	59	97	12	4.2	0.240	0.090	0.04	0.42
10/24/2006		790	208	8.2	109	35	<0.05	<1	<0.20	57	93	12	4.2	0.216	0.092	<0.03	0.33

NOTES:

- 1 DWS = Drinking Water Standard; maximum contaminant levels are from California Domestic Water Quality and Monitoring Regulations, Title 22, 1977.
- 2 The three values for each constituent refer to the "recommended" level, the "upper" level and the "short-term use" level, r

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

GROUND WATER QUALITY MONITORING RESULTS

WELL NO.: T15S/R1E-15K5 WELL NAME: PCA East - Shallow

Date	Specific Conductance (micromhos/cm) 900 1600 22C2	Total Alkalinity (as CaCO3) NA	pH (pH units) NA	Chloride 250 500 600 500 600 Sulfate NA	Ammonia Nitrogen (as NO3) NA 45			Total Organic Carbon NA	Calcium NA	Sodium NA	Magnesium NA	Potassium NA	Iron 0.3	Manganese 0.05	Orthophosphate NA	Boron NA
					Nitrate	Nitrogen	Nitrogen									
Units are milligrams per liter unless otherwise noted.																
DWS 1																
4/27/1990	350	48	7.3	62	71		2.2	27	16	19.0	8.0	<0.05				
4/28/1992	290	61	7.9	46	8		2.1	16	39	3.8	1.9	<0.02				
6/1/1992				45	8		2.0	16	39	3.8	2.3	<0.02				
11/30/1995	306	74	8.5	46	<5	<0.05	3.0	17	40	4.0	1.8	<0.03		0.04		
4/21/1997	no access															
11/19/1997	no access															
10/27/1998	no access															
11/2/1999	384	92	8.2	51	14	<0.05	<1	na	40	40	10.0	3.1	4.8	0.26	0.05	
11/1/2000	314	79	8.2	49	8	<0.05	2.0	0.6	20	40	4.0	2.1	38	0.74	0.22	
10/26/2001	302	64	8.1	49	8	<0.05	2.0	<0.2	22	38	5.0	2.7	2.07	0.06	0.03	
10/31/2002	not sampled															
11/6/2003	307	68	7.7	50	8	0.06	2	0.6	20	35	6	1.8	3.27	0.13	0.88	
11/9/2004	370	89	7.7	56	13	<0.05	<1	2.50	27	40	7	2.7	4.071	0.213	0.44	
11/2/2005	330	70	8.0	56	9	<0.05	2	0.53	26	40	9.7	3.5	2.760	0.229	0.08	
10/24/2006	330	68	7.9	50	10	<0.05	3	<0.20	20	39	6.2	2.9	2.390	0.068	<0.03	

NOTES: 1 DWS = Drinking Water Standard; maximum contaminant levels are from California Domestic Water Quality and Monitoring Regulations, Title 22, 1977.

2 The three values for each constituent refer to the "recommended" level, the "upper" level and the "short-term use" level, respectively.

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

GROUND WATER QUALITY MONITORING RESULTS

WELL NO.: T15S/R1E-23Cb WELL NAME: Ord Terrace - Deep

Units are milligrams per liter unless otherwise noted.

Date	Specific Conductance (micromhos/cm)		pH	Chloride	Sulfate	Ammonia Nitrogen (as NO3)		Total Organic Carbon	Calcium	Sodium	Magnesium	Potassium	Iron	Manganese	Orthophosphate	Boron
	900 1600 220 2	NA				250 500 600	250 500 600									
11/2/1999	1258	294	8.3	147	123	0.21	<1	na	105	118	23	7.2	<0.1	0.09	<0.03	NA
11/2/2000	1241	303	8.3	156	115	0.82	<1	1.3	109	118	24	6.8	<0.1	0.09	0.21	
10/25/2001	1240	310	8.4	163	115	<0.05	<1	1.2	108	111	25	7.1	<0.1	0.09	<0.03	
11/1/2002	1238	300	8.2	170	122	0.52	<1	1.5	103	111	24	5.3	0.12	0.09	<0.03	
12/16/2003	1243	296	8.1	170	116	0.53	<1	1.3	104	113	24	6.4	0.12	0.08	<0.03	
11/9/2004	1300	298	8.2	178	107	0.45	<1	1.1	106	120	23	6.3	0.155	0.082	<0.03	0.38
11/2/2005	1230	326	8.2	194	95	0.57	<1	1.2	113	138	25	7.0	<0.05	0.055	<0.03	0.67
10/24/2006	1280	318	8.2	181	89	0.47	<1	0.84	107	132	26	7.1	0.169	0.026	<0.03	0.58

NOTES:

- (1) Maximum contaminant levels are from California Domestic Water Quality and Monitoring Regulations, Title 22, 1977.
- (2) The three values listed for certain constituents refer to the "recommended" level, the "upper" level, and "short-term use" level, respectively.

