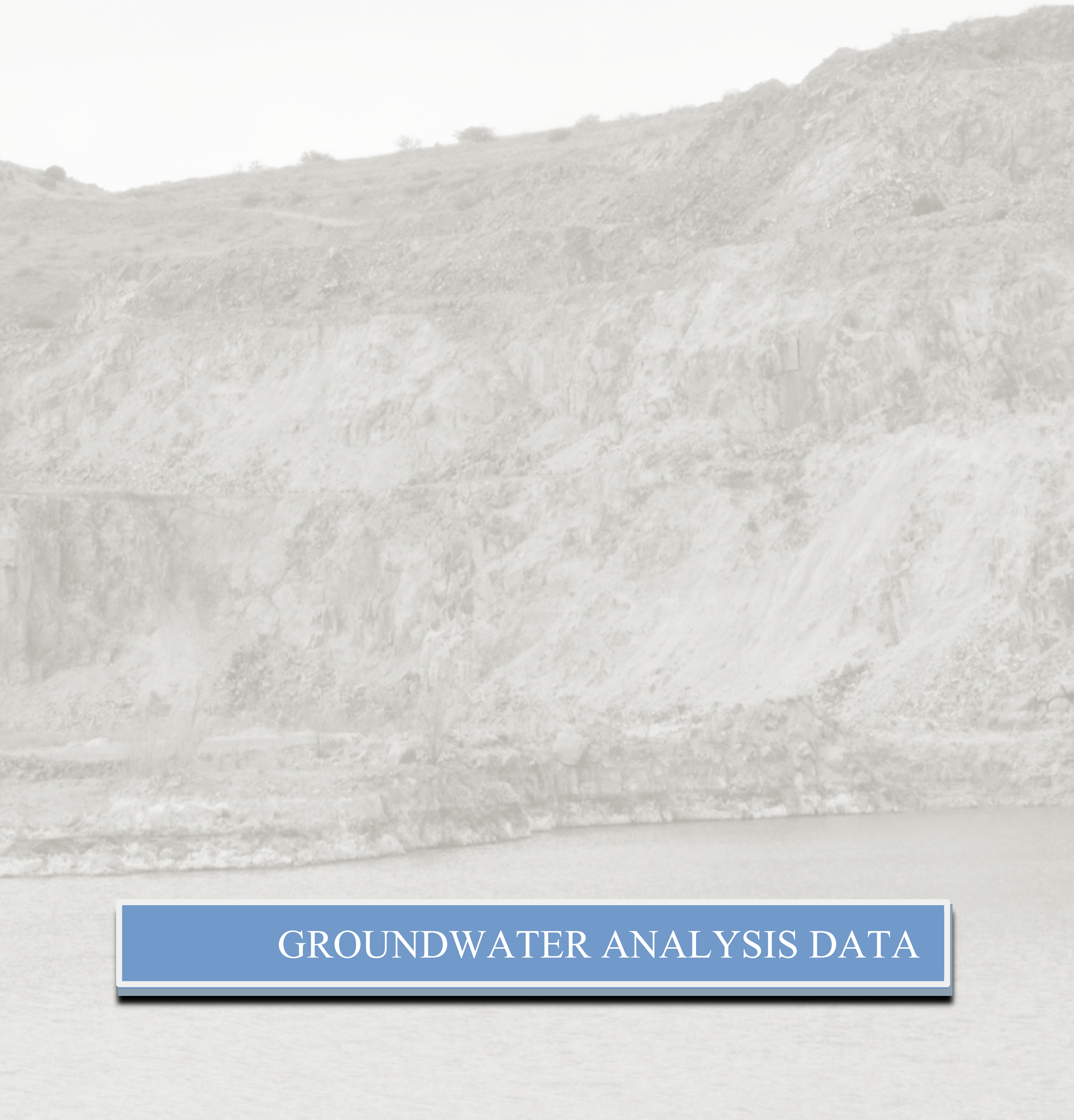
APPENDIX E



GROUNDWATER ANALYSIS DATA

APPENDIX E: GROUNDWATER ANALYSIS DATA

SampType	ClientSampID	CollectionDate	Analyte	Result	Units
GW	GWQ94-14	1/2/1900	Aluminum	<0.05	mg/L
GW	GWQ94-14	1/2/1900	Arsenic	<0.005	mg/L
GW	GWQ94-14	1/2/1900	Barium	<0.1	mg/L
GW	GWQ94-14	1/2/1900	Boron	<0.1	mg/L
GW	GWQ94-14	1/2/1900	Cadmium	<0.0005	mg/L
GW	GWQ94-14	1/2/1900	Chloride	22	mg/L
GW	GWQ94-14	1/2/1900	Chromium	<0.025	mg/L
GW	GWQ94-14	1/2/1900	Cobalt	<0.05	mg/L
GW	GWQ94-14	1/2/1900	Copper	<0.025	mg/L
GW	GWQ94-14	1/2/1900	Fluoride	0.52	mg/L
GW	GWQ94-14	1/2/1900	Iron	<0.05	mg/L
GW	GWQ94-14	1/2/1900	Lead	<0.005	mg/L
GW	GWQ94-14	1/2/1900	Manganese	<0.03	mg/L
GW	GWQ94-14	1/2/1900	Mercury	<0.001	mg/L
GW	GWQ94-14	1/2/1900	Molybdenum	<0.05	mg/L
GW	GWQ94-14	1/2/1900	Nickel	<0.05	mg/L
GW	GWQ94-14	1/2/1900	Nitrate as N (NO3)	1.3	mg/L
GW	GWQ94-14	1/2/1900	Selenium	<0.005	mg/L
GW	GWQ94-14	1/2/1900	Silver	<0.025	mg/L
GW	GWQ94-14	1/2/1900	Sulfate	140	mg/L
GW	GWQ94-14	1/2/1900	TDS	560	mg/L
GW	GWQ94-14	1/2/1900	Zinc	<0.05	mg/L
GW	GWQ94-14	1/2/1900	pH	7.95	pH units
GW	GWQ94-14	1/2/1900	Conductivity	745	µmhos/cm
GW	GWQ94-14	1/2/1900	Antimony	<0.005	mg/L
GW	GWQ94-14	1/2/1900	Beryllium	<0.002	mg/L
GW	GWQ94-14	1/2/1900	Calcium	81	mg/L
GW	GWQ94-14	1/2/1900	Magnesium	23	mg/L
GW	GWQ94-14	1/2/1900	Thallium	<0.005	mg/L
GW	GWQ94-14	1/2/1900	Sodium	46	mg/L
GW	GWQ94-14	1/2/1900	Bicarbonate	279	mg/L CaCO3
GW	GWQ94-14	1/2/1900	Carbonate	0	mg/L CaCO3
GW	GWQ94-14	1/2/1900	Potassium	1.9	mg/L
GW	Pague	8/20/1946	Chloride	26	mg/L
GW	Pague	8/20/1946	Fluoride	1.2	mg/L
GW	Pague	8/20/1946	Nitrate as N (NO3)	1.2	mg/L
GW	Pague	8/20/1946	Sulfate	80	mg/L
GW	Pague	8/20/1946	TDS	348	mg/L
GW	Pague	8/20/1946	Conductivity	409	µmhos/cm
GW	Pague	8/20/1946	Calcium	63	mg/L
GW	Pague	8/20/1946	Magnesium	21	mg/L
GW	Pague	8/20/1946	Bicarbonate	242	mg/L CaCO3
GW	MW-1	1/1/1975	Chloride	10	mg/L
GW	MW-1	1/1/1975	Fluoride	0.7	mg/L
GW	MW-1	1/1/1975	Nitrate as N (NO3)	6.1	mg/L
GW	MW-1	1/1/1975	Sulfate	73	mg/L
GW	MW-1	1/1/1975	TDS	433	mg/L
GW	MW-1	1/1/1975	pH	8.1	pH units
GW	MW-1	1/1/1975	Conductivity	480	µmhos/cm
GW	MW-1	1/1/1975	Calcium	28	mg/L
GW	MW-1	1/1/1975	Magnesium	1	mg/L
GW	MW-1	1/1/1975	Sodium	85	mg/L
GW	MW-1	1/1/1975	Bicarbonate	215	mg/L CaCO3
GW	MW-1	1/1/1975	Carbonate	0	mg/L CaCO3
GW	MW-1	1/1/1975	Potassium	10.6	mg/L
GW	MW-6	1/1/1975	Chloride	66	mg/L
GW	MW-6	1/1/1975	Fluoride	3.4	mg/L
GW	MW-6	1/1/1975	Nitrate as N (NO3)	4.3	mg/L
GW	MW-6	1/1/1975	Sulfate	38	mg/L
GW	MW-6	1/1/1975	TDS	260	mg/L
GW	MW-6	1/1/1975	pH	7.6	pH units
GW	MW-6	1/1/1975	Conductivity	520	µmhos/cm
GW	MW-6	1/1/1975	Calcium	19	mg/L
GW	MW-6	1/1/1975	Magnesium	1	mg/L
GW	MW-6	1/1/1975	Sodium	90	mg/L
GW	MW-6	1/1/1975	Bicarbonate	146	mg/L CaCO3
GW	MW-6	1/1/1975	Carbonate	0	mg/L CaCO3
GW	MW-6	1/1/1975	Potassium	7.3	mg/L
GW	MW-8	1/1/1975	Chloride	10	mg/L
GW	MW-8	1/1/1975	Fluoride	0.86	mg/L
GW	MW-8	1/1/1975	Nitrate as N (NO3)	15.4	mg/L
GW	MW-8	1/1/1975	Sulfate	21	mg/L
GW	MW-8	1/1/1975	TDS	293	mg/L
GW	MW-8	1/1/1975	pH	7.7	pH units

GW	MW-8	1/1/1975	Conductivity	440	µmhos/cm
GW	MW-8	1/1/1975	Calcium	34	mg/L
GW	MW-8	1/1/1975	Magnesium	10	mg/L
GW	MW-8	1/1/1975	Sodium	45	mg/L
GW	MW-8	1/1/1975	Bicarbonate	222	mg/L CaCO3
GW	MW-8	1/1/1975	Carbonate	0	mg/L CaCO3
GW	MW-8	1/1/1975	Potassium	6.2	mg/L
GW	MW-2	5/7/1975	Chloride	8	mg/L
GW	MW-2	5/7/1975	Fluoride	2.3	mg/L
GW	MW-2	5/7/1975	Sulfate	40	mg/L
GW	MW-2	5/7/1975	TDS	327	mg/L
GW	MW-2	5/7/1975	pH	7.9	pH units
GW	MW-2	5/7/1975	Conductivity	400	µmhos/cm
GW	MW-2	5/7/1975	Calcium	9	mg/L
GW	MW-2	5/7/1975	Magnesium	0	mg/L
GW	MW-2	5/7/1975	Sodium	89	mg/L
GW	MW-2	5/7/1975	Bicarbonate	209	mg/L CaCO3
GW	MW-2	5/7/1975	Carbonate	0	mg/L CaCO3
GW	MW-2	5/7/1975	Potassium	5.3	mg/L
GW	MW-4	6/13/1975	Chloride	15	mg/L
GW	MW-4	6/13/1975	Fluoride	0.63	mg/L
GW	MW-4	6/13/1975	Sulfate	110	mg/L
GW	MW-4	6/13/1975	pH	7.9	pH units
GW	MW-4	6/13/1975	Conductivity	620	µmhos/cm
GW	MW-4	6/13/1975	Calcium	46	mg/L
GW	MW-4	6/13/1975	Magnesium	10	mg/L
GW	MW-4	6/13/1975	Sodium	73	mg/L
GW	MW-4	6/13/1975	Bicarbonate	226	mg/L CaCO3
GW	MW-4	6/13/1975	Carbonate	0	mg/L CaCO3
GW	MW-4	6/13/1975	Potassium	4.4	mg/L
GW	MW-5	9/19/1975	Chloride	30	mg/L
GW	MW-5	9/19/1975	Fluoride	0.61	mg/L
GW	MW-5	9/19/1975	Nitrate as N (NO3)	<0.5	mg/L
GW	MW-5	9/19/1975	Sulfate	26	mg/L
GW	MW-5	9/19/1975	TDS	260	mg/L
GW	MW-5	9/19/1975	pH	7.7	pH units
GW	MW-5	9/19/1975	Conductivity	390	µmhos/cm
GW	MW-5	9/19/1975	Calcium	26	mg/L
GW	MW-5	9/19/1975	Magnesium	3	mg/L
GW	MW-5	9/19/1975	Sodium	54	mg/L
GW	MW-5	9/19/1975	Bicarbonate	157	mg/L CaCO3
GW	MW-5	9/19/1975	Carbonate	0	mg/L CaCO3
GW	MW-5	9/19/1975	Potassium	4.1	mg/L
GW	PW-1	12/23/1975	Chloride	16	mg/L
GW	PW-1	12/23/1975	Fluoride	0.46	mg/L
GW	PW-1	12/23/1975	Nitrate as N (NO3)	3.5	mg/L
GW	PW-1	12/23/1975	Sulfate	10	mg/L
GW	PW-1	12/23/1975	TDS	217	mg/L
GW	PW-1	12/23/1975	pH	7.8	pH units
GW	PW-1	12/23/1975	Conductivity	340	µmhos/cm
GW	PW-1	12/23/1975	Calcium	22	mg/L
GW	PW-1	12/23/1975	Magnesium	3	mg/L
GW	PW-1	12/23/1975	Sodium	38	mg/L
GW	PW-1	12/23/1975	Bicarbonate	145	mg/L CaCO3
GW	PW-1	12/23/1975	Carbonate	0	mg/L CaCO3
GW	PW-1	12/23/1975	Potassium	4.5	mg/L
GW	PW-2	1/15/1976	Chloride	17	mg/L
GW	PW-2	1/15/1976	Fluoride	0.66	mg/L
GW	PW-2	1/15/1976	Nitrate as N (NO3)	3.5	mg/L
GW	PW-2	1/15/1976	Sulfate	<5	mg/L
GW	PW-2	1/15/1976	TDS	257	mg/L
GW	PW-2	1/15/1976	pH	8.1	pH units
GW	PW-2	1/15/1976	Conductivity	310	µmhos/cm
GW	PW-2	1/15/1976	Calcium	21	mg/L
GW	PW-2	1/15/1976	Magnesium	3	mg/L
GW	PW-2	1/15/1976	Sodium	39	mg/L
GW	PW-2	1/15/1976	Bicarbonate	153	mg/L CaCO3
GW	PW-2	1/15/1976	Carbonate	0	mg/L CaCO3
GW	PW-2	1/15/1976	Potassium	4.3	mg/L
GW	PW-3	1/27/1976	Chloride	24	mg/L
GW	PW-3	1/27/1976	Fluoride	0.64	mg/L
GW	PW-3	1/27/1976	Nitrate as N (NO3)	2.6	mg/L
GW	PW-3	1/27/1976	Sulfate	<5	mg/L
GW	PW-3	1/27/1976	TDS	243	mg/L
GW	PW-3	1/27/1976	pH	8	pH units
GW	PW-3	1/27/1976	Conductivity	330	µmhos/cm

GW	PW-3	1/27/1976	Calcium	23	mg/L
GW	PW-3	1/27/1976	Magnesium	3	mg/L
GW	PW-3	1/27/1976	Sodium	44	mg/L
GW	PW-3	1/27/1976	Bicarbonate	158	mg/L CaCO3
GW	PW-3	1/27/1976	Carbonate	0	mg/L CaCO3
GW	PW-3	1/27/1976	Potassium	5.1	mg/L
GW	15.6.31.431	6/4/1976	Boron	<0.1	mg/L
GW	15.6.31.431	6/4/1976	Chloride	14.3	mg/L
GW	15.6.31.431	6/4/1976	Fluoride	0.52	mg/L
GW	15.6.31.431	6/4/1976	Iron	0.002	mg/L
GW	15.6.31.431	6/4/1976	Manganese	0.003	mg/L
GW	15.6.31.431	6/4/1976	Nitrate as N (NO3)	1.39	mg/L
GW	15.6.31.431	6/4/1976	Sulfate	137	mg/L
GW	15.6.31.431	6/4/1976	TDS	520	mg/L
GW	15.6.31.431	6/4/1976	pH	7.78	pH units
GW	15.6.31.431	6/4/1976	Conductivity	720	µmhos/cm
GW	15.6.31.431	6/4/1976	Calcium	117	mg/L
GW	15.6.31.431	6/4/1976	Magnesium	25.6	mg/L
GW	15.6.31.431	6/4/1976	Sodium	50.4	mg/L
GW	15.6.31.431	6/4/1976	Bicarbonate	228	mg/L CaCO3
GW	15.6.31.431	6/4/1976	Potassium	1.78	mg/L
GW	GWQ-8	6/4/1976	Boron	<0.1	mg/L
GW	GWQ-8	6/4/1976	Chloride	16.7	mg/L
GW	GWQ-8	6/4/1976	Fluoride	0.51	mg/L
GW	GWQ-8	6/4/1976	Iron	0.002	mg/L
GW	GWQ-8	6/4/1976	Manganese	0.003	mg/L
GW	GWQ-8	6/4/1976	Nitrate as N (NO3)	16.8	mg/L
GW	GWQ-8	6/4/1976	Sulfate	114	mg/L
GW	GWQ-8	6/4/1976	TDS	560	mg/L
GW	GWQ-8	6/4/1976	pH	7.48	pH units
GW	GWQ-8	6/4/1976	Conductivity	780	µmhos/cm
GW	GWQ-8	6/4/1976	Calcium	122	mg/L
GW	GWQ-8	6/4/1976	Magnesium	15.5	mg/L
GW	GWQ-8	6/4/1976	Sodium	76.1	mg/L
GW	GWQ-8	6/4/1976	Bicarbonate	241	mg/L CaCO3
GW	GWQ-8	6/4/1976	Potassium	1.72	mg/L
GW	GWQ-9	6/4/1976	Boron	<0.1	mg/L
GW	GWQ-9	6/4/1976	Chloride	19.9	mg/L
GW	GWQ-9	6/4/1976	Fluoride	0.44	mg/L
GW	GWQ-9	6/4/1976	Iron	0.004	mg/L
GW	GWQ-9	6/4/1976	Manganese	0.001	mg/L
GW	GWQ-9	6/4/1976	Nitrate as N (NO3)	4	mg/L
GW	GWQ-9	6/4/1976	Sulfate	34	mg/L
GW	GWQ-9	6/4/1976	TDS	350	mg/L
GW	GWQ-9	6/4/1976	pH	8.6	pH units
GW	GWQ-9	6/4/1976	Conductivity	480	µmhos/cm
GW	GWQ-9	6/4/1976	Calcium	69.2	mg/L
GW	GWQ-9	6/4/1976	Magnesium	15.2	mg/L
GW	GWQ-9	6/4/1976	Sodium	30	mg/L
GW	GWQ-9	6/4/1976	Bicarbonate	188	mg/L CaCO3
GW	GWQ-9	6/4/1976	Potassium	1.56	mg/L
GW	SHB-27	9/22/1976	Arsenic	<0.01	mg/L
GW	SHB-27	9/22/1976	Boron	<0.1	mg/L
GW	SHB-27	9/22/1976	Cadmium	<0.001	mg/L
GW	SHB-27	9/22/1976	Chloride	20.6	mg/L
GW	SHB-27	9/22/1976	Chromium	0.002	mg/L
GW	SHB-27	9/22/1976	Cobalt	<0.001	mg/L
GW	SHB-27	9/22/1976	Copper	0.002	mg/L
GW	SHB-27	9/22/1976	Fluoride	0.77	mg/L
GW	SHB-27	9/22/1976	Iron	0.007	mg/L
GW	SHB-27	9/22/1976	Lead	<0.001	mg/L
GW	SHB-27	9/22/1976	Manganese	0.039	mg/L
GW	SHB-27	9/22/1976	Mercury	<0.0004	mg/L
GW	SHB-27	9/22/1976	Molybdenum	0.002	mg/L
GW	SHB-27	9/22/1976	Nitrate as N (NO3)	0.8	mg/L
GW	SHB-27	9/22/1976	Selenium	<0.01	mg/L
GW	SHB-27	9/22/1976	Silver	<0.001	mg/L
GW	SHB-27	9/22/1976	Sulfate	233	mg/L
GW	SHB-27	9/22/1976	TDS	434	mg/L
GW	SHB-27	9/22/1976	Zinc	0.004	mg/L
GW	SHB-27	9/22/1976	pH	7.61	pH units
GW	SHB-27	9/22/1976	Conductivity	720	µmhos/cm
GW	SHB-27	9/22/1976	Calcium	5.86	mg/L
GW	SHB-27	9/22/1976	Magnesium	21.4	mg/L
GW	SHB-27	9/22/1976	Sodium	51.1	mg/L
GW	SHB-27	9/22/1976	Bicarbonate	205	mg/L CaCO3

GW	SHB-27	9/22/1976	Potassium	5.86	mg/L
GW	SHB-28	9/22/1976	Boron	<0.1	mg/L
GW	SHB-28	9/22/1976	Cadmium	<0.001	mg/L
GW	SHB-28	9/22/1976	Chloride	51.2	mg/L
GW	SHB-28	9/22/1976	Chromium	0.002	mg/L
GW	SHB-28	9/22/1976	Cobalt	<0.001	mg/L
GW	SHB-28	9/22/1976	Copper	0.005	mg/L
GW	SHB-28	9/22/1976	Fluoride	0.97	mg/L
GW	SHB-28	9/22/1976	Iron	0.015	mg/L
GW	SHB-28	9/22/1976	Lead	<0.001	mg/L
GW	SHB-28	9/22/1976	Manganese	0.42	mg/L
GW	SHB-28	9/22/1976	Mercury	<0.0004	mg/L
GW	SHB-28	9/22/1976	Molybdenum	0.003	mg/L
GW	SHB-28	9/22/1976	Nitrate as N (NO3)	<0.1	mg/L
GW	SHB-28	9/22/1976	Selenium	<0.01	mg/L
GW	SHB-28	9/22/1976	Silver	<0.001	mg/L
GW	SHB-28	9/22/1976	Sulfate	353	mg/L
GW	SHB-28	9/22/1976	TDS	840	mg/L
GW	SHB-28	9/22/1976	Zinc	0.018	mg/L
GW	SHB-28	9/22/1976	pH	7.58	pH units
GW	SHB-28	9/22/1976	Conductivity	1260	µmhos/cm
GW	SHB-28	9/22/1976	Calcium	163	mg/L
GW	SHB-28	9/22/1976	Magnesium	32	mg/L
GW	SHB-28	9/22/1976	Sodium	81.7	mg/L
GW	SHB-28	9/22/1976	Bicarbonate	264	mg/L CaCO3
GW	SHB-28	9/22/1976	Potassium	11.5	mg/L
GW	SHB-29	9/22/1976	Boron	0.1	mg/L
GW	SHB-29	9/22/1976	Cadmium	0.001	mg/L
GW	SHB-29	9/22/1976	Chromium	0.004	mg/L
GW	SHB-29	9/22/1976	Cobalt	0.001	mg/L
GW	SHB-29	9/22/1976	Copper	0.002	mg/L
GW	SHB-29	9/22/1976	Iron	0.52	mg/L
GW	SHB-29	9/22/1976	Lead	0.002	mg/L
GW	SHB-29	9/22/1976	Manganese	0.049	mg/L
GW	SHB-29	9/22/1976	Mercury	<0.0004	mg/L
GW	SHB-29	9/22/1976	Molybdenum	0.003	mg/L
GW	SHB-29	9/22/1976	Nitrate as N (NO3)	<0.1	mg/L
GW	SHB-29	9/22/1976	Selenium	<0.01	mg/L
GW	SHB-29	9/22/1976	Silver	<0.001	mg/L
GW	SHB-29	9/22/1976	TDS	384	mg/L
GW	SHB-29	9/22/1976	Zinc	0.16	mg/L
GW	SHB-29	9/22/1976	pH	7.98	pH units
GW	SHB-29	9/22/1976	Conductivity	640	µmhos/cm
GW	SHB-29	9/22/1976	Calcium	65.1	mg/L
GW	SHB-29	9/22/1976	Magnesium	14.5	mg/L
GW	SHB-29	9/22/1976	Sodium	60.3	mg/L
GW	SHB-29	9/22/1976	Potassium	5.02	mg/L
GW	SHB-30	9/22/1976	Arsenic	0.02	mg/L
GW	SHB-30	9/22/1976	Boron	<0.1	mg/L
GW	SHB-30	9/22/1976	Cadmium	<0.001	mg/L
GW	SHB-30	9/22/1976	Chloride	21	mg/L
GW	SHB-30	9/22/1976	Chromium	0.004	mg/L
GW	SHB-30	9/22/1976	Cobalt	<0.001	mg/L
GW	SHB-30	9/22/1976	Copper	0.002	mg/L
GW	SHB-30	9/22/1976	Fluoride	0.79	mg/L
GW	SHB-30	9/22/1976	Iron	0.009	mg/L
GW	SHB-30	9/22/1976	Lead	<0.001	mg/L
GW	SHB-30	9/22/1976	Manganese	0.036	mg/L
GW	SHB-30	9/22/1976	Mercury	<0.0004	mg/L
GW	SHB-30	9/22/1976	Molybdenum	0.002	mg/L
GW	SHB-30	9/22/1976	Nitrate as N (NO3)	0.7	mg/L
GW	SHB-30	9/22/1976	Selenium	<0.01	mg/L
GW	SHB-30	9/22/1976	Silver	<0.001	mg/L
GW	SHB-30	9/22/1976	Sulfate	145	mg/L
GW	SHB-30	9/22/1976	TDS	486	mg/L
GW	SHB-30	9/22/1976	Zinc	0.004	mg/L
GW	SHB-30	9/22/1976	pH	7.77	pH units
GW	SHB-30	9/22/1976	Conductivity	720	µmhos/cm
GW	SHB-30	9/22/1976	Calcium	84.8	mg/L
GW	SHB-30	9/22/1976	Magnesium	21.3	mg/L
GW	SHB-30	9/22/1976	Sodium	50.6	mg/L
GW	SHB-30	9/22/1976	Bicarbonate	211	mg/L CaCO3
GW	SHB-30	9/22/1976	Potassium	4.88	mg/L
GW	SHB-34	9/22/1976	Boron	<0.1	mg/L
GW	SHB-34	9/22/1976	Cadmium	0.001	mg/L
GW	SHB-34	9/22/1976	Chloride	<1	mg/L

GW	SHB-34	9/22/1976	Chromium	0.002	mg/L
GW	SHB-34	9/22/1976	Cobalt	<0.001	mg/L
GW	SHB-34	9/22/1976	Copper	0.002	mg/L
GW	SHB-34	9/22/1976	Fluoride	0.14	mg/L
GW	SHB-34	9/22/1976	Iron	0.009	mg/L
GW	SHB-34	9/22/1976	Lead	0.001	mg/L
GW	SHB-34	9/22/1976	Manganese	0.004	mg/L
GW	SHB-34	9/22/1976	Mercury	<0.0004	mg/L
GW	SHB-34	9/22/1976	Molybdenum	<0.001	mg/L
GW	SHB-34	9/22/1976	Nitrate as N (NO3)	<0.1	mg/L
GW	SHB-34	9/22/1976	Selenium	<0.01	mg/L
GW	SHB-34	9/22/1976	Silver	<0.001	mg/L
GW	SHB-34	9/22/1976	Sulfate	<1	mg/L
GW	SHB-34	9/22/1976	TDS	50	mg/L
GW	SHB-34	9/22/1976	Zinc	0.014	mg/L
GW	SHB-34	9/22/1976	pH	7.36	pH units
GW	SHB-34	9/22/1976	Conductivity	41	µmhos/cm
GW	SHB-34	9/22/1976	Calcium	3.67	mg/L
GW	SHB-34	9/22/1976	Magnesium	0.52	mg/L
GW	SHB-34	9/22/1976	Sodium	2.55	mg/L
GW	SHB-34	9/22/1976	Bicarbonate	12	mg/L CaCO3
GW	SHB-34	9/22/1976	Potassium	0.63	mg/L
GW	GWQ-1	1/20/1981	Chloride	200	mg/L
GW	GWQ-1	1/20/1981	Iron	0.05	mg/L
GW	GWQ-1	1/20/1981	Sulfate	250	mg/L
GW	GWQ-1	1/20/1981	TDS	450	mg/L
GW	GWQ-1	1/20/1981	pH	7.3	pH units
GW	GWQ-1	1/20/1981	Calcium	84	mg/L
GW	GWQ-1	1/20/1981	Magnesium	14.6	mg/L
GW	GWQ-1	1/20/1981	Sodium	632	mg/L
GW	GWQ-1	1/20/1981	Bicarbonate	280.6	mg/L CaCO3
GW	GWQ-1	1/20/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-7	1/20/1981	Chloride	200	mg/L
GW	GWQ-7	1/20/1981	Iron	0.03	mg/L
GW	GWQ-7	1/20/1981	Sulfate	350	mg/L
GW	GWQ-7	1/20/1981	TDS	500	mg/L
GW	GWQ-7	1/20/1981	pH	7.2	pH units
GW	GWQ-7	1/20/1981	Calcium	96	mg/L
GW	GWQ-7	1/20/1981	Magnesium	14.6	mg/L
GW	GWQ-7	1/20/1981	Sodium	781	mg/L
GW	GWQ-7	1/20/1981	Bicarbonate	341.6	mg/L CaCO3
GW	GWQ-7	1/20/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-9	1/20/1981	Chloride	200	mg/L
GW	GWQ-9	1/20/1981	Iron	0.05	mg/L
GW	GWQ-9	1/20/1981	Sulfate	300	mg/L
GW	GWQ-9	1/20/1981	TDS	450	mg/L
GW	GWQ-9	1/20/1981	pH	7.4	pH units
GW	GWQ-9	1/20/1981	Calcium	92	mg/L
GW	GWQ-9	1/20/1981	Magnesium	9.7	mg/L
GW	GWQ-9	1/20/1981	Sodium	703	mg/L
GW	GWQ-9	1/20/1981	Bicarbonate	305	mg/L CaCO3
GW	GWQ-9	1/20/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-1	2/2/1981	Chloride	20	mg/L
GW	GWQ-1	2/2/1981	Iron	1.7	mg/L
GW	GWQ-1	2/2/1981	Sulfate	156	mg/L
GW	GWQ-1	2/2/1981	TDS	520	mg/L
GW	GWQ-1	2/2/1981	pH	7.9	pH units
GW	GWQ-1	2/2/1981	Calcium	74	mg/L
GW	GWQ-1	2/2/1981	Magnesium	20	mg/L
GW	GWQ-1	2/2/1981	Sodium	60	mg/L
GW	GWQ-1	2/2/1981	Bicarbonate	276	mg/L CaCO3
GW	GWQ-1	2/2/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-7	2/2/1981	Chloride	20	mg/L
GW	GWQ-7	2/2/1981	Iron	3.8	mg/L
GW	GWQ-7	2/2/1981	Sulfate	156	mg/L
GW	GWQ-7	2/2/1981	TDS	530	mg/L
GW	GWQ-7	2/2/1981	pH	7.9	pH units
GW	GWQ-7	2/2/1981	Calcium	74	mg/L
GW	GWQ-7	2/2/1981	Magnesium	27	mg/L
GW	GWQ-7	2/2/1981	Sodium	51	mg/L
GW	GWQ-7	2/2/1981	Bicarbonate	278	mg/L CaCO3
GW	GWQ-7	2/2/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-8	2/2/1981	Chloride	20	mg/L
GW	GWQ-8	2/2/1981	Iron	1.7	mg/L
GW	GWQ-8	2/2/1981	Nitrate as N (NO3)	60	mg/L
GW	GWQ-8	2/2/1981	Sulfate	156	mg/L

GW	GWQ-8	2/2/1981	TDS	520	mg/L
GW	GWQ-8	2/2/1981	pH	7.9	pH units
GW	GWQ-8	2/2/1981	Calcium	74	mg/L
GW	GWQ-8	2/2/1981	Magnesium	20	mg/L
GW	GWQ-8	2/2/1981	Bicarbonate	276	mg/L CaCO3
GW	GWQ-9	2/2/1981	Chloride	20	mg/L
GW	GWQ-9	2/2/1981	Iron	1.8	mg/L
GW	GWQ-9	2/2/1981	Sulfate	156	mg/L
GW	GWQ-9	2/2/1981	TDS	510	mg/L
GW	GWQ-9	2/2/1981	pH	7.9	pH units
GW	GWQ-9	2/2/1981	Calcium	73	mg/L
GW	GWQ-9	2/2/1981	Magnesium	24	mg/L
GW	GWQ-9	2/2/1981	Sodium	49	mg/L
GW	GWQ-9	2/2/1981	Bicarbonate	273	mg/L CaCO3
GW	GWQ-9	2/2/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-1	3/27/1981	Arsenic	<0.01	mg/L
GW	GWQ-1	3/27/1981	Copper	<0.05	mg/L
GW	GWQ-1	3/27/1981	Cyanide	<0.01	mg/L
GW	GWQ-1	3/27/1981	Fluoride	0.6	mg/L
GW	GWQ-1	3/27/1981	Lead	<0.02	mg/L
GW	GWQ-1	3/27/1981	Nitrate as N (NO3)	5.5	mg/L
GW	GWQ-1	3/27/1981	Zinc	0.16	mg/L
GW	GWQ-3	3/27/1981	Arsenic	<0.01	mg/L
GW	GWQ-3	3/27/1981	Copper	<0.05	mg/L
GW	GWQ-3	3/27/1981	Cyanide	<0.01	mg/L
GW	GWQ-3	3/27/1981	Fluoride	0.6	mg/L
GW	GWQ-3	3/27/1981	Lead	<0.02	mg/L
GW	GWQ-3	3/27/1981	Nitrate as N (NO3)	5.5	mg/L
GW	GWQ-3	3/27/1981	Zinc	0.16	mg/L
GW	GWQ-7	3/27/1981	Arsenic	<0.01	mg/L
GW	GWQ-7	3/27/1981	Copper	<0.05	mg/L
GW	GWQ-7	3/27/1981	Cyanide	<0.01	mg/L
GW	GWQ-7	3/27/1981	Fluoride	0.6	mg/L
GW	GWQ-7	3/27/1981	Lead	<0.02	mg/L
GW	GWQ-7	3/27/1981	Nitrate as N (NO3)	1.4	mg/L
GW	GWQ-7	3/27/1981	Zinc	0.28	mg/L
GW	GWQ-9	3/27/1981	Arsenic	<0.01	mg/L
GW	GWQ-9	3/27/1981	Copper	<0.05	mg/L
GW	GWQ-9	3/27/1981	Cyanide	<0.01	mg/L
GW	GWQ-9	3/27/1981	Fluoride	0.6	mg/L
GW	GWQ-9	3/27/1981	Lead	<0.02	mg/L
GW	GWQ-9	3/27/1981	Nitrate as N (NO3)	1.4	mg/L
GW	GWQ-9	3/27/1981	Zinc	0.16	mg/L
GW	GWQ-10	4/6/1981	Arsenic	0.002	mg/L
GW	GWQ-10	4/6/1981	Cadmium	<0.01	mg/L
GW	GWQ-10	4/6/1981	Copper	<0.05	mg/L
GW	GWQ-10	4/6/1981	Cyanide	0.02	mg/L
GW	GWQ-10	4/6/1981	Fluoride	0.53	mg/L
GW	GWQ-10	4/6/1981	Lead	<0.01	mg/L
GW	GWQ-10	4/6/1981	Mercury	<1	mg/L
GW	GWQ-10	4/6/1981	Nitrate as N (NO3)	4.6	mg/L
GW	GWQ-10	4/6/1981	Zinc	0.12	mg/L
GW	GWQ-10	4/6/1981	Potassium	8.25	mg/L
GW	GWQ-7	4/6/1981	Arsenic	0.003	mg/L
GW	GWQ-7	4/6/1981	Copper	<0.05	mg/L
GW	GWQ-7	4/6/1981	Cyanide	0.36	mg/L
GW	GWQ-7	4/6/1981	Fluoride	0.59	mg/L
GW	GWQ-7	4/6/1981	Lead	<0.01	mg/L
GW	GWQ-7	4/6/1981	Nitrate as N (NO3)	0.9	mg/L
GW	GWQ-7	4/6/1981	Zinc	0.24	mg/L
GW	GWQ-9	4/6/1981	Arsenic	0.002	mg/L
GW	GWQ-9	4/6/1981	Copper	<0.05	mg/L
GW	GWQ-9	4/6/1981	Cyanide	0.15	mg/L
GW	GWQ-9	4/6/1981	Fluoride	0.56	mg/L
GW	GWQ-9	4/6/1981	Lead	<0.01	mg/L
GW	GWQ-9	4/6/1981	Nitrate as N (NO3)	1.2	mg/L
GW	GWQ-9	4/6/1981	Zinc	0.13	mg/L
GW	15.6.31.431	4/9/1981	Aluminum	<0.1	mg/L
GW	15.6.31.431	4/9/1981	Arsenic	<0.005	mg/L
GW	15.6.31.431	4/9/1981	Barium	<0.1	mg/L
GW	15.6.31.431	4/9/1981	Boron	0.025	mg/L
GW	15.6.31.431	4/9/1981	Cadmium	<0.001	mg/L
GW	15.6.31.431	4/9/1981	Chloride	22	mg/L
GW	15.6.31.431	4/9/1981	Chromium	<0.005	mg/L
GW	15.6.31.431	4/9/1981	Copper	0.7	mg/L
GW	15.6.31.431	4/9/1981	Fluoride	0.58	mg/L

GW	15.6.31.431	4/9/1981	Iron	<0.25	mg/L
GW	15.6.31.431	4/9/1981	Lead	<0.005	mg/L
GW	15.6.31.431	4/9/1981	Manganese	<0.05	mg/L
GW	15.6.31.431	4/9/1981	Molybdenum	0.005	mg/L
GW	15.6.31.431	4/9/1981	Nickel	<0.01	mg/L
GW	15.6.31.431	4/9/1981	Nitrate as N (NO3)	1.14	mg/L
GW	15.6.31.431	4/9/1981	Selenium	<0.005	mg/L
GW	15.6.31.431	4/9/1981	Sulfate	144.5	mg/L
GW	15.6.31.431	4/9/1981	Zinc	0.14	mg/L
GW	15.6.31.431	4/9/1981	Bicarbonate	285.7	mg/L CaCO3
GW	GWQ-1	6/11/1981	Aluminum	<0.05	mg/L
GW	GWQ-1	6/11/1981	Arsenic	<0.005	mg/L
GW	GWQ-1	6/11/1981	Barium	<0.1	mg/L
GW	GWQ-1	6/11/1981	Boron	<0.1	mg/L
GW	GWQ-1	6/11/1981	Cadmium	<0.0005	mg/L
GW	GWQ-1	6/11/1981	Chromium	<0.025	mg/L
GW	GWQ-1	6/11/1981	Cobalt	<0.05	mg/L
GW	GWQ-1	6/11/1981	Copper	<0.025	mg/L
GW	GWQ-1	6/11/1981	Iron	<0.05	mg/L
GW	GWQ-1	6/11/1981	Lead	<0.005	mg/L
GW	GWQ-1	6/11/1981	Manganese	<0.03	mg/L
GW	GWQ-1	6/11/1981	Mercury	<0.001	mg/L
GW	GWQ-1	6/11/1981	Molybdenum	<0.05	mg/L
GW	GWQ-1	6/11/1981	Nickel	<0.05	mg/L
GW	GWQ-1	6/11/1981	Selenium	<0.005	mg/L
GW	GWQ-1	6/11/1981	Silver	<0.025	mg/L
GW	GWQ-1	6/11/1981	Zinc	<0.05	mg/L
GW	GWQ-1	6/11/1981	Antimony	<0.005	mg/L
GW	GWQ-1	6/11/1981	Beryllium	<0.002	mg/L
GW	GWQ-1	6/11/1981	Thallium	<0.005	mg/L
GW	GWQ-1	6/15/1981	Aluminum	<0.25	mg/L
GW	GWQ-1	6/15/1981	Aluminum	<0.01	mg/L
GW	GWQ-1	6/15/1981	Arsenic	<0.002	mg/L
GW	GWQ-1	6/15/1981	Arsenic	<0.01	mg/L
GW	GWQ-1	6/15/1981	Barium	<1	mg/L
GW	GWQ-1	6/15/1981	Barium	<0.2	mg/L
GW	GWQ-1	6/15/1981	Boron	0.076	mg/L
GW	GWQ-1	6/15/1981	Boron	<0.1	mg/L
GW	GWQ-1	6/15/1981	Cadmium	<0.01	mg/L
GW	GWQ-1	6/15/1981	Cadmium	<0.005	mg/L
GW	GWQ-1	6/15/1981	Chloride	22	mg/L
GW	GWQ-1	6/15/1981	Chloride	16	mg/L
GW	GWQ-1	6/15/1981	Chromium	<0.05	mg/L
GW	GWQ-1	6/15/1981	Chromium	<0.01	mg/L
GW	GWQ-1	6/15/1981	Cobalt	<0.05	mg/L
GW	GWQ-1	6/15/1981	Copper	<0.02	mg/L
GW	GWQ-1	6/15/1981	Copper	<0.05	mg/L
GW	GWQ-1	6/15/1981	Cyanide	<0.05	mg/L
GW	GWQ-1	6/15/1981	Cyanide	<0.01	mg/L
GW	GWQ-1	6/15/1981	Fluoride	0.51	mg/L
GW	GWQ-1	6/15/1981	Fluoride	0.5	mg/L
GW	GWQ-1	6/15/1981	Iron	<0.05	mg/L
GW	GWQ-1	6/15/1981	Iron	<0.1	mg/L
GW	GWQ-1	6/15/1981	Lead	<0.05	mg/L
GW	GWQ-1	6/15/1981	Lead	<0.02	mg/L
GW	GWQ-1	6/15/1981	Manganese	<0.02	mg/L
GW	GWQ-1	6/15/1981	Manganese	<0.05	mg/L
GW	GWQ-1	6/15/1981	Mercury	<0.001	mg/L
GW	GWQ-1	6/15/1981	Molybdenum	<0.1	mg/L
GW	GWQ-1	6/15/1981	Molybdenum	<0.05	mg/L
GW	GWQ-1	6/15/1981	Nickel	<0.05	mg/L
GW	GWQ-1	6/15/1981	Nitrate as N (NO3)	3.75	mg/L
GW	GWQ-1	6/15/1981	Nitrate as N (NO3)	5.1	mg/L
GW	GWQ-1	6/15/1981	Selenium	0.0022	mg/L
GW	GWQ-1	6/15/1981	Selenium	<0.005	mg/L
GW	GWQ-1	6/15/1981	Silver	<0.02	mg/L
GW	GWQ-1	6/15/1981	Sulfate	117	mg/L
GW	GWQ-1	6/15/1981	Sulfate	148	mg/L
GW	GWQ-1	6/15/1981	TDS	500	mg/L
GW	GWQ-1	6/15/1981	Zinc	0.078	mg/L
GW	GWQ-1	6/15/1981	Zinc	0.12	mg/L
GW	GWQ-1	6/15/1981	pH	7.4	pH units
GW	GWQ-1	6/15/1981	Calcium	81	mg/L
GW	GWQ-1	6/15/1981	Magnesium	12	mg/L
GW	GWQ-1	6/15/1981	Thallium	<0.005	mg/L
GW	GWQ-1	6/15/1981	Sodium	49.1	mg/L

GW	GWQ-1	6/15/1981	Potassium	3.06	mg/L
GW	GWQ-1	6/15/1981	Conductivity	700	µmhos/cm
GW	GWQ-1	6/15/1981	Calcium	82	mg/L
GW	GWQ-1	6/15/1981	Magnesium	19	mg/L
GW	GWQ-1	6/15/1981	Sodium	57	mg/L
GW	GWQ-1	6/15/1981	Bicarbonate	251	mg/L CaCO3
GW	GWQ-1	6/15/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-1	6/15/1981	Potassium	2	mg/L
GW	GWQ-2	6/15/1981	Aluminum	<0.01	mg/L
GW	GWQ-2	6/15/1981	Arsenic	<0.01	mg/L
GW	GWQ-2	6/15/1981	Barium	<0.2	mg/L
GW	GWQ-2	6/15/1981	Boron	<0.1	mg/L
GW	GWQ-2	6/15/1981	Cadmium	<0.005	mg/L
GW	GWQ-2	6/15/1981	Chloride	20	mg/L
GW	GWQ-2	6/15/1981	Chromium	<0.01	mg/L
GW	GWQ-2	6/15/1981	Cobalt	<0.1	mg/L
GW	GWQ-2	6/15/1981	Copper	<0.05	mg/L
GW	GWQ-2	6/15/1981	Cyanide	<0.01	mg/L
GW	GWQ-2	6/15/1981	Fluoride	0.5	mg/L
GW	GWQ-2	6/15/1981	Iron	<0.1	mg/L
GW	GWQ-2	6/15/1981	Lead	<0.02	mg/L
GW	GWQ-2	6/15/1981	Manganese	<0.05	mg/L
GW	GWQ-2	6/15/1981	Mercury	0.0013	mg/L
GW	GWQ-2	6/15/1981	Molybdenum	<0.05	mg/L
GW	GWQ-2	6/15/1981	Nickel	<0.05	mg/L
GW	GWQ-2	6/15/1981	Nitrate as N (NO3)	5.6	mg/L
GW	GWQ-2	6/15/1981	Selenium	<0.005	mg/L
GW	GWQ-2	6/15/1981	Silver	<0.02	mg/L
GW	GWQ-2	6/15/1981	Sulfate	140	mg/L
GW	GWQ-2	6/15/1981	TDS	530	mg/L
GW	GWQ-2	6/15/1981	Zinc	0.16	mg/L
GW	GWQ-2	6/15/1981	pH	7.3	pH units
GW	GWQ-2	6/15/1981	Conductivity	700	µmhos/cm
GW	GWQ-2	6/15/1981	Calcium	102	mg/L
GW	GWQ-2	6/15/1981	Magnesium	16	mg/L
GW	GWQ-2	6/15/1981	Sodium	42	mg/L
GW	GWQ-2	6/15/1981	Bicarbonate	242	mg/L CaCO3
GW	GWQ-2	6/15/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-2	6/15/1981	Potassium	2.3	mg/L
GW	GWQ-3	6/15/1981	Aluminum	<0.25	mg/L
GW	GWQ-3	6/15/1981	Aluminum	<0.01	mg/L
GW	GWQ-3	6/15/1981	Arsenic	0.004	mg/L
GW	GWQ-3	6/15/1981	Arsenic	<0.01	mg/L
GW	GWQ-3	6/15/1981	Barium	<1	mg/L
GW	GWQ-3	6/15/1981	Barium	<0.2	mg/L
GW	GWQ-3	6/15/1981	Boron	0.108	mg/L
GW	GWQ-3	6/15/1981	Boron	<0.1	mg/L
GW	GWQ-3	6/15/1981	Cadmium	<0.01	mg/L
GW	GWQ-3	6/15/1981	Cadmium	<0.005	mg/L
GW	GWQ-3	6/15/1981	Chloride	40.1	mg/L
GW	GWQ-3	6/15/1981	Chloride	32	mg/L
GW	GWQ-3	6/15/1981	Chromium	<0.05	mg/L
GW	GWQ-3	6/15/1981	Chromium	<0.01	mg/L
GW	GWQ-3	6/15/1981	Cobalt	<0.05	mg/L
GW	GWQ-3	6/15/1981	Copper	<0.02	mg/L
GW	GWQ-3	6/15/1981	Copper	<0.05	mg/L
GW	GWQ-3	6/15/1981	Cyanide	<0.05	mg/L
GW	GWQ-3	6/15/1981	Cyanide	<0.01	mg/L
GW	GWQ-3	6/15/1981	Fluoride	0.72	mg/L
GW	GWQ-3	6/15/1981	Fluoride	0.7	mg/L
GW	GWQ-3	6/15/1981	Iron	<0.05	mg/L
GW	GWQ-3	6/15/1981	Iron	<0.1	mg/L
GW	GWQ-3	6/15/1981	Lead	<0.05	mg/L
GW	GWQ-3	6/15/1981	Lead	0.073	mg/L
GW	GWQ-3	6/15/1981	Manganese	0.02	mg/L
GW	GWQ-3	6/15/1981	Manganese	<0.05	mg/L
GW	GWQ-3	6/15/1981	Mercury	<0.001	mg/L
GW	GWQ-3	6/15/1981	Molybdenum	<0.1	mg/L
GW	GWQ-3	6/15/1981	Molybdenum	<0.05	mg/L
GW	GWQ-3	6/15/1981	Nickel	<0.05	mg/L
GW	GWQ-3	6/15/1981	Nitrate as N (NO3)	0.25	mg/L
GW	GWQ-3	6/15/1981	Nitrate as N (NO3)	0.1	mg/L
GW	GWQ-3	6/15/1981	Selenium	0.0037	mg/L
GW	GWQ-3	6/15/1981	Selenium	<0.005	mg/L
GW	GWQ-3	6/15/1981	Silver	<0.02	mg/L
GW	GWQ-3	6/15/1981	Sulfate	335	mg/L

GW	GWQ-3	6/15/1981	Sulfate	383	mg/L
GW	GWQ-3	6/15/1981	TDS	868	mg/L
GW	GWQ-3	6/15/1981	TDS	890	mg/L
GW	GWQ-3	6/15/1981	Zinc	0.061	mg/L
GW	GWQ-3	6/15/1981	Zinc	0.32	mg/L
GW	GWQ-3	6/15/1981	pH	7	pH units
GW	GWQ-3	6/15/1981	Calcium	138	mg/L
GW	GWQ-3	6/15/1981	Magnesium	25.8	mg/L
GW	GWQ-3	6/15/1981	Sodium	86	mg/L
GW	GWQ-3	6/15/1981	Bicarbonate	354	mg/L CaCO3
GW	GWQ-3	6/15/1981	Carbonate	<1	mg/L CaCO3
GW	GWQ-3	6/15/1981	Potassium	2.66	mg/L
GW	GWQ-3	6/15/1981	Conductivity	1100	µmhos/cm
GW	GWQ-3	6/15/1981	Calcium	146	mg/L
GW	GWQ-3	6/15/1981	Magnesium	33	mg/L
GW	GWQ-3	6/15/1981	Sodium	95	mg/L
GW	GWQ-3	6/15/1981	Bicarbonate	327	mg/L CaCO3
GW	GWQ-3	6/15/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-3	6/15/1981	Potassium	1.7	mg/L
GW	GWQ-4	6/15/1981	Aluminum	<0.01	mg/L
GW	GWQ-4	6/15/1981	Aluminum	<0.25	mg/L
GW	GWQ-4	6/15/1981	Arsenic	<0.01	mg/L
GW	GWQ-4	6/15/1981	Arsenic	<0.002	mg/L
GW	GWQ-4	6/15/1981	Barium	<0.2	mg/L
GW	GWQ-4	6/15/1981	Barium	<1	mg/L
GW	GWQ-4	6/15/1981	Boron	<0.1	mg/L
GW	GWQ-4	6/15/1981	Boron	0.065	mg/L
GW	GWQ-4	6/15/1981	Cadmium	<0.005	mg/L
GW	GWQ-4	6/15/1981	Cadmium	<0.01	mg/L
GW	GWQ-4	6/15/1981	Chloride	30	mg/L
GW	GWQ-4	6/15/1981	Chloride	35.1	mg/L
GW	GWQ-4	6/15/1981	Chromium	<0.01	mg/L
GW	GWQ-4	6/15/1981	Chromium	<0.05	mg/L
GW	GWQ-4	6/15/1981	Cobalt	<0.05	mg/L
GW	GWQ-4	6/15/1981	Copper	<0.05	mg/L
GW	GWQ-4	6/15/1981	Copper	<0.02	mg/L
GW	GWQ-4	6/15/1981	Cyanide	<0.01	mg/L
GW	GWQ-4	6/15/1981	Cyanide	<0.05	mg/L
GW	GWQ-4	6/15/1981	Fluoride	0.6	mg/L
GW	GWQ-4	6/15/1981	Fluoride	0.68	mg/L
GW	GWQ-4	6/15/1981	Iron	<0.1	mg/L
GW	GWQ-4	6/15/1981	Iron	<0.05	mg/L
GW	GWQ-4	6/15/1981	Lead	<0.02	mg/L
GW	GWQ-4	6/15/1981	Lead	<0.05	mg/L
GW	GWQ-4	6/15/1981	Manganese	<0.05	mg/L
GW	GWQ-4	6/15/1981	Manganese	<0.02	mg/L
GW	GWQ-4	6/15/1981	Mercury	<0.001	mg/L
GW	GWQ-4	6/15/1981	Molybdenum	<0.05	mg/L
GW	GWQ-4	6/15/1981	Molybdenum	<0.1	mg/L
GW	GWQ-4	6/15/1981	Nickel	<0.05	mg/L
GW	GWQ-4	6/15/1981	Nitrate as N (NO3)	1.1	mg/L
GW	GWQ-4	6/15/1981	Nitrate as N (NO3)	0.53	mg/L
GW	GWQ-4	6/15/1981	Selenium	<0.005	mg/L
GW	GWQ-4	6/15/1981	Selenium	0.0025	mg/L
GW	GWQ-4	6/15/1981	Silver	<0.02	mg/L
GW	GWQ-4	6/15/1981	Sulfate	270	mg/L
GW	GWQ-4	6/15/1981	Sulfate	255	mg/L
GW	GWQ-4	6/15/1981	TDS	770	mg/L
GW	GWQ-4	6/15/1981	TDS	776	mg/L
GW	GWQ-4	6/15/1981	Zinc	0.056	mg/L
GW	GWQ-4	6/15/1981	Zinc	<0.025	mg/L
GW	GWQ-4	6/15/1981	pH	7.2	pH units
GW	GWQ-4	6/15/1981	Conductivity	1000	µmhos/cm
GW	GWQ-4	6/15/1981	Calcium	137	mg/L
GW	GWQ-4	6/15/1981	Magnesium	27	mg/L
GW	GWQ-4	6/15/1981	Sodium	91	mg/L
GW	GWQ-4	6/15/1981	Bicarbonate	376	mg/L CaCO3
GW	GWQ-4	6/15/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-4	6/15/1981	Potassium	1.2	mg/L
GW	GWQ-4	6/15/1981	Calcium	132	mg/L
GW	GWQ-4	6/15/1981	Magnesium	18.6	mg/L
GW	GWQ-4	6/15/1981	Sodium	73.8	mg/L
GW	GWQ-4	6/15/1981	Bicarbonate	370	mg/L CaCO3
GW	GWQ-4	6/15/1981	Carbonate	<0.1	mg/L CaCO3
GW	GWQ-4	6/15/1981	Potassium	2.03	mg/L
GW	GWQ-5	6/15/1981	Aluminum	<0.01	mg/L

GW	GWQ-5	6/15/1981	Aluminum	<0.25	mg/L
GW	GWQ-5	6/15/1981	Arsenic	<0.01	mg/L
GW	GWQ-5	6/15/1981	Arsenic	<0.002	mg/L
GW	GWQ-5	6/15/1981	Barium	<0.2	mg/L
GW	GWQ-5	6/15/1981	Barium	<1	mg/L
GW	GWQ-5	6/15/1981	Boron	<0.1	mg/L
GW	GWQ-5	6/15/1981	Boron	0.054	mg/L
GW	GWQ-5	6/15/1981	Cadmium	<0.005	mg/L
GW	GWQ-5	6/15/1981	Cadmium	<0.01	mg/L
GW	GWQ-5	6/15/1981	Chloride	42	mg/L
GW	GWQ-5	6/15/1981	Chloride	45	mg/L
GW	GWQ-5	6/15/1981	Chromium	<0.01	mg/L
GW	GWQ-5	6/15/1981	Chromium	<0.05	mg/L
GW	GWQ-5	6/15/1981	Cobalt	<0.05	mg/L
GW	GWQ-5	6/15/1981	Copper	<0.05	mg/L
GW	GWQ-5	6/15/1981	Copper	<0.02	mg/L
GW	GWQ-5	6/15/1981	Cyanide	<0.01	mg/L
GW	GWQ-5	6/15/1981	Cyanide	<0.05	mg/L
GW	GWQ-5	6/15/1981	Fluoride	1	mg/L
GW	GWQ-5	6/15/1981	Fluoride	1.03	mg/L
GW	GWQ-5	6/15/1981	Iron	<0.1	mg/L
GW	GWQ-5	6/15/1981	Iron	0.07	mg/L
GW	GWQ-5	6/15/1981	Lead	<0.02	mg/L
GW	GWQ-5	6/15/1981	Lead	<0.05	mg/L
GW	GWQ-5	6/15/1981	Manganese	<0.05	mg/L
GW	GWQ-5	6/15/1981	Manganese	<0.02	mg/L
GW	GWQ-5	6/15/1981	Mercury	<0.001	mg/L
GW	GWQ-5	6/15/1981	Molybdenum	<0.05	mg/L
GW	GWQ-5	6/15/1981	Molybdenum	<0.1	mg/L
GW	GWQ-5	6/15/1981	Nickel	<0.05	mg/L
GW	GWQ-5	6/15/1981	Nitrate as N (NO3)	0.6	mg/L
GW	GWQ-5	6/15/1981	Nitrate as N (NO3)	0.37	mg/L
GW	GWQ-5	6/15/1981	Selenium	<0.005	mg/L
GW	GWQ-5	6/15/1981	Selenium	0.0062	mg/L
GW	GWQ-5	6/15/1981	Silver	<0.02	mg/L
GW	GWQ-5	6/15/1981	Sulfate	575	mg/L
GW	GWQ-5	6/15/1981	Sulfate	477	mg/L
GW	GWQ-5	6/15/1981	TDS	1260	mg/L
GW	GWQ-5	6/15/1981	TDS	1070	mg/L
GW	GWQ-5	6/15/1981	Zinc	0.064	mg/L
GW	GWQ-5	6/15/1981	Zinc	<0.025	mg/L
GW	GWQ-5	6/15/1981	pH	7.3	pH units
GW	GWQ-5	6/15/1981	Conductivity	1500	µmhos/cm
GW	GWQ-5	6/15/1981	Calcium	200	mg/L
GW	GWQ-5	6/15/1981	Magnesium	49	mg/L
GW	GWQ-5	6/15/1981	Sodium	173	mg/L
GW	GWQ-5	6/15/1981	Bicarbonate	398	mg/L CaCO3
GW	GWQ-5	6/15/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-5	6/15/1981	Potassium	1.1	mg/L
GW	GWQ-5	6/15/1981	Calcium	175	mg/L
GW	GWQ-5	6/15/1981	Magnesium	35.8	mg/L
GW	GWQ-5	6/15/1981	Sodium	126	mg/L
GW	GWQ-5	6/15/1981	Bicarbonate	431	mg/L CaCO3
GW	GWQ-5	6/15/1981	Carbonate	<1	mg/L CaCO3
GW	GWQ-5	6/15/1981	Potassium	2.26	mg/L
GW	GWQ-6	6/15/1981	Aluminum	<0.25	mg/L
GW	GWQ-6	6/15/1981	Aluminum	<0.01	mg/L
GW	GWQ-6	6/15/1981	Arsenic	<0.002	mg/L
GW	GWQ-6	6/15/1981	Arsenic	<0.01	mg/L
GW	GWQ-6	6/15/1981	Barium	<1	mg/L
GW	GWQ-6	6/15/1981	Barium	<0.2	mg/L
GW	GWQ-6	6/15/1981	Boron	0.135	mg/L
GW	GWQ-6	6/15/1981	Boron	<0.1	mg/L
GW	GWQ-6	6/15/1981	Cadmium	<0.01	mg/L
GW	GWQ-6	6/15/1981	Cadmium	<0.005	mg/L
GW	GWQ-6	6/15/1981	Chloride	32.6	mg/L
GW	GWQ-6	6/15/1981	Chloride	28	mg/L
GW	GWQ-6	6/15/1981	Chromium	<0.05	mg/L
GW	GWQ-6	6/15/1981	Chromium	<0.01	mg/L
GW	GWQ-6	6/15/1981	Cobalt	<0.05	mg/L
GW	GWQ-6	6/15/1981	Copper	<0.02	mg/L
GW	GWQ-6	6/15/1981	Copper	<0.05	mg/L
GW	GWQ-6	6/15/1981	Cyanide	<0.05	mg/L
GW	GWQ-6	6/15/1981	Cyanide	<0.01	mg/L
GW	GWQ-6	6/15/1981	Fluoride	1.09	mg/L
GW	GWQ-6	6/15/1981	Fluoride	1.2	mg/L

GW	GWQ-6	6/15/1981	Iron	<0.05	mg/L
GW	GWQ-6	6/15/1981	Iron	<0.1	mg/L
GW	GWQ-6	6/15/1981	Lead	<0.05	mg/L
GW	GWQ-6	6/15/1981	Lead	<0.02	mg/L
GW	GWQ-6	6/15/1981	Manganese	0.076	mg/L
GW	GWQ-6	6/15/1981	Manganese	0.11	mg/L
GW	GWQ-6	6/15/1981	Mercury	0.00235	mg/L
GW	GWQ-6	6/15/1981	Mercury	<0.001	mg/L
GW	GWQ-6	6/15/1981	Molybdenum	<0.1	mg/L
GW	GWQ-6	6/15/1981	Molybdenum	<0.05	mg/L
GW	GWQ-6	6/15/1981	Nickel	<0.05	mg/L
GW	GWQ-6	6/15/1981	Nitrate as N (NO3)	3.3	mg/L
GW	GWQ-6	6/15/1981	Nitrate as N (NO3)	3.8	mg/L
GW	GWQ-6	6/15/1981	Selenium	0.0046	mg/L
GW	GWQ-6	6/15/1981	Selenium	<0.005	mg/L
GW	GWQ-6	6/15/1981	Silver	<0.02	mg/L
GW	GWQ-6	6/15/1981	Sulfate	40.5	mg/L
GW	GWQ-6	6/15/1981	Sulfate	37	mg/L
GW	GWQ-6	6/15/1981	TDS	400	mg/L
GW	GWQ-6	6/15/1981	TDS	420	mg/L
GW	GWQ-6	6/15/1981	Zinc	<0.025	mg/L
GW	GWQ-6	6/15/1981	Zinc	<0.05	mg/L
GW	GWQ-6	6/15/1981	pH	7.3	pH units
GW	GWQ-6	6/15/1981	Calcium	68	mg/L
GW	GWQ-6	6/15/1981	Magnesium	11.1	mg/L
GW	GWQ-6	6/15/1981	Sodium	57	mg/L
GW	GWQ-6	6/15/1981	Bicarbonate	309	mg/L CaCO3
GW	GWQ-6	6/15/1981	Carbonate	<0.1	mg/L CaCO3
GW	GWQ-6	6/15/1981	Potassium	2.4	mg/L
GW	GWQ-6	6/15/1981	Conductivity	600	µmhos/cm
GW	GWQ-6	6/15/1981	Calcium	73	mg/L
GW	GWQ-6	6/15/1981	Magnesium	16	mg/L
GW	GWQ-6	6/15/1981	Sodium	61	mg/L
GW	GWQ-6	6/15/1981	Bicarbonate	317	mg/L CaCO3
GW	GWQ-6	6/15/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-6	6/15/1981	Potassium	1.6	mg/L
GW	GWQ-7	6/15/1981	Aluminum	<0.25	mg/L
GW	GWQ-7	6/15/1981	Aluminum	<0.01	mg/L
GW	GWQ-7	6/15/1981	Arsenic	<0.002	mg/L
GW	GWQ-7	6/15/1981	Arsenic	<0.01	mg/L
GW	GWQ-7	6/15/1981	Barium	<1	mg/L
GW	GWQ-7	6/15/1981	Barium	<0.2	mg/L
GW	GWQ-7	6/15/1981	Boron	0.065	mg/L
GW	GWQ-7	6/15/1981	Boron	<0.1	mg/L
GW	GWQ-7	6/15/1981	Cadmium	<0.01	mg/L
GW	GWQ-7	6/15/1981	Cadmium	<0.005	mg/L
GW	GWQ-7	6/15/1981	Chloride	24.5	mg/L
GW	GWQ-7	6/15/1981	Chloride	20	mg/L
GW	GWQ-7	6/15/1981	Chromium	<0.05	mg/L
GW	GWQ-7	6/15/1981	Chromium	<0.01	mg/L
GW	GWQ-7	6/15/1981	Cobalt	<0.05	mg/L
GW	GWQ-7	6/15/1981	Copper	<0.02	mg/L
GW	GWQ-7	6/15/1981	Copper	<0.05	mg/L
GW	GWQ-7	6/15/1981	Cyanide	<0.05	mg/L
GW	GWQ-7	6/15/1981	Cyanide	<0.01	mg/L
GW	GWQ-7	6/15/1981	Fluoride	0.53	mg/L
GW	GWQ-7	6/15/1981	Fluoride	0.5	mg/L
GW	GWQ-7	6/15/1981	Iron	<0.05	mg/L
GW	GWQ-7	6/15/1981	Iron	<0.1	mg/L
GW	GWQ-7	6/15/1981	Lead	<0.05	mg/L
GW	GWQ-7	6/15/1981	Lead	<0.02	mg/L
GW	GWQ-7	6/15/1981	Manganese	<0.02	mg/L
GW	GWQ-7	6/15/1981	Manganese	<0.05	mg/L
GW	GWQ-7	6/15/1981	Mercury	<0.001	mg/L
GW	GWQ-7	6/15/1981	Molybdenum	<0.1	mg/L
GW	GWQ-7	6/15/1981	Molybdenum	<0.05	mg/L
GW	GWQ-7	6/15/1981	Nickel	<0.05	mg/L
GW	GWQ-7	6/15/1981	Nitrate as N (NO3)	0.54	mg/L
GW	GWQ-7	6/15/1981	Nitrate as N (NO3)	1.1	mg/L
GW	GWQ-7	6/15/1981	Selenium	<0.0005	mg/L
GW	GWQ-7	6/15/1981	Selenium	<0.005	mg/L
GW	GWQ-7	6/15/1981	Silver	<0.02	mg/L
GW	GWQ-7	6/15/1981	Sulfate	110	mg/L
GW	GWQ-7	6/15/1981	Sulfate	165	mg/L
GW	GWQ-7	6/15/1981	TDS	496	mg/L
GW	GWQ-7	6/15/1981	TDS	510	mg/L

GW	GWQ-7	6/15/1981	Zinc	0.278	mg/L
GW	GWQ-7	6/15/1981	Zinc	0.38	mg/L
GW	GWQ-7	6/15/1981	pH	7.2	pH units
GW	GWQ-7	6/15/1981	Calcium	88	mg/L
GW	GWQ-7	6/15/1981	Magnesium	15.7	mg/L
GW	GWQ-7	6/15/1981	Sodium	47.9	mg/L
GW	GWQ-7	6/15/1981	Bicarbonate	265	mg/L CaCO3
GW	GWQ-7	6/15/1981	Carbonate	<1	mg/L CaCO3
GW	GWQ-7	6/15/1981	Potassium	2.33	mg/L
GW	GWQ-7	6/15/1981	Conductivity	700	µmhos/cm
GW	GWQ-7	6/15/1981	Calcium	86	mg/L
GW	GWQ-7	6/15/1981	Magnesium	24	mg/L
GW	GWQ-7	6/15/1981	Sodium	61	mg/L
GW	GWQ-7	6/15/1981	Bicarbonate	266	mg/L CaCO3
GW	GWQ-7	6/15/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-7	6/15/1981	Potassium	1.6	mg/L
GW	GWQ-2	6/25/1981	Aluminum	<0.025	mg/L
GW	GWQ-2	6/25/1981	Arsenic	<0.002	mg/L
GW	GWQ-2	6/25/1981	Barium	<1	mg/L
GW	GWQ-2	6/25/1981	Boron	0.162	mg/L
GW	GWQ-2	6/25/1981	Cadmium	<0.01	mg/L
GW	GWQ-2	6/25/1981	Chloride	24.8	mg/L
GW	GWQ-2	6/25/1981	Chromium	<0.05	mg/L
GW	GWQ-2	6/25/1981	Cobalt	<0.05	mg/L
GW	GWQ-2	6/25/1981	Copper	<0.02	mg/L
GW	GWQ-2	6/25/1981	Cyanide	<0.05	mg/L
GW	GWQ-2	6/25/1981	Fluoride	0.48	mg/L
GW	GWQ-2	6/25/1981	Iron	0.1	mg/L
GW	GWQ-2	6/25/1981	Lead	<0.05	mg/L
GW	GWQ-2	6/25/1981	Manganese	<0.02	mg/L
GW	GWQ-2	6/25/1981	Mercury	<0.001	mg/L
GW	GWQ-2	6/25/1981	Molybdenum	<0.1	mg/L
GW	GWQ-2	6/25/1981	Nickel	<0.05	mg/L
GW	GWQ-2	6/25/1981	Nitrate as N (NO3)	4.3	mg/L
GW	GWQ-2	6/25/1981	Selenium	0.0022	mg/L
GW	GWQ-2	6/25/1981	Silver	<0.02	mg/L
GW	GWQ-2	6/25/1981	Sulfate	111	mg/L
GW	GWQ-2	6/25/1981	TDS	448	mg/L
GW	GWQ-2	6/25/1981	Zinc	0.11	mg/L
GW	GWQ-2	6/25/1981	Calcium	98	mg/L
GW	GWQ-2	6/25/1981	Magnesium	11.4	mg/L
GW	GWQ-2	6/25/1981	Sodium	41.2	mg/L
GW	GWQ-2	6/25/1981	Bicarbonate	261	mg/L CaCO3
GW	GWQ-2	6/25/1981	Carbonate	<1	mg/L CaCO3
GW	GWQ-2	6/25/1981	Potassium	2.96	mg/L
GW	GWQ-7	8/7/1981	Chloride	100	mg/L
GW	GWQ-7	8/7/1981	Iron	0.02	mg/L
GW	GWQ-7	8/7/1981	Sulfate	150	mg/L
GW	GWQ-7	8/7/1981	TDS	475	mg/L
GW	GWQ-7	8/7/1981	pH	7.4	pH units
GW	GWQ-7	8/7/1981	Calcium	80	mg/L
GW	GWQ-7	8/7/1981	Magnesium	19.4	mg/L
GW	GWQ-7	8/7/1981	Sodium	138.9	mg/L
GW	GWQ-7	8/7/1981	Bicarbonate	268.4	mg/L CaCO3
GW	GWQ-9	8/7/1981	Chloride	100	mg/L
GW	GWQ-9	8/7/1981	Iron	0.06	mg/L
GW	GWQ-9	8/7/1981	Sulfate	140	mg/L
GW	GWQ-9	8/7/1981	TDS	450	mg/L
GW	GWQ-9	8/7/1981	pH	7.4	pH units
GW	GWQ-9	8/7/1981	Calcium	80	mg/L
GW	GWQ-9	8/7/1981	Magnesium	19.4	mg/L
GW	GWQ-9	8/7/1981	Sodium	128.9	mg/L
GW	GWQ-9	8/7/1981	Bicarbonate	268.4	mg/L CaCO3
GW	GWQ-10	8/10/1981	Aluminum	10.2	mg/L
GW	GWQ-10	8/10/1981	Arsenic	<0.004	mg/L
GW	GWQ-10	8/10/1981	Barium	<1	mg/L
GW	GWQ-10	8/10/1981	Boron	0.016	mg/L
GW	GWQ-10	8/10/1981	Cadmium	<0.01	mg/L
GW	GWQ-10	8/10/1981	Chloride	23.5	mg/L
GW	GWQ-10	8/10/1981	Chromium	<0.05	mg/L
GW	GWQ-10	8/10/1981	Cobalt	<0.05	mg/L
GW	GWQ-10	8/10/1981	Copper	<0.05	mg/L
GW	GWQ-10	8/10/1981	Cyanide	<0.05	mg/L
GW	GWQ-10	8/10/1981	Fluoride	1.14	mg/L
GW	GWQ-10	8/10/1981	Iron	2.31	mg/L
GW	GWQ-10	8/10/1981	Lead	<0.05	mg/L

GW	GWQ-10	8/10/1981	Manganese	1.18	mg/L
GW	GWQ-10	8/10/1981	Mercury	<1	mg/L
GW	GWQ-10	8/10/1981	Molybdenum	<0.1	mg/L
GW	GWQ-10	8/10/1981	Nickel	<0.05	mg/L
GW	GWQ-10	8/10/1981	Nitrate as N (NO3)	0.22	mg/L
GW	GWQ-10	8/10/1981	Selenium	<0.002	mg/L
GW	GWQ-10	8/10/1981	Silver	<0.02	mg/L
GW	GWQ-10	8/10/1981	Sulfate	143	mg/L
GW	GWQ-10	8/10/1981	TDS	528	mg/L
GW	GWQ-10	8/10/1981	Zinc	0.23	mg/L
GW	GWQ-10	8/10/1981	pH	7.48	pH units
GW	GWQ-10	8/10/1981	Calcium	74	mg/L
GW	GWQ-10	8/10/1981	Magnesium	11.3	mg/L
GW	GWQ-10	8/10/1981	Sodium	58.7	mg/L
GW	GWQ-10	8/10/1981	Bicarbonate	219	mg/L CaCO3
GW	GWQ-10	8/10/1981	Carbonate	<1	mg/L CaCO3
GW	GWQ-10	8/10/1981	Potassium	8.32	mg/L
GW	GWQ-11	8/10/1981	Aluminum	<0.25	mg/L
GW	GWQ-11	8/10/1981	Arsenic	<0.004	mg/L
GW	GWQ-11	8/10/1981	Barium	<1	mg/L
GW	GWQ-11	8/10/1981	Boron	0.092	mg/L
GW	GWQ-11	8/10/1981	Cadmium	<0.01	mg/L
GW	GWQ-11	8/10/1981	Chloride	37	mg/L
GW	GWQ-11	8/10/1981	Chromium	<0.05	mg/L
GW	GWQ-11	8/10/1981	Cobalt	<0.05	mg/L
GW	GWQ-11	8/10/1981	Copper	<0.05	mg/L
GW	GWQ-11	8/10/1981	Cyanide	<0.05	mg/L
GW	GWQ-11	8/10/1981	Fluoride	0.9	mg/L
GW	GWQ-11	8/10/1981	Iron	1.14	mg/L
GW	GWQ-11	8/10/1981	Lead	<0.05	mg/L
GW	GWQ-11	8/10/1981	Manganese	0.45	mg/L
GW	GWQ-11	8/10/1981	Mercury	<1	mg/L
GW	GWQ-11	8/10/1981	Molybdenum	<0.1	mg/L
GW	GWQ-11	8/10/1981	Nickel	<0.05	mg/L
GW	GWQ-11	8/10/1981	Nitrate as N (NO3)	1.02	mg/L
GW	GWQ-11	8/10/1981	Selenium	0.006	mg/L
GW	GWQ-11	8/10/1981	Silver	<0.02	mg/L
GW	GWQ-11	8/10/1981	Sulfate	123	mg/L
GW	GWQ-11	8/10/1981	TDS	612	mg/L
GW	GWQ-11	8/10/1981	Zinc	<0.05	mg/L
GW	GWQ-11	8/10/1981	pH	7.38	pH units
GW	GWQ-11	8/10/1981	Calcium	68.3	mg/L
GW	GWQ-11	8/10/1981	Magnesium	13.5	mg/L
GW	GWQ-11	8/10/1981	Sodium	48.1	mg/L
GW	GWQ-11	8/10/1981	Bicarbonate	237	mg/L CaCO3
GW	GWQ-11	8/10/1981	Carbonate	<1	mg/L CaCO3
GW	GWQ-11	8/10/1981	Potassium	7.88	mg/L
GW	GWQ-7	8/10/1981	Arsenic	<0.01	mg/L
GW	GWQ-7	8/10/1981	Chloride	24	mg/L
GW	GWQ-7	8/10/1981	Copper	<0.05	mg/L
GW	GWQ-7	8/10/1981	Cyanide	<0.01	mg/L
GW	GWQ-7	8/10/1981	Fluoride	0.6	mg/L
GW	GWQ-7	8/10/1981	Iron	1.7	mg/L
GW	GWQ-7	8/10/1981	Lead	<0.02	mg/L
GW	GWQ-7	8/10/1981	Nitrate as N (NO3)	1.2	mg/L
GW	GWQ-7	8/10/1981	Sulfate	162	mg/L
GW	GWQ-7	8/10/1981	TDS	490	mg/L
GW	GWQ-7	8/10/1981	Zinc	0.63	mg/L
GW	GWQ-7	8/10/1981	pH	7.7	pH units
GW	GWQ-7	8/10/1981	Calcium	68	mg/L
GW	GWQ-7	8/10/1981	Magnesium	21	mg/L
GW	GWQ-7	8/10/1981	Sodium	48	mg/L
GW	GWQ-7	8/10/1981	Bicarbonate	229	mg/L CaCO3
GW	GWQ-9	8/10/1981	Arsenic	<0.01	mg/L
GW	GWQ-9	8/10/1981	Chloride	22	mg/L
GW	GWQ-9	8/10/1981	Copper	<0.05	mg/L
GW	GWQ-9	8/10/1981	Cyanide	<0.01	mg/L
GW	GWQ-9	8/10/1981	Fluoride	0.5	mg/L
GW	GWQ-9	8/10/1981	Iron	0.49	mg/L
GW	GWQ-9	8/10/1981	Lead	0.033	mg/L
GW	GWQ-9	8/10/1981	Nitrate as N (NO3)	1.4	mg/L
GW	GWQ-9	8/10/1981	Sulfate	148	mg/L
GW	GWQ-9	8/10/1981	TDS	470	mg/L
GW	GWQ-9	8/10/1981	Zinc	0.96	mg/L
GW	GWQ-9	8/10/1981	pH	8	pH units
GW	GWQ-9	8/10/1981	Calcium	76	mg/L

GW	GWQ-9	8/10/1981	Magnesium	20	mg/L
GW	GWQ-9	8/10/1981	Sodium	47	mg/L
GW	GWQ-9	8/10/1981	Bicarbonate	268	mg/L CaCO3
GW	PW-1	8/14/1981	Arsenic	<0.01	mg/L
GW	PW-1	8/14/1981	Chloride	32	mg/L
GW	PW-1	8/14/1981	Copper	<0.05	mg/L
GW	PW-1	8/14/1981	Cyanide	<0.01	mg/L
GW	PW-1	8/14/1981	Fluoride	0.9	mg/L
GW	PW-1	8/14/1981	Iron	0.2	mg/L
GW	PW-1	8/14/1981	Lead	<0.02	mg/L
GW	PW-1	8/14/1981	Nitrate as N (NO3)	0.7	mg/L
GW	PW-1	8/14/1981	Sulfate	24	mg/L
GW	PW-1	8/14/1981	TDS	250	mg/L
GW	PW-1	8/14/1981	Zinc	<0.05	mg/L
GW	PW-1	8/14/1981	pH	8.1	pH units
GW	PW-1	8/14/1981	Calcium	28	mg/L
GW	PW-1	8/14/1981	Magnesium	4	mg/L
GW	PW-1	8/14/1981	Sodium	53	mg/L
GW	PW-1	8/14/1981	Bicarbonate	171	mg/L CaCO3
GW	PW-1	8/14/1981	Carbonate	0	mg/L CaCO3
GW	PW-3	8/14/1981	Arsenic	<0.01	mg/L
GW	PW-3	8/14/1981	Chloride	66	mg/L
GW	PW-3	8/14/1981	Copper	<0.05	mg/L
GW	PW-3	8/14/1981	Cyanide	0.01	mg/L
GW	PW-3	8/14/1981	Fluoride	2.5	mg/L
GW	PW-3	8/14/1981	Iron	0.31	mg/L
GW	PW-3	8/14/1981	Lead	<0.02	mg/L
GW	PW-3	8/14/1981	Nitrate as N (NO3)	0.8	mg/L
GW	PW-3	8/14/1981	Sulfate	31	mg/L
GW	PW-3	8/14/1981	TDS	300	mg/L
GW	PW-3	8/14/1981	Zinc	0.19	mg/L
GW	PW-3	8/14/1981	pH	8.2	pH units
GW	PW-3	8/14/1981	Calcium	16	mg/L
GW	PW-3	8/14/1981	Magnesium	1	mg/L
GW	PW-3	8/14/1981	Sodium	87	mg/L
GW	PW-3	8/14/1981	Bicarbonate	139	mg/L CaCO3
GW	PW-3	8/14/1981	Carbonate	0	mg/L CaCO3
GW	GWQ-8	8/19/1981	Aluminum	<0.25	mg/L
GW	GWQ-8	8/19/1981	Arsenic	<0.004	mg/L
GW	GWQ-8	8/19/1981	Barium	<1	mg/L
GW	GWQ-8	8/19/1981	Boron	0.076	mg/L
GW	GWQ-8	8/19/1981	Cadmium	<0.01	mg/L
GW	GWQ-8	8/19/1981	Chloride	24	mg/L
GW	GWQ-8	8/19/1981	Chromium	<0.05	mg/L
GW	GWQ-8	8/19/1981	Cobalt	<0.05	mg/L
GW	GWQ-8	8/19/1981	Copper	<0.05	mg/L
GW	GWQ-8	8/19/1981	Cyanide	<0.05	mg/L
GW	GWQ-8	8/19/1981	Fluoride	0.59	mg/L
GW	GWQ-8	8/19/1981	Iron	<0.1	mg/L
GW	GWQ-8	8/19/1981	Lead	<0.05	mg/L
GW	GWQ-8	8/19/1981	Manganese	0.047	mg/L
GW	GWQ-8	8/19/1981	Mercury	<1	mg/L
GW	GWQ-8	8/19/1981	Molybdenum	<0.1	mg/L
GW	GWQ-8	8/19/1981	Nickel	<0.05	mg/L
GW	GWQ-8	8/19/1981	Nitrate as N (NO3)	2.8	mg/L
GW	GWQ-8	8/19/1981	Selenium	0.004	mg/L
GW	GWQ-8	8/19/1981	Silver	<0.02	mg/L
GW	GWQ-8	8/19/1981	Sulfate	134	mg/L
GW	GWQ-8	8/19/1981	TDS	608	mg/L
GW	GWQ-8	8/19/1981	Zinc	0.69	mg/L
GW	GWQ-8	8/19/1981	pH	7.42	pH units
GW	GWQ-8	8/19/1981	Calcium	72.9	mg/L
GW	GWQ-8	8/19/1981	Magnesium	12.1	mg/L
GW	GWQ-8	8/19/1981	Sodium	84.1	mg/L
GW	GWQ-8	8/19/1981	Bicarbonate	283	mg/L CaCO3
GW	GWQ-8	8/19/1981	Carbonate	<1	mg/L CaCO3
GW	GWQ-8	8/19/1981	Potassium	4.2	mg/L
GW	GWQ-9	10/8/1981	Aluminum	<0.25	mg/L
GW	GWQ-9	10/8/1981	Arsenic	<0.004	mg/L
GW	GWQ-9	10/8/1981	Barium	<1	mg/L
GW	GWQ-9	10/8/1981	Boron	0.044	mg/L
GW	GWQ-9	10/8/1981	Cadmium	<0.01	mg/L
GW	GWQ-9	10/8/1981	Chloride	22.4	mg/L
GW	GWQ-9	10/8/1981	Chromium	<0.05	mg/L
GW	GWQ-9	10/8/1981	Cobalt	<0.05	mg/L
GW	GWQ-9	10/8/1981	Copper	<0.05	mg/L

GW	GWQ-9	10/8/1981	Cyanide	<0.05	mg/L
GW	GWQ-9	10/8/1981	Fluoride	0.6	mg/L
GW	GWQ-9	10/8/1981	Iron	<0.1	mg/L
GW	GWQ-9	10/8/1981	Lead	<0.05	mg/L
GW	GWQ-9	10/8/1981	Manganese	<0.02	mg/L
GW	GWQ-9	10/8/1981	Mercury	<1	mg/L
GW	GWQ-9	10/8/1981	Molybdenum	<0.1	mg/L
GW	GWQ-9	10/8/1981	Nickel	<0.05	mg/L
GW	GWQ-9	10/8/1981	Nitrate as N (NO3)	0.96	mg/L
GW	GWQ-9	10/8/1981	Selenium	<0.002	mg/L
GW	GWQ-9	10/8/1981	Silver	<0.02	mg/L
GW	GWQ-9	10/8/1981	Sulfate	133	mg/L
GW	GWQ-9	10/8/1981	TDS	476	mg/L
GW	GWQ-9	10/8/1981	Zinc	0.35	mg/L
GW	GWQ-9	10/8/1981	pH	7.22	pH units
GW	GWQ-9	10/8/1981	Calcium	51.8	mg/L
GW	GWQ-9	10/8/1981	Magnesium	17.1	mg/L
GW	GWQ-9	10/8/1981	Sodium	71	mg/L
GW	GWQ-9	10/8/1981	Bicarbonate	302	mg/L CaCO3
GW	GWQ-9	10/8/1981	Carbonate	<1	mg/L CaCO3
GW	GWQ-9	10/8/1981	Potassium	3.3	mg/L
GW	NP-1	10/8/1981	Aluminum	<0.25	mg/L
GW	NP-1	10/8/1981	Arsenic	<0.004	mg/L
GW	NP-1	10/8/1981	Barium	<1	mg/L
GW	NP-1	10/8/1981	Boron	<0.004	mg/L
GW	NP-1	10/8/1981	Cadmium	<0.01	mg/L
GW	NP-1	10/8/1981	Chloride	24.9	mg/L
GW	NP-1	10/8/1981	Chromium	<0.05	mg/L
GW	NP-1	10/8/1981	Cobalt	<0.05	mg/L
GW	NP-1	10/8/1981	Copper	<0.05	mg/L
GW	NP-1	10/8/1981	Cyanide	<0.05	mg/L
GW	NP-1	10/8/1981	Fluoride	0.84	mg/L
GW	NP-1	10/8/1981	Iron	0.27	mg/L
GW	NP-1	10/8/1981	Lead	<0.05	mg/L
GW	NP-1	10/8/1981	Manganese	0.92	mg/L
GW	NP-1	10/8/1981	Mercury	<1	mg/L
GW	NP-1	10/8/1981	Molybdenum	<0.1	mg/L
GW	NP-1	10/8/1981	Nickel	<0.05	mg/L
GW	NP-1	10/8/1981	Nitrate as N (NO3)	0.47	mg/L
GW	NP-1	10/8/1981	Selenium	0.003	mg/L
GW	NP-1	10/8/1981	Silver	<0.02	mg/L
GW	NP-1	10/8/1981	Sulfate	108	mg/L
GW	NP-1	10/8/1981	TDS	496	mg/L
GW	NP-1	10/8/1981	Zinc	0.4	mg/L
GW	NP-1	10/8/1981	pH	7.6	pH units
GW	NP-1	10/8/1981	Calcium	55.7	mg/L
GW	NP-1	10/8/1981	Magnesium	13.7	mg/L
GW	NP-1	10/8/1981	Sodium	61.7	mg/L
GW	NP-1	10/8/1981	Bicarbonate	266	mg/L CaCO3
GW	NP-1	10/8/1981	Carbonate	<1	mg/L CaCO3
GW	NP-1	10/8/1981	Potassium	8.25	mg/L
GW	NP-2	10/8/1981	Aluminum	<0.25	mg/L
GW	NP-2	10/8/1981	Arsenic	0.024	mg/L
GW	NP-2	10/8/1981	Barium	<1	mg/L
GW	NP-2	10/8/1981	Boron	0.08	mg/L
GW	NP-2	10/8/1981	Cadmium	<0.01	mg/L
GW	NP-2	10/8/1981	Chloride	45.1	mg/L
GW	NP-2	10/8/1981	Chromium	<0.05	mg/L
GW	NP-2	10/8/1981	Cobalt	<0.05	mg/L
GW	NP-2	10/8/1981	Copper	<0.05	mg/L
GW	NP-2	10/8/1981	Cyanide	<0.05	mg/L
GW	NP-2	10/8/1981	Fluoride	1.78	mg/L
GW	NP-2	10/8/1981	Iron	<0.1	mg/L
GW	NP-2	10/8/1981	Lead	<0.05	mg/L
GW	NP-2	10/8/1981	Manganese	0.62	mg/L
GW	NP-2	10/8/1981	Mercury	<1	mg/L
GW	NP-2	10/8/1981	Molybdenum	<0.1	mg/L
GW	NP-2	10/8/1981	Nickel	<0.05	mg/L
GW	NP-2	10/8/1981	Nitrate as N (NO3)	0.23	mg/L
GW	NP-2	10/8/1981	Selenium	<0.002	mg/L
GW	NP-2	10/8/1981	Silver	<0.02	mg/L
GW	NP-2	10/8/1981	Sulfate	198	mg/L
GW	NP-2	10/8/1981	TDS	476	mg/L
GW	NP-2	10/8/1981	Zinc	0.31	mg/L
GW	NP-2	10/8/1981	pH	7.39	pH units
GW	NP-2	10/8/1981	Calcium	46	mg/L

GW	NP-2	10/8/1981	Magnesium	14.6	mg/L
GW	NP-2	10/8/1981	Sodium	93.5	mg/L
GW	NP-2	10/8/1981	Bicarbonate	159	mg/L CaCO3
GW	NP-2	10/8/1981	Carbonate	<1	mg/L CaCO3
GW	NP-2	10/8/1981	Potassium	9.57	mg/L
GW	NP-3	10/8/1981	Aluminum	<0.25	mg/L
GW	NP-3	10/8/1981	Arsenic	0.005	mg/L
GW	NP-3	10/8/1981	Barium	<1	mg/L
GW	NP-3	10/8/1981	Boron	0.188	mg/L
GW	NP-3	10/8/1981	Cadmium	<0.01	mg/L
GW	NP-3	10/8/1981	Chloride	28.6	mg/L
GW	NP-3	10/8/1981	Chromium	<0.05	mg/L
GW	NP-3	10/8/1981	Cobalt	<0.05	mg/L
GW	NP-3	10/8/1981	Copper	<0.05	mg/L
GW	NP-3	10/8/1981	Cyanide	<0.05	mg/L
GW	NP-3	10/8/1981	Fluoride	1.58	mg/L
GW	NP-3	10/8/1981	Iron	<0.1	mg/L
GW	NP-3	10/8/1981	Lead	<0.05	mg/L
GW	NP-3	10/8/1981	Manganese	0.81	mg/L
GW	NP-3	10/8/1981	Mercury	<1	mg/L
GW	NP-3	10/8/1981	Molybdenum	<0.1	mg/L
GW	NP-3	10/8/1981	Nickel	<0.05	mg/L
GW	NP-3	10/8/1981	Nitrate as N (NO3)	<0.05	mg/L
GW	NP-3	10/8/1981	Selenium	0.005	mg/L
GW	NP-3	10/8/1981	Silver	<0.02	mg/L
GW	NP-3	10/8/1981	Sulfate	94.5	mg/L
GW	NP-3	10/8/1981	TDS	460	mg/L
GW	NP-3	10/8/1981	Zinc	1.25	mg/L
GW	NP-3	10/8/1981	pH	6.98	pH units
GW	NP-3	10/8/1981	Calcium	40.9	mg/L
GW	NP-3	10/8/1981	Magnesium	9.55	mg/L
GW	NP-3	10/8/1981	Sodium	79	mg/L
GW	NP-3	10/8/1981	Bicarbonate	211	mg/L CaCO3
GW	NP-3	10/8/1981	Carbonate	<1	mg/L CaCO3
GW	NP-3	10/8/1981	Potassium	9.71	mg/L
GW	GWQ-7	10/23/1981	Aluminum	<0.01	mg/L
GW	GWQ-7	10/23/1981	Arsenic	<0.01	mg/L
GW	GWQ-7	10/23/1981	Barium	<0.02	mg/L
GW	GWQ-7	10/23/1981	Barium	<0.2	mg/L
GW	GWQ-7	10/23/1981	Boron	<0.1	mg/L
GW	GWQ-7	10/23/1981	Cadmium	<0.005	mg/L
GW	GWQ-7	10/23/1981	Chloride	26	mg/L
GW	GWQ-7	10/23/1981	Chromium	<0.01	mg/L
GW	GWQ-7	10/23/1981	Cobalt	<0.02	mg/L
GW	GWQ-7	10/23/1981	Copper	<0.05	mg/L
GW	GWQ-7	10/23/1981	Cyanide	<0.01	mg/L
GW	GWQ-7	10/23/1981	Fluoride	0.5	mg/L
GW	GWQ-7	10/23/1981	Iron	0.14	mg/L
GW	GWQ-7	10/23/1981	Iron	<0.1	mg/L
GW	GWQ-7	10/23/1981	Lead	<0.02	mg/L
GW	GWQ-7	10/23/1981	Manganese	<0.05	mg/L
GW	GWQ-7	10/23/1981	Mercury	<0.001	mg/L
GW	GWQ-7	10/23/1981	Molybdenum	<0.05	mg/L
GW	GWQ-7	10/23/1981	Nickel	<0.05	mg/L
GW	GWQ-7	10/23/1981	Nitrate as N (NO3)	1.1	mg/L
GW	GWQ-7	10/23/1981	Nitrate as N (NO3)	1.3	mg/L
GW	GWQ-7	10/23/1981	Selenium	<0.005	mg/L
GW	GWQ-7	10/23/1981	Silver	<0.02	mg/L
GW	GWQ-7	10/23/1981	Sulfate	160	mg/L
GW	GWQ-7	10/23/1981	Sulfate	162	mg/L
GW	GWQ-7	10/23/1981	TDS	490	mg/L
GW	GWQ-7	10/23/1981	TDS	500	mg/L
GW	GWQ-7	10/23/1981	Zinc	0.41	mg/L
GW	GWQ-7	10/23/1981	Zinc	0.16	mg/L
GW	GWQ-7	10/23/1981	Calcium	71	mg/L
GW	GWQ-7	10/23/1981	Calcium	70	mg/L
GW	GWQ-10	10/27/1981	Aluminum	<0.01	mg/L
GW	GWQ-10	10/27/1981	Arsenic	<0.01	mg/L
GW	GWQ-10	10/27/1981	Barium	<0.2	mg/L
GW	GWQ-10	10/27/1981	Boron	<0.1	mg/L
GW	GWQ-10	10/27/1981	Cadmium	<0.005	mg/L
GW	GWQ-10	10/27/1981	Chloride	22	mg/L
GW	GWQ-10	10/27/1981	Chromium	<0.01	mg/L
GW	GWQ-10	10/27/1981	Cobalt	<0.02	mg/L
GW	GWQ-10	10/27/1981	Copper	<0.05	mg/L
GW	GWQ-10	10/27/1981	Cyanide	<0.01	mg/L

GW	GWQ-10	10/27/1981	Fluoride	0.6	mg/L
GW	GWQ-10	10/27/1981	Iron	<0.01	mg/L
GW	GWQ-10	10/27/1981	Lead	<0.02	mg/L
GW	GWQ-10	10/27/1981	Manganese	<0.05	mg/L
GW	GWQ-10	10/27/1981	Mercury	<0.001	mg/L
GW	GWQ-10	10/27/1981	Molybdenum	<0.05	mg/L
GW	GWQ-10	10/27/1981	Nickel	<0.05	mg/L
GW	GWQ-10	10/27/1981	Nitrate as N (NO3)	1.1	mg/L
GW	GWQ-10	10/27/1981	Selenium	<0.005	mg/L
GW	GWQ-10	10/27/1981	Silver	<0.02	mg/L
GW	GWQ-10	10/27/1981	Sulfate	168	mg/L
GW	GWQ-10	10/27/1981	TDS	520	mg/L
GW	GWQ-10	10/27/1981	Zinc	0.25	mg/L
GW	GWQ-10	10/27/1981	pH	8.2	pH units
GW	GWQ-10	10/27/1981	Calcium	68	mg/L
GW	GWQ-11	10/27/1981	Aluminum	<0.01	mg/L
GW	GWQ-11	10/27/1981	Arsenic	<0.01	mg/L
GW	GWQ-11	10/27/1981	Barium	<0.2	mg/L
GW	GWQ-11	10/27/1981	Boron	<0.1	mg/L
GW	GWQ-11	10/27/1981	Cadmium	<0.005	mg/L
GW	GWQ-11	10/27/1981	Chloride	36	mg/L
GW	GWQ-11	10/27/1981	Chromium	<0.01	mg/L
GW	GWQ-11	10/27/1981	Cobalt	<0.02	mg/L
GW	GWQ-11	10/27/1981	Copper	<0.05	mg/L
GW	GWQ-11	10/27/1981	Cyanide	<0.01	mg/L
GW	GWQ-11	10/27/1981	Fluoride	1	mg/L
GW	GWQ-11	10/27/1981	Iron	<0.1	mg/L
GW	GWQ-11	10/27/1981	Lead	<0.02	mg/L
GW	GWQ-11	10/27/1981	Manganese	<0.05	mg/L
GW	GWQ-11	10/27/1981	Mercury	<0.001	mg/L
GW	GWQ-11	10/27/1981	Molybdenum	<0.05	mg/L
GW	GWQ-11	10/27/1981	Nickel	<0.05	mg/L
GW	GWQ-11	10/27/1981	Nitrate as N (NO3)	0.7	mg/L
GW	GWQ-11	10/27/1981	Selenium	<0.005	mg/L
GW	GWQ-11	10/27/1981	Silver	<0.02	mg/L
GW	GWQ-11	10/27/1981	Sulfate	183	mg/L
GW	GWQ-11	10/27/1981	TDS	550	mg/L
GW	GWQ-11	10/27/1981	Zinc	0.17	mg/L
GW	GWQ-11	10/27/1981	pH	8.1	pH units
GW	GWQ-11	10/27/1981	Calcium	72	mg/L
GW	NP-3	10/27/1981	Aluminum	<0.01	mg/L
GW	NP-3	10/27/1981	Arsenic	<0.01	mg/L
GW	NP-3	10/27/1981	Barium	0.2	mg/L
GW	NP-3	10/27/1981	Boron	<0.1	mg/L
GW	NP-3	10/27/1981	Cadmium	<0.005	mg/L
GW	NP-3	10/27/1981	Chloride	28	mg/L
GW	NP-3	10/27/1981	Chromium	<0.01	mg/L
GW	NP-3	10/27/1981	Cobalt	<0.02	mg/L
GW	NP-3	10/27/1981	Copper	<0.05	mg/L
GW	NP-3	10/27/1981	Cyanide	<0.01	mg/L
GW	NP-3	10/27/1981	Fluoride	1.9	mg/L
GW	NP-3	10/27/1981	Iron	0.39	mg/L
GW	NP-3	10/27/1981	Lead	<0.02	mg/L
GW	NP-3	10/27/1981	Manganese	1	mg/L
GW	NP-3	10/27/1981	Mercury	<0.001	mg/L
GW	NP-3	10/27/1981	Molybdenum	0.16	mg/L
GW	NP-3	10/27/1981	Nickel	<0.05	mg/L
GW	NP-3	10/27/1981	Nitrate as N (NO3)	0.4	mg/L
GW	NP-3	10/27/1981	Selenium	<0.005	mg/L
GW	NP-3	10/27/1981	Silver	<0.02	mg/L
GW	NP-3	10/27/1981	Sulfate	148	mg/L
GW	NP-3	10/27/1981	TDS	390	mg/L
GW	NP-3	10/27/1981	Zinc	0.98	mg/L
GW	NP-3	10/27/1981	pH	8	pH units
GW	NP-3	10/27/1981	Calcium	41	mg/L
GW	GWQ-10	10/30/1981	Aluminum	<0.25	mg/L
GW	GWQ-10	10/30/1981	Arsenic	<0.005	mg/L
GW	GWQ-10	10/30/1981	Barium	<1	mg/L
GW	GWQ-10	10/30/1981	Boron	0.77	mg/L
GW	GWQ-10	10/30/1981	Cadmium	<0.01	mg/L
GW	GWQ-10	10/30/1981	Chloride	22.8	mg/L
GW	GWQ-10	10/30/1981	Chromium	<0.05	mg/L
GW	GWQ-10	10/30/1981	Cobalt	<0.05	mg/L
GW	GWQ-10	10/30/1981	Copper	<0.05	mg/L
GW	GWQ-10	10/30/1981	Cyanide	<0.05	mg/L
GW	GWQ-10	10/30/1981	Fluoride	0.98	mg/L

GW	GWQ-10	10/30/1981	Iron	<1	mg/L
GW	GWQ-10	10/30/1981	Lead	<0.05	mg/L
GW	GWQ-10	10/30/1981	Manganese	<0.02	mg/L
GW	GWQ-10	10/30/1981	Mercury	<0.001	mg/L
GW	GWQ-10	10/30/1981	Molybdenum	<0.1	mg/L
GW	GWQ-10	10/30/1981	Nickel	<0.02	mg/L
GW	GWQ-10	10/30/1981	Nitrate as N (NO3)	0.66	mg/L
GW	GWQ-10	10/30/1981	Selenium	<0.002	mg/L
GW	GWQ-10	10/30/1981	Silver	<0.02	mg/L
GW	GWQ-10	10/30/1981	Sulfate	122	mg/L
GW	GWQ-10	10/30/1981	TDS	588	mg/L
GW	GWQ-10	10/30/1981	Zinc	0.24	mg/L
GW	GWQ-10	10/30/1981	pH	8.1	pH units
GW	GWQ-11	10/30/1981	Aluminum	<0.25	mg/L
GW	GWQ-11	10/30/1981	Arsenic	<0.005	mg/L
GW	GWQ-11	10/30/1981	Barium	<1	mg/L
GW	GWQ-11	10/30/1981	Boron	0.55	mg/L
GW	GWQ-11	10/30/1981	Cadmium	<0.01	mg/L
GW	GWQ-11	10/30/1981	Chloride	39.1	mg/L
GW	GWQ-11	10/30/1981	Chromium	<0.05	mg/L
GW	GWQ-11	10/30/1981	Cobalt	<0.05	mg/L
GW	GWQ-11	10/30/1981	Copper	<0.05	mg/L
GW	GWQ-11	10/30/1981	Cyanide	<0.05	mg/L
GW	GWQ-11	10/30/1981	Fluoride	0.96	mg/L
GW	GWQ-11	10/30/1981	Iron	<0.1	mg/L
GW	GWQ-11	10/30/1981	Lead	<0.05	mg/L
GW	GWQ-11	10/30/1981	Manganese	<0.02	mg/L
GW	GWQ-11	10/30/1981	Mercury	<0.001	mg/L
GW	GWQ-11	10/30/1981	Molybdenum	<0.1	mg/L
GW	GWQ-11	10/30/1981	Nickel	<0.02	mg/L
GW	GWQ-11	10/30/1981	Nitrate as N (NO3)	0.61	mg/L
GW	GWQ-11	10/30/1981	Selenium	<0.011	mg/L
GW	GWQ-11	10/30/1981	Silver	<0.02	mg/L
GW	GWQ-11	10/30/1981	Sulfate	101	mg/L
GW	GWQ-11	10/30/1981	TDS	536	mg/L
GW	GWQ-11	10/30/1981	Zinc	0.23	mg/L
GW	GWQ-11	10/30/1981	pH	8.4	pH units
GW	NP-3	10/30/1981	Aluminum	<0.25	mg/L
GW	NP-3	10/30/1981	Arsenic	<0.005	mg/L
GW	NP-3	10/30/1981	Barium	<1	mg/L
GW	NP-3	10/30/1981	Boron	0.29	mg/L
GW	NP-3	10/30/1981	Cadmium	<0.01	mg/L
GW	NP-3	10/30/1981	Chloride	31.2	mg/L
GW	NP-3	10/30/1981	Chromium	<0.05	mg/L
GW	NP-3	10/30/1981	Cobalt	<0.05	mg/L
GW	NP-3	10/30/1981	Copper	<0.05	mg/L
GW	NP-3	10/30/1981	Cyanide	<0.05	mg/L
GW	NP-3	10/30/1981	Fluoride	1.6	mg/L
GW	NP-3	10/30/1981	Iron	<0.1	mg/L
GW	NP-3	10/30/1981	Lead	<0.05	mg/L
GW	NP-3	10/30/1981	Manganese	1.03	mg/L
GW	NP-3	10/30/1981	Mercury	<0.001	mg/L
GW	NP-3	10/30/1981	Molybdenum	<0.1	mg/L
GW	NP-3	10/30/1981	Nickel	<0.02	mg/L
GW	NP-3	10/30/1981	Nitrate as N (NO3)	<0.05	mg/L
GW	NP-3	10/30/1981	Selenium	<0.002	mg/L
GW	NP-3	10/30/1981	Silver	<0.02	mg/L
GW	NP-3	10/30/1981	Sulfate	102	mg/L
GW	NP-3	10/30/1981	TDS	428	mg/L
GW	NP-3	10/30/1981	Zinc	0.93	mg/L
GW	NP-3	10/30/1981	pH	7.89	pH units
GW	NP-1	11/4/1981	Aluminum	<0.01	mg/L
GW	NP-1	11/4/1981	Arsenic	<0.01	mg/L
GW	NP-1	11/4/1981	Barium	<0.2	mg/L
GW	NP-1	11/4/1981	Boron	<0.1	mg/L
GW	NP-1	11/4/1981	Cadmium	<0.005	mg/L
GW	NP-1	11/4/1981	Chloride	28	mg/L
GW	NP-1	11/4/1981	Chromium	<0.01	mg/L
GW	NP-1	11/4/1981	Cobalt	<0.02	mg/L
GW	NP-1	11/4/1981	Copper	<0.05	mg/L
GW	NP-1	11/4/1981	Cyanide	0.04	mg/L
GW	NP-1	11/4/1981	Fluoride	1	mg/L
GW	NP-1	11/4/1981	Iron	<0.1	mg/L
GW	NP-1	11/4/1981	Lead	<0.02	mg/L
GW	NP-1	11/4/1981	Manganese	0.6	mg/L
GW	NP-1	11/4/1981	Mercury	<0.001	mg/L

GW	NP-1	11/4/1981	Molybdenum	<0.05	mg/L
GW	NP-1	11/4/1981	Nickel	<0.05	mg/L
GW	NP-1	11/4/1981	Nitrate as N (NO3)	0.3	mg/L
GW	NP-1	11/4/1981	Selenium	<0.005	mg/L
GW	NP-1	11/4/1981	Silver	<0.02	mg/L
GW	NP-1	11/4/1981	Sulfate	148	mg/L
GW	NP-1	11/4/1981	TDS	470	mg/L
GW	NP-1	11/4/1981	Zinc	0.14	mg/L
GW	NP-1	11/4/1981	pH	8.1	pH units
GW	NP-1	11/4/1981	Calcium	54	mg/L
GW	NP-5	11/4/1981	Aluminum	<0.01	mg/L
GW	NP-5	11/4/1981	Arsenic	<0.01	mg/L
GW	NP-5	11/4/1981	Barium	<0.2	mg/L
GW	NP-5	11/4/1981	Boron	<0.1	mg/L
GW	NP-5	11/4/1981	Cadmium	<0.005	mg/L
GW	NP-5	11/4/1981	Chloride	50	mg/L
GW	NP-5	11/4/1981	Chromium	<0.01	mg/L
GW	NP-5	11/4/1981	Cobalt	<0.02	mg/L
GW	NP-5	11/4/1981	Copper	<0.05	mg/L
GW	NP-5	11/4/1981	Cyanide	<0.01	mg/L
GW	NP-5	11/4/1981	Fluoride	1.3	mg/L
GW	NP-5	11/4/1981	Iron	<0.1	mg/L
GW	NP-5	11/4/1981	Lead	<0.02	mg/L
GW	NP-5	11/4/1981	Manganese	0.1	mg/L
GW	NP-5	11/4/1981	Mercury	<0.001	mg/L
GW	NP-5	11/4/1981	Molybdenum	<0.05	mg/L
GW	NP-5	11/4/1981	Nickel	<0.05	mg/L
GW	NP-5	11/4/1981	Nitrate as N (NO3)	4.1	mg/L
GW	NP-5	11/4/1981	Selenium	<0.005	mg/L
GW	NP-5	11/4/1981	Silver	<0.02	mg/L
GW	NP-5	11/4/1981	Sulfate	196	mg/L
GW	NP-5	11/4/1981	TDS	570	mg/L
GW	NP-5	11/4/1981	Zinc	0.14	mg/L
GW	NP-5	11/4/1981	pH	8	pH units
GW	NP-5	11/4/1981	Calcium	86	mg/L
GW	GWQ-10	11/6/1981	Aluminum	<0.01	mg/L
GW	GWQ-10	11/6/1981	Arsenic	<0.01	mg/L
GW	GWQ-10	11/6/1981	Barium	<0.2	mg/L
GW	GWQ-10	11/6/1981	Boron	<0.1	mg/L
GW	GWQ-10	11/6/1981	Cadmium	<0.005	mg/L
GW	GWQ-10	11/6/1981	Chloride	22	mg/L
GW	GWQ-10	11/6/1981	Chromium	<0.01	mg/L
GW	GWQ-10	11/6/1981	Cobalt	<0.02	mg/L
GW	GWQ-10	11/6/1981	Copper	<0.05	mg/L
GW	GWQ-10	11/6/1981	Cyanide	<0.01	mg/L
GW	GWQ-10	11/6/1981	Fluoride	0.7	mg/L
GW	GWQ-10	11/6/1981	Iron	<0.1	mg/L
GW	GWQ-10	11/6/1981	Lead	<0.02	mg/L
GW	GWQ-10	11/6/1981	Manganese	<0.05	mg/L
GW	GWQ-10	11/6/1981	Mercury	<0.001	mg/L
GW	GWQ-10	11/6/1981	Molybdenum	<0.05	mg/L
GW	GWQ-10	11/6/1981	Nickel	<0.05	mg/L
GW	GWQ-10	11/6/1981	Nitrate as N (NO3)	2	mg/L
GW	GWQ-10	11/6/1981	Selenium	<0.005	mg/L
GW	GWQ-10	11/6/1981	Silver	<0.02	mg/L
GW	GWQ-10	11/6/1981	Sulfate	162	mg/L
GW	GWQ-10	11/6/1981	TDS	500	mg/L
GW	GWQ-10	11/6/1981	Zinc	0.28	mg/L
GW	GWQ-10	11/6/1981	pH	7.9	pH units
GW	GWQ-10	11/6/1981	Calcium	72	mg/L
GW	GWQ-11	11/6/1981	Aluminum	<0.01	mg/L
GW	GWQ-11	11/6/1981	Arsenic	<0.01	mg/L
GW	GWQ-11	11/6/1981	Barium	<0.2	mg/L
GW	GWQ-11	11/6/1981	Boron	<0.1	mg/L
GW	GWQ-11	11/6/1981	Cadmium	<0.005	mg/L
GW	GWQ-11	11/6/1981	Chloride	36	mg/L
GW	GWQ-11	11/6/1981	Chromium	<0.01	mg/L
GW	GWQ-11	11/6/1981	Cobalt	<0.02	mg/L
GW	GWQ-11	11/6/1981	Copper	<0.05	mg/L
GW	GWQ-11	11/6/1981	Cyanide	<0.01	mg/L
GW	GWQ-11	11/6/1981	Fluoride	1	mg/L
GW	GWQ-11	11/6/1981	Iron	<0.1	mg/L
GW	GWQ-11	11/6/1981	Lead	<0.02	mg/L
GW	GWQ-11	11/6/1981	Manganese	<0.05	mg/L
GW	GWQ-11	11/6/1981	Mercury	<0.001	mg/L
GW	GWQ-11	11/6/1981	Molybdenum	<0.05	mg/L

GW	GWQ-11	11/6/1981	Nickel	<0.05	mg/L
GW	GWQ-11	11/6/1981	Nitrate as N (NO3)	1.5	mg/L
GW	GWQ-11	11/6/1981	Selenium	<0.005	mg/L
GW	GWQ-11	11/6/1981	Silver	<0.02	mg/L
GW	GWQ-11	11/6/1981	Sulfate	168	mg/L
GW	GWQ-11	11/6/1981	TDS	520	mg/L
GW	GWQ-11	11/6/1981	Zinc	0.29	mg/L
GW	GWQ-11	11/6/1981	pH	8.1	pH units
GW	GWQ-11	11/6/1981	Calcium	67	mg/L
GW	GWQ-4	11/6/1981	Aluminum	<0.01	mg/L
GW	GWQ-4	11/6/1981	Arsenic	<0.01	mg/L
GW	GWQ-4	11/6/1981	Barium	<0.2	mg/L
GW	GWQ-4	11/6/1981	Boron	<0.1	mg/L
GW	GWQ-4	11/6/1981	Cadmium	<0.005	mg/L
GW	GWQ-4	11/6/1981	Chloride	22	mg/L
GW	GWQ-4	11/6/1981	Chromium	<0.01	mg/L
GW	GWQ-4	11/6/1981	Cobalt	<0.02	mg/L
GW	GWQ-4	11/6/1981	Copper	<0.05	mg/L
GW	GWQ-4	11/6/1981	Cyanide	<0.01	mg/L
GW	GWQ-4	11/6/1981	Fluoride	0.7	mg/L
GW	GWQ-4	11/6/1981	Iron	<0.1	mg/L
GW	GWQ-4	11/6/1981	Lead	<0.02	mg/L
GW	GWQ-4	11/6/1981	Manganese	<0.05	mg/L
GW	GWQ-4	11/6/1981	Mercury	<0.001	mg/L
GW	GWQ-4	11/6/1981	Molybdenum	<0.05	mg/L
GW	GWQ-4	11/6/1981	Nickel	<0.05	mg/L
GW	GWQ-4	11/6/1981	Nitrate as N (NO3)	2	mg/L
GW	GWQ-4	11/6/1981	Selenium	<0.005	mg/L
GW	GWQ-4	11/6/1981	Silver	<0.02	mg/L
GW	GWQ-4	11/6/1981	Sulfate	162	mg/L
GW	GWQ-4	11/6/1981	TDS	500	mg/L
GW	GWQ-4	11/6/1981	Zinc	0.28	mg/L
GW	GWQ-4	11/6/1981	pH	7.9	pH units
GW	GWQ-4	11/6/1981	Calcium	72	mg/L
GW	GWQ-7	11/6/1981	Aluminum	<0.01	mg/L
GW	GWQ-7	11/6/1981	Arsenic	<0.01	mg/L
GW	GWQ-7	11/6/1981	Barium	<0.2	mg/L
GW	GWQ-7	11/6/1981	Boron	<0.1	mg/L
GW	GWQ-7	11/6/1981	Cadmium	<0.005	mg/L
GW	GWQ-7	11/6/1981	Chloride	24	mg/L
GW	GWQ-7	11/6/1981	Chromium	<0.01	mg/L
GW	GWQ-7	11/6/1981	Cobalt	<0.02	mg/L
GW	GWQ-7	11/6/1981	Copper	<0.05	mg/L
GW	GWQ-7	11/6/1981	Cyanide	<0.01	mg/L
GW	GWQ-7	11/6/1981	Fluoride	0.8	mg/L
GW	GWQ-7	11/6/1981	Iron	<0.1	mg/L
GW	GWQ-7	11/6/1981	Lead	<0.02	mg/L
GW	GWQ-7	11/6/1981	Manganese	<0.05	mg/L
GW	GWQ-7	11/6/1981	Mercury	<0.001	mg/L
GW	GWQ-7	11/6/1981	Molybdenum	<0.05	mg/L
GW	GWQ-7	11/6/1981	Nickel	<0.05	mg/L
GW	GWQ-7	11/6/1981	Nitrate as N (NO3)	1.2	mg/L
GW	GWQ-7	11/6/1981	Selenium	<0.005	mg/L
GW	GWQ-7	11/6/1981	Silver	<0.02	mg/L
GW	GWQ-7	11/6/1981	Sulfate	158	mg/L
GW	GWQ-7	11/6/1981	TDS	480	mg/L
GW	GWQ-7	11/6/1981	Zinc	0.19	mg/L
GW	GWQ-7	11/6/1981	pH	8.1	pH units
GW	GWQ-7	11/6/1981	Calcium	71	mg/L
GW	NP-2	11/6/1981	Aluminum	<0.01	mg/L
GW	NP-2	11/6/1981	Arsenic	<0.01	mg/L
GW	NP-2	11/6/1981	Barium	<0.2	mg/L
GW	NP-2	11/6/1981	Boron	<0.1	mg/L
GW	NP-2	11/6/1981	Cadmium	<0.005	mg/L
GW	NP-2	11/6/1981	Chloride	35	mg/L
GW	NP-2	11/6/1981	Chromium	<0.01	mg/L
GW	NP-2	11/6/1981	Cobalt	<0.02	mg/L
GW	NP-2	11/6/1981	Copper	<0.05	mg/L
GW	NP-2	11/6/1981	Cyanide	<0.01	mg/L
GW	NP-2	11/6/1981	Fluoride	1.4	mg/L
GW	NP-2	11/6/1981	Iron	<0.1	mg/L
GW	NP-2	11/6/1981	Lead	<0.02	mg/L
GW	NP-2	11/6/1981	Manganese	0.39	mg/L
GW	NP-2	11/6/1981	Mercury	<0.001	mg/L
GW	NP-2	11/6/1981	Molybdenum	0.21	mg/L
GW	NP-2	11/6/1981	Nickel	<0.05	mg/L

GW	NP-2	11/6/1981	Nitrate as N (NO3)	0.4	mg/L
GW	NP-2	11/6/1981	Selenium	<0.005	mg/L
GW	NP-2	11/6/1981	Silver	<0.02	mg/L
GW	NP-2	11/6/1981	Sulfate	164	mg/L
GW	NP-2	11/6/1981	TDS	450	mg/L
GW	NP-2	11/6/1981	Zinc	1.7	mg/L
GW	NP-2	11/6/1981	pH	7.6	pH units
GW	NP-2	11/6/1981	Calcium	53	mg/L
GW	NP-3	11/6/1981	Aluminum	<0.01	mg/L
GW	NP-3	11/6/1981	Arsenic	<0.01	mg/L
GW	NP-3	11/6/1981	Barium	<0.2	mg/L
GW	NP-3	11/6/1981	Boron	<0.1	mg/L
GW	NP-3	11/6/1981	Cadmium	<0.005	mg/L
GW	NP-3	11/6/1981	Chloride	28	mg/L
GW	NP-3	11/6/1981	Chromium	<0.01	mg/L
GW	NP-3	11/6/1981	Cobalt	<0.02	mg/L
GW	NP-3	11/6/1981	Copper	<0.05	mg/L
GW	NP-3	11/6/1981	Cyanide	<0.01	mg/L
GW	NP-3	11/6/1981	Fluoride	1.6	mg/L
GW	NP-3	11/6/1981	Iron	<0.1	mg/L
GW	NP-3	11/6/1981	Lead	<0.02	mg/L
GW	NP-3	11/6/1981	Manganese	0.47	mg/L
GW	NP-3	11/6/1981	Mercury	<0.001	mg/L
GW	NP-3	11/6/1981	Molybdenum	0.26	mg/L
GW	NP-3	11/6/1981	Nickel	<0.05	mg/L
GW	NP-3	11/6/1981	Nitrate as N (NO3)	0.2	mg/L
GW	NP-3	11/6/1981	Selenium	<0.005	mg/L
GW	NP-3	11/6/1981	Silver	<0.02	mg/L
GW	NP-3	11/6/1981	Sulfate	140	mg/L
GW	NP-3	11/6/1981	TDS	380	mg/L
GW	NP-3	11/6/1981	Zinc	1.1	mg/L
GW	NP-3	11/6/1981	pH	7.9	pH units
GW	NP-3	11/6/1981	Calcium	39	mg/L
GW	GWQ-10	11/13/1981	Aluminum	0.37	mg/L
GW	GWQ-10	11/13/1981	Arsenic	<0.005	mg/L
GW	GWQ-10	11/13/1981	Barium	0.25	mg/L
GW	GWQ-10	11/13/1981	Boron	0.037	mg/L
GW	GWQ-10	11/13/1981	Cadmium	0.001	mg/L
GW	GWQ-10	11/13/1981	Chloride	22.85	mg/L
GW	GWQ-10	11/13/1981	Chromium	<0.005	mg/L
GW	GWQ-10	11/13/1981	Cyanide	0.001	mg/L
GW	GWQ-10	11/13/1981	Fluoride	0.62	mg/L
GW	GWQ-10	11/13/1981	Lead	<0.005	mg/L
GW	GWQ-10	11/13/1981	Manganese	0.5	mg/L
GW	GWQ-10	11/13/1981	Mercury	<0.0005	mg/L
GW	GWQ-10	11/13/1981	Molybdenum	<0.01	mg/L
GW	GWQ-10	11/13/1981	Nickel	<0.05	mg/L
GW	GWQ-10	11/13/1981	Nitrate as N (NO3)	1.8	mg/L
GW	GWQ-10	11/13/1981	Selenium	0.01	mg/L
GW	GWQ-10	11/13/1981	Silver	<0.001	mg/L
GW	GWQ-10	11/13/1981	Sulfate	140.9	mg/L
GW	GWQ-10	11/13/1981	TDS	509	mg/L
GW	GWQ-10	11/13/1981	Zinc	0.9	mg/L
GW	GWQ-10	11/13/1981	pH	7.75	pH units
GW	GWQ-10	11/13/1981	Conductivity	700	µmhos/cm
GW	GWQ-10	11/13/1981	Calcium	84.2	mg/L
GW	GWQ-10	11/13/1981	Magnesium	17.45	mg/L
GW	GWQ-10	11/13/1981	Thallium	<0.005	mg/L
GW	GWQ-10	11/13/1981	Sodium	39.1	mg/L
GW	GWQ-10	11/13/1981	Bicarbonate	275.6	mg/L CaCO3
GW	GWQ-10	11/13/1981	Potassium	2.34	mg/L
GW	GWQ-11	11/13/1981	Aluminum	<0.25	mg/L
GW	GWQ-11	11/13/1981	Arsenic	<0.005	mg/L
GW	GWQ-11	11/13/1981	Barium	0.2	mg/L
GW	GWQ-11	11/13/1981	Boron	0.041	mg/L
GW	GWQ-11	11/13/1981	Cadmium	0.001	mg/L
GW	GWQ-11	11/13/1981	Chloride	37.64	mg/L
GW	GWQ-11	11/13/1981	Chromium	<0.005	mg/L
GW	GWQ-11	11/13/1981	Cyanide	<0.001	mg/L
GW	GWQ-11	11/13/1981	Fluoride	0.99	mg/L
GW	GWQ-11	11/13/1981	Lead	<0.005	mg/L
GW	GWQ-11	11/13/1981	Manganese	<0.05	mg/L
GW	GWQ-11	11/13/1981	Mercury	<0.0005	mg/L
GW	GWQ-11	11/13/1981	Molybdenum	0.12	mg/L
GW	GWQ-11	11/13/1981	Nickel	<0.05	mg/L
GW	GWQ-11	11/13/1981	Nitrate as N (NO3)	1.33	mg/L

GW	GWQ-11	11/13/1981	Selenium	0.023	mg/L
GW	GWQ-11	11/13/1981	Silver	<0.001	mg/L
GW	GWQ-11	11/13/1981	Sulfate	155.6	mg/L
GW	GWQ-11	11/13/1981	TDS	544	mg/L
GW	GWQ-11	11/13/1981	Zinc	0.79	mg/L
GW	GWQ-11	11/13/1981	pH	7.7	pH units
GW	GWQ-11	11/13/1981	Conductivity	700	µmhos/cm
GW	GWQ-11	11/13/1981	Calcium	82.6	mg/L
GW	GWQ-11	11/13/1981	Magnesium	17.2	mg/L
GW	GWQ-11	11/13/1981	Sodium	43.7	mg/L
GW	GWQ-11	11/13/1981	Bicarbonate	241.1	mg/L CaCO3
GW	GWQ-11	11/13/1981	Potassium	3.9	mg/L
GW	NP-1	11/13/1981	Aluminum	<0.25	mg/L
GW	NP-1	11/13/1981	Arsenic	<0.005	mg/L
GW	NP-1	11/13/1981	Barium	0.2	mg/L
GW	NP-1	11/13/1981	Boron	0.044	mg/L
GW	NP-1	11/13/1981	Cadmium	0.006	mg/L
GW	NP-1	11/13/1981	Chloride	24.08	mg/L
GW	NP-1	11/13/1981	Chromium	<0.005	mg/L
GW	NP-1	11/13/1981	Cyanide	0.001	mg/L
GW	NP-1	11/13/1981	Fluoride	0.83	mg/L
GW	NP-1	11/13/1981	Lead	<0.005	mg/L
GW	NP-1	11/13/1981	Manganese	1.34	mg/L
GW	NP-1	11/13/1981	Mercury	<0.0005	mg/L
GW	NP-1	11/13/1981	Molybdenum	0.011	mg/L
GW	NP-1	11/13/1981	Nickel	<0.05	mg/L
GW	NP-1	11/13/1981	Nitrate as N (NO3)	0.09	mg/L
GW	NP-1	11/13/1981	Selenium	0.029	mg/L
GW	NP-1	11/13/1981	Silver	<0.001	mg/L
GW	NP-1	11/13/1981	Sulfate	130.7	mg/L
GW	NP-1	11/13/1981	TDS	470	mg/L
GW	NP-1	11/13/1981	Zinc	0.44	mg/L
GW	NP-1	11/13/1981	pH	7.65	pH units
GW	NP-1	11/13/1981	Conductivity	625	µmhos/cm
GW	NP-1	11/13/1981	Calcium	71.6	mg/L
GW	NP-1	11/13/1981	Magnesium	19.28	mg/L
GW	NP-1	11/13/1981	Sodium	39.1	mg/L
GW	NP-1	11/13/1981	Bicarbonate	274.4	mg/L CaCO3
GW	NP-1	11/13/1981	Potassium	5.85	mg/L
GW	NP-2	11/13/1981	Aluminum	<0.25	mg/L
GW	NP-2	11/13/1981	Arsenic	<0.005	mg/L
GW	NP-2	11/13/1981	Barium	<0.1	mg/L
GW	NP-2	11/13/1981	Boron	0.04	mg/L
GW	NP-2	11/13/1981	Cadmium	<0.001	mg/L
GW	NP-2	11/13/1981	Chloride	30.79	mg/L
GW	NP-2	11/13/1981	Chromium	<0.005	mg/L
GW	NP-2	11/13/1981	Cyanide	0.0026	mg/L
GW	NP-2	11/13/1981	Fluoride	1.14	mg/L
GW	NP-2	11/13/1981	Lead	<0.005	mg/L
GW	NP-2	11/13/1981	Manganese	0.79	mg/L
GW	NP-2	11/13/1981	Mercury	<0.0005	mg/L
GW	NP-2	11/13/1981	Molybdenum	0.04	mg/L
GW	NP-2	11/13/1981	Nickel	<0.01	mg/L
GW	NP-2	11/13/1981	Nitrate as N (NO3)	0.25	mg/L
GW	NP-2	11/13/1981	Selenium	0.017	mg/L
GW	NP-2	11/13/1981	Silver	<0.001	mg/L
GW	NP-2	11/13/1981	Sulfate	162.4	mg/L
GW	NP-2	11/13/1981	TDS	466	mg/L
GW	NP-2	11/13/1981	Zinc	3.18	mg/L
GW	NP-2	11/13/1981	pH	7.65	pH units
GW	NP-2	11/13/1981	Conductivity	675	µmhos/cm
GW	NP-2	11/13/1981	Calcium	65.1	mg/L
GW	NP-2	11/13/1981	Magnesium	18.67	mg/L
GW	NP-2	11/13/1981	Sodium	59.8	mg/L
GW	NP-2	11/13/1981	Bicarbonate	221.3	mg/L CaCO3
GW	NP-2	11/13/1981	Potassium	3.9	mg/L
GW	NP-3	11/13/1981	Aluminum	<0.25	mg/L
GW	NP-3	11/13/1981	Arsenic	0.009	mg/L
GW	NP-3	11/13/1981	Barium	<0.1	mg/L
GW	NP-3	11/13/1981	Boron	0.034	mg/L
GW	NP-3	11/13/1981	Cadmium	<0.001	mg/L
GW	NP-3	11/13/1981	Chloride	26.71	mg/L
GW	NP-3	11/13/1981	Chromium	<0.005	mg/L
GW	NP-3	11/13/1981	Fluoride	1.39	mg/L
GW	NP-3	11/13/1981	Lead	<0.005	mg/L
GW	NP-3	11/13/1981	Manganese	1.01	mg/L

GW	NP-3	11/13/1981	Mercury	<0.0005	mg/L
GW	NP-3	11/13/1981	Molybdenum	0.065	mg/L
GW	NP-3	11/13/1981	Nickel	<0.05	mg/L
GW	NP-3	11/13/1981	Nitrate as N (NO3)	0.16	mg/L
GW	NP-3	11/13/1981	Selenium	0.023	mg/L
GW	NP-3	11/13/1981	Silver	0.023	mg/L
GW	NP-3	11/13/1981	Sulfate	140.6	mg/L
GW	NP-3	11/13/1981	TDS	446	mg/L
GW	NP-3	11/13/1981	Zinc	1.59	mg/L
GW	NP-3	11/13/1981	pH	7.6	pH units
GW	NP-3	11/13/1981	Conductivity	600	µmhos/cm
GW	NP-3	11/13/1981	Calcium	55.2	mg/L
GW	NP-3	11/13/1981	Magnesium	13.05	mg/L
GW	NP-3	11/13/1981	Sodium	43.7	mg/L
GW	NP-3	11/13/1981	Bicarbonate	190.3	mg/L CaCO3
GW	NP-3	11/13/1981	Potassium	5.85	mg/L
GW	NP-5	11/13/1981	Aluminum	0.239	mg/L
GW	NP-5	11/13/1981	Arsenic	<0.005	mg/L
GW	NP-5	11/13/1981	Barium	0.218	mg/L
GW	NP-5	11/13/1981	Boron	0.07	mg/L
GW	NP-5	11/13/1981	Cadmium	<0.001	mg/L
GW	NP-5	11/13/1981	Chloride	37.89	mg/L
GW	NP-5	11/13/1981	Chromium	<0.005	mg/L
GW	NP-5	11/13/1981	Copper	<0.1	mg/L
GW	NP-5	11/13/1981	Cyanide	0.001	mg/L
GW	NP-5	11/13/1981	Fluoride	1.28	mg/L
GW	NP-5	11/13/1981	Lead	<0.005	mg/L
GW	NP-5	11/13/1981	Manganese	0.14	mg/L
GW	NP-5	11/13/1981	Mercury	<0.0005	mg/L
GW	NP-5	11/13/1981	Molybdenum	0.015	mg/L
GW	NP-5	11/13/1981	Nickel	0.019	mg/L
GW	NP-5	11/13/1981	Nitrate as N (NO3)	3.56	mg/L
GW	NP-5	11/13/1981	Selenium	0.014	mg/L
GW	NP-5	11/13/1981	Silver	<0.001	mg/L
GW	NP-5	11/13/1981	Sulfate	162	mg/L
GW	NP-5	11/13/1981	TDS	488	mg/L
GW	NP-5	11/13/1981	Zinc	<0.05	mg/L
GW	NP-5	11/13/1981	pH	7.7	pH units
GW	NP-5	11/13/1981	Conductivity	650	µmhos/cm
GW	NP-5	11/13/1981	Calcium	88.6	mg/L
GW	NP-5	11/13/1981	Magnesium	14.4	mg/L
GW	NP-5	11/13/1981	Sodium	43.7	mg/L
GW	NP-5	11/13/1981	Bicarbonate	186.7	mg/L CaCO3
GW	NP-5	11/13/1981	Potassium	5.07	mg/L
GW	GWQ-10	11/17/1981	Aluminum	<0.01	mg/L
GW	GWQ-10	11/17/1981	Arsenic	<0.01	mg/L
GW	GWQ-10	11/17/1981	Barium	<0.2	mg/L
GW	GWQ-10	11/17/1981	Boron	<0.1	mg/L
GW	GWQ-10	11/17/1981	Cadmium	<0.005	mg/L
GW	GWQ-10	11/17/1981	Chloride	26	mg/L
GW	GWQ-10	11/17/1981	Chromium	<0.01	mg/L
GW	GWQ-10	11/17/1981	Cobalt	<0.02	mg/L
GW	GWQ-10	11/17/1981	Copper	<0.05	mg/L
GW	GWQ-10	11/17/1981	Cyanide	<0.01	mg/L
GW	GWQ-10	11/17/1981	Fluoride	0.6	mg/L
GW	GWQ-10	11/17/1981	Iron	<0.1	mg/L
GW	GWQ-10	11/17/1981	Lead	<0.02	mg/L
GW	GWQ-10	11/17/1981	Manganese	<0.05	mg/L
GW	GWQ-10	11/17/1981	Mercury	<0.001	mg/L
GW	GWQ-10	11/17/1981	Molybdenum	<0.05	mg/L
GW	GWQ-10	11/17/1981	Nickel	<0.05	mg/L
GW	GWQ-10	11/17/1981	Nitrate as N (NO3)	1.8	mg/L
GW	GWQ-10	11/17/1981	Selenium	<0.005	mg/L
GW	GWQ-10	11/17/1981	Silver	<0.02	mg/L
GW	GWQ-10	11/17/1981	Sulfate	156	mg/L
GW	GWQ-10	11/17/1981	TDS	500	mg/L
GW	GWQ-10	11/17/1981	Zinc	0.28	mg/L
GW	GWQ-10	11/17/1981	pH	7.9	pH units
GW	GWQ-10	11/17/1981	Calcium	70	mg/L
GW	GWQ-11	11/17/1981	Aluminum	<0.01	mg/L
GW	GWQ-11	11/17/1981	Arsenic	<0.01	mg/L
GW	GWQ-11	11/17/1981	Barium	<0.2	mg/L
GW	GWQ-11	11/17/1981	Boron	<0.1	mg/L
GW	GWQ-11	11/17/1981	Cadmium	<0.005	mg/L
GW	GWQ-11	11/17/1981	Chloride	36	mg/L
GW	GWQ-11	11/17/1981	Chromium	<0.01	mg/L

GW	GWQ-11	11/17/1981	Cobalt	<0.02	mg/L
GW	GWQ-11	11/17/1981	Copper	<0.05	mg/L
GW	GWQ-11	11/17/1981	Cyanide	<0.01	mg/L
GW	GWQ-11	11/17/1981	Fluoride	1	mg/L
GW	GWQ-11	11/17/1981	Iron	<0.1	mg/L
GW	GWQ-11	11/17/1981	Lead	<0.02	mg/L
GW	GWQ-11	11/17/1981	Manganese	<0.05	mg/L
GW	GWQ-11	11/17/1981	Mercury	<0.001	mg/L
GW	GWQ-11	11/17/1981	Molybdenum	<0.05	mg/L
GW	GWQ-11	11/17/1981	Nickel	<0.05	mg/L
GW	GWQ-11	11/17/1981	Nitrate as N (NO3)	1.3	mg/L
GW	GWQ-11	11/17/1981	Selenium	<0.005	mg/L
GW	GWQ-11	11/17/1981	Silver	<0.02	mg/L
GW	GWQ-11	11/17/1981	Sulfate	165	mg/L
GW	GWQ-11	11/17/1981	TDS	520	mg/L
GW	GWQ-11	11/17/1981	Zinc	0.64	mg/L
GW	GWQ-11	11/17/1981	pH	8	pH units
GW	GWQ-11	11/17/1981	Calcium	71	mg/L
GW	NP-1	11/17/1981	Aluminum	<0.01	mg/L
GW	NP-1	11/17/1981	Arsenic	<0.005	mg/L
GW	NP-1	11/17/1981	Barium	0.24	mg/L
GW	NP-1	11/17/1981	Boron	<0.1	mg/L
GW	NP-1	11/17/1981	Cadmium	<0.005	mg/L
GW	NP-1	11/17/1981	Chloride	24	mg/L
GW	NP-1	11/17/1981	Chromium	<0.01	mg/L
GW	NP-1	11/17/1981	Cobalt	<0.02	mg/L
GW	NP-1	11/17/1981	Copper	0.069	mg/L
GW	NP-1	11/17/1981	Cyanide	<0.01	mg/L
GW	NP-1	11/17/1981	Fluoride	0.8	mg/L
GW	NP-1	11/17/1981	Iron	<0.1	mg/L
GW	NP-1	11/17/1981	Lead	<0.02	mg/L
GW	NP-1	11/17/1981	Manganese	1.4	mg/L
GW	NP-1	11/17/1981	Mercury	<0.001	mg/L
GW	NP-1	11/17/1981	Molybdenum	0.06	mg/L
GW	NP-1	11/17/1981	Nickel	<0.05	mg/L
GW	NP-1	11/17/1981	Nitrate as N (NO3)	0.2	mg/L
GW	NP-1	11/17/1981	Selenium	<0.005	mg/L
GW	NP-1	11/17/1981	Silver	<0.02	mg/L
GW	NP-1	11/17/1981	Sulfate	154	mg/L
GW	NP-1	11/17/1981	TDS	460	mg/L
GW	NP-1	11/17/1981	Zinc	3.9	mg/L
GW	NP-1	11/17/1981	pH	8	pH units
GW	NP-1	11/17/1981	Calcium	59	mg/L
GW	NP-3	11/17/1981	Aluminum	<0.01	mg/L
GW	NP-3	11/17/1981	Arsenic	<0.01	mg/L
GW	NP-3	11/17/1981	Barium	0.24	mg/L
GW	NP-3	11/17/1981	Boron	<0.1	mg/L
GW	NP-3	11/17/1981	Cadmium	<0.005	mg/L
GW	NP-3	11/17/1981	Chloride	26	mg/L
GW	NP-3	11/17/1981	Chromium	<0.01	mg/L
GW	NP-3	11/17/1981	Cobalt	<0.02	mg/L
GW	NP-3	11/17/1981	Copper	<0.05	mg/L
GW	NP-3	11/17/1981	Cyanide	<0.01	mg/L
GW	NP-3	11/17/1981	Fluoride	1.4	mg/L
GW	NP-3	11/17/1981	Iron	<0.1	mg/L
GW	NP-3	11/17/1981	Lead	<0.02	mg/L
GW	NP-3	11/17/1981	Manganese	1	mg/L
GW	NP-3	11/17/1981	Mercury	<0.001	mg/L
GW	NP-3	11/17/1981	Molybdenum	0.2	mg/L
GW	NP-3	11/17/1981	Nickel	<0.05	mg/L
GW	NP-3	11/17/1981	Nitrate as N (NO3)	<0.2	mg/L
GW	NP-3	11/17/1981	Selenium	<0.005	mg/L
GW	NP-3	11/17/1981	Silver	<0.02	mg/L
GW	NP-3	11/17/1981	Sulfate	144	mg/L
GW	NP-3	11/17/1981	TDS	390	mg/L
GW	NP-3	11/17/1981	Zinc	1.2	mg/L
GW	NP-3	11/17/1981	pH	8.1	pH units
GW	NP-3	11/17/1981	Calcium	44	mg/L
GW	NP-5	11/17/1981	Aluminum	<0.01	mg/L
GW	NP-5	11/17/1981	Arsenic	<0.01	mg/L
GW	NP-5	11/17/1981	Barium	<0.2	mg/L
GW	NP-5	11/17/1981	Boron	<0.1	mg/L
GW	NP-5	11/17/1981	Cadmium	<0.005	mg/L
GW	NP-5	11/17/1981	Chloride	42	mg/L
GW	NP-5	11/17/1981	Chromium	<0.01	mg/L
GW	NP-5	11/17/1981	Cobalt	<0.02	mg/L

GW	NP-5	11/17/1981	Copper	<0.05	mg/L
GW	NP-5	11/17/1981	Cyanide	<0.01	mg/L
GW	NP-5	11/17/1981	Fluoride	1.3	mg/L
GW	NP-5	11/17/1981	Iron	<0.1	mg/L
GW	NP-5	11/17/1981	Lead	<0.02	mg/L
GW	NP-5	11/17/1981	Manganese	0.3	mg/L
GW	NP-5	11/17/1981	Mercury	<0.001	mg/L
GW	NP-5	11/17/1981	Molybdenum	0.07	mg/L
GW	NP-5	11/17/1981	Nickel	<0.05	mg/L
GW	NP-5	11/17/1981	Nitrate as N (NO3)	2.7	mg/L
GW	NP-5	11/17/1981	Selenium	<0.005	mg/L
GW	NP-5	11/17/1981	Silver	<0.02	mg/L
GW	NP-5	11/17/1981	Sulfate	158	mg/L
GW	NP-5	11/17/1981	TDS	500	mg/L
GW	NP-5	11/17/1981	Zinc	0.19	mg/L
GW	NP-5	11/17/1981	pH	8	pH units
GW	NP-5	11/17/1981	Calcium	72	mg/L
GW	GWQ-10	11/23/1981	Aluminum	<0.01	mg/L
GW	GWQ-10	11/23/1981	Arsenic	<0.01	mg/L
GW	GWQ-10	11/23/1981	Barium	<0.2	mg/L
GW	GWQ-10	11/23/1981	Boron	<0.1	mg/L
GW	GWQ-10	11/23/1981	Cadmium	<0.005	mg/L
GW	GWQ-10	11/23/1981	Chloride	26	mg/L
GW	GWQ-10	11/23/1981	Chromium	<0.01	mg/L
GW	GWQ-10	11/23/1981	Cobalt	<0.02	mg/L
GW	GWQ-10	11/23/1981	Copper	<0.05	mg/L
GW	GWQ-10	11/23/1981	Cyanide	<0.01	mg/L
GW	GWQ-10	11/23/1981	Fluoride	0.6	mg/L
GW	GWQ-10	11/23/1981	Iron	<0.1	mg/L
GW	GWQ-10	11/23/1981	Lead	<0.02	mg/L
GW	GWQ-10	11/23/1981	Manganese	<0.05	mg/L
GW	GWQ-10	11/23/1981	Mercury	<0.001	mg/L
GW	GWQ-10	11/23/1981	Molybdenum	<0.05	mg/L
GW	GWQ-10	11/23/1981	Nickel	<0.05	mg/L
GW	GWQ-10	11/23/1981	Nitrate as N (NO3)	1.8	mg/L
GW	GWQ-10	11/23/1981	Selenium	<0.005	mg/L
GW	GWQ-10	11/23/1981	Silver	<0.02	mg/L
GW	GWQ-10	11/23/1981	Sulfate	161	mg/L
GW	GWQ-10	11/23/1981	TDS	650	mg/L
GW	GWQ-10	11/23/1981	Zinc	0.37	mg/L
GW	GWQ-10	11/23/1981	pH	7.7	pH units
GW	GWQ-10	11/23/1981	Calcium	70	mg/L
GW	GWQ-11	11/23/1981	Aluminum	<0.01	mg/L
GW	GWQ-11	11/23/1981	Arsenic	<0.01	mg/L
GW	GWQ-11	11/23/1981	Barium	<0.2	mg/L
GW	GWQ-11	11/23/1981	Boron	<0.1	mg/L
GW	GWQ-11	11/23/1981	Cadmium	<0.005	mg/L
GW	GWQ-11	11/23/1981	Chloride	36	mg/L
GW	GWQ-11	11/23/1981	Chromium	<0.01	mg/L
GW	GWQ-11	11/23/1981	Cobalt	<0.02	mg/L
GW	GWQ-11	11/23/1981	Copper	<0.05	mg/L
GW	GWQ-11	11/23/1981	Cyanide	<0.01	mg/L
GW	GWQ-11	11/23/1981	Fluoride	0.9	mg/L
GW	GWQ-11	11/23/1981	Iron	<0.1	mg/L
GW	GWQ-11	11/23/1981	Lead	<0.02	mg/L
GW	GWQ-11	11/23/1981	Manganese	<0.05	mg/L
GW	GWQ-11	11/23/1981	Mercury	<0.001	mg/L
GW	GWQ-11	11/23/1981	Molybdenum	<0.05	mg/L
GW	GWQ-11	11/23/1981	Nickel	<0.05	mg/L
GW	GWQ-11	11/23/1981	Nitrate as N (NO3)	1.7	mg/L
GW	GWQ-11	11/23/1981	Selenium	<0.005	mg/L
GW	GWQ-11	11/23/1981	Silver	<0.02	mg/L
GW	GWQ-11	11/23/1981	Sulfate	181	mg/L
GW	GWQ-11	11/23/1981	TDS	570	mg/L
GW	GWQ-11	11/23/1981	Zinc	0.53	mg/L
GW	GWQ-11	11/23/1981	pH	7.8	pH units
GW	GWQ-11	11/23/1981	Calcium	67	mg/L
GW	NP-1	11/23/1981	Aluminum	<0.01	mg/L
GW	NP-1	11/23/1981	Arsenic	<0.01	mg/L
GW	NP-1	11/23/1981	Barium	0.02	mg/L
GW	NP-1	11/23/1981	Boron	<0.1	mg/L
GW	NP-1	11/23/1981	Cadmium	<0.005	mg/L
GW	NP-1	11/23/1981	Chloride	26	mg/L
GW	NP-1	11/23/1981	Chromium	<0.02	mg/L
GW	NP-1	11/23/1981	Cobalt	<0.02	mg/L
GW	NP-1	11/23/1981	Copper	<0.05	mg/L

GW	NP-1	11/23/1981	Cyanide	<0.01	mg/L
GW	NP-1	11/23/1981	Fluoride	0.8	mg/L
GW	NP-1	11/23/1981	Iron	<0.1	mg/L
GW	NP-1	11/23/1981	Lead	<0.02	mg/L
GW	NP-1	11/23/1981	Manganese	1.2	mg/L
GW	NP-1	11/23/1981	Mercury	<0.001	mg/L
GW	NP-1	11/23/1981	Molybdenum	<0.05	mg/L
GW	NP-1	11/23/1981	Nickel	<0.05	mg/L
GW	NP-1	11/23/1981	Nitrate as N (NO3)	0.2	mg/L
GW	NP-1	11/23/1981	Selenium	<0.005	mg/L
GW	NP-1	11/23/1981	Silver	<0.02	mg/L
GW	NP-1	11/23/1981	Sulfate	146	mg/L
GW	NP-1	11/23/1981	TDS	530	mg/L
GW	NP-1	11/23/1981	Zinc	4.1	mg/L
GW	NP-1	11/23/1981	pH	7.7	pH units
GW	NP-1	11/23/1981	Calcium	58	mg/L
GW	NP-2	11/23/1981	Aluminum	<0.01	mg/L
GW	NP-2	11/23/1981	Arsenic	<0.01	mg/L
GW	NP-2	11/23/1981	Barium	0.02	mg/L
GW	NP-2	11/23/1981	Boron	<0.1	mg/L
GW	NP-2	11/23/1981	Cadmium	<0.005	mg/L
GW	NP-2	11/23/1981	Chloride	30	mg/L
GW	NP-2	11/23/1981	Chromium	<0.02	mg/L
GW	NP-2	11/23/1981	Cobalt	<0.02	mg/L
GW	NP-2	11/23/1981	Copper	<0.05	mg/L
GW	NP-2	11/23/1981	Cyanide	<0.01	mg/L
GW	NP-2	11/23/1981	Fluoride	0.9	mg/L
GW	NP-2	11/23/1981	Iron	<0.1	mg/L
GW	NP-2	11/23/1981	Lead	<0.02	mg/L
GW	NP-2	11/23/1981	Manganese	0.54	mg/L
GW	NP-2	11/23/1981	Mercury	<0.001	mg/L
GW	NP-2	11/23/1981	Molybdenum	0.06	mg/L
GW	NP-2	11/23/1981	Nickel	<0.05	mg/L
GW	NP-2	11/23/1981	Nitrate as N (NO3)	0.7	mg/L
GW	NP-2	11/23/1981	Selenium	<0.005	mg/L
GW	NP-2	11/23/1981	Silver	<0.02	mg/L
GW	NP-2	11/23/1981	Sulfate	156	mg/L
GW	NP-2	11/23/1981	TDS	520	mg/L
GW	NP-2	11/23/1981	Zinc	3.5	mg/L
GW	NP-2	11/23/1981	pH	7.7	pH units
GW	NP-2	11/23/1981	Calcium	57	mg/L
GW	NP-3	11/23/1981	Aluminum	<0.01	mg/L
GW	NP-3	11/23/1981	Arsenic	<0.01	mg/L
GW	NP-3	11/23/1981	Barium	0.02	mg/L
GW	NP-3	11/23/1981	Boron	<0.1	mg/L
GW	NP-3	11/23/1981	Cadmium	<0.005	mg/L
GW	NP-3	11/23/1981	Chloride	26	mg/L
GW	NP-3	11/23/1981	Chromium	<0.02	mg/L
GW	NP-3	11/23/1981	Cobalt	<0.02	mg/L
GW	NP-3	11/23/1981	Copper	<0.05	mg/L
GW	NP-3	11/23/1981	Cyanide	<0.01	mg/L
GW	NP-3	11/23/1981	Fluoride	1.2	mg/L
GW	NP-3	11/23/1981	Iron	<0.1	mg/L
GW	NP-3	11/23/1981	Lead	<0.02	mg/L
GW	NP-3	11/23/1981	Manganese	0.96	mg/L
GW	NP-3	11/23/1981	Mercury	<0.001	mg/L
GW	NP-3	11/23/1981	Molybdenum	0.15	mg/L
GW	NP-3	11/23/1981	Nickel	<0.05	mg/L
GW	NP-3	11/23/1981	Nitrate as N (NO3)	0.2	mg/L
GW	NP-3	11/23/1981	Selenium	<0.005	mg/L
GW	NP-3	11/23/1981	Silver	<0.01	mg/L
GW	NP-3	11/23/1981	Sulfate	144	mg/L
GW	NP-3	11/23/1981	TDS	460	mg/L
GW	NP-3	11/23/1981	Zinc	1.9	mg/L
GW	NP-3	11/23/1981	pH	7.8	pH units
GW	NP-3	11/23/1981	Calcium	47	mg/L
GW	NP-5	11/23/1981	Aluminum	<0.01	mg/L
GW	NP-5	11/23/1981	Arsenic	<0.01	mg/L
GW	NP-5	11/23/1981	Barium	<0.2	mg/L
GW	NP-5	11/23/1981	Boron	<0.1	mg/L
GW	NP-5	11/23/1981	Cadmium	<0.005	mg/L
GW	NP-5	11/23/1981	Chloride	36	mg/L
GW	NP-5	11/23/1981	Chromium	<0.02	mg/L
GW	NP-5	11/23/1981	Cobalt	<0.02	mg/L
GW	NP-5	11/23/1981	Copper	<0.05	mg/L
GW	NP-5	11/23/1981	Cyanide	<0.01	mg/L

GW	NP-5	11/23/1981	Fluoride	1.2	mg/L
GW	NP-5	11/23/1981	Iron	<0.1	mg/L
GW	NP-5	11/23/1981	Lead	<0.02	mg/L
GW	NP-5	11/23/1981	Manganese	0.091	mg/L
GW	NP-5	11/23/1981	Mercury	<0.001	mg/L
GW	NP-5	11/23/1981	Molybdenum	<0.05	mg/L
GW	NP-5	11/23/1981	Nickel	<0.05	mg/L
GW	NP-5	11/23/1981	Nitrate as N (NO3)	4	mg/L
GW	NP-5	11/23/1981	Selenium	<0.005	mg/L
GW	NP-5	11/23/1981	Silver	<0.1	mg/L
GW	NP-5	11/23/1981	Sulfate	161	mg/L
GW	NP-5	11/23/1981	TDS	580	mg/L
GW	NP-5	11/23/1981	Zinc	0.21	mg/L
GW	NP-5	11/23/1981	pH	7.8	pH units
GW	NP-5	11/23/1981	Calcium	73	mg/L
GW	GWQ-10	12/7/1981	Aluminum	<0.01	mg/L
GW	GWQ-10	12/7/1981	Arsenic	<0.01	mg/L
GW	GWQ-10	12/7/1981	Barium	<0.2	mg/L
GW	GWQ-10	12/7/1981	Boron	<0.1	mg/L
GW	GWQ-10	12/7/1981	Cadmium	<0.005	mg/L
GW	GWQ-10	12/7/1981	Chloride	24	mg/L
GW	GWQ-10	12/7/1981	Chromium	<0.01	mg/L
GW	GWQ-10	12/7/1981	Cobalt	<0.02	mg/L
GW	GWQ-10	12/7/1981	Copper	<0.05	mg/L
GW	GWQ-10	12/7/1981	Cyanide	<0.01	mg/L
GW	GWQ-10	12/7/1981	Fluoride	0.5	mg/L
GW	GWQ-10	12/7/1981	Iron	<0.1	mg/L
GW	GWQ-10	12/7/1981	Lead	<0.02	mg/L
GW	GWQ-10	12/7/1981	Manganese	<0.05	mg/L
GW	GWQ-10	12/7/1981	Mercury	<0.001	mg/L
GW	GWQ-10	12/7/1981	Molybdenum	<0.05	mg/L
GW	GWQ-10	12/7/1981	Nickel	<0.05	mg/L
GW	GWQ-10	12/7/1981	Nitrate as N (NO3)	1.8	mg/L
GW	GWQ-10	12/7/1981	Selenium	<0.005	mg/L
GW	GWQ-10	12/7/1981	Silver	<0.02	mg/L
GW	GWQ-10	12/7/1981	Sulfate	168	mg/L
GW	GWQ-10	12/7/1981	TDS	490	mg/L
GW	GWQ-10	12/7/1981	Zinc	0.87	mg/L
GW	GWQ-10	12/7/1981	pH	8.2	pH units
GW	GWQ-10	12/7/1981	Calcium	67	mg/L
GW	GWQ-11	12/7/1981	Aluminum	<0.01	mg/L
GW	GWQ-11	12/7/1981	Arsenic	<0.01	mg/L
GW	GWQ-11	12/7/1981	Barium	<0.2	mg/L
GW	GWQ-11	12/7/1981	Boron	<0.1	mg/L
GW	GWQ-11	12/7/1981	Cadmium	<0.005	mg/L
GW	GWQ-11	12/7/1981	Chloride	56	mg/L
GW	GWQ-11	12/7/1981	Chromium	<0.01	mg/L
GW	GWQ-11	12/7/1981	Cobalt	<0.02	mg/L
GW	GWQ-11	12/7/1981	Copper	<0.05	mg/L
GW	GWQ-11	12/7/1981	Cyanide	<0.01	mg/L
GW	GWQ-11	12/7/1981	Fluoride	0.9	mg/L
GW	GWQ-11	12/7/1981	Iron	<0.1	mg/L
GW	GWQ-11	12/7/1981	Lead	<0.02	mg/L
GW	GWQ-11	12/7/1981	Manganese	<0.05	mg/L
GW	GWQ-11	12/7/1981	Mercury	0.0064	mg/L
GW	GWQ-11	12/7/1981	Molybdenum	<0.05	mg/L
GW	GWQ-11	12/7/1981	Nickel	<0.05	mg/L
GW	GWQ-11	12/7/1981	Nitrate as N (NO3)	1.6	mg/L
GW	GWQ-11	12/7/1981	Selenium	<0.005	mg/L
GW	GWQ-11	12/7/1981	Silver	<0.02	mg/L
GW	GWQ-11	12/7/1981	Sulfate	184	mg/L
GW	GWQ-11	12/7/1981	TDS	560	mg/L
GW	GWQ-11	12/7/1981	Zinc	1.6	mg/L
GW	GWQ-11	12/7/1981	pH	7.9	pH units
GW	GWQ-11	12/7/1981	Calcium	57	mg/L
GW	NP-1	12/7/1981	Aluminum	<0.01	mg/L
GW	NP-1	12/7/1981	Arsenic	<0.01	mg/L
GW	NP-1	12/7/1981	Barium	<0.2	mg/L
GW	NP-1	12/7/1981	Boron	<0.1	mg/L
GW	NP-1	12/7/1981	Cadmium	<0.005	mg/L
GW	NP-1	12/7/1981	Chloride	24	mg/L
GW	NP-1	12/7/1981	Chromium	<0.01	mg/L
GW	NP-1	12/7/1981	Cobalt	<0.02	mg/L
GW	NP-1	12/7/1981	Copper	<0.05	mg/L
GW	NP-1	12/7/1981	Cyanide	<0.01	mg/L
GW	NP-1	12/7/1981	Fluoride	0.8	mg/L

GW	NP-1	12/7/1981	Iron	<0.1	mg/L
GW	NP-1	12/7/1981	Lead	<0.02	mg/L
GW	NP-1	12/7/1981	Manganese	1.2	mg/L
GW	NP-1	12/7/1981	Mercury	<0.001	mg/L
GW	NP-1	12/7/1981	Molybdenum	<0.05	mg/L
GW	NP-1	12/7/1981	Nickel	<0.05	mg/L
GW	NP-1	12/7/1981	Nitrate as N (NO3)	0.2	mg/L
GW	NP-1	12/7/1981	Selenium	<0.005	mg/L
GW	NP-1	12/7/1981	Silver	<0.02	mg/L
GW	NP-1	12/7/1981	Sulfate	158	mg/L
GW	NP-1	12/7/1981	TDS	490	mg/L
GW	NP-1	12/7/1981	Zinc	5.1	mg/L
GW	NP-1	12/7/1981	pH	7.3	pH units
GW	NP-1	12/7/1981	Calcium	58	mg/L
GW	NP-2	12/7/1981	Aluminum	<0.01	mg/L
GW	NP-2	12/7/1981	Arsenic	<0.01	mg/L
GW	NP-2	12/7/1981	Barium	<0.2	mg/L
GW	NP-2	12/7/1981	Boron	<0.1	mg/L
GW	NP-2	12/7/1981	Cadmium	<0.005	mg/L
GW	NP-2	12/7/1981	Chloride	30	mg/L
GW	NP-2	12/7/1981	Chromium	<0.01	mg/L
GW	NP-2	12/7/1981	Cobalt	<0.02	mg/L
GW	NP-2	12/7/1981	Copper	<0.05	mg/L
GW	NP-2	12/7/1981	Cyanide	<0.01	mg/L
GW	NP-2	12/7/1981	Fluoride	0.8	mg/L
GW	NP-2	12/7/1981	Iron	<0.1	mg/L
GW	NP-2	12/7/1981	Lead	<0.02	mg/L
GW	NP-2	12/7/1981	Manganese	0.54	mg/L
GW	NP-2	12/7/1981	Mercury	<0.001	mg/L
GW	NP-2	12/7/1981	Molybdenum	0.06	mg/L
GW	NP-2	12/7/1981	Nickel	<0.05	mg/L
GW	NP-2	12/7/1981	Nitrate as N (NO3)	0.6	mg/L
GW	NP-2	12/7/1981	Selenium	<0.005	mg/L
GW	NP-2	12/7/1981	Silver	<0.02	mg/L
GW	NP-2	12/7/1981	Sulfate	160	mg/L
GW	NP-2	12/7/1981	TDS	490	mg/L
GW	NP-2	12/7/1981	Zinc	4.4	mg/L
GW	NP-2	12/7/1981	pH	7.5	pH units
GW	NP-2	12/7/1981	Calcium	53	mg/L
GW	NP-3	12/7/1981	Aluminum	<0.01	mg/L
GW	NP-3	12/7/1981	Arsenic	<0.01	mg/L
GW	NP-3	12/7/1981	Barium	<0.2	mg/L
GW	NP-3	12/7/1981	Boron	<0.1	mg/L
GW	NP-3	12/7/1981	Cadmium	<0.005	mg/L
GW	NP-3	12/7/1981	Chloride	28	mg/L
GW	NP-3	12/7/1981	Chromium	<0.01	mg/L
GW	NP-3	12/7/1981	Cobalt	<0.02	mg/L
GW	NP-3	12/7/1981	Copper	<0.05	mg/L
GW	NP-3	12/7/1981	Cyanide	<0.01	mg/L
GW	NP-3	12/7/1981	Fluoride	1.1	mg/L
GW	NP-3	12/7/1981	Iron	<0.1	mg/L
GW	NP-3	12/7/1981	Lead	<0.02	mg/L
GW	NP-3	12/7/1981	Manganese	0.78	mg/L
GW	NP-3	12/7/1981	Mercury	<0.001	mg/L
GW	NP-3	12/7/1981	Molybdenum	0.13	mg/L
GW	NP-3	12/7/1981	Nickel	<0.05	mg/L
GW	NP-3	12/7/1981	Nitrate as N (NO3)	<0.2	mg/L
GW	NP-3	12/7/1981	Selenium	<0.005	mg/L
GW	NP-3	12/7/1981	Silver	<0.02	mg/L
GW	NP-3	12/7/1981	Sulfate	153	mg/L
GW	NP-3	12/7/1981	TDS	450	mg/L
GW	NP-3	12/7/1981	Zinc	3.5	mg/L
GW	NP-3	12/7/1981	pH	7.9	pH units
GW	NP-3	12/7/1981	Calcium	47	mg/L
GW	NP-5	12/7/1981	Aluminum	<0.01	mg/L
GW	NP-5	12/7/1981	Arsenic	<0.01	mg/L
GW	NP-5	12/7/1981	Barium	<0.2	mg/L
GW	NP-5	12/7/1981	Boron	<0.1	mg/L
GW	NP-5	12/7/1981	Cadmium	<0.005	mg/L
GW	NP-5	12/7/1981	Chloride	34	mg/L
GW	NP-5	12/7/1981	Chromium	<0.01	mg/L
GW	NP-5	12/7/1981	Cobalt	<0.02	mg/L
GW	NP-5	12/7/1981	Copper	<0.05	mg/L
GW	NP-5	12/7/1981	Cyanide	<0.01	mg/L
GW	NP-5	12/7/1981	Fluoride	1.2	mg/L
GW	NP-5	12/7/1981	Iron	<0.1	mg/L

GW	NP-5	12/7/1981	Lead	<0.02	mg/L
GW	NP-5	12/7/1981	Manganese	<0.05	mg/L
GW	NP-5	12/7/1981	Mercury	<0.001	mg/L
GW	NP-5	12/7/1981	Molybdenum	<0.05	mg/L
GW	NP-5	12/7/1981	Nickel	<0.05	mg/L
GW	NP-5	12/7/1981	Nitrate as N (NO3)	3.1	mg/L
GW	NP-5	12/7/1981	Selenium	<0.005	mg/L
GW	NP-5	12/7/1981	Silver	<0.02	mg/L
GW	NP-5	12/7/1981	Sulfate	172	mg/L
GW	NP-5	12/7/1981	TDS	510	mg/L
GW	NP-5	12/7/1981	Zinc	0.24	mg/L
GW	NP-5	12/7/1981	pH	7.9	pH units
GW	NP-5	12/7/1981	Calcium	66	mg/L
GW	GWQ-10	12/15/1981	Aluminum	<0.01	mg/L
GW	GWQ-10	12/15/1981	Arsenic	<0.01	mg/L
GW	GWQ-10	12/15/1981	Barium	<0.2	mg/L
GW	GWQ-10	12/15/1981	Boron	<0.1	mg/L
GW	GWQ-10	12/15/1981	Cadmium	<0.005	mg/L
GW	GWQ-10	12/15/1981	Chloride	24	mg/L
GW	GWQ-10	12/15/1981	Chromium	<0.01	mg/L
GW	GWQ-10	12/15/1981	Cobalt	<0.02	mg/L
GW	GWQ-10	12/15/1981	Copper	<0.05	mg/L
GW	GWQ-10	12/15/1981	Cyanide	<0.01	mg/L
GW	GWQ-10	12/15/1981	Fluoride	0.7	mg/L
GW	GWQ-10	12/15/1981	Iron	<0.1	mg/L
GW	GWQ-10	12/15/1981	Lead	<0.02	mg/L
GW	GWQ-10	12/15/1981	Manganese	<0.05	mg/L
GW	GWQ-10	12/15/1981	Mercury	<0.001	mg/L
GW	GWQ-10	12/15/1981	Molybdenum	<0.05	mg/L
GW	GWQ-10	12/15/1981	Nickel	<0.05	mg/L
GW	GWQ-10	12/15/1981	Nitrate as N (NO3)	2.6	mg/L
GW	GWQ-10	12/15/1981	Selenium	<0.005	mg/L
GW	GWQ-10	12/15/1981	Silver	<0.02	mg/L
GW	GWQ-10	12/15/1981	Sulfate	181	mg/L
GW	GWQ-10	12/15/1981	TDS	550	mg/L
GW	GWQ-10	12/15/1981	Zinc	0.44	mg/L
GW	GWQ-10	12/15/1981	pH	7.9	pH units
GW	GWQ-10	12/15/1981	Calcium	89	mg/L
GW	GWQ-11	12/15/1981	Aluminum	<0.01	mg/L
GW	GWQ-11	12/15/1981	Arsenic	<0.01	mg/L
GW	GWQ-11	12/15/1981	Barium	<0.2	mg/L
GW	GWQ-11	12/15/1981	Boron	<0.1	mg/L
GW	GWQ-11	12/15/1981	Cadmium	<0.005	mg/L
GW	GWQ-11	12/15/1981	Chloride	38	mg/L
GW	GWQ-11	12/15/1981	Chromium	<0.01	mg/L
GW	GWQ-11	12/15/1981	Cobalt	<0.02	mg/L
GW	GWQ-11	12/15/1981	Copper	<0.05	mg/L
GW	GWQ-11	12/15/1981	Cyanide	<0.01	mg/L
GW	GWQ-11	12/15/1981	Fluoride	1	mg/L
GW	GWQ-11	12/15/1981	Iron	<0.1	mg/L
GW	GWQ-11	12/15/1981	Lead	<0.02	mg/L
GW	GWQ-11	12/15/1981	Manganese	<0.05	mg/L
GW	GWQ-11	12/15/1981	Mercury	<0.001	mg/L
GW	GWQ-11	12/15/1981	Molybdenum	<0.05	mg/L
GW	GWQ-11	12/15/1981	Nickel	<0.05	mg/L
GW	GWQ-11	12/15/1981	Nitrate as N (NO3)	1.5	mg/L
GW	GWQ-11	12/15/1981	Selenium	<0.005	mg/L
GW	GWQ-11	12/15/1981	Silver	<0.02	mg/L
GW	GWQ-11	12/15/1981	Sulfate	191	mg/L
GW	GWQ-11	12/15/1981	TDS	570	mg/L
GW	GWQ-11	12/15/1981	Zinc	1.1	mg/L
GW	GWQ-11	12/15/1981	pH	7.9	pH units
GW	GWQ-11	12/15/1981	Calcium	85	mg/L
GW	NP-1	12/15/1981	Aluminum	<0.01	mg/L
GW	NP-1	12/15/1981	Arsenic	<0.01	mg/L
GW	NP-1	12/15/1981	Barium	<0.2	mg/L
GW	NP-1	12/15/1981	Boron	<0.1	mg/L
GW	NP-1	12/15/1981	Cadmium	<0.005	mg/L
GW	NP-1	12/15/1981	Chloride	24	mg/L
GW	NP-1	12/15/1981	Chromium	<0.01	mg/L
GW	NP-1	12/15/1981	Cobalt	<0.02	mg/L
GW	NP-1	12/15/1981	Copper	<0.05	mg/L
GW	NP-1	12/15/1981	Cyanide	<0.01	mg/L
GW	NP-1	12/15/1981	Fluoride	0.8	mg/L
GW	NP-1	12/15/1981	Iron	<0.1	mg/L
GW	NP-1	12/15/1981	Lead	<0.02	mg/L

GW	NP-1	12/15/1981	Manganese	1.2	mg/L
GW	NP-1	12/15/1981	Mercury	<0.001	mg/L
GW	NP-1	12/15/1981	Molybdenum	<0.05	mg/L
GW	NP-1	12/15/1981	Nickel	<0.05	mg/L
GW	NP-1	12/15/1981	Nitrate as N (NO3)	<0.2	mg/L
GW	NP-1	12/15/1981	Selenium	<0.005	mg/L
GW	NP-1	12/15/1981	Silver	<0.02	mg/L
GW	NP-1	12/15/1981	Sulfate	151	mg/L
GW	NP-1	12/15/1981	TDS	480	mg/L
GW	NP-1	12/15/1981	Zinc	5.3	mg/L
GW	NP-1	12/15/1981	pH	7.8	pH units
GW	NP-1	12/15/1981	Calcium	68	mg/L
GW	NP-2	12/15/1981	Aluminum	<0.01	mg/L
GW	NP-2	12/15/1981	Arsenic	<0.01	mg/L
GW	NP-2	12/15/1981	Barium	<0.2	mg/L
GW	NP-2	12/15/1981	Boron	<0.1	mg/L
GW	NP-2	12/15/1981	Cadmium	<0.005	mg/L
GW	NP-2	12/15/1981	Chloride	32	mg/L
GW	NP-2	12/15/1981	Chromium	<0.01	mg/L
GW	NP-2	12/15/1981	Cobalt	<0.02	mg/L
GW	NP-2	12/15/1981	Copper	<0.05	mg/L
GW	NP-2	12/15/1981	Cyanide	<0.01	mg/L
GW	NP-2	12/15/1981	Fluoride	0.9	mg/L
GW	NP-2	12/15/1981	Iron	<0.1	mg/L
GW	NP-2	12/15/1981	Lead	<0.02	mg/L
GW	NP-2	12/15/1981	Manganese	0.52	mg/L
GW	NP-2	12/15/1981	Mercury	<0.001	mg/L
GW	NP-2	12/15/1981	Molybdenum	0.072	mg/L
GW	NP-2	12/15/1981	Nickel	<0.05	mg/L
GW	NP-2	12/15/1981	Nitrate as N (NO3)	0.5	mg/L
GW	NP-2	12/15/1981	Selenium	<0.005	mg/L
GW	NP-2	12/15/1981	Silver	<0.02	mg/L
GW	NP-2	12/15/1981	Sulfate	161	mg/L
GW	NP-2	12/15/1981	TDS	480	mg/L
GW	NP-2	12/15/1981	Zinc	2.9	mg/L
GW	NP-2	12/15/1981	pH	8	pH units
GW	NP-2	12/15/1981	Calcium	62	mg/L
GW	NP-3	12/15/1981	Aluminum	<0.01	mg/L
GW	NP-3	12/15/1981	Arsenic	<0.01	mg/L
GW	NP-3	12/15/1981	Barium	<0.2	mg/L
GW	NP-3	12/15/1981	Boron	<0.1	mg/L
GW	NP-3	12/15/1981	Cadmium	<0.005	mg/L
GW	NP-3	12/15/1981	Chloride	26	mg/L
GW	NP-3	12/15/1981	Chromium	<0.01	mg/L
GW	NP-3	12/15/1981	Cobalt	<0.02	mg/L
GW	NP-3	12/15/1981	Copper	<0.05	mg/L
GW	NP-3	12/15/1981	Cyanide	<0.01	mg/L
GW	NP-3	12/15/1981	Fluoride	1.1	mg/L
GW	NP-3	12/15/1981	Iron	<0.1	mg/L
GW	NP-3	12/15/1981	Lead	<0.02	mg/L
GW	NP-3	12/15/1981	Manganese	0.87	mg/L
GW	NP-3	12/15/1981	Mercury	<0.001	mg/L
GW	NP-3	12/15/1981	Molybdenum	0.094	mg/L
GW	NP-3	12/15/1981	Nickel	<0.05	mg/L
GW	NP-3	12/15/1981	Nitrate as N (NO3)	0.2	mg/L
GW	NP-3	12/15/1981	Selenium	<0.005	mg/L
GW	NP-3	12/15/1981	Silver	<0.02	mg/L
GW	NP-3	12/15/1981	Sulfate	149	mg/L
GW	NP-3	12/15/1981	TDS	450	mg/L
GW	NP-3	12/15/1981	Zinc	2.5	mg/L
GW	NP-3	12/15/1981	pH	7.8	pH units
GW	NP-3	12/15/1981	Calcium	56	mg/L
GW	NP-5	12/15/1981	Aluminum	<0.01	mg/L
GW	NP-5	12/15/1981	Arsenic	<0.01	mg/L
GW	NP-5	12/15/1981	Barium	<0.2	mg/L
GW	NP-5	12/15/1981	Boron	<0.1	mg/L
GW	NP-5	12/15/1981	Cadmium	<0.005	mg/L
GW	NP-5	12/15/1981	Chloride	36	mg/L
GW	NP-5	12/15/1981	Chromium	<0.01	mg/L
GW	NP-5	12/15/1981	Cobalt	<0.02	mg/L
GW	NP-5	12/15/1981	Copper	<0.05	mg/L
GW	NP-5	12/15/1981	Cyanide	<0.01	mg/L
GW	NP-5	12/15/1981	Fluoride	1.2	mg/L
GW	NP-5	12/15/1981	Iron	<0.1	mg/L
GW	NP-5	12/15/1981	Lead	<0.02	mg/L
GW	NP-5	12/15/1981	Manganese	0.08	mg/L

GW	NP-5	12/15/1981	Mercury	<0.001	mg/L
GW	NP-5	12/15/1981	Molybdenum	<0.05	mg/L
GW	NP-5	12/15/1981	Nickel	<0.05	mg/L
GW	NP-5	12/15/1981	Nitrate as N (NO3)	3.3	mg/L
GW	NP-5	12/15/1981	Selenium	<0.005	mg/L
GW	NP-5	12/15/1981	Silver	<0.02	mg/L
GW	NP-5	12/15/1981	Sulfate	168	mg/L
GW	NP-5	12/15/1981	TDS	500	mg/L
GW	NP-5	12/15/1981	Zinc	0.37	mg/L
GW	NP-5	12/15/1981	pH	7.8	pH units
GW	NP-5	12/15/1981	Calcium	90	mg/L
GW	GWQ-10	12/22/1981	Aluminum	<0.01	mg/L
GW	GWQ-10	12/22/1981	Arsenic	<0.01	mg/L
GW	GWQ-10	12/22/1981	Barium	<0.2	mg/L
GW	GWQ-10	12/22/1981	Boron	<0.1	mg/L
GW	GWQ-10	12/22/1981	Cadmium	<0.005	mg/L
GW	GWQ-10	12/22/1981	Chloride	24	mg/L
GW	GWQ-10	12/22/1981	Chromium	<0.01	mg/L
GW	GWQ-10	12/22/1981	Cobalt	<0.02	mg/L
GW	GWQ-10	12/22/1981	Copper	<0.05	mg/L
GW	GWQ-10	12/22/1981	Cyanide	<0.01	mg/L
GW	GWQ-10	12/22/1981	Fluoride	0.5	mg/L
GW	GWQ-10	12/22/1981	Iron	<0.1	mg/L
GW	GWQ-10	12/22/1981	Lead	<0.02	mg/L
GW	GWQ-10	12/22/1981	Manganese	<0.05	mg/L
GW	GWQ-10	12/22/1981	Mercury	<0.001	mg/L
GW	GWQ-10	12/22/1981	Molybdenum	<0.05	mg/L
GW	GWQ-10	12/22/1981	Nickel	<0.05	mg/L
GW	GWQ-10	12/22/1981	Nitrate as N (NO3)	2.5	mg/L
GW	GWQ-10	12/22/1981	Selenium	<0.005	mg/L
GW	GWQ-10	12/22/1981	Silver	<0.02	mg/L
GW	GWQ-10	12/22/1981	Sulfate	168	mg/L
GW	GWQ-10	12/22/1981	TDS	480	mg/L
GW	GWQ-10	12/22/1981	Zinc	0.35	mg/L
GW	GWQ-10	12/22/1981	pH	8.1	pH units
GW	GWQ-10	12/22/1981	Calcium	85	mg/L
GW	GWQ-11	12/22/1981	Aluminum	<0.01	mg/L
GW	GWQ-11	12/22/1981	Arsenic	<0.01	mg/L
GW	GWQ-11	12/22/1981	Barium	<0.2	mg/L
GW	GWQ-11	12/22/1981	Boron	<0.1	mg/L
GW	GWQ-11	12/22/1981	Cadmium	<0.005	mg/L
GW	GWQ-11	12/22/1981	Chloride	40	mg/L
GW	GWQ-11	12/22/1981	Chromium	<0.01	mg/L
GW	GWQ-11	12/22/1981	Cobalt	<0.02	mg/L
GW	GWQ-11	12/22/1981	Copper	<0.05	mg/L
GW	GWQ-11	12/22/1981	Cyanide	<0.01	mg/L
GW	GWQ-11	12/22/1981	Fluoride	0.5	mg/L
GW	GWQ-11	12/22/1981	Iron	0.27	mg/L
GW	GWQ-11	12/22/1981	Lead	<0.02	mg/L
GW	GWQ-11	12/22/1981	Manganese	0.093	mg/L
GW	GWQ-11	12/22/1981	Mercury	<0.001	mg/L
GW	GWQ-11	12/22/1981	Molybdenum	<0.05	mg/L
GW	GWQ-11	12/22/1981	Nickel	<0.05	mg/L
GW	GWQ-11	12/22/1981	Nitrate as N (NO3)	1.9	mg/L
GW	GWQ-11	12/22/1981	Selenium	<0.005	mg/L
GW	GWQ-11	12/22/1981	Silver	<0.02	mg/L
GW	GWQ-11	12/22/1981	Sulfate	185	mg/L
GW	GWQ-11	12/22/1981	TDS	530	mg/L
GW	GWQ-11	12/22/1981	Zinc	0.42	mg/L
GW	GWQ-11	12/22/1981	pH	8	pH units
GW	GWQ-11	12/22/1981	Calcium	82	mg/L
GW	NP-1	12/22/1981	Aluminum	<0.01	mg/L
GW	NP-1	12/22/1981	Arsenic	<0.01	mg/L
GW	NP-1	12/22/1981	Barium	<0.2	mg/L
GW	NP-1	12/22/1981	Boron	<0.1	mg/L
GW	NP-1	12/22/1981	Cadmium	<0.005	mg/L
GW	NP-1	12/22/1981	Chloride	22	mg/L
GW	NP-1	12/22/1981	Chromium	<0.01	mg/L
GW	NP-1	12/22/1981	Cobalt	<0.02	mg/L
GW	NP-1	12/22/1981	Copper	<0.05	mg/L
GW	NP-1	12/22/1981	Cyanide	<0.01	mg/L
GW	NP-1	12/22/1981	Fluoride	0.8	mg/L
GW	NP-1	12/22/1981	Iron	<0.1	mg/L
GW	NP-1	12/22/1981	Lead	<0.02	mg/L
GW	NP-1	12/22/1981	Manganese	1	mg/L
GW	NP-1	12/22/1981	Mercury	<0.001	mg/L

GW	NP-1	12/22/1981	Molybdenum	<0.05	mg/L
GW	NP-1	12/22/1981	Nickel	<0.05	mg/L
GW	NP-1	12/22/1981	Nitrate as N (NO3)	0.3	mg/L
GW	NP-1	12/22/1981	Selenium	<0.005	mg/L
GW	NP-1	12/22/1981	Silver	<0.02	mg/L
GW	NP-1	12/22/1981	Sulfate	149	mg/L
GW	NP-1	12/22/1981	TDS	450	mg/L
GW	NP-1	12/22/1981	Zinc	4.1	mg/L
GW	NP-1	12/22/1981	pH	7.8	pH units
GW	NP-1	12/22/1981	Calcium	66	mg/L
GW	NP-2	12/22/1981	Aluminum	<0.01	mg/L
GW	NP-2	12/22/1981	Arsenic	<0.01	mg/L
GW	NP-2	12/22/1981	Barium	0.21	mg/L
GW	NP-2	12/22/1981	Boron	<0.1	mg/L
GW	NP-2	12/22/1981	Cadmium	<0.005	mg/L
GW	NP-2	12/22/1981	Chloride	32	mg/L
GW	NP-2	12/22/1981	Chromium	<0.01	mg/L
GW	NP-2	12/22/1981	Cobalt	<0.02	mg/L
GW	NP-2	12/22/1981	Copper	<0.05	mg/L
GW	NP-2	12/22/1981	Cyanide	<0.01	mg/L
GW	NP-2	12/22/1981	Fluoride	0.6	mg/L
GW	NP-2	12/22/1981	Iron	0.12	mg/L
GW	NP-2	12/22/1981	Lead	<0.02	mg/L
GW	NP-2	12/22/1981	Manganese	0.51	mg/L
GW	NP-2	12/22/1981	Mercury	<0.001	mg/L
GW	NP-2	12/22/1981	Molybdenum	0.053	mg/L
GW	NP-2	12/22/1981	Nickel	<0.05	mg/L
GW	NP-2	12/22/1981	Nitrate as N (NO3)	0.8	mg/L
GW	NP-2	12/22/1981	Selenium	<0.005	mg/L
GW	NP-2	12/22/1981	Silver	<0.02	mg/L
GW	NP-2	12/22/1981	Sulfate	161	mg/L
GW	NP-2	12/22/1981	TDS	440	mg/L
GW	NP-2	12/22/1981	Zinc	2.8	mg/L
GW	NP-2	12/22/1981	pH	8	pH units
GW	NP-2	12/22/1981	Calcium	73	mg/L
GW	NP-3	12/22/1981	Aluminum	<0.01	mg/L
GW	NP-3	12/22/1981	Arsenic	<0.01	mg/L
GW	NP-3	12/22/1981	Barium	<0.2	mg/L
GW	NP-3	12/22/1981	Boron	<0.1	mg/L
GW	NP-3	12/22/1981	Cadmium	<0.005	mg/L
GW	NP-3	12/22/1981	Chloride	26	mg/L
GW	NP-3	12/22/1981	Chromium	<0.01	mg/L
GW	NP-3	12/22/1981	Cobalt	<0.02	mg/L
GW	NP-3	12/22/1981	Copper	<0.05	mg/L
GW	NP-3	12/22/1981	Cyanide	<0.01	mg/L
GW	NP-3	12/22/1981	Fluoride	0.9	mg/L
GW	NP-3	12/22/1981	Iron	<0.1	mg/L
GW	NP-3	12/22/1981	Lead	<0.02	mg/L
GW	NP-3	12/22/1981	Manganese	0.76	mg/L
GW	NP-3	12/22/1981	Mercury	<0.001	mg/L
GW	NP-3	12/22/1981	Molybdenum	0.1	mg/L
GW	NP-3	12/22/1981	Nickel	<0.05	mg/L
GW	NP-3	12/22/1981	Nitrate as N (NO3)	0.2	mg/L
GW	NP-3	12/22/1981	Selenium	<0.005	mg/L
GW	NP-3	12/22/1981	Silver	<0.02	mg/L
GW	NP-3	12/22/1981	Sulfate	149	mg/L
GW	NP-3	12/22/1981	TDS	410	mg/L
GW	NP-3	12/22/1981	Zinc	2.1	mg/L
GW	NP-3	12/22/1981	pH	7.9	pH units
GW	NP-3	12/22/1981	Calcium	73	mg/L
GW	NP-5	12/22/1981	Aluminum	<0.01	mg/L
GW	NP-5	12/22/1981	Arsenic	<0.01	mg/L
GW	NP-5	12/22/1981	Barium	<0.2	mg/L
GW	NP-5	12/22/1981	Boron	<0.1	mg/L
GW	NP-5	12/22/1981	Cadmium	<0.005	mg/L
GW	NP-5	12/22/1981	Chloride	36	mg/L
GW	NP-5	12/22/1981	Chromium	<0.01	mg/L
GW	NP-5	12/22/1981	Cobalt	<0.02	mg/L
GW	NP-5	12/22/1981	Copper	<0.05	mg/L
GW	NP-5	12/22/1981	Cyanide	<0.01	mg/L
GW	NP-5	12/22/1981	Fluoride	1.1	mg/L
GW	NP-5	12/22/1981	Iron	<0.1	mg/L
GW	NP-5	12/22/1981	Lead	<0.02	mg/L
GW	NP-5	12/22/1981	Manganese	<0.05	mg/L
GW	NP-5	12/22/1981	Mercury	<0.001	mg/L
GW	NP-5	12/22/1981	Molybdenum	<0.05	mg/L