MONTEREY PENINSULA WATER MANAGEMENT DISTRICT

GROUND WATER QUALITY MONITORING RESULTS

WELL NO.: T15S/R1E-23Ca WELL NAME: Ord Terrace - Shallow

Units are milligrams per liter unless otherwise noted.

Date	Specific Conductance (micromhos/cm)	Total Alkalinity (as CaCO ₃)	pH (pH units)	Chloride	Sulfate	Nitrogen (as NO ₃)	Ammonia Nitrate Nitrogen (as NO ₃)	Total Organic Carbon	Calcium	Sodium	Magnesium	Potassium	Iron	Manganese	Orthophosphate	Boron
DWS 1	900 1600 22.2	NA	NA	250 500 600	250 500 600	NA	45	NA	NA	NA	NA	NA	0.3	0.05	NA	NA
11/2/1999	824	220	8.5	100	43	<0.05	3	na	65	94	12	5.0	0.63	0.06	<0.03	
11/2/2000	848	233	8.4	112	40	0.05	<1	1.5	73	86	15	4.3	0.99	0.10	0.36	
10/25/2001	780	220	8.6	106	39	<0.05	5	0.6	106	74	15	4.6	0.75	0.11	<0.03	
11/1/2002	798	222	8.4	111	41	0.07	6	0.6	66	72	16	3.3	1.84	0.23	<0.03	
12/16/2003	917	240	8.3	130	45	<0.05	<1	1.0	77	85	18	4.5	0.79	<0.0005	<0.03	
11/9/2004	990	248	8.3	127	51	<0.05	<1	1.50	85	90	18	4.2	0.556	0.185	0.35	0.18
11/2/2005	805	236	8.2	125	42	<0.05	6	0.82	82	86	20	5.6	1.080	0.280	<0.03	0.60
10/24/2006	800	212	8.3	106	37	<0.05	6	0.35	68	79	17	4.4	1.080	0.077	<0.03	0.29

NOTES:

(1) Maximum contaminant levels are from California Domestic Water Quality and Monitoring Regulations, Title 22, 1977.

(2) The three values listed for certain constituents refer to the "recommended" level, the "upper" level, and "short-term use" level, respectively.

ATTACHMENT 7

SEASIDE GROUNDWATER BASIN WATERMASTER

SEAWATER SENTINEL MONITORING WELLS

WORKPLAN

January 26, 2007

INTRODUCTION

As part of the court decree, the Seaside Groundwater Basin Watermaster (Watermaster) is required to install a series of coastal monitoring wells for the purpose of enhancing the existing network of monitoring wells that can detect seawater intrusion into the Seaside Basin. As part of the judge's review of the Watermaster's progress, he imposed a set of deadlines for implementation of this work. The timelines set by the judge are aggressive and will be difficult to achieve without refocusing the scope and goals of this work. This document intends to detail a revised approach to the work, propose preliminary well locations, identify required permits, and suggest an achievable schedule. A preliminary estimate of costs is also provided.

BACKGROUND

The Watermaster has initiated a multi-faceted Basin Monitoring and Management Program (MMP) that includes data collection, management and analysis, ground water modeling, and hydrogeologic analysis. This program also includes the installation of monitoring wells for purposes of refining basin hydrogeology and water quality monitoring. Because of the wells dual purpose of refining basin hydrogeology and water quality monitoring, the magnitude of the monitoring well program was large and expensive. While the insight and data from these wells may be necessary in the long run, achieving the primary goal of detecting seawater intrusion can be achieved with well designs that focus on the water quality monitoring. Hydrogeologic data and understanding that are developed as part of implementation of the coastal monitoring wells will be useful, but not the primary purpose. The decoupling of the dual purposes for installing monitoring wells allows redesign of the coastal monitoring wells, reducing their cost and speeding implementation.

The MMP approved by the judge also includes the construction of several inland monitoring wells to further the understanding of the groundwater basin. The purpose of these wells is to provide better understanding of the structure, hydrostratigraphy, and water level conditions of the inland portions of the basin. These inland wells are not part of this work plan as the purpose of these wells is significantly different than the coastal monitors.