GW	NP-5	12/22/1981	Nickel	<0.05	mg/L
GW	NP-5	12/22/1981	Nitrate as N (NO3)	3.8	mg/L
GW	NP-5	12/22/1981	Selenium	<0.005	mg/L
GW	NP-5	12/22/1981	Silver	<0.02	mg/L
GW	NP-5	12/22/1981	Sulfate	161	mg/L
GW	NP-5	12/22/1981	TDS	460	mg/L
GW	NP-5	12/22/1981	Zinc	0.32	mg/L
GW	NP-5	12/22/1981	pH	7.9	pH units
GW	NP-5	12/22/1981	Calcium	101	mg/L
GW	GWQ-10	1/5/1982	Aluminum	<0.01	mg/L
GW	GWQ-10	1/5/1982	Arsenic	<0.01	mg/L
GW	GWQ-10	1/5/1982	Barium	<0.2	mg/L
GW	GWQ-10	1/5/1982	Boron	<0.1	mg/L
GW	GWQ-10	1/5/1982	Cadmium	<0.005	mg/L
GW	GWQ-10	1/5/1982	Chloride	22	mg/L
GW	GWQ-10	1/5/1982	Chromium	<0.01	mg/L
GW	GWQ-10	1/5/1982	Cobalt	<0.02	mg/L
GW	GWQ-10	1/5/1982	Copper	<0.05	mg/L
GW	GWQ-10	1/5/1982	Cyanide	<0.01	mg/L
GW	GWQ-10	1/5/1982	Fluoride	0.6	mg/L
GW	GWQ-10	1/5/1982	Iron	0.13	mg/L
GW	GWQ-10	1/5/1982	Lead	<0.02	mg/L
GW	GWQ-10	1/5/1982	Manganese	<0.05	mg/L
GW	GWQ-10	1/5/1982	Mercury	<0.001	mg/L
GW	GWQ-10	1/5/1982	Molybdenum	<0.05	mg/L
GW	GWQ-10	1/5/1982	Nickel	<0.05	mg/L
GW	GWQ-10	1/5/1982	Nitrate as N (NO3)	2.9	mg/L
GW	GWQ-10	1/5/1982	Selenium	<0.005	mg/L
GW	GWQ-10	1/5/1982	Silver	<0.02	mg/L
GW	GWQ-10	1/5/1982	Sulfate	174	mg/L
GW	GWQ-10	1/5/1982	TDS	430	mg/L
GW	GWQ-10	1/5/1982	Zinc	0.31	mg/L
GW	GWQ-10	1/5/1982	pH	7.5	pH units
GW	GWQ-10	1/5/1982	Calcium	80	mg/L
GW	GWQ-11	1/5/1982	Aluminum	<0.01	mg/L
GW	GWQ-11	1/5/1982	Arsenic	<0.01	mg/L
GW	GWQ-11	1/5/1982	Barium	<0.2	mg/L
GW	GWQ-11	1/5/1982	Boron	<0.1	mg/L
GW	GWQ-11	1/5/1982	Cadmium	<0.005	mg/L
GW	GWQ-11	1/5/1982	Chloride	40	mg/L
GW	GWQ-11	1/5/1982	Chromium	<0.01	mg/L
GW	GWQ-11	1/5/1982	Cobalt	<0.02	mg/L
GW	GWQ-11	1/5/1982	Copper	<0.05	mg/L
GW	GWQ-11	1/5/1982	Cyanide	<0.01	mg/L
GW	GWQ-11	1/5/1982	Fluoride	1	mg/L
GW	GWQ-11	1/5/1982	Iron	0.14	mg/L
GW	GWQ-11	1/5/1982	Lead	<0.02	mg/L
GW	GWQ-11	1/5/1982	Manganese	<0.05	mg/L
GW	GWQ-11	1/5/1982	Mercury	<0.001	mg/L
GW	GWQ-11	1/5/1982	Molybdenum	<0.05	mg/L
GW	GWQ-11	1/5/1982	Nickel	<0.05	mg/L
GW	GWQ-11	1/5/1982	Nitrate as N (NO3)	2.5	mg/L
GW	GWQ-11	1/5/1982	Selenium	<0.005	mg/L
GW	GWQ-11	1/5/1982	Silver	<0.02	mg/L
GW	GWQ-11	1/5/1982	Sulfate	174	mg/L
GW	GWQ-11	1/5/1982	TDS	480	mg/L
GW	GWQ-11	1/5/1982	Zinc	0.44	mg/L
GW	GWQ-11	1/5/1982	pH	7.5	pH units
GW	GWQ-11	1/5/1982	Calcium	79	mg/L
GW	NP-1	1/5/1982	Aluminum	<0.01	mg/L
GW	NP-1	1/5/1982	Arsenic	<0.01	mg/L
GW	NP-1	1/5/1982	Barium	<0.2	mg/L
GW	NP-1	1/5/1982	Boron	<0.1	mg/L
GW	NP-1	1/5/1982	Cadmium	<0.005	mg/L
GW	NP-1	1/5/1982	Chloride	22	mg/L
GW	NP-1	1/5/1982	Chromium	<0.01	mg/L
GW	NP-1	1/5/1982	Cobalt	<0.02	mg/L
GW	NP-1	1/5/1982	Copper	<0.05	mg/L
GW	NP-1	1/5/1982	Cyanide	<0.01	mg/L
GW	NP-1	1/5/1982	Fluoride	0.8	mg/L
GW	NP-1	1/5/1982	Iron	0.14	mg/L
GW	NP-1	1/5/1982	Lead	<0.02	mg/L
GW	NP-1	1/5/1982	Manganese	0.71	mg/L
GW	NP-1	1/5/1982	Mercury	0.0012	mg/L
GW	NP-1	1/5/1982	Molybdenum	<0.05	mg/L
GW	NP-1	1/5/1982	Nickel	<0.05	mg/L

GW	NP-1	1/5/1982	Nitrate as N (NO3)	0.7	mg/L
GW	NP-1	1/5/1982	Selenium	<0.02	mg/L
GW	NP-1	1/5/1982	Silver	<0.02	mg/L
GW	NP-1	1/5/1982	Sulfate	163	mg/L
GW	NP-1	1/5/1982	TDS	400	mg/L
GW	NP-1	1/5/1982	Zinc	4.1	mg/L
GW	NP-1	1/5/1982	pH	7.6	pH units
GW	NP-1	1/5/1982	Calcium	67	mg/L
GW	NP-2	1/5/1982	Aluminum	<0.01	mg/L
GW	NP-2	1/5/1982	Arsenic	<0.01	mg/L
GW	NP-2	1/5/1982	Barium	<0.2	mg/L
GW	NP-2	1/5/1982	Boron	<0.1	mg/L
GW	NP-2	1/5/1982	Cadmium	<0.005	mg/L
GW	NP-2	1/5/1982	Chloride	28	mg/L
GW	NP-2	1/5/1982	Chromium	<0.01	mg/L
GW	NP-2	1/5/1982	Cobalt	<0.02	mg/L
GW	NP-2	1/5/1982	Copper	<0.05	mg/L
GW	NP-2	1/5/1982	Cyanide	<0.01	mg/L
GW	NP-2	1/5/1982	Fluoride	0.9	mg/L
GW	NP-2	1/5/1982	Iron	0.14	mg/L
GW	NP-2	1/5/1982	Lead	<0.02	mg/L
GW	NP-2	1/5/1982	Manganese	0.49	mg/L
GW	NP-2	1/5/1982	Mercury	<0.001	mg/L
GW	NP-2	1/5/1982	Molybdenum	0.07	mg/L
GW	NP-2	1/5/1982	Nickel	<0.05	mg/L
GW	NP-2	1/5/1982	Nitrate as N (NO3)	0.9	mg/L
GW	NP-2	1/5/1982	Selenium	<0.02	mg/L
GW	NP-2	1/5/1982	Silver	<0.02	mg/L
GW	NP-2	1/5/1982	Sulfate	158	mg/L
GW	NP-2	1/5/1982	TDS	400	mg/L
GW	NP-2	1/5/1982	Zinc	3.2	mg/L
GW	NP-2	1/5/1982	pH	7.6	pH units
GW	NP-2	1/5/1982	Calcium	65	mg/L
GW	NP-3	1/5/1982	Aluminum	<0.01	mg/L
GW	NP-3	1/5/1982	Arsenic	<0.01	mg/L
GW	NP-3	1/5/1982	Barium	<0.2	mg/L
GW	NP-3	1/5/1982	Boron	<0.1	mg/L
GW	NP-3	1/5/1982	Cadmium	<0.005	mg/L
GW	NP-3	1/5/1982	Chloride	26	mg/L
GW	NP-3	1/5/1982	Chromium	<0.01	mg/L
GW	NP-3	1/5/1982	Cobalt	<0.02	mg/L
GW	NP-3	1/5/1982	Copper	<0.05	mg/L
GW	NP-3	1/5/1982	Cyanide	<0.01	mg/L
GW	NP-3	1/5/1982	Fluoride	1.1	mg/L
GW	NP-3	1/5/1982	Iron	0.31	mg/L
GW	NP-3	1/5/1982	Lead	<0.02	mg/L
GW	NP-3	1/5/1982	Manganese	0.72	mg/L
GW	NP-3	1/5/1982	Mercury	<0.001	mg/L
GW	NP-3	1/5/1982	Molybdenum	0.01	mg/L
GW	NP-3	1/5/1982	Nickel	<0.05	mg/L
GW	NP-3	1/5/1982	Nitrate as N (NO3)	0.2	mg/L
GW	NP-3	1/5/1982	Selenium	<0.02	mg/L
GW	NP-3	1/5/1982	Silver	<0.02	mg/L
GW	NP-3	1/5/1982	Sulfate	154	mg/L
GW	NP-3	1/5/1982	TDS	360	mg/L
GW	NP-3	1/5/1982	Zinc	1.7	mg/L
GW	NP-3	1/5/1982	pH	7.7	pH units
GW	NP-3	1/5/1982	Calcium	56	mg/L
GW	NP-5	1/5/1982	Aluminum	<0.01	mg/L
GW	NP-5	1/5/1982	Arsenic	<0.01	mg/L
GW	NP-5	1/5/1982	Barium	<0.2	mg/L
GW	NP-5	1/5/1982	Boron	<0.1	mg/L
GW	NP-5	1/5/1982	Cadmium	<0.005	mg/L
GW	NP-5	1/5/1982	Chloride	34	mg/L
GW	NP-5	1/5/1982	Chromium	<0.01	mg/L
GW	NP-5	1/5/1982	Cobalt	<0.02	mg/L
GW	NP-5	1/5/1982	Copper	<0.05	mg/L
GW	NP-5	1/5/1982	Cyanide	<0.01	mg/L
GW	NP-5	1/5/1982	Fluoride	1.1	mg/L
GW	NP-5	1/5/1982	Iron	0.18	mg/L
GW	NP-5	1/5/1982	Lead	<0.02	mg/L
GW	NP-5	1/5/1982	Manganese	<0.05	mg/L
GW	NP-5	1/5/1982	Mercury	<0.001	mg/L
GW	NP-5	1/5/1982	Molybdenum	<0.05	mg/L
GW	NP-5	1/5/1982	Nickel	<0.05	mg/L
GW	NP-5	1/5/1982	Nitrate as N (NO3)	4.1	mg/L

GW	NP-5	1/5/1982	Selenium	<0.02	mg/L
GW	NP-5	1/5/1982	Silver	<0.02	mg/L
GW	NP-5	1/5/1982	Sulfate	163	mg/L
GW	NP-5	1/5/1982	TDS	420	mg/L
GW	NP-5	1/5/1982	Zinc	0.4	mg/L
GW	NP-5	1/5/1982	pH	7.7	pH units
GW	NP-5	1/5/1982	Calcium	87	mg/L
GW	GWQ-10	1/26/1982	Cadmium	<0.005	mg/L
GW	GWQ-10	1/26/1982	Chloride	24	mg/L
GW	GWQ-10	1/26/1982	Copper	<0.05	mg/L
GW	GWQ-10	1/26/1982	Cyanide	<0.01	mg/L
GW	GWQ-10	1/26/1982	Fluoride	0.6	mg/L
GW	GWQ-10	1/26/1982	Iron	<0.1	mg/L
GW	GWQ-10	1/26/1982	Manganese	<0.05	mg/L
GW	GWQ-10	1/26/1982	Mercury	<0.001	mg/L
GW	GWQ-10	1/26/1982	Molybdenum	<0.1	mg/L
GW	GWQ-10	1/26/1982	Nitrate as N (NO3)	2.3	mg/L
GW	GWQ-10	1/26/1982	Selenium	<0.005	mg/L
GW	GWQ-10	1/26/1982	Sulfate	162	mg/L
GW	GWQ-10	1/26/1982	TDS	490	mg/L
GW	GWQ-10	1/26/1982	pH	7.8	pH units
GW	GWQ-11	1/26/1982	Cadmium	<0.005	mg/L
GW	GWQ-11	1/26/1982	Chloride	40	mg/L
GW	GWQ-11	1/26/1982	Copper	<0.05	mg/L
GW	GWQ-11	1/26/1982	Cyanide	<0.01	mg/L
GW	GWQ-11	1/26/1982	Fluoride	1	mg/L
GW	GWQ-11	1/26/1982	Iron	<0.1	mg/L
GW	GWQ-11	1/26/1982	Manganese	<0.05	mg/L
GW	GWQ-11	1/26/1982	Mercury	<0.001	mg/L
GW	GWQ-11	1/26/1982	Molybdenum	<0.1	mg/L
GW	GWQ-11	1/26/1982	Nitrate as N (NO3)	1.7	mg/L
GW	GWQ-11	1/26/1982	Selenium	<0.005	mg/L
GW	GWQ-11	1/26/1982	Sulfate	168	mg/L
GW	GWQ-11	1/26/1982	TDS	500	mg/L
GW	GWQ-11	1/26/1982	pH	7.9	pH units
GW	NP-1	1/26/1982	Cadmium	<0.005	mg/L
GW	NP-1	1/26/1982	Chloride	22	mg/L
GW	NP-1	1/26/1982	Copper	<0.05	mg/L
GW	NP-1	1/26/1982	Cyanide	<0.01	mg/L
GW	NP-1	1/26/1982	Fluoride	0.7	mg/L
GW	NP-1	1/26/1982	Iron	<0.1	mg/L
GW	NP-1	1/26/1982	Manganese	0.45	mg/L
GW	NP-1	1/26/1982	Mercury	<0.001	mg/L
GW	NP-1	1/26/1982	Molybdenum	<0.1	mg/L
GW	NP-1	1/26/1982	Nitrate as N (NO3)	0.5	mg/L
GW	NP-1	1/26/1982	Selenium	<0.005	mg/L
GW	NP-1	1/26/1982	Sulfate	154	mg/L
GW	NP-1	1/26/1982	TDS	440	mg/L
GW	NP-1	1/26/1982	pH	7.9	pH units
GW	NP-2	1/26/1982	Cadmium	<0.005	mg/L
GW	NP-2	1/26/1982	Chloride	24	mg/L
GW	NP-2	1/26/1982	Copper	<0.05	mg/L
GW	NP-2	1/26/1982	Cyanide	<0.01	mg/L
GW	NP-2	1/26/1982	Fluoride	0.7	mg/L
GW	NP-2	1/26/1982	Iron	<0.1	mg/L
GW	NP-2	1/26/1982	Manganese	0.34	mg/L
GW	NP-2	1/26/1982	Mercury	<0.001	mg/L
GW	NP-2	1/26/1982	Molybdenum	<0.1	mg/L
GW	NP-2	1/26/1982	Nitrate as N (NO3)	1.1	mg/L
GW	NP-2	1/26/1982	Selenium	<0.005	mg/L
GW	NP-2	1/26/1982	Sulfate	160	mg/L
GW	NP-2	1/26/1982	TDS	450	mg/L
GW	NP-2	1/26/1982	pH	8	pH units
GW	NP-3	1/26/1982	Cadmium	<0.005	mg/L
GW	NP-3	1/26/1982	Chloride	30	mg/L
GW	NP-3	1/26/1982	Copper	<0.05	mg/L
GW	NP-3	1/26/1982	Cyanide	<0.01	mg/L
GW	NP-3	1/26/1982	Fluoride	1	mg/L
GW	NP-3	1/26/1982	Iron	<0.1	mg/L
GW	NP-3	1/26/1982	Manganese	0.7	mg/L
GW	NP-3	1/26/1982	Mercury	<0.001	mg/L
GW	NP-3	1/26/1982	Molybdenum	<0.1	mg/L
GW	NP-3	1/26/1982	Nitrate as N (NO3)	0.2	mg/L
GW	NP-3	1/26/1982	Selenium	<0.005	mg/L
GW	NP-3	1/26/1982	Sulfate	151	mg/L
GW	NP-3	1/26/1982	TDS	400	mg/L

GW	NP-3	1/26/1982	pH	8.1	pH units
GW	NP-5	1/26/1982	Cadmium	<0.005	mg/L
GW	NP-5	1/26/1982	Chloride	32	mg/L
GW	NP-5	1/26/1982	Copper	<0.05	mg/L
GW	NP-5	1/26/1982	Cyanide	<0.01	mg/L
GW	NP-5	1/26/1982	Fluoride	1.1	mg/L
GW	NP-5	1/26/1982	Iron	<0.01	mg/L
GW	NP-5	1/26/1982	Manganese	<0.05	mg/L
GW	NP-5	1/26/1982	Mercury	<0.001	mg/L
GW	NP-5	1/26/1982	Molybdenum	<0.1	mg/L
GW	NP-5	1/26/1982	Nitrate as N (NO3)	2.9	mg/L
GW	NP-5	1/26/1982	Selenium	<0.005	mg/L
GW	NP-5	1/26/1982	Sulfate	158	mg/L
GW	NP-5	1/26/1982	TDS	440	mg/L
GW	NP-5	1/26/1982	pH	8	pH units
GW	GWQ-10	2/22/1982	Cadmium	<0.005	mg/L
GW	GWQ-10	2/22/1982	Chloride	24	mg/L
GW	GWQ-10	2/22/1982	Copper	<0.05	mg/L
GW	GWQ-10	2/22/1982	Cyanide	<0.01	mg/L
GW	GWQ-10	2/22/1982	Fluoride	0.6	mg/L
GW	GWQ-10	2/22/1982	Iron	0.12	mg/L
GW	GWQ-10	2/22/1982	Manganese	<0.05	mg/L
GW	GWQ-10	2/22/1982	Mercury	<0.001	mg/L
GW	GWQ-10	2/22/1982	Molybdenum	<0.05	mg/L
GW	GWQ-10	2/22/1982	Nitrate as N (NO3)	2.1	mg/L
GW	GWQ-10	2/22/1982	Selenium	<0.005	mg/L
GW	GWQ-10	2/22/1982	Sulfate	161	mg/L
GW	GWQ-10	2/22/1982	TDS	510	mg/L
GW	GWQ-10	2/22/1982	pH	7.6	pH units
GW	GWQ-11	2/22/1982	Cadmium	<0.005	mg/L
GW	GWQ-11	2/22/1982	Chloride	38	mg/L
GW	GWQ-11	2/22/1982	Copper	<0.05	mg/L
GW	GWQ-11	2/22/1982	Cyanide	<0.01	mg/L
GW	GWQ-11	2/22/1982	Fluoride	0.9	mg/L
GW	GWQ-11	2/22/1982	Iron	0.11	mg/L
GW	GWQ-11	2/22/1982	Manganese	<0.05	mg/L
GW	GWQ-11	2/22/1982	Mercury	<0.001	mg/L
GW	GWQ-11	2/22/1982	Molybdenum	<0.05	mg/L
GW	GWQ-11	2/22/1982	Nitrate as N (NO3)	1.4	mg/L
GW	GWQ-11	2/22/1982	Selenium	<0.005	mg/L
GW	GWQ-11	2/22/1982	Sulfate	168	mg/L
GW	GWQ-11	2/22/1982	TDS	510	mg/L
GW	GWQ-11	2/22/1982	pH	7.7	pH units
GW	NP-1	2/22/1982	Cadmium	<0.005	mg/L
GW	NP-1	2/22/1982	Chloride	24	mg/L
GW	NP-1	2/22/1982	Copper	0.48	mg/L
GW	NP-1	2/22/1982	Cyanide	<0.01	mg/L
GW	NP-1	2/22/1982	Fluoride	0.7	mg/L
GW	NP-1	2/22/1982	Iron	0.83	mg/L
GW	NP-1	2/22/1982	Manganese	0.26	mg/L
GW	NP-1	2/22/1982	Mercury	<0.001	mg/L
GW	NP-1	2/22/1982	Molybdenum	<0.05	mg/L
GW	NP-1	2/22/1982	Nitrate as N (NO3)	0.6	mg/L
GW	NP-1	2/22/1982	Selenium	<0.005	mg/L
GW	NP-1	2/22/1982	Sulfate	158	mg/L
GW	NP-1	2/22/1982	TDS	460	mg/L
GW	NP-1	2/22/1982	pH	7.9	pH units
GW	NP-2	2/22/1982	Cadmium	<0.005	mg/L
GW	NP-2	2/22/1982	Chloride	30	mg/L
GW	NP-2	2/22/1982	Copper	0.069	mg/L
GW	NP-2	2/22/1982	Cyanide	<0.01	mg/L
GW	NP-2	2/22/1982	Fluoride	0.7	mg/L
GW	NP-2	2/22/1982	Iron	0.37	mg/L
GW	NP-2	2/22/1982	Manganese	0.3	mg/L
GW	NP-2	2/22/1982	Mercury	<0.001	mg/L
GW	NP-2	2/22/1982	Molybdenum	<0.05	mg/L
GW	NP-2	2/22/1982	Nitrate as N (NO3)	0.8	mg/L
GW	NP-2	2/22/1982	Selenium	<0.005	mg/L
GW	NP-2	2/22/1982	Sulfate	151	mg/L
GW	NP-2	2/22/1982	TDS	440	mg/L
GW	NP-2	2/22/1982	pH	8	pH units
GW	NP-3	2/22/1982	Cadmium	<0.005	mg/L
GW	NP-3	2/22/1982	Chloride	28	mg/L
GW	NP-3	2/22/1982	Copper	<0.05	mg/L
GW	NP-3	2/22/1982	Cyanide	<0.01	mg/L
GW	NP-3	2/22/1982	Fluoride	0.9	mg/L

GW	NP-3	2/22/1982	Iron	0.14	mg/L
GW	NP-3	2/22/1982	Manganese	0.66	mg/L
GW	NP-3	2/22/1982	Mercury	<0.001	mg/L
GW	NP-3	2/22/1982	Molybdenum	<0.05	mg/L
GW	NP-3	2/22/1982	Nitrate as N (NO3)	<0.2	mg/L
GW	NP-3	2/22/1982	Selenium	<0.005	mg/L
GW	NP-3	2/22/1982	Sulfate	137	mg/L
GW	NP-3	2/22/1982	TDS	420	mg/L
GW	NP-3	2/22/1982	pH	8	pH units
GW	NP-5	2/22/1982	Cadmium	<0.005	mg/L
GW	NP-5	2/22/1982	Chloride	32	mg/L
GW	NP-5	2/22/1982	Copper	<0.05	mg/L
GW	NP-5	2/22/1982	Cyanide	<0.01	mg/L
GW	NP-5	2/22/1982	Fluoride	1	mg/L
GW	NP-5	2/22/1982	Iron	0.12	mg/L
GW	NP-5	2/22/1982	Manganese	<0.05	mg/L
GW	NP-5	2/22/1982	Mercury	<0.001	mg/L
GW	NP-5	2/22/1982	Molybdenum	<0.05	mg/L
GW	NP-5	2/22/1982	Nitrate as N (NO3)	2	mg/L
GW	NP-5	2/22/1982	Selenium	<0.005	mg/L
GW	NP-5	2/22/1982	Sulfate	150	mg/L
GW	NP-5	2/22/1982	TDS	450	mg/L
GW	NP-5	2/22/1982	pH	8	pH units
GW	GWQ-1	2/25/1982	Cadmium	<0.005	mg/L
GW	GWQ-1	2/25/1982	Chloride	22	mg/L
GW	GWQ-1	2/25/1982	Copper	<0.05	mg/L
GW	GWQ-1	2/25/1982	Cyanide	<0.01	mg/L
GW	GWQ-1	2/25/1982	Fluoride	0.3	mg/L
GW	GWQ-1	2/25/1982	Iron	0.14	mg/L
GW	GWQ-1	2/25/1982	Manganese	0.063	mg/L
GW	GWQ-1	2/25/1982	Mercury	<0.001	mg/L
GW	GWQ-1	2/25/1982	Molybdenum	<0.05	mg/L
GW	GWQ-1	2/25/1982	Nitrate as N (NO3)	0.2	mg/L
GW	GWQ-1	2/25/1982	Selenium	<0.005	mg/L
GW	GWQ-1	2/25/1982	Sulfate	84	mg/L
GW	GWQ-1	2/25/1982	TDS	410	mg/L
GW	GWQ-1	2/25/1982	pH	7.9	pH units
GW	GWQ-3	2/25/1982	Cadmium	<0.005	mg/L
GW	GWQ-3	2/25/1982	Chloride	56	mg/L
GW	GWQ-3	2/25/1982	Copper	<0.05	mg/L
GW	GWQ-3	2/25/1982	Cyanide	<0.01	mg/L
GW	GWQ-3	2/25/1982	Fluoride	0.6	mg/L
GW	GWQ-3	2/25/1982	Iron	<0.1	mg/L
GW	GWQ-3	2/25/1982	Manganese	<0.05	mg/L
GW	GWQ-3	2/25/1982	Mercury	<0.001	mg/L
GW	GWQ-3	2/25/1982	Molybdenum	<0.05	mg/L
GW	GWQ-3	2/25/1982	Nitrate as N (NO3)	0.4	mg/L
GW	GWQ-3	2/25/1982	Selenium	<0.005	mg/L
GW	GWQ-3	2/25/1982	Sulfate	490	mg/L
GW	GWQ-3	2/25/1982	TDS	1040	mg/L
GW	GWQ-3	2/25/1982	pH	7.9	pH units
GW	GWQ-6	2/25/1982	Cadmium	<0.005	mg/L
GW	GWQ-6	2/25/1982	Chloride	102	mg/L
GW	GWQ-6	2/25/1982	Copper	<0.05	mg/L
GW	GWQ-6	2/25/1982	Cyanide	<0.01	mg/L
GW	GWQ-6	2/25/1982	Fluoride	1.1	mg/L
GW	GWQ-6	2/25/1982	Iron	<0.1	mg/L
GW	GWQ-6	2/25/1982	Manganese	<0.05	mg/L
GW	GWQ-6	2/25/1982	Mercury	<0.001	mg/L
GW	GWQ-6	2/25/1982	Molybdenum	<0.05	mg/L
GW	GWQ-6	2/25/1982	Nitrate as N (NO3)	0.5	mg/L
GW	GWQ-6	2/25/1982	Selenium	<0.005	mg/L
GW	GWQ-6	2/25/1982	Sulfate	220	mg/L
GW	GWQ-6	2/25/1982	TDS	810	mg/L
GW	GWQ-6	2/25/1982	pH	8.3	pH units
GW	GWQ-7	2/25/1982	Cadmium	<0.005	mg/L
GW	GWQ-7	2/25/1982	Chloride	26	mg/L
GW	GWQ-7	2/25/1982	Copper	<0.05	mg/L
GW	GWQ-7	2/25/1982	Cyanide	<0.01	mg/L
GW	GWQ-7	2/25/1982	Fluoride	0.5	mg/L
GW	GWQ-7	2/25/1982	Iron	0.17	mg/L
GW	GWQ-7	2/25/1982	Manganese	<0.05	mg/L
GW	GWQ-7	2/25/1982	Mercury	<0.001	mg/L
GW	GWQ-7	2/25/1982	Molybdenum	<0.05	mg/L
GW	GWQ-7	2/25/1982	Nitrate as N (NO3)	0.8	mg/L
GW	GWQ-7	2/25/1982	Selenium	<0.005	mg/L

GW	GWQ-7	2/25/1982	Sulfate	162	mg/L
GW	GWQ-7	2/25/1982	TDS	510	mg/L
GW	GWQ-7	2/25/1982	pH	8	pH units
GW	GWQ-8	2/25/1982	Cadmium	<0.005	mg/L
GW	GWQ-8	2/25/1982	Chloride	38	mg/L
GW	GWQ-8	2/25/1982	Copper	<0.05	mg/L
GW	GWQ-8	2/25/1982	Cyanide	<0.01	mg/L
GW	GWQ-8	2/25/1982	Fluoride	1	mg/L
GW	GWQ-8	2/25/1982	Iron	<0.1	mg/L
GW	GWQ-8	2/25/1982	Manganese	0.17	mg/L
GW	GWQ-8	2/25/1982	Mercury	<0.001	mg/L
GW	GWQ-8	2/25/1982	Molybdenum	<0.05	mg/L
GW	GWQ-8	2/25/1982	Nitrate as N (NO3)	0.3	mg/L
GW	GWQ-8	2/25/1982	Selenium	<0.005	mg/L
GW	GWQ-8	2/25/1982	Sulfate	220	mg/L
GW	GWQ-8	2/25/1982	TDS	380	mg/L
GW	GWQ-8	2/25/1982	pH	7.6	pH units
GW	GWQ-9	2/25/1982	Cadmium	<0.005	mg/L
GW	GWQ-9	2/25/1982	Chloride	26	mg/L
GW	GWQ-9	2/25/1982	Copper	<0.05	mg/L
GW	GWQ-9	2/25/1982	Cyanide	<0.01	mg/L
GW	GWQ-9	2/25/1982	Fluoride	0.5	mg/L
GW	GWQ-9	2/25/1982	Iron	<0.1	mg/L
GW	GWQ-9	2/25/1982	Manganese	<0.05	mg/L
GW	GWQ-9	2/25/1982	Mercury	<0.001	mg/L
GW	GWQ-9	2/25/1982	Molybdenum	<0.05	mg/L
GW	GWQ-9	2/25/1982	Nitrate as N (NO3)	0.9	mg/L
GW	GWQ-9	2/25/1982	Selenium	<0.005	mg/L
GW	GWQ-9	2/25/1982	Sulfate	160	mg/L
GW	GWQ-9	2/25/1982	TDS	430	mg/L
GW	GWQ-9	2/25/1982	pH	8.3	pH units
GW	GWQ-10	4/26/1982	Cadmium	<0.005	mg/L
GW	GWQ-10	4/26/1982	Chloride	20	mg/L
GW	GWQ-10	4/26/1982	Copper	<0.05	mg/L
GW	GWQ-10	4/26/1982	Cyanide	<0.01	mg/L
GW	GWQ-10	4/26/1982	Fluoride	0.6	mg/L
GW	GWQ-10	4/26/1982	Iron	0.41	mg/L
GW	GWQ-10	4/26/1982	Manganese	<0.05	mg/L
GW	GWQ-10	4/26/1982	Mercury	<0.001	mg/L
GW	GWQ-10	4/26/1982	Molybdenum	<0.05	mg/L
GW	GWQ-10	4/26/1982	Nitrate as N (NO3)	2	mg/L
GW	GWQ-10	4/26/1982	Selenium	<0.005	mg/L
GW	GWQ-10	4/26/1982	Sulfate	168	mg/L
GW	GWQ-10	4/26/1982	TDS	840	mg/L
GW	GWQ-10	4/26/1982	pH	7.4	pH units
GW	GWQ-11	4/26/1982	Cadmium	<0.005	mg/L
GW	GWQ-11	4/26/1982	Chloride	40	mg/L
GW	GWQ-11	4/26/1982	Copper	<0.05	mg/L
GW	GWQ-11	4/26/1982	Cyanide	<0.01	mg/L
GW	GWQ-11	4/26/1982	Fluoride	0.8	mg/L
GW	GWQ-11	4/26/1982	Iron	0.36	mg/L
GW	GWQ-11	4/26/1982	Manganese	<0.05	mg/L
GW	GWQ-11	4/26/1982	Mercury	<0.001	mg/L
GW	GWQ-11	4/26/1982	Molybdenum	0.05	mg/L
GW	GWQ-11	4/26/1982	Nitrate as N (NO3)	1.3	mg/L
GW	GWQ-11	4/26/1982	Selenium	<0.005	mg/L
GW	GWQ-11	4/26/1982	Sulfate	165	mg/L
GW	GWQ-11	4/26/1982	TDS	510	mg/L
GW	GWQ-11	4/26/1982	pH	7.6	pH units
GW	NP-1	4/26/1982	Cadmium	<0.005	mg/L
GW	NP-1	4/26/1982	Chloride	26	mg/L
GW	NP-1	4/26/1982	Copper	<0.05	mg/L
GW	NP-1	4/26/1982	Cyanide	<0.01	mg/L
GW	NP-1	4/26/1982	Fluoride	0.6	mg/L
GW	NP-1	4/26/1982	Iron	1.2	mg/L
GW	NP-1	4/26/1982	Manganese	0.16	mg/L
GW	NP-1	4/26/1982	Mercury	<0.001	mg/L
GW	NP-1	4/26/1982	Molybdenum	<0.05	mg/L
GW	NP-1	4/26/1982	Nitrate as N (NO3)	0.7	mg/L
GW	NP-1	4/26/1982	Selenium	<0.005	mg/L
GW	NP-1	4/26/1982	Sulfate	154	mg/L
GW	NP-1	4/26/1982	TDS	440	mg/L
GW	NP-1	4/26/1982	pH	7.9	pH units
GW	NP-2	4/26/1982	Cadmium	<0.005	mg/L
GW	NP-2	4/26/1982	Chloride	42	mg/L
GW	NP-2	4/26/1982	Copper	<0.05	mg/L

GW	NP-2	4/26/1982	Cyanide	<0.01	mg/L
GW	NP-2	4/26/1982	Fluoride	1	mg/L
GW	NP-2	4/26/1982	Iron	1.2	mg/L
GW	NP-2	4/26/1982	Manganese	0.29	mg/L
GW	NP-2	4/26/1982	Mercury	<0.001	mg/L
GW	NP-2	4/26/1982	Molybdenum	<0.05	mg/L
GW	NP-2	4/26/1982	Nitrate as N (NO3)	2.4	mg/L
GW	NP-2	4/26/1982	Selenium	<0.005	mg/L
GW	NP-2	4/26/1982	Sulfate	149	mg/L
GW	NP-2	4/26/1982	TDS	450	mg/L
GW	NP-2	4/26/1982	pH	8	pH units
GW	NP-3	4/26/1982	Cadmium	<0.005	mg/L
GW	NP-3	4/26/1982	Chloride	28	mg/L
GW	NP-3	4/26/1982	Copper	<0.05	mg/L
GW	NP-3	4/26/1982	Cyanide	<0.01	mg/L
GW	NP-3	4/26/1982	Fluoride	0.8	mg/L
GW	NP-3	4/26/1982	Iron	0.24	mg/L
GW	NP-3	4/26/1982	Manganese	0.4	mg/L
GW	NP-3	4/26/1982	Mercury	<0.001	mg/L
GW	NP-3	4/26/1982	Molybdenum	<0.05	mg/L
GW	NP-3	4/26/1982	Nitrate as N (NO3)	<0.2	mg/L
GW	NP-3	4/26/1982	Selenium	<0.005	mg/L
GW	NP-3	4/26/1982	Sulfate	146	mg/L
GW	NP-3	4/26/1982	TDS	410	mg/L
GW	NP-3	4/26/1982	pH	7.9	pH units
GW	NP-4	4/26/1982	Cadmium	<0.005	mg/L
GW	NP-4	4/26/1982	Chloride	46	mg/L
GW	NP-4	4/26/1982	Copper	0.051	mg/L
GW	NP-4	4/26/1982	Cyanide	<0.01	mg/L
GW	NP-4	4/26/1982	Fluoride	1.5	mg/L
GW	NP-4	4/26/1982	Iron	3.8	mg/L
GW	NP-4	4/26/1982	Manganese	0.6	mg/L
GW	NP-4	4/26/1982	Mercury	<0.001	mg/L
GW	NP-4	4/26/1982	Molybdenum	0.07	mg/L
GW	NP-4	4/26/1982	Nitrate as N (NO3)	0.6	mg/L
GW	NP-4	4/26/1982	Selenium	<0.005	mg/L
GW	NP-4	4/26/1982	Sulfate	132	mg/L
GW	NP-4	4/26/1982	TDS	410	mg/L
GW	NP-4	4/26/1982	pH	8.6	pH units
GW	NP-5	4/26/1982	Cadmium	<0.005	mg/L
GW	NP-5	4/26/1982	Chloride	30	mg/L
GW	NP-5	4/26/1982	Copper	0.31	mg/L
GW	NP-5	4/26/1982	Cyanide	0.04	mg/L
GW	NP-5	4/26/1982	Fluoride	1.1	mg/L
GW	NP-5	4/26/1982	Iron	3.8	mg/L
GW	NP-5	4/26/1982	Manganese	6.9	mg/L
GW	NP-5	4/26/1982	Mercury	<0.001	mg/L
GW	NP-5	4/26/1982	Molybdenum	<0.05	mg/L
GW	NP-5	4/26/1982	Nitrate as N (NO3)	1.1	mg/L
GW	NP-5	4/26/1982	Selenium	<0.005	mg/L
GW	NP-5	4/26/1982	Sulfate	154	mg/L
GW	NP-5	4/26/1982	TDS	450	mg/L
GW	NP-5	4/26/1982	pH	7.9	pH units
GW	GWQ-3	5/12/1982	Cadmium	<0.005	mg/L
GW	GWQ-3	5/12/1982	Chloride	56	mg/L
GW	GWQ-3	5/12/1982	Copper	<0.05	mg/L
GW	GWQ-3	5/12/1982	Cyanide	<0.01	mg/L
GW	GWQ-3	5/12/1982	Fluoride	0.7	mg/L
GW	GWQ-3	5/12/1982	Iron	<0.1	mg/L
GW	GWQ-3	5/12/1982	Manganese	<0.05	mg/L
GW	GWQ-3	5/12/1982	Mercury	<0.001	mg/L
GW	GWQ-3	5/12/1982	Molybdenum	<0.05	mg/L
GW	GWQ-3	5/12/1982	Nitrate as N (NO3)	0.2	mg/L
GW	GWQ-3	5/12/1982	Selenium	<0.005	mg/L
GW	GWQ-3	5/12/1982	Sulfate	410	mg/L
GW	GWQ-3	5/12/1982	TDS	930	mg/L
GW	GWQ-3	5/12/1982	pH	7.9	pH units
GW	GWQ-10	5/17/1982	Cadmium	<0.005	mg/L
GW	GWQ-10	5/17/1982	Chloride	28	mg/L
GW	GWQ-10	5/17/1982	Copper	<0.05	mg/L
GW	GWQ-10	5/17/1982	Cyanide	<0.01	mg/L
GW	GWQ-10	5/17/1982	Fluoride	0.6	mg/L
GW	GWQ-10	5/17/1982	Iron	0.1	mg/L
GW	GWQ-10	5/17/1982	Manganese	<0.05	mg/L
GW	GWQ-10	5/17/1982	Mercury	<0.001	mg/L
GW	GWQ-10	5/17/1982	Molybdenum	<0.05	mg/L

GW	GWQ-10	5/17/1982	Nitrate as N (NO3)	2.3	mg/L
GW	GWQ-10	5/17/1982	Selenium	<0.005	mg/L
GW	GWQ-10	5/17/1982	Sulfate	175	mg/L
GW	GWQ-10	5/17/1982	TDS	490	mg/L
GW	GWQ-10	5/17/1982	pH	7.7	pH units
GW	GWQ-11	5/17/1982	Cadmium	<0.005	mg/L
GW	GWQ-11	5/17/1982	Chloride	44	mg/L
GW	GWQ-11	5/17/1982	Copper	<0.05	mg/L
GW	GWQ-11	5/17/1982	Cyanide	<0.01	mg/L
GW	GWQ-11	5/17/1982	Fluoride	0.8	mg/L
GW	GWQ-11	5/17/1982	Iron	0.11	mg/L
GW	GWQ-11	5/17/1982	Manganese	<0.05	mg/L
GW	GWQ-11	5/17/1982	Mercury	<0.001	mg/L
GW	GWQ-11	5/17/1982	Molybdenum	<0.05	mg/L
GW	GWQ-11	5/17/1982	Nitrate as N (NO3)	1.9	mg/L
GW	GWQ-11	5/17/1982	Selenium	<0.005	mg/L
GW	GWQ-11	5/17/1982	Sulfate	185	mg/L
GW	GWQ-11	5/17/1982	TDS	510	mg/L
GW	GWQ-11	5/17/1982	pH	7.8	pH units
GW	NP-3	5/17/1982	Cadmium	<0.005	mg/L
GW	NP-3	5/17/1982	Chloride	562	mg/L
GW	NP-3	5/17/1982	Copper	<0.05	mg/L
GW	NP-3	5/17/1982	Cyanide	<0.01	mg/L
GW	NP-3	5/17/1982	Fluoride	0.7	mg/L
GW	NP-3	5/17/1982	Iron	0.16	mg/L
GW	NP-3	5/17/1982	Manganese	0.23	mg/L
GW	NP-3	5/17/1982	Mercury	<0.001	mg/L
GW	NP-3	5/17/1982	Molybdenum	<0.05	mg/L
GW	NP-3	5/17/1982	Nitrate as N (NO3)	12	mg/L
GW	NP-3	5/17/1982	Selenium	<0.005	mg/L
GW	NP-3	5/17/1982	Sulfate	900	mg/L
GW	NP-3	5/17/1982	TDS	2460	mg/L
GW	NP-3	5/17/1982	pH	7.6	pH units
GW	NP-4	5/17/1982	Cadmium	<0.005	mg/L
GW	NP-4	5/17/1982	Chloride	46	mg/L
GW	NP-4	5/17/1982	Copper	<0.05	mg/L
GW	NP-4	5/17/1982	Cyanide	<0.01	mg/L
GW	NP-4	5/17/1982	Fluoride	1	mg/L
GW	NP-4	5/17/1982	Iron	0.11	mg/L
GW	NP-4	5/17/1982	Manganese	<0.05	mg/L
GW	NP-4	5/17/1982	Mercury	<0.001	mg/L
GW	NP-4	5/17/1982	Molybdenum	<0.05	mg/L
GW	NP-4	5/17/1982	Nitrate as N (NO3)	1.3	mg/L
GW	NP-4	5/17/1982	Selenium	<0.005	mg/L
GW	NP-4	5/17/1982	Sulfate	138	mg/L
GW	NP-4	5/17/1982	TDS	310	mg/L
GW	NP-4	5/17/1982	pH	9.4	pH units
GW	NP-5	5/17/1982	Cadmium	<0.005	mg/L
GW	NP-5	5/17/1982	Chloride	36	mg/L
GW	NP-5	5/17/1982	Copper	<0.05	mg/L
GW	NP-5	5/17/1982	Cyanide	<0.01	mg/L
GW	NP-5	5/17/1982	Fluoride	1.1	mg/L
GW	NP-5	5/17/1982	Iron	0.14	mg/L
GW	NP-5	5/17/1982	Manganese	<0.05	mg/L
GW	NP-5	5/17/1982	Mercury	<0.001	mg/L
GW	NP-5	5/17/1982	Molybdenum	<0.05	mg/L
GW	NP-5	5/17/1982	Nitrate as N (NO3)	6.7	mg/L
GW	NP-5	5/17/1982	Selenium	<0.005	mg/L
GW	NP-5	5/17/1982	Sulfate	165	mg/L
GW	NP-5	5/17/1982	TDS	490	mg/L
GW	NP-5	5/17/1982	pH	8	pH units
GW	NP-2	5/18/1982	Cadmium	0.015	mg/L
GW	NP-2	5/18/1982	Chloride	34	mg/L
GW	NP-2	5/18/1982	Copper	<0.05	mg/L
GW	NP-2	5/18/1982	Cyanide	<0.01	mg/L
GW	NP-2	5/18/1982	Fluoride	0.6	mg/L
GW	NP-2	5/18/1982	Iron	0.68	mg/L
GW	NP-2	5/18/1982	Manganese	0.078	mg/L
GW	NP-2	5/18/1982	Mercury	<0.001	mg/L
GW	NP-2	5/18/1982	Molybdenum	<0.05	mg/L
GW	NP-2	5/18/1982	Nitrate as N (NO3)	1.8	mg/L
GW	NP-2	5/18/1982	Selenium	<0.005	mg/L
GW	NP-2	5/18/1982	Sulfate	128	mg/L
GW	NP-2	5/18/1982	TDS	460	mg/L
GW	NP-2	5/18/1982	pH	7.9	pH units
GW	NP-1	5/24/1982	Iron	<0.1	mg/L

GW	NP-1	5/24/1982	Manganese	0.28	mg/L
GW	NP-2	5/24/1982	Iron	<0.1	mg/L
GW	NP-2	5/24/1982	Manganese	<0.05	mg/L
GW	NP-3	5/24/1982	Iron	<0.1	mg/L
GW	NP-3	5/24/1982	Manganese	0.053	mg/L
GW	NP-4	5/24/1982	Iron	<0.1	mg/L
GW	NP-4	5/24/1982	Manganese	<0.05	mg/L
GW	NP-5	5/24/1982	Iron	<0.1	mg/L
GW	NP-5	5/24/1982	Manganese	<0.05	mg/L
GW	NP-1	5/28/1982	Iron	<0.1	mg/L
GW	NP-1	5/28/1982	Manganese	0.22	mg/L
GW	NP-2	5/28/1982	Iron	<0.1	mg/L
GW	NP-2	5/28/1982	Manganese	<0.05	mg/L
GW	NP-3	5/28/1982	Iron	<0.1	mg/L
GW	NP-3	5/28/1982	Manganese	0.063	mg/L
GW	NP-4	5/28/1982	Iron	<0.1	mg/L
GW	NP-4	5/28/1982	Manganese	<0.05	mg/L
GW	NP-5	5/28/1982	Iron	<0.1	mg/L
GW	NP-5	5/28/1982	Manganese	<0.05	mg/L
GW	GWQ-10	6/8/1982	Cadmium	<0.005	mg/L
GW	GWQ-10	6/8/1982	Chloride	22	mg/L
GW	GWQ-10	6/8/1982	Copper	<0.05	mg/L
GW	GWQ-10	6/8/1982	Cyanide	<0.01	mg/L
GW	GWQ-10	6/8/1982	Fluoride	0.5	mg/L
GW	GWQ-10	6/8/1982	Iron	<0.1	mg/L
GW	GWQ-10	6/8/1982	Manganese	<0.05	mg/L
GW	GWQ-10	6/8/1982	Mercury	<0.001	mg/L
GW	GWQ-10	6/8/1982	Molybdenum	<0.05	mg/L
GW	GWQ-10	6/8/1982	Nitrate as N (NO3)	2.2	mg/L
GW	GWQ-10	6/8/1982	Selenium	<0.005	mg/L
GW	GWQ-10	6/8/1982	Sulfate	162	mg/L
GW	GWQ-10	6/8/1982	TDS	500	mg/L
GW	GWQ-10	6/8/1982	pH	8	pH units
GW	GWQ-11	6/8/1982	Cadmium	<0.005	mg/L
GW	GWQ-11	6/8/1982	Chloride	44	mg/L
GW	GWQ-11	6/8/1982	Copper	<0.05	mg/L
GW	GWQ-11	6/8/1982	Cyanide	<0.01	mg/L
GW	GWQ-11	6/8/1982	Fluoride	0.8	mg/L
GW	GWQ-11	6/8/1982	Iron	<0.1	mg/L
GW	GWQ-11	6/8/1982	Manganese	<0.05	mg/L
GW	GWQ-11	6/8/1982	Mercury	<0.001	mg/L
GW	GWQ-11	6/8/1982	Molybdenum	<0.05	mg/L
GW	GWQ-11	6/8/1982	Nitrate as N (NO3)	1.7	mg/L
GW	GWQ-11	6/8/1982	Selenium	<0.005	mg/L
GW	GWQ-11	6/8/1982	Sulfate	185	mg/L
GW	GWQ-11	6/8/1982	TDS	530	mg/L
GW	GWQ-11	6/8/1982	pH	7.9	pH units
GW	NP-1	6/8/1982	Cadmium	<0.005	mg/L
GW	NP-1	6/8/1982	Chloride	20	mg/L
GW	NP-1	6/8/1982	Copper	<0.05	mg/L
GW	NP-1	6/8/1982	Cyanide	<0.01	mg/L
GW	NP-1	6/8/1982	Fluoride	0.6	mg/L
GW	NP-1	6/8/1982	Iron	<0.1	mg/L
GW	NP-1	6/8/1982	Manganese	0.25	mg/L
GW	NP-1	6/8/1982	Mercury	<0.001	mg/L
GW	NP-1	6/8/1982	Molybdenum	<0.05	mg/L
GW	NP-1	6/8/1982	Nitrate as N (NO3)	1.1	mg/L
GW	NP-1	6/8/1982	Selenium	<0.005	mg/L
GW	NP-1	6/8/1982	Sulfate	162	mg/L
GW	NP-1	6/8/1982	TDS	500	mg/L
GW	NP-1	6/8/1982	pH	7.5	pH units
GW	NP-2	6/8/1982	Cadmium	<0.005	mg/L
GW	NP-2	6/8/1982	Chloride	26	mg/L
GW	NP-2	6/8/1982	Copper	<0.05	mg/L
GW	NP-2	6/8/1982	Cyanide	<0.01	mg/L
GW	NP-2	6/8/1982	Fluoride	0.5	mg/L
GW	NP-2	6/8/1982	Iron	<0.1	mg/L
GW	NP-2	6/8/1982	Manganese	<0.05	mg/L
GW	NP-2	6/8/1982	Mercury	<0.001	mg/L
GW	NP-2	6/8/1982	Molybdenum	<0.05	mg/L
GW	NP-2	6/8/1982	Nitrate as N (NO3)	0.9	mg/L
GW	NP-2	6/8/1982	Selenium	<0.005	mg/L
GW	NP-2	6/8/1982	Sulfate	158	mg/L
GW	NP-2	6/8/1982	TDS	490	mg/L
GW	NP-2	6/8/1982	pH	7.8	pH units
GW	NP-3	6/8/1982	Cadmium	<0.005	mg/L

GW	NP-3	6/8/1982	Chloride	30	mg/L
GW	NP-3	6/8/1982	Copper	<0.05	mg/L
GW	NP-3	6/8/1982	Cyanide	<0.01	mg/L
GW	NP-3	6/8/1982	Fluoride	0.5	mg/L
GW	NP-3	6/8/1982	Iron	<0.1	mg/L
GW	NP-3	6/8/1982	Manganese	0.1	mg/L
GW	NP-3	6/8/1982	Mercury	<0.001	mg/L
GW	NP-3	6/8/1982	Molybdenum	<0.05	mg/L
GW	NP-3	6/8/1982	Nitrate as N (NO3)	1.9	mg/L
GW	NP-3	6/8/1982	Selenium	<0.005	mg/L
GW	NP-3	6/8/1982	Sulfate	150	mg/L
GW	NP-3	6/8/1982	TDS	500	mg/L
GW	NP-3	6/8/1982	pH	7.9	pH units
GW	NP-4	6/8/1982	Cadmium	<0.005	mg/L
GW	NP-4	6/8/1982	Chloride	26	mg/L
GW	NP-4	6/8/1982	Copper	<0.05	mg/L
GW	NP-4	6/8/1982	Cyanide	<0.01	mg/L
GW	NP-4	6/8/1982	Fluoride	0.5	mg/L
GW	NP-4	6/8/1982	Iron	<0.1	mg/L
GW	NP-4	6/8/1982	Manganese	<0.05	mg/L
GW	NP-4	6/8/1982	Mercury	<0.001	mg/L
GW	NP-4	6/8/1982	Molybdenum	<0.05	mg/L
GW	NP-4	6/8/1982	Nitrate as N (NO3)	4.5	mg/L
GW	NP-4	6/8/1982	Selenium	<0.005	mg/L
GW	NP-4	6/8/1982	Sulfate	140	mg/L
GW	NP-4	6/8/1982	TDS	420	mg/L
GW	NP-4	6/8/1982	pH	8.4	pH units
GW	NP-5	6/8/1982	Cadmium	<0.005	mg/L
GW	NP-5	6/8/1982	Chloride	30	mg/L
GW	NP-5	6/8/1982	Copper	<0.05	mg/L
GW	NP-5	6/8/1982	Cyanide	<0.01	mg/L
GW	NP-5	6/8/1982	Fluoride	0.9	mg/L
GW	NP-5	6/8/1982	Iron	0.44	mg/L
GW	NP-5	6/8/1982	Manganese	<0.05	mg/L
GW	NP-5	6/8/1982	Mercury	<0.001	mg/L
GW	NP-5	6/8/1982	Molybdenum	<0.05	mg/L
GW	NP-5	6/8/1982	Nitrate as N (NO3)	4.5	mg/L
GW	NP-5	6/8/1982	Selenium	<0.005	mg/L
GW	NP-5	6/8/1982	Sulfate	150	mg/L
GW	NP-5	6/8/1982	TDS	420	mg/L
GW	NP-5	6/8/1982	pH	8.1	pH units
GW	GWQ-10	6/30/1982	Cadmium	<0.005	mg/L
GW	GWQ-10	6/30/1982	Chloride	20	mg/L
GW	GWQ-10	6/30/1982	Copper	<0.05	mg/L
GW	GWQ-10	6/30/1982	Cyanide	<0.01	mg/L
GW	GWQ-10	6/30/1982	Fluoride	0.6	mg/L
GW	GWQ-10	6/30/1982	Iron	0.62	mg/L
GW	GWQ-10	6/30/1982	Manganese	<0.05	mg/L
GW	GWQ-10	6/30/1982	Mercury	<0.001	mg/L
GW	GWQ-10	6/30/1982	Molybdenum	<0.05	mg/L
GW	GWQ-10	6/30/1982	Nitrate as N (NO3)	3.3	mg/L
GW	GWQ-10	6/30/1982	Selenium	<0.005	mg/L
GW	GWQ-10	6/30/1982	Sulfate	160	mg/L
GW	GWQ-10	6/30/1982	TDS	510	mg/L
GW	GWQ-10	6/30/1982	pH	8	pH units
GW	GWQ-11	6/30/1982	Cadmium	<0.005	mg/L
GW	GWQ-11	6/30/1982	Chloride	44	mg/L
GW	GWQ-11	6/30/1982	Copper	<0.05	mg/L
GW	GWQ-11	6/30/1982	Cyanide	<0.01	mg/L
GW	GWQ-11	6/30/1982	Fluoride	0.8	mg/L
GW	GWQ-11	6/30/1982	Iron	0.39	mg/L
GW	GWQ-11	6/30/1982	Manganese	<0.05	mg/L
GW	GWQ-11	6/30/1982	Mercury	<0.001	mg/L
GW	GWQ-11	6/30/1982	Molybdenum	<0.05	mg/L
GW	GWQ-11	6/30/1982	Nitrate as N (NO3)	2.3	mg/L
GW	GWQ-11	6/30/1982	Selenium	<0.005	mg/L
GW	GWQ-11	6/30/1982	Sulfate	198	mg/L
GW	GWQ-11	6/30/1982	TDS	590	mg/L
GW	GWQ-11	6/30/1982	pH	7.9	pH units
GW	GWQ-3	6/30/1982	Cadmium	<0.005	mg/L
GW	GWQ-3	6/30/1982	Chloride	48	mg/L
GW	GWQ-3	6/30/1982	Copper	<0.05	mg/L
GW	GWQ-3	6/30/1982	Cyanide	<0.01	mg/L
GW	GWQ-3	6/30/1982	Fluoride	0.7	mg/L
GW	GWQ-3	6/30/1982	Iron	<0.1	mg/L
GW	GWQ-3	6/30/1982	Manganese	<0.05	mg/L

GW	GWQ-3	6/30/1982	Mercury	<0.001	mg/L
GW	GWQ-3	6/30/1982	Molybdenum	<0.05	mg/L
GW	GWQ-3	6/30/1982	Nitrate as N (NO3)	0.4	mg/L
GW	GWQ-3	6/30/1982	Selenium	<0.005	mg/L
GW	GWQ-3	6/30/1982	Sulfate	365	mg/L
GW	GWQ-3	6/30/1982	TDS	860	mg/L
GW	GWQ-3	6/30/1982	pH	7.6	pH units
GW	NP-1	6/30/1982	Cadmium	<0.005	mg/L
GW	NP-1	6/30/1982	Chloride	18	mg/L
GW	NP-1	6/30/1982	Copper	<0.05	mg/L
GW	NP-1	6/30/1982	Cyanide	<0.01	mg/L
GW	NP-1	6/30/1982	Fluoride	0.6	mg/L
GW	NP-1	6/30/1982	Iron	<0.1	mg/L
GW	NP-1	6/30/1982	Manganese	0.18	mg/L
GW	NP-1	6/30/1982	Mercury	<0.001	mg/L
GW	NP-1	6/30/1982	Molybdenum	<0.05	mg/L
GW	NP-1	6/30/1982	Nitrate as N (NO3)	1.1	mg/L
GW	NP-1	6/30/1982	Selenium	<0.005	mg/L
GW	NP-1	6/30/1982	Sulfate	143	mg/L
GW	NP-1	6/30/1982	TDS	500	mg/L
GW	NP-1	6/30/1982	pH	7.7	pH units
GW	NP-2	6/30/1982	Cadmium	<0.005	mg/L
GW	NP-2	6/30/1982	Chloride	26	mg/L
GW	NP-2	6/30/1982	Copper	<0.05	mg/L
GW	NP-2	6/30/1982	Cyanide	<0.01	mg/L
GW	NP-2	6/30/1982	Fluoride	0.6	mg/L
GW	NP-2	6/30/1982	Iron	<0.1	mg/L
GW	NP-2	6/30/1982	Manganese	<0.05	mg/L
GW	NP-2	6/30/1982	Mercury	<0.001	mg/L
GW	NP-2	6/30/1982	Molybdenum	<0.05	mg/L
GW	NP-2	6/30/1982	Nitrate as N (NO3)	1.4	mg/L
GW	NP-2	6/30/1982	Selenium	<0.005	mg/L
GW	NP-2	6/30/1982	Sulfate	133	mg/L
GW	NP-2	6/30/1982	TDS	490	mg/L
GW	NP-2	6/30/1982	pH	7.8	pH units
GW	NP-3	6/30/1982	Cadmium	<0.005	mg/L
GW	NP-3	6/30/1982	Chloride	26	mg/L
GW	NP-3	6/30/1982	Copper	<0.05	mg/L
GW	NP-3	6/30/1982	Cyanide	<0.01	mg/L
GW	NP-3	6/30/1982	Fluoride	0.5	mg/L
GW	NP-3	6/30/1982	Iron	<0.1	mg/L
GW	NP-3	6/30/1982	Manganese	0.081	mg/L
GW	NP-3	6/30/1982	Mercury	<0.001	mg/L
GW	NP-3	6/30/1982	Molybdenum	<0.05	mg/L
GW	NP-3	6/30/1982	Nitrate as N (NO3)	1.8	mg/L
GW	NP-3	6/30/1982	Selenium	<0.005	mg/L
GW	NP-3	6/30/1982	Sulfate	128	mg/L
GW	NP-3	6/30/1982	TDS	510	mg/L
GW	NP-3	6/30/1982	pH	7.9	pH units
GW	NP-4	6/30/1982	Cadmium	<0.005	mg/L
GW	NP-4	6/30/1982	Chloride	28	mg/L
GW	NP-4	6/30/1982	Copper	<0.05	mg/L
GW	NP-4	6/30/1982	Cyanide	<0.01	mg/L
GW	NP-4	6/30/1982	Fluoride	0.4	mg/L
GW	NP-4	6/30/1982	Iron	<0.1	mg/L
GW	NP-4	6/30/1982	Manganese	<0.05	mg/L
GW	NP-4	6/30/1982	Mercury	<0.001	mg/L
GW	NP-4	6/30/1982	Molybdenum	<0.05	mg/L
GW	NP-4	6/30/1982	Nitrate as N (NO3)	<0.2	mg/L
GW	NP-4	6/30/1982	Selenium	<0.005	mg/L
GW	NP-4	6/30/1982	Sulfate	115	mg/L
GW	NP-4	6/30/1982	TDS	270	mg/L
GW	NP-4	6/30/1982	pH	9.5	pH units
GW	NP-5	6/30/1982	Cadmium	<0.005	mg/L
GW	NP-5	6/30/1982	Chloride	28	mg/L
GW	NP-5	6/30/1982	Copper	<0.05	mg/L
GW	NP-5	6/30/1982	Cyanide	<0.01	mg/L
GW	NP-5	6/30/1982	Fluoride	0.9	mg/L
GW	NP-5	6/30/1982	Iron	0.36	mg/L
GW	NP-5	6/30/1982	Manganese	<0.05	mg/L
GW	NP-5	6/30/1982	Mercury	<0.001	mg/L
GW	NP-5	6/30/1982	Molybdenum	<0.05	mg/L
GW	NP-5	6/30/1982	Nitrate as N (NO3)	3.9	mg/L
GW	NP-5	6/30/1982	Selenium	<0.005	mg/L
GW	NP-5	6/30/1982	Sulfate	133	mg/L
GW	NP-5	6/30/1982	TDS	460	mg/L

GW	NP-5	6/30/1982	pH	8.1	pH units
GW	GWQ-10	9/2/1982	Cadmium	<0.001	mg/L
GW	GWQ-10	9/2/1982	Chloride	22.3	mg/L
GW	GWQ-10	9/2/1982	Fluoride	0.54	mg/L
GW	GWQ-10	9/2/1982	Manganese	<0.05	mg/L
GW	GWQ-10	9/2/1982	Molybdenum	<0.01	mg/L
GW	GWQ-10	9/2/1982	Nitrate as N (NO3)	2.25	mg/L
GW	GWQ-10	9/2/1982	Selenium	<0.005	mg/L
GW	GWQ-10	9/2/1982	Sulfate	143.4	mg/L
GW	GWQ-10	9/2/1982	TDS	506	mg/L
GW	GWQ-10	9/2/1982	pH	7.3	pH units
GW	GWQ-10	9/2/1982	Conductivity	690	µmhos/cm
GW	GWQ-10	9/2/1982	Calcium	82.6	mg/L
GW	GWQ-10	9/2/1982	Magnesium	17	mg/L
GW	GWQ-10	9/2/1982	Sodium	57.5	mg/L
GW	GWQ-10	9/2/1982	Bicarbonate	278	mg/L CaCO3
GW	GWQ-10	9/2/1982	Potassium	2.73	mg/L
GW	GWQ-11	9/2/1982	Cadmium	<0.001	mg/L
GW	GWQ-11	9/2/1982	Chloride	52.22	mg/L
GW	GWQ-11	9/2/1982	Fluoride	0.78	mg/L
GW	GWQ-11	9/2/1982	Manganese	<0.05	mg/L
GW	GWQ-11	9/2/1982	Molybdenum	<0.01	mg/L
GW	GWQ-11	9/2/1982	Nitrate as N (NO3)	1.94	mg/L
GW	GWQ-11	9/2/1982	Selenium	<0.005	mg/L
GW	GWQ-11	9/2/1982	Sulfate	247.6	mg/L
GW	GWQ-11	9/2/1982	TDS	700	mg/L
GW	GWQ-11	9/2/1982	pH	7.3	pH units
GW	GWQ-11	9/2/1982	Conductivity	940	µmhos/cm
GW	GWQ-11	9/2/1982	Calcium	111.2	mg/L
GW	GWQ-11	9/2/1982	Magnesium	27.6	mg/L
GW	GWQ-11	9/2/1982	Sodium	57.5	mg/L
GW	GWQ-11	9/2/1982	Bicarbonate	226	mg/L CaCO3
GW	GWQ-11	9/2/1982	Potassium	3.51	mg/L
GW	IW-2	9/2/1982	Cadmium	<0.001	mg/L
GW	IW-2	9/2/1982	Chloride	409.07	mg/L
GW	IW-2	9/2/1982	Fluoride	1.22	mg/L
GW	IW-2	9/2/1982	Manganese	<0.05	mg/L
GW	IW-2	9/2/1982	Molybdenum	<0.01	mg/L
GW	IW-2	9/2/1982	Nitrate as N (NO3)	1.38	mg/L
GW	IW-2	9/2/1982	Selenium	<0.005	mg/L
GW	IW-2	9/2/1982	Sulfate	2252	mg/L
GW	IW-2	9/2/1982	TDS	4010	mg/L
GW	IW-2	9/2/1982	pH	7.3	pH units
GW	IW-2	9/2/1982	Conductivity	4250	µmhos/cm
GW	IW-2	9/2/1982	Calcium	320	mg/L
GW	IW-2	9/2/1982	Magnesium	173.7	mg/L
GW	IW-2	9/2/1982	Sodium	720	mg/L
GW	IW-2	9/2/1982	Bicarbonate	185	mg/L CaCO3
GW	IW-2	9/2/1982	Potassium	234	mg/L
GW	IW-3	9/2/1982	Cadmium	<0.001	mg/L
GW	IW-3	9/2/1982	Chloride	159.12	mg/L
GW	IW-3	9/2/1982	Fluoride	0.42	mg/L
GW	IW-3	9/2/1982	Manganese	<0.05	mg/L
GW	IW-3	9/2/1982	Molybdenum	<0.01	mg/L
GW	IW-3	9/2/1982	Nitrate as N (NO3)	4.12	mg/L
GW	IW-3	9/2/1982	Selenium	<0.005	mg/L
GW	IW-3	9/2/1982	Sulfate	707.3	mg/L
GW	IW-3	9/2/1982	TDS	1562	mg/L
GW	IW-3	9/2/1982	pH	7.2	pH units
GW	IW-3	9/2/1982	Conductivity	1700	µmhos/cm
GW	IW-3	9/2/1982	Calcium	233.6	mg/L
GW	IW-3	9/2/1982	Magnesium	42.1	mg/L
GW	IW-3	9/2/1982	Sodium	168	mg/L
GW	IW-3	9/2/1982	Bicarbonate	179	mg/L CaCO3
GW	IW-3	9/2/1982	Potassium	3.51	mg/L
GW	NP-2	9/2/1982	Cadmium	<0.001	mg/L
GW	NP-2	9/2/1982	Chloride	26.49	mg/L
GW	NP-2	9/2/1982	Fluoride	0.54	mg/L
GW	NP-2	9/2/1982	Manganese	<0.05	mg/L
GW	NP-2	9/2/1982	Molybdenum	<0.01	mg/L
GW	NP-2	9/2/1982	Nitrate as N (NO3)	1.66	mg/L
GW	NP-2	9/2/1982	Selenium	<0.005	mg/L
GW	NP-2	9/2/1982	Sulfate	127	mg/L
GW	NP-2	9/2/1982	TDS	468	mg/L
GW	NP-2	9/2/1982	pH	7.4	pH units
GW	NP-2	9/2/1982	Conductivity	650	µmhos/cm

GW	NP-2	9/2/1982	Calcium	73.8	mg/L
GW	NP-2	9/2/1982	Magnesium	17.9	mg/L
GW	NP-2	9/2/1982	Sodium	57.5	mg/L
GW	NP-2	9/2/1982	Bicarbonate	316	mg/L CaCO3
GW	NP-2	9/2/1982	Potassium	1.95	mg/L
GW	NP-3	9/2/1982	Cadmium	<0.001	mg/L
GW	NP-3	9/2/1982	Chloride	27.82	mg/L
GW	NP-3	9/2/1982	Fluoride	0.53	mg/L
GW	NP-3	9/2/1982	Manganese	<0.05	mg/L
GW	NP-3	9/2/1982	Molybdenum	<0.01	mg/L
GW	NP-3	9/2/1982	Nitrate as N (NO3)	1.94	mg/L
GW	NP-3	9/2/1982	Selenium	<0.005	mg/L
GW	NP-3	9/2/1982	Sulfate	123.8	mg/L
GW	NP-3	9/2/1982	TDS	498	mg/L
GW	NP-3	9/2/1982	pH	7.5	pH units
GW	NP-3	9/2/1982	Conductivity	750	µmhos/cm
GW	NP-3	9/2/1982	Calcium	77.4	mg/L
GW	NP-3	9/2/1982	Magnesium	15.1	mg/L
GW	NP-3	9/2/1982	Sodium	64.4	mg/L
GW	NP-3	9/2/1982	Bicarbonate	308	mg/L CaCO3
GW	NP-3	9/2/1982	Potassium	3.9	mg/L
GW	NP-4	9/2/1982	Cadmium	<0.001	mg/L
GW	NP-4	9/2/1982	Chloride	28.72	mg/L
GW	NP-4	9/2/1982	Fluoride	0.4	mg/L
GW	NP-4	9/2/1982	Manganese	<0.05	mg/L
GW	NP-4	9/2/1982	Molybdenum	<0.01	mg/L
GW	NP-4	9/2/1982	Nitrate as N (NO3)	0.03	mg/L
GW	NP-4	9/2/1982	Selenium	<0.005	mg/L
GW	NP-4	9/2/1982	Sulfate	107.1	mg/L
GW	NP-4	9/2/1982	TDS	252	mg/L
GW	NP-4	9/2/1982	pH	8.5	pH units
GW	NP-4	9/2/1982	Conductivity	410	µmhos/cm
GW	NP-4	9/2/1982	Calcium	7.2	mg/L
GW	NP-4	9/2/1982	Magnesium	3.5	mg/L
GW	NP-4	9/2/1982	Sodium	71.3	mg/L
GW	NP-4	9/2/1982	Bicarbonate	63.1	mg/L CaCO3
GW	NP-4	9/2/1982	Potassium	3.9	mg/L
GW	NP-5	9/2/1982	Cadmium	<0.001	mg/L
GW	NP-5	9/2/1982	Chloride	33.98	mg/L
GW	NP-5	9/2/1982	Fluoride	0.82	mg/L
GW	NP-5	9/2/1982	Manganese	<0.05	mg/L
GW	NP-5	9/2/1982	Molybdenum	<0.01	mg/L
GW	NP-5	9/2/1982	Nitrate as N (NO3)	4.2	mg/L
GW	NP-5	9/2/1982	Selenium	<0.005	mg/L
GW	NP-5	9/2/1982	Sulfate	137.2	mg/L
GW	NP-5	9/2/1982	TDS	472	mg/L
GW	NP-5	9/2/1982	pH	7.6	pH units
GW	NP-5	9/2/1982	Conductivity	650	µmhos/cm
GW	NP-5	9/2/1982	Calcium	72.6	mg/L
GW	NP-5	9/2/1982	Magnesium	21.8	mg/L
GW	NP-5	9/2/1982	Sodium	46	mg/L
GW	NP-5	9/2/1982	Bicarbonate	206	mg/L CaCO3
GW	NP-5	9/2/1982	Potassium	3.9	mg/L
GW	NP-1	10/27/1982	Cadmium	<0.005	mg/L
GW	NP-1	10/27/1982	Chloride	20	mg/L
GW	NP-1	10/27/1982	Copper	<0.05	mg/L
GW	NP-1	10/27/1982	Cyanide	<0.01	mg/L
GW	NP-1	10/27/1982	Fluoride	0.7	mg/L
GW	NP-1	10/27/1982	Iron	0.45	mg/L
GW	NP-1	10/27/1982	Manganese	0.058	mg/L
GW	NP-1	10/27/1982	Mercury	<0.001	mg/L
GW	NP-1	10/27/1982	Molybdenum	<0.05	mg/L
GW	NP-1	10/27/1982	Nitrate as N (NO3)	1.3	mg/L
GW	NP-1	10/27/1982	Selenium	<0.005	mg/L
GW	NP-1	10/27/1982	Sulfate	151	mg/L
GW	NP-1	10/27/1982	TDS	470	mg/L
GW	NP-1	10/27/1982	pH	7.7	pH units
GW	NP-2	10/27/1982	Cadmium	<0.005	mg/L
GW	NP-2	10/27/1982	Chloride	26	mg/L
GW	NP-2	10/27/1982	Copper	<0.05	mg/L
GW	NP-2	10/27/1982	Cyanide	<0.01	mg/L
GW	NP-2	10/27/1982	Fluoride	0.6	mg/L
GW	NP-2	10/27/1982	Iron	0.29	mg/L
GW	NP-2	10/27/1982	Manganese	<0.05	mg/L
GW	NP-2	10/27/1982	Mercury	<0.001	mg/L
GW	NP-2	10/27/1982	Molybdenum	<0.05	mg/L

GW	NP-2	10/27/1982	Nitrate as N (NO3)	1.6	mg/L
GW	NP-2	10/27/1982	Selenium	<0.005	mg/L
GW	NP-2	10/27/1982	Sulfate	120	mg/L
GW	NP-2	10/27/1982	TDS	440	mg/L
GW	NP-2	10/27/1982	pH	7.9	pH units
GW	NP-3	10/27/1982	Cadmium	<0.005	mg/L
GW	NP-3	10/27/1982	Chloride	26	mg/L
GW	NP-3	10/27/1982	Copper	<0.05	mg/L
GW	NP-3	10/27/1982	Cyanide	<0.01	mg/L
GW	NP-3	10/27/1982	Fluoride	0.6	mg/L
GW	NP-3	10/27/1982	Iron	<0.1	mg/L
GW	NP-3	10/27/1982	Manganese	<0.05	mg/L
GW	NP-3	10/27/1982	Mercury	<0.001	mg/L
GW	NP-3	10/27/1982	Molybdenum	<0.05	mg/L
GW	NP-3	10/27/1982	Nitrate as N (NO3)	1.6	mg/L
GW	NP-3	10/27/1982	Selenium	<0.005	mg/L
GW	NP-3	10/27/1982	Sulfate	132	mg/L
GW	NP-3	10/27/1982	TDS	450	mg/L
GW	NP-3	10/27/1982	pH	8	pH units
GW	NP-4	10/27/1982	Cadmium	0.0061	mg/L
GW	NP-4	10/27/1982	Chloride	36	mg/L
GW	NP-4	10/27/1982	Copper	<0.05	mg/L
GW	NP-4	10/27/1982	Cyanide	<0.01	mg/L
GW	NP-4	10/27/1982	Fluoride	0.4	mg/L
GW	NP-4	10/27/1982	Iron	0.34	mg/L
GW	NP-4	10/27/1982	Manganese	<0.05	mg/L
GW	NP-4	10/27/1982	Mercury	<0.001	mg/L
GW	NP-4	10/27/1982	Molybdenum	<0.05	mg/L
GW	NP-4	10/27/1982	Nitrate as N (NO3)	<0.2	mg/L
GW	NP-4	10/27/1982	Selenium	<0.005	mg/L
GW	NP-4	10/27/1982	Sulfate	108	mg/L
GW	NP-4	10/27/1982	TDS	230	mg/L
GW	NP-4	10/27/1982	pH	8.9	pH units
GW	NP-5	10/27/1982	Cadmium	<0.005	mg/L
GW	NP-5	10/27/1982	Chloride	34	mg/L
GW	NP-5	10/27/1982	Copper	<0.05	mg/L
GW	NP-5	10/27/1982	Cyanide	<0.01	mg/L
GW	NP-5	10/27/1982	Fluoride	0.8	mg/L
GW	NP-5	10/27/1982	Iron	0.21	mg/L
GW	NP-5	10/27/1982	Manganese	<0.05	mg/L
GW	NP-5	10/27/1982	Mercury	<0.001	mg/L
GW	NP-5	10/27/1982	Molybdenum	<0.05	mg/L
GW	NP-5	10/27/1982	Nitrate as N (NO3)	3.7	mg/L
GW	NP-5	10/27/1982	Selenium	<0.005	mg/L
GW	NP-5	10/27/1982	Sulfate	139	mg/L
GW	NP-5	10/27/1982	TDS	440	mg/L
GW	NP-5	10/27/1982	pH	8	pH units
GW	GWQ-10	12/23/1982	Cadmium	<0.005	mg/L
GW	GWQ-10	12/23/1982	Chloride	26	mg/L
GW	GWQ-10	12/23/1982	Copper	<0.05	mg/L
GW	GWQ-10	12/23/1982	Cyanide	<0.01	mg/L
GW	GWQ-10	12/23/1982	Fluoride	0.6	mg/L
GW	GWQ-10	12/23/1982	Iron	<0.1	mg/L
GW	GWQ-10	12/23/1982	Manganese	<0.05	mg/L
GW	GWQ-10	12/23/1982	Mercury	<0.001	mg/L
GW	GWQ-10	12/23/1982	Molybdenum	<0.05	mg/L
GW	GWQ-10	12/23/1982	Nitrate as N (NO3)	1.7	mg/L
GW	GWQ-10	12/23/1982	Selenium	<0.005	mg/L
GW	GWQ-10	12/23/1982	Sulfate	138	mg/L
GW	GWQ-10	12/23/1982	TDS	500	mg/L
GW	GWQ-10	12/23/1982	pH	8.5	pH units
GW	GWQ-11	12/23/1982	Cadmium	<0.005	mg/L
GW	GWQ-11	12/23/1982	Chloride	52	mg/L
GW	GWQ-11	12/23/1982	Copper	<0.05	mg/L
GW	GWQ-11	12/23/1982	Cyanide	<0.01	mg/L
GW	GWQ-11	12/23/1982	Fluoride	0.8	mg/L
GW	GWQ-11	12/23/1982	Iron	<0.1	mg/L
GW	GWQ-11	12/23/1982	Manganese	<0.05	mg/L
GW	GWQ-11	12/23/1982	Mercury	<0.001	mg/L
GW	GWQ-11	12/23/1982	Molybdenum	<0.05	mg/L
GW	GWQ-11	12/23/1982	Nitrate as N (NO3)	1.6	mg/L
GW	GWQ-11	12/23/1982	Selenium	<0.005	mg/L
GW	GWQ-11	12/23/1982	Sulfate	235	mg/L
GW	GWQ-11	12/23/1982	TDS	650	mg/L
GW	GWQ-11	12/23/1982	pH	8.5	pH units
GW	GWQ-3	12/23/1982	Cadmium	<0.005	mg/L

GW	GWQ-3	12/23/1982	Chloride	64	mg/L
GW	GWQ-3	12/23/1982	Copper	<0.05	mg/L
GW	GWQ-3	12/23/1982	Cyanide	<0.01	mg/L
GW	GWQ-3	12/23/1982	Fluoride	0.7	mg/L
GW	GWQ-3	12/23/1982	Iron	<0.1	mg/L
GW	GWQ-3	12/23/1982	Manganese	<0.05	mg/L
GW	GWQ-3	12/23/1982	Mercury	<0.001	mg/L
GW	GWQ-3	12/23/1982	Molybdenum	<0.05	mg/L
GW	GWQ-3	12/23/1982	Nitrate as N (NO3)	0.2	mg/L
GW	GWQ-3	12/23/1982	Selenium	<0.005	mg/L
GW	GWQ-3	12/23/1982	Sulfate	340	mg/L
GW	GWQ-3	12/23/1982	TDS	990	mg/L
GW	GWQ-3	12/23/1982	pH	8.5	pH units
GW	GWQ-7	12/28/1982	Cadmium	<0.005	mg/L
GW	GWQ-7	12/28/1982	Chloride	20	mg/L
GW	GWQ-7	12/28/1982	Copper	<0.05	mg/L
GW	GWQ-7	12/28/1982	Cyanide	<0.01	mg/L
GW	GWQ-7	12/28/1982	Fluoride	0.3	mg/L
GW	GWQ-7	12/28/1982	Iron	0.26	mg/L
GW	GWQ-7	12/28/1982	Manganese	0.16	mg/L
GW	GWQ-7	12/28/1982	Mercury	<0.001	mg/L
GW	GWQ-7	12/28/1982	Molybdenum	<0.05	mg/L
GW	GWQ-7	12/28/1982	Nitrate as N (NO3)	<0.2	mg/L
GW	GWQ-7	12/28/1982	Selenium	<0.005	mg/L
GW	GWQ-7	12/28/1982	Sulfate	40	mg/L
GW	GWQ-7	12/28/1982	TDS	250	mg/L
GW	GWQ-7	12/28/1982	pH	8.1	pH units
GW	GWQ-9	12/28/1982	Cadmium	<0.005	mg/L
GW	GWQ-9	12/28/1982	Chloride	20	mg/L
GW	GWQ-9	12/28/1982	Copper	<0.05	mg/L
GW	GWQ-9	12/28/1982	Cyanide	<0.01	mg/L
GW	GWQ-9	12/28/1982	Fluoride	0.5	mg/L
GW	GWQ-9	12/28/1982	Iron	<0.1	mg/L
GW	GWQ-9	12/28/1982	Manganese	<0.05	mg/L
GW	GWQ-9	12/28/1982	Mercury	<0.001	mg/L
GW	GWQ-9	12/28/1982	Molybdenum	<0.05	mg/L
GW	GWQ-9	12/28/1982	Nitrate as N (NO3)	1	mg/L
GW	GWQ-9	12/28/1982	Selenium	<0.005	mg/L
GW	GWQ-9	12/28/1982	Sulfate	150	mg/L
GW	GWQ-9	12/28/1982	TDS	480	mg/L
GW	GWQ-9	12/28/1982	pH	7.8	pH units
GW	GWQ-10	2/21/1983	Cadmium	<0.005	mg/L
GW	GWQ-10	2/21/1983	Chloride	24	mg/L
GW	GWQ-10	2/21/1983	Copper	<0.05	mg/L
GW	GWQ-10	2/21/1983	Cyanide	<0.01	mg/L
GW	GWQ-10	2/21/1983	Fluoride	0.6	mg/L
GW	GWQ-10	2/21/1983	Iron	<0.1	mg/L
GW	GWQ-10	2/21/1983	Manganese	<0.05	mg/L
GW	GWQ-10	2/21/1983	Mercury	<0.001	mg/L
GW	GWQ-10	2/21/1983	Molybdenum	<0.05	mg/L
GW	GWQ-10	2/21/1983	Nitrate as N (NO3)	2.4	mg/L
GW	GWQ-10	2/21/1983	Selenium	<0.005	mg/L
GW	GWQ-10	2/21/1983	Sulfate	161	mg/L
GW	GWQ-10	2/21/1983	TDS	470	mg/L
GW	GWQ-10	2/21/1983	pH	7.9	pH units
GW	GWQ-11	2/21/1983	Cadmium	<0.005	mg/L
GW	GWQ-11	2/21/1983	Chloride	44	mg/L
GW	GWQ-11	2/21/1983	Copper	<0.05	mg/L
GW	GWQ-11	2/21/1983	Cyanide	<0.01	mg/L
GW	GWQ-11	2/21/1983	Fluoride	0.8	mg/L
GW	GWQ-11	2/21/1983	Iron	0.38	mg/L
GW	GWQ-11	2/21/1983	Manganese	<0.05	mg/L
GW	GWQ-11	2/21/1983	Mercury	<0.001	mg/L
GW	GWQ-11	2/21/1983	Molybdenum	<0.05	mg/L
GW	GWQ-11	2/21/1983	Nitrate as N (NO3)	1.7	mg/L
GW	GWQ-11	2/21/1983	Selenium	<0.005	mg/L
GW	GWQ-11	2/21/1983	Sulfate	218	mg/L
GW	GWQ-11	2/21/1983	TDS	600	mg/L
GW	GWQ-11	2/21/1983	pH	8	pH units
GW	GWQ-12	2/21/1983	Cadmium	<0.005	mg/L
GW	GWQ-12	2/21/1983	Chloride	18	mg/L
GW	GWQ-12	2/21/1983	Copper	<0.05	mg/L
GW	GWQ-12	2/21/1983	Cyanide	<0.01	mg/L
GW	GWQ-12	2/21/1983	Fluoride	1	mg/L
GW	GWQ-12	2/21/1983	Iron	<0.1	mg/L
GW	GWQ-12	2/21/1983	Manganese	<0.05	mg/L

GW	GWQ-12	2/21/1983	Molybdenum	<0.05	mg/L
GW	GWQ-12	2/21/1983	Nitrate as N (NO3)	2.2	mg/L
GW	GWQ-12	2/21/1983	Selenium	<0.005	mg/L
GW	GWQ-12	2/21/1983	Sulfate	53	mg/L
GW	GWQ-12	2/21/1983	TDS	360	mg/L
GW	GWQ-12	2/21/1983	pH	7.7	pH units
GW	GWQ-3	2/21/1983	Cadmium	<0.005	mg/L
GW	GWQ-3	2/21/1983	Chloride	68	mg/L
GW	GWQ-3	2/21/1983	Copper	<0.05	mg/L
GW	GWQ-3	2/21/1983	Cyanide	<0.01	mg/L
GW	GWQ-3	2/21/1983	Fluoride	0.7	mg/L
GW	GWQ-3	2/21/1983	Iron	<0.1	mg/L
GW	GWQ-3	2/21/1983	Manganese	<0.05	mg/L
GW	GWQ-3	2/21/1983	Mercury	<0.001	mg/L
GW	GWQ-3	2/21/1983	Molybdenum	<0.05	mg/L
GW	GWQ-3	2/21/1983	Nitrate as N (NO3)	0.2	mg/L
GW	GWQ-3	2/21/1983	Selenium	<0.005	mg/L
GW	GWQ-3	2/21/1983	Sulfate	428	mg/L
GW	GWQ-3	2/21/1983	TDS	970	mg/L
GW	GWQ-3	2/21/1983	pH	7.7	pH units
GW	GWQ-7	2/21/1983	Cadmium	<0.005	mg/L
GW	GWQ-7	2/21/1983	Chloride	22	mg/L
GW	GWQ-7	2/21/1983	Copper	<0.05	mg/L
GW	GWQ-7	2/21/1983	Cyanide	<0.01	mg/L
GW	GWQ-7	2/21/1983	Fluoride	0.4	mg/L
GW	GWQ-7	2/21/1983	Iron	<0.1	mg/L
GW	GWQ-7	2/21/1983	Manganese	0.27	mg/L
GW	GWQ-7	2/21/1983	Mercury	<0.001	mg/L
GW	GWQ-7	2/21/1983	Molybdenum	<0.05	mg/L
GW	GWQ-7	2/21/1983	Nitrate as N (NO3)	2.8	mg/L
GW	GWQ-7	2/21/1983	Selenium	<0.005	mg/L
GW	GWQ-7	2/21/1983	Sulfate	47	mg/L
GW	GWQ-7	2/21/1983	TDS	250	mg/L
GW	GWQ-7	2/21/1983	pH	8.3	pH units
GW	GWQ-9	2/21/1983	Cadmium	<0.005	mg/L
GW	GWQ-9	2/21/1983	Chloride	20	mg/L
GW	GWQ-9	2/21/1983	Copper	<0.05	mg/L
GW	GWQ-9	2/21/1983	Cyanide	<0.01	mg/L
GW	GWQ-9	2/21/1983	Fluoride	0.5	mg/L
GW	GWQ-9	2/21/1983	Iron	<0.1	mg/L
GW	GWQ-9	2/21/1983	Manganese	<0.05	mg/L
GW	GWQ-9	2/21/1983	Mercury	<0.001	mg/L
GW	GWQ-9	2/21/1983	Molybdenum	<0.05	mg/L
GW	GWQ-9	2/21/1983	Nitrate as N (NO3)	1.4	mg/L
GW	GWQ-9	2/21/1983	Selenium	<0.005	mg/L
GW	GWQ-9	2/21/1983	Sulfate	161	mg/L
GW	GWQ-9	2/21/1983	TDS	480	mg/L
GW	GWQ-9	2/21/1983	pH	8	pH units
GW	NP-1	2/21/1983	Cadmium	<0.005	mg/L
GW	NP-1	2/21/1983	Chloride	18	mg/L
GW	NP-1	2/21/1983	Copper	<0.05	mg/L
GW	NP-1	2/21/1983	Cyanide	<0.01	mg/L
GW	NP-1	2/21/1983	Fluoride	0.7	mg/L
GW	NP-1	2/21/1983	Iron	<0.1	mg/L
GW	NP-1	2/21/1983	Manganese	<0.05	mg/L
GW	NP-1	2/21/1983	Mercury	<0.001	mg/L
GW	NP-1	2/21/1983	Molybdenum	<0.05	mg/L
GW	NP-1	2/21/1983	Nitrate as N (NO3)	1.3	mg/L
GW	NP-1	2/21/1983	Selenium	<0.005	mg/L
GW	NP-1	2/21/1983	Sulfate	156	mg/L
GW	NP-1	2/21/1983	TDS	490	mg/L
GW	NP-1	2/21/1983	pH	7.7	pH units
GW	NP-2	2/21/1983	Cadmium	<0.005	mg/L
GW	NP-2	2/21/1983	Chloride	24	mg/L
GW	NP-2	2/21/1983	Copper	<0.05	mg/L
GW	NP-2	2/21/1983	Cyanide	<0.01	mg/L
GW	NP-2	2/21/1983	Fluoride	0.6	mg/L
GW	NP-2	2/21/1983	Iron	0.12	mg/L
GW	NP-2	2/21/1983	Manganese	<0.05	mg/L
GW	NP-2	2/21/1983	Mercury	<0.001	mg/L
GW	NP-2	2/21/1983	Molybdenum	<0.05	mg/L
GW	NP-2	2/21/1983	Nitrate as N (NO3)	1.6	mg/L
GW	NP-2	2/21/1983	Selenium	<0.005	mg/L
GW	NP-2	2/21/1983	Sulfate	127	mg/L
GW	NP-2	2/21/1983	TDS	440	mg/L
GW	NP-2	2/21/1983	pH	7.8	pH units