Previous Approach

The previous approach consisted of six monitoring well clusters. Each cluster would have four monitoring wells completed to various depths. One borehole would be drilled to the Monterey Formation and completed toward the lower portion of the aquifer system, one would be completed in the upper Santa Margarita Sandstone, and two would be completed in the overlying Paso Robles Formation. It was assumed that the deeper boring would extend as deep as 1,500 to 2,500 feet. Each well was to be constructed of PVC casing with gravel pack and perforations in the appropriate hydrostratigraphic interval. The deeper well was to be 3-inch diameter while the other wells would be 2-inch diameter. The drilling cost estimate included site preparation, well construction and development, fluid/cuttings disposal and site restoration. Total cost of the drilling program was estimated \$3.8 million. The actual well sites were undetermined. The

estimated costs did not include site selection, design, permitting, site acquisition, or construction management. These costs were estimated at approximately \$550,000 which bring total project cost to \$4.35 million.

The proposed approach would have allowed collection of the following data:

- Water levels in the upper and lower Santa Margarita Sandstone
- Water levels in two discrete hydrostratigraphic intervals in the Paso Robles Formation
- Water Quality sampling of the Santa Margarita Sandstone and Paso Robles Formation intervals
- Conductivity/Resistivity (Induction) surveys of entire sediment column providing indirect measurement of water quality and water quality changes.
- Base of water bearing sediments – Depth to Monterey Formation

Revised Approach

With the exception of distilled water, all water contains some level of dissolved minerals or salts. Typical drinking water contains less than 1,000 part per million of dissolved salts whereas seawater contains approximately 35,000 parts per million of salts. Unlike organic contaminants which degrade water with concentrations measured in parts per billion; degradation of water by seawater is the result of contamination on the parts per million or even parts per thousand basis. The addition of more salts to the water, as the result of mixing with seawater, changes the physical properties of the water such as the density of the water and, most relevant to the subject project, the electrical properties of the water.

Distilled water is essentially electrically non-conductive; with increasing amounts of salinity water becomes increasingly more conductive. As such, the electrical conductivity of water can be used to infer the salt concentration. The revised work plan relies on this principal.

The change in electrical properties with increasing salinity makes the detection of seawater contamination into an aquifer relatively easy. As the water within the aquifer becomes more saline due to the intrusion of seawater, the electrical conductivity of the formation containing the water increases relative to the value measured when the aquifer was filled with native ground water.

The revised work plan utilizes single-well monitoring sites (as opposed to the multiple wells at each site described in the existing plan). The wells would extend into and perforate the Santa Margarita Sandstone. The well would be constructed of 3-inch diameter casing to allow the periodic cased-hole conductivity/resistivity (induction) profiling of the aquifer system. This would allow detection of seawater (as measured as an increase in formation conductivity) at any depth from the top of saturation (i.e. the water table) to bottom of the well.

Well Specifics for Each Site:

- One 8 3/4-inch boring to 1,500 feet or Monterey Formation (whichever comes first)
- Geophysical logging (Resistivity, SP and Natural Gamma)
- 3" diameter flush threaded Sch. 80 PVC Casing into Santa Margarita Sandstone

- 100 feet of 0.032-inch horizontally-cut PVC perforations. Continuous or placed in the most productive zones – the zones a production well would be perforated
- Gravel packed in the perforated interval(s)
- Well sealed from the top of Santa Margarita Sandstone
- Well air lifted developed until clean
- Flush-grade surface vault with room for data logging equipment

Data collection from the monitoring well network would include periodic induction logging of the cased borehole and collection of physical water samples from the Santa Margarita Sandstone for calibration purposes. Successive induction logs would be overlaid on previous logs for comparison. If a significant change in conductivity was detected, a depth-specific monitoring well should be drilled at the site to provide improved understanding of the nature of the change. In addition to the indirect measurement of water quality within all portions of the Paso Robles Formation and Santa Margarita Sandstone, the wells would allow monitoring of water level conditions in the Santa Margarita Sandstone.

An example of the type of data that is collected as part of the proposed approach is presented on Figure 1. Figure 1 presents data collected recently from a coastal monitoring well. The data are taken from an induction survey conducted within a three-inch diameter monitoring well similar to the proposed design. This aquifer system has seawater at a depth of 450 feet below ground surface. The presence of seawater is indicated by the rapid increase in conductivity (decrease in resistivity) values below a depth of 450 feet. The presented data represent the baseline value. This well will be surveyed periodically. Data (curves) will be compared to detect the movement of seawater within the aquifer system at this location.

Supplement Network Through Use of Existing Monitoring Wells. In addition to the new wells, and the existing network of monitoring wells owned by MPWMD and California American (see attached map) there are other existing wells in the area of the proposed new wells that can be integrated into the sentinel well network. The proposed well sites are in the coastal bluffs area on the former Fort Ord. As part of the conversion of Fort Ord to civilian use, extensive subsurface exploration has been performed to assess environmental impacts of historical land use. At many locations along the coast, there remain monitoring wells that could be brought into the Watermaster's monitoring program. Many of these wells are quite shallow, but several extend to into the upper aquifer system. These wells would be useful additions to a coastal monitoring network, as many have water quality data extending back to the early 1990's.

In summary, the revised approach will allow collection of the following data:

- Water levels in the Santa Margarita Sandstone
- Collection of water quality samples from the Santa Margarita Sandstone
- Conductivity/Resistivity (Induction) surveys of entire sediment column providing indirect measurement of water quality and water quality changes

Compared to the previous approach the revised approach does not directly collect these data:

- *Base of water bearing sediments – Depth to Monterey Formation.* These data are desirable for increasing understanding of the basin structure. However, these data are very expensive, as drilling to the proposed depths requires a different class of drilling equipment, significantly raising costs. The proposed approach includes drilling into the Santa Margarita Sandstone/Purissima Formation. Within the coastal areas of the Seaside Basin, there are adequate data to project the depth to the Monterey Formation below the bottom of the borehole. In the areas where the Purissima may be encountered, this could be more problematic as there are few, if any, wells that fully penetrate the Purissima into the Monterey.
- *Water Quality sampling of the Paso Robles Formation.* The proposed approach would not allow collection of water quality samples from the Paso Robles Formation. However, the induction surveys will provide water quality data for water within the various units of the Paso Robles Formation.
- *Water levels in two discrete hydrostratigraphic intervals in the Paso Robles Formation.* The proposed approach does not provide water level data from any of the various water bearing units of the Paso Robles Formation. However, some of the sites have existing shallow monitoring wells installed as part of Fort Ord clean-up investigations. Water level data from the shallow system may be available from these wells. Additionally, most of the basin's production and artificial recharge is from the confined Santa Margarita Sandstone, and water levels in this aquifer unit at the coast are the primary management tool.

MONITORING PROGRAM

It is assumed that the new monitoring wells would be folded into the existing Seaside Basin monitoring network. It is understood that the judge has specified collection of water data on a quarterly basis from the coastal monitoring well network. This could be accomplished cost-effectively by quarterly induction profiling of the wells supported by periodic (annual) collection of water quality samples. The quarterly induction surveys could be performed by a geophysical contractor who could provide the data to the Watermaster's designated technical personnel for analysis. This approach would reduce quarterly monitoring cost significantly.

WELL SITES

As part of the work associated with the preparation of this work plan, the team (Joe Oliver of the MPWMD and I) met with a representative of the California State Parks (Ken Gray) to identify locations for the coastal monitoring wells. The team visited and received conceptual approval for five sites in the coastal portion of Fort Ord north of Sand City, and I have identified four primary sites and one alternative location. The tentatively approved sites are shown on the attached map and are as follows:

- Range 8 – This site is at the extreme southwestern corner of Range 8. There is an existing shallow monitoring well at this site although actual depth is unknown. The well site would be with the existing paved road.
- Bunker 11 – This site is located immediately in front of the abandoned Ammo Bunker No. 11. The Ammo bunkers are planned to be maintained for public access and historical interest.
- Bunker 1 – This site is located immediately in front of the abandoned Ammo Bunker No. 1.

- MCWD Lift Station – This site is located at the site of Marina Coast Water District’s existing sewer lift station. There is an existing shallow monitoring well at this site. Again, its actual depth is unknown at the time of the preparation of this plan. Data on the construction of the existing well is likely available from BRAC personnel.

The site below was identified as an alternative site due to its distance from the ocean.

- Along Road – This site will be located along the existing north-south trending road. Several turn-out areas were identified that would support a well site and provide sufficient room for construction.

All of sites are located in existing roads and have sufficient previously-disturbed area for well construction staging. Additionally, each site is in an area where State Parks plans to maintain roads and access. This will allow for continued on-going access to the well sites for the purpose of collecting data.

Alternative Sites: If the well sites on State Park Land become infeasible, a fall back position would be to locate the wells within the TAMC right-of-way. These sites are less favorable for coastal monitoring wells because this right-of-way is significantly farther from the ocean than the above sites.