GW	NP-3	2/21/1983	Cadmium	<0.005	mg/L
GW	NP-3	2/21/1983	Chloride	26	mg/L
GW	NP-3	2/21/1983	Copper	<0.05	mg/L
GW	NP-3	2/21/1983	Cyanide	<0.01	mg/L
GW	NP-3	2/21/1983	Fluoride	0.5	mg/L
GW	NP-3	2/21/1983	Iron	<0.1	mg/L
GW	NP-3	2/21/1983	Manganese	<0.05	mg/L
GW	NP-3	2/21/1983	Mercury	<0.001	mg/L
GW	NP-3	2/21/1983	Molybdenum	<0.05	mg/L
GW	NP-3	2/21/1983	Nitrate as N (NO3)	1.4	mg/L
GW	NP-3	2/21/1983	Selenium	<0.005	mg/L
GW	NP-3	2/21/1983	Sulfate	131	mg/L
GW	NP-3	2/21/1983	TDS	410	mg/L
GW	NP-3	2/21/1983	pH	8.2	pH units
GW	NP-4	2/21/1983	Cadmium	<0.005	mg/L
GW	NP-4	2/21/1983	Chloride	48	mg/L
GW	NP-4	2/21/1983	Copper	<0.05	mg/L
GW	NP-4	2/21/1983	Cyanide	<0.01	mg/L
GW	NP-4	2/21/1983	Fluoride	0.4	mg/L
GW	NP-4	2/21/1983	Iron	0.28	mg/L
GW	NP-4	2/21/1983	Manganese	<0.05	mg/L
GW	NP-4	2/21/1983	Mercury	0.001	mg/L
GW	NP-4	2/21/1983	Molybdenum	<0.05	mg/L
GW	NP-4	2/21/1983	Nitrate as N (NO3)	0.2	mg/L
GW	NP-4	2/21/1983	Selenium	<0.005	mg/L
GW	NP-4	2/21/1983	Sulfate	115	mg/L
GW	NP-4	2/21/1983	TDS	250	mg/L
GW	NP-4	2/21/1983	pH	9.3	pH units
GW	NP-5	2/21/1983	Cadmium	<0.005	mg/L
GW	NP-5	2/21/1983	Chloride	26	mg/L
GW	NP-5	2/21/1983	Copper	<0.05	mg/L
GW	NP-5	2/21/1983	Cyanide	<0.01	mg/L
GW	NP-5	2/21/1983	Fluoride	0.5	mg/L
GW	NP-5	2/21/1983	Iron	<0.1	mg/L
GW	NP-5	2/21/1983	Manganese	<0.05	mg/L
GW	NP-5	2/21/1983	Mercury	<0.001	mg/L
GW	NP-5	2/21/1983	Molybdenum	<0.05	mg/L
GW	NP-5	2/21/1983	Nitrate as N (NO3)	1.3	mg/L
GW	NP-5	2/21/1983	Selenium	<0.005	mg/L
GW	NP-5	2/21/1983	Sulfate	139	mg/L
GW	NP-5	2/21/1983	TDS	420	mg/L
GW	NP-5	2/21/1983	pH	8.3	pH units
GW	GWQ-7	3/16/1983	Manganese	<0.05	mg/L
GW	GWQ-10	5/13/1983	Cadmium	<0.005	mg/L
GW	GWQ-10	5/13/1983	Chloride	32	mg/L
GW	GWQ-10	5/13/1983	Copper	<0.05	mg/L
GW	GWQ-10	5/13/1983	Cyanide	0.02	mg/L
GW	GWQ-10	5/13/1983	Fluoride	0.6	mg/L
GW	GWQ-10	5/13/1983	Iron	<0.1	mg/L
GW	GWQ-10	5/13/1983	Manganese	<0.05	mg/L
GW	GWQ-10	5/13/1983	Mercury	<0.001	mg/L
GW	GWQ-10	5/13/1983	Molybdenum	<0.05	mg/L
GW	GWQ-10	5/13/1983	Nitrate as N (NO3)	2.4	mg/L
GW	GWQ-10	5/13/1983	Selenium	<0.005	mg/L
GW	GWQ-10	5/13/1983	Sulfate	161	mg/L
GW	GWQ-10	5/13/1983	TDS	480	mg/L
GW	GWQ-10	5/13/1983	pH	8	pH units
GW	GWQ-11	5/13/1983	Cadmium	<0.005	mg/L
GW	GWQ-11	5/13/1983	Chloride	44	mg/L
GW	GWQ-11	5/13/1983	Copper	<0.05	mg/L
GW	GWQ-11	5/13/1983	Cyanide	0.01	mg/L
GW	GWQ-11	5/13/1983	Fluoride	0.8	mg/L
GW	GWQ-11	5/13/1983	Iron	<0.1	mg/L
GW	GWQ-11	5/13/1983	Manganese	<0.05	mg/L
GW	GWQ-11	5/13/1983	Mercury	<0.001	mg/L
GW	GWQ-11	5/13/1983	Molybdenum	<0.05	mg/L
GW	GWQ-11	5/13/1983	Nitrate as N (NO3)	1.9	mg/L
GW	GWQ-11	5/13/1983	Selenium	<0.005	mg/L
GW	GWQ-11	5/13/1983	Sulfate	206	mg/L
GW	GWQ-11	5/13/1983	TDS	570	mg/L
GW	GWQ-11	5/13/1983	pH	8.1	pH units
GW	GWQ-12	5/13/1983	Cadmium	<0.005	mg/L
GW	GWQ-12	5/13/1983	Chloride	16	mg/L
GW	GWQ-12	5/13/1983	Copper	<0.05	mg/L
GW	GWQ-12	5/13/1983	Cyanide	<0.01	mg/L
GW	GWQ-12	5/13/1983	Fluoride	1	mg/L

GW	GWQ-12	5/13/1983	Iron	<0.1	mg/L
GW	GWQ-12	5/13/1983	Manganese	<0.05	mg/L
GW	GWQ-12	5/13/1983	Mercury	<0.001	mg/L
GW	GWQ-12	5/13/1983	Molybdenum	<0.05	mg/L
GW	GWQ-12	5/13/1983	Nitrate as N (NO3)	2.1	mg/L
GW	GWQ-12	5/13/1983	Selenium	<0.005	mg/L
GW	GWQ-12	5/13/1983	Sulfate	37	mg/L
GW	GWQ-12	5/13/1983	TDS	330	mg/L
GW	GWQ-12	5/13/1983	pH	8.1	pH units
GW	GWQ-3	5/13/1983	Cadmium	<0.005	mg/L
GW	GWQ-3	5/13/1983	Chloride	82	mg/L
GW	GWQ-3	5/13/1983	Copper	<0.05	mg/L
GW	GWQ-3	5/13/1983	Cyanide	<0.01	mg/L
GW	GWQ-3	5/13/1983	Fluoride	0.6	mg/L
GW	GWQ-3	5/13/1983	Iron	<0.1	mg/L
GW	GWQ-3	5/13/1983	Manganese	<0.05	mg/L
GW	GWQ-3	5/13/1983	Mercury	<0.001	mg/L
GW	GWQ-3	5/13/1983	Molybdenum	0.11	mg/L
GW	GWQ-3	5/13/1983	Nitrate as N (NO3)	0.3	mg/L
GW	GWQ-3	5/13/1983	Selenium	<0.005	mg/L
GW	GWQ-3	5/13/1983	Sulfate	437	mg/L
GW	GWQ-3	5/13/1983	TDS	980	mg/L
GW	GWQ-3	5/13/1983	pH	8	pH units
GW	GWQ-7	5/13/1983	Cadmium	<0.005	mg/L
GW	GWQ-7	5/13/1983	Chloride	20	mg/L
GW	GWQ-7	5/13/1983	Copper	<0.05	mg/L
GW	GWQ-7	5/13/1983	Cyanide	<0.01	mg/L
GW	GWQ-7	5/13/1983	Fluoride	0.6	mg/L
GW	GWQ-7	5/13/1983	Iron	<0.1	mg/L
GW	GWQ-7	5/13/1983	Manganese	<0.05	mg/L
GW	GWQ-7	5/13/1983	Mercury	<0.001	mg/L
GW	GWQ-7	5/13/1983	Molybdenum	<0.05	mg/L
GW	GWQ-7	5/13/1983	Nitrate as N (NO3)	1.2	mg/L
GW	GWQ-7	5/13/1983	Selenium	<0.005	mg/L
GW	GWQ-7	5/13/1983	Sulfate	158	mg/L
GW	GWQ-7	5/13/1983	TDS	470	mg/L
GW	GWQ-7	5/13/1983	pH	8.1	pH units
GW	GWQ-9	5/13/1983	Cadmium	<0.005	mg/L
GW	GWQ-9	5/13/1983	Chloride	20	mg/L
GW	GWQ-9	5/13/1983	Copper	<0.05	mg/L
GW	GWQ-9	5/13/1983	Cyanide	<0.01	mg/L
GW	GWQ-9	5/13/1983	Fluoride	0.5	mg/L
GW	GWQ-9	5/13/1983	Iron	<0.1	mg/L
GW	GWQ-9	5/13/1983	Manganese	<0.05	mg/L
GW	GWQ-9	5/13/1983	Mercury	<0.001	mg/L
GW	GWQ-9	5/13/1983	Molybdenum	<0.05	mg/L
GW	GWQ-9	5/13/1983	Nitrate as N (NO3)	1.1	mg/L
GW	GWQ-9	5/13/1983	Selenium	<0.005	mg/L
GW	GWQ-9	5/13/1983	Sulfate	158	mg/L
GW	GWQ-9	5/13/1983	TDS	460	mg/L
GW	GWQ-9	5/13/1983	pH	8.2	pH units
GW	NP-1	5/13/1983	Cadmium	<0.005	mg/L
GW	NP-1	5/13/1983	Chloride	24	mg/L
GW	NP-1	5/13/1983	Copper	<0.05	mg/L
GW	NP-1	5/13/1983	Cyanide	<0.01	mg/L
GW	NP-1	5/13/1983	Fluoride	0.6	mg/L
GW	NP-1	5/13/1983	Iron	<0.1	mg/L
GW	NP-1	5/13/1983	Manganese	<0.05	mg/L
GW	NP-1	5/13/1983	Mercury	<0.001	mg/L
GW	NP-1	5/13/1983	Molybdenum	<0.05	mg/L
GW	NP-1	5/13/1983	Nitrate as N (NO3)	1.1	mg/L
GW	NP-1	5/13/1983	Selenium	<0.005	mg/L
GW	NP-1	5/13/1983	Sulfate	149	mg/L
GW	NP-1	5/13/1983	TDS	470	mg/L
GW	NP-1	5/13/1983	pH	7.9	pH units
GW	NP-2	5/13/1983	Cadmium	<0.005	mg/L
GW	NP-2	5/13/1983	Chloride	24	mg/L
GW	NP-2	5/13/1983	Copper	<0.05	mg/L
GW	NP-2	5/13/1983	Cyanide	<0.01	mg/L
GW	NP-2	5/13/1983	Fluoride	0.6	mg/L
GW	NP-2	5/13/1983	Iron	<0.1	mg/L
GW	NP-2	5/13/1983	Manganese	<0.05	mg/L
GW	NP-2	5/13/1983	Mercury	<0.001	mg/L
GW	NP-2	5/13/1983	Molybdenum	<0.05	mg/L
GW	NP-2	5/13/1983	Nitrate as N (NO3)	1.5	mg/L
GW	NP-2	5/13/1983	Selenium	<0.005	mg/L

GW	NP-2	5/13/1983	Sulfate	139	mg/L
GW	NP-2	5/13/1983	TDS	460	mg/L
GW	NP-2	5/13/1983	pH	8.1	pH units
GW	NP-3	5/13/1983	Cadmium	<0.005	mg/L
GW	NP-3	5/13/1983	Chloride	64	mg/L
GW	NP-3	5/13/1983	Copper	<0.05	mg/L
GW	NP-3	5/13/1983	Cyanide	<0.01	mg/L
GW	NP-3	5/13/1983	Fluoride	0.5	mg/L
GW	NP-3	5/13/1983	Iron	<0.1	mg/L
GW	NP-3	5/13/1983	Manganese	<0.05	mg/L
GW	NP-3	5/13/1983	Mercury	<0.001	mg/L
GW	NP-3	5/13/1983	Molybdenum	<0.05	mg/L
GW	NP-3	5/13/1983	Nitrate as N (NO3)	2.1	mg/L
GW	NP-3	5/13/1983	Selenium	<0.005	mg/L
GW	NP-3	5/13/1983	Sulfate	139	mg/L
GW	NP-3	5/13/1983	TDS	500	mg/L
GW	NP-3	5/13/1983	pH	8	pH units
GW	NP-4	5/13/1983	Cadmium	<0.005	mg/L
GW	NP-4	5/13/1983	Chloride	76	mg/L
GW	NP-4	5/13/1983	Copper	<0.05	mg/L
GW	NP-4	5/13/1983	Cyanide	<0.01	mg/L
GW	NP-4	5/13/1983	Fluoride	0.4	mg/L
GW	NP-4	5/13/1983	Iron	<0.1	mg/L
GW	NP-4	5/13/1983	Manganese	<0.05	mg/L
GW	NP-4	5/13/1983	Mercury	<0.001	mg/L
GW	NP-4	5/13/1983	Molybdenum	<0.05	mg/L
GW	NP-4	5/13/1983	Nitrate as N (NO3)	<0.2	mg/L
GW	NP-4	5/13/1983	Selenium	<0.005	mg/L
GW	NP-4	5/13/1983	Sulfate	134	mg/L
GW	NP-4	5/13/1983	TDS	340	mg/L
GW	NP-4	5/13/1983	pH	7.9	pH units
GW	NP-5	5/13/1983	Cadmium	<0.005	mg/L
GW	NP-5	5/13/1983	Chloride	70	mg/L
GW	NP-5	5/13/1983	Copper	<0.05	mg/L
GW	NP-5	5/13/1983	Cyanide	<0.01	mg/L
GW	NP-5	5/13/1983	Fluoride	0.4	mg/L
GW	NP-5	5/13/1983	Iron	<0.1	mg/L
GW	NP-5	5/13/1983	Manganese	<0.05	mg/L
GW	NP-5	5/13/1983	Mercury	<0.001	mg/L
GW	NP-5	5/13/1983	Molybdenum	<0.05	mg/L
GW	NP-5	5/13/1983	Nitrate as N (NO3)	0.2	mg/L
GW	NP-5	5/13/1983	Selenium	<0.005	mg/L
GW	NP-5	5/13/1983	Sulfate	134	mg/L
GW	NP-5	5/13/1983	TDS	290	mg/L
GW	NP-5	5/13/1983	pH	8.9	pH units
GW	GWQ-10	8/9/1983	Cadmium	<0.005	mg/L
GW	GWQ-10	8/9/1983	Chloride	36	mg/L
GW	GWQ-10	8/9/1983	Copper	<0.05	mg/L
GW	GWQ-10	8/9/1983	Cyanide	<0.01	mg/L
GW	GWQ-10	8/9/1983	Fluoride	0.6	mg/L
GW	GWQ-10	8/9/1983	Iron	<0.1	mg/L
GW	GWQ-10	8/9/1983	Manganese	<0.05	mg/L
GW	GWQ-10	8/9/1983	Mercury	<0.001	mg/L
GW	GWQ-10	8/9/1983	Molybdenum	<0.05	mg/L
GW	GWQ-10	8/9/1983	Nitrate as N (NO3)	2.4	mg/L
GW	GWQ-10	8/9/1983	Selenium	<0.005	mg/L
GW	GWQ-10	8/9/1983	Sulfate	142	mg/L
GW	GWQ-10	8/9/1983	TDS	510	mg/L
GW	GWQ-10	8/9/1983	pH	7.9	pH units
GW	GWQ-11	8/9/1983	Cadmium	<0.005	mg/L
GW	GWQ-11	8/9/1983	Chloride	46	mg/L
GW	GWQ-11	8/9/1983	Copper	<0.05	mg/L
GW	GWQ-11	8/9/1983	Cyanide	<0.01	mg/L
GW	GWQ-11	8/9/1983	Fluoride	0.8	mg/L
GW	GWQ-11	8/9/1983	Iron	<0.1	mg/L
GW	GWQ-11	8/9/1983	Manganese	<0.05	mg/L
GW	GWQ-11	8/9/1983	Mercury	<0.001	mg/L
GW	GWQ-11	8/9/1983	Molybdenum	<0.05	mg/L
GW	GWQ-11	8/9/1983	Nitrate as N (NO3)	2	mg/L
GW	GWQ-11	8/9/1983	Selenium	<0.005	mg/L
GW	GWQ-11	8/9/1983	Sulfate	168	mg/L
GW	GWQ-11	8/9/1983	TDS	580	mg/L
GW	GWQ-11	8/9/1983	pH	7.9	pH units
GW	GWQ-12	8/9/1983	Cadmium	<0.005	mg/L
GW	GWQ-12	8/9/1983	Chloride	22	mg/L
GW	GWQ-12	8/9/1983	Copper	<0.05	mg/L

GW	GWQ-12	8/9/1983	Cyanide	<0.01	mg/L
GW	GWQ-12	8/9/1983	Fluoride	0.6	mg/L
GW	GWQ-12	8/9/1983	Iron	<0.1	mg/L
GW	GWQ-12	8/9/1983	Manganese	<0.05	mg/L
GW	GWQ-12	8/9/1983	Mercury	<0.001	mg/L
GW	GWQ-12	8/9/1983	Molybdenum	<0.05	mg/L
GW	GWQ-12	8/9/1983	Nitrate as N (NO3)	1.1	mg/L
GW	GWQ-12	8/9/1983	Selenium	<0.005	mg/L
GW	GWQ-12	8/9/1983	Sulfate	130	mg/L
GW	GWQ-12	8/9/1983	TDS	480	mg/L
GW	GWQ-12	8/9/1983	pH	7.8	pH units
GW	GWQ-3	8/9/1983	Cadmium	<0.005	mg/L
GW	GWQ-3	8/9/1983	Chloride	78	mg/L
GW	GWQ-3	8/9/1983	Copper	<0.05	mg/L
GW	GWQ-3	8/9/1983	Cyanide	<0.01	mg/L
GW	GWQ-3	8/9/1983	Fluoride	0.7	mg/L
GW	GWQ-3	8/9/1983	Iron	0.11	mg/L
GW	GWQ-3	8/9/1983	Manganese	<0.05	mg/L
GW	GWQ-3	8/9/1983	Mercury	<0.001	mg/L
GW	GWQ-3	8/9/1983	Molybdenum	<0.05	mg/L
GW	GWQ-3	8/9/1983	Nitrate as N (NO3)	<0.2	mg/L
GW	GWQ-3	8/9/1983	Selenium	<0.005	mg/L
GW	GWQ-3	8/9/1983	Sulfate	385	mg/L
GW	GWQ-3	8/9/1983	TDS	1060	mg/L
GW	GWQ-3	8/9/1983	pH	7.8	pH units
GW	GWQ-7	8/9/1983	Cadmium	<0.005	mg/L
GW	GWQ-7	8/9/1983	Chloride	22	mg/L
GW	GWQ-7	8/9/1983	Copper	<0.05	mg/L
GW	GWQ-7	8/9/1983	Cyanide	<0.01	mg/L
GW	GWQ-7	8/9/1983	Fluoride	0.6	mg/L
GW	GWQ-7	8/9/1983	Iron	<0.1	mg/L
GW	GWQ-7	8/9/1983	Manganese	<0.05	mg/L
GW	GWQ-7	8/9/1983	Mercury	<0.001	mg/L
GW	GWQ-7	8/9/1983	Molybdenum	<0.05	mg/L
GW	GWQ-7	8/9/1983	Nitrate as N (NO3)	1	mg/L
GW	GWQ-7	8/9/1983	Selenium	<0.005	mg/L
GW	GWQ-7	8/9/1983	Sulfate	130	mg/L
GW	GWQ-7	8/9/1983	TDS	490	mg/L
GW	GWQ-7	8/9/1983	pH	8	pH units
GW	GWQ-9	8/9/1983	Cadmium	<0.005	mg/L
GW	GWQ-9	8/9/1983	Chloride	20	mg/L
GW	GWQ-9	8/9/1983	Copper	<0.05	mg/L
GW	GWQ-9	8/9/1983	Cyanide	<0.01	mg/L
GW	GWQ-9	8/9/1983	Fluoride	0.5	mg/L
GW	GWQ-9	8/9/1983	Iron	<0.1	mg/L
GW	GWQ-9	8/9/1983	Manganese	<0.05	mg/L
GW	GWQ-9	8/9/1983	Mercury	<0.001	mg/L
GW	GWQ-9	8/9/1983	Molybdenum	<0.05	mg/L
GW	GWQ-9	8/9/1983	Nitrate as N (NO3)	0.9	mg/L
GW	GWQ-9	8/9/1983	Selenium	<0.005	mg/L
GW	GWQ-9	8/9/1983	Sulfate	135	mg/L
GW	GWQ-9	8/9/1983	TDS	480	mg/L
GW	GWQ-9	8/9/1983	pH	8	pH units
GW	NP-1	8/9/1983	Cadmium	<0.005	mg/L
GW	NP-1	8/9/1983	Chloride	22	mg/L
GW	NP-1	8/9/1983	Copper	<0.05	mg/L
GW	NP-1	8/9/1983	Cyanide	<0.01	mg/L
GW	NP-1	8/9/1983	Fluoride	0.6	mg/L
GW	NP-1	8/9/1983	Iron	0.22	mg/L
GW	NP-1	8/9/1983	Manganese	<0.05	mg/L
GW	NP-1	8/9/1983	Mercury	<0.001	mg/L
GW	NP-1	8/9/1983	Molybdenum	<0.05	mg/L
GW	NP-1	8/9/1983	Nitrate as N (NO3)	1.1	mg/L
GW	NP-1	8/9/1983	Selenium	<0.005	mg/L
GW	NP-1	8/9/1983	Sulfate	130	mg/L
GW	NP-1	8/9/1983	TDS	480	mg/L
GW	NP-1	8/9/1983	pH	7.8	pH units
GW	NP-2	8/9/1983	Cadmium	<0.005	mg/L
GW	NP-2	8/9/1983	Chloride	36	mg/L
GW	NP-2	8/9/1983	Copper	<0.05	mg/L
GW	NP-2	8/9/1983	Cyanide	<0.01	mg/L
GW	NP-2	8/9/1983	Fluoride	0.6	mg/L
GW	NP-2	8/9/1983	Iron	<0.1	mg/L
GW	NP-2	8/9/1983	Manganese	<0.05	mg/L
GW	NP-2	8/9/1983	Mercury	<0.001	mg/L
GW	NP-2	8/9/1983	Molybdenum	<0.05	mg/L

GW	NP-2	8/9/1983	Nitrate as N (NO3)	1.6	mg/L
GW	NP-2	8/9/1983	Selenium	<0.005	mg/L
GW	NP-2	8/9/1983	Sulfate	148	mg/L
GW	NP-2	8/9/1983	TDS	560	mg/L
GW	NP-2	8/9/1983	pH	7.9	pH units
GW	NP-3	8/9/1983	Cadmium	<0.005	mg/L
GW	NP-3	8/9/1983	Chloride	114	mg/L
GW	NP-3	8/9/1983	Copper	<0.05	mg/L
GW	NP-3	8/9/1983	Cyanide	<0.01	mg/L
GW	NP-3	8/9/1983	Fluoride	0.5	mg/L
GW	NP-3	8/9/1983	Iron	<0.1	mg/L
GW	NP-3	8/9/1983	Manganese	<0.05	mg/L
GW	NP-3	8/9/1983	Mercury	<0.001	mg/L
GW	NP-3	8/9/1983	Molybdenum	<0.05	mg/L
GW	NP-3	8/9/1983	Nitrate as N (NO3)	2.3	mg/L
GW	NP-3	8/9/1983	Selenium	<0.005	mg/L
GW	NP-3	8/9/1983	Sulfate	100	mg/L
GW	NP-3	8/9/1983	TDS	630	mg/L
GW	NP-3	8/9/1983	pH	7.8	pH units
GW	NP-4	8/9/1983	Cadmium	<0.005	mg/L
GW	NP-4	8/9/1983	Chloride	94	mg/L
GW	NP-4	8/9/1983	Copper	<0.05	mg/L
GW	NP-4	8/9/1983	Cyanide	<0.01	mg/L
GW	NP-4	8/9/1983	Fluoride	0.3	mg/L
GW	NP-4	8/9/1983	Iron	<0.1	mg/L
GW	NP-4	8/9/1983	Manganese	<0.05	mg/L
GW	NP-4	8/9/1983	Mercury	<0.001	mg/L
GW	NP-4	8/9/1983	Molybdenum	<0.05	mg/L
GW	NP-4	8/9/1983	Nitrate as N (NO3)	<0.2	mg/L
GW	NP-4	8/9/1983	Selenium	<0.005	mg/L
GW	NP-4	8/9/1983	Sulfate	156	mg/L
GW	NP-4	8/9/1983	TDS	430	mg/L
GW	NP-4	8/9/1983	pH	8.8	pH units
GW	NP-5	8/9/1983	Cadmium	<0.005	mg/L
GW	NP-5	8/9/1983	Chloride	26	mg/L
GW	NP-5	8/9/1983	Copper	<0.05	mg/L
GW	NP-5	8/9/1983	Cyanide	<0.01	mg/L
GW	NP-5	8/9/1983	Fluoride	0.8	mg/L
GW	NP-5	8/9/1983	Iron	<0.1	mg/L
GW	NP-5	8/9/1983	Manganese	<0.05	mg/L
GW	NP-5	8/9/1983	Mercury	<0.001	mg/L
GW	NP-5	8/9/1983	Molybdenum	<0.05	mg/L
GW	NP-5	8/9/1983	Nitrate as N (NO3)	3.7	mg/L
GW	NP-5	8/9/1983	Selenium	<0.005	mg/L
GW	NP-5	8/9/1983	Sulfate	108	mg/L
GW	NP-5	8/9/1983	TDS	460	mg/L
GW	NP-5	8/9/1983	pH	8.1	pH units
GW	GWQ-10	11/1/1983	Cadmium	<0.005	mg/L
GW	GWQ-10	11/1/1983	Chloride	34	mg/L
GW	GWQ-10	11/1/1983	Copper	<0.05	mg/L
GW	GWQ-10	11/1/1983	Cyanide	<0.01	mg/L
GW	GWQ-10	11/1/1983	Fluoride	0.6	mg/L
GW	GWQ-10	11/1/1983	Iron	0.17	mg/L
GW	GWQ-10	11/1/1983	Manganese	<0.05	mg/L
GW	GWQ-10	11/1/1983	Mercury	<0.001	mg/L
GW	GWQ-10	11/1/1983	Molybdenum	<0.05	mg/L
GW	GWQ-10	11/1/1983	Nitrate as N (NO3)	4.8	mg/L
GW	GWQ-10	11/1/1983	Selenium	<0.005	mg/L
GW	GWQ-10	11/1/1983	Sulfate	125	mg/L
GW	GWQ-10	11/1/1983	TDS	500	mg/L
GW	GWQ-10	11/1/1983	pH	8.1	pH units
GW	GWQ-11	11/1/1983	Cadmium	<0.005	mg/L
GW	GWQ-11	11/1/1983	Chloride	46	mg/L
GW	GWQ-11	11/1/1983	Copper	<0.05	mg/L
GW	GWQ-11	11/1/1983	Cyanide	<0.01	mg/L
GW	GWQ-11	11/1/1983	Fluoride	0.8	mg/L
GW	GWQ-11	11/1/1983	Iron	<0.1	mg/L
GW	GWQ-11	11/1/1983	Manganese	<0.05	mg/L
GW	GWQ-11	11/1/1983	Mercury	<0.001	mg/L
GW	GWQ-11	11/1/1983	Molybdenum	<0.05	mg/L
GW	GWQ-11	11/1/1983	Nitrate as N (NO3)	4.8	mg/L
GW	GWQ-11	11/1/1983	Selenium	<0.005	mg/L
GW	GWQ-11	11/1/1983	Sulfate	174	mg/L
GW	GWQ-11	11/1/1983	TDS	580	mg/L
GW	GWQ-11	11/1/1983	pH	8	pH units
GW	GWQ-12	11/1/1983	Cadmium	<0.005	mg/L

GW	GWQ-12	11/1/1983	Chloride	14	mg/L
GW	GWQ-12	11/1/1983	Copper	<0.05	mg/L
GW	GWQ-12	11/1/1983	Cyanide	<0.01	mg/L
GW	GWQ-12	11/1/1983	Fluoride	1.1	mg/L
GW	GWQ-12	11/1/1983	Iron	0.32	mg/L
GW	GWQ-12	11/1/1983	Manganese	<0.05	mg/L
GW	GWQ-12	11/1/1983	Mercury	<0.001	mg/L
GW	GWQ-12	11/1/1983	Molybdenum	<0.05	mg/L
GW	GWQ-12	11/1/1983	Nitrate as N (NO3)	2.8	mg/L
GW	GWQ-12	11/1/1983	Selenium	<0.005	mg/L
GW	GWQ-12	11/1/1983	Sulfate	38	mg/L
GW	GWQ-12	11/1/1983	TDS	340	mg/L
GW	GWQ-12	11/1/1983	pH	8.2	pH units
GW	GWQ-3	11/1/1983	Cadmium	<0.005	mg/L
GW	GWQ-3	11/1/1983	Chloride	90	mg/L
GW	GWQ-3	11/1/1983	Copper	<0.05	mg/L
GW	GWQ-3	11/1/1983	Cyanide	<0.01	mg/L
GW	GWQ-3	11/1/1983	Fluoride	0.7	mg/L
GW	GWQ-3	11/1/1983	Iron	<0.1	mg/L
GW	GWQ-3	11/1/1983	Manganese	<0.05	mg/L
GW	GWQ-3	11/1/1983	Mercury	<0.001	mg/L
GW	GWQ-3	11/1/1983	Molybdenum	<0.05	mg/L
GW	GWQ-3	11/1/1983	Nitrate as N (NO3)	0.3	mg/L
GW	GWQ-3	11/1/1983	Selenium	<0.005	mg/L
GW	GWQ-3	11/1/1983	Sulfate	529	mg/L
GW	GWQ-3	11/1/1983	TDS	1240	mg/L
GW	GWQ-3	11/1/1983	pH	8	pH units
GW	GWQ-7	11/1/1983	Cadmium	<0.005	mg/L
GW	GWQ-7	11/1/1983	Chloride	22	mg/L
GW	GWQ-7	11/1/1983	Copper	<0.05	mg/L
GW	GWQ-7	11/1/1983	Cyanide	<0.01	mg/L
GW	GWQ-7	11/1/1983	Fluoride	0.6	mg/L
GW	GWQ-7	11/1/1983	Iron	<0.1	mg/L
GW	GWQ-7	11/1/1983	Manganese	<0.05	mg/L
GW	GWQ-7	11/1/1983	Mercury	<0.001	mg/L
GW	GWQ-7	11/1/1983	Molybdenum	<0.05	mg/L
GW	GWQ-7	11/1/1983	Nitrate as N (NO3)	1.8	mg/L
GW	GWQ-7	11/1/1983	Selenium	<0.005	mg/L
GW	GWQ-7	11/1/1983	Sulfate	137	mg/L
GW	GWQ-7	11/1/1983	TDS	500	mg/L
GW	GWQ-7	11/1/1983	pH	8.1	pH units
GW	GWQ-9	11/1/1983	Cadmium	<0.005	mg/L
GW	GWQ-9	11/1/1983	Chloride	18	mg/L
GW	GWQ-9	11/1/1983	Copper	<0.05	mg/L
GW	GWQ-9	11/1/1983	Cyanide	<0.01	mg/L
GW	GWQ-9	11/1/1983	Fluoride	0.5	mg/L
GW	GWQ-9	11/1/1983	Iron	<0.1	mg/L
GW	GWQ-9	11/1/1983	Manganese	<0.05	mg/L
GW	GWQ-9	11/1/1983	Mercury	<0.001	mg/L
GW	GWQ-9	11/1/1983	Molybdenum	<0.05	mg/L
GW	GWQ-9	11/1/1983	Nitrate as N (NO3)	0.8	mg/L
GW	GWQ-9	11/1/1983	Selenium	<0.005	mg/L
GW	GWQ-9	11/1/1983	Sulfate	132	mg/L
GW	GWQ-9	11/1/1983	TDS	460	mg/L
GW	GWQ-9	11/1/1983	pH	8.2	pH units
GW	NP-1	11/1/1983	Cadmium	<0.005	mg/L
GW	NP-1	11/1/1983	Chloride	18	mg/L
GW	NP-1	11/1/1983	Copper	<0.05	mg/L
GW	NP-1	11/1/1983	Cyanide	<0.01	mg/L
GW	NP-1	11/1/1983	Fluoride	0.6	mg/L
GW	NP-1	11/1/1983	Iron	0.14	mg/L
GW	NP-1	11/1/1983	Manganese	<0.05	mg/L
GW	NP-1	11/1/1983	Mercury	<0.001	mg/L
GW	NP-1	11/1/1983	Molybdenum	<0.05	mg/L
GW	NP-1	11/1/1983	Nitrate as N (NO3)	2.1	mg/L
GW	NP-1	11/1/1983	Selenium	<0.005	mg/L
GW	NP-1	11/1/1983	Sulfate	125	mg/L
GW	NP-1	11/1/1983	TDS	500	mg/L
GW	NP-1	11/1/1983	pH	7.8	pH units
GW	NP-2	11/1/1983	Cadmium	<0.005	mg/L
GW	NP-2	11/1/1983	Chloride	24	mg/L
GW	NP-2	11/1/1983	Copper	<0.05	mg/L
GW	NP-2	11/1/1983	Cyanide	<0.01	mg/L
GW	NP-2	11/1/1983	Fluoride	0.6	mg/L
GW	NP-2	11/1/1983	Iron	0.17	mg/L
GW	NP-2	11/1/1983	Manganese	<0.05	mg/L

GW	NP-2	11/1/1983	Mercury	<0.001	mg/L
GW	NP-2	11/1/1983	Molybdenum	<0.05	mg/L
GW	NP-2	11/1/1983	Nitrate as N (NO3)	2.3	mg/L
GW	NP-2	11/1/1983	Selenium	<0.005	mg/L
GW	NP-2	11/1/1983	Sulfate	111	mg/L
GW	NP-2	11/1/1983	TDS	470	mg/L
GW	NP-2	11/1/1983	pH	8	pH units
GW	NP-3	11/1/1983	Cadmium	<0.005	mg/L
GW	NP-3	11/1/1983	Chloride	162	mg/L
GW	NP-3	11/1/1983	Copper	<0.05	mg/L
GW	NP-3	11/1/1983	Cyanide	<0.01	mg/L
GW	NP-3	11/1/1983	Fluoride	0.5	mg/L
GW	NP-3	11/1/1983	Iron	0.14	mg/L
GW	NP-3	11/1/1983	Manganese	<0.05	mg/L
GW	NP-3	11/1/1983	Mercury	<0.001	mg/L
GW	NP-3	11/1/1983	Molybdenum	<0.05	mg/L
GW	NP-3	11/1/1983	Nitrate as N (NO3)	3.8	mg/L
GW	NP-3	11/1/1983	Selenium	<0.005	mg/L
GW	NP-3	11/1/1983	Sulfate	163	mg/L
GW	NP-3	11/1/1983	TDS	760	mg/L
GW	NP-3	11/1/1983	pH	7.9	pH units
GW	NP-4	11/1/1983	Cadmium	<0.005	mg/L
GW	NP-4	11/1/1983	Chloride	114	mg/L
GW	NP-4	11/1/1983	Copper	<0.05	mg/L
GW	NP-4	11/1/1983	Cyanide	<0.01	mg/L
GW	NP-4	11/1/1983	Fluoride	0.3	mg/L
GW	NP-4	11/1/1983	Iron	<0.1	mg/L
GW	NP-4	11/1/1983	Manganese	<0.05	mg/L
GW	NP-4	11/1/1983	Mercury	<0.001	mg/L
GW	NP-4	11/1/1983	Molybdenum	<0.05	mg/L
GW	NP-4	11/1/1983	Nitrate as N (NO3)	0.6	mg/L
GW	NP-4	11/1/1983	Selenium	<0.005	mg/L
GW	NP-4	11/1/1983	Sulfate	206	mg/L
GW	NP-4	11/1/1983	TDS	530	mg/L
GW	NP-4	11/1/1983	pH	8.2	pH units
GW	NP-5	11/1/1983	Cadmium	<0.005	mg/L
GW	NP-5	11/1/1983	Chloride	30	mg/L
GW	NP-5	11/1/1983	Copper	<0.05	mg/L
GW	NP-5	11/1/1983	Cyanide	<0.01	mg/L
GW	NP-5	11/1/1983	Fluoride	0.8	mg/L
GW	NP-5	11/1/1983	Iron	0.1	mg/L
GW	NP-5	11/1/1983	Manganese	<0.05	mg/L
GW	NP-5	11/1/1983	Mercury	<0.001	mg/L
GW	NP-5	11/1/1983	Molybdenum	<0.05	mg/L
GW	NP-5	11/1/1983	Nitrate as N (NO3)	5.2	mg/L
GW	NP-5	11/1/1983	Selenium	<0.005	mg/L
GW	NP-5	11/1/1983	Sulfate	111	mg/L
GW	NP-5	11/1/1983	TDS	440	mg/L
GW	NP-5	11/1/1983	pH	8.2	pH units
GW	GWQ-10	3/16/1984	Cadmium	<0.005	mg/L
GW	GWQ-10	3/16/1984	Chloride	42	mg/L
GW	GWQ-10	3/16/1984	Copper	<0.05	mg/L
GW	GWQ-10	3/16/1984	Cyanide	<0.01	mg/L
GW	GWQ-10	3/16/1984	Fluoride	0.5	mg/L
GW	GWQ-10	3/16/1984	Iron	0.11	mg/L
GW	GWQ-10	3/16/1984	Manganese	<0.05	mg/L
GW	GWQ-10	3/16/1984	Mercury	<0.001	mg/L
GW	GWQ-10	3/16/1984	Molybdenum	<0.05	mg/L
GW	GWQ-10	3/16/1984	Nitrate as N (NO3)	3.5	mg/L
GW	GWQ-10	3/16/1984	Selenium	<0.005	mg/L
GW	GWQ-10	3/16/1984	Sulfate	128	mg/L
GW	GWQ-10	3/16/1984	TDS	500	mg/L
GW	GWQ-10	3/16/1984	pH	8.2	pH units
GW	GWQ-11	3/16/1984	Cadmium	<0.005	mg/L
GW	GWQ-11	3/16/1984	Chloride	52	mg/L
GW	GWQ-11	3/16/1984	Copper	<0.05	mg/L
GW	GWQ-11	3/16/1984	Cyanide	<0.01	mg/L
GW	GWQ-11	3/16/1984	Fluoride	0.6	mg/L
GW	GWQ-11	3/16/1984	Iron	<0.1	mg/L
GW	GWQ-11	3/16/1984	Manganese	<0.05	mg/L
GW	GWQ-11	3/16/1984	Mercury	<0.001	mg/L
GW	GWQ-11	3/16/1984	Molybdenum	<0.05	mg/L
GW	GWQ-11	3/16/1984	Nitrate as N (NO3)	3.8	mg/L
GW	GWQ-11	3/16/1984	Selenium	<0.005	mg/L
GW	GWQ-11	3/16/1984	Sulfate	184	mg/L
GW	GWQ-11	3/16/1984	TDS	540	mg/L

GW	GWQ-11	3/16/1984	pH	8.3	pH units
GW	GWQ-12	3/16/1984	Cadmium	<0.005	mg/L
GW	GWQ-12	3/16/1984	Chloride	14	mg/L
GW	GWQ-12	3/16/1984	Copper	<0.05	mg/L
GW	GWQ-12	3/16/1984	Cyanide	<0.01	mg/L
GW	GWQ-12	3/16/1984	Fluoride	1.1	mg/L
GW	GWQ-12	3/16/1984	Iron	<0.1	mg/L
GW	GWQ-12	3/16/1984	Manganese	<0.05	mg/L
GW	GWQ-12	3/16/1984	Mercury	<0.001	mg/L
GW	GWQ-12	3/16/1984	Molybdenum	<0.05	mg/L
GW	GWQ-12	3/16/1984	Nitrate as N (NO3)	3.8	mg/L
GW	GWQ-12	3/16/1984	Selenium	<0.005	mg/L
GW	GWQ-12	3/16/1984	Sulfate	44	mg/L
GW	GWQ-12	3/16/1984	TDS	320	mg/L
GW	GWQ-12	3/16/1984	pH	8.2	pH units
GW	GWQ-3	3/16/1984	Cadmium	<0.005	mg/L
GW	GWQ-3	3/16/1984	Chloride	74	mg/L
GW	GWQ-3	3/16/1984	Copper	<0.05	mg/L
GW	GWQ-3	3/16/1984	Cyanide	<0.01	mg/L
GW	GWQ-3	3/16/1984	Fluoride	0.3	mg/L
GW	GWQ-3	3/16/1984	Iron	<0.1	mg/L
GW	GWQ-3	3/16/1984	Manganese	<0.05	mg/L
GW	GWQ-3	3/16/1984	Mercury	<0.001	mg/L
GW	GWQ-3	3/16/1984	Molybdenum	<0.05	mg/L
GW	GWQ-3	3/16/1984	Nitrate as N (NO3)	3.4	mg/L
GW	GWQ-3	3/16/1984	Selenium	<0.005	mg/L
GW	GWQ-3	3/16/1984	Sulfate	530	mg/L
GW	GWQ-3	3/16/1984	TDS	1190	mg/L
GW	GWQ-3	3/16/1984	pH	8.2	pH units
GW	GWQ-7	3/16/1984	Cadmium	<0.005	mg/L
GW	GWQ-7	3/16/1984	Chloride	20	mg/L
GW	GWQ-7	3/16/1984	Copper	<0.05	mg/L
GW	GWQ-7	3/16/1984	Cyanide	<0.01	mg/L
GW	GWQ-7	3/16/1984	Fluoride	0.8	mg/L
GW	GWQ-7	3/16/1984	Iron	<0.1	mg/L
GW	GWQ-7	3/16/1984	Manganese	<0.05	mg/L
GW	GWQ-7	3/16/1984	Mercury	<0.001	mg/L
GW	GWQ-7	3/16/1984	Molybdenum	0.08	mg/L
GW	GWQ-7	3/16/1984	Nitrate as N (NO3)	1	mg/L
GW	GWQ-7	3/16/1984	Selenium	<0.005	mg/L
GW	GWQ-7	3/16/1984	Sulfate	140	mg/L
GW	GWQ-7	3/16/1984	TDS	450	mg/L
GW	GWQ-7	3/16/1984	pH	8.3	pH units
GW	GWQ-9	3/16/1984	Cadmium	<0.005	mg/L
GW	GWQ-9	3/16/1984	Chloride	18	mg/L
GW	GWQ-9	3/16/1984	Copper	<0.05	mg/L
GW	GWQ-9	3/16/1984	Cyanide	<0.01	mg/L
GW	GWQ-9	3/16/1984	Fluoride	0.7	mg/L
GW	GWQ-9	3/16/1984	Iron	<0.1	mg/L
GW	GWQ-9	3/16/1984	Manganese	<0.05	mg/L
GW	GWQ-9	3/16/1984	Mercury	<0.001	mg/L
GW	GWQ-9	3/16/1984	Molybdenum	<0.05	mg/L
GW	GWQ-9	3/16/1984	Nitrate as N (NO3)	1.7	mg/L
GW	GWQ-9	3/16/1984	Selenium	<0.005	mg/L
GW	GWQ-9	3/16/1984	Sulfate	132	mg/L
GW	GWQ-9	3/16/1984	TDS	460	mg/L
GW	GWQ-9	3/16/1984	pH	8.1	pH units
GW	NP-1	3/16/1984	Cadmium	<0.005	mg/L
GW	NP-1	3/16/1984	Chloride	22	mg/L
GW	NP-1	3/16/1984	Copper	<0.05	mg/L
GW	NP-1	3/16/1984	Cyanide	<0.01	mg/L
GW	NP-1	3/16/1984	Fluoride	0.6	mg/L
GW	NP-1	3/16/1984	Iron	<0.1	mg/L
GW	NP-1	3/16/1984	Manganese	<0.05	mg/L
GW	NP-1	3/16/1984	Mercury	0.0083	mg/L
GW	NP-1	3/16/1984	Molybdenum	<0.05	mg/L
GW	NP-1	3/16/1984	Nitrate as N (NO3)	1.8	mg/L
GW	NP-1	3/16/1984	Selenium	<0.005	mg/L
GW	NP-1	3/16/1984	Sulfate	124	mg/L
GW	NP-1	3/16/1984	TDS	480	mg/L
GW	NP-1	3/16/1984	pH	8.2	pH units
GW	NP-2	3/16/1984	Cadmium	<0.005	mg/L
GW	NP-2	3/16/1984	Chloride	30	mg/L
GW	NP-2	3/16/1984	Copper	<0.05	mg/L
GW	NP-2	3/16/1984	Cyanide	<0.01	mg/L
GW	NP-2	3/16/1984	Fluoride	0.8	mg/L

GW	NP-2	3/16/1984	Iron	<0.1	mg/L
GW	NP-2	3/16/1984	Manganese	<0.05	mg/L
GW	NP-2	3/16/1984	Mercury	0.001	mg/L
GW	NP-2	3/16/1984	Molybdenum	<0.05	mg/L
GW	NP-2	3/16/1984	Nitrate as N (NO3)	1.6	mg/L
GW	NP-2	3/16/1984	Selenium	<0.005	mg/L
GW	NP-2	3/16/1984	Sulfate	146	mg/L
GW	NP-2	3/16/1984	TDS	500	mg/L
GW	NP-2	3/16/1984	pH	8.2	pH units
GW	NP-3	3/16/1984	Cadmium	<0.005	mg/L
GW	NP-3	3/16/1984	Chloride	228	mg/L
GW	NP-3	3/16/1984	Copper	<0.05	mg/L
GW	NP-3	3/16/1984	Cyanide	<0.01	mg/L
GW	NP-3	3/16/1984	Fluoride	0.6	mg/L
GW	NP-3	3/16/1984	Iron	<0.1	mg/L
GW	NP-3	3/16/1984	Manganese	<0.05	mg/L
GW	NP-3	3/16/1984	Mercury	0.001	mg/L
GW	NP-3	3/16/1984	Molybdenum	<0.05	mg/L
GW	NP-3	3/16/1984	Nitrate as N (NO3)	3.2	mg/L
GW	NP-3	3/16/1984	Selenium	<0.005	mg/L
GW	NP-3	3/16/1984	Sulfate	216	mg/L
GW	NP-3	3/16/1984	TDS	870	mg/L
GW	NP-3	3/16/1984	pH	8.1	pH units
GW	NP-4	3/16/1984	Cadmium	<0.005	mg/L
GW	NP-4	3/16/1984	Chloride	126	mg/L
GW	NP-4	3/16/1984	Copper	<0.05	mg/L
GW	NP-4	3/16/1984	Cyanide	<0.01	mg/L
GW	NP-4	3/16/1984	Fluoride	0.6	mg/L
GW	NP-4	3/16/1984	Iron	<0.1	mg/L
GW	NP-4	3/16/1984	Manganese	<0.05	mg/L
GW	NP-4	3/16/1984	Mercury	0.001	mg/L
GW	NP-4	3/16/1984	Molybdenum	<0.05	mg/L
GW	NP-4	3/16/1984	Nitrate as N (NO3)	0.2	mg/L
GW	NP-4	3/16/1984	Selenium	<0.005	mg/L
GW	NP-4	3/16/1984	Sulfate	256	mg/L
GW	NP-4	3/16/1984	TDS	540	mg/L
GW	NP-4	3/16/1984	pH	8	pH units
GW	NP-5	3/16/1984	Cadmium	<0.005	mg/L
GW	NP-5	3/16/1984	Chloride	26	mg/L
GW	NP-5	3/16/1984	Copper	<0.05	mg/L
GW	NP-5	3/16/1984	Cyanide	<0.01	mg/L
GW	NP-5	3/16/1984	Fluoride	0.4	mg/L
GW	NP-5	3/16/1984	Iron	<0.1	mg/L
GW	NP-5	3/16/1984	Manganese	<0.05	mg/L
GW	NP-5	3/16/1984	Mercury	<0.001	mg/L
GW	NP-5	3/16/1984	Molybdenum	<0.05	mg/L
GW	NP-5	3/16/1984	Nitrate as N (NO3)	3	mg/L
GW	NP-5	3/16/1984	Selenium	<0.005	mg/L
GW	NP-5	3/16/1984	Sulfate	130	mg/L
GW	NP-5	3/16/1984	TDS	380	mg/L
GW	NP-5	3/16/1984	pH	8	pH units
GW	NP-1	4/9/1984	Mercury	<0.001	mg/L
GW	GWQ-10	5/30/1984	Cadmium	<0.005	mg/L
GW	GWQ-10	5/30/1984	Chloride	56	mg/L
GW	GWQ-10	5/30/1984	Copper	<0.05	mg/L
GW	GWQ-10	5/30/1984	Cyanide	<0.01	mg/L
GW	GWQ-10	5/30/1984	Fluoride	0.5	mg/L
GW	GWQ-10	5/30/1984	Iron	<0.1	mg/L
GW	GWQ-10	5/30/1984	Manganese	<0.05	mg/L
GW	GWQ-10	5/30/1984	Mercury	<0.001	mg/L
GW	GWQ-10	5/30/1984	Molybdenum	<0.05	mg/L
GW	GWQ-10	5/30/1984	Nitrate as N (NO3)	3.3	mg/L
GW	GWQ-10	5/30/1984	Selenium	<0.005	mg/L
GW	GWQ-10	5/30/1984	Sulfate	161	mg/L
GW	GWQ-10	5/30/1984	TDS	530	mg/L
GW	GWQ-10	5/30/1984	pH	7.5	pH units
GW	GWQ-11	5/30/1984	Cadmium	<0.005	mg/L
GW	GWQ-11	5/30/1984	Chloride	58	mg/L
GW	GWQ-11	5/30/1984	Copper	<0.05	mg/L
GW	GWQ-11	5/30/1984	Cyanide	<0.01	mg/L
GW	GWQ-11	5/30/1984	Fluoride	0.8	mg/L
GW	GWQ-11	5/30/1984	Iron	<0.1	mg/L
GW	GWQ-11	5/30/1984	Manganese	<0.05	mg/L
GW	GWQ-11	5/30/1984	Mercury	<0.001	mg/L
GW	GWQ-11	5/30/1984	Molybdenum	<0.05	mg/L
GW	GWQ-11	5/30/1984	Nitrate as N (NO3)	1.9	mg/L

GW	GWQ-11	5/30/1984	Selenium	<0.005	mg/L
GW	GWQ-11	5/30/1984	Sulfate	195	mg/L
GW	GWQ-11	5/30/1984	TDS	550	mg/L
GW	GWQ-11	5/30/1984	pH	7.5	pH units
GW	GWQ-12	5/30/1984	Cadmium	<0.005	mg/L
GW	GWQ-12	5/30/1984	Chloride	16	mg/L
GW	GWQ-12	5/30/1984	Copper	<0.05	mg/L
GW	GWQ-12	5/30/1984	Cyanide	<0.01	mg/L
GW	GWQ-12	5/30/1984	Fluoride	1	mg/L
GW	GWQ-12	5/30/1984	Iron	<0.1	mg/L
GW	GWQ-12	5/30/1984	Manganese	<0.05	mg/L
GW	GWQ-12	5/30/1984	Mercury	<0.001	mg/L
GW	GWQ-12	5/30/1984	Molybdenum	<0.05	mg/L
GW	GWQ-12	5/30/1984	Nitrate as N (NO3)	2.5	mg/L
GW	GWQ-12	5/30/1984	Selenium	<0.005	mg/L
GW	GWQ-12	5/30/1984	Sulfate	47	mg/L
GW	GWQ-12	5/30/1984	TDS	320	mg/L
GW	GWQ-12	5/30/1984	pH	8	pH units
GW	GWQ-7	5/30/1984	Cadmium	<0.005	mg/L
GW	GWQ-7	5/30/1984	Chloride	20	mg/L
GW	GWQ-7	5/30/1984	Copper	<0.05	mg/L
GW	GWQ-7	5/30/1984	Cyanide	0.02	mg/L
GW	GWQ-7	5/30/1984	Fluoride	0.6	mg/L
GW	GWQ-7	5/30/1984	Iron	<0.1	mg/L
GW	GWQ-7	5/30/1984	Manganese	<0.05	mg/L
GW	GWQ-7	5/30/1984	Mercury	<0.001	mg/L
GW	GWQ-7	5/30/1984	Molybdenum	<0.05	mg/L
GW	GWQ-7	5/30/1984	Nitrate as N (NO3)	0.9	mg/L
GW	GWQ-7	5/30/1984	Selenium	<0.005	mg/L
GW	GWQ-7	5/30/1984	Sulfate	154	mg/L
GW	GWQ-7	5/30/1984	TDS	470	mg/L
GW	GWQ-7	5/30/1984	pH	7.7	pH units
GW	GWQ-9	5/30/1984	Cadmium	<0.005	mg/L
GW	GWQ-9	5/30/1984	Chloride	18	mg/L
GW	GWQ-9	5/30/1984	Copper	<0.05	mg/L
GW	GWQ-9	5/30/1984	Cyanide	<0.01	mg/L
GW	GWQ-9	5/30/1984	Fluoride	0.5	mg/L
GW	GWQ-9	5/30/1984	Iron	<0.1	mg/L
GW	GWQ-9	5/30/1984	Manganese	<0.05	mg/L
GW	GWQ-9	5/30/1984	Mercury	<0.001	mg/L
GW	GWQ-9	5/30/1984	Molybdenum	<0.05	mg/L
GW	GWQ-9	5/30/1984	Nitrate as N (NO3)	0.9	mg/L
GW	GWQ-9	5/30/1984	Selenium	<0.005	mg/L
GW	GWQ-9	5/30/1984	Sulfate	154	mg/L
GW	GWQ-9	5/30/1984	TDS	450	mg/L
GW	GWQ-9	5/30/1984	pH	7.6	pH units
GW	NP-1	5/30/1984	Cadmium	<0.005	mg/L
GW	NP-1	5/30/1984	Chloride	22	mg/L
GW	NP-1	5/30/1984	Copper	<0.05	mg/L
GW	NP-1	5/30/1984	Cyanide	<0.01	mg/L
GW	NP-1	5/30/1984	Fluoride	0.6	mg/L
GW	NP-1	5/30/1984	Iron	<0.1	mg/L
GW	NP-1	5/30/1984	Manganese	<0.05	mg/L
GW	NP-1	5/30/1984	Mercury	<0.001	mg/L
GW	NP-1	5/30/1984	Molybdenum	<0.05	mg/L
GW	NP-1	5/30/1984	Nitrate as N (NO3)	0.7	mg/L
GW	NP-1	5/30/1984	Selenium	<0.005	mg/L
GW	NP-1	5/30/1984	Sulfate	154	mg/L
GW	NP-1	5/30/1984	TDS	510	mg/L
GW	NP-1	5/30/1984	pH	7.5	pH units
GW	NP-2	5/30/1984	Cadmium	<0.005	mg/L
GW	NP-2	5/30/1984	Chloride	32	mg/L
GW	NP-2	5/30/1984	Copper	<0.05	mg/L
GW	NP-2	5/30/1984	Cyanide	<0.01	mg/L
GW	NP-2	5/30/1984	Fluoride	0.6	mg/L
GW	NP-2	5/30/1984	Iron	<0.1	mg/L
GW	NP-2	5/30/1984	Manganese	<0.05	mg/L
GW	NP-2	5/30/1984	Mercury	<0.001	mg/L
GW	NP-2	5/30/1984	Molybdenum	<0.05	mg/L
GW	NP-2	5/30/1984	Nitrate as N (NO3)	1.4	mg/L
GW	NP-2	5/30/1984	Selenium	<0.005	mg/L
GW	NP-2	5/30/1984	Sulfate	175	mg/L
GW	NP-2	5/30/1984	TDS	520	mg/L
GW	NP-2	5/30/1984	pH	7.7	pH units
GW	NP-3	5/30/1984	Cadmium	<0.005	mg/L
GW	NP-3	5/30/1984	Chloride	248	mg/L

GW	NP-3	5/30/1984	Copper	<0.05	mg/L
GW	NP-3	5/30/1984	Cyanide	<0.01	mg/L
GW	NP-3	5/30/1984	Fluoride	0.4	mg/L
GW	NP-3	5/30/1984	Iron	<0.1	mg/L
GW	NP-3	5/30/1984	Manganese	<0.05	mg/L
GW	NP-3	5/30/1984	Mercury	<0.001	mg/L
GW	NP-3	5/30/1984	Molybdenum	<0.05	mg/L
GW	NP-3	5/30/1984	Nitrate as N (NO3)	2.9	mg/L
GW	NP-3	5/30/1984	Selenium	<0.005	mg/L
GW	NP-3	5/30/1984	Sulfate	292	mg/L
GW	NP-3	5/30/1984	TDS	1060	mg/L
GW	NP-3	5/30/1984	pH	7.8	pH units
GW	NP-4	5/30/1984	Cadmium	<0.005	mg/L
GW	NP-4	5/30/1984	Chloride	134	mg/L
GW	NP-4	5/30/1984	Copper	<0.05	mg/L
GW	NP-4	5/30/1984	Cyanide	<0.01	mg/L
GW	NP-4	5/30/1984	Fluoride	0.3	mg/L
GW	NP-4	5/30/1984	Iron	<0.1	mg/L
GW	NP-4	5/30/1984	Manganese	<0.05	mg/L
GW	NP-4	5/30/1984	Mercury	<0.001	mg/L
GW	NP-4	5/30/1984	Molybdenum	<0.05	mg/L
GW	NP-4	5/30/1984	Nitrate as N (NO3)	<0.2	mg/L
GW	NP-4	5/30/1984	Selenium	<0.005	mg/L
GW	NP-4	5/30/1984	Sulfate	320	mg/L
GW	NP-4	5/30/1984	TDS	630	mg/L
GW	NP-4	5/30/1984	pH	8	pH units
GW	NP-5	5/30/1984	Cadmium	<0.005	mg/L
GW	NP-5	5/30/1984	Chloride	22	mg/L
GW	NP-5	5/30/1984	Copper	<0.05	mg/L
GW	NP-5	5/30/1984	Cyanide	<0.01	mg/L
GW	NP-5	5/30/1984	Fluoride	0.8	mg/L
GW	NP-5	5/30/1984	Iron	<0.1	mg/L
GW	NP-5	5/30/1984	Manganese	<0.05	mg/L
GW	NP-5	5/30/1984	Mercury	<0.001	mg/L
GW	NP-5	5/30/1984	Molybdenum	<0.05	mg/L
GW	NP-5	5/30/1984	Nitrate as N (NO3)	2.9	mg/L
GW	NP-5	5/30/1984	Selenium	<0.005	mg/L
GW	NP-5	5/30/1984	Sulfate	139	mg/L
GW	NP-5	5/30/1984	TDS	400	mg/L
GW	NP-5	5/30/1984	pH	7.8	pH units
GW	GWQ-10	9/12/1984	Cadmium	<0.005	mg/L
GW	GWQ-10	9/12/1984	Chloride	68	mg/L
GW	GWQ-10	9/12/1984	Copper	<0.05	mg/L
GW	GWQ-10	9/12/1984	Fluoride	0.5	mg/L
GW	GWQ-10	9/12/1984	Iron	<0.1	mg/L
GW	GWQ-10	9/12/1984	Manganese	<0.05	mg/L
GW	GWQ-10	9/12/1984	Mercury	<0.001	mg/L
GW	GWQ-10	9/12/1984	Molybdenum	<0.05	mg/L
GW	GWQ-10	9/12/1984	Nitrate as N (NO3)	4.2	mg/L
GW	GWQ-10	9/12/1984	Selenium	<0.005	mg/L
GW	GWQ-10	9/12/1984	Sulfate	158	mg/L
GW	GWQ-10	9/12/1984	TDS	580	mg/L
GW	GWQ-10	9/12/1984	pH	7.8	pH units
GW	GWQ-11	9/12/1984	Cadmium	<0.005	mg/L
GW	GWQ-11	9/12/1984	Chloride	60	mg/L
GW	GWQ-11	9/12/1984	Copper	<0.05	mg/L
GW	GWQ-11	9/12/1984	Cyanide	<0.01	mg/L
GW	GWQ-11	9/12/1984	Fluoride	0.8	mg/L
GW	GWQ-11	9/12/1984	Iron	<0.1	mg/L
GW	GWQ-11	9/12/1984	Manganese	<0.05	mg/L
GW	GWQ-11	9/12/1984	Mercury	<0.001	mg/L
GW	GWQ-11	9/12/1984	Molybdenum	<0.05	mg/L
GW	GWQ-11	9/12/1984	Nitrate as N (NO3)	2.3	mg/L
GW	GWQ-11	9/12/1984	Selenium	<0.005	mg/L
GW	GWQ-11	9/12/1984	Sulfate	181	mg/L
GW	GWQ-11	9/12/1984	TDS	590	mg/L
GW	GWQ-11	9/12/1984	pH	7.9	pH units
GW	GWQ-12	9/12/1984	Cadmium	<0.005	mg/L
GW	GWQ-12	9/12/1984	Chloride	16	mg/L
GW	GWQ-12	9/12/1984	Copper	<0.05	mg/L
GW	GWQ-12	9/12/1984	Cyanide	<0.01	mg/L
GW	GWQ-12	9/12/1984	Fluoride	1	mg/L
GW	GWQ-12	9/12/1984	Iron	<0.1	mg/L
GW	GWQ-12	9/12/1984	Manganese	<0.05	mg/L
GW	GWQ-12	9/12/1984	Mercury	<0.001	mg/L
GW	GWQ-12	9/12/1984	Molybdenum	<0.05	mg/L

GW	GWQ-12	9/12/1984	Nitrate as N (NO3)	2.2	mg/L
GW	GWQ-12	9/12/1984	Selenium	<0.005	mg/L
GW	GWQ-12	9/12/1984	Sulfate	38	mg/L
GW	GWQ-12	9/12/1984	TDS	330	mg/L
GW	GWQ-12	9/12/1984	pH	8	pH units
GW	GWQ-7	9/12/1984	Cadmium	<0.005	mg/L
GW	GWQ-7	9/12/1984	Chloride	20	mg/L
GW	GWQ-7	9/12/1984	Copper	<0.05	mg/L
GW	GWQ-7	9/12/1984	Cyanide	<0.01	mg/L
GW	GWQ-7	9/12/1984	Fluoride	0.6	mg/L
GW	GWQ-7	9/12/1984	Iron	<0.1	mg/L
GW	GWQ-7	9/12/1984	Manganese	<0.05	mg/L
GW	GWQ-7	9/12/1984	Mercury	<0.001	mg/L
GW	GWQ-7	9/12/1984	Molybdenum	<0.05	mg/L
GW	GWQ-7	9/12/1984	Nitrate as N (NO3)	1.4	mg/L
GW	GWQ-7	9/12/1984	Selenium	<0.005	mg/L
GW	GWQ-7	9/12/1984	Sulfate	128	mg/L
GW	GWQ-7	9/12/1984	TDS	500	mg/L
GW	GWQ-7	9/12/1984	pH	8	pH units
GW	GWQ-9	9/12/1984	Cadmium	<0.005	mg/L
GW	GWQ-9	9/12/1984	Chloride	20	mg/L
GW	GWQ-9	9/12/1984	Copper	<0.05	mg/L
GW	GWQ-9	9/12/1984	Cyanide	<0.01	mg/L
GW	GWQ-9	9/12/1984	Fluoride	0.5	mg/L
GW	GWQ-9	9/12/1984	Iron	<0.1	mg/L
GW	GWQ-9	9/12/1984	Manganese	<0.05	mg/L
GW	GWQ-9	9/12/1984	Mercury	<0.001	mg/L
GW	GWQ-9	9/12/1984	Molybdenum	<0.05	mg/L
GW	GWQ-9	9/12/1984	Nitrate as N (NO3)	1.3	mg/L
GW	GWQ-9	9/12/1984	Selenium	<0.005	mg/L
GW	GWQ-9	9/12/1984	Sulfate	132	mg/L
GW	GWQ-9	9/12/1984	TDS	470	mg/L
GW	GWQ-9	9/12/1984	pH	8	pH units
GW	NP-1	9/12/1984	Cadmium	<0.005	mg/L
GW	NP-1	9/12/1984	Chloride	22	mg/L
GW	NP-1	9/12/1984	Copper	<0.05	mg/L
GW	NP-1	9/12/1984	Cyanide	<0.01	mg/L
GW	NP-1	9/12/1984	Fluoride	0.6	mg/L
GW	NP-1	9/12/1984	Iron	<0.1	mg/L
GW	NP-1	9/12/1984	Manganese	<0.05	mg/L
GW	NP-1	9/12/1984	Mercury	<0.001	mg/L
GW	NP-1	9/12/1984	Molybdenum	<0.05	mg/L
GW	NP-1	9/12/1984	Nitrate as N (NO3)	1.1	mg/L
GW	NP-1	9/12/1984	Selenium	<0.005	mg/L
GW	NP-1	9/12/1984	Sulfate	137	mg/L
GW	NP-1	9/12/1984	TDS	480	mg/L
GW	NP-1	9/12/1984	pH	7.7	pH units
GW	NP-2	9/12/1984	Cadmium	<0.005	mg/L
GW	NP-2	9/12/1984	Chloride	22	mg/L
GW	NP-2	9/12/1984	Copper	<0.05	mg/L
GW	NP-2	9/12/1984	Cyanide	<0.01	mg/L
GW	NP-2	9/12/1984	Fluoride	0.6	mg/L
GW	NP-2	9/12/1984	Iron	<0.1	mg/L
GW	NP-2	9/12/1984	Manganese	<0.05	mg/L
GW	NP-2	9/12/1984	Mercury	<0.001	mg/L
GW	NP-2	9/12/1984	Molybdenum	<0.05	mg/L
GW	NP-2	9/12/1984	Nitrate as N (NO3)	1.7	mg/L
GW	NP-2	9/12/1984	Selenium	<0.005	mg/L
GW	NP-2	9/12/1984	Sulfate	134	mg/L
GW	NP-2	9/12/1984	TDS	470	mg/L
GW	NP-2	9/12/1984	pH	7.8	pH units
GW	NP-3	9/12/1984	Cadmium	<0.005	mg/L
GW	NP-3	9/12/1984	Chloride	270	mg/L
GW	NP-3	9/12/1984	Copper	<0.05	mg/L
GW	NP-3	9/12/1984	Cyanide	<0.01	mg/L
GW	NP-3	9/12/1984	Fluoride	0.4	mg/L
GW	NP-3	9/12/1984	Iron	<0.1	mg/L
GW	NP-3	9/12/1984	Manganese	<0.05	mg/L
GW	NP-3	9/12/1984	Mercury	<0.001	mg/L
GW	NP-3	9/12/1984	Molybdenum	<0.05	mg/L
GW	NP-3	9/12/1984	Nitrate as N (NO3)	3.1	mg/L
GW	NP-3	9/12/1984	Selenium	<0.005	mg/L
GW	NP-3	9/12/1984	Sulfate	292	mg/L
GW	NP-3	9/12/1984	TDS	1140	mg/L
GW	NP-3	9/12/1984	pH	7.7	pH units
GW	NP-4	9/12/1984	Cadmium	<0.005	mg/L

GW	NP-4	9/12/1984	Chloride	134	mg/L
GW	NP-4	9/12/1984	Copper	<0.05	mg/L
GW	NP-4	9/12/1984	Cyanide	<0.01	mg/L
GW	NP-4	9/12/1984	Fluoride	0.3	mg/L
GW	NP-4	9/12/1984	Iron	<0.1	mg/L
GW	NP-4	9/12/1984	Manganese	<0.05	mg/L
GW	NP-4	9/12/1984	Mercury	<0.001	mg/L
GW	NP-4	9/12/1984	Molybdenum	<0.05	mg/L
GW	NP-4	9/12/1984	Nitrate as N (NO3)	0.9	mg/L
GW	NP-4	9/12/1984	Selenium	<0.005	mg/L
GW	NP-4	9/12/1984	Sulfate	339	mg/L
GW	NP-4	9/12/1984	TDS	760	mg/L
GW	NP-4	9/12/1984	pH	8	pH units
GW	NP-5	9/12/1984	Cadmium	<0.005	mg/L
GW	NP-5	9/12/1984	Chloride	28	mg/L
GW	NP-5	9/12/1984	Copper	<0.05	mg/L
GW	NP-5	9/12/1984	Cyanide	<0.01	mg/L
GW	NP-5	9/12/1984	Fluoride	0.8	mg/L
GW	NP-5	9/12/1984	Iron	<0.1	mg/L
GW	NP-5	9/12/1984	Manganese	<0.05	mg/L
GW	NP-5	9/12/1984	Mercury	<0.001	mg/L
GW	NP-5	9/12/1984	Molybdenum	<0.05	mg/L
GW	NP-5	9/12/1984	Nitrate as N (NO3)	3.4	mg/L
GW	NP-5	9/12/1984	Selenium	<0.005	mg/L
GW	NP-5	9/12/1984	Sulfate	125	mg/L
GW	NP-5	9/12/1984	TDS	420	mg/L
GW	NP-5	9/12/1984	pH	8	pH units
GW	GWQ-10	11/27/1984	Cadmium	<0.005	mg/L
GW	GWQ-10	11/27/1984	Chloride	64	mg/L
GW	GWQ-10	11/27/1984	Copper	<0.05	mg/L
GW	GWQ-10	11/27/1984	Cyanide	<0.01	mg/L
GW	GWQ-10	11/27/1984	Fluoride	0.6	mg/L
GW	GWQ-10	11/27/1984	Iron	<0.1	mg/L
GW	GWQ-10	11/27/1984	Manganese	<0.05	mg/L
GW	GWQ-10	11/27/1984	Mercury	<0.001	mg/L
GW	GWQ-10	11/27/1984	Molybdenum	<0.05	mg/L
GW	GWQ-10	11/27/1984	Nitrate as N (NO3)	4.9	mg/L
GW	GWQ-10	11/27/1984	Selenium	<0.005	mg/L
GW	GWQ-10	11/27/1984	Sulfate	163	mg/L
GW	GWQ-10	11/27/1984	TDS	580	mg/L
GW	GWQ-10	11/27/1984	pH	7.7	pH units
GW	GWQ-11	11/27/1984	Cadmium	<0.005	mg/L
GW	GWQ-11	11/27/1984	Chloride	60	mg/L
GW	GWQ-11	11/27/1984	Copper	<0.05	mg/L
GW	GWQ-11	11/27/1984	Cyanide	<0.01	mg/L
GW	GWQ-11	11/27/1984	Fluoride	0.8	mg/L
GW	GWQ-11	11/27/1984	Iron	<0.1	mg/L
GW	GWQ-11	11/27/1984	Manganese	<0.05	mg/L
GW	GWQ-11	11/27/1984	Mercury	<0.001	mg/L
GW	GWQ-11	11/27/1984	Molybdenum	<0.05	mg/L
GW	GWQ-11	11/27/1984	Nitrate as N (NO3)	2.3	mg/L
GW	GWQ-11	11/27/1984	Selenium	<0.005	mg/L
GW	GWQ-11	11/27/1984	Sulfate	165	mg/L
GW	GWQ-11	11/27/1984	TDS	570	mg/L
GW	GWQ-11	11/27/1984	pH	7.7	pH units
GW	GWQ-12	11/27/1984	Cadmium	<0.005	mg/L
GW	GWQ-12	11/27/1984	Chloride	14	mg/L
GW	GWQ-12	11/27/1984	Copper	<0.05	mg/L
GW	GWQ-12	11/27/1984	Cyanide	<0.01	mg/L
GW	GWQ-12	11/27/1984	Fluoride	1	mg/L
GW	GWQ-12	11/27/1984	Iron	<0.1	mg/L
GW	GWQ-12	11/27/1984	Manganese	<0.05	mg/L
GW	GWQ-12	11/27/1984	Mercury	<0.001	mg/L
GW	GWQ-12	11/27/1984	Molybdenum	<0.05	mg/L
GW	GWQ-12	11/27/1984	Nitrate as N (NO3)	2.3	mg/L
GW	GWQ-12	11/27/1984	Selenium	<0.005	mg/L
GW	GWQ-12	11/27/1984	Sulfate	37	mg/L
GW	GWQ-12	11/27/1984	TDS	340	mg/L
GW	GWQ-12	11/27/1984	pH	7.8	pH units
GW	GWQ-7	11/27/1984	Cadmium	<0.005	mg/L
GW	GWQ-7	11/27/1984	Chloride	18	mg/L
GW	GWQ-7	11/27/1984	Copper	<0.05	mg/L
GW	GWQ-7	11/27/1984	Cyanide	<0.01	mg/L
GW	GWQ-7	11/27/1984	Fluoride	0.6	mg/L
GW	GWQ-7	11/27/1984	Iron	<0.1	mg/L
GW	GWQ-7	11/27/1984	Manganese	<0.05	mg/L

GW	GWQ-7	11/27/1984	Mercury	<0.001	mg/L
GW	GWQ-7	11/27/1984	Molybdenum	<0.05	mg/L
GW	GWQ-7	11/27/1984	Nitrate as N (NO3)	1.4	mg/L
GW	GWQ-7	11/27/1984	Selenium	<0.005	mg/L
GW	GWQ-7	11/27/1984	Sulfate	144	mg/L
GW	GWQ-7	11/27/1984	TDS	490	mg/L
GW	GWQ-7	11/27/1984	pH	7.7	pH units
GW	GWQ-9	11/27/1984	Cadmium	<0.005	mg/L
GW	GWQ-9	11/27/1984	Chloride	16	mg/L
GW	GWQ-9	11/27/1984	Copper	<0.05	mg/L
GW	GWQ-9	11/27/1984	Cyanide	<0.01	mg/L
GW	GWQ-9	11/27/1984	Fluoride	0.5	mg/L
GW	GWQ-9	11/27/1984	Iron	<0.1	mg/L
GW	GWQ-9	11/27/1984	Manganese	<0.05	mg/L
GW	GWQ-9	11/27/1984	Mercury	<0.001	mg/L
GW	GWQ-9	11/27/1984	Molybdenum	<0.05	mg/L
GW	GWQ-9	11/27/1984	Nitrate as N (NO3)	1.5	mg/L
GW	GWQ-9	11/27/1984	Selenium	<0.005	mg/L
GW	GWQ-9	11/27/1984	Sulfate	132	mg/L
GW	GWQ-9	11/27/1984	TDS	470	mg/L
GW	GWQ-9	11/27/1984	pH	7.9	pH units
GW	NP-1	11/27/1984	Cadmium	<0.005	mg/L
GW	NP-1	11/27/1984	Chloride	16	mg/L
GW	NP-1	11/27/1984	Copper	<0.05	mg/L
GW	NP-1	11/27/1984	Cyanide	<0.01	mg/L
GW	NP-1	11/27/1984	Fluoride	0.6	mg/L
GW	NP-1	11/27/1984	Iron	<0.1	mg/L
GW	NP-1	11/27/1984	Manganese	<0.05	mg/L
GW	NP-1	11/27/1984	Mercury	<0.001	mg/L
GW	NP-1	11/27/1984	Molybdenum	<0.05	mg/L
GW	NP-1	11/27/1984	Nitrate as N (NO3)	1.1	mg/L
GW	NP-1	11/27/1984	Selenium	<0.005	mg/L
GW	NP-1	11/27/1984	Sulfate	144	mg/L
GW	NP-1	11/27/1984	TDS	480	mg/L
GW	NP-1	11/27/1984	pH	7.8	pH units
GW	NP-2	11/27/1984	Cadmium	<0.005	mg/L
GW	NP-2	11/27/1984	Chloride	20	mg/L
GW	NP-2	11/27/1984	Copper	<0.05	mg/L
GW	NP-2	11/27/1984	Cyanide	<0.01	mg/L
GW	NP-2	11/27/1984	Fluoride	0.6	mg/L
GW	NP-2	11/27/1984	Iron	<0.1	mg/L
GW	NP-2	11/27/1984	Manganese	<0.05	mg/L
GW	NP-2	11/27/1984	Mercury	<0.001	mg/L
GW	NP-2	11/27/1984	Molybdenum	<0.05	mg/L
GW	NP-2	11/27/1984	Nitrate as N (NO3)	1.7	mg/L
GW	NP-2	11/27/1984	Selenium	<0.005	mg/L
GW	NP-2	11/27/1984	Sulfate	125	mg/L
GW	NP-2	11/27/1984	TDS	470	mg/L
GW	NP-2	11/27/1984	pH	7.9	pH units
GW	NP-3	11/27/1984	Cadmium	<0.005	mg/L
GW	NP-3	11/27/1984	Chloride	290	mg/L
GW	NP-3	11/27/1984	Copper	<0.05	mg/L
GW	NP-3	11/27/1984	Cyanide	<0.01	mg/L
GW	NP-3	11/27/1984	Fluoride	0.4	mg/L
GW	NP-3	11/27/1984	Iron	<0.1	mg/L
GW	NP-3	11/27/1984	Manganese	<0.05	mg/L
GW	NP-3	11/27/1984	Mercury	<0.001	mg/L
GW	NP-3	11/27/1984	Molybdenum	<0.05	mg/L
GW	NP-3	11/27/1984	Nitrate as N (NO3)	3.5	mg/L
GW	NP-3	11/27/1984	Selenium	<0.005	mg/L
GW	NP-3	11/27/1984	Sulfate	348	mg/L
GW	NP-3	11/27/1984	TDS	1150	mg/L
GW	NP-3	11/27/1984	pH	7.8	pH units
GW	NP-4	11/27/1984	Cadmium	<0.005	mg/L
GW	NP-4	11/27/1984	Chloride	140	mg/L
GW	NP-4	11/27/1984	Copper	<0.05	mg/L
GW	NP-4	11/27/1984	Cyanide	<0.01	mg/L
GW	NP-4	11/27/1984	Fluoride	0.3	mg/L
GW	NP-4	11/27/1984	Iron	<0.1	mg/L
GW	NP-4	11/27/1984	Manganese	<0.05	mg/L
GW	NP-4	11/27/1984	Mercury	<0.001	mg/L
GW	NP-4	11/27/1984	Molybdenum	<0.05	mg/L
GW	NP-4	11/27/1984	Nitrate as N (NO3)	0.2	mg/L
GW	NP-4	11/27/1984	Selenium	<0.005	mg/L
GW	NP-4	11/27/1984	Sulfate	354	mg/L
GW	NP-4	11/27/1984	TDS	740	mg/L

GW	NP-4	11/27/1984	pH	8.5	pH units
GW	NP-5	11/27/1984	Cadmium	<0.005	mg/L
GW	NP-5	11/27/1984	Chloride	28	mg/L
GW	NP-5	11/27/1984	Copper	<0.05	mg/L
GW	NP-5	11/27/1984	Cyanide	<0.01	mg/L
GW	NP-5	11/27/1984	Fluoride	0.8	mg/L
GW	NP-5	11/27/1984	Iron	<0.1	mg/L
GW	NP-5	11/27/1984	Manganese	<0.05	mg/L
GW	NP-5	11/27/1984	Mercury	<0.001	mg/L
GW	NP-5	11/27/1984	Molybdenum	<0.05	mg/L
GW	NP-5	11/27/1984	Nitrate as N (NO3)	3.2	mg/L
GW	NP-5	11/27/1984	Selenium	<0.005	mg/L
GW	NP-5	11/27/1984	Sulfate	120	mg/L
GW	NP-5	11/27/1984	TDS	420	mg/L
GW	NP-5	11/27/1984	pH	8.2	pH units
GW	PW-2	11/27/1984	Cadmium	<0.005	mg/L
GW	PW-2	11/27/1984	Chloride	20	mg/L
GW	PW-2	11/27/1984	Copper	<0.05	mg/L
GW	PW-2	11/27/1984	Cyanide	<0.01	mg/L
GW	PW-2	11/27/1984	Fluoride	0.6	mg/L
GW	PW-2	11/27/1984	Iron	<0.1	mg/L
GW	PW-2	11/27/1984	Manganese	<0.05	mg/L
GW	PW-2	11/27/1984	Mercury	<0.001	mg/L
GW	PW-2	11/27/1984	Nitrate as N (NO3)	1.7	mg/L
GW	PW-2	11/27/1984	Selenium	<0.005	mg/L
GW	PW-2	11/27/1984	Sulfate	125	mg/L
GW	PW-2	11/27/1984	TDS	470	mg/L
GW	PW-2	11/27/1984	pH	7.9	pH units
GW	GWQ-10	5/17/1985	Chloride	52	mg/L
GW	GWQ-10	5/17/1985	Sulfate	163	mg/L
GW	GWQ-10	5/17/1985	TDS	570	mg/L
GW	GWQ-10	5/17/1985	pH	7.8	pH units
GW	GWQ-11	5/17/1985	Chloride	64	mg/L
GW	GWQ-11	5/17/1985	Sulfate	197	mg/L
GW	GWQ-11	5/17/1985	TDS	640	mg/L
GW	GWQ-11	5/17/1985	pH	7.8	pH units
GW	GWQ-7	5/17/1985	Chloride	20	mg/L
GW	GWQ-7	5/17/1985	Sulfate	144	mg/L
GW	GWQ-7	5/17/1985	TDS	500	mg/L
GW	GWQ-7	5/17/1985	pH	7.9	pH units
GW	GWQ-9	5/17/1985	Chloride	20	mg/L
GW	GWQ-9	5/17/1985	Sulfate	149	mg/L
GW	GWQ-9	5/17/1985	TDS	490	mg/L
GW	GWQ-9	5/17/1985	pH	8	pH units
GW	NP-1	5/17/1985	Chloride	20	mg/L
GW	NP-1	5/17/1985	Sulfate	144	mg/L
GW	NP-1	5/17/1985	TDS	510	mg/L
GW	NP-1	5/17/1985	pH	7.6	pH units
GW	NP-2	5/17/1985	Chloride	22	mg/L
GW	NP-2	5/17/1985	Sulfate	120	mg/L
GW	NP-2	5/17/1985	TDS	480	mg/L
GW	NP-2	5/17/1985	pH	7.8	pH units
GW	NP-3	5/17/1985	Chloride	310	mg/L
GW	NP-3	5/17/1985	Sulfate	453	mg/L
GW	NP-3	5/17/1985	TDS	1470	mg/L
GW	NP-3	5/17/1985	pH	7.7	pH units
GW	NP-4	5/17/1985	Chloride	146	mg/L
GW	NP-4	5/17/1985	Sulfate	348	mg/L
GW	NP-4	5/17/1985	TDS	770	mg/L
GW	NP-4	5/17/1985	pH	8.2	pH units
GW	NP-5	5/17/1985	Chloride	28	mg/L
GW	NP-5	5/17/1985	Sulfate	130	mg/L
GW	NP-5	5/17/1985	TDS	450	mg/L
GW	NP-5	5/17/1985	pH	7.9	pH units
GW	GWQ-12	5/27/1985	Chloride	14	mg/L
GW	GWQ-12	5/27/1985	Sulfate	36	mg/L
GW	GWQ-12	5/27/1985	TDS	370	mg/L
GW	GWQ-12	5/27/1985	pH	8	pH units
GW	GWQ-10	11/13/1985	Chloride	42	mg/L
GW	GWQ-10	11/13/1985	Sulfate	149	mg/L
GW	GWQ-10	11/13/1985	TDS	500	mg/L
GW	GWQ-10	11/13/1985	pH	7.7	pH units
GW	GWQ-11	11/13/1985	Chloride	62	mg/L
GW	GWQ-11	11/13/1985	Sulfate	183	mg/L
GW	GWQ-11	11/13/1985	TDS	600	mg/L
GW	GWQ-11	11/13/1985	pH	7.7	pH units

GW	GWQ-12	11/13/1985	Chloride	14	mg/L
GW	GWQ-12	11/13/1985	Sulfate	35	mg/L
GW	GWQ-12	11/13/1985	TDS	310	mg/L
GW	GWQ-12	11/13/1985	pH	7.8	pH units
GW	GWQ-7	11/13/1985	Chloride	18	mg/L
GW	GWQ-7	11/13/1985	Sulfate	137	mg/L
GW	GWQ-7	11/13/1985	TDS	450	mg/L
GW	GWQ-7	11/13/1985	pH	7.8	pH units
GW	GWQ-9	11/13/1985	Chloride	20	mg/L
GW	GWQ-9	11/13/1985	Sulfate	142	mg/L
GW	GWQ-9	11/13/1985	TDS	450	mg/L
GW	GWQ-9	11/13/1985	pH	7.8	pH units
GW	NP-1	11/13/1985	Chloride	16	mg/L
GW	NP-1	11/13/1985	Sulfate	149	mg/L
GW	NP-1	11/13/1985	TDS	480	mg/L
GW	NP-1	11/13/1985	pH	7.3	pH units
GW	NP-2	11/13/1985	Chloride	22	mg/L
GW	NP-2	11/13/1985	Sulfate	115	mg/L
GW	NP-2	11/13/1985	TDS	460	mg/L
GW	NP-2	11/13/1985	pH	7.4	pH units
GW	NP-3	11/13/1985	Chloride	288	mg/L
GW	NP-3	11/13/1985	Sulfate	541	mg/L
GW	NP-3	11/13/1985	TDS	1520	mg/L
GW	NP-3	11/13/1985	pH	7.2	pH units
GW	NP-4	11/13/1985	Chloride	142	mg/L
GW	NP-4	11/13/1985	Sulfate	292	mg/L
GW	NP-4	11/13/1985	TDS	690	mg/L
GW	NP-4	11/13/1985	pH	8	pH units
GW	NP-5	11/13/1985	Chloride	24	mg/L
GW	NP-5	11/13/1985	Sulfate	134	mg/L
GW	NP-5	11/13/1985	TDS	400	mg/L
GW	NP-5	11/13/1985	pH	7.8	pH units
GW	GWQ-10	5/23/1986	Chloride	58	mg/L
GW	GWQ-10	5/23/1986	Sulfate	151	mg/L
GW	GWQ-10	5/23/1986	TDS	560	mg/L
GW	GWQ-10	5/23/1986	pH	7.9	pH units
GW	GWQ-11	5/23/1986	Chloride	66	mg/L
GW	GWQ-11	5/23/1986	Sulfate	210	mg/L
GW	GWQ-11	5/23/1986	TDS	650	mg/L
GW	GWQ-11	5/23/1986	pH	7.8	pH units
GW	GWQ-12	5/23/1986	Chloride	16	mg/L
GW	GWQ-12	5/23/1986	Sulfate	31	mg/L
GW	GWQ-12	5/23/1986	TDS	330	mg/L
GW	GWQ-12	5/23/1986	pH	7.8	pH units
GW	GWQ-7	5/23/1986	Chloride	22	mg/L
GW	GWQ-7	5/23/1986	Sulfate	142	mg/L
GW	GWQ-7	5/23/1986	TDS	490	mg/L
GW	GWQ-7	5/23/1986	pH	7.9	pH units
GW	GWQ-9	5/23/1986	Chloride	36	mg/L
GW	GWQ-9	5/23/1986	Sulfate	137	mg/L
GW	GWQ-9	5/23/1986	TDS	490	mg/L
GW	GWQ-9	5/23/1986	pH	7.9	pH units
GW	NP-1	5/23/1986	Chloride	18	mg/L
GW	NP-1	5/23/1986	Sulfate	142	mg/L
GW	NP-1	5/23/1986	TDS	500	mg/L
GW	NP-1	5/23/1986	pH	7.6	pH units
GW	NP-2	5/23/1986	Chloride	28	mg/L
GW	NP-2	5/23/1986	Sulfate	113	mg/L
GW	NP-2	5/23/1986	TDS	480	mg/L
GW	NP-2	5/23/1986	pH	7.6	pH units
GW	NP-3	5/23/1986	Chloride	282	mg/L
GW	NP-3	5/23/1986	Sulfate	624	mg/L
GW	NP-3	5/23/1986	TDS	1590	mg/L
GW	NP-3	5/23/1986	pH	7.5	pH units
GW	NP-4	5/23/1986	Chloride	136	mg/L
GW	NP-4	5/23/1986	Sulfate	300	mg/L
GW	NP-4	5/23/1986	TDS	690	mg/L
GW	NP-4	5/23/1986	pH	8	pH units
GW	NP-5	5/23/1986	Chloride	28	mg/L
GW	NP-5	5/23/1986	Sulfate	120	mg/L
GW	NP-5	5/23/1986	TDS	430	mg/L
GW	NP-5	5/23/1986	pH	7.9	pH units
GW	GWQ-10	10/8/1986	Chloride	54	mg/L
GW	GWQ-10	10/8/1986	Sulfate	137	mg/L
GW	GWQ-10	10/8/1986	TDS	550	mg/L
GW	GWQ-10	10/8/1986	pH	7.5	pH units

GW	GWQ-11	10/8/1986	Chloride	70	mg/L
GW	GWQ-11	10/8/1986	Sulfate	200	mg/L
GW	GWQ-11	10/8/1986	TDS	560	mg/L
GW	GWQ-11	10/8/1986	pH	7.6	pH units
GW	GWQ-12	10/8/1986	Chloride	16	mg/L
GW	GWQ-12	10/8/1986	Sulfate	35	mg/L
GW	GWQ-12	10/8/1986	TDS	310	mg/L
GW	GWQ-12	10/8/1986	pH	7.6	pH units
GW	GWQ-7	10/8/1986	Chloride	22	mg/L
GW	GWQ-7	10/8/1986	Sulfate	116	mg/L
GW	GWQ-7	10/8/1986	TDS	460	mg/L
GW	GWQ-7	10/8/1986	pH	7.4	pH units
GW	GWQ-9	10/8/1986	Chloride	20	mg/L
GW	GWQ-9	10/8/1986	Sulfate	125	mg/L
GW	GWQ-9	10/8/1986	TDS	460	mg/L
GW	GWQ-9	10/8/1986	pH	7.6	pH units
GW	NP-1	10/8/1986	Chloride	22	mg/L
GW	NP-1	10/8/1986	Sulfate	107	mg/L
GW	NP-1	10/8/1986	TDS	470	mg/L
GW	NP-1	10/8/1986	pH	7.4	pH units
GW	NP-2	10/8/1986	Chloride	24	mg/L
GW	NP-2	10/8/1986	Sulfate	100	mg/L
GW	NP-2	10/8/1986	TDS	430	mg/L
GW	NP-2	10/8/1986	pH	7.4	pH units
GW	NP-3	10/8/1986	Chloride	272	mg/L
GW	NP-3	10/8/1986	Sulfate	620	mg/L
GW	NP-3	10/8/1986	TDS	1710	mg/L
GW	NP-3	10/8/1986	pH	7.4	pH units
GW	NP-4	10/8/1986	Chloride	134	mg/L
GW	NP-4	10/8/1986	Sulfate	290	mg/L
GW	NP-4	10/8/1986	TDS	660	mg/L
GW	NP-4	10/8/1986	pH	7.8	pH units
GW	NP-5	10/8/1986	Chloride	28	mg/L
GW	NP-5	10/8/1986	Sulfate	113	mg/L
GW	NP-5	10/8/1986	TDS	420	mg/L
GW	NP-5	10/8/1986	pH	7.8	pH units
GW	NP-3	3/3/1987	Sulfate	695	mg/L
GW	GWQ-10	3/4/1987	Aluminum	<0.1	mg/L
GW	GWQ-10	3/4/1987	Barium	<0.1	mg/L
GW	GWQ-10	3/4/1987	Boron	<0.1	mg/L
GW	GWQ-10	3/4/1987	Cadmium	<0.1	mg/L
GW	GWQ-10	3/4/1987	Chloride	59	mg/L
GW	GWQ-10	3/4/1987	Chromium	<0.1	mg/L
GW	GWQ-10	3/4/1987	Cobalt	<0.05	mg/L
GW	GWQ-10	3/4/1987	Copper	<0.1	mg/L
GW	GWQ-10	3/4/1987	Iron	<0.1	mg/L
GW	GWQ-10	3/4/1987	Lead	<0.1	mg/L
GW	GWQ-10	3/4/1987	Manganese	<0.05	mg/L
GW	GWQ-10	3/4/1987	Molybdenum	<0.1	mg/L
GW	GWQ-10	3/4/1987	Nickel	<0.1	mg/L
GW	GWQ-10	3/4/1987	Silver	<0.1	mg/L
GW	GWQ-10	3/4/1987	Sulfate	150	mg/L
GW	GWQ-10	3/4/1987	TDS	568	mg/L
GW	GWQ-10	3/4/1987	Zinc	<0.1	mg/L
GW	GWQ-10	3/4/1987	Conductivity	740	µmhos/cm
GW	GWQ-10	3/4/1987	Antimony	0.9	mg/L
GW	GWQ-10	3/4/1987	Beryllium	<0.1	mg/L
GW	GWQ-10	3/4/1987	Calcium	90	mg/L
GW	GWQ-10	3/4/1987	Magnesium	20.7	mg/L
GW	GWQ-10	3/4/1987	Sodium	73.6	mg/L
GW	GWQ-10	3/4/1987	Bicarbonate	256	mg/L CaCO3
GW	GWQ-10	3/4/1987	Potassium	2.34	mg/L
GW	GWQ-11	3/4/1987	Aluminum	<0.1	mg/L
GW	GWQ-11	3/4/1987	Barium	<0.1	mg/L
GW	GWQ-11	3/4/1987	Boron	<0.1	mg/L
GW	GWQ-11	3/4/1987	Cadmium	<0.1	mg/L
GW	GWQ-11	3/4/1987	Chloride	69	mg/L
GW	GWQ-11	3/4/1987	Chromium	<0.1	mg/L
GW	GWQ-11	3/4/1987	Cobalt	<0.05	mg/L
GW	GWQ-11	3/4/1987	Copper	<0.1	mg/L
GW	GWQ-11	3/4/1987	Iron	<0.1	mg/L
GW	GWQ-11	3/4/1987	Lead	<0.1	mg/L
GW	GWQ-11	3/4/1987	Manganese	<0.05	mg/L
GW	GWQ-11	3/4/1987	Molybdenum	<0.1	mg/L
GW	GWQ-11	3/4/1987	Nickel	<0.1	mg/L
GW	GWQ-11	3/4/1987	Silver	<0.1	mg/L

GW	GWQ-11	3/4/1987	Sulfate	200	mg/L
GW	GWQ-11	3/4/1987	TDS	696	mg/L
GW	GWQ-11	3/4/1987	Zinc	<0.1	mg/L
GW	GWQ-11	3/4/1987	pH	6.7	pH units
GW	GWQ-11	3/4/1987	Conductivity	820	µmhos/cm
GW	GWQ-11	3/4/1987	Antimony	1.1	mg/L
GW	GWQ-11	3/4/1987	Beryllium	<0.1	mg/L
GW	GWQ-11	3/4/1987	Calcium	108	mg/L
GW	GWQ-11	3/4/1987	Magnesium	26.1	mg/L
GW	GWQ-11	3/4/1987	Sodium	62.1	mg/L
GW	GWQ-11	3/4/1987	Bicarbonate	220	mg/L CaCO3
GW	GWQ-11	3/4/1987	Potassium	3.51	mg/L
GW	IW-1	3/4/1987	Chloride	575	mg/L
GW	IW-1	3/4/1987	Sulfate	1901	mg/L
GW	IW-1	3/4/1987	TDS	3802	mg/L
GW	IW-1	3/4/1987	pH	6.6	pH units
GW	IW-1	3/4/1987	Conductivity	3950	µmhos/cm
GW	IW-1	3/4/1987	Calcium	564	mg/L
GW	IW-1	3/4/1987	Sodium	273.7	mg/L
GW	IW-1	3/4/1987	Bicarbonate	193	mg/L CaCO3
GW	IW-1	3/4/1987	Potassium	3.12	mg/L
GW	NP-3	3/4/1987	Chloride	283	mg/L
GW	NP-3	3/4/1987	Sulfate	695	mg/L
GW	NP-3	3/4/1987	TDS	1882	mg/L
GW	NP-3	3/4/1987	pH	6.8	pH units
GW	NP-3	3/4/1987	Conductivity	1850	µmhos/cm
GW	NP-3	3/4/1987	Calcium	320	mg/L
GW	NP-3	3/4/1987	Magnesium	67.1	mg/L
GW	NP-3	3/4/1987	Sodium	117.3	mg/L
GW	NP-3	3/4/1987	Bicarbonate	188	mg/L CaCO3
GW	NP-3	3/4/1987	Potassium	4.29	mg/L
GW	GWQ-10	5/25/1987	Sulfate	154.2	mg/L
GW	GWQ-11	5/25/1987	Sulfate	230	mg/L
GW	NP-3	5/25/1987	Sulfate	735.5	mg/L
GW	NP-4	5/25/1987	Sulfate	278.5	mg/L
GW	GWQ-10	1/12/1988	Aluminum	<0.1	mg/L
GW	GWQ-10	1/12/1988	Barium	<0.1	mg/L
GW	GWQ-10	1/12/1988	Boron	<0.1	mg/L
GW	GWQ-10	1/12/1988	Cadmium	<0.1	mg/L
GW	GWQ-10	1/12/1988	Chloride	78.8	mg/L
GW	GWQ-10	1/12/1988	Chromium	<0.1	mg/L
GW	GWQ-10	1/12/1988	Cobalt	<0.05	mg/L
GW	GWQ-10	1/12/1988	Copper	<0.1	mg/L
GW	GWQ-10	1/12/1988	Iron	<0.1	mg/L
GW	GWQ-10	1/12/1988	Lead	<0.1	mg/L
GW	GWQ-10	1/12/1988	Manganese	<0.05	mg/L
GW	GWQ-10	1/12/1988	Molybdenum	<0.1	mg/L
GW	GWQ-10	1/12/1988	Nickel	<0.1	mg/L
GW	GWQ-10	1/12/1988	Silver	<0.1	mg/L
GW	GWQ-10	1/12/1988	Sulfate	173	mg/L
GW	GWQ-10	1/12/1988	TDS	648	mg/L
GW	GWQ-10	1/12/1988	Zinc	<0.1	mg/L
GW	GWQ-10	1/12/1988	Beryllium	<0.1	mg/L
GW	GWQ-10	1/12/1988	Calcium	116	mg/L
GW	GWQ-10	1/12/1988	Magnesium	24	mg/L
GW	GWQ-10	1/12/1988	Sodium	64	mg/L
GW	GWQ-10	1/12/1988	Bicarbonate	243	mg/L CaCO3
GW	GWQ-10	1/12/1988	Potassium	3	mg/L
GW	GWQ-11	1/12/1988	Aluminum	<0.1	mg/L
GW	GWQ-11	1/12/1988	Barium	<0.1	mg/L
GW	GWQ-11	1/12/1988	Boron	<0.1	mg/L
GW	GWQ-11	1/12/1988	Cadmium	<0.1	mg/L
GW	GWQ-11	1/12/1988	Chloride	77.1	mg/L
GW	GWQ-11	1/12/1988	Chromium	<0.1	mg/L
GW	GWQ-11	1/12/1988	Cobalt	<0.05	mg/L
GW	GWQ-11	1/12/1988	Copper	<0.1	mg/L
GW	GWQ-11	1/12/1988	Iron	<0.1	mg/L
GW	GWQ-11	1/12/1988	Lead	<0.1	mg/L
GW	GWQ-11	1/12/1988	Manganese	<0.05	mg/L
GW	GWQ-11	1/12/1988	Molybdenum	<0.1	mg/L
GW	GWQ-11	1/12/1988	Nickel	<0.1	mg/L
GW	GWQ-11	1/12/1988	Silver	<0.1	mg/L
GW	GWQ-11	1/12/1988	Sulfate	253	mg/L
GW	GWQ-11	1/12/1988	TDS	718	mg/L
GW	GWQ-11	1/12/1988	Zinc	<0.1	mg/L
GW	GWQ-11	1/12/1988	Beryllium	<0.1	mg/L

GW	GWQ-11	1/12/1988	Calcium	128	mg/L
GW	GWQ-11	1/12/1988	Magnesium	31	mg/L
GW	GWQ-11	1/12/1988	Sodium	63	mg/L
GW	GWQ-11	1/12/1988	Bicarbonate	214	mg/L CaCO3
GW	GWQ-11	1/12/1988	Potassium	4	mg/L
GW	NP-3	1/12/1988	Aluminum	<0.1	mg/L
GW	NP-3	1/12/1988	Barium	<0.1	mg/L
GW	NP-3	1/12/1988	Boron	<0.1	mg/L
GW	NP-3	1/12/1988	Cadmium	<0.1	mg/L
GW	NP-3	1/12/1988	Chloride	359	mg/L
GW	NP-3	1/12/1988	Chromium	<0.1	mg/L
GW	NP-3	1/12/1988	Cobalt	<0.05	mg/L
GW	NP-3	1/12/1988	Copper	<0.1	mg/L
GW	NP-3	1/12/1988	Iron	<0.1	mg/L
GW	NP-3	1/12/1988	Lead	<0.1	mg/L
GW	NP-3	1/12/1988	Manganese	0.57	mg/L
GW	NP-3	1/12/1988	Molybdenum	<0.1	mg/L
GW	NP-3	1/12/1988	Nickel	<0.1	mg/L
GW	NP-3	1/12/1988	Silver	<0.1	mg/L
GW	NP-3	1/12/1988	Sulfate	755	mg/L
GW	NP-3	1/12/1988	TDS	1584	mg/L
GW	NP-3	1/12/1988	Zinc	1.1	mg/L
GW	NP-3	1/12/1988	Beryllium	<0.1	mg/L
GW	NP-3	1/12/1988	Calcium	268	mg/L
GW	NP-3	1/12/1988	Magnesium	57	mg/L
GW	NP-3	1/12/1988	Sodium	142	mg/L
GW	NP-3	1/12/1988	Bicarbonate	30	mg/L CaCO3
GW	NP-3	1/12/1988	Potassium	38	mg/L
GW	NP-4	1/12/1988	Aluminum	<0.1	mg/L
GW	NP-4	1/12/1988	Barium	<0.1	mg/L
GW	NP-4	1/12/1988	Boron	<0.1	mg/L
GW	NP-4	1/12/1988	Cadmium	<0.1	mg/L
GW	NP-4	1/12/1988	Chloride	137	mg/L
GW	NP-4	1/12/1988	Chromium	<0.1	mg/L
GW	NP-4	1/12/1988	Cobalt	<0.05	mg/L
GW	NP-4	1/12/1988	Copper	<0.1	mg/L
GW	NP-4	1/12/1988	Iron	<0.1	mg/L
GW	NP-4	1/12/1988	Lead	<0.1	mg/L
GW	NP-4	1/12/1988	Manganese	0.06	mg/L
GW	NP-4	1/12/1988	Molybdenum	<0.1	mg/L
GW	NP-4	1/12/1988	Nickel	<0.1	mg/L
GW	NP-4	1/12/1988	Silver	<0.1	mg/L
GW	NP-4	1/12/1988	Sulfate	256	mg/L
GW	NP-4	1/12/1988	TDS	612	mg/L
GW	NP-4	1/12/1988	Zinc	0.1	mg/L
GW	NP-4	1/12/1988	Beryllium	<0.1	mg/L
GW	NP-4	1/12/1988	Calcium	76	mg/L
GW	NP-4	1/12/1988	Magnesium	21	mg/L
GW	NP-4	1/12/1988	Sodium	86	mg/L
GW	NP-4	1/12/1988	Bicarbonate	24.4	mg/L CaCO3
GW	NP-4	1/12/1988	Potassium	5	mg/L
GW	GWQ-10	4/4/1988	Chloride	65	mg/L
GW	GWQ-10	4/4/1988	Sulfate	170.6	mg/L
GW	GWQ-10	4/4/1988	TDS	552	mg/L
GW	GWQ-11	4/4/1988	Chloride	74.6	mg/L
GW	GWQ-11	4/4/1988	Sulfate	277.7	mg/L
GW	GWQ-11	4/4/1988	TDS	694	mg/L
GW	NP-3	4/4/1988	Chloride	254	mg/L
GW	NP-3	4/4/1988	Sulfate	587	mg/L
GW	NP-3	4/4/1988	TDS	1772	mg/L
GW	NP-4	4/4/1988	Chloride	130.4	mg/L
GW	NP-4	4/4/1988	Sulfate	328.8	mg/L
GW	NP-4	4/4/1988	TDS	610	mg/L
GW	GWQ-10	8/23/1988	Chloride	63	mg/L
GW	GWQ-10	8/23/1988	Sulfate	179.2	mg/L
GW	GWQ-10	8/23/1988	TDS	692	mg/L
GW	GWQ-11	8/23/1988	Chloride	73	mg/L
GW	GWQ-11	8/23/1988	Sulfate	293.8	mg/L
GW	GWQ-11	8/23/1988	TDS	772	mg/L
GW	NP-3	8/23/1988	Chloride	251.4	mg/L
GW	NP-3	8/23/1988	Sulfate	835.2	mg/L
GW	NP-3	8/23/1988	TDS	1744	mg/L
GW	NP-4	8/23/1988	Chloride	132.1	mg/L
GW	NP-4	8/23/1988	Sulfate	292.2	mg/L
GW	NP-4	8/23/1988	TDS	688	mg/L
GW	GWQ-10	2/9/1989	Chloride	76.3	mg/L

GW	GWQ-10	2/9/1989	Sulfate	180.5	mg/L
GW	GWQ-10	2/9/1989	TDS	618	mg/L
GW	GWQ-11	2/9/1989	Chloride	77	mg/L
GW	GWQ-11	2/9/1989	Sulfate	258.4	mg/L
GW	GWQ-11	2/9/1989	TDS	730	mg/L
GW	NP-3	2/9/1989	Chloride	254.3	mg/L
GW	NP-3	2/9/1989	Sulfate	763.4	mg/L
GW	NP-3	2/9/1989	TDS	1583	mg/L
GW	NP-4	2/9/1989	Chloride	130	mg/L
GW	NP-4	2/9/1989	Sulfate	266.8	mg/L
GW	NP-4	2/9/1989	TDS	604	mg/L
GW	GWQ-1	3/30/1989	Aluminum	<0.1	mg/L
GW	GWQ-1	3/30/1989	Barium	<0.1	mg/L
GW	GWQ-1	3/30/1989	Boron	<0.1	mg/L
GW	GWQ-1	3/30/1989	Cadmium	<0.1	mg/L
GW	GWQ-1	3/30/1989	Chloride	20	mg/L
GW	GWQ-1	3/30/1989	Chromium	<0.1	mg/L
GW	GWQ-1	3/30/1989	Cobalt	<0.05	mg/L
GW	GWQ-1	3/30/1989	Copper	<0.1	mg/L
GW	GWQ-1	3/30/1989	Iron	<0.1	mg/L
GW	GWQ-1	3/30/1989	Lead	<0.1	mg/L
GW	GWQ-1	3/30/1989	Manganese	<0.05	mg/L
GW	GWQ-1	3/30/1989	Molybdenum	<0.1	mg/L
GW	GWQ-1	3/30/1989	Nickel	<0.1	mg/L
GW	GWQ-1	3/30/1989	Silver	<0.1	mg/L
GW	GWQ-1	3/30/1989	Sulfate	133	mg/L
GW	GWQ-1	3/30/1989	TDS	512	mg/L
GW	GWQ-1	3/30/1989	Zinc	<0.1	mg/L
GW	GWQ-1	3/30/1989	Beryllium	<0.1	mg/L
GW	GWQ-1	3/30/1989	Calcium	84	mg/L
GW	GWQ-1	3/30/1989	Magnesium	16	mg/L
GW	GWQ-1	3/30/1989	Sodium	61	mg/L
GW	GWQ-1	3/30/1989	Bicarbonate	280	mg/L CaCO3
GW	GWQ-1	3/30/1989	Potassium	3	mg/L
GW	GWQ-7	3/30/1989	Aluminum	<0.1	mg/L
GW	GWQ-7	3/30/1989	Barium	<0.1	mg/L
GW	GWQ-7	3/30/1989	Boron	<0.1	mg/L
GW	GWQ-7	3/30/1989	Cadmium	<0.1	mg/L
GW	GWQ-7	3/30/1989	Chloride	15.9	mg/L
GW	GWQ-7	3/30/1989	Chromium	<0.1	mg/L
GW	GWQ-7	3/30/1989	Cobalt	<0.05	mg/L
GW	GWQ-7	3/30/1989	Copper	<0.1	mg/L
GW	GWQ-7	3/30/1989	Iron	<0.1	mg/L
GW	GWQ-7	3/30/1989	Lead	<0.1	mg/L
GW	GWQ-7	3/30/1989	Manganese	<0.05	mg/L
GW	GWQ-7	3/30/1989	Molybdenum	<0.1	mg/L
GW	GWQ-7	3/30/1989	Nickel	<0.1	mg/L
GW	GWQ-7	3/30/1989	Silver	<0.1	mg/L
GW	GWQ-7	3/30/1989	Sulfate	131	mg/L
GW	GWQ-7	3/30/1989	TDS	492	mg/L
GW	GWQ-7	3/30/1989	Zinc	0.1	mg/L
GW	GWQ-7	3/30/1989	Beryllium	<0.1	mg/L
GW	GWQ-7	3/30/1989	Calcium	80	mg/L
GW	GWQ-7	3/30/1989	Magnesium	22	mg/L
GW	GWQ-7	3/30/1989	Sodium	47	mg/L
GW	GWQ-7	3/30/1989	Bicarbonate	278	mg/L CaCO3
GW	GWQ-7	3/30/1989	Potassium	2	mg/L
GW	NP-1	3/30/1989	Aluminum	<0.1	mg/L
GW	NP-1	3/30/1989	Barium	<0.1	mg/L
GW	NP-1	3/30/1989	Boron	<0.1	mg/L
GW	NP-1	3/30/1989	Cadmium	<0.1	mg/L
GW	NP-1	3/30/1989	Chloride	14.9	mg/L
GW	NP-1	3/30/1989	Chromium	<0.1	mg/L
GW	NP-1	3/30/1989	Cobalt	<0.05	mg/L
GW	NP-1	3/30/1989	Copper	<0.1	mg/L
GW	NP-1	3/30/1989	Iron	<0.1	mg/L
GW	NP-1	3/30/1989	Lead	<0.1	mg/L
GW	NP-1	3/30/1989	Manganese	<0.05	mg/L
GW	NP-1	3/30/1989	Molybdenum	<0.1	mg/L
GW	NP-1	3/30/1989	Nickel	<0.1	mg/L
GW	NP-1	3/30/1989	Silver	<0.1	mg/L
GW	NP-1	3/30/1989	Sulfate	137	mg/L
GW	NP-1	3/30/1989	TDS	492	mg/L
GW	NP-1	3/30/1989	Zinc	2.6	mg/L
GW	NP-1	3/30/1989	Beryllium	<0.1	mg/L
GW	NP-1	3/30/1989	Calcium	88	mg/L

GW	NP-1	3/30/1989	Magnesium	23	mg/L
GW	NP-1	3/30/1989	Sodium	46	mg/L
GW	NP-1	3/30/1989	Bicarbonate	279	mg/L CaCO3
GW	NP-1	3/30/1989	Potassium	3	mg/L
GW	NP-2	3/30/1989	Aluminum	<0.1	mg/L
GW	NP-2	3/30/1989	Barium	<0.1	mg/L
GW	NP-2	3/30/1989	Boron	<0.1	mg/L
GW	NP-2	3/30/1989	Cadmium	<0.1	mg/L
GW	NP-2	3/30/1989	Chloride	29.2	mg/L
GW	NP-2	3/30/1989	Chromium	<0.1	mg/L
GW	NP-2	3/30/1989	Cobalt	<0.05	mg/L
GW	NP-2	3/30/1989	Copper	<0.1	mg/L
GW	NP-2	3/30/1989	Iron	<0.1	mg/L
GW	NP-2	3/30/1989	Lead	<0.1	mg/L
GW	NP-2	3/30/1989	Manganese	0.06	mg/L
GW	NP-2	3/30/1989	Molybdenum	<0.1	mg/L
GW	NP-2	3/30/1989	Nickel	<0.1	mg/L
GW	NP-2	3/30/1989	Silver	<0.1	mg/L
GW	NP-2	3/30/1989	Sulfate	124	mg/L
GW	NP-2	3/30/1989	TDS	376	mg/L
GW	NP-2	3/30/1989	Zinc	0.5	mg/L
GW	NP-2	3/30/1989	Beryllium	<0.1	mg/L
GW	NP-2	3/30/1989	Calcium	52	mg/L
GW	NP-2	3/30/1989	Magnesium	18	mg/L
GW	NP-2	3/30/1989	Sodium	65	mg/L
GW	NP-2	3/30/1989	Bicarbonate	183	mg/L CaCO3
GW	NP-2	3/30/1989	Potassium	3	mg/L
GW	NP-5	3/30/1989	Aluminum	<0.1	mg/L
GW	NP-5	3/30/1989	Barium	<0.1	mg/L
GW	NP-5	3/30/1989	Boron	<0.1	mg/L
GW	NP-5	3/30/1989	Cadmium	<0.1	mg/L
GW	NP-5	3/30/1989	Chloride	32	mg/L
GW	NP-5	3/30/1989	Chromium	<0.1	mg/L
GW	NP-5	3/30/1989	Cobalt	<0.05	mg/L
GW	NP-5	3/30/1989	Copper	<0.1	mg/L
GW	NP-5	3/30/1989	Iron	<0.1	mg/L
GW	NP-5	3/30/1989	Lead	<0.1	mg/L
GW	NP-5	3/30/1989	Manganese	<0.05	mg/L
GW	NP-5	3/30/1989	Molybdenum	<0.1	mg/L
GW	NP-5	3/30/1989	Nickel	<0.1	mg/L
GW	NP-5	3/30/1989	Silver	<0.1	mg/L
GW	NP-5	3/30/1989	Sulfate	125	mg/L
GW	NP-5	3/30/1989	TDS	458	mg/L
GW	NP-5	3/30/1989	Zinc	0.4	mg/L
GW	NP-5	3/30/1989	Beryllium	<0.1	mg/L
GW	NP-5	3/30/1989	Calcium	82	mg/L
GW	NP-5	3/30/1989	Magnesium	22	mg/L
GW	NP-5	3/30/1989	Sodium	39	mg/L
GW	NP-5	3/30/1989	Bicarbonate	211	mg/L CaCO3
GW	NP-5	3/30/1989	Potassium	3	mg/L
GW	GWQ-10	6/1/1989	Chloride	67.9	mg/L
GW	GWQ-10	6/1/1989	Sulfate	162.7	mg/L
GW	GWQ-10	6/1/1989	TDS	604	mg/L
GW	GWQ-11	6/1/1989	Chloride	69.7	mg/L
GW	GWQ-11	6/1/1989	Sulfate	238.2	mg/L
GW	GWQ-11	6/1/1989	TDS	708	mg/L
GW	NP-3	6/1/1989	Chloride	241.1	mg/L
GW	NP-3	6/1/1989	Sulfate	713.6	mg/L
GW	NP-3	6/1/1989	TDS	1596	mg/L
GW	NP-4	6/1/1989	Chloride	116.4	mg/L
GW	NP-4	6/1/1989	Sulfate	243.5	mg/L
GW	NP-4	6/1/1989	TDS	580	mg/L
GW	GWQ-10	11/30/1989	Chloride	72.1	mg/L
GW	GWQ-10	11/30/1989	Sulfate	161.7	mg/L
GW	GWQ-10	11/30/1989	TDS	620	mg/L
GW	GWQ-11	11/30/1989	Chloride	79.8	mg/L
GW	GWQ-11	11/30/1989	Sulfate	254.3	mg/L
GW	GWQ-11	11/30/1989	TDS	732	mg/L
GW	NP-3	11/30/1989	Chloride	158.9	mg/L
GW	NP-3	11/30/1989	Sulfate	742.9	mg/L
GW	NP-3	11/30/1989	TDS	1600	mg/L
GW	NP-4	11/30/1989	Chloride	96.9	mg/L
GW	NP-4	11/30/1989	Sulfate	237.4	mg/L
GW	NP-4	11/30/1989	TDS	572	mg/L
GW	GWQ-10	11/14/1990	Chloride	92.7	mg/L
GW	GWQ-10	11/14/1990	Sulfate	178	mg/L

GW	GWQ-10	11/14/1990	TDS	635	mg/L
GW	GWQ-11	11/14/1990	Chloride	104.4	mg/L
GW	GWQ-11	11/14/1990	Sulfate	257.4	mg/L
GW	GWQ-11	11/14/1990	TDS	746	mg/L
GW	NP-3	11/14/1990	Chloride	228.7	mg/L
GW	NP-3	11/14/1990	Sulfate	821.6	mg/L
GW	NP-3	11/14/1990	TDS	1675	mg/L
GW	NP-4	11/14/1990	Chloride	153.1	mg/L
GW	NP-4	11/14/1990	Sulfate	254.5	mg/L
GW	NP-4	11/14/1990	TDS	262	mg/L
GW	GWQ-10	2/11/1991	Arsenic	<0.001	mg/L
GW	GWQ-10	2/11/1991	Chloride	78.1	mg/L
GW	GWQ-10	2/11/1991	Sulfate	213.5	mg/L
GW	GWQ-10	2/11/1991	TDS	696	mg/L
GW	GWQ-11	2/11/1991	Arsenic	<0.001	mg/L
GW	GWQ-11	2/11/1991	Chloride	88.9	mg/L
GW	GWQ-11	2/11/1991	Sulfate	233.4	mg/L
GW	GWQ-11	2/11/1991	TDS	790	mg/L
GW	NP-3	2/11/1991	Arsenic	<0.001	mg/L
GW	NP-3	2/11/1991	Chloride	255.9	mg/L
GW	NP-3	2/11/1991	Silver	255.9	mg/L
GW	NP-3	2/11/1991	Sulfate	970.5	mg/L
GW	NP-3	2/11/1991	TDS	1551	mg/L
GW	NP-4	2/11/1991	Arsenic	<0.001	mg/L
GW	NP-4	2/11/1991	Chloride	126.1	mg/L
GW	NP-4	2/11/1991	Sulfate	288.9	mg/L
GW	NP-4	2/11/1991	TDS	676	mg/L
GW	GWQ-1	7/19/1991	Arsenic	0.003	mg/L
GW	GWQ-1	7/19/1991	Barium	0.01	mg/L
GW	GWQ-1	7/19/1991	Cadmium	<0.005	mg/L
GW	GWQ-1	7/19/1991	Chloride	21.1	mg/L
GW	GWQ-1	7/19/1991	Chromium	<0.02	mg/L
GW	GWQ-1	7/19/1991	Copper	<0.02	mg/L
GW	GWQ-1	7/19/1991	Fluoride	0.58	mg/L
GW	GWQ-1	7/19/1991	Iron	<0.05	mg/L
GW	GWQ-1	7/19/1991	Lead	<0.005	mg/L
GW	GWQ-1	7/19/1991	Manganese	<0.02	mg/L
GW	GWQ-1	7/19/1991	Mercury	<0.0002	mg/L
GW	GWQ-1	7/19/1991	Nitrate as N (NO3)	5.19	mg/L
GW	GWQ-1	7/19/1991	Selenium	<0.002	mg/L
GW	GWQ-1	7/19/1991	Silver	<0.02	mg/L
GW	GWQ-1	7/19/1991	Sulfate	136.4	mg/L
GW	GWQ-1	7/19/1991	TDS	543	mg/L
GW	GWQ-1	7/19/1991	pH	7.34	pH units
GW	GWQ-1	7/19/1991	Conductivity	799	µmhos/cm
GW	GWQ-1	7/19/1991	Calcium	88	mg/L
GW	GWQ-1	7/19/1991	Magnesium	18	mg/L
GW	GWQ-1	7/19/1991	Sodium	39.6	mg/L
GW	GWQ-1	7/19/1991	Bicarbonate	262.4	mg/L CaCO3
GW	GWQ-1	7/19/1991	Carbonate	0	mg/L CaCO3
GW	GWQ-1	7/19/1991	Potassium	2.7	mg/L
GW	GWQ-10	7/19/1991	Arsenic	0.002	mg/L
GW	GWQ-10	7/19/1991	Barium	0.02	mg/L
GW	GWQ-10	7/19/1991	Cadmium	<0.005	mg/L
GW	GWQ-10	7/19/1991	Chloride	83.3	mg/L
GW	GWQ-10	7/19/1991	Chromium	<0.02	mg/L
GW	GWQ-10	7/19/1991	Fluoride	0.51	mg/L
GW	GWQ-10	7/19/1991	Iron	0.07	mg/L
GW	GWQ-10	7/19/1991	Lead	<0.005	mg/L
GW	GWQ-10	7/19/1991	Manganese	<0.02	mg/L
GW	GWQ-10	7/19/1991	Mercury	<0.0002	mg/L
GW	GWQ-10	7/19/1991	Nitrate as N (NO3)	3.88	mg/L
GW	GWQ-10	7/19/1991	Selenium	0.002	mg/L
GW	GWQ-10	7/19/1991	Silver	<0.02	mg/L
GW	GWQ-10	7/19/1991	Sulfate	166.6	mg/L
GW	GWQ-10	7/19/1991	TDS	645	mg/L
GW	GWQ-10	7/19/1991	pH	8.05	pH units
GW	GWQ-10	7/19/1991	Conductivity	975	µmhos/cm
GW	GWQ-10	7/19/1991	Calcium	106.3	mg/L
GW	GWQ-10	7/19/1991	Magnesium	24.1	mg/L
GW	GWQ-10	7/19/1991	Sodium	46.9	mg/L
GW	GWQ-10	7/19/1991	Bicarbonate	241.6	mg/L CaCO3
GW	GWQ-10	7/19/1991	Carbonate	0	mg/L CaCO3
GW	GWQ-10	7/19/1991	Potassium	3.9	mg/L
GW	GWQ-11	7/19/1991	Arsenic	0.004	mg/L
GW	GWQ-11	7/19/1991	Barium	0.1	mg/L

GW	GWQ-11	7/19/1991	Cadmium	<0.005	mg/L
GW	GWQ-11	7/19/1991	Chloride	89.7	mg/L
GW	GWQ-11	7/19/1991	Chromium	<0.02	mg/L
GW	GWQ-11	7/19/1991	Fluoride	0.74	mg/L
GW	GWQ-11	7/19/1991	Iron	<0.05	mg/L
GW	GWQ-11	7/19/1991	Lead	<0.002	mg/L
GW	GWQ-11	7/19/1991	Manganese	<0.02	mg/L
GW	GWQ-11	7/19/1991	Mercury	<0.0002	mg/L
GW	GWQ-11	7/19/1991	Nitrate as N (NO3)	3.93	mg/L
GW	GWQ-11	7/19/1991	Selenium	0.002	mg/L
GW	GWQ-11	7/19/1991	Silver	<0.02	mg/L
GW	GWQ-11	7/19/1991	Sulfate	210.2	mg/L
GW	GWQ-11	7/19/1991	TDS	785	mg/L
GW	GWQ-11	7/19/1991	pH	7.36	pH units
GW	GWQ-11	7/19/1991	Conductivity	1100	µmhos/cm
GW	GWQ-11	7/19/1991	Calcium	122.5	mg/L
GW	GWQ-11	7/19/1991	Magnesium	33.6	mg/L
GW	GWQ-11	7/19/1991	Sodium	40.1	mg/L
GW	GWQ-11	7/19/1991	Bicarbonate	220.9	mg/L CaCO3
GW	GWQ-11	7/19/1991	Carbonate	0	mg/L CaCO3
GW	GWQ-11	7/19/1991	Potassium	3.9	mg/L
GW	IW-1	7/19/1991	Arsenic	<0.002	mg/L
GW	IW-1	7/19/1991	Barium	<0.01	mg/L
GW	IW-1	7/19/1991	Cadmium	<0.005	mg/L
GW	IW-1	7/19/1991	Chloride	632.6	mg/L
GW	IW-1	7/19/1991	Chromium	<0.02	mg/L
GW	IW-1	7/19/1991	Copper	<0.02	mg/L
GW	IW-1	7/19/1991	Fluoride	0.69	mg/L
GW	IW-1	7/19/1991	Iron	<0.05	mg/L
GW	IW-1	7/19/1991	Lead	<0.005	mg/L
GW	IW-1	7/19/1991	Manganese	<0.02	mg/L
GW	IW-1	7/19/1991	Mercury	0.0005	mg/L
GW	IW-1	7/19/1991	Nitrate as N (NO3)	9.06	mg/L
GW	IW-1	7/19/1991	Selenium	0.015	mg/L
GW	IW-1	7/19/1991	Silver	<0.02	mg/L
GW	IW-1	7/19/1991	Sulfate	1965	mg/L
GW	IW-1	7/19/1991	TDS	4235	mg/L
GW	IW-1	7/19/1991	pH	7.87	pH units
GW	IW-1	7/19/1991	Conductivity	6460	µmhos/cm
GW	IW-1	7/19/1991	Calcium	635.5	mg/L
GW	IW-1	7/19/1991	Magnesium	181.6	mg/L
GW	IW-1	7/19/1991	Sodium	375	mg/L
GW	IW-1	7/19/1991	Bicarbonate	222.1	mg/L CaCO3
GW	IW-1	7/19/1991	Carbonate	0	mg/L CaCO3
GW	IW-1	7/19/1991	Potassium	7	mg/L
GW	NP-1	7/19/1991	Arsenic	0.003	mg/L
GW	NP-1	7/19/1991	Barium	0.02	mg/L
GW	NP-1	7/19/1991	Cadmium	<0.005	mg/L
GW	NP-1	7/19/1991	Chloride	21.6	mg/L
GW	NP-1	7/19/1991	Chromium	<0.02	mg/L
GW	NP-1	7/19/1991	Fluoride	0.58	mg/L
GW	NP-1	7/19/1991	Iron	0.59	mg/L
GW	NP-1	7/19/1991	Lead	0.007	mg/L
GW	NP-1	7/19/1991	Manganese	<0.02	mg/L
GW	NP-1	7/19/1991	Mercury	<0.0002	mg/L
GW	NP-1	7/19/1991	Nitrate as N (NO3)	0.99	mg/L
GW	NP-1	7/19/1991	Selenium	<0.002	mg/L
GW	NP-1	7/19/1991	Silver	<0.02	mg/L
GW	NP-1	7/19/1991	Sulfate	133.4	mg/L
GW	NP-1	7/19/1991	TDS	530	mg/L
GW	NP-1	7/19/1991	pH	8.04	pH units
GW	NP-1	7/19/1991	Conductivity	761	µmhos/cm
GW	NP-1	7/19/1991	Calcium	81.1	mg/L
GW	NP-1	7/19/1991	Magnesium	23.9	mg/L
GW	NP-1	7/19/1991	Sodium	31.2	mg/L
GW	NP-1	7/19/1991	Bicarbonate	256.3	mg/L CaCO3
GW	NP-1	7/19/1991	Carbonate	0	mg/L CaCO3
GW	NP-1	7/19/1991	Potassium	2	mg/L
GW	NP-2	7/19/1991	Arsenic	<0.002	mg/L
GW	NP-2	7/19/1991	Barium	<0.01	mg/L
GW	NP-2	7/19/1991	Cadmium	<0.005	mg/L
GW	NP-2	7/19/1991	Chloride	60.9	mg/L
GW	NP-2	7/19/1991	Chromium	<0.02	mg/L
GW	NP-2	7/19/1991	Copper	<0.02	mg/L
GW	NP-2	7/19/1991	Fluoride	0.64	mg/L
GW	NP-2	7/19/1991	Iron	<0.05	mg/L

GW	NP-2	7/19/1991	Lead	<0.005	mg/L
GW	NP-2	7/19/1991	Manganese	<0.02	mg/L
GW	NP-2	7/19/1991	Mercury	<0.0002	mg/L
GW	NP-2	7/19/1991	Nitrate as N (NO3)	0.02	mg/L
GW	NP-2	7/19/1991	Selenium	0.018	mg/L
GW	NP-2	7/19/1991	Silver	<0.02	mg/L
GW	NP-2	7/19/1991	Sulfate	180.8	mg/L
GW	NP-2	7/19/1991	TDS	453	mg/L
GW	NP-2	7/19/1991	pH	7.55	pH units
GW	NP-2	7/19/1991	Conductivity	726	µmhos/cm
GW	NP-2	7/19/1991	Calcium	34.2	mg/L
GW	NP-2	7/19/1991	Magnesium	24	mg/L
GW	NP-2	7/19/1991	Sodium	47.8	mg/L
GW	NP-2	7/19/1991	Bicarbonate	56.1	mg/L CaCO3
GW	NP-2	7/19/1991	Carbonate	0	mg/L CaCO3
GW	NP-2	7/19/1991	Potassium	0.8	mg/L
GW	NP-3	7/19/1991	Arsenic	<0.002	mg/L
GW	NP-3	7/19/1991	Barium	<0.01	mg/L
GW	NP-3	7/19/1991	Cadmium	<0.005	mg/L
GW	NP-3	7/19/1991	Chloride	239.2	mg/L
GW	NP-3	7/19/1991	Chromium	<0.02	mg/L
GW	NP-3	7/19/1991	Copper	<0.02	mg/L
GW	NP-3	7/19/1991	Fluoride	0.66	mg/L
GW	NP-3	7/19/1991	Iron	0.28	mg/L
GW	NP-3	7/19/1991	Lead	<0.005	mg/L
GW	NP-3	7/19/1991	Manganese	0.08	mg/L
GW	NP-3	7/19/1991	Mercury	0.0002	mg/L
GW	NP-3	7/19/1991	Nitrate as N (NO3)	0.23	mg/L
GW	NP-3	7/19/1991	Selenium	0.011	mg/L
GW	NP-3	7/19/1991	Silver	<0.02	mg/L
GW	NP-3	7/19/1991	Sulfate	820.3	mg/L
GW	NP-3	7/19/1991	TDS	1663	mg/L
GW	NP-3	7/19/1991	pH	8.29	pH units
GW	NP-3	7/19/1991	Conductivity	2520	µmhos/cm
GW	NP-3	7/19/1991	Calcium	287	mg/L
GW	NP-3	7/19/1991	Magnesium	53.4	mg/L
GW	NP-3	7/19/1991	Sodium	189.7	mg/L
GW	NP-3	7/19/1991	Bicarbonate	191.6	mg/L CaCO3
GW	NP-3	7/19/1991	Carbonate	0	mg/L CaCO3
GW	NP-3	7/19/1991	Potassium	7	mg/L
GW	NP-4	7/19/1991	Arsenic	<0.002	mg/L
GW	NP-4	7/19/1991	Barium	0.28	mg/L
GW	NP-4	7/19/1991	Cadmium	<0.005	mg/L
GW	NP-4	7/19/1991	Chloride	112.3	mg/L
GW	NP-4	7/19/1991	Chromium	<0.02	mg/L
GW	NP-4	7/19/1991	Fluoride	0.41	mg/L
GW	NP-4	7/19/1991	Iron	5.14	mg/L
GW	NP-4	7/19/1991	Lead	<0.005	mg/L
GW	NP-4	7/19/1991	Manganese	<0.02	mg/L
GW	NP-4	7/19/1991	Mercury	<0.0002	mg/L
GW	NP-4	7/19/1991	Nitrate as N (NO3)	0.07	mg/L
GW	NP-4	7/19/1991	Selenium	<0.002	mg/L
GW	NP-4	7/19/1991	Silver	<0.02	mg/L
GW	NP-4	7/19/1991	Sulfate	198.5	mg/L
GW	NP-4	7/19/1991	TDS	532	mg/L
GW	NP-4	7/19/1991	pH	7.81	pH units
GW	NP-4	7/19/1991	Conductivity	802	µmhos/cm
GW	NP-4	7/19/1991	Calcium	63.4	mg/L
GW	NP-4	7/19/1991	Magnesium	20.8	mg/L
GW	NP-4	7/19/1991	Sodium	66.7	mg/L
GW	NP-4	7/19/1991	Bicarbonate	54.9	mg/L CaCO3
GW	NP-4	7/19/1991	Carbonate	0	mg/L CaCO3
GW	NP-4	7/19/1991	Potassium	3.1	mg/L
GW	GWQ-10	8/29/1991	Chloride	84.7	mg/L
GW	GWQ-10	8/29/1991	Sulfate	191.7	mg/L
GW	GWQ-10	8/29/1991	TDS	665	mg/L
GW	GWQ-10	8/29/1991	pH	7.44	pH units
GW	GWQ-11	8/29/1991	Chloride	92.6	mg/L
GW	GWQ-11	8/29/1991	Sulfate	278.6	mg/L
GW	GWQ-11	8/29/1991	TDS	771	mg/L
GW	GWQ-11	8/29/1991	pH	7.46	pH units
GW	IW-1	8/29/1991	Chloride	642.4	mg/L
GW	IW-1	8/29/1991	Sulfate	1917.9	mg/L
GW	IW-1	8/29/1991	TDS	4120	mg/L
GW	IW-1	8/29/1991	pH	7.13	pH units
GW	NP-1	8/29/1991	Chloride	21.1	mg/L

GW	NP-1	8/29/1991	Sulfate	140.7	mg/L
GW	NP-1	8/29/1991	TDS	501	mg/L
GW	NP-1	8/29/1991	pH	7.69	pH units
GW	NP-2	8/29/1991	Chloride	62.8	mg/L
GW	NP-2	8/29/1991	Sulfate	197.6	mg/L
GW	NP-2	8/29/1991	TDS	471	mg/L
GW	NP-2	8/29/1991	pH	8.11	pH units
GW	NP-3	8/29/1991	Chloride	254.3	mg/L
GW	NP-3	8/29/1991	Sulfate	854.1	mg/L
GW	NP-3	8/29/1991	TDS	1616	mg/L
GW	NP-3	8/29/1991	pH	7.84	pH units
GW	NP-4	8/29/1991	Chloride	110.7	mg/L
GW	NP-4	8/29/1991	Sulfate	232	mg/L
GW	NP-4	8/29/1991	TDS	532	mg/L
GW	NP-4	8/29/1991	pH	8.37	pH units
GW	NP-5	8/29/1991	Chloride	38.7	mg/L
GW	NP-5	8/29/1991	Sulfate	152.1	mg/L
GW	NP-5	8/29/1991	TDS	499	mg/L
GW	NP-5	8/29/1991	pH	7.68	pH units
GW	GWQ-10	11/26/1991	Chloride	58.2	mg/L
GW	GWQ-10	11/26/1991	Sulfate	171.2	mg/L
GW	GWQ-10	11/26/1991	TDS	648	mg/L
GW	GWQ-10	11/26/1991	pH	7.46	pH units
GW	GWQ-11	11/26/1991	Chloride	89.3	mg/L
GW	GWQ-11	11/26/1991	Sulfate	240.7	mg/L
GW	GWQ-11	11/26/1991	TDS	770	mg/L
GW	GWQ-11	11/26/1991	pH	7.29	pH units
GW	IW-1	11/26/1991	Chloride	615.1	mg/L
GW	IW-1	11/26/1991	Sulfate	1634	mg/L
GW	IW-1	11/26/1991	TDS	3979	mg/L
GW	IW-1	11/26/1991	pH	7.53	pH units
GW	NP-1	11/26/1991	Chloride	22.7	mg/L
GW	NP-1	11/26/1991	Sulfate	136.8	mg/L
GW	NP-1	11/26/1991	TDS	1484	mg/L
GW	NP-1	11/26/1991	pH	7.12	pH units
GW	NP-2	11/26/1991	Chloride	63	mg/L
GW	NP-2	11/26/1991	Sulfate	170	mg/L
GW	NP-2	11/26/1991	TDS	460	mg/L
GW	NP-2	11/26/1991	pH	7.45	pH units
GW	NP-3	11/26/1991	Chloride	248.1	mg/L
GW	NP-3	11/26/1991	Sulfate	745.2	mg/L
GW	NP-3	11/26/1991	TDS	1613	mg/L
GW	NP-3	11/26/1991	pH	7.08	pH units
GW	NP-4	11/26/1991	Chloride	99	mg/L
GW	NP-4	11/26/1991	Sulfate	193.6	mg/L
GW	NP-4	11/26/1991	TDS	522	mg/L
GW	NP-4	11/26/1991	pH	8.54	pH units
GW	NP-5	11/26/1991	Chloride	37.7	mg/L
GW	NP-5	11/26/1991	Sulfate	129.5	mg/L
GW	NP-5	11/26/1991	TDS	472	mg/L
GW	NP-5	11/26/1991	pH	7	pH units
GW	GWQ-10	3/15/1992	Chloride	82.5	mg/L
GW	GWQ-10	3/15/1992	Sulfate	191.6	mg/L
GW	GWQ-10	3/15/1992	TDS	641	mg/L
GW	GWQ-10	3/15/1992	pH	7.85	pH units
GW	GWQ-11	3/15/1992	Chloride	65.1	mg/L
GW	GWQ-11	3/15/1992	Sulfate	260.2	mg/L
GW	GWQ-11	3/15/1992	TDS	765	mg/L
GW	GWQ-11	3/15/1992	pH	7.91	pH units
GW	IW-1	3/15/1992	Chloride	610.7	mg/L
GW	IW-1	3/15/1992	Sulfate	2201	mg/L
GW	IW-1	3/15/1992	TDS	4026	mg/L
GW	IW-1	3/15/1992	pH	7.88	pH units
GW	NP-1	3/15/1992	Chloride	22.1	mg/L
GW	NP-1	3/15/1992	Sulfate	146.2	mg/L
GW	NP-1	3/15/1992	TDS	510	mg/L
GW	NP-1	3/15/1992	pH	7.8	pH units
GW	NP-2	3/15/1992	Chloride	67.6	mg/L
GW	NP-2	3/15/1992	Iron	<0.05	mg/L
GW	NP-2	3/15/1992	Sulfate	194.2	mg/L
GW	NP-2	3/15/1992	TDS	467	mg/L
GW	NP-2	3/15/1992	pH	8.07	pH units
GW	NP-3	3/15/1992	Chloride	227.8	mg/L
GW	NP-3	3/15/1992	Sulfate	921.3	mg/L
GW	NP-3	3/15/1992	TDS	1644	mg/L
GW	NP-3	3/15/1992	pH	7.63	pH units

GW	NP-4	3/15/1992	Chloride	102.9	mg/L
GW	NP-4	3/15/1992	Sulfate	216.5	mg/L
GW	NP-4	3/15/1992	TDS	465	mg/L
GW	NP-4	3/15/1992	pH	8.85	pH units
GW	NP-5	3/15/1992	Chloride	46.7	mg/L
GW	NP-5	3/15/1992	Sulfate	140.7	mg/L
GW	NP-5	3/15/1992	TDS	456	mg/L
GW	NP-5	3/15/1992	pH	7.89	pH units
GW	GWQ-10	5/25/1992	Chloride	83.8	mg/L
GW	GWQ-10	5/25/1992	Sulfate	169.2	mg/L
GW	GWQ-10	5/25/1992	TDS	621	mg/L
GW	GWQ-10	5/25/1992	pH	7.41	pH units
GW	GWQ-11	5/25/1992	Chloride	96.2	mg/L
GW	GWQ-11	5/25/1992	Sulfate	258.1	mg/L
GW	GWQ-11	5/25/1992	TDS	761	mg/L
GW	GWQ-11	5/25/1992	pH	7.45	pH units
GW	IW-1	5/25/1992	Chloride	598.2	mg/L
GW	IW-1	5/25/1992	Sulfate	2203	mg/L
GW	IW-1	5/25/1992	TDS	4155	mg/L
GW	IW-1	5/25/1992	pH	7.09	pH units
GW	NP-1	5/25/1992	Chloride	28.6	mg/L
GW	NP-1	5/25/1992	Sulfate	128.2	mg/L
GW	NP-1	5/25/1992	TDS	608	mg/L
GW	NP-1	5/25/1992	pH	7.49	pH units
GW	NP-2	5/25/1992	Chloride	66.6	mg/L
GW	NP-2	5/25/1992	Iron	<0.05	mg/L
GW	NP-2	5/25/1992	Sulfate	161.7	mg/L
GW	NP-2	5/25/1992	TDS	456	mg/L
GW	NP-2	5/25/1992	pH	8.34	pH units
GW	NP-3	5/25/1992	Chloride	216.4	mg/L
GW	NP-3	5/25/1992	Sulfate	752.9	mg/L
GW	NP-3	5/25/1992	TDS	1607	mg/L
GW	NP-3	5/25/1992	pH	7.85	pH units
GW	NP-4	5/25/1992	Chloride	106.2	mg/L
GW	NP-4	5/25/1992	Sulfate	171.4	mg/L
GW	NP-4	5/25/1992	TDS	439	mg/L
GW	NP-4	5/25/1992	pH	8.62	pH units
GW	NP-5	5/25/1992	Chloride	75.5	mg/L
GW	NP-5	5/25/1992	Sulfate	131.1	mg/L
GW	NP-5	5/25/1992	TDS	490	mg/L
GW	NP-5	5/25/1992	pH	7.8	pH units
GW	GWQ-10	7/16/1992	Chloride	76.3	mg/L
GW	GWQ-10	7/16/1992	Sulfate	166.6	mg/L
GW	GWQ-10	7/16/1992	TDS	626	mg/L
GW	GWQ-10	7/16/1992	pH	7.51	pH units
GW	IW-1	7/16/1992	Chloride	584.6	mg/L
GW	IW-1	7/16/1992	Sulfate	1775	mg/L
GW	IW-1	7/16/1992	TDS	4297	mg/L
GW	IW-1	7/16/1992	pH	7.12	pH units
GW	NP-1	7/16/1992	Chloride	21.7	mg/L
GW	NP-1	7/16/1992	Sulfate	142.2	mg/L
GW	NP-1	7/16/1992	TDS	487	mg/L
GW	NP-1	7/16/1992	pH	7.5	pH units
GW	NP-2	7/16/1992	Chloride	65.3	mg/L
GW	NP-2	7/16/1992	Iron	<0.05	mg/L
GW	NP-2	7/16/1992	Sulfate	183.7	mg/L
GW	NP-2	7/16/1992	TDS	479	mg/L
GW	NP-2	7/16/1992	pH	8.13	pH units
GW	NP-3	7/16/1992	Chloride	226.1	mg/L
GW	NP-3	7/16/1992	Sulfate	802.2	mg/L
GW	NP-3	7/16/1992	TDS	1578	mg/L
GW	NP-3	7/16/1992	pH	7.26	pH units
GW	NP-4	7/16/1992	Chloride	94.4	mg/L
GW	NP-4	7/16/1992	Sulfate	176.8	mg/L
GW	NP-4	7/16/1992	TDS	458	mg/L
GW	NP-4	7/16/1992	pH	7.64	pH units
GW	NP-5	7/16/1992	Chloride	37.8	mg/L
GW	NP-5	7/16/1992	Sulfate	132.4	mg/L
GW	NP-5	7/16/1992	TDS	476	mg/L
GW	NP-5	7/16/1992	pH	7.63	pH units
GW	GWQ-10	10/8/1992	Chloride	83.4	mg/L
GW	GWQ-10	10/8/1992	Sulfate	161.4	mg/L
GW	GWQ-10	10/8/1992	TDS	659	mg/L
GW	GWQ-10	10/8/1992	pH	7.43	pH units
GW	GWQ-11	10/8/1992	Chloride	96	mg/L
GW	GWQ-11	10/8/1992	Sulfate	226.9	mg/L

GW	GWQ-11	10/8/1992	TDS	755	mg/L
GW	GWQ-11	10/8/1992	pH	7.42	pH units
GW	IW-1	10/8/1992	Chloride	616.9	mg/L
GW	IW-1	10/8/1992	Sulfate	1726.8	mg/L
GW	IW-1	10/8/1992	TDS	3996	mg/L
GW	IW-1	10/8/1992	pH	6.96	pH units
GW	NP-1	10/8/1992	Chloride	21.7	mg/L
GW	NP-1	10/8/1992	Sulfate	128.8	mg/L
GW	NP-1	10/8/1992	TDS	517	mg/L
GW	NP-1	10/8/1992	pH	7.35	pH units
GW	NP-2	10/8/1992	Chloride	78.2	mg/L
GW	NP-2	10/8/1992	Sulfate	178.9	mg/L
GW	NP-2	10/8/1992	TDS	494	mg/L
GW	NP-2	10/8/1992	pH	8.26	pH units
GW	NP-3	10/8/1992	Chloride	211.6	mg/L
GW	NP-3	10/8/1992	Sulfate	799.1	mg/L
GW	NP-3	10/8/1992	TDS	1445	mg/L
GW	NP-3	10/8/1992	pH	7.69	pH units
GW	NP-4	10/8/1992	Chloride	102.9	mg/L
GW	NP-4	10/8/1992	Sulfate	182.9	mg/L
GW	NP-4	10/8/1992	TDS	535	mg/L
GW	NP-4	10/8/1992	pH	9.01	pH units
GW	NP-5	10/8/1992	Chloride	39.4	mg/L
GW	NP-5	10/8/1992	Sulfate	133.2	mg/L
GW	NP-5	10/8/1992	TDS	431	mg/L
GW	NP-5	10/8/1992	pH	7.64	pH units
GW	GWQ-10	11/27/1992	Chloride	80.3	mg/L
GW	GWQ-10	11/27/1992	Sulfate	174.4	mg/L
GW	GWQ-10	11/27/1992	TDS	654	mg/L
GW	GWQ-10	11/27/1992	pH	7.89	pH units
GW	GWQ-11	11/27/1992	Chloride	96	mg/L
GW	GWQ-11	11/27/1992	Sulfate	248.4	mg/L
GW	GWQ-11	11/27/1992	TDS	763	mg/L
GW	GWQ-11	11/27/1992	pH	7.85	pH units
GW	IW-1	11/27/1992	Chloride	604.8	mg/L
GW	IW-1	11/27/1992	Sulfate	1716.6	mg/L
GW	IW-1	11/27/1992	TDS	4004	mg/L
GW	IW-1	11/27/1992	pH	7.71	pH units
GW	NP-1	11/27/1992	Chloride	21.3	mg/L
GW	NP-1	11/27/1992	Sulfate	142.4	mg/L
GW	NP-1	11/27/1992	TDS	498	mg/L
GW	NP-1	11/27/1992	pH	7.85	pH units
GW	NP-2	11/27/1992	Chloride	63.7	mg/L
GW	NP-2	11/27/1992	Sulfate	179.4	mg/L
GW	NP-2	11/27/1992	TDS	451	mg/L
GW	NP-2	11/27/1992	pH	8.38	pH units
GW	NP-3	11/27/1992	Chloride	254.7	mg/L
GW	NP-3	11/27/1992	Sulfate	796.1	mg/L
GW	NP-3	11/27/1992	TDS	1640	mg/L
GW	NP-3	11/27/1992	pH	7.49	pH units
GW	NP-4	11/27/1992	Chloride	97.5	mg/L
GW	NP-4	11/27/1992	Sulfate	201.7	mg/L
GW	NP-4	11/27/1992	TDS	495	mg/L
GW	NP-4	11/27/1992	pH	8.12	pH units
GW	NP-5	11/27/1992	Chloride	117.2	mg/L
GW	NP-5	11/27/1992	Sulfate	133.9	mg/L
GW	NP-5	11/27/1992	TDS	475	mg/L
GW	NP-5	11/27/1992	pH	8.01	pH units
GW	Saladone Well	12/5/1992	Nitrate as N (NO3)	0.19	mg/L
GW	Saladone Well	12/5/1992	Sulfate	23	mg/L
GW	Saladone Well	12/5/1992	TDS	354	mg/L
GW	Saladone Well	12/5/1992	pH	7.91	pH units
GW	Saladone Well	12/5/1992	Conductivity	429	µmhos/cm
GW	Saladone Well	12/5/1992	Calcium	54.8	mg/L
GW	Saladone Well	12/5/1992	Magnesium	23	mg/L
GW	Saladone Well	12/5/1992	Sodium	22.4	mg/L
GW	Saladone Well	12/5/1992	Bicarbonate	213.2	mg/L CaCO3
GW	Saladone Well	12/5/1992	Carbonate	<0.3	mg/L CaCO3
GW	Saladone Well	12/5/1992	Potassium	2.16	mg/L
GW	GWQ-10	12/15/1992	Chloride	90.9	mg/L
GW	GWQ-10	12/15/1992	Sulfate	168.7	mg/L
GW	GWQ-10	12/15/1992	TDS	582	mg/L
GW	GWQ-10	12/15/1992	pH	7.48	pH units
GW	GWQ-11	12/15/1992	Chloride	98.1	mg/L
GW	GWQ-11	12/15/1992	Copper	0.017	mg/L
GW	GWQ-11	12/15/1992	Sulfate	220	mg/L

GW	GWQ-11	12/15/1992	TDS	741	mg/L
GW	GWQ-11	12/15/1992	pH	7.59	pH units
GW	IW-1	12/15/1992	Chloride	608.9	mg/L
GW	IW-1	12/15/1992	Sulfate	1414.6	mg/L
GW	IW-1	12/15/1992	TDS	3969	mg/L
GW	IW-1	12/15/1992	pH	7.4	pH units
GW	NP-1	12/15/1992	Chloride	23.7	mg/L
GW	NP-1	12/15/1992	Sulfate	125	mg/L
GW	NP-1	12/15/1992	TDS	502	mg/L
GW	NP-1	12/15/1992	pH	7.58	pH units
GW	NP-2	12/15/1992	Chloride	82.5	mg/L
GW	NP-2	12/15/1992	Iron	<0.05	mg/L
GW	NP-2	12/15/1992	Sulfate	166.8	mg/L
GW	NP-2	12/15/1992	TDS	612	mg/L
GW	NP-2	12/15/1992	pH	8.43	pH units
GW	NP-3	12/15/1992	Chloride	223.2	mg/L
GW	NP-3	12/15/1992	Copper	0.01	mg/L
GW	NP-3	12/15/1992	Sulfate	545.3	mg/L
GW	NP-3	12/15/1992	TDS	1558	mg/L
GW	NP-3	12/15/1992	pH	7.75	pH units
GW	NP-4	12/15/1992	Chloride	84.4	mg/L
GW	NP-4	12/15/1992	Sulfate	151.2	mg/L
GW	NP-4	12/15/1992	TDS	424	mg/L
GW	NP-4	12/15/1992	pH	9.52	pH units
GW	NP-5	12/15/1992	Chloride	40.4	mg/L
GW	NP-5	12/15/1992	Copper	0.025	mg/L
GW	NP-5	12/15/1992	Sulfate	104	mg/L
GW	NP-5	12/15/1992	TDS	402	mg/L
GW	NP-5	12/15/1992	pH	7.8	pH units
GW	GWQ-10	2/25/1993	Chloride	95.5	mg/L
GW	GWQ-10	2/25/1993	Sulfate	175.8	mg/L
GW	GWQ-10	2/25/1993	TDS	620	mg/L
GW	GWQ-10	2/25/1993	pH	7.39	pH units
GW	GWQ-11	2/25/1993	Chloride	104	mg/L
GW	GWQ-11	2/25/1993	Sulfate	273.3	mg/L
GW	GWQ-11	2/25/1993	TDS	762	mg/L
GW	GWQ-11	2/25/1993	pH	7.64	pH units
GW	IW-3	2/25/1993	Chloride	589.5	mg/L
GW	IW-3	2/25/1993	Sulfate	1738.9	mg/L
GW	IW-3	2/25/1993	TDS	3892	mg/L
GW	IW-3	2/25/1993	pH	7.27	pH units
GW	NP-1	2/25/1993	Chloride	22.6	mg/L
GW	NP-1	2/25/1993	Sulfate	138.3	mg/L
GW	NP-1	2/25/1993	TDS	510	mg/L
GW	NP-1	2/25/1993	pH	7.42	pH units
GW	NP-2	2/25/1993	Chloride	77.8	mg/L
GW	NP-2	2/25/1993	Sulfate	197.2	mg/L
GW	NP-2	2/25/1993	TDS	475	mg/L
GW	NP-2	2/25/1993	pH	8.62	pH units
GW	NP-3	2/25/1993	Chloride	219.3	mg/L
GW	NP-3	2/25/1993	Sulfate	793.6	mg/L
GW	NP-3	2/25/1993	TDS	1580	mg/L
GW	NP-3	2/25/1993	pH	7.65	pH units
GW	NP-4	2/25/1993	Chloride	76.6	mg/L
GW	NP-4	2/25/1993	Sulfate	150.8	mg/L
GW	NP-4	2/25/1993	TDS	349	mg/L
GW	NP-4	2/25/1993	pH	9.85	pH units
GW	NP-5	2/25/1993	Chloride	41.4	mg/L
GW	NP-5	2/25/1993	Sulfate	140.8	mg/L
GW	NP-5	2/25/1993	TDS	487	mg/L
GW	NP-5	2/25/1993	pH	7.65	pH units
GW	GWQ-10	3/30/1993	Aluminum	<0.1	mg/L
GW	GWQ-10	3/30/1993	Arsenic	<0.005	mg/L
GW	GWQ-10	3/30/1993	Barium	<0.5	mg/L
GW	GWQ-10	3/30/1993	Boron	0.04	mg/L
GW	GWQ-10	3/30/1993	Cadmium	<0.002	mg/L
GW	GWQ-10	3/30/1993	Chloride	94	mg/L
GW	GWQ-10	3/30/1993	Chromium	<0.02	mg/L
GW	GWQ-10	3/30/1993	Cobalt	<0.05	mg/L
GW	GWQ-10	3/30/1993	Copper	<0.01	mg/L
GW	GWQ-10	3/30/1993	Cyanide	<0.01	mg/L
GW	GWQ-10	3/30/1993	Fluoride	0.52	mg/L
GW	GWQ-10	3/30/1993	Iron	<0.05	mg/L
GW	GWQ-10	3/30/1993	Lead	<0.02	mg/L
GW	GWQ-10	3/30/1993	Manganese	<0.02	mg/L
GW	GWQ-10	3/30/1993	Mercury	<0.001	mg/L

GW	GWQ-10	3/30/1993	Molybdenum	<0.02	mg/L
GW	GWQ-10	3/30/1993	Nickel	<0.01	mg/L
GW	GWQ-10	3/30/1993	Nitrate as N (NO3)	3.9	mg/L
GW	GWQ-10	3/30/1993	Selenium	<0.005	mg/L
GW	GWQ-10	3/30/1993	Silver	<0.01	mg/L
GW	GWQ-10	3/30/1993	Sulfate	183	mg/L
GW	GWQ-10	3/30/1993	TDS	642	mg/L
GW	GWQ-10	3/30/1993	Zinc	0.11	mg/L
GW	GWQ-10	3/30/1993	pH	7.8	pH units
GW	GWQ-10	3/30/1993	Conductivity	1020	µmhos/cm
GW	GWQ-10	3/30/1993	Calcium	104	mg/L
GW	GWQ-10	3/30/1993	Magnesium	27	mg/L
GW	GWQ-10	3/30/1993	Sodium	71	mg/L
GW	GWQ-10	3/30/1993	Bicarbonate	254	mg/L CaCO3
GW	GWQ-10	3/30/1993	Carbonate	0	mg/L CaCO3
GW	GWQ-10	3/30/1993	Potassium	2.3	mg/L
GW	GWQ-11	3/30/1993	Aluminum	0.2	mg/L
GW	GWQ-11	3/30/1993	Arsenic	<0.005	mg/L
GW	GWQ-11	3/30/1993	Barium	<0.5	mg/L
GW	GWQ-11	3/30/1993	Boron	0.04	mg/L
GW	GWQ-11	3/30/1993	Cadmium	<0.002	mg/L
GW	GWQ-11	3/30/1993	Chloride	104	mg/L
GW	GWQ-11	3/30/1993	Chromium	<0.02	mg/L
GW	GWQ-11	3/30/1993	Cobalt	<0.05	mg/L
GW	GWQ-11	3/30/1993	Copper	<0.01	mg/L
GW	GWQ-11	3/30/1993	Cyanide	<0.01	mg/L
GW	GWQ-11	3/30/1993	Fluoride	0.52	mg/L
GW	GWQ-11	3/30/1993	Iron	0.33	mg/L
GW	GWQ-11	3/30/1993	Lead	<0.02	mg/L
GW	GWQ-11	3/30/1993	Manganese	0.03	mg/L
GW	GWQ-11	3/30/1993	Mercury	<0.001	mg/L
GW	GWQ-11	3/30/1993	Molybdenum	<0.02	mg/L
GW	GWQ-11	3/30/1993	Nickel	<0.01	mg/L
GW	GWQ-11	3/30/1993	Nitrate as N (NO3)	4.1	mg/L
GW	GWQ-11	3/30/1993	Selenium	<0.005	mg/L
GW	GWQ-11	3/30/1993	Silver	<0.01	mg/L
GW	GWQ-11	3/30/1993	Sulfate	271	mg/L
GW	GWQ-11	3/30/1993	TDS	776	mg/L
GW	GWQ-11	3/30/1993	Zinc	0.03	mg/L
GW	GWQ-11	3/30/1993	pH	7.7	pH units
GW	GWQ-11	3/30/1993	Conductivity	1170	µmhos/cm
GW	GWQ-11	3/30/1993	Calcium	126	mg/L
GW	GWQ-11	3/30/1993	Magnesium	34	mg/L
GW	GWQ-11	3/30/1993	Sodium	68	mg/L
GW	GWQ-11	3/30/1993	Bicarbonate	227	mg/L CaCO3
GW	GWQ-11	3/30/1993	Carbonate	0	mg/L CaCO3
GW	GWQ-11	3/30/1993	Potassium	2.9	mg/L
GW	GWQ-7	3/30/1993	Aluminum	<0.1	mg/L
GW	GWQ-7	3/30/1993	Arsenic	<0.005	mg/L
GW	GWQ-7	3/30/1993	Barium	<0.5	mg/L
GW	GWQ-7	3/30/1993	Boron	0.04	mg/L
GW	GWQ-7	3/30/1993	Cadmium	<0.002	mg/L
GW	GWQ-7	3/30/1993	Chloride	21	mg/L
GW	GWQ-7	3/30/1993	Chromium	<0.02	mg/L
GW	GWQ-7	3/30/1993	Cobalt	<0.05	mg/L
GW	GWQ-7	3/30/1993	Copper	<0.01	mg/L
GW	GWQ-7	3/30/1993	Cyanide	<0.01	mg/L
GW	GWQ-7	3/30/1993	Fluoride	0.56	mg/L
GW	GWQ-7	3/30/1993	Iron	<0.05	mg/L
GW	GWQ-7	3/30/1993	Lead	<0.02	mg/L
GW	GWQ-7	3/30/1993	Manganese	<0.02	mg/L
GW	GWQ-7	3/30/1993	Mercury	<0.001	mg/L
GW	GWQ-7	3/30/1993	Molybdenum	<0.02	mg/L
GW	GWQ-7	3/30/1993	Nickel	<0.01	mg/L
GW	GWQ-7	3/30/1993	Nitrate as N (NO3)	138	mg/L
GW	GWQ-7	3/30/1993	Selenium	<0.005	mg/L
GW	GWQ-7	3/30/1993	Silver	<0.01	mg/L
GW	GWQ-7	3/30/1993	Sulfate	138	mg/L
GW	GWQ-7	3/30/1993	TDS	482	mg/L
GW	GWQ-7	3/30/1993	Zinc	0.1	mg/L
GW	GWQ-7	3/30/1993	pH	7.8	pH units
GW	GWQ-7	3/30/1993	Conductivity	752	µmhos/cm
GW	GWQ-7	3/30/1993	Calcium	68	mg/L
GW	GWQ-7	3/30/1993	Magnesium	31	mg/L
GW	GWQ-7	3/30/1993	Sodium	52	mg/L
GW	GWQ-7	3/30/1993	Bicarbonate	298	mg/L CaCO3

GW	GWQ-7	3/30/1993	Carbonate	0	mg/L CaCO3
GW	GWQ-7	3/30/1993	Potassium	1.6	mg/L
GW	NP-1	3/30/1993	Aluminum	<0.1	mg/L
GW	NP-1	3/30/1993	Arsenic	<0.005	mg/L
GW	NP-1	3/30/1993	Barium	<0.5	mg/L
GW	NP-1	3/30/1993	Boron	0.03	mg/L
GW	NP-1	3/30/1993	Cadmium	<0.002	mg/L
GW	NP-1	3/30/1993	Chloride	22	mg/L
GW	NP-1	3/30/1993	Chromium	<0.02	mg/L
GW	NP-1	3/30/1993	Cobalt	<0.05	mg/L
GW	NP-1	3/30/1993	Copper	<0.01	mg/L
GW	NP-1	3/30/1993	Cyanide	<0.01	mg/L
GW	NP-1	3/30/1993	Fluoride	0.59	mg/L
GW	NP-1	3/30/1993	Iron	0.17	mg/L
GW	NP-1	3/30/1993	Lead	<0.02	mg/L
GW	NP-1	3/30/1993	Manganese	<0.02	mg/L
GW	NP-1	3/30/1993	Mercury	<0.001	mg/L
GW	NP-1	3/30/1993	Molybdenum	<0.02	mg/L
GW	NP-1	3/30/1993	Nickel	<0.01	mg/L
GW	NP-1	3/30/1993	Nitrate as N (NO3)	1.1	mg/L
GW	NP-1	3/30/1993	Selenium	<0.005	mg/L
GW	NP-1	3/30/1993	Silver	<0.01	mg/L
GW	NP-1	3/30/1993	Sulfate	145	mg/L
GW	NP-1	3/30/1993	TDS	496	mg/L
GW	NP-1	3/30/1993	Zinc	1.13	mg/L
GW	NP-1	3/30/1993	pH	7.7	pH units
GW	NP-1	3/30/1993	Conductivity	767	µmhos/cm
GW	NP-1	3/30/1993	Calcium	79	mg/L
GW	NP-1	3/30/1993	Magnesium	27	mg/L
GW	NP-1	3/30/1993	Sodium	52	mg/L
GW	NP-1	3/30/1993	Bicarbonate	306	mg/L CaCO3
GW	NP-1	3/30/1993	Carbonate	0	mg/L CaCO3
GW	NP-1	3/30/1993	Potassium	1.8	mg/L
GW	NP-2	3/30/1993	Aluminum	0.5	mg/L
GW	NP-2	3/30/1993	Arsenic	<0.005	mg/L
GW	NP-2	3/30/1993	Barium	0.6	mg/L
GW	NP-2	3/30/1993	Boron	0.1	mg/L
GW	NP-2	3/30/1993	Cadmium	<0.002	mg/L
GW	NP-2	3/30/1993	Chloride	239	mg/L
GW	NP-2	3/30/1993	Chromium	<0.02	mg/L
GW	NP-2	3/30/1993	Cobalt	<0.05	mg/L
GW	NP-2	3/30/1993	Copper	0.01	mg/L
GW	NP-2	3/30/1993	Cyanide	<0.01	mg/L
GW	NP-2	3/30/1993	Fluoride	1.33	mg/L
GW	NP-2	3/30/1993	Iron	1.85	mg/L
GW	NP-2	3/30/1993	Lead	<0.02	mg/L
GW	NP-2	3/30/1993	Manganese	0.07	mg/L
GW	NP-2	3/30/1993	Mercury	<0.001	mg/L
GW	NP-2	3/30/1993	Molybdenum	<0.02	mg/L
GW	NP-2	3/30/1993	Nickel	<0.01	mg/L
GW	NP-2	3/30/1993	Nitrate as N (NO3)	3.3	mg/L
GW	NP-2	3/30/1993	Selenium	0.005	mg/L
GW	NP-2	3/30/1993	Silver	<0.01	mg/L
GW	NP-2	3/30/1993	Sulfate	436	mg/L
GW	NP-2	3/30/1993	TDS	1310	mg/L
GW	NP-2	3/30/1993	Zinc	0.67	mg/L
GW	NP-2	3/30/1993	pH	7.7	pH units
GW	NP-2	3/30/1993	Conductivity	1910	µmhos/cm
GW	NP-2	3/30/1993	Calcium	163	mg/L
GW	NP-2	3/30/1993	Magnesium	61	mg/L
GW	NP-2	3/30/1993	Sodium	163	mg/L
GW	NP-2	3/30/1993	Bicarbonate	289	mg/L CaCO3
GW	NP-2	3/30/1993	Carbonate	0	mg/L CaCO3
GW	NP-2	3/30/1993	Potassium	0.9	mg/L
GW	NP-3	3/30/1993	Aluminum	0.1	mg/L
GW	NP-3	3/30/1993	Arsenic	<0.005	mg/L
GW	NP-3	3/30/1993	Barium	<0.5	mg/L
GW	NP-3	3/30/1993	Boron	0.02	mg/L
GW	NP-3	3/30/1993	Cadmium	<0.002	mg/L
GW	NP-3	3/30/1993	Chloride	205	mg/L
GW	NP-3	3/30/1993	Chromium	<0.02	mg/L
GW	NP-3	3/30/1993	Cobalt	<0.05	mg/L
GW	NP-3	3/30/1993	Copper	0.01	mg/L
GW	NP-3	3/30/1993	Cyanide	<0.01	mg/L
GW	NP-3	3/30/1993	Fluoride	0.54	mg/L
GW	NP-3	3/30/1993	Iron	4.99	mg/L

GW	NP-3	3/30/1993	Lead	<0.02	mg/L
GW	NP-3	3/30/1993	Manganese	0.32	mg/L
GW	NP-3	3/30/1993	Mercury	<0.001	mg/L
GW	NP-3	3/30/1993	Molybdenum	<0.02	mg/L
GW	NP-3	3/30/1993	Nickel	<0.01	mg/L
GW	NP-3	3/30/1993	Selenium	<0.005	mg/L
GW	NP-3	3/30/1993	Silver	<0.01	mg/L
GW	NP-3	3/30/1993	Sulfate	825	mg/L
GW	NP-3	3/30/1993	TDS	1560	mg/L
GW	NP-3	3/30/1993	Zinc	6.98	mg/L
GW	NP-3	3/30/1993	pH	7.4	pH units
GW	NP-3	3/30/1993	Conductivity	2070	µmhos/cm
GW	NP-3	3/30/1993	Calcium	296	mg/L
GW	NP-3	3/30/1993	Magnesium	35	mg/L
GW	NP-3	3/30/1993	Sodium	129	mg/L
GW	NP-3	3/30/1993	Bicarbonate	29	mg/L CaCO3
GW	NP-3	3/30/1993	Carbonate	0	mg/L CaCO3
GW	NP-3	3/30/1993	Potassium	4.1	mg/L
GW	NP-5	3/30/1993	Aluminum	0.2	mg/L
GW	NP-5	3/30/1993	Arsenic	<0.005	mg/L
GW	NP-5	3/30/1993	Barium	<0.5	mg/L
GW	NP-5	3/30/1993	Boron	0.04	mg/L
GW	NP-5	3/30/1993	Cadmium	<0.002	mg/L
GW	NP-5	3/30/1993	Chloride	39	mg/L
GW	NP-5	3/30/1993	Chromium	<0.02	mg/L
GW	NP-5	3/30/1993	Cobalt	<0.05	mg/L
GW	NP-5	3/30/1993	Copper	<0.01	mg/L
GW	NP-5	3/30/1993	Cyanide	<0.01	mg/L
GW	NP-5	3/30/1993	Fluoride	0.77	mg/L
GW	NP-5	3/30/1993	Iron	0.29	mg/L
GW	NP-5	3/30/1993	Lead	<0.02	mg/L
GW	NP-5	3/30/1993	Manganese	0.02	mg/L
GW	NP-5	3/30/1993	Mercury	<0.001	mg/L
GW	NP-5	3/30/1993	Molybdenum	<0.02	mg/L
GW	NP-5	3/30/1993	Nickel	<0.01	mg/L
GW	NP-5	3/30/1993	Nitrate as N (NO3)	4	mg/L
GW	NP-5	3/30/1993	Selenium	<0.005	mg/L
GW	NP-5	3/30/1993	Silver	<0.01	mg/L
GW	NP-5	3/30/1993	Sulfate	146	mg/L
GW	NP-5	3/30/1993	TDS	488	mg/L
GW	NP-5	3/30/1993	Zinc	0.19	mg/L
GW	NP-5	3/30/1993	pH	7.8	pH units
GW	NP-5	3/30/1993	Conductivity	746	µmhos/cm
GW	NP-5	3/30/1993	Calcium	76	mg/L
GW	NP-5	3/30/1993	Magnesium	26	mg/L
GW	NP-5	3/30/1993	Sodium	43	mg/L
GW	NP-5	3/30/1993	Bicarbonate	221	mg/L CaCO3
GW	NP-5	3/30/1993	Carbonate	0	mg/L CaCO3
GW	NP-5	3/30/1993	Potassium	2.5	mg/L
GW	GWQ-1	3/31/1993	Aluminum	<0.01	mg/L
GW	GWQ-1	3/31/1993	Arsenic	<0.005	mg/L
GW	GWQ-1	3/31/1993	Barium	<0.5	mg/L
GW	GWQ-1	3/31/1993	Boron	0.03	mg/L
GW	GWQ-1	3/31/1993	Cadmium	<0.002	mg/L
GW	GWQ-1	3/31/1993	Chloride	22	mg/L
GW	GWQ-1	3/31/1993	Chromium	<0.02	mg/L
GW	GWQ-1	3/31/1993	Cobalt	<0.05	mg/L
GW	GWQ-1	3/31/1993	Copper	<0.01	mg/L
GW	GWQ-1	3/31/1993	Cyanide	<0.01	mg/L
GW	GWQ-1	3/31/1993	Fluoride	0.54	mg/L
GW	GWQ-1	3/31/1993	Iron	<0.05	mg/L
GW	GWQ-1	3/31/1993	Lead	<0.02	mg/L
GW	GWQ-1	3/31/1993	Manganese	<0.02	mg/L
GW	GWQ-1	3/31/1993	Mercury	<0.001	mg/L
GW	GWQ-1	3/31/1993	Molybdenum	<0.02	mg/L
GW	GWQ-1	3/31/1993	Nickel	<0.01	mg/L
GW	GWQ-1	3/31/1993	Nitrate as N (NO3)	4.9	mg/L
GW	GWQ-1	3/31/1993	Selenium	<0.005	mg/L
GW	GWQ-1	3/31/1993	Silver	<0.01	mg/L
GW	GWQ-1	3/31/1993	Sulfate	160	mg/L
GW	GWQ-1	3/31/1993	TDS	536	mg/L
GW	GWQ-1	3/31/1993	Zinc	<0.01	mg/L
GW	GWQ-1	3/31/1993	pH	7.7	pH units
GW	GWQ-1	3/31/1993	Conductivity	822	µmhos/cm
GW	GWQ-1	3/31/1993	Calcium	82	mg/L
GW	GWQ-1	3/31/1993	Magnesium	21	mg/L

GW	GWQ-1	3/31/1993	Sodium	67	mg/L
GW	GWQ-1	3/31/1993	Bicarbonate	297	mg/L CaCO3
GW	GWQ-1	3/31/1993	Carbonate	0	mg/L CaCO3
GW	GWQ-1	3/31/1993	Potassium	2.1	mg/L
GW	GWQ-8	3/31/1993	Aluminum	<0.05	mg/L
GW	GWQ-8	3/31/1993	Aluminum	<0.1	mg/L
GW	GWQ-8	3/31/1993	Arsenic	<0.005	mg/L
GW	GWQ-8	3/31/1993	Barium	0.042	mg/L
GW	GWQ-8	3/31/1993	Barium	<0.5	mg/L
GW	GWQ-8	3/31/1993	Boron	<0.1	mg/L
GW	GWQ-8	3/31/1993	Boron	0.03	mg/L
GW	GWQ-8	3/31/1993	Cadmium	<0.0005	mg/L
GW	GWQ-8	3/31/1993	Cadmium	<0.002	mg/L
GW	GWQ-8	3/31/1993	Chloride	22	mg/L
GW	GWQ-8	3/31/1993	Chloride	38	mg/L
GW	GWQ-8	3/31/1993	Chromium	<0.01	mg/L
GW	GWQ-8	3/31/1993	Chromium	<0.02	mg/L
GW	GWQ-8	3/31/1993	Cobalt	<0.01	mg/L
GW	GWQ-8	3/31/1993	Cobalt	<0.05	mg/L
GW	GWQ-8	3/31/1993	Copper	<0.01	mg/L
GW	GWQ-8	3/31/1993	Copper	0.01	mg/L
GW	GWQ-8	3/31/1993	Cyanide	<0.01	mg/L
GW	GWQ-8	3/31/1993	Fluoride	0.53	mg/L
GW	GWQ-8	3/31/1993	Fluoride	0.51	mg/L
GW	GWQ-8	3/31/1993	Iron	0.038	mg/L
GW	GWQ-8	3/31/1993	Iron	<0.05	mg/L
GW	GWQ-8	3/31/1993	Lead	<0.002	mg/L
GW	GWQ-8	3/31/1993	Lead	<0.02	mg/L
GW	GWQ-8	3/31/1993	Manganese	<0.01	mg/L
GW	GWQ-8	3/31/1993	Manganese	<0.02	mg/L
GW	GWQ-8	3/31/1993	Mercury	<0.0002	mg/L
GW	GWQ-8	3/31/1993	Mercury	<0.001	mg/L
GW	GWQ-8	3/31/1993	Molybdenum	<0.02	mg/L
GW	GWQ-8	3/31/1993	Nickel	<0.02	mg/L
GW	GWQ-8	3/31/1993	Nickel	<0.01	mg/L
GW	GWQ-8	3/31/1993	Nitrate as N (NO3)	5.7	mg/L
GW	GWQ-8	3/31/1993	Nitrate as N (NO3)	6.3	mg/L
GW	GWQ-8	3/31/1993	Selenium	<0.005	mg/L
GW	GWQ-8	3/31/1993	Silver	<0.01	mg/L
GW	GWQ-8	3/31/1993	Sulfate	260	mg/L
GW	GWQ-8	3/31/1993	Sulfate	283	mg/L
GW	GWQ-8	3/31/1993	TDS	290	mg/L
GW	GWQ-8	3/31/1993	TDS	764	mg/L
GW	GWQ-8	3/31/1993	Zinc	0.075	mg/L
GW	GWQ-8	3/31/1993	Zinc	0.09	mg/L
GW	GWQ-8	3/31/1993	pH	7.7	pH units
GW	GWQ-8	3/31/1993	pH	7.6	pH units
GW	GWQ-8	3/31/1993	Calcium	149	mg/L
GW	GWQ-8	3/31/1993	Magnesium	21	mg/L
GW	GWQ-8	3/31/1993	Sodium	94	mg/L
GW	GWQ-8	3/31/1993	Bicarbonate	262	mg/L CaCO3
GW	GWQ-8	3/31/1993	Carbonate	<1	mg/L CaCO3
GW	GWQ-8	3/31/1993	Potassium	3.5	mg/L
GW	GWQ-8	3/31/1993	Conductivity	1110	µmhos/cm
GW	GWQ-8	3/31/1993	Calcium	132	mg/L
GW	GWQ-8	3/31/1993	Magnesium	18	mg/L
GW	GWQ-8	3/31/1993	Bicarbonate	298	mg/L CaCO3
GW	GWQ-8	3/31/1993	Carbonate	0	mg/L CaCO3
GW	GWQ-8	3/31/1993	Potassium	1.8	mg/L
GW	McCravey-Greyback	3/31/1993	Aluminum	<0.1	mg/L
GW	McCravey-Greyback	3/31/1993	Arsenic	<0.005	mg/L
GW	McCravey-Greyback	3/31/1993	Barium	<0.5	mg/L
GW	McCravey-Greyback	3/31/1993	Boron	<0.04	mg/L
GW	McCravey-Greyback	3/31/1993	Cadmium	<0.002	mg/L
GW	McCravey-Greyback	3/31/1993	Chloride	30	mg/L
GW	McCravey-Greyback	3/31/1993	Chromium	<0.02	mg/L
GW	McCravey-Greyback	3/31/1993	Cobalt	<0.05	mg/L
GW	McCravey-Greyback	3/31/1993	Copper	<0.01	mg/L
GW	McCravey-Greyback	3/31/1993	Cyanide	<0.01	mg/L
GW	McCravey-Greyback	3/31/1993	Fluoride	0.51	mg/L
GW	McCravey-Greyback	3/31/1993	Iron	0.05	mg/L
GW	McCravey-Greyback	3/31/1993	Lead	<0.02	mg/L
GW	McCravey-Greyback	3/31/1993	Manganese	<0.02	mg/L
GW	McCravey-Greyback	3/31/1993	Mercury	<0.001	mg/L
GW	McCravey-Greyback	3/31/1993	Molybdenum	<0.02	mg/L
GW	McCravey-Greyback	3/31/1993	Nickel	<0.01	mg/L

GW	McCravey-Greyback	3/31/1993	Nitrate as N (NO3)	3	mg/L
GW	McCravey-Greyback	3/31/1993	Selenium	<0.005	mg/L
GW	McCravey-Greyback	3/31/1993	Silver	<0.01	mg/L
GW	McCravey-Greyback	3/31/1993	Sulfate	207	mg/L
GW	McCravey-Greyback	3/31/1993	TDS	632	mg/L
GW	McCravey-Greyback	3/31/1993	Zinc	0.01	mg/L
GW	McCravey-Greyback	3/31/1993	pH	7.8	pH units
GW	McCravey-Greyback	3/31/1993	Conductivity	927	µmhos/cm
GW	McCravey-Greyback	3/31/1993	Calcium	97	mg/L
GW	McCravey-Greyback	3/31/1993	Magnesium	24	mg/L
GW	McCravey-Greyback	3/31/1993	Sodium	78	mg/L
GW	McCravey-Greyback	3/31/1993	Bicarbonate	302	mg/L CaCO3
GW	McCravey-Greyback	3/31/1993	Carbonate	0	mg/L CaCO3
GW	McCravey-Greyback	3/31/1993	Potassium	2	mg/L
GW	NP-4	3/31/1993	Aluminum	0.3	mg/L
GW	NP-4	3/31/1993	Arsenic	<0.005	mg/L
GW	NP-4	3/31/1993	Barium	<0.5	mg/L
GW	NP-4	3/31/1993	Boron	0.04	mg/L
GW	NP-4	3/31/1993	Cadmium	<0.002	mg/L
GW	NP-4	3/31/1993	Chloride	45	mg/L
GW	NP-4	3/31/1993	Chromium	<0.02	mg/L
GW	NP-4	3/31/1993	Cobalt	<0.05	mg/L
GW	NP-4	3/31/1993	Copper	0.01	mg/L
GW	NP-4	3/31/1993	Cyanide	<0.01	mg/L
GW	NP-4	3/31/1993	Fluoride	0.53	mg/L
GW	NP-4	3/31/1993	Iron	0.62	mg/L
GW	NP-4	3/31/1993	Lead	<0.02	mg/L
GW	NP-4	3/31/1993	Manganese	0.84	mg/L
GW	NP-4	3/31/1993	Mercury	0.009	mg/L
GW	NP-4	3/31/1993	Molybdenum	<0.02	mg/L
GW	NP-4	3/31/1993	Nickel	<0.01	mg/L
GW	NP-4	3/31/1993	Nitrate as N (NO3)	3.7	mg/L
GW	NP-4	3/31/1993	Selenium	<0.005	mg/L
GW	NP-4	3/31/1993	Silver	<0.01	mg/L
GW	NP-4	3/31/1993	Sulfate	134	mg/L
GW	NP-4	3/31/1993	TDS	504	mg/L
GW	NP-4	3/31/1993	Zinc	2.41	mg/L
GW	NP-4	3/31/1993	pH	7.6	pH units
GW	NP-4	3/31/1993	Conductivity	813	µmhos/cm
GW	NP-4	3/31/1993	Calcium	76	mg/L
GW	NP-4	3/31/1993	Magnesium	17	mg/L
GW	NP-4	3/31/1993	Sodium	79	mg/L
GW	NP-4	3/31/1993	Bicarbonate	275	mg/L CaCO3
GW	NP-4	3/31/1993	Carbonate	0	mg/L CaCO3
GW	NP-4	3/31/1993	Potassium	2.2	mg/L
GW	GWQ-4	4/1/1993	Aluminum	<0.1	mg/L
GW	GWQ-4	4/1/1993	Arsenic	<0.005	mg/L
GW	GWQ-4	4/1/1993	Barium	1	mg/L
GW	GWQ-4	4/1/1993	Boron	0.02	mg/L
GW	GWQ-4	4/1/1993	Cadmium	<0.002	mg/L
GW	GWQ-4	4/1/1993	Chloride	27	mg/L
GW	GWQ-4	4/1/1993	Chromium	<0.02	mg/L
GW	GWQ-4	4/1/1993	Cobalt	<0.05	mg/L
GW	GWQ-4	4/1/1993	Copper	<0.01	mg/L
GW	GWQ-4	4/1/1993	Cyanide	<0.01	mg/L
GW	GWQ-4	4/1/1993	Fluoride	0.73	mg/L
GW	GWQ-4	4/1/1993	Iron	0.2	mg/L
GW	GWQ-4	4/1/1993	Lead	<0.02	mg/L
GW	GWQ-4	4/1/1993	Manganese	<0.02	mg/L
GW	GWQ-4	4/1/1993	Mercury	<0.001	mg/L
GW	GWQ-4	4/1/1993	Molybdenum	<0.02	mg/L
GW	GWQ-4	4/1/1993	Nickel	<0.01	mg/L
GW	GWQ-4	4/1/1993	Nitrate as N (NO3)	0.1	mg/L
GW	GWQ-4	4/1/1993	Selenium	<0.005	mg/L
GW	GWQ-4	4/1/1993	Silver	<0.01	mg/L
GW	GWQ-4	4/1/1993	Sulfate	235	mg/L
GW	GWQ-4	4/1/1993	TDS	702	mg/L
GW	GWQ-4	4/1/1993	Zinc	0.38	mg/L
GW	GWQ-4	4/1/1993	pH	7.6	pH units
GW	GWQ-4	4/1/1993	Conductivity	1060	µmhos/cm
GW	GWQ-4	4/1/1993	Calcium	125	mg/L
GW	GWQ-4	4/1/1993	Magnesium	23	mg/L
GW	GWQ-4	4/1/1993	Sodium	86	mg/L
GW	GWQ-4	4/1/1993	Bicarbonate	404	mg/L CaCO3
GW	GWQ-4	4/1/1993	Carbonate	0	mg/L CaCO3
GW	GWQ-4	4/1/1993	Potassium	1	mg/L