PERMITTING

Permitting of the well sites will likely be the critical path issue in meeting deadlines imposed by the judge. The discussion below assumes the construction on State Parks property. Construction in the TAMC right-of-way has similar permitting requirements.

The coastal bluffs property of former Fort Ord was formally transferred from the U.S. Army to the Dept. of Interior (Nat’l Parks Service) last fall. Ken Gray’s best guess is that the Nat’l Park Service could do a formal transfer to State Parks as early as this March, but based on a field meeting with Mr. Gray on 1/22, the fact that this property has not yet been formally transferred to State Parks does not prevent State Parks from authorizing uses such as monitor wells, because State Parks currently has “operational authority” for the property. Assuming Mr. Gray’s assumption is correct the permitting process would likely include:

- State Parks – Based on discussions with Mr. Gray, the Watermaster could submit a project description and an application for permission to install the monitoring wells. The application would need to include assessment of potential impacts for their review prior to granting the permit.
 - The key issue will likely be construction impacts on:
 - Biological resources, including habitat for special-status wildlife species (Smith’s blue butterfly, snowy plover, and black legless lizard) and presence of special-status plant species (Monterey Spineflower, Wallflower, and Sand Gilia). If the land has been transferred to State Parks, implementation of the Habitat Management Plan would likely mitigate for these impacts, except for state listed plants. If land has not been transferred and remains federal property, there are existing biological opinions that would likely cover impacts to all these species.

- Coastal zone analysis/consistencies (aesthetics, impacts on visitor serving uses and coastal access)
 - Other construction impacts (air quality, noise, etc.) - These can be easily mitigated with standard construction practices.
- CEQA - Assuming that the project can be designed and implemented without significant environmental impacts (i.e., possible biological resources impacts discussed below which require more comprehensive mitigation); a Notice of Exemption could be the appropriate document. This assumes that the project will not involve major controversy or objection.
 - NEPA - The project would not be subject to NEPA if the US Army has conveyed or will convey ownership of the property to State Parks prior to commencement of construction. Ken Gray has indicated that he believes that State Parks has operational control giving them the permitting authority. If Mr. Gray's assumption is wrong regarding permitting authority, it is believed that there is a categorical exemption for monitor wells under NEPA.
 - Coastal Act (California Coastal Commission) - The project would require, at a minimum, an "Amendment to an Existing Coastal Development Permit" which would be considered "Immaterial" (staff level approval). It may be considered "Material" (requiring approval by the Coastal Commission; therefore more coordination and longer time period). If there is no existing permit covering related activities, another process that would be expeditious would be for the project to be considered *de minimus* and receive a waiver from the Coastal Commission staff.

The sites have been selected to avoid impacts to habitat. However, if construction activities are deemed to potentially disturb sensitive habitat, the permits listed below would be necessary. However, the sites likely would be moved to avoid these issues.

- CA Endangered Species Act (ESA) Take permit (California Dept. of Fish and Game) - if the Sand Gilia is located at any sites that may be disturbed and the land has been transferred.
- Federal ESA Take permit (USFWS) - If habitat for snowy plover and/or Smith's blue butterfly is to be disturbed and the land has been transferred.

In addition to the above permits, well construction permits will be required from Monterey County Environmental Health Department. These permits are essentially ministerial and require 2 to 3 weeks to be issued. These permits can only be issued to the drilling contractor.

Timing of permits:

- Timing of State Park Permit: 1 month or less from submission of project definition and supporting documentation
- Well Construction Permits - 2 to 3 weeks.
- CEQA - Assuming a Notice of Exemption: 1 month or less from project definition.
- NEPA - Not Required
- Coastal Commission (if required): minimum 2 months, if Coastal Commission hearing required several months to a year.

- CA / Federal ESA: 6 months to a over a year depending upon resources affected and ownership/designation of land

SCHEDULE

Permitting and site acquisition will control schedule. After permitting is completed, sentinel wells can be installed within 6 weeks. Initial data from the wells would be available within 10 weeks.

COST

Permitting Costs:

Permitting Costs are always difficult to estimate, as the process can be unpredictable. Assuming the permitting process is somewhat similar to that discussed above; permitting costs are estimated at \$ 35,000.