GW	GWQ-6	4/1/1993	Aluminum	<0.1	mg/L
GW	GWQ-6	4/1/1993	Arsenic	<0.005	mg/L
GW	GWQ-6	4/1/1993	Barium	0.6	mg/L
GW	GWQ-6	4/1/1993	Boron	0.09	mg/L
GW	GWQ-6	4/1/1993	Cadmium	<0.002	mg/L
GW	GWQ-6	4/1/1993	Chloride	22	mg/L
GW	GWQ-6	4/1/1993	Chromium	<0.02	mg/L
GW	GWQ-6	4/1/1993	Cobalt	<0.05	mg/L
GW	GWQ-6	4/1/1993	Copper	0.03	mg/L
GW	GWQ-6	4/1/1993	Cyanide	<0.01	mg/L
GW	GWQ-6	4/1/1993	Fluoride	0.84	mg/L
GW	GWQ-6	4/1/1993	Iron	5.05	mg/L
GW	GWQ-6	4/1/1993	Lead	<0.02	mg/L
GW	GWQ-6	4/1/1993	Manganese	0.36	mg/L
GW	GWQ-6	4/1/1993	Mercury	<0.001	mg/L
GW	GWQ-6	4/1/1993	Molybdenum	<0.02	mg/L
GW	GWQ-6	4/1/1993	Nickel	<0.01	mg/L
GW	GWQ-6	4/1/1993	Nitrate as N (NO3)	1.1	mg/L
GW	GWQ-6	4/1/1993	Selenium	<0.005	mg/L
GW	GWQ-6	4/1/1993	Silver	<0.01	mg/L
GW	GWQ-6	4/1/1993	Sulfate	10	mg/L
GW	GWQ-6	4/1/1993	TDS	304	mg/L
GW	GWQ-6	4/1/1993	Zinc	0.03	mg/L
GW	GWQ-6	4/1/1993	pH	7.7	pH units
GW	GWQ-6	4/1/1993	Conductivity	597	µmhos/cm
GW	GWQ-6	4/1/1993	Calcium	49	mg/L
GW	GWQ-6	4/1/1993	Magnesium	14	mg/L
GW	GWQ-6	4/1/1993	Sodium	53	mg/L
GW	GWQ-6	4/1/1993	Bicarbonate	322	mg/L CaCO3
GW	GWQ-6	4/1/1993	Carbonate	0	mg/L CaCO3
GW	GWQ-6	4/1/1993	Potassium	3.1	mg/L
GW	GWQ-10	9/28/1993	Chloride	96	mg/L
GW	GWQ-10	9/28/1993	Sulfate	142.6	mg/L
GW	GWQ-10	9/28/1993	TDS	693	mg/L
GW	GWQ-10	9/28/1993	pH	7.7	pH units
GW	GWQ-11	9/28/1993	Chloride	105.6	mg/L
GW	GWQ-11	9/28/1993	Sulfate	207.7	mg/L
GW	GWQ-11	9/28/1993	TDS	800	mg/L
GW	GWQ-11	9/28/1993	pH	7.57	pH units
GW	IW-1	9/28/1993	Chloride	521.1	mg/L
GW	IW-1	9/28/1993	Sulfate	1150	mg/L
GW	IW-1	9/28/1993	TDS	3661	mg/L
GW	IW-1	9/28/1993	pH	7.12	pH units
GW	NP-1	9/28/1993	Chloride	36.2	mg/L
GW	NP-1	9/28/1993	Sulfate	110.1	mg/L
GW	NP-1	9/28/1993	TDS	508	mg/L
GW	NP-1	9/28/1993	pH	7.48	pH units
GW	NP-2	9/28/1993	Chloride	207	mg/L
GW	NP-2	9/28/1993	Sulfate	299.9	mg/L
GW	NP-2	9/28/1993	TDS	1170	mg/L
GW	NP-2	9/28/1993	pH	7.92	pH units
GW	NP-3	9/28/1993	Chloride	210.3	mg/L
GW	NP-3	9/28/1993	Copper	<0.001	mg/L
GW	NP-3	9/28/1993	Iron	<0.05	mg/L
GW	NP-3	9/28/1993	Manganese	0.24	mg/L
GW	NP-3	9/28/1993	Sulfate	619.4	mg/L
GW	NP-3	9/28/1993	TDS	1544	mg/L
GW	NP-3	9/28/1993	Zinc	1.04	mg/L
GW	NP-3	9/28/1993	pH	7.88	pH units
GW	NP-4	9/28/1993	Chloride	56.9	mg/L
GW	NP-4	9/28/1993	Sulfate	108.5	mg/L
GW	NP-4	9/28/1993	TDS	437	mg/L
GW	NP-4	9/28/1993	pH	8.2	pH units
GW	NP-5	9/28/1993	Chloride	48.1	mg/L
GW	NP-5	9/28/1993	Sulfate	109.2	mg/L
GW	NP-5	9/28/1993	TDS	518	mg/L
GW	NP-5	9/28/1993	pH	7.79	pH units
GW	IW-1	3/17/1994	Chloride	404.8	mg/L
GW	IW-1	3/17/1994	Sulfate	1569	mg/L
GW	IW-1	3/17/1994	TDS	3684	mg/L
GW	IW-1	3/17/1994	pH	7	pH units
GW	NP-1	3/17/1994	Chloride	24	mg/L
GW	NP-1	3/17/1994	Sulfate	134.2	mg/L
GW	NP-1	3/17/1994	TDS	516	mg/L
GW	NP-1	3/17/1994	pH	7.3	pH units
GW	NP-2	3/17/1994	Chloride	118.2	mg/L

GW	NP-2	3/17/1994	Sulfate	300.5	mg/L
GW	NP-2	3/17/1994	TDS	971	mg/L
GW	NP-2	3/17/1994	pH	7.65	pH units
GW	NP-3	3/17/1994	Chloride	169.5	mg/L
GW	NP-3	3/17/1994	Copper	0.012	mg/L
GW	NP-3	3/17/1994	Iron	0.24	mg/L
GW	NP-3	3/17/1994	Manganese	0.33	mg/L
GW	NP-3	3/17/1994	Sulfate	746.9	mg/L
GW	NP-3	3/17/1994	TDS	1609	mg/L
GW	NP-3	3/17/1994	Zinc	2.58	mg/L
GW	NP-3	3/17/1994	pH	7.46	pH units
GW	IW-1	5/24/1994	Aluminum	0.94	mg/L
GW	IW-1	5/24/1994	Arsenic	<0.005	mg/L
GW	IW-1	5/24/1994	Barium	<0.1	mg/L
GW	IW-1	5/24/1994	Cadmium	<0.0005	mg/L
GW	IW-1	5/24/1994	Chloride	470	mg/L
GW	IW-1	5/24/1994	Chromium	<0.025	mg/L
GW	IW-1	5/24/1994	Copper	<0.025	mg/L
GW	IW-1	5/24/1994	Fluoride	0.7	mg/L
GW	IW-1	5/24/1994	Iron	1	mg/L
GW	IW-1	5/24/1994	Lead	<0.005	mg/L
GW	IW-1	5/24/1994	Manganese	<0.03	mg/L
GW	IW-1	5/24/1994	Mercury	<0.001	mg/L
GW	IW-1	5/24/1994	Nickel	<0.05	mg/L
GW	IW-1	5/24/1994	Nitrate as N (NO3)	5.8	mg/L
GW	IW-1	5/24/1994	Selenium	<0.005	mg/L
GW	IW-1	5/24/1994	Silver	<0.025	mg/L
GW	IW-1	5/24/1994	Sulfate	1500	mg/L
GW	IW-1	5/24/1994	TDS	3500	mg/L
GW	IW-1	5/24/1994	Zinc	0.053	mg/L
GW	IW-1	5/24/1994	pH	7.84	pH units
GW	IW-1	5/24/1994	Conductivity	3920	µmhos/cm
GW	IW-1	5/24/1994	Antimony	<0.005	mg/L
GW	IW-1	5/24/1994	Calcium	550	mg/L
GW	IW-1	5/24/1994	Magnesium	170	mg/L
GW	IW-1	5/24/1994	Sodium	250	mg/L
GW	IW-1	5/24/1994	Bicarbonate	248	mg/L CaCO3
GW	IW-1	5/24/1994	Carbonate	0	mg/L CaCO3
GW	IW-1	5/24/1994	Potassium	2.9	mg/L
GW	NP-1	5/24/1994	Aluminum	0.83	mg/L
GW	NP-1	5/24/1994	Arsenic	0.005	mg/L
GW	NP-1	5/24/1994	Barium	<0.1	mg/L
GW	NP-1	5/24/1994	Cadmium	0.0096	mg/L
GW	NP-1	5/24/1994	Chloride	22	mg/L
GW	NP-1	5/24/1994	Chromium	<0.025	mg/L
GW	NP-1	5/24/1994	Copper	<0.025	mg/L
GW	NP-1	5/24/1994	Fluoride	0.56	mg/L
GW	NP-1	5/24/1994	Iron	9.5	mg/L
GW	NP-1	5/24/1994	Lead	0.016	mg/L
GW	NP-1	5/24/1994	Manganese	0.1	mg/L
GW	NP-1	5/24/1994	Mercury	<0.001	mg/L
GW	NP-1	5/24/1994	Nickel	<0.05	mg/L
GW	NP-1	5/24/1994	Nitrate as N (NO3)	1.1	mg/L
GW	NP-1	5/24/1994	Selenium	<0.005	mg/L
GW	NP-1	5/24/1994	Silver	<0.025	mg/L
GW	NP-1	5/24/1994	Sulfate	130	mg/L
GW	NP-1	5/24/1994	TDS	510	mg/L
GW	NP-1	5/24/1994	Zinc	5.7	mg/L
GW	NP-1	5/24/1994	pH	7.53	pH units
GW	NP-1	5/24/1994	Conductivity	680	µmhos/cm
GW	NP-1	5/24/1994	Antimony	<0.005	mg/L
GW	NP-1	5/24/1994	Calcium	79	mg/L
GW	NP-1	5/24/1994	Magnesium	23	mg/L
GW	NP-1	5/24/1994	Sodium	48	mg/L
GW	NP-1	5/24/1994	Bicarbonate	263	mg/L CaCO3
GW	NP-1	5/24/1994	Carbonate	0	mg/L CaCO3
GW	NP-1	5/24/1994	Potassium	2.5	mg/L
GW	NP-2	5/24/1994	Aluminum	4.6	mg/L
GW	NP-2	5/24/1994	Arsenic	<0.005	mg/L
GW	NP-2	5/24/1994	Barium	<0.1	mg/L
GW	NP-2	5/24/1994	Cadmium	0.00097	mg/L
GW	NP-2	5/24/1994	Chloride	130	mg/L
GW	NP-2	5/24/1994	Chromium	<0.025	mg/L
GW	NP-2	5/24/1994	Copper	<0.025	mg/L
GW	NP-2	5/24/1994	Fluoride	0.97	mg/L
GW	NP-2	5/24/1994	Iron	4.5	mg/L

GW	NP-2	5/24/1994	Lead	0.0079	mg/L
GW	NP-2	5/24/1994	Manganese	0.19	mg/L
GW	NP-2	5/24/1994	Mercury	<0.001	mg/L
GW	NP-2	5/24/1994	Nickel	<0.05	mg/L
GW	NP-2	5/24/1994	Nitrate as N (NO3)	<0.1	mg/L
GW	NP-2	5/24/1994	Selenium	<0.005	mg/L
GW	NP-2	5/24/1994	Silver	<0.025	mg/L
GW	NP-2	5/24/1994	Sulfate	300	mg/L
GW	NP-2	5/24/1994	TDS	878	mg/L
GW	NP-2	5/24/1994	Zinc	4.1	mg/L
GW	NP-2	5/24/1994	pH	8.03	pH units
GW	NP-2	5/24/1994	Conductivity	1250	µmhos/cm
GW	NP-2	5/24/1994	Antimony	<0.005	mg/L
GW	NP-2	5/24/1994	Calcium	120	mg/L
GW	NP-2	5/24/1994	Magnesium	47	mg/L
GW	NP-2	5/24/1994	Sodium	100	mg/L
GW	NP-2	5/24/1994	Bicarbonate	261	mg/L CaCO3
GW	NP-2	5/24/1994	Carbonate	0	mg/L CaCO3
GW	NP-2	5/24/1994	Potassium	2.3	mg/L
GW	NP-5	5/24/1994	Aluminum	1.1	mg/L
GW	NP-5	5/24/1994	Arsenic	<0.005	mg/L
GW	NP-5	5/24/1994	Barium	<0.1	mg/L
GW	NP-5	5/24/1994	Cadmium	<0.0005	mg/L
GW	NP-5	5/24/1994	Chloride	41	mg/L
GW	NP-5	5/24/1994	Chromium	<0.025	mg/L
GW	NP-5	5/24/1994	Copper	<0.025	mg/L
GW	NP-5	5/24/1994	Fluoride	0.74	mg/L
GW	NP-5	5/24/1994	Iron	1.2	mg/L
GW	NP-5	5/24/1994	Lead	0.0077	mg/L
GW	NP-5	5/24/1994	Manganese	0.086	mg/L
GW	NP-5	5/24/1994	Mercury	<0.001	mg/L
GW	NP-5	5/24/1994	Nickel	<0.05	mg/L
GW	NP-5	5/24/1994	Nitrate as N (NO3)	3.4	mg/L
GW	NP-5	5/24/1994	Selenium	<0.005	mg/L
GW	NP-5	5/24/1994	Silver	<0.025	mg/L
GW	NP-5	5/24/1994	Sulfate	130	mg/L
GW	NP-5	5/24/1994	TDS	520	mg/L
GW	NP-5	5/24/1994	Zinc	2.3	mg/L
GW	NP-5	5/24/1994	pH	7.84	pH units
GW	NP-5	5/24/1994	Conductivity	680	µmhos/cm
GW	NP-5	5/24/1994	Antimony	<0.005	mg/L
GW	NP-5	5/24/1994	Calcium	86	mg/L
GW	NP-5	5/24/1994	Magnesium	26	mg/L
GW	NP-5	5/24/1994	Sodium	40	mg/L
GW	NP-5	5/24/1994	Bicarbonate	211	mg/L CaCO3
GW	NP-5	5/24/1994	Carbonate	0	mg/L CaCO3
GW	NP-5	5/24/1994	Potassium	3.4	mg/L
GW	GWQ-1	5/25/1994	Aluminum	0.025	mg/L
GW	GWQ-1	5/25/1994	Arsenic	<0.005	mg/L
GW	GWQ-1	5/25/1994	Barium	<0.1	mg/L
GW	GWQ-1	5/25/1994	Cadmium	<0.0005	mg/L
GW	GWQ-1	5/25/1994	Chloride	22	mg/L
GW	GWQ-1	5/25/1994	Chromium	<0.025	mg/L
GW	GWQ-1	5/25/1994	Copper	<0.025	mg/L
GW	GWQ-1	5/25/1994	Fluoride	0.52	mg/L
GW	GWQ-1	5/25/1994	Iron	<0.05	mg/L
GW	GWQ-1	5/25/1994	Lead	<0.005	mg/L
GW	GWQ-1	5/25/1994	Manganese	<0.03	mg/L
GW	GWQ-1	5/25/1994	Mercury	<0.001	mg/L
GW	GWQ-1	5/25/1994	Nickel	<0.05	mg/L
GW	GWQ-1	5/25/1994	Nitrate as N (NO3)	4.3	mg/L
GW	GWQ-1	5/25/1994	Selenium	<0.005	mg/L
GW	GWQ-1	5/25/1994	Silver	<0.025	mg/L
GW	GWQ-1	5/25/1994	Sulfate	150	mg/L
GW	GWQ-1	5/25/1994	TDS	614	mg/L
GW	GWQ-1	5/25/1994	Zinc	<0.05	mg/L
GW	GWQ-1	5/25/1994	pH	7.9	pH units
GW	GWQ-1	5/25/1994	Conductivity	760	µmhos/cm
GW	GWQ-1	5/25/1994	Antimony	<0.005	mg/L
GW	GWQ-1	5/25/1994	Calcium	80	mg/L
GW	GWQ-1	5/25/1994	Magnesium	18	mg/L
GW	GWQ-1	5/25/1994	Sodium	55	mg/L
GW	GWQ-1	5/25/1994	Bicarbonate	270	mg/L CaCO3
GW	GWQ-1	5/25/1994	Carbonate	0	mg/L CaCO3
GW	GWQ-1	5/25/1994	Potassium	2.7	mg/L
GW	GWQ-11	5/25/1994	Aluminum	0.14	mg/L

GW	GWQ-11	5/25/1994	Arsenic	<0.005	mg/L
GW	GWQ-11	5/25/1994	Barium	<0.1	mg/L
GW	GWQ-11	5/25/1994	Cadmium	<0.0005	mg/L
GW	GWQ-11	5/25/1994	Chloride	110	mg/L
GW	GWQ-11	5/25/1994	Chromium	<0.025	mg/L
GW	GWQ-11	5/25/1994	Copper	<0.025	mg/L
GW	GWQ-11	5/25/1994	Fluoride	0.72	mg/L
GW	GWQ-11	5/25/1994	Iron	0.16	mg/L
GW	GWQ-11	5/25/1994	Lead	<0.005	mg/L
GW	GWQ-11	5/25/1994	Manganese	<0.03	mg/L
GW	GWQ-11	5/25/1994	Mercury	<0.001	mg/L
GW	GWQ-11	5/25/1994	Nickel	<0.05	mg/L
GW	GWQ-11	5/25/1994	Nitrate as N (NO3)	3.8	mg/L
GW	GWQ-11	5/25/1994	Selenium	<0.005	mg/L
GW	GWQ-11	5/25/1994	Silver	<0.025	mg/L
GW	GWQ-11	5/25/1994	Sulfate	260	mg/L
GW	GWQ-11	5/25/1994	TDS	820	mg/L
GW	GWQ-11	5/25/1994	Zinc	<0.05	mg/L
GW	GWQ-11	5/25/1994	pH	7.88	pH units
GW	GWQ-11	5/25/1994	Conductivity	1130	µmhos/cm
GW	GWQ-11	5/25/1994	Antimony	<0.005	mg/L
GW	GWQ-11	5/25/1994	Calcium	120	mg/L
GW	GWQ-11	5/25/1994	Magnesium	34	mg/L
GW	GWQ-11	5/25/1994	Sodium	55	mg/L
GW	GWQ-11	5/25/1994	Bicarbonate	199	mg/L CaCO3
GW	GWQ-11	5/25/1994	Carbonate	0	mg/L CaCO3
GW	GWQ-11	5/25/1994	Potassium	3.5	mg/L
GW	GWQ-7	5/25/1994	Aluminum	0.25	mg/L
GW	GWQ-7	5/25/1994	Arsenic	<0.005	mg/L
GW	GWQ-7	5/25/1994	Barium	<0.1	mg/L
GW	GWQ-7	5/25/1994	Cadmium	0.00058	mg/L
GW	GWQ-7	5/25/1994	Chloride	20	mg/L
GW	GWQ-7	5/25/1994	Chromium	<0.025	mg/L
GW	GWQ-7	5/25/1994	Copper	0.11	mg/L
GW	GWQ-7	5/25/1994	Fluoride	2.1	mg/L
GW	GWQ-7	5/25/1994	Iron	0.72	mg/L
GW	GWQ-7	5/25/1994	Lead	<0.005	mg/L
GW	GWQ-7	5/25/1994	Manganese	1.1	mg/L
GW	GWQ-7	5/25/1994	Mercury	<0.001	mg/L
GW	GWQ-7	5/25/1994	Nickel	<0.05	mg/L
GW	GWQ-7	5/25/1994	Nitrate as N (NO3)	<1	mg/L
GW	GWQ-7	5/25/1994	Selenium	<0.005	mg/L
GW	GWQ-7	5/25/1994	Silver	<0.025	mg/L
GW	GWQ-7	5/25/1994	Sulfate	1300	mg/L
GW	GWQ-7	5/25/1994	TDS	2420	mg/L
GW	GWQ-7	5/25/1994	Zinc	<0.05	mg/L
GW	GWQ-7	5/25/1994	pH	7.26	pH units
GW	GWQ-7	5/25/1994	Conductivity	2630	µmhos/cm
GW	GWQ-7	5/25/1994	Antimony	<0.005	mg/L
GW	GWQ-7	5/25/1994	Calcium	490	mg/L
GW	GWQ-7	5/25/1994	Magnesium	51	mg/L
GW	GWQ-7	5/25/1994	Sodium	80	mg/L
GW	GWQ-7	5/25/1994	Bicarbonate	480	mg/L CaCO3
GW	GWQ-7	5/25/1994	Carbonate	0	mg/L CaCO3
GW	GWQ-7	5/25/1994	Potassium	14	mg/L
GW	GWQ-8	5/25/1994	Aluminum	<0.025	mg/L
GW	GWQ-8	5/25/1994	Arsenic	<0.005	mg/L
GW	GWQ-8	5/25/1994	Barium	<0.1	mg/L
GW	GWQ-8	5/25/1994	Boron	<0.1	mg/L
GW	GWQ-8	5/25/1994	Cadmium	<0.0005	mg/L
GW	GWQ-8	5/25/1994	Chloride	41	mg/L
GW	GWQ-8	5/25/1994	Chromium	<0.025	mg/L
GW	GWQ-8	5/25/1994	Cobalt	<0.05	mg/L
GW	GWQ-8	5/25/1994	Copper	<0.025	mg/L
GW	GWQ-8	5/25/1994	Fluoride	0.5	mg/L
GW	GWQ-8	5/25/1994	Iron	0.24	mg/L
GW	GWQ-8	5/25/1994	Lead	<0.005	mg/L
GW	GWQ-8	5/25/1994	Manganese	<0.03	mg/L
GW	GWQ-8	5/25/1994	Mercury	<0.001	mg/L
GW	GWQ-8	5/25/1994	Molybdenum	<0.05	mg/L
GW	GWQ-8	5/25/1994	Nickel	<0.05	mg/L
GW	GWQ-8	5/25/1994	Nitrate as N (NO3)	5.3	mg/L
GW	GWQ-8	5/25/1994	Selenium	<0.005	mg/L
GW	GWQ-8	5/25/1994	Silver	<0.025	mg/L
GW	GWQ-8	5/25/1994	Sulfate	290	mg/L
GW	GWQ-8	5/25/1994	TDS	792	mg/L

GW	GWQ-8	5/25/1994	Zinc	<0.05	mg/L
GW	GWQ-8	5/25/1994	pH	7.97	pH units
GW	GWQ-8	5/25/1994	Conductivity	1060	µmhos/cm
GW	GWQ-8	5/25/1994	Antimony	<0.005	mg/L
GW	GWQ-8	5/25/1994	Calcium	120	mg/L
GW	GWQ-8	5/25/1994	Magnesium	20	mg/L
GW	GWQ-8	5/25/1994	Sodium	76	mg/L
GW	GWQ-8	5/25/1994	Bicarbonate	272	mg/L CaCO3
GW	GWQ-8	5/25/1994	Carbonate	0	mg/L CaCO3
GW	GWQ-8	5/25/1994	Potassium	2.4	mg/L
GW	IW-2	5/25/1994	Aluminum	22	mg/L
GW	IW-2	5/25/1994	Arsenic	<0.005	mg/L
GW	IW-2	5/25/1994	Barium	0.12	mg/L
GW	IW-2	5/25/1994	Cadmium	<0.0005	mg/L
GW	IW-2	5/25/1994	Chloride	340	mg/L
GW	IW-2	5/25/1994	Chromium	0.046	mg/L
GW	IW-2	5/25/1994	Copper	<0.025	mg/L
GW	IW-2	5/25/1994	Fluoride	0.66	mg/L
GW	IW-2	5/25/1994	Iron	16	mg/L
GW	IW-2	5/25/1994	Lead	0.0073	mg/L
GW	IW-2	5/25/1994	Manganese	0.77	mg/L
GW	IW-2	5/25/1994	Mercury	<0.001	mg/L
GW	IW-2	5/25/1994	Nickel	0.097	mg/L
GW	IW-2	5/25/1994	Nitrate as N (NO3)	1.5	mg/L
GW	IW-2	5/25/1994	Selenium	<0.005	mg/L
GW	IW-2	5/25/1994	Silver	<0.025	mg/L
GW	IW-2	5/25/1994	Sulfate	1000	mg/L
GW	IW-2	5/25/1994	TDS	2400	mg/L
GW	IW-2	5/25/1994	Zinc	0.084	mg/L
GW	IW-2	5/25/1994	pH	7.75	pH units
GW	IW-2	5/25/1994	Conductivity	2890	µmhos/cm
GW	IW-2	5/25/1994	Antimony	<0.005	mg/L
GW	IW-2	5/25/1994	Calcium	430	mg/L
GW	IW-2	5/25/1994	Magnesium	94	mg/L
GW	IW-2	5/25/1994	Sodium	290	mg/L
GW	IW-2	5/25/1994	Bicarbonate	534	mg/L CaCO3
GW	IW-2	5/25/1994	Carbonate	0	mg/L CaCO3
GW	IW-2	5/25/1994	Potassium	3.2	mg/L
GW	GWQ-10	5/26/1994	Aluminum	0.85	mg/L
GW	GWQ-10	5/26/1994	Arsenic	<0.005	mg/L
GW	GWQ-10	5/26/1994	Barium	<0.1	mg/L
GW	GWQ-10	5/26/1994	Cadmium	<0.0005	mg/L
GW	GWQ-10	5/26/1994	Chloride	92	mg/L
GW	GWQ-10	5/26/1994	Chromium	<0.025	mg/L
GW	GWQ-10	5/26/1994	Copper	0.026	mg/L
GW	GWQ-10	5/26/1994	Fluoride	0.51	mg/L
GW	GWQ-10	5/26/1994	Iron	1.1	mg/L
GW	GWQ-10	5/26/1994	Lead	<0.005	mg/L
GW	GWQ-10	5/26/1994	Manganese	0.059	mg/L
GW	GWQ-10	5/26/1994	Mercury	<0.001	mg/L
GW	GWQ-10	5/26/1994	Nickel	<0.05	mg/L
GW	GWQ-10	5/26/1994	Nitrate as N (NO3)	3.5	mg/L
GW	GWQ-10	5/26/1994	Selenium	<0.005	mg/L
GW	GWQ-10	5/26/1994	Silver	<0.025	mg/L
GW	GWQ-10	5/26/1994	Sulfate	175	mg/L
GW	GWQ-10	5/26/1994	TDS	1000	mg/L
GW	GWQ-10	5/26/1994	Zinc	0.55	mg/L
GW	GWQ-10	5/26/1994	pH	7.82	pH units
GW	GWQ-10	5/26/1994	Conductivity	1050	µmhos/cm
GW	GWQ-10	5/26/1994	Antimony	<0.005	mg/L
GW	GWQ-10	5/26/1994	Calcium	100	mg/L
GW	GWQ-10	5/26/1994	Magnesium	25	mg/L
GW	GWQ-10	5/26/1994	Sodium	56	mg/L
GW	GWQ-10	5/26/1994	Bicarbonate	232	mg/L CaCO3
GW	GWQ-10	5/26/1994	Carbonate	0	mg/L CaCO3
GW	GWQ-10	5/26/1994	Potassium	3.1	mg/L
GW	GWQ-4	5/26/1994	Aluminum	<0.025	mg/L
GW	GWQ-4	5/26/1994	Arsenic	<0.005	mg/L
GW	GWQ-4	5/26/1994	Barium	<0.1	mg/L
GW	GWQ-4	5/26/1994	Boron	<0.1	mg/L
GW	GWQ-4	5/26/1994	Cadmium	<0.0005	mg/L
GW	GWQ-4	5/26/1994	Chloride	30	mg/L
GW	GWQ-4	5/26/1994	Chromium	<0.025	mg/L
GW	GWQ-4	5/26/1994	Cobalt	<0.05	mg/L
GW	GWQ-4	5/26/1994	Copper	<0.025	mg/L
GW	GWQ-4	5/26/1994	Fluoride	0.63	mg/L

GW	GWQ-4	5/26/1994	Iron	0.13	mg/L
GW	GWQ-4	5/26/1994	Lead	<0.005	mg/L
GW	GWQ-4	5/26/1994	Manganese	<0.03	mg/L
GW	GWQ-4	5/26/1994	Mercury	<0.001	mg/L
GW	GWQ-4	5/26/1994	Molybdenum	<0.05	mg/L
GW	GWQ-4	5/26/1994	Nickel	<0.05	mg/L
GW	GWQ-4	5/26/1994	Nitrate as N (NO3)	<1	mg/L
GW	GWQ-4	5/26/1994	Selenium	<0.005	mg/L
GW	GWQ-4	5/26/1994	Silver	<0.025	mg/L
GW	GWQ-4	5/26/1994	Sulfate	220	mg/L
GW	GWQ-4	5/26/1994	TDS	926	mg/L
GW	GWQ-4	5/26/1994	Zinc	0.56	mg/L
GW	GWQ-4	5/26/1994	pH	8.08	pH units
GW	GWQ-4	5/26/1994	Conductivity	1010	µmhos/cm
GW	GWQ-4	5/26/1994	Antimony	<0.005	mg/L
GW	GWQ-4	5/26/1994	Calcium	93	mg/L
GW	GWQ-4	5/26/1994	Magnesium	22	mg/L
GW	GWQ-4	5/26/1994	Sodium	74	mg/L
GW	GWQ-4	5/26/1994	Bicarbonate	316	mg/L CaCO3
GW	GWQ-4	5/26/1994	Carbonate	0	mg/L CaCO3
GW	GWQ-4	5/26/1994	Potassium	1.8	mg/L
GW	IW-3	5/26/1994	Aluminum	32	mg/L
GW	IW-3	5/26/1994	Arsenic	<0.005	mg/L
GW	IW-3	5/26/1994	Barium	0.2	mg/L
GW	IW-3	5/26/1994	Cadmium	<0.0005	mg/L
GW	IW-3	5/26/1994	Chloride	209	mg/L
GW	IW-3	5/26/1994	Chromium	0.059	mg/L
GW	IW-3	5/26/1994	Copper	6	mg/L
GW	IW-3	5/26/1994	Fluoride	0.47	mg/L
GW	IW-3	5/26/1994	Iron	22	mg/L
GW	IW-3	5/26/1994	Lead	0.077	mg/L
GW	IW-3	5/26/1994	Manganese	0.35	mg/L
GW	IW-3	5/26/1994	Mercury	<0.001	mg/L
GW	IW-3	5/26/1994	Nickel	0.19	mg/L
GW	IW-3	5/26/1994	Nitrate as N (NO3)	5.7	mg/L
GW	IW-3	5/26/1994	Selenium	<0.005	mg/L
GW	IW-3	5/26/1994	Silver	<0.025	mg/L
GW	IW-3	5/26/1994	Sulfate	415	mg/L
GW	IW-3	5/26/1994	TDS	1870	mg/L
GW	IW-3	5/26/1994	Zinc	0.15	mg/L
GW	IW-3	5/26/1994	pH	7.83	pH units
GW	IW-3	5/26/1994	Conductivity	1790	µmhos/cm
GW	IW-3	5/26/1994	Antimony	<0.005	mg/L
GW	IW-3	5/26/1994	Calcium	240	mg/L
GW	IW-3	5/26/1994	Magnesium	51	mg/L
GW	IW-3	5/26/1994	Sodium	69	mg/L
GW	IW-3	5/26/1994	Bicarbonate	341	mg/L CaCO3
GW	IW-3	5/26/1994	Carbonate	0	mg/L CaCO3
GW	IW-3	5/26/1994	Potassium	4	mg/L
GW	NP-4	5/26/1994	Aluminum	3.5	mg/L
GW	NP-4	5/26/1994	Arsenic	<0.005	mg/L
GW	NP-4	5/26/1994	Barium	<0.1	mg/L
GW	NP-4	5/26/1994	Cadmium	0.0034	mg/L
GW	NP-4	5/26/1994	Chloride	39	mg/L
GW	NP-4	5/26/1994	Chromium	<0.025	mg/L
GW	NP-4	5/26/1994	Copper	<0.025	mg/L
GW	NP-4	5/26/1994	Fluoride	0.46	mg/L
GW	NP-4	5/26/1994	Iron	15	mg/L
GW	NP-4	5/26/1994	Lead	0.018	mg/L
GW	NP-4	5/26/1994	Manganese	0.16	mg/L
GW	NP-4	5/26/1994	Mercury	<0.001	mg/L
GW	NP-4	5/26/1994	Nickel	<0.05	mg/L
GW	NP-4	5/26/1994	Nitrate as N (NO3)	4.3	mg/L
GW	NP-4	5/26/1994	Selenium	<0.005	mg/L
GW	NP-4	5/26/1994	Silver	<0.025	mg/L
GW	NP-4	5/26/1994	Sulfate	131	mg/L
GW	NP-4	5/26/1994	TDS	666	mg/L
GW	NP-4	5/26/1994	Zinc	12	mg/L
GW	NP-4	5/26/1994	pH	8.1	pH units
GW	NP-4	5/26/1994	Conductivity	800	µmhos/cm
GW	NP-4	5/26/1994	Antimony	<0.005	mg/L
GW	NP-4	5/26/1994	Calcium	73	mg/L
GW	NP-4	5/26/1994	Magnesium	15	mg/L
GW	NP-4	5/26/1994	Sodium	62	mg/L
GW	NP-4	5/26/1994	Bicarbonate	320	mg/L CaCO3
GW	NP-4	5/26/1994	Carbonate	0	mg/L CaCO3

GW	NP-4	5/26/1994	Potassium	3	mg/L
GW	GWQ-10	6/23/1994	Chloride	103.6	mg/L
GW	GWQ-10	6/23/1994	Sulfate	191.6	mg/L
GW	GWQ-10	6/23/1994	TDS	671	mg/L
GW	GWQ-10	6/23/1994	pH	7.97	pH units
GW	GWQ-11	6/23/1994	Chloride	117.2	mg/L
GW	GWQ-11	6/23/1994	Sulfate	274.6	mg/L
GW	GWQ-11	6/23/1994	TDS	802	mg/L
GW	GWQ-11	6/23/1994	pH	7.42	pH units
GW	IW-1	6/23/1994	Chloride	473.8	mg/L
GW	IW-1	6/23/1994	Sulfate	1444	mg/L
GW	IW-1	6/23/1994	TDS	3555	mg/L
GW	IW-1	6/23/1994	pH	7.69	pH units
GW	NP-1	6/23/1994	Chloride	40.3	mg/L
GW	NP-1	6/23/1994	Sulfate	142.3	mg/L
GW	NP-1	6/23/1994	TDS	453	mg/L
GW	NP-1	6/23/1994	pH	7.5	pH units
GW	NP-2	6/23/1994	Chloride	124.3	mg/L
GW	NP-2	6/23/1994	Sulfate	267.6	mg/L
GW	NP-2	6/23/1994	TDS	848	mg/L
GW	NP-2	6/23/1994	pH	7.69	pH units
GW	NP-3	6/23/1994	Chloride	205.7	mg/L
GW	NP-3	6/23/1994	Sulfate	778.6	mg/L
GW	NP-3	6/23/1994	TDS	1628	mg/L
GW	NP-3	6/23/1994	pH	7.77	pH units
GW	NP-4	6/23/1994	Chloride	48.5	mg/L
GW	NP-4	6/23/1994	Sulfate	133.5	mg/L
GW	NP-4	6/23/1994	TDS	498	mg/L
GW	NP-4	6/23/1994	pH	8.13	pH units
GW	NP-5	6/23/1994	Chloride	54.1	mg/L
GW	NP-5	6/23/1994	Sulfate	142.3	mg/L
GW	NP-5	6/23/1994	TDS	466	mg/L
GW	NP-5	6/23/1994	pH	7.66	pH units
GW	MW-2	7/20/1994	Aluminum	<0.05	mg/L
GW	MW-2	7/20/1994	Arsenic	0.019	mg/L
GW	MW-2	7/20/1994	Barium	<0.1	mg/L
GW	MW-2	7/20/1994	Boron	0.16	mg/L
GW	MW-2	7/20/1994	Cadmium	<0.0005	mg/L
GW	MW-2	7/20/1994	Chloride	5.5	mg/L
GW	MW-2	7/20/1994	Chromium	<0.025	mg/L
GW	MW-2	7/20/1994	Cobalt	<0.05	mg/L
GW	MW-2	7/20/1994	Copper	<0.025	mg/L
GW	MW-2	7/20/1994	Fluoride	3.1	mg/L
GW	MW-2	7/20/1994	Iron	0.069	mg/L
GW	MW-2	7/20/1994	Lead	<0.005	mg/L
GW	MW-2	7/20/1994	Manganese	<0.03	mg/L
GW	MW-2	7/20/1994	Mercury	<0.001	mg/L
GW	MW-2	7/20/1994	Molybdenum	<0.05	mg/L
GW	MW-2	7/20/1994	Nickel	<0.05	mg/L
GW	MW-2	7/20/1994	Nitrate as N (NO3)	<1	mg/L
GW	MW-2	7/20/1994	Selenium	<0.005	mg/L
GW	MW-2	7/20/1994	Silver	<0.025	mg/L
GW	MW-2	7/20/1994	Sulfate	18	mg/L
GW	MW-2	7/20/1994	TDS	254	mg/L
GW	MW-2	7/20/1994	Zinc	<0.05	mg/L
GW	MW-2	7/20/1994	pH	9	pH units
GW	MW-2	7/20/1994	Conductivity	347	µmhos/cm
GW	MW-2	7/20/1994	Antimony	<0.005	mg/L
GW	MW-2	7/20/1994	Beryllium	<0.002	mg/L
GW	MW-2	7/20/1994	Calcium	2.5	mg/L
GW	MW-2	7/20/1994	Magnesium	0.16	mg/L
GW	MW-2	7/20/1994	Thallium	<0.005	mg/L
GW	MW-2	7/20/1994	Sodium	79	mg/L
GW	MW-2	7/20/1994	Bicarbonate	149	mg/L CaCO3
GW	MW-2	7/20/1994	Carbonate	19	mg/L CaCO3
GW	MW-2	7/20/1994	Potassium	<1	mg/L
GW	MW-4	7/20/1994	Aluminum	<0.05	mg/L
GW	MW-4	7/20/1994	Arsenic	<0.005	mg/L
GW	MW-4	7/20/1994	Barium	<0.1	mg/L
GW	MW-4	7/20/1994	Boron	<0.1	mg/L
GW	MW-4	7/20/1994	Cadmium	<0.0005	mg/L
GW	MW-4	7/20/1994	Chloride	17	mg/L
GW	MW-4	7/20/1994	Chromium	<0.025	mg/L
GW	MW-4	7/20/1994	Cobalt	<0.05	mg/L
GW	MW-4	7/20/1994	Copper	<0.025	mg/L
GW	MW-4	7/20/1994	Fluoride	0.28	mg/L

GW	MW-4	7/20/1994	Iron	<0.05	mg/L
GW	MW-4	7/20/1994	Lead	<0.005	mg/L
GW	MW-4	7/20/1994	Manganese	<0.03	mg/L
GW	MW-4	7/20/1994	Mercury	<0.001	mg/L
GW	MW-4	7/20/1994	Molybdenum	<0.05	mg/L
GW	MW-4	7/20/1994	Nickel	<0.05	mg/L
GW	MW-4	7/20/1994	Nitrate as N (NO3)	<1	mg/L
GW	MW-4	7/20/1994	Selenium	<0.005	mg/L
GW	MW-4	7/20/1994	Silver	<0.025	mg/L
GW	MW-4	7/20/1994	Sulfate	66	mg/L
GW	MW-4	7/20/1994	TDS	256	mg/L
GW	MW-4	7/20/1994	Zinc	<0.05	mg/L
GW	MW-4	7/20/1994	pH	8.34	pH units
GW	MW-4	7/20/1994	Conductivity	408	µmhos/cm
GW	MW-4	7/20/1994	Antimony	<0.005	mg/L
GW	MW-4	7/20/1994	Beryllium	<0.002	mg/L
GW	MW-4	7/20/1994	Calcium	15	mg/L
GW	MW-4	7/20/1994	Magnesium	13	mg/L
GW	MW-4	7/20/1994	Thallium	<0.005	mg/L
GW	MW-4	7/20/1994	Sodium	56	mg/L
GW	MW-4	7/20/1994	Bicarbonate	139	mg/L CaCO3
GW	MW-4	7/20/1994	Carbonate	2	mg/L CaCO3
GW	MW-4	7/20/1994	Potassium	3.4	mg/L
GW	MW-5	7/20/1994	Aluminum	<0.05	mg/L
GW	MW-5	7/20/1994	Arsenic	<0.005	mg/L
GW	MW-5	7/20/1994	Barium	<0.1	mg/L
GW	MW-5	7/20/1994	Boron	<0.1	mg/L
GW	MW-5	7/20/1994	Cadmium	<0.0005	mg/L
GW	MW-5	7/20/1994	Chloride	17	mg/L
GW	MW-5	7/20/1994	Chromium	<0.025	mg/L
GW	MW-5	7/20/1994	Cobalt	<0.05	mg/L
GW	MW-5	7/20/1994	Copper	<0.025	mg/L
GW	MW-5	7/20/1994	Fluoride	0.18	mg/L
GW	MW-5	7/20/1994	Iron	<0.05	mg/L
GW	MW-5	7/20/1994	Lead	<0.005	mg/L
GW	MW-5	7/20/1994	Manganese	<0.03	mg/L
GW	MW-5	7/20/1994	Mercury	<0.001	mg/L
GW	MW-5	7/20/1994	Molybdenum	<0.05	mg/L
GW	MW-5	7/20/1994	Nickel	<0.05	mg/L
GW	MW-5	7/20/1994	Nitrate as N (NO3)	<1	mg/L
GW	MW-5	7/20/1994	Selenium	<0.005	mg/L
GW	MW-5	7/20/1994	Silver	<0.025	mg/L
GW	MW-5	7/20/1994	Sulfate	24	mg/L
GW	MW-5	7/20/1994	TDS	440	mg/L
GW	MW-5	7/20/1994	Zinc	<0.05	mg/L
GW	MW-5	7/20/1994	pH	7.97	pH units
GW	MW-5	7/20/1994	Conductivity	507	µmhos/cm
GW	MW-5	7/20/1994	Antimony	<0.005	mg/L
GW	MW-5	7/20/1994	Beryllium	<0.002	mg/L
GW	MW-5	7/20/1994	Calcium	71	mg/L
GW	MW-5	7/20/1994	Magnesium	11	mg/L
GW	MW-5	7/20/1994	Thallium	<0.005	mg/L
GW	MW-5	7/20/1994	Sodium	33	mg/L
GW	MW-5	7/20/1994	Bicarbonate	274	mg/L CaCO3
GW	MW-5	7/20/1994	Carbonate	0	mg/L CaCO3
GW	MW-5	7/20/1994	Potassium	3.6	mg/L
GW	GWQ-1	7/21/1994	Aluminum	<0.05	mg/L
GW	GWQ-1	7/21/1994	Arsenic	<0.005	mg/L
GW	GWQ-1	7/21/1994	Barium	<0.1	mg/L
GW	GWQ-1	7/21/1994	Boron	<0.1	mg/L
GW	GWQ-1	7/21/1994	Cadmium	<0.0005	mg/L
GW	GWQ-1	7/21/1994	Chloride	25	mg/L
GW	GWQ-1	7/21/1994	Chromium	<0.025	mg/L
GW	GWQ-1	7/21/1994	Cobalt	<0.05	mg/L
GW	GWQ-1	7/21/1994	Copper	<0.025	mg/L
GW	GWQ-1	7/21/1994	Fluoride	0.52	mg/L
GW	GWQ-1	7/21/1994	Iron	<0.05	mg/L
GW	GWQ-1	7/21/1994	Lead	<0.005	mg/L
GW	GWQ-1	7/21/1994	Manganese	<0.03	mg/L
GW	GWQ-1	7/21/1994	Mercury	<0.001	mg/L
GW	GWQ-1	7/21/1994	Molybdenum	<0.05	mg/L
GW	GWQ-1	7/21/1994	Nickel	<0.05	mg/L
GW	GWQ-1	7/21/1994	Nitrate as N (NO3)	4.2	mg/L
GW	GWQ-1	7/21/1994	Selenium	<0.005	mg/L
GW	GWQ-1	7/21/1994	Silver	<0.025	mg/L
GW	GWQ-1	7/21/1994	Sulfate	162	mg/L

GW	GWQ-1	7/21/1994	TDS	558	mg/L
GW	GWQ-1	7/21/1994	Zinc	<0.05	mg/L
GW	GWQ-1	7/21/1994	pH	7.97	pH units
GW	GWQ-1	7/21/1994	Conductivity	861	µmhos/cm
GW	GWQ-1	7/21/1994	Antimony	0.0052	mg/L
GW	GWQ-1	7/21/1994	Beryllium	<0.002	mg/L
GW	GWQ-1	7/21/1994	Calcium	95	mg/L
GW	GWQ-1	7/21/1994	Magnesium	19	mg/L
GW	GWQ-1	7/21/1994	Thallium	<0.005	mg/L
GW	GWQ-1	7/21/1994	Sodium	66	mg/L
GW	GWQ-1	7/21/1994	Bicarbonate	278	mg/L CaCO3
GW	GWQ-1	7/21/1994	Carbonate	0	mg/L CaCO3
GW	GWQ-1	7/21/1994	Potassium	2.7	mg/L
GW	GWQ-12	7/21/1994	Aluminum	<0.05	mg/L
GW	GWQ-12	7/21/1994	Arsenic	<0.005	mg/L
GW	GWQ-12	7/21/1994	Barium	<0.1	mg/L
GW	GWQ-12	7/21/1994	Boron	<0.1	mg/L
GW	GWQ-12	7/21/1994	Cadmium	<0.0005	mg/L
GW	GWQ-12	7/21/1994	Chloride	16	mg/L
GW	GWQ-12	7/21/1994	Chromium	<0.025	mg/L
GW	GWQ-12	7/21/1994	Cobalt	<0.05	mg/L
GW	GWQ-12	7/21/1994	Copper	<0.025	mg/L
GW	GWQ-12	7/21/1994	Fluoride	0.99	mg/L
GW	GWQ-12	7/21/1994	Iron	<0.05	mg/L
GW	GWQ-12	7/21/1994	Lead	<0.005	mg/L
GW	GWQ-12	7/21/1994	Manganese	<0.03	mg/L
GW	GWQ-12	7/21/1994	Mercury	<0.001	mg/L
GW	GWQ-12	7/21/1994	Molybdenum	<0.05	mg/L
GW	GWQ-12	7/21/1994	Nickel	<0.05	mg/L
GW	GWQ-12	7/21/1994	Nitrate as N (NO3)	2.1	mg/L
GW	GWQ-12	7/21/1994	Selenium	<0.005	mg/L
GW	GWQ-12	7/21/1994	Silver	<0.025	mg/L
GW	GWQ-12	7/21/1994	Sulfate	38	mg/L
GW	GWQ-12	7/21/1994	TDS	358	mg/L
GW	GWQ-12	7/21/1994	Zinc	<0.05	mg/L
GW	GWQ-12	7/21/1994	pH	7.75	pH units
GW	GWQ-12	7/21/1994	Conductivity	537	µmhos/cm
GW	GWQ-12	7/21/1994	Antimony	0.0064	mg/L
GW	GWQ-12	7/21/1994	Beryllium	<0.002	mg/L
GW	GWQ-12	7/21/1994	Calcium	59	mg/L
GW	GWQ-12	7/21/1994	Magnesium	19	mg/L
GW	GWQ-12	7/21/1994	Thallium	<0.005	mg/L
GW	GWQ-12	7/21/1994	Sodium	29	mg/L
GW	GWQ-12	7/21/1994	Bicarbonate	262	mg/L CaCO3
GW	GWQ-12	7/21/1994	Carbonate	0	mg/L CaCO3
GW	GWQ-12	7/21/1994	Potassium	3.2	mg/L
GW	GWQ-7	7/21/1994	Aluminum	<0.05	mg/L
GW	GWQ-7	7/21/1994	Arsenic	<0.005	mg/L
GW	GWQ-7	7/21/1994	Barium	<0.1	mg/L
GW	GWQ-7	7/21/1994	Boron	<0.1	mg/L
GW	GWQ-7	7/21/1994	Cadmium	<0.0005	mg/L
GW	GWQ-7	7/21/1994	Chloride	22	mg/L
GW	GWQ-7	7/21/1994	Chromium	<0.025	mg/L
GW	GWQ-7	7/21/1994	Cobalt	<0.05	mg/L
GW	GWQ-7	7/21/1994	Copper	<0.025	mg/L
GW	GWQ-7	7/21/1994	Fluoride	16	mg/L
GW	GWQ-7	7/21/1994	Iron	1.2	mg/L
GW	GWQ-7	7/21/1994	Lead	<0.005	mg/L
GW	GWQ-7	7/21/1994	Manganese	0.21	mg/L
GW	GWQ-7	7/21/1994	Mercury	<0.001	mg/L
GW	GWQ-7	7/21/1994	Molybdenum	<0.05	mg/L
GW	GWQ-7	7/21/1994	Nickel	<0.05	mg/L
GW	GWQ-7	7/21/1994	Nitrate as N (NO3)	<1	mg/L
GW	GWQ-7	7/21/1994	Selenium	<0.005	mg/L
GW	GWQ-7	7/21/1994	Silver	<0.025	mg/L
GW	GWQ-7	7/21/1994	Sulfate	<5	mg/L
GW	GWQ-7	7/21/1994	TDS	224	mg/L
GW	GWQ-7	7/21/1994	Zinc	<0.05	mg/L
GW	GWQ-7	7/21/1994	pH	7.72	pH units
GW	GWQ-7	7/21/1994	Conductivity	660	µmhos/cm
GW	GWQ-7	7/21/1994	Antimony	<0.005	mg/L
GW	GWQ-7	7/21/1994	Beryllium	<0.002	mg/L
GW	GWQ-7	7/21/1994	Calcium	14	mg/L
GW	GWQ-7	7/21/1994	Magnesium	8.2	mg/L
GW	GWQ-7	7/21/1994	Thallium	<0.005	mg/L
GW	GWQ-7	7/21/1994	Sodium	47	mg/L

GW	GWQ-7	7/21/1994	Bicarbonate	349	mg/L CaCO3
GW	GWQ-7	7/21/1994	Carbonate	0	mg/L CaCO3
GW	GWQ-7	7/21/1994	Potassium	13	mg/L
GW	MW-8	7/21/1994	Aluminum	<0.05	mg/L
GW	MW-8	7/21/1994	Arsenic	0.012	mg/L
GW	MW-8	7/21/1994	Barium	<0.1	mg/L
GW	MW-8	7/21/1994	Boron	<0.1	mg/L
GW	MW-8	7/21/1994	Cadmium	<0.0005	mg/L
GW	MW-8	7/21/1994	Chloride	6.6	mg/L
GW	MW-8	7/21/1994	Chromium	<0.025	mg/L
GW	MW-8	7/21/1994	Cobalt	<0.05	mg/L
GW	MW-8	7/21/1994	Copper	<0.025	mg/L
GW	MW-8	7/21/1994	Fluoride	1	mg/L
GW	MW-8	7/21/1994	Iron	0.14	mg/L
GW	MW-8	7/21/1994	Lead	<0.005	mg/L
GW	MW-8	7/21/1994	Manganese	<0.03	mg/L
GW	MW-8	7/21/1994	Mercury	<0.001	mg/L
GW	MW-8	7/21/1994	Molybdenum	<0.05	mg/L
GW	MW-8	7/21/1994	Nickel	<0.05	mg/L
GW	MW-8	7/21/1994	Nitrate as N (NO3)	<1	mg/L
GW	MW-8	7/21/1994	Selenium	<0.005	mg/L
GW	MW-8	7/21/1994	Silver	<0.025	mg/L
GW	MW-8	7/21/1994	Sulfate	18	mg/L
GW	MW-8	7/21/1994	TDS	290	mg/L
GW	MW-8	7/21/1994	Zinc	<0.05	mg/L
GW	MW-8	7/21/1994	pH	8.88	pH units
GW	MW-8	7/21/1994	Conductivity	438	µmhos/cm
GW	MW-8	7/21/1994	Antimony	<0.005	mg/L
GW	MW-8	7/21/1994	Beryllium	<0.002	mg/L
GW	MW-8	7/21/1994	Calcium	4.8	mg/L
GW	MW-8	7/21/1994	Magnesium	1	mg/L
GW	MW-8	7/21/1994	Thallium	<0.005	mg/L
GW	MW-8	7/21/1994	Sodium	89	mg/L
GW	MW-8	7/21/1994	Bicarbonate	196	mg/L CaCO3
GW	MW-8	7/21/1994	Carbonate	16	mg/L CaCO3
GW	MW-8	7/21/1994	Potassium	3.4	mg/L
GW	NP-1	7/21/1994	Aluminum	<0.05	mg/L
GW	NP-1	7/21/1994	Arsenic	<0.005	mg/L
GW	NP-1	7/21/1994	Barium	<0.1	mg/L
GW	NP-1	7/21/1994	Boron	<0.1	mg/L
GW	NP-1	7/21/1994	Cadmium	<0.0005	mg/L
GW	NP-1	7/21/1994	Chloride	23	mg/L
GW	NP-1	7/21/1994	Chromium	<0.025	mg/L
GW	NP-1	7/21/1994	Cobalt	<0.05	mg/L
GW	NP-1	7/21/1994	Copper	<0.025	mg/L
GW	NP-1	7/21/1994	Fluoride	0.65	mg/L
GW	NP-1	7/21/1994	Iron	0.052	mg/L
GW	NP-1	7/21/1994	Lead	<0.005	mg/L
GW	NP-1	7/21/1994	Manganese	0.27	mg/L
GW	NP-1	7/21/1994	Mercury	<0.001	mg/L
GW	NP-1	7/21/1994	Molybdenum	<0.05	mg/L
GW	NP-1	7/21/1994	Nickel	<0.05	mg/L
GW	NP-1	7/21/1994	Nitrate as N (NO3)	<1	mg/L
GW	NP-1	7/21/1994	Selenium	<0.005	mg/L
GW	NP-1	7/21/1994	Silver	<0.025	mg/L
GW	NP-1	7/21/1994	Sulfate	133	mg/L
GW	NP-1	7/21/1994	TDS	464	mg/L
GW	NP-1	7/21/1994	Zinc	4.9	mg/L
GW	NP-1	7/21/1994	pH	7.87	pH units
GW	NP-1	7/21/1994	Conductivity	698	µmhos/cm
GW	NP-1	7/21/1994	Antimony	<0.005	mg/L
GW	NP-1	7/21/1994	Beryllium	<0.002	mg/L
GW	NP-1	7/21/1994	Calcium	71	mg/L
GW	NP-1	7/21/1994	Magnesium	23	mg/L
GW	NP-1	7/21/1994	Thallium	<0.005	mg/L
GW	NP-1	7/21/1994	Sodium	47	mg/L
GW	NP-1	7/21/1994	Bicarbonate	249	mg/L CaCO3
GW	NP-1	7/21/1994	Carbonate	0	mg/L CaCO3
GW	NP-1	7/21/1994	Potassium	2.2	mg/L
GW	GWQ-11	7/22/1994	Aluminum	<0.05	mg/L
GW	GWQ-11	7/22/1994	Arsenic	<0.005	mg/L
GW	GWQ-11	7/22/1994	Barium	<0.1	mg/L
GW	GWQ-11	7/22/1994	Boron	<0.1	mg/L
GW	GWQ-11	7/22/1994	Cadmium	<0.0005	mg/L
GW	GWQ-11	7/22/1994	Chloride	116	mg/L
GW	GWQ-11	7/22/1994	Chromium	<0.025	mg/L

GW	GWQ-11	7/22/1994	Cobalt	<0.05	mg/L
GW	GWQ-11	7/22/1994	Copper	<0.025	mg/L
GW	GWQ-11	7/22/1994	Fluoride	0.7	mg/L
GW	GWQ-11	7/22/1994	Iron	<0.05	mg/L
GW	GWQ-11	7/22/1994	Lead	<0.005	mg/L
GW	GWQ-11	7/22/1994	Manganese	<0.03	mg/L
GW	GWQ-11	7/22/1994	Mercury	<0.001	mg/L
GW	GWQ-11	7/22/1994	Molybdenum	<0.05	mg/L
GW	GWQ-11	7/22/1994	Nickel	<0.05	mg/L
GW	GWQ-11	7/22/1994	Nitrate as N (NO3)	3.8	mg/L
GW	GWQ-11	7/22/1994	Selenium	<0.005	mg/L
GW	GWQ-11	7/22/1994	Silver	<0.025	mg/L
GW	GWQ-11	7/22/1994	Sulfate	272	mg/L
GW	GWQ-11	7/22/1994	TDS	808	mg/L
GW	GWQ-11	7/22/1994	Zinc	<0.05	mg/L
GW	GWQ-11	7/22/1994	pH	7.7	pH units
GW	GWQ-11	7/22/1994	Conductivity	1210	µmhos/cm
GW	GWQ-11	7/22/1994	Antimony	0.0055	mg/L
GW	GWQ-11	7/22/1994	Beryllium	<0.002	mg/L
GW	GWQ-11	7/22/1994	Calcium	140	mg/L
GW	GWQ-11	7/22/1994	Magnesium	37	mg/L
GW	GWQ-11	7/22/1994	Thallium	<0.005	mg/L
GW	GWQ-11	7/22/1994	Sodium	66	mg/L
GW	GWQ-11	7/22/1994	Bicarbonate	207	mg/L CaCO3
GW	GWQ-11	7/22/1994	Carbonate	0	mg/L CaCO3
GW	GWQ-11	7/22/1994	Potassium	3.4	mg/L
GW	IW-1	7/22/1994	Aluminum	<0.05	mg/L
GW	IW-1	7/22/1994	Arsenic	<0.005	mg/L
GW	IW-1	7/22/1994	Barium	<0.1	mg/L
GW	IW-1	7/22/1994	Boron	0.1	mg/L
GW	IW-1	7/22/1994	Cadmium	<0.0005	mg/L
GW	IW-1	7/22/1994	Chloride	431	mg/L
GW	IW-1	7/22/1994	Chromium	<0.025	mg/L
GW	IW-1	7/22/1994	Cobalt	<0.05	mg/L
GW	IW-1	7/22/1994	Copper	<0.025	mg/L
GW	IW-1	7/22/1994	Fluoride	0.72	mg/L
GW	IW-1	7/22/1994	Iron	<0.05	mg/L
GW	IW-1	7/22/1994	Lead	<0.005	mg/L
GW	IW-1	7/22/1994	Manganese	<0.03	mg/L
GW	IW-1	7/22/1994	Mercury	<0.001	mg/L
GW	IW-1	7/22/1994	Molybdenum	<0.05	mg/L
GW	IW-1	7/22/1994	Nickel	<0.05	mg/L
GW	IW-1	7/22/1994	Nitrate as N (NO3)	5.9	mg/L
GW	IW-1	7/22/1994	Selenium	0.018	mg/L
GW	IW-1	7/22/1994	Silver	<0.025	mg/L
GW	IW-1	7/22/1994	Sulfate	1480	mg/L
GW	IW-1	7/22/1994	TDS	3450	mg/L
GW	IW-1	7/22/1994	Zinc	<0.05	mg/L
GW	IW-1	7/22/1994	pH	7.51	pH units
GW	IW-1	7/22/1994	Conductivity	4100	µmhos/cm
GW	IW-1	7/22/1994	Antimony	<0.005	mg/L
GW	IW-1	7/22/1994	Beryllium	<0.002	mg/L
GW	IW-1	7/22/1994	Calcium	570	mg/L
GW	IW-1	7/22/1994	Magnesium	200	mg/L
GW	IW-1	7/22/1994	Thallium	0.0063	mg/L
GW	IW-1	7/22/1994	Sodium	280	mg/L
GW	IW-1	7/22/1994	Bicarbonate	256	mg/L CaCO3
GW	IW-1	7/22/1994	Carbonate	0	mg/L CaCO3
GW	IW-1	7/22/1994	Potassium	2.5	mg/L
GW	IW-2	7/22/1994	Aluminum	<0.05	mg/L
GW	IW-2	7/22/1994	Arsenic	<0.005	mg/L
GW	IW-2	7/22/1994	Barium	<0.1	mg/L
GW	IW-2	7/22/1994	Boron	0.15	mg/L
GW	IW-2	7/22/1994	Cadmium	<0.0005	mg/L
GW	IW-2	7/22/1994	Chloride	380	mg/L
GW	IW-2	7/22/1994	Chromium	<0.025	mg/L
GW	IW-2	7/22/1994	Cobalt	<0.05	mg/L
GW	IW-2	7/22/1994	Copper	<0.025	mg/L
GW	IW-2	7/22/1994	Fluoride	0.69	mg/L
GW	IW-2	7/22/1994	Iron	<0.05	mg/L
GW	IW-2	7/22/1994	Lead	<0.005	mg/L
GW	IW-2	7/22/1994	Manganese	0.036	mg/L
GW	IW-2	7/22/1994	Mercury	<0.001	mg/L
GW	IW-2	7/22/1994	Molybdenum	<0.05	mg/L
GW	IW-2	7/22/1994	Nickel	<0.05	mg/L
GW	IW-2	7/22/1994	Nitrate as N (NO3)	<1	mg/L

GW	IW-2	7/22/1994	Selenium	0.014	mg/L
GW	IW-2	7/22/1994	Silver	<0.025	mg/L
GW	IW-2	7/22/1994	Sulfate	1040	mg/L
GW	IW-2	7/22/1994	TDS	2390	mg/L
GW	IW-2	7/22/1994	Zinc	<0.05	mg/L
GW	IW-2	7/22/1994	pH	7.78	pH units
GW	IW-2	7/22/1994	Conductivity	3400	µmhos/cm
GW	IW-2	7/22/1994	Antimony	<0.005	mg/L
GW	IW-2	7/22/1994	Beryllium	<0.002	mg/L
GW	IW-2	7/22/1994	Calcium	390	mg/L
GW	IW-2	7/22/1994	Magnesium	110	mg/L
GW	IW-2	7/22/1994	Thallium	0.0073	mg/L
GW	IW-2	7/22/1994	Sodium	360	mg/L
GW	IW-2	7/22/1994	Bicarbonate	300	mg/L CaCO3
GW	IW-2	7/22/1994	Carbonate	0	mg/L CaCO3
GW	IW-2	7/22/1994	Potassium	1.3	mg/L
GW	NP-2	7/22/1994	Aluminum	<0.05	mg/L
GW	NP-2	7/22/1994	Arsenic	<0.005	mg/L
GW	NP-2	7/22/1994	Barium	<0.1	mg/L
GW	NP-2	7/22/1994	Boron	<0.1	mg/L
GW	NP-2	7/22/1994	Cadmium	<0.0005	mg/L
GW	NP-2	7/22/1994	Chloride	128	mg/L
GW	NP-2	7/22/1994	Chromium	<0.025	mg/L
GW	NP-2	7/22/1994	Cobalt	<0.05	mg/L
GW	NP-2	7/22/1994	Copper	<0.025	mg/L
GW	NP-2	7/22/1994	Fluoride	0.94	mg/L
GW	NP-2	7/22/1994	Iron	<0.05	mg/L
GW	NP-2	7/22/1994	Lead	<0.005	mg/L
GW	NP-2	7/22/1994	Manganese	<0.03	mg/L
GW	NP-2	7/22/1994	Mercury	<0.001	mg/L
GW	NP-2	7/22/1994	Molybdenum	<0.05	mg/L
GW	NP-2	7/22/1994	Nickel	<0.05	mg/L
GW	NP-2	7/22/1994	Nitrate as N (NO3)	1.5	mg/L
GW	NP-2	7/22/1994	Selenium	<0.005	mg/L
GW	NP-2	7/22/1994	Silver	<0.025	mg/L
GW	NP-2	7/22/1994	Sulfate	299	mg/L
GW	NP-2	7/22/1994	TDS	878	mg/L
GW	NP-2	7/22/1994	Zinc	1.2	mg/L
GW	NP-2	7/22/1994	pH	7.88	pH units
GW	NP-2	7/22/1994	Conductivity	1360	µmhos/cm
GW	NP-2	7/22/1994	Antimony	0.0059	mg/L
GW	NP-2	7/22/1994	Beryllium	<0.002	mg/L
GW	NP-2	7/22/1994	Calcium	120	mg/L
GW	NP-2	7/22/1994	Magnesium	43	mg/L
GW	NP-2	7/22/1994	Thallium	<0.005	mg/L
GW	NP-2	7/22/1994	Sodium	120	mg/L
GW	NP-2	7/22/1994	Bicarbonate	270	mg/L CaCO3
GW	NP-2	7/22/1994	Carbonate	0	mg/L CaCO3
GW	NP-2	7/22/1994	Potassium	1.3	mg/L
GW	NP-3	7/22/1994	Aluminum	<0.05	mg/L
GW	NP-3	7/22/1994	Arsenic	<0.005	mg/L
GW	NP-3	7/22/1994	Barium	<0.1	mg/L
GW	NP-3	7/22/1994	Boron	<0.1	mg/L
GW	NP-3	7/22/1994	Cadmium	<0.0005	mg/L
GW	NP-3	7/22/1994	Chloride	194	mg/L
GW	NP-3	7/22/1994	Chromium	<0.025	mg/L
GW	NP-3	7/22/1994	Cobalt	<0.05	mg/L
GW	NP-3	7/22/1994	Copper	<0.025	mg/L
GW	NP-3	7/22/1994	Fluoride	0.34	mg/L
GW	NP-3	7/22/1994	Iron	<0.05	mg/L
GW	NP-3	7/22/1994	Lead	<0.005	mg/L
GW	NP-3	7/22/1994	Manganese	0.61	mg/L
GW	NP-3	7/22/1994	Mercury	<0.001	mg/L
GW	NP-3	7/22/1994	Molybdenum	<0.05	mg/L
GW	NP-3	7/22/1994	Nickel	<0.05	mg/L
GW	NP-3	7/22/1994	Nitrate as N (NO3)	<1	mg/L
GW	NP-3	7/22/1994	Selenium	<0.005	mg/L
GW	NP-3	7/22/1994	Silver	<0.025	mg/L
GW	NP-3	7/22/1994	Sulfate	796	mg/L
GW	NP-3	7/22/1994	TDS	1620	mg/L
GW	NP-3	7/22/1994	Zinc	1.8	mg/L
GW	NP-3	7/22/1994	pH	7.83	pH units
GW	NP-3	7/22/1994	Conductivity	2160	µmhos/cm
GW	NP-3	7/22/1994	Antimony	<0.005	mg/L
GW	NP-3	7/22/1994	Beryllium	<0.002	mg/L
GW	NP-3	7/22/1994	Calcium	320	mg/L

GW	NP-3	7/22/1994	Magnesium	73	mg/L
GW	NP-3	7/22/1994	Thallium	<0.005	mg/L
GW	NP-3	7/22/1994	Sodium	120	mg/L
GW	NP-3	7/22/1994	Bicarbonate	118	mg/L CaCO3
GW	NP-3	7/22/1994	Carbonate	0	mg/L CaCO3
GW	NP-3	7/22/1994	Potassium	4.5	mg/L
GW	GWQ-10	7/23/1994	Aluminum	<0.05	mg/L
GW	GWQ-10	7/23/1994	Arsenic	<0.005	mg/L
GW	GWQ-10	7/23/1994	Barium	<0.1	mg/L
GW	GWQ-10	7/23/1994	Boron	<0.1	mg/L
GW	GWQ-10	7/23/1994	Cadmium	<0.0005	mg/L
GW	GWQ-10	7/23/1994	Chloride	98	mg/L
GW	GWQ-10	7/23/1994	Chromium	<0.025	mg/L
GW	GWQ-10	7/23/1994	Cobalt	<0.05	mg/L
GW	GWQ-10	7/23/1994	Copper	<0.025	mg/L
GW	GWQ-10	7/23/1994	Fluoride	0.49	mg/L
GW	GWQ-10	7/23/1994	Iron	<0.05	mg/L
GW	GWQ-10	7/23/1994	Lead	<0.005	mg/L
GW	GWQ-10	7/23/1994	Manganese	<0.03	mg/L
GW	GWQ-10	7/23/1994	Mercury	<0.001	mg/L
GW	GWQ-10	7/23/1994	Molybdenum	<0.05	mg/L
GW	GWQ-10	7/23/1994	Nickel	<0.05	mg/L
GW	GWQ-10	7/23/1994	Nitrate as N (NO3)	3.5	mg/L
GW	GWQ-10	7/23/1994	Selenium	<0.005	mg/L
GW	GWQ-10	7/23/1994	Silver	<0.025	mg/L
GW	GWQ-10	7/23/1994	Sulfate	184	mg/L
GW	GWQ-10	7/23/1994	TDS	696	mg/L
GW	GWQ-10	7/23/1994	Zinc	<0.05	mg/L
GW	GWQ-10	7/23/1994	pH	7.97	pH units
GW	GWQ-10	7/23/1994	Conductivity	1050	µmhos/cm
GW	GWQ-10	7/23/1994	Antimony	<0.005	mg/L
GW	GWQ-10	7/23/1994	Beryllium	<0.002	mg/L
GW	GWQ-10	7/23/1994	Calcium	110	mg/L
GW	GWQ-10	7/23/1994	Magnesium	26	mg/L
GW	GWQ-10	7/23/1994	Thallium	<0.005	mg/L
GW	GWQ-10	7/23/1994	Sodium	66	mg/L
GW	GWQ-10	7/23/1994	Bicarbonate	238	mg/L CaCO3
GW	GWQ-10	7/23/1994	Carbonate	0	mg/L CaCO3
GW	GWQ-10	7/23/1994	Potassium	2.8	mg/L
GW	IW-3	7/23/1994	Aluminum	<0.05	mg/L
GW	IW-3	7/23/1994	Arsenic	<0.005	mg/L
GW	IW-3	7/23/1994	Barium	<0.1	mg/L
GW	IW-3	7/23/1994	Boron	<0.1	mg/L
GW	IW-3	7/23/1994	Cadmium	<0.0005	mg/L
GW	IW-3	7/23/1994	Chloride	206	mg/L
GW	IW-3	7/23/1994	Chromium	<0.025	mg/L
GW	IW-3	7/23/1994	Cobalt	<0.05	mg/L
GW	IW-3	7/23/1994	Copper	0.058	mg/L
GW	IW-3	7/23/1994	Fluoride	0.48	mg/L
GW	IW-3	7/23/1994	Iron	<0.05	mg/L
GW	IW-3	7/23/1994	Lead	<0.005	mg/L
GW	IW-3	7/23/1994	Manganese	0.13	mg/L
GW	IW-3	7/23/1994	Mercury	<0.001	mg/L
GW	IW-3	7/23/1994	Molybdenum	0.062	mg/L
GW	IW-3	7/23/1994	Nickel	<0.05	mg/L
GW	IW-3	7/23/1994	Nitrate as N (NO3)	5	mg/L
GW	IW-3	7/23/1994	Selenium	0.011	mg/L
GW	IW-3	7/23/1994	Silver	<0.025	mg/L
GW	IW-3	7/23/1994	Sulfate	437	mg/L
GW	IW-3	7/23/1994	TDS	1300	mg/L
GW	IW-3	7/23/1994	Zinc	<0.05	mg/L
GW	IW-3	7/23/1994	pH	7.76	pH units
GW	IW-3	7/23/1994	Conductivity	1860	µmhos/cm
GW	IW-3	7/23/1994	Antimony	0.0055	mg/L
GW	IW-3	7/23/1994	Beryllium	<0.002	mg/L
GW	IW-3	7/23/1994	Calcium	200	mg/L
GW	IW-3	7/23/1994	Magnesium	66	mg/L
GW	IW-3	7/23/1994	Thallium	<0.005	mg/L
GW	IW-3	7/23/1994	Sodium	89	mg/L
GW	IW-3	7/23/1994	Bicarbonate	255	mg/L CaCO3
GW	IW-3	7/23/1994	Carbonate	0	mg/L CaCO3
GW	IW-3	7/23/1994	Potassium	3.5	mg/L
GW	NP-4	7/23/1994	Aluminum	<0.05	mg/L
GW	NP-4	7/23/1994	Arsenic	<0.005	mg/L
GW	NP-4	7/23/1994	Barium	<0.1	mg/L
GW	NP-4	7/23/1994	Boron	<0.1	mg/L

GW	NP-4	7/23/1994	Cadmium	<0.0005	mg/L
GW	NP-4	7/23/1994	Chloride	34	mg/L
GW	NP-4	7/23/1994	Chromium	<0.025	mg/L
GW	NP-4	7/23/1994	Cobalt	<0.05	mg/L
GW	NP-4	7/23/1994	Copper	<0.025	mg/L
GW	NP-4	7/23/1994	Fluoride	0.48	mg/L
GW	NP-4	7/23/1994	Iron	<0.05	mg/L
GW	NP-4	7/23/1994	Lead	<0.005	mg/L
GW	NP-4	7/23/1994	Manganese	<0.03	mg/L
GW	NP-4	7/23/1994	Mercury	<0.001	mg/L
GW	NP-4	7/23/1994	Molybdenum	<0.05	mg/L
GW	NP-4	7/23/1994	Nickel	<0.05	mg/L
GW	NP-4	7/23/1994	Nitrate as N (NO3)	4.6	mg/L
GW	NP-4	7/23/1994	Selenium	<0.005	mg/L
GW	NP-4	7/23/1994	Silver	<0.025	mg/L
GW	NP-4	7/23/1994	Sulfate	120	mg/L
GW	NP-4	7/23/1994	TDS	536	mg/L
GW	NP-4	7/23/1994	Zinc	0.51	mg/L
GW	NP-4	7/23/1994	pH	7.9	pH units
GW	NP-4	7/23/1994	Conductivity	828	µmhos/cm
GW	NP-4	7/23/1994	Antimony	0.01	mg/L
GW	NP-4	7/23/1994	Beryllium	<0.002	mg/L
GW	NP-4	7/23/1994	Calcium	88	mg/L
GW	NP-4	7/23/1994	Magnesium	16	mg/L
GW	NP-4	7/23/1994	Thallium	<0.005	mg/L
GW	NP-4	7/23/1994	Sodium	72	mg/L
GW	NP-4	7/23/1994	Bicarbonate	279	mg/L CaCO3
GW	NP-4	7/23/1994	Carbonate	0	mg/L CaCO3
GW	NP-4	7/23/1994	Potassium	2.5	mg/L
GW	NP-5	7/23/1994	Aluminum	<0.05	mg/L
GW	NP-5	7/23/1994	Arsenic	<0.005	mg/L
GW	NP-5	7/23/1994	Barium	<0.1	mg/L
GW	NP-5	7/23/1994	Boron	<0.1	mg/L
GW	NP-5	7/23/1994	Cadmium	<0.0005	mg/L
GW	NP-5	7/23/1994	Chloride	41	mg/L
GW	NP-5	7/23/1994	Chromium	<0.025	mg/L
GW	NP-5	7/23/1994	Cobalt	<0.05	mg/L
GW	NP-5	7/23/1994	Copper	<0.025	mg/L
GW	NP-5	7/23/1994	Fluoride	0.71	mg/L
GW	NP-5	7/23/1994	Iron	<0.05	mg/L
GW	NP-5	7/23/1994	Lead	<0.005	mg/L
GW	NP-5	7/23/1994	Manganese	<0.03	mg/L
GW	NP-5	7/23/1994	Mercury	<0.001	mg/L
GW	NP-5	7/23/1994	Molybdenum	<0.05	mg/L
GW	NP-5	7/23/1994	Nickel	<0.05	mg/L
GW	NP-5	7/23/1994	Nitrate as N (NO3)	3.3	mg/L
GW	NP-5	7/23/1994	Selenium	<0.005	mg/L
GW	NP-5	7/23/1994	Silver	<0.025	mg/L
GW	NP-5	7/23/1994	Sulfate	131	mg/L
GW	NP-5	7/23/1994	TDS	494	mg/L
GW	NP-5	7/23/1994	Zinc	<0.05	mg/L
GW	NP-5	7/23/1994	pH	7.89	pH units
GW	NP-5	7/23/1994	Conductivity	749	µmhos/cm
GW	NP-5	7/23/1994	Antimony	<0.005	mg/L
GW	NP-5	7/23/1994	Beryllium	<0.002	mg/L
GW	NP-5	7/23/1994	Calcium	79	mg/L
GW	NP-5	7/23/1994	Magnesium	24	mg/L
GW	NP-5	7/23/1994	Thallium	<0.005	mg/L
GW	NP-5	7/23/1994	Sodium	45	mg/L
GW	NP-5	7/23/1994	Bicarbonate	206	mg/L CaCO3
GW	NP-5	7/23/1994	Carbonate	0	mg/L CaCO3
GW	NP-5	7/23/1994	Potassium	3.1	mg/L
GW	MW-6	8/2/1994	Aluminum	<0.05	mg/L
GW	MW-6	8/2/1994	Arsenic	0.013	mg/L
GW	MW-6	8/2/1994	Barium	<0.1	mg/L
GW	MW-6	8/2/1994	Boron	0.16	mg/L
GW	MW-6	8/2/1994	Cadmium	<0.0005	mg/L
GW	MW-6	8/2/1994	Chloride	75	mg/L
GW	MW-6	8/2/1994	Chromium	<0.025	mg/L
GW	MW-6	8/2/1994	Cobalt	<0.05	mg/L
GW	MW-6	8/2/1994	Copper	<0.025	mg/L
GW	MW-6	8/2/1994	Fluoride	1.6	mg/L
GW	MW-6	8/2/1994	Iron	0.41	mg/L
GW	MW-6	8/2/1994	Lead	<0.005	mg/L
GW	MW-6	8/2/1994	Manganese	<0.03	mg/L
GW	MW-6	8/2/1994	Mercury	<0.001	mg/L

GW	MW-6	8/2/1994	Molybdenum	<0.05	mg/L
GW	MW-6	8/2/1994	Nickel	<0.05	mg/L
GW	MW-6	8/2/1994	Nitrate as N (NO3)	<1	mg/L
GW	MW-6	8/2/1994	Selenium	<0.005	mg/L
GW	MW-6	8/2/1994	Silver	<0.025	mg/L
GW	MW-6	8/2/1994	Sulfate	45	mg/L
GW	MW-6	8/2/1994	TDS	436	mg/L
GW	MW-6	8/2/1994	Zinc	<0.05	mg/L
GW	MW-6	8/2/1994	pH	8.09	pH units
GW	MW-6	8/2/1994	Conductivity	626	µmhos/cm
GW	MW-6	8/2/1994	Antimony	0.01	mg/L
GW	MW-6	8/2/1994	Beryllium	<0.002	mg/L
GW	MW-6	8/2/1994	Calcium	14	mg/L
GW	MW-6	8/2/1994	Magnesium	0.95	mg/L
GW	MW-6	8/2/1994	Thallium	<0.005	mg/L
GW	MW-6	8/2/1994	Sodium	120	mg/L
GW	MW-6	8/2/1994	Bicarbonate	154	mg/L CaCO3
GW	MW-6	8/2/1994	Carbonate	0	mg/L CaCO3
GW	MW-6	8/2/1994	Potassium	6.2	mg/L
GW	PW-2	8/2/1994	Aluminum	<0.05	mg/L
GW	PW-2	8/2/1994	Arsenic	<0.005	mg/L
GW	PW-2	8/2/1994	Barium	<0.1	mg/L
GW	PW-2	8/2/1994	Boron	<0.1	mg/L
GW	PW-2	8/2/1994	Cadmium	<0.0005	mg/L
GW	PW-2	8/2/1994	Chloride	24	mg/L
GW	PW-2	8/2/1994	Chromium	<0.025	mg/L
GW	PW-2	8/2/1994	Cobalt	<0.05	mg/L
GW	PW-2	8/2/1994	Copper	<0.025	mg/L
GW	PW-2	8/2/1994	Fluoride	0.39	mg/L
GW	PW-2	8/2/1994	Iron	0.062	mg/L
GW	PW-2	8/2/1994	Lead	<0.005	mg/L
GW	PW-2	8/2/1994	Manganese	0.032	mg/L
GW	PW-2	8/2/1994	Mercury	<0.001	mg/L
GW	PW-2	8/2/1994	Molybdenum	<0.05	mg/L
GW	PW-2	8/2/1994	Nickel	<0.05	mg/L
GW	PW-2	8/2/1994	Nitrate as N (NO3)	<1	mg/L
GW	PW-2	8/2/1994	Selenium	<0.005	mg/L
GW	PW-2	8/2/1994	Silver	<0.025	mg/L
GW	PW-2	8/2/1994	Sulfate	27	mg/L
GW	PW-2	8/2/1994	TDS	338	mg/L
GW	PW-2	8/2/1994	Zinc	<0.05	mg/L
GW	PW-2	8/2/1994	pH	7.63	pH units
GW	PW-2	8/2/1994	Conductivity	506	µmhos/cm
GW	PW-2	8/2/1994	Antimony	0.011	mg/L
GW	PW-2	8/2/1994	Beryllium	<0.002	mg/L
GW	PW-2	8/2/1994	Calcium	60	mg/L
GW	PW-2	8/2/1994	Magnesium	8.4	mg/L
GW	PW-2	8/2/1994	Thallium	<0.005	mg/L
GW	PW-2	8/2/1994	Sodium	46	mg/L
GW	PW-2	8/2/1994	Bicarbonate	273	mg/L CaCO3
GW	PW-2	8/2/1994	Carbonate	0	mg/L CaCO3
GW	PW-2	8/2/1994	Potassium	3.4	mg/L
GW	PW-4	8/2/1994	Aluminum	<0.05	mg/L
GW	PW-4	8/2/1994	Arsenic	0.0058	mg/L
GW	PW-4	8/2/1994	Barium	<0.1	mg/L
GW	PW-4	8/2/1994	Boron	<0.1	mg/L
GW	PW-4	8/2/1994	Cadmium	<0.0005	mg/L
GW	PW-4	8/2/1994	Chloride	27	mg/L
GW	PW-4	8/2/1994	Chromium	<0.025	mg/L
GW	PW-4	8/2/1994	Cobalt	<0.05	mg/L
GW	PW-4	8/2/1994	Copper	<0.025	mg/L
GW	PW-4	8/2/1994	Fluoride	0.46	mg/L
GW	PW-4	8/2/1994	Iron	<0.05	mg/L
GW	PW-4	8/2/1994	Lead	<0.005	mg/L
GW	PW-4	8/2/1994	Manganese	<0.03	mg/L
GW	PW-4	8/2/1994	Mercury	<0.001	mg/L
GW	PW-4	8/2/1994	Molybdenum	<0.05	mg/L
GW	PW-4	8/2/1994	Nickel	<0.05	mg/L
GW	PW-4	8/2/1994	Nitrate as N (NO3)	<1	mg/L
GW	PW-4	8/2/1994	Selenium	<0.005	mg/L
GW	PW-4	8/2/1994	Silver	<0.025	mg/L
GW	PW-4	8/2/1994	Sulfate	17	mg/L
GW	PW-4	8/2/1994	TDS	274	mg/L
GW	PW-4	8/2/1994	Zinc	<0.05	mg/L
GW	PW-4	8/2/1994	pH	7.57	pH units
GW	PW-4	8/2/1994	Conductivity	398	µmhos/cm

GW	PW-4	8/2/1994	Antimony	0.0062	mg/L
GW	PW-4	8/2/1994	Beryllium	<0.002	mg/L
GW	PW-4	8/2/1994	Calcium	21	mg/L
GW	PW-4	8/2/1994	Magnesium	1.7	mg/L
GW	PW-4	8/2/1994	Thallium	<0.005	mg/L
GW	PW-4	8/2/1994	Sodium	73	mg/L
GW	PW-4	8/2/1994	Bicarbonate	190	mg/L CaCO3
GW	PW-4	8/2/1994	Carbonate	0	mg/L CaCO3
GW	PW-4	8/2/1994	Potassium	3.5	mg/L
GW	GWQ-10	9/22/1994	Chloride	89.2	mg/L
GW	GWQ-10	9/22/1994	Sulfate	155.8	mg/L
GW	GWQ-10	9/22/1994	TDS	668	mg/L
GW	GWQ-10	9/22/1994	pH	7.45	pH units
GW	GWQ-11	9/22/1994	Chloride	112.3	mg/L
GW	GWQ-11	9/22/1994	Sulfate	234.5	mg/L
GW	GWQ-11	9/22/1994	TDS	816	mg/L
GW	GWQ-11	9/22/1994	pH	7.37	pH units
GW	IW-1	9/22/1994	Chloride	435.9	mg/L
GW	IW-1	9/22/1994	Sulfate	1348	mg/L
GW	IW-1	9/22/1994	TDS	3466	mg/L
GW	IW-1	9/22/1994	pH	7.05	pH units
GW	NP-1	9/22/1994	Chloride	24.3	mg/L
GW	NP-1	9/22/1994	Sulfate	118.8	mg/L
GW	NP-1	9/22/1994	TDS	488	mg/L
GW	NP-1	9/22/1994	pH	7.49	pH units
GW	NP-2	9/22/1994	Chloride	123.8	mg/L
GW	NP-2	9/22/1994	Sulfate	252.7	mg/L
GW	NP-2	9/22/1994	TDS	963	mg/L
GW	NP-2	9/22/1994	pH	7.55	pH units
GW	NP-3	9/22/1994	Chloride	195.5	mg/L
GW	NP-3	9/22/1994	Sulfate	707.1	mg/L
GW	NP-3	9/22/1994	TDS	1691	mg/L
GW	NP-3	9/22/1994	pH	7.65	pH units
GW	NP-4	9/22/1994	Chloride	36.9	mg/L
GW	NP-4	9/22/1994	Sulfate	111	mg/L
GW	NP-4	9/22/1994	TDS	547	mg/L
GW	NP-4	9/22/1994	pH	7.73	pH units
GW	NP-5	9/22/1994	Chloride	42.8	mg/L
GW	NP-5	9/22/1994	Sulfate	117.7	mg/L
GW	NP-5	9/22/1994	TDS	526	mg/L
GW	NP-5	9/22/1994	pH	7.73	pH units
GW	GWQ94-16	11/13/1994	Aluminum	<0.05	mg/L
GW	GWQ94-16	11/13/1994	Arsenic	<0.005	mg/L
GW	GWQ94-16	11/13/1994	Barium	<0.1	mg/L
GW	GWQ94-16	11/13/1994	Boron	<0.1	mg/L
GW	GWQ94-16	11/13/1994	Cadmium	<0.0005	mg/L
GW	GWQ94-16	11/13/1994	Chloride	190	mg/L
GW	GWQ94-16	11/13/1994	Chromium	<0.025	mg/L
GW	GWQ94-16	11/13/1994	Cobalt	<0.05	mg/L
GW	GWQ94-16	11/13/1994	Copper	<0.025	mg/L
GW	GWQ94-16	11/13/1994	Fluoride	0.66	mg/L
GW	GWQ94-16	11/13/1994	Iron	<0.05	mg/L
GW	GWQ94-16	11/13/1994	Lead	<0.005	mg/L
GW	GWQ94-16	11/13/1994	Manganese	0.038	mg/L
GW	GWQ94-16	11/13/1994	Mercury	<0.001	mg/L
GW	GWQ94-16	11/13/1994	Molybdenum	<0.05	mg/L
GW	GWQ94-16	11/13/1994	Nickel	<0.05	mg/L
GW	GWQ94-16	11/13/1994	Nitrate as N (NO3)	3.8	mg/L
GW	GWQ94-16	11/13/1994	Selenium	<0.005	mg/L
GW	GWQ94-16	11/13/1994	Silver	<0.025	mg/L
GW	GWQ94-16	11/13/1994	Sulfate	410	mg/L
GW	GWQ94-16	11/13/1994	TDS	1140	mg/L
GW	GWQ94-16	11/13/1994	Zinc	<0.05	mg/L
GW	GWQ94-16	11/13/1994	pH	7.55	pH units
GW	GWQ94-16	11/13/1994	Conductivity	1600	µmhos/cm
GW	GWQ94-16	11/13/1994	Antimony	<0.005	mg/L
GW	GWQ94-16	11/13/1994	Beryllium	<0.002	mg/L
GW	GWQ94-16	11/13/1994	Calcium	190	mg/L
GW	GWQ94-16	11/13/1994	Magnesium	51	mg/L
GW	GWQ94-16	11/13/1994	Thallium	<0.005	mg/L
GW	GWQ94-16	11/13/1994	Sodium	78	mg/L
GW	GWQ94-16	11/13/1994	Bicarbonate	199	mg/L CaCO3
GW	GWQ94-16	11/13/1994	Carbonate	0	mg/L CaCO3
GW	GWQ94-16	11/13/1994	Potassium	3.7	mg/L
GW	GWQ94-21A	11/13/1994	Aluminum	<0.05	mg/L
GW	GWQ94-21A	11/13/1994	Arsenic	<0.005	mg/L

GW	GWQ94-21A	11/13/1994	Barium	<0.1	mg/L
GW	GWQ94-21A	11/13/1994	Boron	<0.1	mg/L
GW	GWQ94-21A	11/13/1994	Cadmium	<0.0005	mg/L
GW	GWQ94-21A	11/13/1994	Chloride	18	mg/L
GW	GWQ94-21A	11/13/1994	Chromium	<0.025	mg/L
GW	GWQ94-21A	11/13/1994	Cobalt	<0.05	mg/L
GW	GWQ94-21A	11/13/1994	Copper	<0.025	mg/L
GW	GWQ94-21A	11/13/1994	Fluoride	0.57	mg/L
GW	GWQ94-21A	11/13/1994	Iron	<0.05	mg/L
GW	GWQ94-21A	11/13/1994	Lead	<0.005	mg/L
GW	GWQ94-21A	11/13/1994	Manganese	0.2	mg/L
GW	GWQ94-21A	11/13/1994	Mercury	<0.001	mg/L
GW	GWQ94-21A	11/13/1994	Molybdenum	<0.05	mg/L
GW	GWQ94-21A	11/13/1994	Nickel	<0.05	mg/L
GW	GWQ94-21A	11/13/1994	Nitrate as N (NO3)	1	mg/L
GW	GWQ94-21A	11/13/1994	Selenium	<0.005	mg/L
GW	GWQ94-21A	11/13/1994	Silver	<0.025	mg/L
GW	GWQ94-21A	11/13/1994	Sulfate	130	mg/L
GW	GWQ94-21A	11/13/1994	TDS	480	mg/L
GW	GWQ94-21A	11/13/1994	Zinc	<0.05	mg/L
GW	GWQ94-21A	11/13/1994	pH	7.25	pH units
GW	GWQ94-21A	11/13/1994	Conductivity	672	µmhos/cm
GW	GWQ94-21A	11/13/1994	Antimony	<0.005	mg/L
GW	GWQ94-21A	11/13/1994	Beryllium	<0.002	mg/L
GW	GWQ94-21A	11/13/1994	Calcium	82	mg/L
GW	GWQ94-21A	11/13/1994	Magnesium	23	mg/L
GW	GWQ94-21A	11/13/1994	Thallium	<0.005	mg/L
GW	GWQ94-21A	11/13/1994	Sodium	39	mg/L
GW	GWQ94-21A	11/13/1994	Bicarbonate	267	mg/L CaCO3
GW	GWQ94-21A	11/13/1994	Carbonate	0	mg/L CaCO3
GW	GWQ94-21A	11/13/1994	Potassium	2.1	mg/L
GW	GWQ94-21B	11/13/1994	Aluminum	<0.05	mg/L
GW	GWQ94-21B	11/13/1994	Arsenic	<0.005	mg/L
GW	GWQ94-21B	11/13/1994	Barium	<0.1	mg/L
GW	GWQ94-21B	11/13/1994	Boron	<0.1	mg/L
GW	GWQ94-21B	11/13/1994	Cadmium	<0.0005	mg/L
GW	GWQ94-21B	11/13/1994	Chloride	19	mg/L
GW	GWQ94-21B	11/13/1994	Chromium	<0.025	mg/L
GW	GWQ94-21B	11/13/1994	Cobalt	<0.05	mg/L
GW	GWQ94-21B	11/13/1994	Copper	<0.025	mg/L
GW	GWQ94-21B	11/13/1994	Fluoride	0.39	mg/L
GW	GWQ94-21B	11/13/1994	Iron	<0.05	mg/L
GW	GWQ94-21B	11/13/1994	Lead	<0.005	mg/L
GW	GWQ94-21B	11/13/1994	Manganese	0.37	mg/L
GW	GWQ94-21B	11/13/1994	Mercury	<0.001	mg/L
GW	GWQ94-21B	11/13/1994	Molybdenum	<0.05	mg/L
GW	GWQ94-21B	11/13/1994	Nickel	<0.05	mg/L
GW	GWQ94-21B	11/13/1994	Nitrate as N (NO3)	<1	mg/L
GW	GWQ94-21B	11/13/1994	Selenium	<0.005	mg/L
GW	GWQ94-21B	11/13/1994	Silver	<0.025	mg/L
GW	GWQ94-21B	11/13/1994	Sulfate	130	mg/L
GW	GWQ94-21B	11/13/1994	TDS	440	mg/L
GW	GWQ94-21B	11/13/1994	Zinc	<0.05	mg/L
GW	GWQ94-21B	11/13/1994	pH	7.57	pH units
GW	GWQ94-21B	11/13/1994	Conductivity	669	µmhos/cm
GW	GWQ94-21B	11/13/1994	Antimony	<0.005	mg/L
GW	GWQ94-21B	11/13/1994	Beryllium	<0.002	mg/L
GW	GWQ94-21B	11/13/1994	Calcium	71	mg/L
GW	GWQ94-21B	11/13/1994	Magnesium	18	mg/L
GW	GWQ94-21B	11/13/1994	Thallium	<0.005	mg/L
GW	GWQ94-21B	11/13/1994	Sodium	56	mg/L
GW	GWQ94-21B	11/13/1994	Bicarbonate	255	mg/L CaCO3
GW	GWQ94-21B	11/13/1994	Carbonate	0	mg/L CaCO3
GW	GWQ94-21B	11/13/1994	Potassium	2.6	mg/L
GW	GWQ94-15	11/14/1994	Aluminum	<0.05	mg/L
GW	GWQ94-15	11/14/1994	Arsenic	<0.005	mg/L
GW	GWQ94-15	11/14/1994	Barium	<0.1	mg/L
GW	GWQ94-15	11/14/1994	Boron	<0.1	mg/L
GW	GWQ94-15	11/14/1994	Cadmium	<0.0005	mg/L
GW	GWQ94-15	11/14/1994	Chloride	110	mg/L
GW	GWQ94-15	11/14/1994	Chromium	<0.025	mg/L
GW	GWQ94-15	11/14/1994	Cobalt	<0.05	mg/L
GW	GWQ94-15	11/14/1994	Copper	<0.025	mg/L
GW	GWQ94-15	11/14/1994	Fluoride	0.46	mg/L
GW	GWQ94-15	11/14/1994	Iron	<0.05	mg/L
GW	GWQ94-15	11/14/1994	Lead	<0.005	mg/L