Well Construction/Hydrogeologic Data Collection Costs:

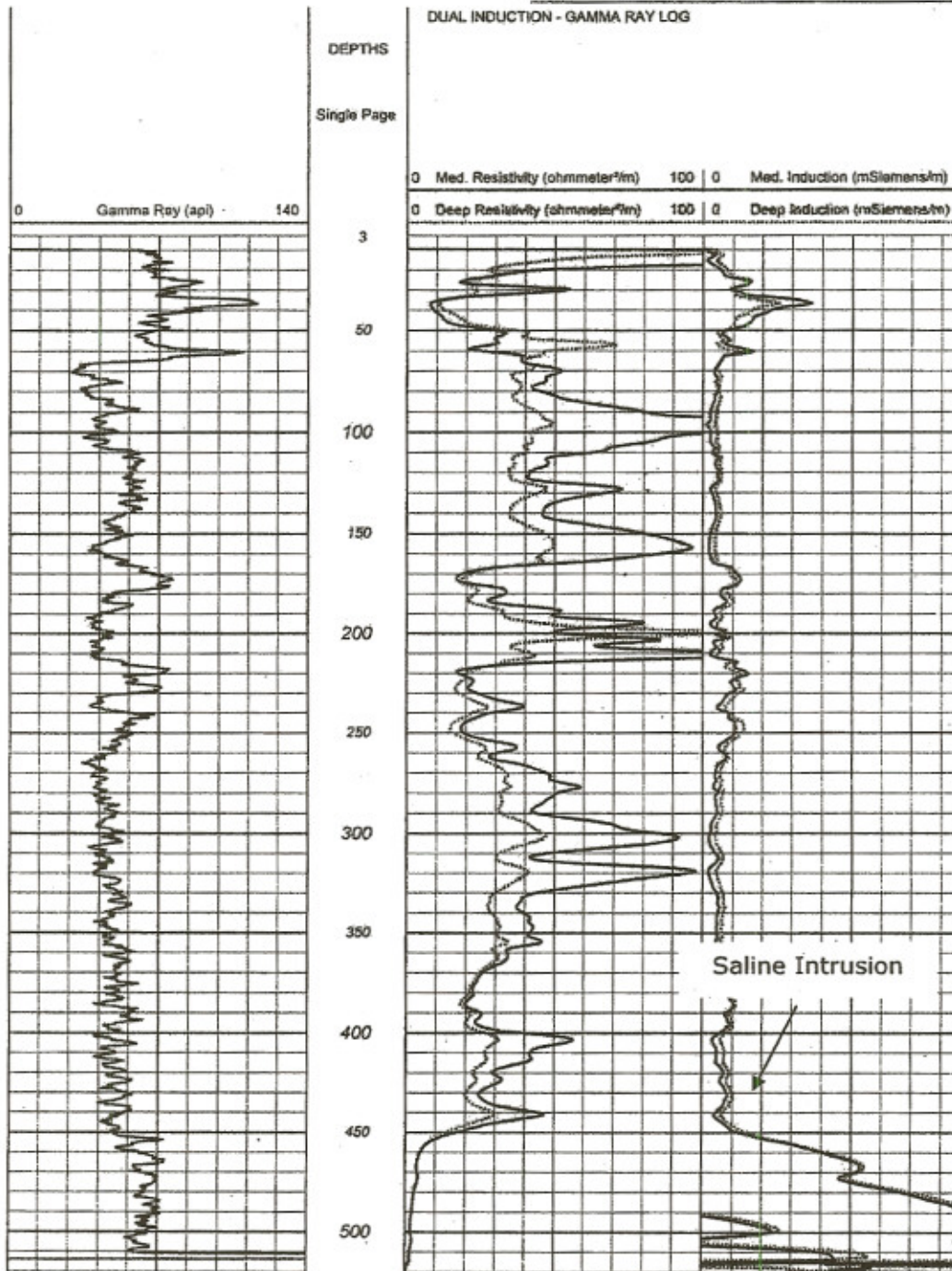
Cost for program management, well construction, hydrogeologic supervision and analysis, monitoring network review and initial data collection are estimated at between \$850,000.

Annual Monitoring Program Costs:

As proposed the 4 coastal sentinel wells would be induction logged quarterly and water quality samples collected annually. This cost of this limited program is estimated \$18,000 per year. This would include approximately \$12,000 for induction logging (\$3,000 per quarter) and annual collection and analysis of water quality samples of approximately \$6,000.

~//~

FIGURE 1 - CASED HOLE INDUCTION LOG



SITE MAP

[Hard Copy to Follow]

SEASIDE BASIN COASTAL WATER QUALITY MONITORING WELLS



Scale



- ◆ Proposed SWI Sentinel Wells
- ⊕ Existing Monitoring Wells