GW	GWQ94-15	11/14/1994	Manganese	<0.03	mg/L
GW	GWQ94-15	11/14/1994	Mercury	<0.001	mg/L
GW	GWQ94-15	11/14/1994	Molybdenum	<0.05	mg/L
GW	GWQ94-15	11/14/1994	Nickel	<0.05	mg/L
GW	GWQ94-15	11/14/1994	Nitrate as N (NO3)	2.1	mg/L
GW	GWQ94-15	11/14/1994	Selenium	<0.005	mg/L
GW	GWQ94-15	11/14/1994	Silver	<0.025	mg/L
GW	GWQ94-15	11/14/1994	Sulfate	180	mg/L
GW	GWQ94-15	11/14/1994	TDS	790	mg/L
GW	GWQ94-15	11/14/1994	Zinc	<0.05	mg/L
GW	GWQ94-15	11/14/1994	pH	7.74	pH units
GW	GWQ94-15	11/14/1994	Conductivity	1058	µmhos/cm
GW	GWQ94-15	11/14/1994	Antimony	<0.005	mg/L
GW	GWQ94-15	11/14/1994	Beryllium	<0.002	mg/L
GW	GWQ94-15	11/14/1994	Calcium	110	mg/L
GW	GWQ94-15	11/14/1994	Magnesium	29	mg/L
GW	GWQ94-15	11/14/1994	Thallium	<0.005	mg/L
GW	GWQ94-15	11/14/1994	Sodium	68	mg/L
GW	GWQ94-15	11/14/1994	Bicarbonate	265	mg/L CaCO3
GW	GWQ94-15	11/14/1994	Carbonate	0	mg/L CaCO3
GW	GWQ94-15	11/14/1994	Potassium	2.5	mg/L
GW	GWQ94-13	11/15/1994	Aluminum	<0.05	mg/L
GW	GWQ94-13	11/15/1994	Arsenic	<0.005	mg/L
GW	GWQ94-13	11/15/1994	Barium	<0.1	mg/L
GW	GWQ94-13	11/15/1994	Boron	<0.1	mg/L
GW	GWQ94-13	11/15/1994	Cadmium	<0.0005	mg/L
GW	GWQ94-13	11/15/1994	Chloride	190	mg/L
GW	GWQ94-13	11/15/1994	Chromium	<0.025	mg/L
GW	GWQ94-13	11/15/1994	Cobalt	<0.05	mg/L
GW	GWQ94-13	11/15/1994	Copper	<0.025	mg/L
GW	GWQ94-13	11/15/1994	Fluoride	0.36	mg/L
GW	GWQ94-13	11/15/1994	Iron	0.11	mg/L
GW	GWQ94-13	11/15/1994	Lead	<0.005	mg/L
GW	GWQ94-13	11/15/1994	Manganese	<0.03	mg/L
GW	GWQ94-13	11/15/1994	Mercury	<0.001	mg/L
GW	GWQ94-13	11/15/1994	Molybdenum	<0.05	mg/L
GW	GWQ94-13	11/15/1994	Nickel	<0.05	mg/L
GW	GWQ94-13	11/15/1994	Nitrate as N (NO3)	4.6	mg/L
GW	GWQ94-13	11/15/1994	Selenium	<0.005	mg/L
GW	GWQ94-13	11/15/1994	Silver	<0.025	mg/L
GW	GWQ94-13	11/15/1994	Sulfate	720	mg/L
GW	GWQ94-13	11/15/1994	TDS	1570	mg/L
GW	GWQ94-13	11/15/1994	Zinc	<0.05	mg/L
GW	GWQ94-13	11/15/1994	pH	7.74	pH units
GW	GWQ94-13	11/15/1994	Conductivity	2026	µmhos/cm
GW	GWQ94-13	11/15/1994	Antimony	<0.005	mg/L
GW	GWQ94-13	11/15/1994	Beryllium	<0.002	mg/L
GW	GWQ94-13	11/15/1994	Calcium	270	mg/L
GW	GWQ94-13	11/15/1994	Magnesium	56	mg/L
GW	GWQ94-13	11/15/1994	Thallium	<0.005	mg/L
GW	GWQ94-13	11/15/1994	Sodium	110	mg/L
GW	GWQ94-13	11/15/1994	Bicarbonate	159	mg/L CaCO3
GW	GWQ94-13	11/15/1994	Carbonate	0	mg/L CaCO3
GW	GWQ94-13	11/15/1994	Potassium	3.9	mg/L
GW	GWQ94-17	11/15/1994	Aluminum	<0.05	mg/L
GW	GWQ94-17	11/15/1994	Arsenic	<0.005	mg/L
GW	GWQ94-17	11/15/1994	Barium	<0.1	mg/L
GW	GWQ94-17	11/15/1994	Boron	<0.1	mg/L
GW	GWQ94-17	11/15/1994	Cadmium	<0.0005	mg/L
GW	GWQ94-17	11/15/1994	Chloride	110	mg/L
GW	GWQ94-17	11/15/1994	Chromium	<0.025	mg/L
GW	GWQ94-17	11/15/1994	Cobalt	<0.05	mg/L
GW	GWQ94-17	11/15/1994	Copper	<0.025	mg/L
GW	GWQ94-17	11/15/1994	Fluoride	0.46	mg/L
GW	GWQ94-17	11/15/1994	Iron	<0.05	mg/L
GW	GWQ94-17	11/15/1994	Lead	<0.005	mg/L
GW	GWQ94-17	11/15/1994	Manganese	<0.03	mg/L
GW	GWQ94-17	11/15/1994	Mercury	<0.001	mg/L
GW	GWQ94-17	11/15/1994	Molybdenum	<0.05	mg/L
GW	GWQ94-17	11/15/1994	Nickel	<0.05	mg/L
GW	GWQ94-17	11/15/1994	Nitrate as N (NO3)	2.4	mg/L
GW	GWQ94-17	11/15/1994	Selenium	<0.005	mg/L
GW	GWQ94-17	11/15/1994	Silver	<0.025	mg/L
GW	GWQ94-17	11/15/1994	Sulfate	240	mg/L
GW	GWQ94-17	11/15/1994	TDS	820	mg/L
GW	GWQ94-17	11/15/1994	Zinc	<0.05	mg/L

GW	GWQ94-17	11/15/1994	pH	7.71	pH units
GW	GWQ94-17	11/15/1994	Conductivity	1147	µmhos/cm
GW	GWQ94-17	11/15/1994	Antimony	<0.005	mg/L
GW	GWQ94-17	11/15/1994	Beryllium	<0.002	mg/L
GW	GWQ94-17	11/15/1994	Calcium	120	mg/L
GW	GWQ94-17	11/15/1994	Magnesium	33	mg/L
GW	GWQ94-17	11/15/1994	Thallium	<0.005	mg/L
GW	GWQ94-17	11/15/1994	Sodium	62	mg/L
GW	GWQ94-17	11/15/1994	Bicarbonate	232	mg/L CaCO3
GW	GWQ94-17	11/15/1994	Carbonate	0	mg/L CaCO3
GW	GWQ94-17	11/15/1994	Potassium	2.4	mg/L
GW	GWQ94-20	11/15/1994	Aluminum	<0.05	mg/L
GW	GWQ94-20	11/15/1994	Arsenic	<0.005	mg/L
GW	GWQ94-20	11/15/1994	Barium	<0.1	mg/L
GW	GWQ94-20	11/15/1994	Boron	0.11	mg/L
GW	GWQ94-20	11/15/1994	Cadmium	<0.0005	mg/L
GW	GWQ94-20	11/15/1994	Chloride	19	mg/L
GW	GWQ94-20	11/15/1994	Chromium	<0.025	mg/L
GW	GWQ94-20	11/15/1994	Cobalt	<0.05	mg/L
GW	GWQ94-20	11/15/1994	Copper	<0.025	mg/L
GW	GWQ94-20	11/15/1994	Fluoride	0.36	mg/L
GW	GWQ94-20	11/15/1994	Iron	<0.05	mg/L
GW	GWQ94-20	11/15/1994	Lead	<0.005	mg/L
GW	GWQ94-20	11/15/1994	Manganese	0.42	mg/L
GW	GWQ94-20	11/15/1994	Mercury	<0.001	mg/L
GW	GWQ94-20	11/15/1994	Molybdenum	<0.05	mg/L
GW	GWQ94-20	11/15/1994	Nickel	<0.05	mg/L
GW	GWQ94-20	11/15/1994	Nitrate as N (NO3)	1	mg/L
GW	GWQ94-20	11/15/1994	Selenium	<0.005	mg/L
GW	GWQ94-20	11/15/1994	Silver	<0.025	mg/L
GW	GWQ94-20	11/15/1994	Sulfate	40	mg/L
GW	GWQ94-20	11/15/1994	TDS	370	mg/L
GW	GWQ94-20	11/15/1994	Zinc	<0.05	mg/L
GW	GWQ94-20	11/15/1994	pH	7.66	pH units
GW	GWQ94-20	11/15/1994	Conductivity	588	µmhos/cm
GW	GWQ94-20	11/15/1994	Antimony	<0.005	mg/L
GW	GWQ94-20	11/15/1994	Beryllium	<0.002	mg/L
GW	GWQ94-20	11/15/1994	Calcium	48	mg/L
GW	GWQ94-20	11/15/1994	Magnesium	9.8	mg/L
GW	GWQ94-20	11/15/1994	Thallium	<0.005	mg/L
GW	GWQ94-20	11/15/1994	Sodium	67	mg/L
GW	GWQ94-20	11/15/1994	Bicarbonate	296	mg/L CaCO3
GW	GWQ94-20	11/15/1994	Carbonate	0	mg/L CaCO3
GW	GWQ94-20	11/15/1994	Potassium	3.2	mg/L
GW	MW-10	11/16/1994	Aluminum	<0.05	mg/L
GW	MW-10	11/16/1994	Arsenic	<0.005	mg/L
GW	MW-10	11/16/1994	Barium	<0.1	mg/L
GW	MW-10	11/16/1994	Boron	<0.1	mg/L
GW	MW-10	11/16/1994	Cadmium	<0.0005	mg/L
GW	MW-10	11/16/1994	Chloride	14	mg/L
GW	MW-10	11/16/1994	Chromium	<0.025	mg/L
GW	MW-10	11/16/1994	Cobalt	<0.05	mg/L
GW	MW-10	11/16/1994	Copper	<0.025	mg/L
GW	MW-10	11/16/1994	Fluoride	0.43	mg/L
GW	MW-10	11/16/1994	Iron	<0.05	mg/L
GW	MW-10	11/16/1994	Lead	<0.005	mg/L
GW	MW-10	11/16/1994	Manganese	<0.03	mg/L
GW	MW-10	11/16/1994	Mercury	<0.001	mg/L
GW	MW-10	11/16/1994	Molybdenum	<0.05	mg/L
GW	MW-10	11/16/1994	Nickel	<0.05	mg/L
GW	MW-10	11/16/1994	Nitrate as N (NO3)	<1	mg/L
GW	MW-10	11/16/1994	Selenium	<0.005	mg/L
GW	MW-10	11/16/1994	Silver	<0.025	mg/L
GW	MW-10	11/16/1994	Sulfate	25	mg/L
GW	MW-10	11/16/1994	TDS	310	mg/L
GW	MW-10	11/16/1994	Zinc	<0.05	mg/L
GW	MW-10	11/16/1994	pH	7.84	pH units
GW	MW-10	11/16/1994	Conductivity	473	µmhos/cm
GW	MW-10	11/16/1994	Antimony	<0.005	mg/L
GW	MW-10	11/16/1994	Beryllium	<0.002	mg/L
GW	MW-10	11/16/1994	Calcium	59	mg/L
GW	MW-10	11/16/1994	Magnesium	9.4	mg/L
GW	MW-10	11/16/1994	Thallium	<0.005	mg/L
GW	MW-10	11/16/1994	Sodium	29	mg/L
GW	MW-10	11/16/1994	Bicarbonate	262	mg/L CaCO3
GW	MW-10	11/16/1994	Carbonate	0	mg/L CaCO3

GW	MW-10	11/16/1994	Potassium	1.9	mg/L
GW	MW-11	11/16/1994	Aluminum	<0.05	mg/L
GW	MW-11	11/16/1994	Arsenic	<0.005	mg/L
GW	MW-11	11/16/1994	Barium	<0.1	mg/L
GW	MW-11	11/16/1994	Boron	<0.1	mg/L
GW	MW-11	11/16/1994	Cadmium	<0.0005	mg/L
GW	MW-11	11/16/1994	Chloride	15	mg/L
GW	MW-11	11/16/1994	Chromium	<0.025	mg/L
GW	MW-11	11/16/1994	Cobalt	<0.05	mg/L
GW	MW-11	11/16/1994	Copper	<0.025	mg/L
GW	MW-11	11/16/1994	Fluoride	0.45	mg/L
GW	MW-11	11/16/1994	Iron	<0.05	mg/L
GW	MW-11	11/16/1994	Lead	<0.005	mg/L
GW	MW-11	11/16/1994	Manganese	<0.03	mg/L
GW	MW-11	11/16/1994	Mercury	<0.001	mg/L
GW	MW-11	11/16/1994	Molybdenum	<0.05	mg/L
GW	MW-11	11/16/1994	Nickel	<0.05	mg/L
GW	MW-11	11/16/1994	Nitrate as N (NO3)	<1	mg/L
GW	MW-11	11/16/1994	Selenium	<0.005	mg/L
GW	MW-11	11/16/1994	Silver	<0.025	mg/L
GW	MW-11	11/16/1994	Sulfate	21	mg/L
GW	MW-11	11/16/1994	TDS	314	mg/L
GW	MW-11	11/16/1994	Zinc	<0.05	mg/L
GW	MW-11	11/16/1994	pH	7.79	pH units
GW	MW-11	11/16/1994	Conductivity	480	µmhos/cm
GW	MW-11	11/16/1994	Antimony	<0.005	mg/L
GW	MW-11	11/16/1994	Beryllium	<0.002	mg/L
GW	MW-11	11/16/1994	Calcium	63	mg/L
GW	MW-11	11/16/1994	Magnesium	9.7	mg/L
GW	MW-11	11/16/1994	Thallium	<0.005	mg/L
GW	MW-11	11/16/1994	Sodium	23	mg/L
GW	MW-11	11/16/1994	Bicarbonate	263	mg/L CaCO3
GW	MW-11	11/16/1994	Carbonate	0	mg/L CaCO3
GW	MW-11	11/16/1994	Potassium	1.5	mg/L
GW	MW-9	11/16/1994	Aluminum	<0.05	mg/L
GW	MW-9	11/16/1994	Arsenic	<0.005	mg/L
GW	MW-9	11/16/1994	Barium	<0.1	mg/L
GW	MW-9	11/16/1994	Boron	<0.1	mg/L
GW	MW-9	11/16/1994	Cadmium	<0.0005	mg/L
GW	MW-9	11/16/1994	Chloride	12	mg/L
GW	MW-9	11/16/1994	Chromium	<0.025	mg/L
GW	MW-9	11/16/1994	Cobalt	<0.05	mg/L
GW	MW-9	11/16/1994	Copper	<0.025	mg/L
GW	MW-9	11/16/1994	Fluoride	1.4	mg/L
GW	MW-9	11/16/1994	Iron	<0.05	mg/L
GW	MW-9	11/16/1994	Lead	<0.005	mg/L
GW	MW-9	11/16/1994	Manganese	<0.03	mg/L
GW	MW-9	11/16/1994	Mercury	<0.001	mg/L
GW	MW-9	11/16/1994	Molybdenum	<0.05	mg/L
GW	MW-9	11/16/1994	Nickel	<0.05	mg/L
GW	MW-9	11/16/1994	Nitrate as N (NO3)	<1	mg/L
GW	MW-9	11/16/1994	Selenium	<0.005	mg/L
GW	MW-9	11/16/1994	Silver	<0.025	mg/L
GW	MW-9	11/16/1994	Sulfate	12	mg/L
GW	MW-9	11/16/1994	TDS	230	mg/L
GW	MW-9	11/16/1994	Zinc	<0.05	mg/L
GW	MW-9	11/16/1994	pH	8.05	pH units
GW	MW-9	11/16/1994	Conductivity	293	µmhos/cm
GW	MW-9	11/16/1994	Antimony	<0.005	mg/L
GW	MW-9	11/16/1994	Beryllium	<0.002	mg/L
GW	MW-9	11/16/1994	Calcium	12	mg/L
GW	MW-9	11/16/1994	Magnesium	1	mg/L
GW	MW-9	11/16/1994	Thallium	<0.005	mg/L
GW	MW-9	11/16/1994	Sodium	52	mg/L
GW	MW-9	11/16/1994	Bicarbonate	149	mg/L CaCO3
GW	MW-9	11/16/1994	Carbonate	0	mg/L CaCO3
GW	MW-9	11/16/1994	Potassium	2.3	mg/L
GW	GWQ-10	1/29/1995	Chloride	87.5	mg/L
GW	GWQ-10	1/29/1995	Sulfate	65.7	mg/L
GW	GWQ-10	1/29/1995	TDS	672	mg/L
GW	GWQ-10	1/29/1995	pH	7.52	pH units
GW	GWQ-11	1/29/1995	Chloride	199.5	mg/L
GW	GWQ-11	1/29/1995	Sulfate	158.7	mg/L
GW	GWQ-11	1/29/1995	TDS	861	mg/L
GW	GWQ-11	1/29/1995	pH	7.6	pH units
GW	IW-1	1/29/1995	Chloride	663	mg/L

GW	IW-1	1/29/1995	Sulfate	1478.5	mg/L
GW	IW-1	1/29/1995	TDS	3395	mg/L
GW	IW-1	1/29/1995	pH	7.18	pH units
GW	NP-1	1/29/1995	Chloride	26.2	mg/L
GW	NP-1	1/29/1995	Sulfate	125.4	mg/L
GW	NP-1	1/29/1995	TDS	407	mg/L
GW	NP-1	1/29/1995	pH	7.94	pH units
GW	NP-2	1/29/1995	Chloride	94.1	mg/L
GW	NP-2	1/29/1995	Sulfate	120.9	mg/L
GW	NP-2	1/29/1995	TDS	791	mg/L
GW	NP-2	1/29/1995	pH	7.57	pH units
GW	NP-3	1/29/1995	Chloride	566.4	mg/L
GW	NP-3	1/29/1995	Sulfate	651.9	mg/L
GW	NP-3	1/29/1995	TDS	1623	mg/L
GW	NP-3	1/29/1995	pH	7.45	pH units
GW	NP-4	1/29/1995	Chloride	34.5	mg/L
GW	NP-4	1/29/1995	Sulfate	110.7	mg/L
GW	NP-4	1/29/1995	TDS	447	mg/L
GW	NP-4	1/29/1995	pH	7.88	pH units
GW	NP-5	1/29/1995	Chloride	43.5	mg/L
GW	NP-5	1/29/1995	Sulfate	101.2	mg/L
GW	NP-5	1/29/1995	TDS	490	mg/L
GW	NP-5	1/29/1995	pH	7.99	pH units
GW	GWQ-10	3/29/1995	Chloride	84.9	mg/L
GW	GWQ-10	3/29/1995	Sulfate	176	mg/L
GW	GWQ-10	3/29/1995	TDS	62	mg/L
GW	GWQ-10	3/29/1995	TDS	622	mg/L
GW	GWQ-10	3/29/1995	pH	7.67	pH units
GW	GWQ-11	3/29/1995	Chloride	99.4	mg/L
GW	GWQ-11	3/29/1995	Sulfate	136.9	mg/L
GW	GWQ-11	3/29/1995	TDS	793	mg/L
GW	GWQ-11	3/29/1995	pH	7.96	pH units
GW	IW-1	3/29/1995	Chloride	419.4	mg/L
GW	IW-1	3/29/1995	Sulfate	1350.7	mg/L
GW	IW-1	3/29/1995	TDS	3465	mg/L
GW	IW-1	3/29/1995	pH	7.49	pH units
GW	NP-1	3/29/1995	Chloride	23.3	mg/L
GW	NP-1	3/29/1995	Sulfate	86.2	mg/L
GW	NP-1	3/29/1995	TDS	392	mg/L
GW	NP-1	3/29/1995	pH	7.98	pH units
GW	NP-2	3/29/1995	Chloride	90.7	mg/L
GW	NP-2	3/29/1995	Sulfate	228.7	mg/L
GW	NP-2	3/29/1995	TDS	1164	mg/L
GW	NP-2	3/29/1995	pH	7.69	pH units
GW	NP-3	3/29/1995	Chloride	185.5	mg/L
GW	NP-3	3/29/1995	Sulfate	558	mg/L
GW	NP-3	3/29/1995	TDS	1639	mg/L
GW	NP-3	3/29/1995	pH	7.48	pH units
GW	NP-4	3/29/1995	Chloride	33.8	mg/L
GW	NP-4	3/29/1995	Sulfate	121.7	mg/L
GW	NP-4	3/29/1995	TDS	494	mg/L
GW	NP-4	3/29/1995	pH	7.86	pH units
GW	NP-5	3/29/1995	Chloride	42.4	mg/L
GW	NP-5	3/29/1995	Sulfate	130.8	mg/L
GW	NP-5	3/29/1995	TDS	449	mg/L
GW	NP-5	3/29/1995	pH	7.94	pH units
GW	GWQ-10	6/27/1995	Chloride	84.8	mg/L
GW	GWQ-10	6/27/1995	Sulfate	168.7	mg/L
GW	GWQ-10	6/27/1995	TDS	677	mg/L
GW	GWQ-10	6/27/1995	pH	7.29	pH units
GW	GWQ-11	6/27/1995	Chloride	101.7	mg/L
GW	GWQ-11	6/27/1995	Sulfate	278.8	mg/L
GW	GWQ-11	6/27/1995	TDS	835	mg/L
GW	GWQ-11	6/27/1995	pH	7.67	pH units
GW	IW-1	6/27/1995	Chloride	446.1	mg/L
GW	IW-1	6/27/1995	Sulfate	1680.1	mg/L
GW	IW-1	6/27/1995	TDS	3599	mg/L
GW	IW-1	6/27/1995	pH	6.99	pH units
GW	NP-1	6/27/1995	Chloride	24.1	mg/L
GW	NP-1	6/27/1995	Sulfate	113.7	mg/L
GW	NP-1	6/27/1995	TDS	385	mg/L
GW	NP-1	6/27/1995	pH	8.02	pH units
GW	NP-2	6/27/1995	Chloride	95.9	mg/L
GW	NP-2	6/27/1995	Sulfate	247.1	mg/L
GW	NP-2	6/27/1995	TDS	778	mg/L
GW	NP-2	6/27/1995	pH	7.93	pH units

GW	NP-3	6/27/1995	Chloride	202.7	mg/L
GW	NP-3	6/27/1995	Sulfate	717	mg/L
GW	NP-3	6/27/1995	TDS	1607	mg/L
GW	NP-3	6/27/1995	pH	7.38	pH units
GW	NP-4	6/27/1995	Chloride	33.2	mg/L
GW	NP-4	6/27/1995	Sulfate	134.1	mg/L
GW	NP-4	6/27/1995	TDS	487	mg/L
GW	NP-4	6/27/1995	pH	7.37	pH units
GW	NP-5	6/27/1995	Chloride	43.4	mg/L
GW	NP-5	6/27/1995	Sulfate	119.4	mg/L
GW	NP-5	6/27/1995	TDS	525	mg/L
GW	NP-5	6/27/1995	pH	7.64	pH units
GW	GWQ-10	9/21/1995	Chloride	91.3	mg/L
GW	GWQ-10	9/21/1995	Sulfate	187.4	mg/L
GW	GWQ-10	9/21/1995	TDS	693	mg/L
GW	GWQ-10	9/21/1995	pH	7.42	pH units
GW	GWQ-11	9/21/1995	Chloride	112.1	mg/L
GW	GWQ-11	9/21/1995	Sulfate	289.5	mg/L
GW	GWQ-11	9/21/1995	TDS	865	mg/L
GW	GWQ-11	9/21/1995	pH	7.58	pH units
GW	IW-1	9/21/1995	Chloride	458.7	mg/L
GW	IW-1	9/21/1995	Sulfate	1710.8	mg/L
GW	IW-1	9/21/1995	TDS	34.87	mg/L
GW	IW-1	9/21/1995	pH	6.82	pH units
GW	NP-1	9/21/1995	Chloride	27.2	mg/L
GW	NP-1	9/21/1995	Sulfate	145	mg/L
GW	NP-1	9/21/1995	TDS	373	mg/L
GW	NP-1	9/21/1995	pH	7.96	pH units
GW	NP-2	9/21/1995	Chloride	86.6	mg/L
GW	NP-2	9/21/1995	Sulfate	211.8	mg/L
GW	NP-2	9/21/1995	TDS	722	mg/L
GW	NP-2	9/21/1995	pH	7.36	pH units
GW	NP-3	9/21/1995	Chloride	208.4	mg/L
GW	NP-3	9/21/1995	Sulfate	822	mg/L
GW	NP-3	9/21/1995	TDS	1557	mg/L
GW	NP-3	9/21/1995	pH	7.5	pH units
GW	NP-4	9/21/1995	Chloride	35.3	mg/L
GW	NP-4	9/21/1995	Sulfate	132.1	mg/L
GW	NP-4	9/21/1995	TDS	509	mg/L
GW	NP-4	9/21/1995	pH	7.51	pH units
GW	NP-5	9/21/1995	Chloride	44.3	mg/L
GW	NP-5	9/21/1995	Sulfate	134.6	mg/L
GW	NP-5	9/21/1995	TDS	483	mg/L
GW	NP-5	9/21/1995	pH	7.71	pH units
GW	GWQ-10	1/10/1996	Chloride	97.7	mg/L
GW	GWQ-10	1/10/1996	Sulfate	197.5	mg/L
GW	GWQ-10	1/10/1996	TDS	654	mg/L
GW	GWQ-10	1/10/1996	pH	7.29	pH units
GW	GWQ-11	1/10/1996	Chloride	120.8	mg/L
GW	GWQ-11	1/10/1996	Sulfate	287.5	mg/L
GW	GWQ-11	1/10/1996	TDS	777	mg/L
GW	GWQ-11	1/10/1996	pH	7.36	pH units
GW	IW-1	1/10/1996	Chloride	442.2	mg/L
GW	IW-1	1/10/1996	Sulfate	1595.5	mg/L
GW	IW-1	1/10/1996	TDS	3437	mg/L
GW	IW-1	1/10/1996	pH	7.23	pH units
GW	NP-1	1/10/1996	Chloride	26.1	mg/L
GW	NP-1	1/10/1996	Sulfate	109.4	mg/L
GW	NP-1	1/10/1996	TDS	277	mg/L
GW	NP-1	1/10/1996	pH	7.73	pH units
GW	NP-2	1/10/1996	Chloride	78.6	mg/L
GW	NP-2	1/10/1996	Sulfate	173.1	mg/L
GW	NP-2	1/10/1996	TDS	632	mg/L
GW	NP-2	1/10/1996	pH	7.1	pH units
GW	NP-3	1/10/1996	Chloride	208.5	mg/L
GW	NP-3	1/10/1996	Sulfate	724.1	mg/L
GW	NP-3	1/10/1996	TDS	1464	mg/L
GW	NP-3	1/10/1996	pH	7.32	pH units
GW	NP-4	1/10/1996	Chloride	34.7	mg/L
GW	NP-4	1/10/1996	Sulfate	123.1	mg/L
GW	NP-4	1/10/1996	TDS	483	mg/L
GW	NP-4	1/10/1996	pH	7.35	pH units
GW	NP-5	1/10/1996	Chloride	41.6	mg/L
GW	NP-5	1/10/1996	Sulfate	136.6	mg/L
GW	NP-5	1/10/1996	TDS	406	mg/L
GW	NP-5	1/10/1996	pH	8.04	pH units

GW	GWQ-10	4/3/1996	Chloride	97.4	mg/L
GW	GWQ-10	4/3/1996	Sulfate	218.2	mg/L
GW	GWQ-10	4/3/1996	TDS	628	mg/L
GW	GWQ-10	4/3/1996	pH	6.95	pH units
GW	GWQ-11	4/3/1996	Chloride	119.2	mg/L
GW	GWQ-11	4/3/1996	Sulfate	276.5	mg/L
GW	GWQ-11	4/3/1996	TDS	767	mg/L
GW	GWQ-11	4/3/1996	pH	7.38	pH units
GW	IW-3	4/3/1996	Chloride	432.6	mg/L
GW	IW-3	4/3/1996	Sulfate	1566.3	mg/L
GW	IW-3	4/3/1996	TDS	3364	mg/L
GW	IW-3	4/3/1996	pH	7.04	pH units
GW	NP-1	4/3/1996	Chloride	25.7	mg/L
GW	NP-1	4/3/1996	Sulfate	123.3	mg/L
GW	NP-1	4/3/1996	TDS	300	mg/L
GW	NP-1	4/3/1996	pH	7.89	pH units
GW	NP-2	4/3/1996	Chloride	76.8	mg/L
GW	NP-2	4/3/1996	Sulfate	168.7	mg/L
GW	NP-2	4/3/1996	TDS	603	mg/L
GW	NP-2	4/3/1996	pH	7.23	pH units
GW	NP-3	4/3/1996	Chloride	208.3	mg/L
GW	NP-3	4/3/1996	Sulfate	722.6	mg/L
GW	NP-3	4/3/1996	TDS	1415	mg/L
GW	NP-3	4/3/1996	pH	7.29	pH units
GW	NP-4	4/3/1996	Chloride	26	mg/L
GW	NP-4	4/3/1996	Sulfate	123.3	mg/L
GW	NP-4	4/3/1996	TDS	475	mg/L
GW	NP-4	4/3/1996	pH	7.19	pH units
GW	NP-5	4/3/1996	Chloride	31.8	mg/L
GW	NP-5	4/3/1996	Sulfate	130	mg/L
GW	NP-5	4/3/1996	TDS	405	mg/L
GW	NP-5	4/3/1996	pH	7.67	pH units
GW	GWQ94-14	6/30/1996	Aluminum	<0.025	mg/L
GW	GWQ94-14	6/30/1996	Arsenic	<0.005	mg/L
GW	GWQ94-14	6/30/1996	Barium	<0.05	mg/L
GW	GWQ94-14	6/30/1996	Boron	<0.05	mg/L
GW	GWQ94-14	6/30/1996	Cadmium	<0.0005	mg/L
GW	GWQ94-14	6/30/1996	Chloride	26	mg/L
GW	GWQ94-14	6/30/1996	Chromium	<0.025	mg/L
GW	GWQ94-14	6/30/1996	Cobalt	<0.05	mg/L
GW	GWQ94-14	6/30/1996	Copper	<0.025	mg/L
GW	GWQ94-14	6/30/1996	Fluoride	0.48	mg/L
GW	GWQ94-14	6/30/1996	Iron	<0.05	mg/L
GW	GWQ94-14	6/30/1996	Lead	<0.005	mg/L
GW	GWQ94-14	6/30/1996	Manganese	<0.03	mg/L
GW	GWQ94-14	6/30/1996	Mercury	<0.001	mg/L
GW	GWQ94-14	6/30/1996	Molybdenum	<0.05	mg/L
GW	GWQ94-14	6/30/1996	Nickel	<0.05	mg/L
GW	GWQ94-14	6/30/1996	Nitrate as N (NO3)	1.5	mg/L
GW	GWQ94-14	6/30/1996	Selenium	<0.005	mg/L
GW	GWQ94-14	6/30/1996	Silver	<0.05	mg/L
GW	GWQ94-14	6/30/1996	Sulfate	140	mg/L
GW	GWQ94-14	6/30/1996	TDS	520	mg/L
GW	GWQ94-14	6/30/1996	Zinc	<0.05	mg/L
GW	GWQ94-14	6/30/1996	pH	8.44	pH units
GW	GWQ94-14	6/30/1996	Conductivity	641	µmhos/cm
GW	GWQ94-14	6/30/1996	Antimony	<0.002	mg/L
GW	GWQ94-14	6/30/1996	Beryllium	<0.002	mg/L
GW	GWQ94-14	6/30/1996	Calcium	87	mg/L
GW	GWQ94-14	6/30/1996	Magnesium	23	mg/L
GW	GWQ94-14	6/30/1996	Thallium	<0.001	mg/L
GW	GWQ94-14	6/30/1996	Sodium	51	mg/L
GW	GWQ94-14	6/30/1996	Bicarbonate	261	mg/L CaCO3
GW	GWQ94-14	6/30/1996	Carbonate	5	mg/L CaCO3
GW	GWQ94-14	6/30/1996	Potassium	1.9	mg/L
GW	GWQ94-17	6/30/1996	Aluminum	<0.025	mg/L
GW	GWQ94-17	6/30/1996	Arsenic	<0.005	mg/L
GW	GWQ94-17	6/30/1996	Barium	<0.05	mg/L
GW	GWQ94-17	6/30/1996	Boron	<0.05	mg/L
GW	GWQ94-17	6/30/1996	Cadmium	<0.0005	mg/L
GW	GWQ94-17	6/30/1996	Chloride	81	mg/L
GW	GWQ94-17	6/30/1996	Chromium	<0.025	mg/L
GW	GWQ94-17	6/30/1996	Cobalt	<0.05	mg/L
GW	GWQ94-17	6/30/1996	Copper	<0.025	mg/L
GW	GWQ94-17	6/30/1996	Fluoride	0.46	mg/L
GW	GWQ94-17	6/30/1996	Iron	0.062	mg/L

GW	GWQ94-17	6/30/1996	Lead	<0.005	mg/L
GW	GWQ94-17	6/30/1996	Manganese	<0.03	mg/L
GW	GWQ94-17	6/30/1996	Mercury	<0.001	mg/L
GW	GWQ94-17	6/30/1996	Molybdenum	<0.05	mg/L
GW	GWQ94-17	6/30/1996	Nickel	<0.05	mg/L
GW	GWQ94-17	6/30/1996	Nitrate as N (NO3)	2	mg/L
GW	GWQ94-17	6/30/1996	Selenium	<0.005	mg/L
GW	GWQ94-17	6/30/1996	Silver	<0.05	mg/L
GW	GWQ94-17	6/30/1996	Sulfate	190	mg/L
GW	GWQ94-17	6/30/1996	TDS	690	mg/L
GW	GWQ94-17	6/30/1996	Zinc	<0.05	mg/L
GW	GWQ94-17	6/30/1996	pH	8.56	pH units
GW	GWQ94-17	6/30/1996	Conductivity	925	µmhos/cm
GW	GWQ94-17	6/30/1996	Antimony	<0.002	mg/L
GW	GWQ94-17	6/30/1996	Beryllium	<0.002	mg/L
GW	GWQ94-17	6/30/1996	Calcium	120	mg/L
GW	GWQ94-17	6/30/1996	Magnesium	28	mg/L
GW	GWQ94-17	6/30/1996	Thallium	<0.001	mg/L
GW	GWQ94-17	6/30/1996	Sodium	61	mg/L
GW	GWQ94-17	6/30/1996	Bicarbonate	227	mg/L CaCO3
GW	GWQ94-17	6/30/1996	Carbonate	7	mg/L CaCO3
GW	GWQ94-17	6/30/1996	Potassium	2	mg/L
GW	GWQ94-20	6/30/1996	Aluminum	<0.025	mg/L
GW	GWQ94-20	6/30/1996	Arsenic	<0.005	mg/L
GW	GWQ94-20	6/30/1996	Barium	0.12	mg/L
GW	GWQ94-20	6/30/1996	Boron	0.086	mg/L
GW	GWQ94-20	6/30/1996	Cadmium	<0.0005	mg/L
GW	GWQ94-20	6/30/1996	Chloride	21	mg/L
GW	GWQ94-20	6/30/1996	Chromium	<0.025	mg/L
GW	GWQ94-20	6/30/1996	Cobalt	<0.05	mg/L
GW	GWQ94-20	6/30/1996	Copper	<0.025	mg/L
GW	GWQ94-20	6/30/1996	Fluoride	0.29	mg/L
GW	GWQ94-20	6/30/1996	Iron	<0.05	mg/L
GW	GWQ94-20	6/30/1996	Lead	<0.005	mg/L
GW	GWQ94-20	6/30/1996	Manganese	<0.03	mg/L
GW	GWQ94-20	6/30/1996	Mercury	<0.001	mg/L
GW	GWQ94-20	6/30/1996	Molybdenum	<0.05	mg/L
GW	GWQ94-20	6/30/1996	Nickel	<0.05	mg/L
GW	GWQ94-20	6/30/1996	Nitrate as N (NO3)	<1	mg/L
GW	GWQ94-20	6/30/1996	Selenium	<0.005	mg/L
GW	GWQ94-20	6/30/1996	Silver	<0.05	mg/L
GW	GWQ94-20	6/30/1996	Sulfate	56	mg/L
GW	GWQ94-20	6/30/1996	TDS	390	mg/L
GW	GWQ94-20	6/30/1996	Zinc	<0.05	mg/L
GW	GWQ94-20	6/30/1996	pH	8.79	pH units
GW	GWQ94-20	6/30/1996	Conductivity	597	µmhos/cm
GW	GWQ94-20	6/30/1996	Antimony	<0.002	mg/L
GW	GWQ94-20	6/30/1996	Beryllium	<0.002	mg/L
GW	GWQ94-20	6/30/1996	Calcium	58	mg/L
GW	GWQ94-20	6/30/1996	Magnesium	10	mg/L
GW	GWQ94-20	6/30/1996	Thallium	<0.001	mg/L
GW	GWQ94-20	6/30/1996	Sodium	75	mg/L
GW	GWQ94-20	6/30/1996	Bicarbonate	273	mg/L CaCO3
GW	GWQ94-20	6/30/1996	Carbonate	19	mg/L CaCO3
GW	GWQ94-20	6/30/1996	Potassium	3.1	mg/L
GW	GWQ94-21A	6/30/1996	Aluminum	<0.025	mg/L
GW	GWQ94-21A	6/30/1996	Arsenic	<0.005	mg/L
GW	GWQ94-21A	6/30/1996	Barium	<0.05	mg/L
GW	GWQ94-21A	6/30/1996	Boron	<0.05	mg/L
GW	GWQ94-21A	6/30/1996	Cadmium	<0.0005	mg/L
GW	GWQ94-21A	6/30/1996	Chloride	16	mg/L
GW	GWQ94-21A	6/30/1996	Chromium	<0.025	mg/L
GW	GWQ94-21A	6/30/1996	Cobalt	<0.05	mg/L
GW	GWQ94-21A	6/30/1996	Copper	<0.025	mg/L
GW	GWQ94-21A	6/30/1996	Fluoride	0.51	mg/L
GW	GWQ94-21A	6/30/1996	Iron	<0.05	mg/L
GW	GWQ94-21A	6/30/1996	Lead	<0.005	mg/L
GW	GWQ94-21A	6/30/1996	Manganese	<0.03	mg/L
GW	GWQ94-21A	6/30/1996	Mercury	<0.001	mg/L
GW	GWQ94-21A	6/30/1996	Molybdenum	<0.05	mg/L
GW	GWQ94-21A	6/30/1996	Nickel	<0.05	mg/L
GW	GWQ94-21A	6/30/1996	Nitrate as N (NO3)	1.1	mg/L
GW	GWQ94-21A	6/30/1996	Selenium	<0.005	mg/L
GW	GWQ94-21A	6/30/1996	Silver	<0.05	mg/L
GW	GWQ94-21A	6/30/1996	Sulfate	120	mg/L
GW	GWQ94-21A	6/30/1996	TDS	470	mg/L

GW	GWQ94-21A	6/30/1996	Zinc	<0.05	mg/L
GW	GWQ94-21A	6/30/1996	pH	8.22	pH units
GW	GWQ94-21A	6/30/1996	Conductivity	649	µmhos/cm
GW	GWQ94-21A	6/30/1996	Antimony	<0.002	mg/L
GW	GWQ94-21A	6/30/1996	Beryllium	<0.002	mg/L
GW	GWQ94-21A	6/30/1996	Calcium	86	mg/L
GW	GWQ94-21A	6/30/1996	Magnesium	22	mg/L
GW	GWQ94-21A	6/30/1996	Thallium	<0.001	mg/L
GW	GWQ94-21A	6/30/1996	Sodium	37	mg/L
GW	GWQ94-21A	6/30/1996	Bicarbonate	268	mg/L CaCO3
GW	GWQ94-21A	6/30/1996	Carbonate	0	mg/L CaCO3
GW	GWQ94-21A	6/30/1996	Potassium	1.5	mg/L
GW	GWQ94-21B	6/30/1996	Aluminum	<0.025	mg/L
GW	GWQ94-21B	6/30/1996	Arsenic	<0.005	mg/L
GW	GWQ94-21B	6/30/1996	Barium	<0.05	mg/L
GW	GWQ94-21B	6/30/1996	Boron	<0.05	mg/L
GW	GWQ94-21B	6/30/1996	Cadmium	<0.0005	mg/L
GW	GWQ94-21B	6/30/1996	Chloride	17	mg/L
GW	GWQ94-21B	6/30/1996	Chromium	<0.025	mg/L
GW	GWQ94-21B	6/30/1996	Cobalt	<0.05	mg/L
GW	GWQ94-21B	6/30/1996	Copper	<0.025	mg/L
GW	GWQ94-21B	6/30/1996	Fluoride	0.52	mg/L
GW	GWQ94-21B	6/30/1996	Iron	<0.05	mg/L
GW	GWQ94-21B	6/30/1996	Lead	<0.005	mg/L
GW	GWQ94-21B	6/30/1996	Manganese	<0.03	mg/L
GW	GWQ94-21B	6/30/1996	Mercury	<0.001	mg/L
GW	GWQ94-21B	6/30/1996	Molybdenum	<0.05	mg/L
GW	GWQ94-21B	6/30/1996	Nickel	<0.05	mg/L
GW	GWQ94-21B	6/30/1996	Nitrate as N (NO3)	1.1	mg/L
GW	GWQ94-21B	6/30/1996	Selenium	<0.005	mg/L
GW	GWQ94-21B	6/30/1996	Silver	<0.05	mg/L
GW	GWQ94-21B	6/30/1996	Sulfate	120	mg/L
GW	GWQ94-21B	6/30/1996	TDS	470	mg/L
GW	GWQ94-21B	6/30/1996	Zinc	<0.05	mg/L
GW	GWQ94-21B	6/30/1996	pH	8.6	pH units
GW	GWQ94-21B	6/30/1996	Conductivity	648	µmhos/cm
GW	GWQ94-21B	6/30/1996	Antimony	<0.002	mg/L
GW	GWQ94-21B	6/30/1996	Beryllium	<0.002	mg/L
GW	GWQ94-21B	6/30/1996	Calcium	87	mg/L
GW	GWQ94-21B	6/30/1996	Magnesium	22	mg/L
GW	GWQ94-21B	6/30/1996	Thallium	<0.001	mg/L
GW	GWQ94-21B	6/30/1996	Sodium	40	mg/L
GW	GWQ94-21B	6/30/1996	Bicarbonate	256	mg/L CaCO3
GW	GWQ94-21B	6/30/1996	Carbonate	10	mg/L CaCO3
GW	GWQ94-21B	6/30/1996	Potassium	1.7	mg/L
GW	GWQ94-13	7/1/1996	Aluminum	<0.025	mg/L
GW	GWQ94-13	7/1/1996	Arsenic	<0.005	mg/L
GW	GWQ94-13	7/1/1996	Barium	<0.05	mg/L
GW	GWQ94-13	7/1/1996	Boron	<0.05	mg/L
GW	GWQ94-13	7/1/1996	Cadmium	<0.0005	mg/L
GW	GWQ94-13	7/1/1996	Chloride	200	mg/L
GW	GWQ94-13	7/1/1996	Chromium	<0.025	mg/L
GW	GWQ94-13	7/1/1996	Cobalt	<0.05	mg/L
GW	GWQ94-13	7/1/1996	Copper	<0.025	mg/L
GW	GWQ94-13	7/1/1996	Fluoride	0.34	mg/L
GW	GWQ94-13	7/1/1996	Iron	<0.05	mg/L
GW	GWQ94-13	7/1/1996	Lead	<0.005	mg/L
GW	GWQ94-13	7/1/1996	Manganese	<0.03	mg/L
GW	GWQ94-13	7/1/1996	Mercury	<0.001	mg/L
GW	GWQ94-13	7/1/1996	Molybdenum	<0.05	mg/L
GW	GWQ94-13	7/1/1996	Nickel	<0.05	mg/L
GW	GWQ94-13	7/1/1996	Nitrate as N (NO3)	5.2	mg/L
GW	GWQ94-13	7/1/1996	Selenium	0.0068	mg/L
GW	GWQ94-13	7/1/1996	Silver	<0.05	mg/L
GW	GWQ94-13	7/1/1996	Sulfate	620	mg/L
GW	GWQ94-13	7/1/1996	TDS	1520	mg/L
GW	GWQ94-13	7/1/1996	Zinc	<0.05	mg/L
GW	GWQ94-13	7/1/1996	pH	7.76	pH units
GW	GWQ94-13	7/1/1996	Conductivity	2000	µmhos/cm
GW	GWQ94-13	7/1/1996	Antimony	<0.002	mg/L
GW	GWQ94-13	7/1/1996	Beryllium	<0.002	mg/L
GW	GWQ94-13	7/1/1996	Calcium	290	mg/L
GW	GWQ94-13	7/1/1996	Magnesium	62	mg/L
GW	GWQ94-13	7/1/1996	Thallium	<0.001	mg/L
GW	GWQ94-13	7/1/1996	Sodium	120	mg/L
GW	GWQ94-13	7/1/1996	Bicarbonate	156	mg/L CaCO3

GW	GWQ94-13	7/1/1996	Carbonate	0	mg/L CaCO3
GW	GWQ94-13	7/1/1996	Potassium	3.6	mg/L
GW	GWQ94-15	7/1/1996	Aluminum	<0.025	mg/L
GW	GWQ94-15	7/1/1996	Arsenic	<0.005	mg/L
GW	GWQ94-15	7/1/1996	Barium	<0.05	mg/L
GW	GWQ94-15	7/1/1996	Boron	<0.05	mg/L
GW	GWQ94-15	7/1/1996	Cadmium	<0.0005	mg/L
GW	GWQ94-15	7/1/1996	Chloride	130	mg/L
GW	GWQ94-15	7/1/1996	Chromium	<0.025	mg/L
GW	GWQ94-15	7/1/1996	Cobalt	<0.05	mg/L
GW	GWQ94-15	7/1/1996	Copper	<0.025	mg/L
GW	GWQ94-15	7/1/1996	Fluoride	0.42	mg/L
GW	GWQ94-15	7/1/1996	Iron	0.41	mg/L
GW	GWQ94-15	7/1/1996	Lead	<0.005	mg/L
GW	GWQ94-15	7/1/1996	Manganese	<0.03	mg/L
GW	GWQ94-15	7/1/1996	Mercury	<0.001	mg/L
GW	GWQ94-15	7/1/1996	Molybdenum	<0.05	mg/L
GW	GWQ94-15	7/1/1996	Nickel	<0.05	mg/L
GW	GWQ94-15	7/1/1996	Nitrate as N (NO3)	2.5	mg/L
GW	GWQ94-15	7/1/1996	Selenium	<0.005	mg/L
GW	GWQ94-15	7/1/1996	Silver	<0.05	mg/L
GW	GWQ94-15	7/1/1996	Sulfate	240	mg/L
GW	GWQ94-15	7/1/1996	TDS	780	mg/L
GW	GWQ94-15	7/1/1996	Zinc	<0.05	mg/L
GW	GWQ94-15	7/1/1996	pH	7.31	pH units
GW	GWQ94-15	7/1/1996	Conductivity	1190	µmhos/cm
GW	GWQ94-15	7/1/1996	Antimony	<0.002	mg/L
GW	GWQ94-15	7/1/1996	Beryllium	<0.002	mg/L
GW	GWQ94-15	7/1/1996	Calcium	140	mg/L
GW	GWQ94-15	7/1/1996	Magnesium	38	mg/L
GW	GWQ94-15	7/1/1996	Thallium	<0.001	mg/L
GW	GWQ94-15	7/1/1996	Sodium	77	mg/L
GW	GWQ94-15	7/1/1996	Bicarbonate	227	mg/L CaCO3
GW	GWQ94-15	7/1/1996	Carbonate	0	mg/L CaCO3
GW	GWQ94-15	7/1/1996	Potassium	2.4	mg/L
GW	GWQ94-16	7/1/1996	Aluminum	<0.025	mg/L
GW	GWQ94-16	7/1/1996	Arsenic	<0.005	mg/L
GW	GWQ94-16	7/1/1996	Barium	<0.05	mg/L
GW	GWQ94-16	7/1/1996	Boron	<0.05	mg/L
GW	GWQ94-16	7/1/1996	Cadmium	<0.0005	mg/L
GW	GWQ94-16	7/1/1996	Chloride	200	mg/L
GW	GWQ94-16	7/1/1996	Chromium	<0.025	mg/L
GW	GWQ94-16	7/1/1996	Cobalt	<0.05	mg/L
GW	GWQ94-16	7/1/1996	Copper	<0.025	mg/L
GW	GWQ94-16	7/1/1996	Fluoride	0.57	mg/L
GW	GWQ94-16	7/1/1996	Iron	0.22	mg/L
GW	GWQ94-16	7/1/1996	Lead	<0.005	mg/L
GW	GWQ94-16	7/1/1996	Manganese	<0.03	mg/L
GW	GWQ94-16	7/1/1996	Mercury	<0.001	mg/L
GW	GWQ94-16	7/1/1996	Molybdenum	<0.05	mg/L
GW	GWQ94-16	7/1/1996	Nickel	<0.05	mg/L
GW	GWQ94-16	7/1/1996	Nitrate as N (NO3)	3.7	mg/L
GW	GWQ94-16	7/1/1996	Selenium	<0.005	mg/L
GW	GWQ94-16	7/1/1996	Silver	<0.05	mg/L
GW	GWQ94-16	7/1/1996	Sulfate	500	mg/L
GW	GWQ94-16	7/1/1996	TDS	1160	mg/L
GW	GWQ94-16	7/1/1996	Zinc	<0.05	mg/L
GW	GWQ94-16	7/1/1996	pH	7.95	pH units
GW	GWQ94-16	7/1/1996	Conductivity	1620	µmhos/cm
GW	GWQ94-16	7/1/1996	Antimony	<0.002	mg/L
GW	GWQ94-16	7/1/1996	Beryllium	<0.002	mg/L
GW	GWQ94-16	7/1/1996	Calcium	200	mg/L
GW	GWQ94-16	7/1/1996	Magnesium	54	mg/L
GW	GWQ94-16	7/1/1996	Thallium	<0.001	mg/L
GW	GWQ94-16	7/1/1996	Sodium	80	mg/L
GW	GWQ94-16	7/1/1996	Bicarbonate	193	mg/L CaCO3
GW	GWQ94-16	7/1/1996	Carbonate	0	mg/L CaCO3
GW	GWQ94-16	7/1/1996	Potassium	3.4	mg/L
GW	GWQ96-22A	7/13/1996	Aluminum	<0.025	mg/L
GW	GWQ96-22A	7/13/1996	Arsenic	<0.005	mg/L
GW	GWQ96-22A	7/13/1996	Barium	<0.05	mg/L
GW	GWQ96-22A	7/13/1996	Boron	<0.05	mg/L
GW	GWQ96-22A	7/13/1996	Cadmium	<0.0005	mg/L
GW	GWQ96-22A	7/13/1996	Chloride	89	mg/L
GW	GWQ96-22A	7/13/1996	Chromium	<0.025	mg/L
GW	GWQ96-22A	7/13/1996	Cobalt	<0.05	mg/L

GW	GWQ96-22A	7/13/1996	Copper	<0.025	mg/L
GW	GWQ96-22A	7/13/1996	Fluoride	3.3	mg/L
GW	GWQ96-22A	7/13/1996	Iron	<0.05	mg/L
GW	GWQ96-22A	7/13/1996	Lead	<0.005	mg/L
GW	GWQ96-22A	7/13/1996	Manganese	0.075	mg/L
GW	GWQ96-22A	7/13/1996	Mercury	<0.001	mg/L
GW	GWQ96-22A	7/13/1996	Molybdenum	<0.05	mg/L
GW	GWQ96-22A	7/13/1996	Nickel	<0.05	mg/L
GW	GWQ96-22A	7/13/1996	Nitrate as N (NO3)	<1	mg/L
GW	GWQ96-22A	7/13/1996	Selenium	<0.005	mg/L
GW	GWQ96-22A	7/13/1996	Silver	<0.05	mg/L
GW	GWQ96-22A	7/13/1996	Sulfate	250	mg/L
GW	GWQ96-22A	7/13/1996	TDS	700	mg/L
GW	GWQ96-22A	7/13/1996	Zinc	<0.05	mg/L
GW	GWQ96-22A	7/13/1996	pH	7.5	pH units
GW	GWQ96-22A	7/13/1996	Conductivity	1040	µmhos/cm
GW	GWQ96-22A	7/13/1996	Antimony	<0.003	mg/L
GW	GWQ96-22A	7/13/1996	Beryllium	<0.002	mg/L
GW	GWQ96-22A	7/13/1996	Calcium	71	mg/L
GW	GWQ96-22A	7/13/1996	Magnesium	6.7	mg/L
GW	GWQ96-22A	7/13/1996	Thallium	<0.001	mg/L
GW	GWQ96-22A	7/13/1996	Sodium	150	mg/L
GW	GWQ96-22A	7/13/1996	Bicarbonate	124	mg/L CaCO3
GW	GWQ96-22A	7/13/1996	Carbonate	0	mg/L CaCO3
GW	GWQ96-22A	7/13/1996	Potassium	2.5	mg/L
GW	GWQ96-22B	7/13/1996	Aluminum	<0.025	mg/L
GW	GWQ96-22B	7/13/1996	Arsenic	<0.005	mg/L
GW	GWQ96-22B	7/13/1996	Barium	0.096	mg/L
GW	GWQ96-22B	7/13/1996	Boron	0.12	mg/L
GW	GWQ96-22B	7/13/1996	Cadmium	<0.0005	mg/L
GW	GWQ96-22B	7/13/1996	Chloride	210	mg/L
GW	GWQ96-22B	7/13/1996	Chromium	<0.025	mg/L
GW	GWQ96-22B	7/13/1996	Cobalt	<0.05	mg/L
GW	GWQ96-22B	7/13/1996	Copper	<0.025	mg/L
GW	GWQ96-22B	7/13/1996	Fluoride	1.8	mg/L
GW	GWQ96-22B	7/13/1996	Iron	<0.05	mg/L
GW	GWQ96-22B	7/13/1996	Lead	<0.005	mg/L
GW	GWQ96-22B	7/13/1996	Manganese	0.41	mg/L
GW	GWQ96-22B	7/13/1996	Mercury	<0.001	mg/L
GW	GWQ96-22B	7/13/1996	Molybdenum	<0.05	mg/L
GW	GWQ96-22B	7/13/1996	Nickel	<0.05	mg/L
GW	GWQ96-22B	7/13/1996	Nitrate as N (NO3)	<1	mg/L
GW	GWQ96-22B	7/13/1996	Selenium	<0.005	mg/L
GW	GWQ96-22B	7/13/1996	Silver	<0.05	mg/L
GW	GWQ96-22B	7/13/1996	Sulfate	79	mg/L
GW	GWQ96-22B	7/13/1996	TDS	650	mg/L
GW	GWQ96-22B	7/13/1996	Zinc	<0.05	mg/L
GW	GWQ96-22B	7/13/1996	pH	7.75	pH units
GW	GWQ96-22B	7/13/1996	Conductivity	1070	µmhos/cm
GW	GWQ96-22B	7/13/1996	Antimony	<0.003	mg/L
GW	GWQ96-22B	7/13/1996	Beryllium	<0.002	mg/L
GW	GWQ96-22B	7/13/1996	Calcium	66	mg/L
GW	GWQ96-22B	7/13/1996	Magnesium	10	mg/L
GW	GWQ96-22B	7/13/1996	Thallium	<0.001	mg/L
GW	GWQ96-22B	7/13/1996	Sodium	130	mg/L
GW	GWQ96-22B	7/13/1996	Bicarbonate	141	mg/L CaCO3
GW	GWQ96-22B	7/13/1996	Carbonate	0	mg/L CaCO3
GW	GWQ96-22B	7/13/1996	Potassium	10	mg/L
GW	GWQ96-23A	7/14/1996	Aluminum	0.28	mg/L
GW	GWQ96-23A	7/14/1996	Arsenic	<0.005	mg/L
GW	GWQ96-23A	7/14/1996	Barium	0.064	mg/L
GW	GWQ96-23A	7/14/1996	Boron	<0.05	mg/L
GW	GWQ96-23A	7/14/1996	Cadmium	<0.0005	mg/L
GW	GWQ96-23A	7/14/1996	Chloride	22	mg/L
GW	GWQ96-23A	7/14/1996	Chromium	<0.025	mg/L
GW	GWQ96-23A	7/14/1996	Cobalt	<0.05	mg/L
GW	GWQ96-23A	7/14/1996	Copper	<0.025	mg/L
GW	GWQ96-23A	7/14/1996	Fluoride	0.84	mg/L
GW	GWQ96-23A	7/14/1996	Iron	0.26	mg/L
GW	GWQ96-23A	7/14/1996	Lead	<0.005	mg/L
GW	GWQ96-23A	7/14/1996	Manganese	0.05	mg/L
GW	GWQ96-23A	7/14/1996	Mercury	<0.001	mg/L
GW	GWQ96-23A	7/14/1996	Molybdenum	<0.05	mg/L
GW	GWQ96-23A	7/14/1996	Nickel	<0.05	mg/L
GW	GWQ96-23A	7/14/1996	Nitrate as N (NO3)	<1	mg/L
GW	GWQ96-23A	7/14/1996	Selenium	<0.005	mg/L

GW	GWQ96-23A	7/14/1996	Silver	<0.05	mg/L
GW	GWQ96-23A	7/14/1996	Sulfate	140	mg/L
GW	GWQ96-23A	7/14/1996	TDS	520	mg/L
GW	GWQ96-23A	7/14/1996	Zinc	<0.05	mg/L
GW	GWQ96-23A	7/14/1996	pH	7.95	pH units
GW	GWQ96-23A	7/14/1996	Conductivity	760	µmhos/cm
GW	GWQ96-23A	7/14/1996	Antimony	<0.003	mg/L
GW	GWQ96-23A	7/14/1996	Beryllium	<0.002	mg/L
GW	GWQ96-23A	7/14/1996	Calcium	59	mg/L
GW	GWQ96-23A	7/14/1996	Magnesium	18	mg/L
GW	GWQ96-23A	7/14/1996	Thallium	<0.001	mg/L
GW	GWQ96-23A	7/14/1996	Sodium	98	mg/L
GW	GWQ96-23A	7/14/1996	Bicarbonate	280	mg/L CaCO3
GW	GWQ96-23A	7/14/1996	Carbonate	0	mg/L CaCO3
GW	GWQ96-23A	7/14/1996	Potassium	4.2	mg/L
GW	GWQ96-23B	7/14/1996	Aluminum	7.4	mg/L
GW	GWQ96-23B	7/14/1996	Arsenic	<0.005	mg/L
GW	GWQ96-23B	7/14/1996	Barium	0.093	mg/L
GW	GWQ96-23B	7/14/1996	Boron	0.058	mg/L
GW	GWQ96-23B	7/14/1996	Cadmium	<0.0005	mg/L
GW	GWQ96-23B	7/14/1996	Chloride	20	mg/L
GW	GWQ96-23B	7/14/1996	Chromium	<0.025	mg/L
GW	GWQ96-23B	7/14/1996	Cobalt	<0.05	mg/L
GW	GWQ96-23B	7/14/1996	Copper	<0.025	mg/L
GW	GWQ96-23B	7/14/1996	Fluoride	1.1	mg/L
GW	GWQ96-23B	7/14/1996	Iron	3.7	mg/L
GW	GWQ96-23B	7/14/1996	Lead	<0.005	mg/L
GW	GWQ96-23B	7/14/1996	Manganese	0.13	mg/L
GW	GWQ96-23B	7/14/1996	Mercury	<0.001	mg/L
GW	GWQ96-23B	7/14/1996	Molybdenum	<0.05	mg/L
GW	GWQ96-23B	7/14/1996	Nickel	<0.05	mg/L
GW	GWQ96-23B	7/14/1996	Nitrate as N (NO3)	<1	mg/L
GW	GWQ96-23B	7/14/1996	Selenium	<0.005	mg/L
GW	GWQ96-23B	7/14/1996	Silver	<0.05	mg/L
GW	GWQ96-23B	7/14/1996	Sulfate	170	mg/L
GW	GWQ96-23B	7/14/1996	TDS	550	mg/L
GW	GWQ96-23B	7/14/1996	Zinc	<0.05	mg/L
GW	GWQ96-23B	7/14/1996	pH	8.15	pH units
GW	GWQ96-23B	7/14/1996	Conductivity	780	µmhos/cm
GW	GWQ96-23B	7/14/1996	Antimony	<0.003	mg/L
GW	GWQ96-23B	7/14/1996	Beryllium	<0.002	mg/L
GW	GWQ96-23B	7/14/1996	Calcium	67	mg/L
GW	GWQ96-23B	7/14/1996	Magnesium	20	mg/L
GW	GWQ96-23B	7/14/1996	Thallium	<0.001	mg/L
GW	GWQ96-23B	7/14/1996	Sodium	79	mg/L
GW	GWQ96-23B	7/14/1996	Bicarbonate	234	mg/L CaCO3
GW	GWQ96-23B	7/14/1996	Carbonate	0	mg/L CaCO3
GW	GWQ96-23B	7/14/1996	Potassium	4	mg/L
GW	GWQ-10	9/25/1996	Chloride	86.2	mg/L
GW	GWQ-10	9/25/1996	Sulfate	190.8	mg/L
GW	GWQ-10	9/25/1996	TDS	679	mg/L
GW	GWQ-10	9/25/1996	pH	7.56	pH units
GW	GWQ-11	9/25/1996	Chloride	116	mg/L
GW	GWQ-11	9/25/1996	Sulfate	229.9	mg/L
GW	GWQ-11	9/25/1996	TDS	835	mg/L
GW	GWQ-11	9/25/1996	pH	7.78	pH units
GW	IW-1	9/25/1996	Chloride	568	mg/L
GW	IW-1	9/25/1996	Sulfate	1493	mg/L
GW	IW-1	9/25/1996	TDS	3551	mg/L
GW	IW-1	9/25/1996	pH	7.17	pH units
GW	NP-1	9/25/1996	Chloride	23.6	mg/L
GW	NP-1	9/25/1996	Sulfate	94.4	mg/L
GW	NP-1	9/25/1996	TDS	320	mg/L
GW	NP-1	9/25/1996	pH	8.22	pH units
GW	NP-2	9/25/1996	Chloride	57.2	mg/L
GW	NP-2	9/25/1996	Sulfate	118	mg/L
GW	NP-2	9/25/1996	TDS	598	mg/L
GW	NP-2	9/25/1996	pH	7.68	pH units
GW	NP-3	9/25/1996	Chloride	190.5	mg/L
GW	NP-3	9/25/1996	Sulfate	536.5	mg/L
GW	NP-3	9/25/1996	TDS	1472	mg/L
GW	NP-3	9/25/1996	pH	7.72	pH units
GW	NP-4	9/25/1996	Chloride	31.7	mg/L
GW	NP-4	9/25/1996	Sulfate	125.6	mg/L
GW	NP-4	9/25/1996	TDS	504	mg/L
GW	NP-4	9/25/1996	pH	7.75	pH units

GW	NP-5	9/25/1996	Chloride	42.5	mg/L
GW	NP-5	9/25/1996	Sulfate	129.4	mg/L
GW	NP-5	9/25/1996	TDS	504	mg/L
GW	NP-5	9/25/1996	pH	8.09	pH units
GW	GWQ-10	1/15/1997	Chloride	91	mg/L
GW	GWQ-10	1/15/1997	Sulfate	203.67	mg/L
GW	GWQ-10	1/15/1997	TDS	746	mg/L
GW	GWQ-10	1/15/1997	pH	7.59	pH units
GW	GWQ-11	1/15/1997	Chloride	127	mg/L
GW	GWQ-11	1/15/1997	Sulfate	303.9	mg/L
GW	GWQ-11	1/15/1997	TDS	860	mg/L
GW	GWQ-11	1/15/1997	pH	7.68	pH units
GW	IW-1	1/15/1997	Chloride	410	mg/L
GW	IW-1	1/15/1997	Sulfate	1694.5	mg/L
GW	IW-1	1/15/1997	TDS	35.97	mg/L
GW	IW-1	1/15/1997	pH	7.44	pH units
GW	NP-1	1/15/1997	Chloride	25.6	mg/L
GW	NP-1	1/15/1997	Sulfate	109.13	mg/L
GW	NP-1	1/15/1997	TDS	318	mg/L
GW	NP-1	1/15/1997	pH	8.42	pH units
GW	NP-2	1/15/1997	Chloride	56	mg/L
GW	NP-2	1/15/1997	Sulfate	148.4	mg/L
GW	NP-2	1/15/1997	TDS	536	mg/L
GW	NP-2	1/15/1997	pH	7.44	pH units
GW	NP-3	1/15/1997	Chloride	207	mg/L
GW	NP-3	1/15/1997	Sulfate	657.4	mg/L
GW	NP-3	1/15/1997	TDS	1478	mg/L
GW	NP-3	1/15/1997	pH	7.51	pH units
GW	NP-4	1/15/1997	Chloride	98	mg/L
GW	NP-4	1/15/1997	Sulfate	1113	mg/L
GW	NP-4	1/15/1997	TDS	2651	mg/L
GW	NP-4	1/15/1997	pH	7.43	pH units
GW	NP-5	1/15/1997	Chloride	45.7	mg/L
GW	NP-5	1/15/1997	Sulfate	140.69	mg/L
GW	NP-5	1/15/1997	TDS	498	mg/L
GW	NP-5	1/15/1997	pH	7.76	pH units
GW	GWQ96-22A	4/9/1997	Chloride	20	mg/L
GW	GWQ96-22A	4/9/1997	Copper	<0.025	mg/L
GW	GWQ96-22A	4/9/1997	Fluoride	0.8	mg/L
GW	GWQ96-22A	4/9/1997	Iron	6.5	mg/L
GW	GWQ96-22A	4/9/1997	Manganese	2.8	mg/L
GW	GWQ96-22A	4/9/1997	Mercury	<0.001	mg/L
GW	GWQ96-22A	4/9/1997	Selenium	<0.005	mg/L
GW	GWQ96-22A	4/9/1997	Sulfate	150	mg/L
GW	GWQ96-22A	4/9/1997	TDS	770	mg/L
GW	GWQ96-22A	4/9/1997	pH	7.58	pH units
GW	GWQ96-22A	4/9/1997	Conductivity	930	µmhos/cm
GW	GWQ96-23A	4/9/1997	Chloride	16	mg/L
GW	GWQ96-23A	4/9/1997	Copper	<0.025	mg/L
GW	GWQ96-23A	4/9/1997	Fluoride	1.4	mg/L
GW	GWQ96-23A	4/9/1997	Iron	0.1	mg/L
GW	GWQ96-23A	4/9/1997	Manganese	0.75	mg/L
GW	GWQ96-23A	4/9/1997	Mercury	<0.001	mg/L
GW	GWQ96-23A	4/9/1997	Selenium	<0.005	mg/L
GW	GWQ96-23A	4/9/1997	Sulfate	170	mg/L
GW	GWQ96-23A	4/9/1997	TDS	580	mg/L
GW	GWQ96-23A	4/9/1997	Conductivity	850	µmhos/cm
GW	GWQ96-22A	8/8/1997	Aluminum	0.028	mg/L
GW	GWQ96-22A	8/8/1997	Arsenic	<0.005	mg/L
GW	GWQ96-22A	8/8/1997	Barium	0.057	mg/L
GW	GWQ96-22A	8/8/1997	Boron	0.23	mg/L
GW	GWQ96-22A	8/8/1997	Cadmium	<0.002	mg/L
GW	GWQ96-22A	8/8/1997	Chloride	89	mg/L
GW	GWQ96-22A	8/8/1997	Chromium	<0.025	mg/L
GW	GWQ96-22A	8/8/1997	Cobalt	<0.05	mg/L
GW	GWQ96-22A	8/8/1997	Copper	<0.05	mg/L
GW	GWQ96-22A	8/8/1997	Fluoride	2.2	mg/L
GW	GWQ96-22A	8/8/1997	Iron	0.13	mg/L
GW	GWQ96-22A	8/8/1997	Lead	<0.005	mg/L
GW	GWQ96-22A	8/8/1997	Manganese	0.53	mg/L
GW	GWQ96-22A	8/8/1997	Molybdenum	<0.05	mg/L
GW	GWQ96-22A	8/8/1997	Nickel	<0.05	mg/L
GW	GWQ96-22A	8/8/1997	Nitrate as N (NO3)	<1	mg/L
GW	GWQ96-22A	8/8/1997	Selenium	<0.005	mg/L
GW	GWQ96-22A	8/8/1997	Silver	<0.025	mg/L
GW	GWQ96-22A	8/8/1997	Sulfate	230	mg/L

GW	GWQ96-22A	8/8/1997	TDS	700	mg/L
GW	GWQ96-22A	8/8/1997	Zinc	<0.05	mg/L
GW	GWQ96-22A	8/8/1997	pH	7.65	pH units
GW	GWQ96-22A	8/8/1997	Conductivity	1140	µmhos/cm
GW	GWQ96-22A	8/8/1997	Beryllium	<0.002	mg/L
GW	GWQ96-22A	8/8/1997	Calcium	73	mg/L
GW	GWQ96-22A	8/8/1997	Magnesium	8.2	mg/L
GW	GWQ96-22A	8/8/1997	Thallium	<0.001	mg/L
GW	GWQ96-22A	8/8/1997	Sodium	170	mg/L
GW	GWQ96-22A	8/8/1997	Bicarbonate	177	mg/L CaCO3
GW	GWQ96-22A	8/8/1997	Carbonate	0	mg/L CaCO3
GW	GWQ96-22A	8/8/1997	Potassium	6.2	mg/L
GW	GWQ96-23A	8/8/1997	Aluminum	0.036	mg/L
GW	GWQ96-23A	8/8/1997	Arsenic	<0.005	mg/L
GW	GWQ96-23A	8/8/1997	Barium	0.13	mg/L
GW	GWQ96-23A	8/8/1997	Boron	0.067	mg/L
GW	GWQ96-23A	8/8/1997	Cadmium	<0.002	mg/L
GW	GWQ96-23A	8/8/1997	Chloride	18	mg/L
GW	GWQ96-23A	8/8/1997	Chromium	<0.025	mg/L
GW	GWQ96-23A	8/8/1997	Cobalt	<0.05	mg/L
GW	GWQ96-23A	8/8/1997	Copper	<0.025	mg/L
GW	GWQ96-23A	8/8/1997	Fluoride	1.2	mg/L
GW	GWQ96-23A	8/8/1997	Iron	0.82	mg/L
GW	GWQ96-23A	8/8/1997	Lead	<0.005	mg/L
GW	GWQ96-23A	8/8/1997	Manganese	1.6	mg/L
GW	GWQ96-23A	8/8/1997	Molybdenum	<0.05	mg/L
GW	GWQ96-23A	8/8/1997	Nickel	<0.05	mg/L
GW	GWQ96-23A	8/8/1997	Nitrate as N (NO3)	<1	mg/L
GW	GWQ96-23A	8/8/1997	Selenium	<0.005	mg/L
GW	GWQ96-23A	8/8/1997	Silver	<0.025	mg/L
GW	GWQ96-23A	8/8/1997	Sulfate	410	mg/L
GW	GWQ96-23A	8/8/1997	TDS	920	mg/L
GW	GWQ96-23A	8/8/1997	Zinc	<0.05	mg/L
GW	GWQ96-23A	8/8/1997	pH	7.68	pH units
GW	GWQ96-23A	8/8/1997	Conductivity	1310	µmhos/cm
GW	GWQ96-23A	8/8/1997	Beryllium	<0.002	mg/L
GW	GWQ96-23A	8/8/1997	Calcium	130	mg/L
GW	GWQ96-23A	8/8/1997	Magnesium	36	mg/L
GW	GWQ96-23A	8/8/1997	Thallium	<0.001	mg/L
GW	GWQ96-23A	8/8/1997	Sodium	72	mg/L
GW	GWQ96-23A	8/8/1997	Bicarbonate	328	mg/L CaCO3
GW	GWQ96-23A	8/8/1997	Carbonate	0	mg/L CaCO3
GW	GWQ96-23A	8/8/1997	Potassium	2.5	mg/L
GW	GWQ94-14	1/29/2010	Aluminum	<0.02	mg/L
GW	GWQ94-14	1/29/2010	Arsenic	0.0032	mg/L
GW	GWQ94-14	1/29/2010	Barium	0.045	mg/L
GW	GWQ94-14	1/29/2010	Boron	<0.04	mg/L
GW	GWQ94-14	1/29/2010	Cadmium	<0.002	mg/L
GW	GWQ94-14	1/29/2010	Chloride	50	mg/L
GW	GWQ94-14	1/29/2010	Chromium	<0.006	mg/L
GW	GWQ94-14	1/29/2010	Cobalt	<0.006	mg/L
GW	GWQ94-14	1/29/2010	Copper	<0.006	mg/L
GW	GWQ94-14	1/29/2010	Cyanide	<0.005	mg/L
GW	GWQ94-14	1/29/2010	Fluoride	0.48	mg/L
GW	GWQ94-14	1/29/2010	Iron	<0.02	mg/L
GW	GWQ94-14	1/29/2010	Lead	<0.005	mg/L
GW	GWQ94-14	1/29/2010	Manganese	<0.002	mg/L
GW	GWQ94-14	1/29/2010	Mercury	<0.0002	mg/L
GW	GWQ94-14	1/29/2010	Molybdenum	<0.008	mg/L
GW	GWQ94-14	1/29/2010	Nickel	<0.01	mg/L
GW	GWQ94-14	1/29/2010	Selenium	0.0068	mg/L
GW	GWQ94-14	1/29/2010	Silver	<0.005	mg/L
GW	GWQ94-14	1/29/2010	Sulfate	150	mg/L
GW	GWQ94-14	1/29/2010	TDS	550	mg/L
GW	GWQ94-14	1/29/2010	Zinc	0.01	mg/L
GW	GWQ94-14	1/29/2010	pH	8	pH units
GW	GWQ94-14	1/29/2010	Beryllium	<0.002	mg/L
GW	GWQ94-14	1/29/2010	Calcium	96	mg/L
GW	GWQ94-14	1/29/2010	Magnesium	26	mg/L
GW	GWQ94-14	1/29/2010	Potassium	2	mg/L
GW	GWQ94-14	1/29/2010	Sodium	49	mg/L
GW	GWQ94-14	1/29/2010	Antimony	<0.0025	mg/L
GW	GWQ94-14	1/29/2010	Thallium	<0.0025	mg/L
GW	GWQ94-14	1/29/2010	Nitrate (As N)+Nitrite (As N)	2.2	mg/L
GW	GWQ94-14	1/29/2010	Alkalinity, Total (As CaCO3)	210	mg/L CaCO3
GW	GWQ94-14	1/29/2010	Carbonate	<2	mg/L CaCO3

GW	GWQ94-14	1/29/2010	Bicarbonate	210	mg/L CaCO3
GW	GWQ94-14	1/29/2010	Specific Conductance	820	µmhos/cm
GW	GWQ94-15	1/29/2010	Aluminum	<0.020	mg/L
GW	GWQ94-15	1/29/2010	Arsenic	0.0042	mg/L
GW	GWQ94-15	1/29/2010	Barium	0.058	mg/L
GW	GWQ94-15	1/29/2010	Boron	<0.040	mg/L
GW	GWQ94-15	1/29/2010	Cadmium	<0.0020	mg/L
GW	GWQ94-15	1/29/2010	Chloride	170	mg/L
GW	GWQ94-15	1/29/2010	Chromium	<0.0060	mg/L
GW	GWQ94-15	1/29/2010	Cobalt	<0.0060	mg/L
GW	GWQ94-15	1/29/2010	Copper	<0.0060	mg/L
GW	GWQ94-15	1/29/2010	Cyanide	<0.005	mg/L
GW	GWQ94-15	1/29/2010	Fluoride	0.3	mg/L
GW	GWQ94-15	1/29/2010	Iron	<0.020	mg/L
GW	GWQ94-15	1/29/2010	Lead	<0.0050	mg/L
GW	GWQ94-15	1/29/2010	Manganese	<0.0020	mg/L
GW	GWQ94-15	1/29/2010	Mercury	<0.00020	mg/L
GW	GWQ94-15	1/29/2010	Molybdenum	<0.0080	mg/L
GW	GWQ94-15	1/29/2010	Nickel	<0.010	mg/L
GW	GWQ94-15	1/29/2010	Selenium	0.021	mg/L
GW	GWQ94-15	1/29/2010	Silver	<0.0050	mg/L
GW	GWQ94-15	1/29/2010	Sulfate	420	mg/L
GW	GWQ94-15	1/29/2010	TDS	1080	mg/L
GW	GWQ94-15	1/29/2010	Zinc	0.022	mg/L
GW	GWQ94-15	1/29/2010	pH	7	pH units
GW	GWQ94-15	1/29/2010	Beryllium	<0.0020	mg/L
GW	GWQ94-15	1/29/2010	Calcium	180	mg/L
GW	GWQ94-15	1/29/2010	Magnesium	47	mg/L
GW	GWQ94-15	1/29/2010	Potassium	3	mg/L
GW	GWQ94-15	1/29/2010	Sodium	84	mg/L
GW	GWQ94-15	1/29/2010	Antimony	<0.0025	mg/L
GW	GWQ94-15	1/29/2010	Thallium	<0.0025	mg/L
GW	GWQ94-15	1/29/2010	Nitrate (As N)+Nitrite (As N)	4.1	mg/L
GW	GWQ94-15	1/29/2010	Alkalinity, Total (As CaCO3)	160	mg/L CaCO3
GW	GWQ94-15	1/29/2010	Carbonate	<2.0	mg/L CaCO3
GW	GWQ94-15	1/29/2010	Bicarbonate	160	mg/L CaCO3
GW	GWQ94-15	1/29/2010	Specific Conductance	1500	µmhos/cm
GW	GWQ96-22A	1/30/2010	Aluminum	<0.020	mg/L
GW	GWQ96-22A	1/30/2010	Arsenic	0.0029	mg/L
GW	GWQ96-22A	1/30/2010	Barium	0.094	mg/L
GW	GWQ96-22A	1/30/2010	Boron	0.28	mg/L
GW	GWQ96-22A	1/30/2010	Cadmium	<0.0020	mg/L
GW	GWQ96-22A	1/30/2010	Chloride	81	mg/L
GW	GWQ96-22A	1/30/2010	Chromium	<0.0060	mg/L
GW	GWQ96-22A	1/30/2010	Cobalt	<0.0060	mg/L
GW	GWQ96-22A	1/30/2010	Copper	<0.0060	mg/L
GW	GWQ96-22A	1/30/2010	Fluoride	2.6	mg/L
GW	GWQ96-22A	1/30/2010	Iron	2.1	mg/L
GW	GWQ96-22A	1/30/2010	Lead	<0.0050	mg/L
GW	GWQ94-22A	1/30/2010	Cyanide	<0.005	mg/L
GW	GWQ96-22A	1/30/2010	Manganese	0.74	mg/L
GW	GWQ96-22A	1/30/2010	Mercury	<0.00020	mg/L
GW	GWQ96-22A	1/30/2010	Molybdenum	<0.0080	mg/L
GW	GWQ96-22A	1/30/2010	Nickel	<0.010	mg/L
GW	GWQ96-22A	1/30/2010	Selenium	<0.0025	mg/L
GW	GWQ96-22A	1/30/2010	Silver	<0.0050	mg/L
GW	GWQ96-22A	1/30/2010	Sulfate	44	mg/L
GW	GWQ96-22A	1/30/2010	TDS	557	mg/L
GW	GWQ96-22A	1/30/2010	Zinc	<0.010	mg/L
GW	GWQ96-22A	1/30/2010	pH	8	pH units
GW	GWQ96-22A	1/30/2010	Beryllium	<0.0020	mg/L
GW	GWQ96-22A	1/30/2010	Calcium	51	mg/L
GW	GWQ96-22A	1/30/2010	Magnesium	3.8	mg/L
GW	GWQ96-22A	1/30/2010	Potassium	2.8	mg/L
GW	GWQ96-22A	1/30/2010	Sodium	160	mg/L
GW	GWQ96-22A	1/30/2010	Antimony	<0.0025	mg/L
GW	GWQ96-22A	1/30/2010	Thallium	<0.0025	mg/L
GW	GWQ96-22A	1/30/2010	Nitrate (As N)+Nitrite (As N)	<1.0	mg/L
GW	GWQ96-22A	1/30/2010	Alkalinity, Total (As CaCO3)	320	mg/L CaCO3
GW	GWQ96-22A	1/30/2010	Carbonate	<2.0	mg/L CaCO3
GW	GWQ96-22A	1/30/2010	Bicarbonate	320	mg/L CaCO3
GW	GWQ96-22A	1/30/2010	Specific Conductance	920	µmhos/cm
GW	GWQ96-23A	1/30/2010	Aluminum	<0.020	mg/L
GW	GWQ96-23A	1/30/2010	Arsenic	0.0027	mg/L
GW	GWQ96-23A	1/30/2010	Barium	0.091	mg/L
GW	GWQ96-23A	1/30/2010	Boron	0.074	mg/L

GW	GWQ96-23A	1/30/2010	Cadmium	<0.0020	mg/L
GW	GWQ96-23A	1/30/2010	Chloride	12	mg/L
GW	GWQ96-23A	1/30/2010	Chromium	<0.0060	mg/L
GW	GWQ96-23A	1/30/2010	Cobalt	<0.0060	mg/L
GW	GWQ96-23A	1/30/2010	Copper	<0.0060	mg/L
GW	GWQ94-23A	1/30/2010	Cyanide	<0.005	mg/L
GW	GWQ96-23A	1/30/2010	Fluoride	1.7	mg/L
GW	GWQ96-23A	1/30/2010	Iron	0.66	mg/L
GW	GWQ96-23A	1/30/2010	Lead	<0.0050	mg/L
GW	GWQ96-23A	1/30/2010	Manganese	0.63	mg/L
GW	GWQ96-23A	1/30/2010	Mercury	<0.00020	mg/L
GW	GWQ96-23A	1/30/2010	Molybdenum	<0.0080	mg/L
GW	GWQ96-23A	1/30/2010	Nickel	<0.010	mg/L
GW	GWQ96-23A	1/30/2010	Selenium	<0.0025	mg/L
GW	GWQ96-23A	1/30/2010	Silver	<0.0050	mg/L
GW	GWQ96-23A	1/30/2010	Sulfate	5.6	mg/L
GW	GWQ96-23A	1/30/2010	TDS	689	mg/L
GW	GWQ96-23A	1/30/2010	Zinc	<0.010	mg/L
GW	GWQ96-23A	1/30/2010	pH	8	pH units
GW	GWQ96-23A	1/30/2010	Beryllium	<0.0020	mg/L
GW	GWQ96-23A	1/30/2010	Calcium	150	mg/L
GW	GWQ96-23A	1/30/2010	Magnesium	45	mg/L
GW	GWQ96-23A	1/30/2010	Potassium	1.6	mg/L
GW	GWQ96-23A	1/30/2010	Sodium	69	mg/L
GW	GWQ96-23A	1/30/2010	Antimony	<0.0025	mg/L
GW	GWQ96-23A	1/30/2010	Thallium	<0.0025	mg/L
GW	GWQ96-23A	1/30/2010	Nitrate (As N)+Nitrite (As N)	<1.0	mg/L
GW	GWQ96-23A	1/30/2010	Alkalinity, Total (As CaCO3)	640	mg/L CaCO3
GW	GWQ96-23A	1/30/2010	Carbonate	<2.0	mg/L CaCO3
GW	GWQ96-23A	1/30/2010	Bicarbonate	640	mg/L CaCO3
GW	GWQ96-23A	1/30/2010	Specific Conductance	1100	µmhos/cm
GW	IW-2	1/31/2010	Aluminum	0.13	mg/L
GW	IW-2	1/31/2010	Arsenic	0.0092	mg/L
GW	IW-2	1/31/2010	Barium	0.024	mg/L
GW	IW-2	1/31/2010	Boron	0.075	mg/L
GW	IW-2	1/31/2010	Cadmium	<0.0020	mg/L
GW	IW-2	1/31/2010	Chloride	600	mg/L
GW	IW-2	1/31/2010	Chromium	<0.0060	mg/L
GW	IW-2	1/31/2010	Cobalt	0.0065	mg/L
GW	IW-2	1/31/2010	Copper	<0.0060	mg/L
GW	IW-2	1/31/2010	Cyanide	<0.005	mg/L
GW	IW-2	1/31/2010	Fluoride	0.74	mg/L
GW	IW-2	1/31/2010	Iron	1.3	mg/L
GW	IW-2	1/31/2010	Lead	<0.0050	mg/L
GW	IW-2	1/31/2010	Manganese	1.6	mg/L
GW	IW-2	1/31/2010	Mercury	<0.00020	mg/L
GW	IW-2	1/31/2010	Molybdenum	0.02	mg/L
GW	IW-2	1/31/2010	Nickel	<0.010	mg/L
GW	IW-2	1/31/2010	Selenium	0.033	mg/L
GW	IW-2	1/31/2010	Silver	<0.0050	mg/L
GW	IW-2	1/31/2010	Sulfate	1200	mg/L
GW	IW-2	1/31/2010	TDS	2770	mg/L
GW	IW-2	1/31/2010	Zinc	<0.010	mg/L
GW	IW-2	1/31/2010	pH	8	pH units
GW	IW-2	1/31/2010	Beryllium	<0.0020	mg/L
GW	IW-2	1/31/2010	Calcium	390	mg/L
GW	IW-2	1/31/2010	Magnesium	120	mg/L
GW	IW-2	1/31/2010	Potassium	1.6	mg/L
GW	IW-2	1/31/2010	Sodium	290	mg/L
GW	IW-2	1/31/2010	Antimony	<0.0025	mg/L
GW	IW-2	1/31/2010	Thallium	<0.0025	mg/L
GW	IW-2	1/31/2010	Nitrate (As N)+Nitrite (As N)	<2.0	mg/L
GW	IW-2	1/31/2010	Alkalinity, Total (As CaCO3)	260	mg/L CaCO3
GW	IW-2	1/31/2010	Carbonate	<2.0	mg/L CaCO3
GW	IW-2	1/31/2010	Bicarbonate	260	mg/L CaCO3
GW	IW-2	1/31/2010	Specific Conductance	3200	µmhos/cm
GW	NP-1	1/31/2010	Aluminum	<0.020	mg/L
GW	NP-1	1/31/2010	Arsenic	<0.0025	mg/L
GW	NP-1	1/31/2010	Barium	0.037	mg/L
GW	NP-1	1/31/2010	Boron	<0.040	mg/L
GW	NP-1	1/31/2010	Cadmium	<0.0020	mg/L
GW	NP-1	1/31/2010	Chloride	38	mg/L
GW	NP-1	1/31/2010	Chromium	<0.0060	mg/L
GW	NP-1	1/31/2010	Cobalt	<0.0060	mg/L
GW	NP-1	1/31/2010	Copper	<0.0060	mg/L
GW	NP-1	1/31/2010	Cyanide	<0.005	mg/L

GW	NP-1	1/31/2010	Fluoride	0.55	mg/L
GW	NP-1	1/31/2010	Iron	0.1	mg/L
GW	NP-1	1/31/2010	Lead	<0.0050	mg/L
GW	NP-1	1/31/2010	Manganese	0.0088	mg/L
GW	NP-1	1/31/2010	Mercury	<0.00020	mg/L
GW	NP-1	1/31/2010	Molybdenum	<0.0080	mg/L
GW	NP-1	1/31/2010	Nickel	<0.010	mg/L
GW	NP-1	1/31/2010	Selenium	0.0055	mg/L
GW	NP-1	1/31/2010	Silver	<0.0050	mg/L
GW	NP-1	1/31/2010	Sulfate	140	mg/L
GW	NP-1	1/31/2010	TDS	514	mg/L
GW	NP-1	1/31/2010	Zinc	0.38	mg/L
GW	NP-1	1/31/2010	pH	8	pH units
GW	NP-1	1/31/2010	Beryllium	<0.0020	mg/L
GW	NP-1	1/31/2010	Calcium	87	mg/L
GW	NP-1	1/31/2010	Magnesium	29	mg/L
GW	NP-1	1/31/2010	Potassium	2	mg/L
GW	NP-1	1/31/2010	Sodium	52	mg/L
GW	NP-1	1/31/2010	Antimony	<0.0025	mg/L
GW	NP-1	1/31/2010	Thallium	<0.0025	mg/L
GW	NP-1	1/31/2010	Nitrate (As N)+Nitrite (As N)	1.4	mg/L
GW	NP-1	1/31/2010	Alkalinity, Total (As CaCO3)	220	mg/L CaCO3
GW	NP-1	1/31/2010	Carbonate	<2.0	mg/L CaCO3
GW	NP-1	1/31/2010	Bicarbonate	220	mg/L CaCO3
GW	NP-1	1/31/2010	Specific Conductance	780	µmhos/cm
GW	NP-2	1/31/2010	Aluminum	<0.020	mg/L
GW	NP-2	1/31/2010	Arsenic	0.0032	mg/L
GW	NP-2	1/31/2010	Barium	0.058	mg/L
GW	NP-2	1/31/2010	Boron	<0.040	mg/L
GW	NP-2	1/31/2010	Cadmium	<0.0020	mg/L
GW	NP-2	1/31/2010	Chloride	150	mg/L
GW	NP-2	1/31/2010	Chromium	<0.0060	mg/L
GW	NP-2	1/31/2010	Cobalt	<0.0060	mg/L
GW	NP-2	1/31/2010	Copper	<0.0060	mg/L
GW	NP-2	1/31/2010	Cyanide	<0.005	mg/L
GW	NP-2	1/31/2010	Fluoride	0.48	mg/L
GW	NP-2	1/31/2010	Iron	0.089	mg/L
GW	NP-2	1/31/2010	Lead	<0.0050	mg/L
GW	NP-2	1/31/2010	Manganese	0.19	mg/L
GW	NP-2	1/31/2010	Mercury	<0.00020	mg/L
GW	NP-2	1/31/2010	Molybdenum	<0.0080	mg/L
GW	NP-2	1/31/2010	Nickel	<0.010	mg/L
GW	NP-2	1/31/2010	Selenium	0.017	mg/L
GW	NP-2	1/31/2010	Silver	<0.0050	mg/L
GW	NP-2	1/31/2010	Sulfate	210	mg/L
GW	NP-2	1/31/2010	TDS	746	mg/L
GW	NP-2	1/31/2010	Zinc	1.1	mg/L
GW	NP-2	1/31/2010	pH	8	pH units
GW	NP-2	1/31/2010	Beryllium	<0.0020	mg/L
GW	NP-2	1/31/2010	Calcium	120	mg/L
GW	NP-2	1/31/2010	Magnesium	35	mg/L
GW	NP-2	1/31/2010	Potassium	2.4	mg/L
GW	NP-2	1/31/2010	Sodium	75	mg/L
GW	NP-2	1/31/2010	Antimony	<0.0025	mg/L
GW	NP-2	1/31/2010	Thallium	<0.0025	mg/L
GW	NP-2	1/31/2010	Nitrate (As N)+Nitrite (As N)	2.5	mg/L
GW	NP-2	1/31/2010	Alkalinity, Total (As CaCO3)	160	mg/L CaCO3
GW	NP-2	1/31/2010	Carbonate	<2.0	mg/L CaCO3
GW	NP-2	1/31/2010	Bicarbonate	160	mg/L CaCO3
GW	NP-2	1/31/2010	Specific Conductance	1100	µmhos/cm
GW	NP-4	1/31/2010	Aluminum	<0.020	mg/L
GW	NP-4	1/31/2010	Arsenic	<0.0025	mg/L
GW	NP-4	1/31/2010	Barium	0.036	mg/L
GW	NP-4	1/31/2010	Boron	<0.040	mg/L
GW	NP-4	1/31/2010	Cadmium	<0.0020	mg/L
GW	NP-4	1/31/2010	Chloride	40	mg/L
GW	NP-4	1/31/2010	Chromium	<0.0060	mg/L
GW	NP-4	1/31/2010	Cobalt	<0.0060	mg/L
GW	NP-4	1/31/2010	Copper	<0.0060	mg/L
GW	NP-4	1/31/2010	Cyanide	<0.005	mg/L
GW	NP-4	1/31/2010	Fluoride	0.46	mg/L
GW	NP-4	1/31/2010	Iron	0.04	mg/L
GW	NP-4	1/31/2010	Lead	<0.0050	mg/L
GW	NP-4	1/31/2010	Manganese	0.0098	mg/L
GW	NP-4	1/31/2010	Mercury	<0.00020	mg/L
GW	NP-4	1/31/2010	Molybdenum	<0.0080	mg/L

GW	NP-4	1/31/2010	Nickel	<0.010	mg/L
GW	NP-4	1/31/2010	Selenium	0.0057	mg/L
GW	NP-4	1/31/2010	Silver	<0.0050	mg/L
GW	NP-4	1/31/2010	Sulfate	190	mg/L
GW	NP-4	1/31/2010	TDS	626	mg/L
GW	NP-4	1/31/2010	Zinc	1.3	mg/L
GW	NP-4	1/31/2010	pH	8	pH units
GW	NP-4	1/31/2010	Beryllium	<0.0020	mg/L
GW	NP-4	1/31/2010	Calcium	100	mg/L
GW	NP-4	1/31/2010	Magnesium	18	mg/L
GW	NP-4	1/31/2010	Potassium	2.4	mg/L
GW	NP-4	1/31/2010	Sodium	79	mg/L
GW	NP-4	1/31/2010	Antimony	<0.0025	mg/L
GW	NP-4	1/31/2010	Thallium	<0.0025	mg/L
GW	NP-4	1/31/2010	Nitrate (As N)+Nitrite (As N)	7.4	mg/L
GW	NP-4	1/31/2010	Alkalinity, Total (As CaCO3)	210	mg/L CaCO3
GW	NP-4	1/31/2010	Carbonate	<2.0	mg/L CaCO3
GW	NP-4	1/31/2010	Bicarbonate	210	mg/L CaCO3
GW	NP-4	1/31/2010	Specific Conductance	900	µmhos/cm
GW	NP-1	6/28/2010	Aluminum	<0.020	mg/L
GW	NP-1	6/28/2010	Arsenic	0.0034	mg/L
GW	NP-1	6/28/2010	Barium	0.043	mg/L
GW	NP-1	6/28/2010	Boron	<0.040	mg/L
GW	NP-1	6/28/2010	Cadmium	<0.0020	mg/L
GW	NP-1	6/28/2010	Chloride	37	mg/L
GW	NP-1	6/28/2010	Chromium	<0.0060	mg/L
GW	NP-1	6/28/2010	Cobalt	<0.0060	mg/L
GW	NP-1	6/28/2010	Copper	<0.0060	mg/L
GW	NP-1	6/28/2010	Fluoride	0.61	mg/L
GW	NP-1	6/28/2010	Iron	<0.020	mg/L
GW	NP-1	6/28/2010	Lead	<0.0050	mg/L
GW	NP-1	6/28/2010	Manganese	<0.0020	mg/L
GW	NP-1	6/28/2010	Mercury	<0.00020	mg/L
GW	NP-1	6/28/2010	Molybdenum	<0.0080	mg/L
GW	NP-1	6/28/2010	Nickel	<0.010	mg/L
GW	NP-1	6/28/2010	Selenium	0.0045	mg/L
GW	NP-1	6/28/2010	Silver	<0.0050	mg/L
GW	NP-1	6/28/2010	Sulfate	150	mg/L
GW	NP-1	6/28/2010	TDS	548	mg/L
GW	NP-1	6/28/2010	Uranium	0.0019	mg/L
GW	NP-1	6/28/2010	Zinc	0.047	mg/L
GW	NP-1	6/28/2010	pH	8	pH units
GW	NP-1	6/28/2010	Beryllium	<0.0020	mg/L
GW	NP-1	6/28/2010	Calcium	90	mg/L
GW	NP-1	6/28/2010	Magnesium	26	mg/L
GW	NP-1	6/28/2010	Potassium	1.9	mg/L
GW	NP-1	6/28/2010	Silicon	19	mg/L
GW	NP-1	6/28/2010	Sodium	46	mg/L
GW	NP-1	6/28/2010	Vanadium	<0.050	mg/L
GW	NP-1	6/28/2010	Antimony	<0.0010	mg/L
GW	NP-1	6/28/2010	Thallium	<0.0010	mg/L
GW	NP-1	6/28/2010	Nitrate (As N)+Nitrite (As N)	1.4	mg/L
GW	NP-1	6/28/2010	Alkalinity, Total (As CaCO3)	230	mg/L CaCO3
GW	NP-1	6/28/2010	Carbonate	<2.0	mg/L CaCO3
GW	NP-1	6/28/2010	Bicarbonate	230	mg/L CaCO3
GW	NP-1	6/28/2010	Specific Conductance	790	µmhos/cm
GW	NP-1	6/28/2010	Suspended Solids	<10	mg/L
GW	NP-2	6/28/2010	Aluminum	<0.020	mg/L
GW	NP-2	6/28/2010	Arsenic	<0.0010	mg/L
GW	NP-2	6/28/2010	Barium	0.057	mg/L
GW	NP-2	6/28/2010	Boron	<0.040	mg/L
GW	NP-2	6/28/2010	Cadmium	<0.0020	mg/L
GW	NP-2	6/28/2010	Chloride	170	mg/L
GW	NP-2	6/28/2010	Chromium	<0.0060	mg/L
GW	NP-2	6/28/2010	Cobalt	<0.0060	mg/L
GW	NP-2	6/28/2010	Copper	<0.0060	mg/L
GW	NP-2	6/28/2010	Fluoride	0.44	mg/L
GW	NP-2	6/28/2010	Iron	<0.020	mg/L
GW	NP-2	6/28/2010	Lead	<0.0050	mg/L
GW	NP-2	6/28/2010	Manganese	0.021	mg/L
GW	NP-2	6/28/2010	Mercury	<0.00020	mg/L
GW	NP-2	6/28/2010	Molybdenum	<0.0080	mg/L
GW	NP-2	6/28/2010	Nickel	<0.010	mg/L
GW	NP-2	6/28/2010	Selenium	0.012	mg/L
GW	NP-2	6/28/2010	Silver	<0.0050	mg/L
GW	NP-2	6/28/2010	Sulfate	260	mg/L

GW	NP-2	6/28/2010	TDS	846	mg/L
GW	NP-2	6/28/2010	Uranium	0.0017	mg/L
GW	NP-2	6/28/2010	Zinc	0.26	mg/L
GW	NP-2	6/28/2010	pH	7	pH units
GW	NP-2	6/28/2010	Beryllium	<0.0020	mg/L
GW	NP-2	6/28/2010	Calcium	130	mg/L
GW	NP-2	6/28/2010	Magnesium	35	mg/L
GW	NP-2	6/28/2010	Potassium	2.2	mg/L
GW	NP-2	6/28/2010	Silicon	17	mg/L
GW	NP-2	6/28/2010	Sodium	71	mg/L
GW	NP-2	6/28/2010	Vanadium	<0.050	mg/L
GW	NP-2	6/28/2010	Antimony	<0.0010	mg/L
GW	NP-2	6/28/2010	Thallium	<0.0010	mg/L
GW	NP-2	6/28/2010	Nitrate (As N)+Nitrite (As N)	2.7	mg/L
GW	NP-2	6/28/2010	Alkalinity, Total (As CaCO3)	170	mg/L CaCO3
GW	NP-2	6/28/2010	Carbonate	<2.0	mg/L CaCO3
GW	NP-2	6/28/2010	Bicarbonate	170	mg/L CaCO3
GW	NP-2	6/28/2010	Specific Conductance	1200	µmhos/cm
GW	NP-2	6/28/2010	Suspended Solids	740	mg/L
GW	NP-5	6/28/2010	Aluminum	<0.020	mg/L
GW	NP-5	6/28/2010	Arsenic	0.0014	mg/L
GW	NP-5	6/28/2010	Barium	0.018	mg/L
GW	NP-5	6/28/2010	Boron	<0.040	mg/L
GW	NP-5	6/28/2010	Cadmium	<0.0020	mg/L
GW	NP-5	6/28/2010	Chloride	80	mg/L
GW	NP-5	6/28/2010	Chromium	<0.0060	mg/L
GW	NP-5	6/28/2010	Cobalt	<0.0060	mg/L
GW	NP-5	6/28/2010	Copper	<0.0060	mg/L
GW	NP-5	6/28/2010	Fluoride	0.68	mg/L
GW	NP-5	6/28/2010	Iron	<0.020	mg/L
GW	NP-5	6/28/2010	Lead	<0.0050	mg/L
GW	NP-5	6/28/2010	Manganese	<0.0020	mg/L
GW	NP-5	6/28/2010	Mercury	<0.00020	mg/L
GW	NP-5	6/28/2010	Molybdenum	<0.0080	mg/L
GW	NP-5	6/28/2010	Nickel	<0.010	mg/L
GW	NP-5	6/28/2010	Selenium	0.0067	mg/L
GW	NP-5	6/28/2010	Silver	<0.0050	mg/L
GW	NP-5	6/28/2010	Sulfate	180	mg/L
GW	NP-5	6/28/2010	TDS	623	mg/L
GW	NP-5	6/28/2010	Uranium	0.0013	mg/L
GW	NP-5	6/28/2010	Zinc	0.29	mg/L
GW	NP-5	6/28/2010	pH	8	pH units
GW	NP-5	6/28/2010	Beryllium	<0.0020	mg/L
GW	NP-5	6/28/2010	Calcium	100	mg/L
GW	NP-5	6/28/2010	Magnesium	31	mg/L
GW	NP-5	6/28/2010	Potassium	2.9	mg/L
GW	NP-5	6/28/2010	Silicon	20	mg/L
GW	NP-5	6/28/2010	Sodium	44	mg/L
GW	NP-5	6/28/2010	Vanadium	<0.050	mg/L
GW	NP-5	6/28/2010	Antimony	<0.0010	mg/L
GW	NP-5	6/28/2010	Thallium	<0.0010	mg/L
GW	NP-5	6/28/2010	Nitrate (As N)+Nitrite (As N)	3.9	mg/L
GW	NP-5	6/28/2010	Alkalinity, Total (As CaCO3)	160	mg/L CaCO3
GW	NP-5	6/28/2010	Carbonate	<2.0	mg/L CaCO3
GW	NP-5	6/28/2010	Bicarbonate	160	mg/L CaCO3
GW	NP-5	6/28/2010	Specific Conductance	900	µmhos/cm
GW	NP-5	6/28/2010	Suspended Solids	23	mg/L
GW	GWQ94-14	6/29/2010	Aluminum	<0.020	mg/L
GW	GWQ94-14	6/29/2010	Arsenic	0.0023	mg/L
GW	GWQ94-14	6/29/2010	Barium	0.048	mg/L
GW	GWQ94-14	6/29/2010	Boron	<0.040	mg/L
GW	GWQ94-14	6/29/2010	Cadmium	<0.0020	mg/L
GW	GWQ94-14	6/29/2010	Chloride	49	mg/L
GW	GWQ94-14	6/29/2010	Chromium	<0.0060	mg/L
GW	GWQ94-14	6/29/2010	Cobalt	<0.0060	mg/L
GW	GWQ94-14	6/29/2010	Copper	<0.0060	mg/L
GW	GWQ94-14	6/29/2010	Fluoride	0.48	mg/L
GW	GWQ94-14	6/29/2010	Iron	<0.020	mg/L
GW	GWQ94-14	6/29/2010	Lead	<0.0050	mg/L
GW	GWQ94-14	6/29/2010	Manganese	<0.0020	mg/L
GW	GWQ94-14	6/29/2010	Mercury	<0.00020	mg/L
GW	GWQ94-14	6/29/2010	Molybdenum	<0.0080	mg/L
GW	GWQ94-14	6/29/2010	Nickel	<0.010	mg/L
GW	GWQ94-14	6/29/2010	Selenium	0.0052	mg/L
GW	GWQ94-14	6/29/2010	Silver	<0.0050	mg/L
GW	GWQ94-14	6/29/2010	Sulfate	150	mg/L

GW	GWQ94-14	6/29/2010	TDS	573	mg/L
GW	GWQ94-14	6/29/2010	Uranium	0.0014	mg/L
GW	GWQ94-14	6/29/2010	Zinc	<0.010	mg/L
GW	GWQ94-14	6/29/2010	pH	8	pH units
GW	GWQ94-14	6/29/2010	Beryllium	<0.0020	mg/L
GW	GWQ94-14	6/29/2010	Calcium	98	mg/L
GW	GWQ94-14	6/29/2010	Magnesium	25	mg/L
GW	GWQ94-14	6/29/2010	Potassium	1.7	mg/L
GW	GWQ94-14	6/29/2010	Silicon	19	mg/L
GW	GWQ94-14	6/29/2010	Sodium	45	mg/L
GW	GWQ94-14	6/29/2010	Vanadium	<0.050	mg/L
GW	GWQ94-14	6/29/2010	Antimony	<0.0010	mg/L
GW	GWQ94-14	6/29/2010	Thallium	<0.0010	mg/L
GW	GWQ94-14	6/29/2010	Nitrate (As N)+Nitrite (As N)	2.3	mg/L
GW	GWQ94-14	6/29/2010	Alkalinity, Total (As CaCO3)	210	mg/L CaCO3
GW	GWQ94-14	6/29/2010	Carbonate	<2.0	mg/L CaCO3
GW	GWQ94-14	6/29/2010	Bicarbonate	210	mg/L CaCO3
GW	GWQ94-14	6/29/2010	Specific Conductance	820	µmhos/cm
GW	GWQ94-14	6/29/2010	Suspended Solids	<10	mg/L
GW	GWQ94-15	6/29/2010	Aluminum	<0.020	mg/L
GW	GWQ94-15	6/29/2010	Arsenic	<0.0010	mg/L
GW	GWQ94-15	6/29/2010	Barium	0.059	mg/L
GW	GWQ94-15	6/29/2010	Boron	<0.040	mg/L
GW	GWQ94-15	6/29/2010	Cadmium	<0.0020	mg/L
GW	GWQ94-15	6/29/2010	Chloride	110	mg/L
GW	GWQ94-15	6/29/2010	Chromium	<0.0060	mg/L
GW	GWQ94-15	6/29/2010	Cobalt	<0.0060	mg/L
GW	GWQ94-15	6/29/2010	Copper	<0.0060	mg/L
GW	GWQ94-15	6/29/2010	Fluoride	0.43	mg/L
GW	GWQ94-15	6/29/2010	Iron	<0.020	mg/L
GW	GWQ94-15	6/29/2010	Lead	<0.0050	mg/L
GW	GWQ94-15	6/29/2010	Manganese	0.0049	mg/L
GW	GWQ94-15	6/29/2010	Mercury	<0.00020	mg/L
GW	GWQ94-15	6/29/2010	Molybdenum	<0.0080	mg/L
GW	GWQ94-15	6/29/2010	Nickel	<0.010	mg/L
GW	GWQ94-15	6/29/2010	Selenium	0.0095	mg/L
GW	GWQ94-15	6/29/2010	Silver	<0.0050	mg/L
GW	GWQ94-15	6/29/2010	Sulfate	260	mg/L
GW	GWQ94-15	6/29/2010	TDS	805	mg/L
GW	GWQ94-15	6/29/2010	Uranium	0.0017	mg/L
GW	GWQ94-15	6/29/2010	Zinc	<0.010	mg/L
GW	GWQ94-15	6/29/2010	pH	8	pH units
GW	GWQ94-15	6/29/2010	Beryllium	<0.0020	mg/L
GW	GWQ94-15	6/29/2010	Calcium	140	mg/L
GW	GWQ94-15	6/29/2010	Magnesium	34	mg/L
GW	GWQ94-15	6/29/2010	Potassium	2.1	mg/L
GW	GWQ94-15	6/29/2010	Silicon	18	mg/L
GW	GWQ94-15	6/29/2010	Sodium	60	mg/L
GW	GWQ94-15	6/29/2010	Vanadium	<0.050	mg/L
GW	GWQ94-15	6/29/2010	Antimony	<0.0010	mg/L
GW	GWQ94-15	6/29/2010	Thallium	<0.0010	mg/L
GW	GWQ94-15	6/29/2010	Nitrate (As N)+Nitrite (As N)	2.7	mg/L
GW	GWQ94-15	6/29/2010	Alkalinity, Total (As CaCO3)	180	mg/L CaCO3
GW	GWQ94-15	6/29/2010	Carbonate	<2.0	mg/L CaCO3
GW	GWQ94-15	6/29/2010	Bicarbonate	180	mg/L CaCO3
GW	GWQ94-15	6/29/2010	Specific Conductance	1100	µmhos/cm
GW	GWQ94-15	6/29/2010	Suspended Solids	<10	mg/L
GW	GWQ94-16	6/29/2010	Aluminum	<0.020	mg/L
GW	GWQ94-16	6/29/2010	Arsenic	0.0022	mg/L
GW	GWQ94-16	6/29/2010	Barium	0.039	mg/L
GW	GWQ94-16	6/29/2010	Boron	0.048	mg/L
GW	GWQ94-16	6/29/2010	Cadmium	<0.0020	mg/L
GW	GWQ94-16	6/29/2010	Chloride	180	mg/L
GW	GWQ94-16	6/29/2010	Chromium	<0.0060	mg/L
GW	GWQ94-16	6/29/2010	Cobalt	<0.0060	mg/L
GW	GWQ94-16	6/29/2010	Copper	<0.0060	mg/L
GW	GWQ94-16	6/29/2010	Fluoride	0.62	mg/L
GW	GWQ94-16	6/29/2010	Iron	<0.020	mg/L
GW	GWQ94-16	6/29/2010	Lead	<0.0050	mg/L
GW	GWQ94-16	6/29/2010	Manganese	<0.0020	mg/L
GW	GWQ94-16	6/29/2010	Mercury	<0.00020	mg/L
GW	GWQ94-16	6/29/2010	Molybdenum	<0.0080	mg/L
GW	GWQ94-16	6/29/2010	Nickel	<0.010	mg/L
GW	GWQ94-16	6/29/2010	Selenium	0.011	mg/L
GW	GWQ94-16	6/29/2010	Silver	<0.0050	mg/L
GW	GWQ94-16	6/29/2010	Sulfate	440	mg/L

GW	GWQ94-16	6/29/2010	TDS	1190	mg/L
GW	GWQ94-16	6/29/2010	Uranium	0.0025	mg/L
GW	GWQ94-16	6/29/2010	Zinc	<0.010	mg/L
GW	GWQ94-16	6/29/2010	pH	8	pH units
GW	GWQ94-16	6/29/2010	Beryllium	<0.0020	mg/L
GW	GWQ94-16	6/29/2010	Calcium	210	mg/L
GW	GWQ94-16	6/29/2010	Magnesium	50	mg/L
GW	GWQ94-16	6/29/2010	Potassium	3.1	mg/L
GW	GWQ94-16	6/29/2010	Silicon	22	mg/L
GW	GWQ94-16	6/29/2010	Sodium	74	mg/L
GW	GWQ94-16	6/29/2010	Vanadium	<0.050	mg/L
GW	GWQ94-16	6/29/2010	Antimony	<0.0010	mg/L
GW	GWQ94-16	6/29/2010	Thallium	<0.0010	mg/L
GW	GWQ94-16	6/29/2010	Nitrate (As N)+Nitrite (As N)	3.7	mg/L
GW	GWQ94-16	6/29/2010	Alkalinity, Total (As CaCO3)	180	mg/L CaCO3
GW	GWQ94-16	6/29/2010	Carbonate	<2.0	mg/L CaCO3
GW	GWQ94-16	6/29/2010	Bicarbonate	180	mg/L CaCO3
GW	GWQ94-16	6/29/2010	Specific Conductance	1600	µmhos/cm
GW	GWQ94-16	6/29/2010	Suspended Solids	<10	mg/L
GW	IW-2	6/29/2010	Aluminum	<0.020	mg/L
GW	IW-2	6/29/2010	Arsenic	<0.0010	mg/L
GW	IW-2	6/29/2010	Barium	0.029	mg/L
GW	IW-2	6/29/2010	Boron	0.061	mg/L
GW	IW-2	6/29/2010	Cadmium	<0.0020	mg/L
GW	IW-2	6/29/2010	Chloride	580	mg/L
GW	IW-2	6/29/2010	Chromium	<0.0060	mg/L
GW	IW-2	6/29/2010	Cobalt	<0.0060	mg/L
GW	IW-2	6/29/2010	Copper	<0.0060	mg/L
GW	IW-2	6/29/2010	Fluoride	0.67	mg/L
GW	IW-2	6/29/2010	Iron	0.87	mg/L
GW	IW-2	6/29/2010	Lead	<0.0050	mg/L
GW	IW-2	6/29/2010	Manganese	2.2	mg/L
GW	IW-2	6/29/2010	Mercury	0.00048	mg/L
GW	IW-2	6/29/2010	Molybdenum	0.024	mg/L
GW	IW-2	6/29/2010	Nickel	<0.010	mg/L
GW	IW-2	6/29/2010	Selenium	0.029	mg/L
GW	IW-2	6/29/2010	Silver	<0.0050	mg/L
GW	IW-2	6/29/2010	Sulfate	1100	mg/L
GW	IW-2	6/29/2010	TDS	2700	mg/L
GW	IW-2	6/29/2010	Uranium	0.006	mg/L
GW	IW-2	6/29/2010	Zinc	<0.010	mg/L
GW	IW-2	6/29/2010	pH	7	pH units
GW	IW-2	6/29/2010	Beryllium	<0.0020	mg/L
GW	IW-2	6/29/2010	Calcium	390	mg/L
GW	IW-2	6/29/2010	Magnesium	110	mg/L
GW	IW-2	6/29/2010	Potassium	1.8	mg/L
GW	IW-2	6/29/2010	Silicon	28	mg/L
GW	IW-2	6/29/2010	Sodium	260	mg/L
GW	IW-2	6/29/2010	Vanadium	<0.050	mg/L
GW	IW-2	6/29/2010	Antimony	<0.0010	mg/L
GW	IW-2	6/29/2010	Thallium	<0.0010	mg/L
GW	IW-2	6/29/2010	Nitrate (As N)+Nitrite (As N)	<2.0	mg/L
GW	IW-2	6/29/2010	Alkalinity, Total (As CaCO3)	250	mg/L CaCO3
GW	IW-2	6/29/2010	Carbonate	<2.0	mg/L CaCO3
GW	IW-2	6/29/2010	Bicarbonate	250	mg/L CaCO3
GW	IW-2	6/29/2010	Specific Conductance	3400	µmhos/cm
GW	IW-2	6/29/2010	Suspended Solids	31000	mg/L
GW	GWQ96-22A	7/1/2010	Aluminum	<0.020	mg/L
GW	GWQ96-22A	7/1/2010	Arsenic	0.0035	mg/L
GW	GWQ96-22A	7/1/2010	Barium	0.079	mg/L
GW	GWQ96-22A	7/1/2010	Boron	0.28	mg/L
GW	GWQ96-22A	7/1/2010	Cadmium	<0.0020	mg/L
GW	GWQ96-22A	7/1/2010	Chloride	70	mg/L
GW	GWQ96-22A	7/1/2010	Chromium	<0.0060	mg/L
GW	GWQ96-22A	7/1/2010	Cobalt	<0.0060	mg/L
GW	GWQ96-22A	7/1/2010	Copper	<0.0060	mg/L
GW	GWQ96-22A	7/1/2010	Fluoride	2.7	mg/L
GW	GWQ96-22A	7/1/2010	Iron	0.021	mg/L
GW	GWQ96-22A	7/1/2010	Lead	<0.0050	mg/L
GW	GWQ96-22A	7/1/2010	Manganese	0.65	mg/L
GW	GWQ96-22A	7/1/2010	Mercury	<0.00020	mg/L
GW	GWQ96-22A	7/1/2010	Molybdenum	<0.0080	mg/L
GW	GWQ96-22A	7/1/2010	Nickel	<0.010	mg/L
GW	GWQ96-22A	7/1/2010	Selenium	0.0011	mg/L
GW	GWQ96-22A	7/1/2010	Silver	<0.0050	mg/L
GW	GWQ96-22A	7/1/2010	Sulfate	52	mg/L

GW	GWQ96-22A	7/1/2010	TDS	573	mg/L
GW	GWQ96-22A	7/1/2010	Uranium	<0.0010	mg/L
GW	GWQ96-22A	7/1/2010	Zinc	<0.010	mg/L
GW	GWQ96-22A	7/1/2010	pH	8	pH units
GW	GWQ96-22A	7/1/2010	Beryllium	<0.0020	mg/L
GW	GWQ96-22A	7/1/2010	Calcium	53	mg/L
GW	GWQ96-22A	7/1/2010	Magnesium	3.7	mg/L
GW	GWQ96-22A	7/1/2010	Potassium	2.8	mg/L
GW	GWQ96-22A	7/1/2010	Silicon	13	mg/L
GW	GWQ96-22A	7/1/2010	Sodium	150	mg/L
GW	GWQ96-22A	7/1/2010	Vanadium	<0.050	mg/L
GW	GWQ96-22A	7/1/2010	Antimony	<0.0010	mg/L
GW	GWQ96-22A	7/1/2010	Thallium	<0.0010	mg/L
GW	GWQ96-22A	7/1/2010	Nitrate (As N)+Nitrite (As N)	<1.0	mg/L
GW	GWQ96-22A	7/1/2010	Alkalinity, Total (As CaCO3)	310	mg/L CaCO3
GW	GWQ96-22A	7/1/2010	Carbonate	<2.0	mg/L CaCO3
GW	GWQ96-22A	7/1/2010	Bicarbonate	310	mg/L CaCO3
GW	GWQ96-22A	7/1/2010	Specific Conductance	920	µmhos/cm
GW	GWQ96-22A	7/1/2010	Suspended Solids	19	mg/L
GW	GWQ96-23A	7/1/2010	Aluminum	<0.020	mg/L
GW	GWQ96-23A	7/1/2010	Arsenic	0.0011	mg/L
GW	GWQ96-23A	7/1/2010	Barium	0.13	mg/L
GW	GWQ96-23A	7/1/2010	Boron	0.068	mg/L
GW	GWQ96-23A	7/1/2010	Cadmium	<0.0020	mg/L
GW	GWQ96-23A	7/1/2010	Chloride	14	mg/L
GW	GWQ96-23A	7/1/2010	Chromium	<0.0060	mg/L
GW	GWQ96-23A	7/1/2010	Cobalt	<0.0060	mg/L
GW	GWQ96-23A	7/1/2010	Copper	<0.0060	mg/L
GW	GWQ96-23A	7/1/2010	Fluoride	1.5	mg/L
GW	GWQ96-23A	7/1/2010	Iron	0.048	mg/L
GW	GWQ96-23A	7/1/2010	Lead	<0.0050	mg/L
GW	GWQ96-23A	7/1/2010	Manganese	0.37	mg/L
GW	GWQ96-23A	7/1/2010	Mercury	<0.00020	mg/L
GW	GWQ96-23A	7/1/2010	Molybdenum	<0.0080	mg/L
GW	GWQ96-23A	7/1/2010	Nickel	<0.010	mg/L
GW	GWQ96-23A	7/1/2010	Selenium	0.0014	mg/L
GW	GWQ96-23A	7/1/2010	Silver	<0.0050	mg/L
GW	GWQ96-23A	7/1/2010	Sulfate	140	mg/L
GW	GWQ96-23A	7/1/2010	TDS	804	mg/L
GW	GWQ96-23A	7/1/2010	Uranium	0.0025	mg/L
GW	GWQ96-23A	7/1/2010	Zinc	<0.010	mg/L
GW	GWQ96-23A	7/1/2010	pH	8	pH units
GW	GWQ96-23A	7/1/2010	Beryllium	<0.0020	mg/L
GW	GWQ96-23A	7/1/2010	Calcium	150	mg/L
GW	GWQ96-23A	7/1/2010	Magnesium	40	mg/L
GW	GWQ96-23A	7/1/2010	Potassium	1.5	mg/L
GW	GWQ96-23A	7/1/2010	Silicon	15	mg/L
GW	GWQ96-23A	7/1/2010	Sodium	81	mg/L
GW	GWQ96-23A	7/1/2010	Vanadium	<0.050	mg/L
GW	GWQ96-23A	7/1/2010	Antimony	<0.0010	mg/L
GW	GWQ96-23A	7/1/2010	Thallium	<0.0010	mg/L
GW	GWQ96-23A	7/1/2010	Nitrate (As N)+Nitrite (As N)	<1.0	mg/L
GW	GWQ96-23A	7/1/2010	Alkalinity, Total (As CaCO3)	510	mg/L CaCO3
GW	GWQ96-23A	7/1/2010	Carbonate	<2.0	mg/L CaCO3
GW	GWQ96-23A	7/1/2010	Bicarbonate	510	mg/L CaCO3
GW	GWQ96-23A	7/1/2010	Specific Conductance	1200	µmhos/cm
GW	GWQ96-23A	7/1/2010	Suspended Solids	13	mg/L
GW	GWQ94-13	7/2/2010	Aluminum	<0.020	mg/L
GW	GWQ94-13	7/2/2010	Arsenic	<0.0010	mg/L
GW	GWQ94-13	7/2/2010	Barium	0.04	mg/L
GW	GWQ94-13	7/2/2010	Boron	<0.040	mg/L
GW	GWQ94-13	7/2/2010	Cadmium	<0.0020	mg/L
GW	GWQ94-13	7/2/2010	Chloride	290	mg/L
GW	GWQ94-13	7/2/2010	Chromium	<0.0060	mg/L
GW	GWQ94-13	7/2/2010	Cobalt	<0.0060	mg/L
GW	GWQ94-13	7/2/2010	Copper	<0.0060	mg/L
GW	GWQ94-13	7/2/2010	Fluoride	0.35	mg/L
GW	GWQ94-13	7/2/2010	Iron	<0.020	mg/L
GW	GWQ94-13	7/2/2010	Lead	<0.0050	mg/L
GW	GWQ94-13	7/2/2010	Manganese	<0.0020	mg/L
GW	GWQ94-13	7/2/2010	Mercury	0.00026	mg/L
GW	GWQ94-13	7/2/2010	Molybdenum	<0.0080	mg/L
GW	GWQ94-13	7/2/2010	Nickel	<0.010	mg/L
GW	GWQ94-13	7/2/2010	Selenium	0.024	mg/L
GW	GWQ94-13	7/2/2010	Silver	<0.0050	mg/L
GW	GWQ94-13	7/2/2010	Sulfate	770	mg/L

GW	GWQ94-13	7/2/2010	TDS	1730	mg/L
GW	GWQ94-13	7/2/2010	Uranium	0.0016	mg/L
GW	GWQ94-13	7/2/2010	Zinc	<0.010	mg/L
GW	GWQ94-13	7/2/2010	pH	8	pH units
GW	GWQ94-13	7/2/2010	Beryllium	<0.0020	mg/L
GW	GWQ94-13	7/2/2010	Calcium	320	mg/L
GW	GWQ94-13	7/2/2010	Magnesium	62	mg/L
GW	GWQ94-13	7/2/2010	Potassium	3.4	mg/L
GW	GWQ94-13	7/2/2010	Silicon	16	mg/L
GW	GWQ94-13	7/2/2010	Sodium	110	mg/L
GW	GWQ94-13	7/2/2010	Vanadium	<0.050	mg/L
GW	GWQ94-13	7/2/2010	Antimony	<0.0010	mg/L
GW	GWQ94-13	7/2/2010	Thallium	<0.0010	mg/L
GW	GWQ94-13	7/2/2010	Nitrate (As N)+Nitrite (As N)	5.9	mg/L
GW	GWQ94-13	7/2/2010	Alkalinity, Total (As CaCO3)	120	mg/L CaCO3
GW	GWQ94-13	7/2/2010	Carbonate	<2.0	mg/L CaCO3
GW	GWQ94-13	7/2/2010	Bicarbonate	120	mg/L CaCO3
GW	GWQ94-13	7/2/2010	Specific Conductance	2200	µmhos/cm
GW	GWQ94-13	7/2/2010	Suspended Solids	10	mg/L
GW	NP-4	7/2/2010	Aluminum	<0.020	mg/L
GW	NP-4	7/2/2010	Arsenic	<0.0010	mg/L
GW	NP-4	7/2/2010	Barium	0.039	mg/L
GW	NP-4	7/2/2010	Boron	<0.040	mg/L
GW	NP-4	7/2/2010	Cadmium	<0.0020	mg/L
GW	NP-4	7/2/2010	Chloride	39	mg/L
GW	NP-4	7/2/2010	Chromium	<0.0060	mg/L
GW	NP-4	7/2/2010	Cobalt	<0.0060	mg/L
GW	NP-4	7/2/2010	Copper	<0.0060	mg/L
GW	NP-4	7/2/2010	Fluoride	0.46	mg/L
GW	NP-4	7/2/2010	Iron	<0.020	mg/L
GW	NP-4	7/2/2010	Lead	<0.0050	mg/L
GW	NP-4	7/2/2010	Manganese	0.002	mg/L
GW	NP-4	7/2/2010	Mercury	<0.00020	mg/L
GW	NP-4	7/2/2010	Molybdenum	<0.0080	mg/L
GW	NP-4	7/2/2010	Nickel	<0.010	mg/L
GW	NP-4	7/2/2010	Selenium	0.0043	mg/L
GW	NP-4	7/2/2010	Silver	<0.0050	mg/L
GW	NP-4	7/2/2010	Sulfate	190	mg/L
GW	NP-4	7/2/2010	TDS	640	mg/L
GW	NP-4	7/2/2010	Uranium	0.0023	mg/L
GW	NP-4	7/2/2010	Zinc	0.82	mg/L
GW	NP-4	7/2/2010	pH	8	pH units
GW	NP-4	7/2/2010	Beryllium	<0.0020	mg/L
GW	NP-4	7/2/2010	Calcium	110	mg/L
GW	NP-4	7/2/2010	Magnesium	18	mg/L
GW	NP-4	7/2/2010	Potassium	2.1	mg/L
GW	NP-4	7/2/2010	Silicon	15	mg/L
GW	NP-4	7/2/2010	Sodium	70	mg/L
GW	NP-4	7/2/2010	Vanadium	<0.050	mg/L
GW	NP-4	7/2/2010	Antimony	<0.0010	mg/L
GW	NP-4	7/2/2010	Thallium	<0.0010	mg/L
GW	NP-4	7/2/2010	Nitrate (As N)+Nitrite (As N)	7.5	mg/L
GW	NP-4	7/2/2010	Alkalinity, Total (As CaCO3)	210	mg/L CaCO3
GW	NP-4	7/2/2010	Carbonate	<2.0	mg/L CaCO3
GW	NP-4	7/2/2010	Bicarbonate	210	mg/L CaCO3
GW	NP-4	7/2/2010	Specific Conductance	910	µmhos/cm
GW	NP-4	7/2/2010	Suspended Solids	140	mg/L
GW	GWQ94-17	7/6/2010	Aluminum	<0.020	mg/L
GW	GWQ94-17	7/6/2010	Arsenic	0.0022	mg/L
GW	GWQ94-17	7/6/2010	Barium	0.047	mg/L
GW	GWQ94-17	7/6/2010	Boron	<0.040	mg/L
GW	GWQ94-17	7/6/2010	Cadmium	<0.0020	mg/L
GW	GWQ94-17	7/6/2010	Chloride	68	mg/L
GW	GWQ94-17	7/6/2010	Chromium	<0.0060	mg/L
GW	GWQ94-17	7/6/2010	Cobalt	<0.0060	mg/L
GW	GWQ94-17	7/6/2010	Copper	<0.0060	mg/L
GW	GWQ94-17	7/6/2010	Fluoride	0.52	mg/L
GW	GWQ94-17	7/6/2010	Iron	<0.020	mg/L
GW	GWQ94-17	7/6/2010	Lead	<0.0050	mg/L
GW	GWQ94-17	7/6/2010	Manganese	<0.0020	mg/L
GW	GWQ94-17	7/6/2010	Mercury	<0.00020	mg/L
GW	GWQ94-17	7/6/2010	Molybdenum	<0.0080	mg/L
GW	GWQ94-17	7/6/2010	Nickel	<0.010	mg/L
GW	GWQ94-17	7/6/2010	Selenium	0.0062	mg/L
GW	GWQ94-17	7/6/2010	Silver	<0.0050	mg/L
GW	GWQ94-17	7/6/2010	Sulfate	180	mg/L

GW	GWQ94-17	7/6/2010	TDS	629	mg/L
GW	GWQ94-17	7/6/2010	Uranium	0.0016	mg/L
GW	GWQ94-17	7/6/2010	Zinc	<0.010	mg/L
GW	GWQ94-17	7/6/2010	pH	8	pH units
GW	GWQ94-17	7/6/2010	Beryllium	<0.0020	mg/L
GW	GWQ94-17	7/6/2010	Calcium	110	mg/L
GW	GWQ94-17	7/6/2010	Magnesium	27	mg/L
GW	GWQ94-17	7/6/2010	Potassium	1.8	mg/L
GW	GWQ94-17	7/6/2010	Silicon	19	mg/L
GW	GWQ94-17	7/6/2010	Sodium	49	mg/L
GW	GWQ94-17	7/6/2010	Vanadium	<0.050	mg/L
GW	GWQ94-17	7/6/2010	Antimony	<0.0010	mg/L
GW	GWQ94-17	7/6/2010	Thallium	<0.0010	mg/L
GW	GWQ94-17	7/6/2010	Nitrate (As N)+Nitrite (As N)	2	mg/L
GW	GWQ94-17	7/6/2010	Alkalinity, Total (As CaCO3)	200	mg/L CaCO3
GW	GWQ94-17	7/6/2010	Carbonate	<2.0	mg/L CaCO3
GW	GWQ94-17	7/6/2010	Bicarbonate	200	mg/L CaCO3
GW	GWQ94-17	7/6/2010	Specific Conductance	880	µmhos/cm
GW	GWQ94-17	7/6/2010	Suspended Solids	61	mg/L
GW	MW-11	7/7/2010	Aluminum	<0.020	mg/L
GW	MW-11	7/7/2010	Arsenic	0.0015	mg/L
GW	MW-11	7/7/2010	Barium	0.018	mg/L
GW	MW-11	7/7/2010	Boron	<0.040	mg/L
GW	MW-11	7/7/2010	Cadmium	<0.0020	mg/L
GW	MW-11	7/7/2010	Chloride	14	mg/L
GW	MW-11	7/7/2010	Chromium	<0.0060	mg/L
GW	MW-11	7/7/2010	Cobalt	<0.0060	mg/L
GW	MW-11	7/7/2010	Copper	<0.0060	mg/L
GW	MW-11	7/7/2010	Fluoride	0.49	mg/L
GW	MW-11	7/7/2010	Iron	<0.020	mg/L
GW	MW-11	7/7/2010	Lead	<0.0050	mg/L
GW	MW-11	7/7/2010	Manganese	<0.0020	mg/L
GW	MW-11	7/7/2010	Mercury	<0.00020	mg/L
GW	MW-11	7/7/2010	Molybdenum	<0.0080	mg/L
GW	MW-11	7/7/2010	Nickel	<0.010	mg/L
GW	MW-11	7/7/2010	Selenium	<0.0010	mg/L
GW	MW-11	7/7/2010	Silver	<0.0050	mg/L
GW	MW-11	7/7/2010	Sulfate	15	mg/L
GW	MW-11	7/7/2010	TDS	289	mg/L
GW	MW-11	7/7/2010	Uranium	<0.0010	mg/L
GW	MW-11	7/7/2010	Zinc	<0.010	mg/L
GW	MW-11	7/7/2010	pH	7	pH units
GW	MW-11	7/7/2010	Beryllium	<0.0020	mg/L
GW	MW-11	7/7/2010	Calcium	59	mg/L
GW	MW-11	7/7/2010	Magnesium	8.1	mg/L
GW	MW-11	7/7/2010	Potassium	1.3	mg/L
GW	MW-11	7/7/2010	Silicon	20	mg/L
GW	MW-11	7/7/2010	Sodium	23	mg/L
GW	MW-11	7/7/2010	Vanadium	<0.050	mg/L
GW	MW-11	7/7/2010	Antimony	<0.0010	mg/L
GW	MW-11	7/7/2010	Thallium	<0.0010	mg/L
GW	MW-11	7/7/2010	Nitrate (As N)+Nitrite (As N)	<1.0	mg/L
GW	MW-11	7/7/2010	Alkalinity, Total (As CaCO3)	190	mg/L CaCO3
GW	MW-11	7/7/2010	Carbonate	<2.0	mg/L CaCO3
GW	MW-11	7/7/2010	Bicarbonate	190	mg/L CaCO3
GW	MW-11	7/7/2010	Specific Conductance	420	µmhos/cm
GW	MW-11	7/7/2010	Suspended Solids	<10	mg/L
GW	MW-9	7/7/2010	Aluminum	<0.020	mg/L
GW	MW-9	7/7/2010	Arsenic	0.0039	mg/L
GW	MW-9	7/7/2010	Barium	0.0023	mg/L
GW	MW-9	7/7/2010	Boron	<0.040	mg/L
GW	MW-9	7/7/2010	Cadmium	<0.0020	mg/L
GW	MW-9	7/7/2010	Chloride	13	mg/L
GW	MW-9	7/7/2010	Chromium	<0.0060	mg/L
GW	MW-9	7/7/2010	Cobalt	<0.0060	mg/L
GW	MW-9	7/7/2010	Copper	<0.0060	mg/L
GW	MW-9	7/7/2010	Fluoride	1.4	mg/L
GW	MW-9	7/7/2010	Iron	<0.020	mg/L
GW	MW-9	7/7/2010	Lead	<0.0050	mg/L
GW	MW-9	7/7/2010	Manganese	<0.0020	mg/L
GW	MW-9	7/7/2010	Mercury	<0.00020	mg/L
GW	MW-9	7/7/2010	Molybdenum	<0.0080	mg/L
GW	MW-9	7/7/2010	Nickel	<0.010	mg/L
GW	MW-9	7/7/2010	Selenium	<0.0010	mg/L
GW	MW-9	7/7/2010	Silver	<0.0050	mg/L
GW	MW-9	7/7/2010	Sulfate	12	mg/L

GW	MW-9	7/7/2010	TDS	206	mg/L
GW	MW-9	7/7/2010	Uranium	0.0012	mg/L
GW	MW-9	7/7/2010	Zinc	<0.010	mg/L
GW	MW-9	7/7/2010	pH	8	pH units
GW	MW-9	7/7/2010	Beryllium	<0.0020	mg/L
GW	MW-9	7/7/2010	Calcium	12	mg/L
GW	MW-9	7/7/2010	Magnesium	<1.0	mg/L
GW	MW-9	7/7/2010	Potassium	2	mg/L
GW	MW-9	7/7/2010	Silicon	15	mg/L
GW	MW-9	7/7/2010	Sodium	54	mg/L
GW	MW-9	7/7/2010	Vanadium	<0.050	mg/L
GW	MW-9	7/7/2010	Antimony	<0.0010	mg/L
GW	MW-9	7/7/2010	Thallium	<0.0010	mg/L
GW	MW-9	7/7/2010	Nitrate (As N)+Nitrite (As N)	1.1	mg/L
GW	MW-9	7/7/2010	Alkalinity, Total (As CaCO3)	110	mg/L CaCO3
GW	MW-9	7/7/2010	Carbonate	<2.0	mg/L CaCO3
GW	MW-9	7/7/2010	Bicarbonate	110	mg/L CaCO3
GW	MW-9	7/7/2010	Specific Conductance	290	µmhos/cm
GW	MW-9	7/7/2010	Suspended Solids	<10	mg/L
GW	MW-6	7/8/2010	Aluminum	<0.020	mg/L
GW	MW-6	7/8/2010	Arsenic	0.018	mg/L
GW	MW-6	7/8/2010	Barium	0.0095	mg/L
GW	MW-6	7/8/2010	Boron	0.15	mg/L
GW	MW-6	7/8/2010	Cadmium	<0.0020	mg/L
GW	MW-6	7/8/2010	Chloride	75	mg/L
GW	MW-6	7/8/2010	Chromium	0.016	mg/L
GW	MW-6	7/8/2010	Cobalt	<0.0060	mg/L
GW	MW-6	7/8/2010	Copper	<0.0060	mg/L
GW	MW-6	7/8/2010	Fluoride	8.1	mg/L
GW	MW-6	7/8/2010	Iron	0.024	mg/L
GW	MW-6	7/8/2010	Lead	<0.0050	mg/L
GW	MW-6	7/8/2010	Manganese	0.0027	mg/L
GW	MW-6	7/8/2010	Mercury	<0.00020	mg/L
GW	MW-6	7/8/2010	Molybdenum	0.013	mg/L
GW	MW-6	7/8/2010	Nickel	<0.010	mg/L
GW	MW-6	7/8/2010	Selenium	0.0015	mg/L
GW	MW-6	7/8/2010	Silver	<0.0050	mg/L
GW	MW-6	7/8/2010	Sulfate	49	mg/L
GW	MW-6	7/8/2010	TDS	456	mg/L
GW	MW-6	7/8/2010	Uranium	<0.0010	mg/L
GW	MW-6	7/8/2010	Zinc	<0.010	mg/L
GW	MW-6	7/8/2010	pH	8	pH units
GW	MW-6	7/8/2010	Beryllium	<0.0020	mg/L
GW	MW-6	7/8/2010	Calcium	13	mg/L
GW	MW-6	7/8/2010	Magnesium	<1.0	mg/L
GW	MW-6	7/8/2010	Potassium	6	mg/L
GW	MW-6	7/8/2010	Silicon	46	mg/L
GW	MW-6	7/8/2010	Sodium	120	mg/L
GW	MW-6	7/8/2010	Vanadium	<0.050	mg/L
GW	MW-6	7/8/2010	Antimony	<0.0010	mg/L
GW	MW-6	7/8/2010	Thallium	<0.0010	mg/L
GW	MW-6	7/8/2010	Nitrate (As N)+Nitrite (As N)	8.5	mg/L
GW	MW-6	7/8/2010	Alkalinity, Total (As CaCO3)	120	mg/L CaCO3
GW	MW-6	7/8/2010	Carbonate	<2.0	mg/L CaCO3
GW	MW-6	7/8/2010	Bicarbonate	120	mg/L CaCO3
GW	MW-6	7/8/2010	Specific Conductance	610	µmhos/cm
GW	MW-6	7/8/2010	Suspended Solids	<10	mg/L
GW	NP-3	7/8/2010	Aluminum	<0.020	mg/L
GW	NP-3	7/8/2010	Arsenic	<0.0010	mg/L
GW	NP-3	7/8/2010	Barium	0.03	mg/L
GW	NP-3	7/8/2010	Boron	<0.040	mg/L
GW	NP-3	7/8/2010	Cadmium	<0.0020	mg/L
GW	NP-3	7/8/2010	Chloride	270	mg/L
GW	NP-3	7/8/2010	Chromium	<0.0060	mg/L
GW	NP-3	7/8/2010	Cobalt	<0.0060	mg/L
GW	NP-3	7/8/2010	Copper	<0.0060	mg/L
GW	NP-3	7/8/2010	Fluoride	0.36	mg/L
GW	NP-3	7/8/2010	Iron	0.049	mg/L
GW	NP-3	7/8/2010	Lead	<0.0050	mg/L
GW	NP-3	7/8/2010	Manganese	0.031	mg/L
GW	NP-3	7/8/2010	Mercury	<0.00020	mg/L
GW	NP-3	7/8/2010	Molybdenum	<0.0080	mg/L
GW	NP-3	7/8/2010	Nickel	<0.010	mg/L
GW	NP-3	7/8/2010	Selenium	0.023	mg/L
GW	NP-3	7/8/2010	Silver	<0.0050	mg/L
GW	NP-3	7/8/2010	Sulfate	790	mg/L

GW	NP-3	7/8/2010	TDS	1740	mg/L
GW	NP-3	7/8/2010	Uranium	0.0014	mg/L
GW	NP-3	7/8/2010	Zinc	0.44	mg/L
GW	NP-3	7/8/2010	pH	8	pH units
GW	NP-3	7/8/2010	Beryllium	<0.0020	mg/L
GW	NP-3	7/8/2010	Calcium	310	mg/L
GW	NP-3	7/8/2010	Magnesium	60	mg/L
GW	NP-3	7/8/2010	Potassium	3.6	mg/L
GW	NP-3	7/8/2010	Silicon	15	mg/L
GW	NP-3	7/8/2010	Sodium	120	mg/L
GW	NP-3	7/8/2010	Vanadium	<0.050	mg/L
GW	NP-3	7/8/2010	Antimony	<0.0010	mg/L
GW	NP-3	7/8/2010	Thallium	<0.0010	mg/L
GW	NP-3	7/8/2010	Nitrate (As N)+Nitrite (As N)	6.8	mg/L
GW	NP-3	7/8/2010	Alkalinity, Total (As CaCO3)	120	mg/L CaCO3
GW	NP-3	7/8/2010	Carbonate	<2.0	mg/L CaCO3
GW	NP-3	7/8/2010	Bicarbonate	120	mg/L CaCO3
GW	NP-3	7/8/2010	Specific Conductance	2100	µmhos/cm
GW	NP-3	7/8/2010	Suspended Solids	100	mg/L
GW	MW-6	9/27/2010	Aluminum	<0.02	mg/L
GW	MW-6	9/27/2010	Arsenic	0.02	mg/L
GW	MW-6	9/27/2010	Barium	0.0093	mg/L
GW	MW-6	9/27/2010	Boron	0.16	mg/L
GW	MW-6	9/27/2010	Cadmium	<0.002	mg/L
GW	MW-6	9/27/2010	Chloride	73	mg/L
GW	MW-6	9/27/2010	Chromium	0.016	mg/L
GW	MW-6	9/27/2010	Cobalt	<0.006	mg/L
GW	MW-6	9/27/2010	Copper	<0.006	mg/L
GW	MW-6	9/27/2010	Cyanide	<0.01	mg/L
GW	MW-6	9/27/2010	Fluoride	8.2	mg/L
GW	MW-6	9/27/2010	Iron	0.021	mg/L
GW	MW-6	9/27/2010	Lead	<0.005	mg/L
GW	MW-6	9/27/2010	Manganese	<0.002	mg/L
GW	MW-6	9/27/2010	Mercury	<0.0002	mg/L
GW	MW-6	9/27/2010	Molybdenum	0.013	mg/L
GW	MW-6	9/27/2010	Nickel	<0.01	mg/L
GW	MW-6	9/27/2010	Selenium	<0.005	mg/L
GW	MW-6	9/27/2010	Silver	<0.005	mg/L
GW	MW-6	9/27/2010	Sulfate	49	mg/L
GW	MW-6	9/27/2010	TDS	468	mg/L
GW	MW-6	9/27/2010	Uranium	<0.001	mg/L
GW	MW-6	9/27/2010	Zinc	<0.01	mg/L
GW	MW-6	9/27/2010	pH	8.44	pH units
GW	MW-6	9/27/2010	Beryllium	<0.002	mg/L
GW	MW-6	9/27/2010	Calcium	13	mg/L
GW	MW-6	9/27/2010	Magnesium	<1	mg/L
GW	MW-6	9/27/2010	Potassium	6.3	mg/L
GW	MW-6	9/27/2010	Silicon	45	mg/L
GW	MW-6	9/27/2010	Sodium	120	mg/L
GW	MW-6	9/27/2010	Vanadium	<0.05	mg/L
GW	MW-6	9/27/2010	Antimony	<0.001	mg/L
GW	MW-6	9/27/2010	Thallium	<0.001	mg/L
GW	MW-6	9/27/2010	Nitrate (As N)+Nitrite (As N)	<1	mg/L
GW	MW-6	9/27/2010	Alkalinity, Total (As CaCO3)	130	mg/L CaCO3
GW	MW-6	9/27/2010	Carbonate	<2	mg/L CaCO3
GW	MW-6	9/27/2010	Bicarbonate	130	mg/L CaCO3
GW	MW-6	9/27/2010	Specific Conductance	620	µmhos/cm
GW	MW-6	9/27/2010	Suspended Solids	<10	mg/L
GW	MW-1	9/28/2010	Aluminum	<0.02	mg/L
GW	MW-1	9/28/2010	Arsenic	0.0039	mg/L
GW	MW-1	9/28/2010	Barium	0.022	mg/L
GW	MW-1	9/28/2010	Boron	0.044	mg/L
GW	MW-1	9/28/2010	Cadmium	<0.002	mg/L
GW	MW-1	9/28/2010	Chloride	14	mg/L
GW	MW-1	9/28/2010	Chromium	<0.006	mg/L
GW	MW-1	9/28/2010	Cobalt	<0.006	mg/L
GW	MW-1	9/28/2010	Copper	<0.006	mg/L
GW	MW-1	9/28/2010	Fluoride	0.4	mg/L
GW	MW-1	9/28/2010	Iron	0.11	mg/L
GW	MW-1	9/28/2010	Lead	<0.005	mg/L
GW	MW-1	9/28/2010	Manganese	0.0054	mg/L
GW	MW-1	9/28/2010	Mercury	<0.0002	mg/L
GW	MW-1	9/28/2010	Molybdenum	<0.008	mg/L
GW	MW-1	9/28/2010	Nickel	<0.01	mg/L
GW	MW-1	9/28/2010	Selenium	<0.005	mg/L
GW	MW-1	9/28/2010	Silver	<0.005	mg/L

GW	MW-1	9/28/2010	Sulfate	48	mg/L
GW	MW-1	9/28/2010	TDS	303	mg/L
GW	MW-1	9/28/2010	Uranium	0.0016	mg/L
GW	MW-1	9/28/2010	Zinc	0.43	mg/L
GW	MW-1	9/28/2010	pH	8.1	pH units
GW	MW-1	9/28/2010	Beryllium	<0.002	mg/L
GW	MW-1	9/28/2010	Calcium	43	mg/L
GW	MW-1	9/28/2010	Magnesium	6.8	mg/L
GW	MW-1	9/28/2010	Potassium	3.9	mg/L
GW	MW-1	9/28/2010	Silicon	15	mg/L
GW	MW-1	9/28/2010	Sodium	40	mg/L
GW	MW-1	9/28/2010	Vanadium	<0.05	mg/L
GW	MW-1	9/28/2010	Antimony	<0.001	mg/L
GW	MW-1	9/28/2010	Thallium	<0.001	mg/L
GW	MW-1	9/28/2010	Nitrate (As N)+Nitrite (As N)	1.9	mg/L
GW	MW-1	9/28/2010	Alkalinity, Total (As CaCO3)	150	mg/L CaCO3
GW	MW-1	9/28/2010	Carbonate	<2	mg/L CaCO3
GW	MW-1	9/28/2010	Bicarbonate	150	mg/L CaCO3
GW	MW-1	9/28/2010	Specific Conductance	440	µmhos/cm
GW	MW-1	9/28/2010	Suspended Solids	<10	mg/L
GW	MW-2	9/28/2010	Aluminum	<0.02	mg/L
GW	MW-2	9/28/2010	Arsenic	0.02	mg/L
GW	MW-2	9/28/2010	Barium	<0.002	mg/L
GW	MW-2	9/28/2010	Boron	0.15	mg/L
GW	MW-2	9/28/2010	Cadmium	<0.002	mg/L
GW	MW-2	9/28/2010	Chloride	5.8	mg/L
GW	MW-2	9/28/2010	Chromium	0.032	mg/L
GW	MW-2	9/28/2010	Cobalt	<0.006	mg/L
GW	MW-2	9/28/2010	Copper	<0.006	mg/L
GW	MW-2	9/28/2010	Cyanide	<0.01	mg/L
GW	MW-2	9/28/2010	Fluoride	3.3	mg/L
GW	MW-2	9/28/2010	Iron	<0.02	mg/L
GW	MW-2	9/28/2010	Lead	<0.005	mg/L
GW	MW-2	9/28/2010	Manganese	<0.002	mg/L
GW	MW-2	9/28/2010	Mercury	<0.0002	mg/L
GW	MW-2	9/28/2010	Molybdenum	<0.008	mg/L
GW	MW-2	9/28/2010	Nickel	<0.01	mg/L
GW	MW-2	9/28/2010	Selenium	<0.005	mg/L
GW	MW-2	9/28/2010	Silver	<0.005	mg/L
GW	MW-2	9/28/2010	Sulfate	18	mg/L
GW	MW-2	9/28/2010	TDS	274	mg/L
GW	MW-2	9/28/2010	Uranium	0.0022	mg/L
GW	MW-2	9/28/2010	Zinc	<0.01	mg/L
GW	MW-2	9/28/2010	pH	9.27	pH units
GW	MW-2	9/28/2010	Beryllium	<0.002	mg/L
GW	MW-2	9/28/2010	Calcium	1.9	mg/L
GW	MW-2	9/28/2010	Magnesium	<1	mg/L
GW	MW-2	9/28/2010	Potassium	<1	mg/L
GW	MW-2	9/28/2010	Silicon	23	mg/L
GW	MW-2	9/28/2010	Sodium	80	mg/L
GW	MW-2	9/28/2010	Vanadium	0.065	mg/L
GW	MW-2	9/28/2010	Antimony	<0.001	mg/L
GW	MW-2	9/28/2010	Thallium	<0.001	mg/L
GW	MW-2	9/28/2010	Nitrate (As N)+Nitrite (As N)	<1	mg/L
GW	MW-2	9/28/2010	Alkalinity, Total (As CaCO3)	150	mg/L CaCO3
GW	MW-2	9/28/2010	Carbonate	28	mg/L CaCO3
GW	MW-2	9/28/2010	Bicarbonate	120	mg/L CaCO3
GW	MW-2	9/28/2010	Specific Conductance	360	µmhos/cm
GW	MW-2	9/28/2010	Suspended Solids	<10	mg/L
GW	MW-1	9/29/2010	Cyanide	<0.01	mg/L
GW	GWQ94-16	9/30/2010	Aluminum	<0.02	mg/L
GW	GWQ94-16	9/30/2010	Arsenic	0.0024	mg/L
GW	GWQ94-16	9/30/2010	Barium	0.038	mg/L
GW	GWQ94-16	9/30/2010	Boron	0.053	mg/L
GW	GWQ94-16	9/30/2010	Cadmium	<0.002	mg/L
GW	GWQ94-16	9/30/2010	Chloride	190	mg/L
GW	GWQ94-16	9/30/2010	Chromium	<0.006	mg/L
GW	GWQ94-16	9/30/2010	Cobalt	<0.006	mg/L
GW	GWQ94-16	9/30/2010	Copper	<0.006	mg/L
GW	GWQ94-16	9/30/2010	Cyanide	<0.01	mg/L
GW	GWQ94-16	9/30/2010	Fluoride	0.67	mg/L
GW	GWQ94-16	9/30/2010	Iron	<0.02	mg/L
GW	GWQ94-16	9/30/2010	Lead	<0.005	mg/L
GW	GWQ94-16	9/30/2010	Manganese	<0.002	mg/L
GW	GWQ94-16	9/30/2010	Mercury	<0.0002	mg/L
GW	GWQ94-16	9/30/2010	Molybdenum	<0.008	mg/L

GW	GWQ94-16	9/30/2010	Nickel	<0.01	mg/L
GW	GWQ94-16	9/30/2010	Selenium	0.015	mg/L
GW	GWQ94-16	9/30/2010	Silver	<0.005	mg/L
GW	GWQ94-16	9/30/2010	Sulfate	440	mg/L
GW	GWQ94-16	9/30/2010	TDS	1170	mg/L
GW	GWQ94-16	9/30/2010	Uranium	0.0024	mg/L
GW	GWQ94-16	9/30/2010	Zinc	<0.01	mg/L
GW	GWQ94-16	9/30/2010	pH	7.5	pH units
GW	GWQ94-16	9/30/2010	Beryllium	<0.002	mg/L
GW	GWQ94-16	9/30/2010	Calcium	200	mg/L
GW	GWQ94-16	9/30/2010	Magnesium	51	mg/L
GW	GWQ94-16	9/30/2010	Potassium	3.1	mg/L
GW	GWQ94-16	9/30/2010	Silicon	21	mg/L
GW	GWQ94-16	9/30/2010	Sodium	78	mg/L
GW	GWQ94-16	9/30/2010	Vanadium	<0.05	mg/L
GW	GWQ94-16	9/30/2010	Antimony	<0.001	mg/L
GW	GWQ94-16	9/30/2010	Thallium	<0.001	mg/L
GW	GWQ94-16	9/30/2010	Nitrate (As N)+Nitrite (As N)	3.9	mg/L
GW	GWQ94-16	9/30/2010	Alkalinity, Total (As CaCO3)	180	mg/L CaCO3
GW	GWQ94-16	9/30/2010	Carbonate	<2	mg/L CaCO3
GW	GWQ94-16	9/30/2010	Bicarbonate	180	mg/L CaCO3
GW	GWQ94-16	9/30/2010	Specific Conductance	1500	µmhos/cm
GW	GWQ94-16	9/30/2010	Suspended Solids	<10	mg/L
GW	IW-2	9/30/2010	Aluminum	0.044	mg/L
GW	IW-2	9/30/2010	Arsenic	<0.001	mg/L
GW	IW-2	9/30/2010	Barium	0.028	mg/L
GW	IW-2	9/30/2010	Boron	0.073	mg/L
GW	IW-2	9/30/2010	Cadmium	<0.002	mg/L
GW	IW-2	9/30/2010	Chloride	500	mg/L
GW	IW-2	9/30/2010	Chromium	<0.006	mg/L
GW	IW-2	9/30/2010	Cobalt	<0.006	mg/L
GW	IW-2	9/30/2010	Copper	<0.006	mg/L
GW	IW-2	9/30/2010	Cyanide	<0.01	mg/L
GW	IW-2	9/30/2010	Fluoride	0.68	mg/L
GW	IW-2	9/30/2010	Iron	0.41	mg/L
GW	IW-2	9/30/2010	Lead	<0.005	mg/L
GW	IW-2	9/30/2010	Manganese	2.2	mg/L
GW	IW-2	9/30/2010	Mercury	<0.0002	mg/L
GW	IW-2	9/30/2010	Molybdenum	0.02	mg/L
GW	IW-2	9/30/2010	Nickel	<0.01	mg/L
GW	IW-2	9/30/2010	Selenium	0.037	mg/L
GW	IW-2	9/30/2010	Silver	<0.005	mg/L
GW	IW-2	9/30/2010	Sulfate	1000	mg/L
GW	IW-2	9/30/2010	TDS	2280	mg/L
GW	IW-2	9/30/2010	Uranium	0.0057	mg/L
GW	IW-2	9/30/2010	Zinc	0.018	mg/L
GW	IW-2	9/30/2010	pH	7.36	pH units
GW	IW-2	9/30/2010	Beryllium	<0.002	mg/L
GW	IW-2	9/30/2010	Calcium	360	mg/L
GW	IW-2	9/30/2010	Magnesium	110	mg/L
GW	IW-2	9/30/2010	Potassium	1.6	mg/L
GW	IW-2	9/30/2010	Silicon	27	mg/L
GW	IW-2	9/30/2010	Sodium	270	mg/L
GW	IW-2	9/30/2010	Vanadium	<0.05	mg/L
GW	IW-2	9/30/2010	Antimony	<0.001	mg/L
GW	IW-2	9/30/2010	Thallium	<0.001	mg/L
GW	IW-2	9/30/2010	Nitrate (As N)+Nitrite (As N)	<2	mg/L
GW	IW-2	9/30/2010	Alkalinity, Total (As CaCO3)	250	mg/L CaCO3
GW	IW-2	9/30/2010	Carbonate	<2	mg/L CaCO3
GW	IW-2	9/30/2010	Bicarbonate	250	mg/L CaCO3
GW	IW-2	9/30/2010	Specific Conductance	3000	µmhos/cm
GW	IW-2	9/30/2010	Suspended Solids	71000	mg/L
GW	NP-5	9/30/2010	Aluminum	<0.02	mg/L
GW	NP-5	9/30/2010	Arsenic	0.0015	mg/L
GW	NP-5	9/30/2010	Barium	0.018	mg/L
GW	NP-5	9/30/2010	Boron	0.041	mg/L
GW	NP-5	9/30/2010	Cadmium	<0.002	mg/L
GW	NP-5	9/30/2010	Chloride	83	mg/L
GW	NP-5	9/30/2010	Chromium	<0.006	mg/L
GW	NP-5	9/30/2010	Cobalt	<0.006	mg/L
GW	NP-5	9/30/2010	Copper	<0.006	mg/L
GW	NP-5	9/30/2010	Cyanide	<0.01	mg/L
GW	NP-5	9/30/2010	Fluoride	0.71	mg/L
GW	NP-5	9/30/2010	Iron	<0.02	mg/L
GW	NP-5	9/30/2010	Lead	<0.005	mg/L
GW	NP-5	9/30/2010	Manganese	0.005	mg/L

GW	NP-5	9/30/2010	Mercury	<0.0002	mg/L
GW	NP-5	9/30/2010	Molybdenum	<0.008	mg/L
GW	NP-5	9/30/2010	Nickel	<0.01	mg/L
GW	NP-5	9/30/2010	Selenium	0.0079	mg/L
GW	NP-5	9/30/2010	Silver	<0.005	mg/L
GW	NP-5	9/30/2010	Sulfate	170	mg/L
GW	NP-5	9/30/2010	TDS	629	mg/L
GW	NP-5	9/30/2010	Uranium	0.0013	mg/L
GW	NP-5	9/30/2010	Zinc	0.2	mg/L
GW	NP-5	9/30/2010	pH	7.72	pH units
GW	NP-5	9/30/2010	Beryllium	<0.002	mg/L
GW	NP-5	9/30/2010	Calcium	99	mg/L
GW	NP-5	9/30/2010	Magnesium	33	mg/L
GW	NP-5	9/30/2010	Potassium	2.8	mg/L
GW	NP-5	9/30/2010	Silicon	19	mg/L
GW	NP-5	9/30/2010	Sodium	46	mg/L
GW	NP-5	9/30/2010	Vanadium	<0.05	mg/L
GW	NP-5	9/30/2010	Antimony	<0.001	mg/L
GW	NP-5	9/30/2010	Thallium	<0.001	mg/L
GW	NP-5	9/30/2010	Nitrate (As N)+Nitrite (As N)	4	mg/L
GW	NP-5	9/30/2010	Alkalinity, Total (As CaCO3)	170	mg/L CaCO3
GW	NP-5	9/30/2010	Carbonate	<2	mg/L CaCO3
GW	NP-5	9/30/2010	Bicarbonate	170	mg/L CaCO3
GW	NP-5	9/30/2010	Specific Conductance	910	µmhos/cm
GW	NP-5	9/30/2010	Suspended Solids	31	mg/L
GW	GWQ94-15	10/1/2010	Aluminum	<0.02	mg/L
GW	GWQ94-15	10/1/2010	Arsenic	<0.001	mg/L
GW	GWQ94-15	10/1/2010	Barium	0.056	mg/L
GW	GWQ94-15	10/1/2010	Boron	<0.04	mg/L
GW	GWQ94-15	10/1/2010	Cadmium	<0.002	mg/L
GW	GWQ94-15	10/1/2010	Chloride	110	mg/L
GW	GWQ94-15	10/1/2010	Chromium	<0.006	mg/L
GW	GWQ94-15	10/1/2010	Cobalt	<0.006	mg/L
GW	GWQ94-15	10/1/2010	Copper	<0.006	mg/L
GW	GWQ94-15	10/1/2010	Cyanide	<0.01	mg/L
GW	GWQ94-15	10/1/2010	Fluoride	0.44	mg/L
GW	GWQ94-15	10/1/2010	Iron	<0.02	mg/L
GW	GWQ94-15	10/1/2010	Lead	<0.005	mg/L
GW	GWQ94-15	10/1/2010	Manganese	<0.002	mg/L
GW	GWQ94-15	10/1/2010	Mercury	<0.0002	mg/L
GW	GWQ94-15	10/1/2010	Molybdenum	<0.008	mg/L
GW	GWQ94-15	10/1/2010	Nickel	<0.01	mg/L
GW	GWQ94-15	10/1/2010	Selenium	0.012	mg/L
GW	GWQ94-15	10/1/2010	Silver	<0.005	mg/L
GW	GWQ94-15	10/1/2010	Sulfate	260	mg/L
GW	GWQ94-15	10/1/2010	TDS	794	mg/L
GW	GWQ94-15	10/1/2010	Uranium	0.0018	mg/L
GW	GWQ94-15	10/1/2010	Zinc	<0.01	mg/L
GW	GWQ94-15	10/1/2010	pH	7.52	pH units
GW	GWQ94-15	10/1/2010	Beryllium	<0.002	mg/L
GW	GWQ94-15	10/1/2010	Calcium	130	mg/L
GW	GWQ94-15	10/1/2010	Magnesium	37	mg/L
GW	GWQ94-15	10/1/2010	Potassium	2.2	mg/L
GW	GWQ94-15	10/1/2010	Silicon	17	mg/L
GW	GWQ94-15	10/1/2010	Sodium	65	mg/L
GW	GWQ94-15	10/1/2010	Vanadium	<0.05	mg/L
GW	GWQ94-15	10/1/2010	Antimony	<0.001	mg/L
GW	GWQ94-15	10/1/2010	Thallium	<0.001	mg/L
GW	GWQ94-15	10/1/2010	Nitrate (As N)+Nitrite (As N)	2.7	mg/L
GW	GWQ94-15	10/1/2010	Alkalinity, Total (As CaCO3)	190	mg/L CaCO3
GW	GWQ94-15	10/1/2010	Carbonate	<2	mg/L CaCO3
GW	GWQ94-15	10/1/2010	Bicarbonate	190	mg/L CaCO3
GW	GWQ94-15	10/1/2010	Specific Conductance	1100	µmhos/cm
GW	GWQ94-15	10/1/2010	Suspended Solids	<10	mg/L
GW	MW-11	10/4/2010	Aluminum	<0.02	mg/L
GW	MW-11	10/4/2010	Arsenic	0.0016	mg/L
GW	MW-11	10/4/2010	Barium	0.02	mg/L
GW	MW-11	10/4/2010	Boron	<0.04	mg/L
GW	MW-11	10/4/2010	Cadmium	<0.002	mg/L
GW	MW-11	10/4/2010	Chloride	14	mg/L
GW	MW-11	10/4/2010	Chromium	<0.006	mg/L
GW	MW-11	10/4/2010	Cobalt	<0.006	mg/L
GW	MW-11	10/4/2010	Copper	<0.006	mg/L
GW	MW-11	10/4/2010	Fluoride	0.49	mg/L
GW	MW-11	10/4/2010	Iron	<0.02	mg/L
GW	MW-11	10/4/2010	Lead	<0.005	mg/L

GW	MW-11	10/4/2010	Manganese	<0.002	mg/L
GW	MW-11	10/4/2010	Mercury	<0.0002	mg/L
GW	MW-11	10/4/2010	Molybdenum	<0.008	mg/L
GW	MW-11	10/4/2010	Nickel	<0.01	mg/L
GW	MW-11	10/4/2010	Selenium	<0.001	mg/L
GW	MW-11	10/4/2010	Silver	<0.005	mg/L
GW	MW-11	10/4/2010	Sulfate	14	mg/L
GW	MW-11	10/4/2010	TDS	301	mg/L
GW	MW-11	10/4/2010	Uranium	<0.001	mg/L
GW	MW-11	10/4/2010	Zinc	<0.01	mg/L
GW	MW-11	10/4/2010	pH	7.32	pH units
GW	MW-11	10/4/2010	Beryllium	<0.002	mg/L
GW	MW-11	10/4/2010	Calcium	62	mg/L
GW	MW-11	10/4/2010	Magnesium	8.9	mg/L
GW	MW-11	10/4/2010	Potassium	1.5	mg/L
GW	MW-11	10/4/2010	Silicon	20	mg/L
GW	MW-11	10/4/2010	Sodium	24	mg/L
GW	MW-11	10/4/2010	Vanadium	<0.05	mg/L
GW	MW-11	10/4/2010	Antimony	<0.001	mg/L
GW	MW-11	10/4/2010	Thallium	<0.001	mg/L
GW	MW-11	10/4/2010	Nitrate (As N)+Nitrite (As N)	<1	mg/L
GW	MW-11	10/4/2010	Alkalinity, Total (As CaCO3)	210	mg/L CaCO3
GW	MW-11	10/4/2010	Carbonate	<2	mg/L CaCO3
GW	MW-11	10/4/2010	Bicarbonate	210	mg/L CaCO3
GW	MW-11	10/4/2010	Specific Conductance	470	µmhos/cm
GW	MW-11	10/4/2010	Suspended Solids	12	mg/L
GW	MW-9	10/4/2010	Aluminum	<0.02	mg/L
GW	MW-9	10/4/2010	Arsenic	0.0039	mg/L
GW	MW-9	10/4/2010	Barium	<0.002	mg/L
GW	MW-9	10/4/2010	Boron	0.051	mg/L
GW	MW-9	10/4/2010	Cadmium	<0.002	mg/L
GW	MW-9	10/4/2010	Chloride	13	mg/L
GW	MW-9	10/4/2010	Chromium	<0.006	mg/L
GW	MW-9	10/4/2010	Cobalt	<0.006	mg/L
GW	MW-9	10/4/2010	Copper	<0.006	mg/L
GW	MW-9	10/4/2010	Fluoride	1.3	mg/L
GW	MW-9	10/4/2010	Iron	<0.02	mg/L
GW	MW-9	10/4/2010	Lead	<0.005	mg/L
GW	MW-9	10/4/2010	Manganese	<0.002	mg/L
GW	MW-9	10/4/2010	Mercury	<0.0002	mg/L
GW	MW-9	10/4/2010	Molybdenum	<0.008	mg/L
GW	MW-9	10/4/2010	Nickel	<0.01	mg/L
GW	MW-9	10/4/2010	Selenium	<0.001	mg/L
GW	MW-9	10/4/2010	Silver	<0.005	mg/L
GW	MW-9	10/4/2010	Sulfate	11	mg/L
GW	MW-9	10/4/2010	TDS	194	mg/L
GW	MW-9	10/4/2010	Uranium	0.0012	mg/L
GW	MW-9	10/4/2010	Zinc	<0.01	mg/L
GW	MW-9	10/4/2010	pH	8.06	pH units
GW	MW-9	10/4/2010	Beryllium	<0.002	mg/L
GW	MW-9	10/4/2010	Calcium	12	mg/L
GW	MW-9	10/4/2010	Magnesium	<1	mg/L
GW	MW-9	10/4/2010	Potassium	2	mg/L
GW	MW-9	10/4/2010	Silicon	14	mg/L
GW	MW-9	10/4/2010	Sodium	51	mg/L
GW	MW-9	10/4/2010	Vanadium	<0.05	mg/L
GW	MW-9	10/4/2010	Antimony	<0.001	mg/L
GW	MW-9	10/4/2010	Thallium	<0.001	mg/L
GW	MW-9	10/4/2010	Nitrate (As N)+Nitrite (As N)	7.4	mg/L
GW	MW-9	10/4/2010	Alkalinity, Total (As CaCO3)	110	mg/L CaCO3
GW	MW-9	10/4/2010	Carbonate	<2	mg/L CaCO3
GW	MW-9	10/4/2010	Bicarbonate	110	mg/L CaCO3
GW	MW-9	10/4/2010	Specific Conductance	300	µmhos/cm
GW	MW-9	10/4/2010	Suspended Solids	<10	mg/L
GW	GWQ94-13	10/5/2010	Aluminum	<0.02	mg/L
GW	GWQ94-13	10/5/2010	Arsenic	<0.005	mg/L
GW	GWQ94-13	10/5/2010	Barium	0.038	mg/L
GW	GWQ94-13	10/5/2010	Boron	<0.04	mg/L
GW	GWQ94-13	10/5/2010	Cadmium	<0.002	mg/L
GW	GWQ94-13	10/5/2010	Chloride	280	mg/L
GW	GWQ94-13	10/5/2010	Chromium	<0.006	mg/L
GW	GWQ94-13	10/5/2010	Cobalt	<0.006	mg/L
GW	GWQ94-13	10/5/2010	Copper	<0.006	mg/L
GW	GWQ94-13	10/5/2010	Fluoride	0.32	mg/L
GW	GWQ94-13	10/5/2010	Iron	<0.02	mg/L
GW	GWQ94-13	10/5/2010	Lead	<0.005	mg/L

GW	GWQ94-13	10/5/2010	Manganese	<0.002	mg/L
GW	GWQ94-13	10/5/2010	Mercury	<0.0002	mg/L
GW	GWQ94-13	10/5/2010	Molybdenum	<0.008	mg/L
GW	GWQ94-13	10/5/2010	Nickel	<0.01	mg/L
GW	GWQ94-13	10/5/2010	Selenium	0.024	mg/L
GW	GWQ94-13	10/5/2010	Silver	<0.005	mg/L
GW	GWQ94-13	10/5/2010	Sulfate	760	mg/L
GW	GWQ94-13	10/5/2010	TDS	1670	mg/L
GW	GWQ94-13	10/5/2010	Uranium	0.0015	mg/L
GW	GWQ94-13	10/5/2010	Zinc	<0.01	mg/L
GW	GWQ94-13	10/5/2010	pH	7.39	pH units
GW	GWQ94-13	10/5/2010	Beryllium	<0.002	mg/L
GW	GWQ94-13	10/5/2010	Calcium	300	mg/L
GW	GWQ94-13	10/5/2010	Magnesium	62	mg/L
GW	GWQ94-13	10/5/2010	Potassium	3.4	mg/L
GW	GWQ94-13	10/5/2010	Silicon	16	mg/L
GW	GWQ94-13	10/5/2010	Sodium	110	mg/L
GW	GWQ94-13	10/5/2010	Vanadium	<0.05	mg/L
GW	GWQ94-13	10/5/2010	Antimony	<0.001	mg/L
GW	GWQ94-13	10/5/2010	Thallium	<0.001	mg/L
GW	GWQ94-13	10/5/2010	Nitrate (As N)+Nitrite (As N)	5.8	mg/L
GW	GWQ94-13	10/5/2010	Alkalinity, Total (As CaCO3)	120	mg/L CaCO3
GW	GWQ94-13	10/5/2010	Carbonate	<2	mg/L CaCO3
GW	GWQ94-13	10/5/2010	Bicarbonate	120	mg/L CaCO3
GW	GWQ94-13	10/5/2010	Specific Conductance	2100	µmhos/cm
GW	GWQ94-13	10/5/2010	Suspended Solids	<10	mg/L
GW	GWQ94-14	10/5/2010	Aluminum	<0.02	mg/L
GW	GWQ94-14	10/5/2010	Arsenic	0.0024	mg/L
GW	GWQ94-14	10/5/2010	Barium	0.045	mg/L
GW	GWQ94-14	10/5/2010	Boron	<0.04	mg/L
GW	GWQ94-14	10/5/2010	Cadmium	<0.002	mg/L
GW	GWQ94-14	10/5/2010	Chloride	50	mg/L
GW	GWQ94-14	10/5/2010	Chromium	<0.006	mg/L
GW	GWQ94-14	10/5/2010	Cobalt	<0.006	mg/L
GW	GWQ94-14	10/5/2010	Copper	<0.006	mg/L
GW	GWQ94-14	10/5/2010	Fluoride	0.53	mg/L
GW	GWQ94-14	10/5/2010	Iron	<0.02	mg/L
GW	GWQ94-14	10/5/2010	Lead	<0.005	mg/L
GW	GWQ94-14	10/5/2010	Manganese	<0.002	mg/L
GW	GWQ94-14	10/5/2010	Mercury	<0.0002	mg/L
GW	GWQ94-14	10/5/2010	Molybdenum	<0.008	mg/L
GW	GWQ94-14	10/5/2010	Nickel	<0.01	mg/L
GW	GWQ94-14	10/5/2010	Selenium	0.0053	mg/L
GW	GWQ94-14	10/5/2010	Silver	<0.005	mg/L
GW	GWQ94-14	10/5/2010	Sulfate	150	mg/L
GW	GWQ94-14	10/5/2010	TDS	563	mg/L
GW	GWQ94-14	10/5/2010	Uranium	0.0013	mg/L
GW	GWQ94-14	10/5/2010	Zinc	<0.01	mg/L
GW	GWQ94-14	10/5/2010	pH	7.57	pH units
GW	GWQ94-14	10/5/2010	Beryllium	<0.002	mg/L
GW	GWQ94-14	10/5/2010	Calcium	94	mg/L
GW	GWQ94-14	10/5/2010	Magnesium	27	mg/L
GW	GWQ94-14	10/5/2010	Potassium	1.7	mg/L
GW	GWQ94-14	10/5/2010	Silicon	18	mg/L
GW	GWQ94-14	10/5/2010	Sodium	47	mg/L
GW	GWQ94-14	10/5/2010	Vanadium	<0.05	mg/L
GW	GWQ94-14	10/5/2010	Antimony	<0.001	mg/L
GW	GWQ94-14	10/5/2010	Thallium	<0.001	mg/L
GW	GWQ94-14	10/5/2010	Nitrate (As N)+Nitrite (As N)	2.2	mg/L
GW	GWQ94-14	10/5/2010	Alkalinity, Total (As CaCO3)	210	mg/L CaCO3
GW	GWQ94-14	10/5/2010	Carbonate	<2	mg/L CaCO3
GW	GWQ94-14	10/5/2010	Bicarbonate	210	mg/L CaCO3
GW	GWQ94-14	10/5/2010	Specific Conductance	840	µmhos/cm
GW	GWQ94-14	10/5/2010	Suspended Solids	<10	mg/L
GW	NP-1	10/5/2010	Aluminum	0.14	mg/L
GW	NP-1	10/5/2010	Arsenic	0.0035	mg/L
GW	NP-1	10/5/2010	Barium	0.041	mg/L
GW	NP-1	10/5/2010	Boron	0.04	mg/L
GW	NP-1	10/5/2010	Cadmium	<0.002	mg/L
GW	NP-1	10/5/2010	Chloride	35	mg/L
GW	NP-1	10/5/2010	Chromium	<0.006	mg/L
GW	NP-1	10/5/2010	Cobalt	<0.006	mg/L
GW	NP-1	10/5/2010	Copper	<0.006	mg/L
GW	NP-1	10/5/2010	Fluoride	0.58	mg/L
GW	NP-1	10/5/2010	Iron	<0.02	mg/L
GW	NP-1	10/5/2010	Lead	<0.005	mg/L

GW	NP-1	10/5/2010	Manganese	<0.002	mg/L
GW	NP-1	10/5/2010	Mercury	<0.0002	mg/L
GW	NP-1	10/5/2010	Molybdenum	<0.008	mg/L
GW	NP-1	10/5/2010	Nickel	<0.01	mg/L
GW	NP-1	10/5/2010	Selenium	0.0045	mg/L
GW	NP-1	10/5/2010	Silver	<0.005	mg/L
GW	NP-1	10/5/2010	Sulfate	140	mg/L
GW	NP-1	10/5/2010	TDS	537	mg/L
GW	NP-1	10/5/2010	Uranium	0.0018	mg/L
GW	NP-1	10/5/2010	Zinc	0.055	mg/L
GW	NP-1	10/5/2010	pH	7.63	pH units
GW	NP-1	10/5/2010	Beryllium	<0.002	mg/L
GW	NP-1	10/5/2010	Calcium	86	mg/L
GW	NP-1	10/5/2010	Magnesium	28	mg/L
GW	NP-1	10/5/2010	Potassium	1.9	mg/L
GW	NP-1	10/5/2010	Silicon	18	mg/L
GW	NP-1	10/5/2010	Sodium	50	mg/L
GW	NP-1	10/5/2010	Vanadium	<0.05	mg/L
GW	NP-1	10/5/2010	Antimony	<0.001	mg/L
GW	NP-1	10/5/2010	Thallium	<0.001	mg/L
GW	NP-1	10/5/2010	Nitrate (As N)+Nitrite (As N)	4.9	mg/L
GW	NP-1	10/5/2010	Alkalinity, Total (As CaCO3)	220	mg/L CaCO3
GW	NP-1	10/5/2010	Carbonate	<2	mg/L CaCO3
GW	NP-1	10/5/2010	Bicarbonate	220	mg/L CaCO3
GW	NP-1	10/5/2010	Specific Conductance	800	µmhos/cm
GW	NP-1	10/5/2010	Suspended Solids	13	mg/L
GW	GWQ96-23A	10/6/2010	Aluminum	<0.02	mg/L
GW	GWQ96-23A	10/6/2010	Arsenic	<0.001	mg/L
GW	GWQ96-23A	10/6/2010	Barium	0.067	mg/L
GW	GWQ96-23A	10/6/2010	Boron	0.08	mg/L
GW	GWQ96-23A	10/6/2010	Cadmium	<0.002	mg/L
GW	GWQ96-23A	10/6/2010	Chloride	12	mg/L
GW	GWQ96-23A	10/6/2010	Chromium	<0.006	mg/L
GW	GWQ96-23A	10/6/2010	Cobalt	<0.006	mg/L
GW	GWQ96-23A	10/6/2010	Copper	<0.006	mg/L
GW	GWQ96-23A	10/6/2010	Fluoride	1.6	mg/L
GW	GWQ96-23A	10/6/2010	Iron	0.31	mg/L
GW	GWQ96-23A	10/6/2010	Lead	<0.005	mg/L
GW	GWQ96-23A	10/6/2010	Manganese	0.41	mg/L
GW	GWQ96-23A	10/6/2010	Mercury	<0.0002	mg/L
GW	GWQ96-23A	10/6/2010	Molybdenum	<0.008	mg/L
GW	GWQ96-23A	10/6/2010	Nickel	<0.01	mg/L
GW	GWQ96-23A	10/6/2010	Selenium	0.0013	mg/L
GW	GWQ96-23A	10/6/2010	Silver	<0.005	mg/L
GW	GWQ96-23A	10/6/2010	Sulfate	99	mg/L
GW	GWQ96-23A	10/6/2010	TDS	769	mg/L
GW	GWQ96-23A	10/6/2010	Uranium	0.0037	mg/L
GW	GWQ96-23A	10/6/2010	Zinc	<0.01	mg/L
GW	GWQ96-23A	10/6/2010	pH	7.89	pH units
GW	GWQ96-23A	10/6/2010	Beryllium	<0.002	mg/L
GW	GWQ96-23A	10/6/2010	Calcium	140	mg/L
GW	GWQ96-23A	10/6/2010	Magnesium	45	mg/L
GW	GWQ96-23A	10/6/2010	Potassium	1.3	mg/L
GW	GWQ96-23A	10/6/2010	Silicon	15	mg/L
GW	GWQ96-23A	10/6/2010	Sodium	80	mg/L
GW	GWQ96-23A	10/6/2010	Vanadium	<0.05	mg/L
GW	GWQ96-23A	10/6/2010	Antimony	<0.001	mg/L
GW	GWQ96-23A	10/6/2010	Thallium	<0.001	mg/L
GW	GWQ96-23A	10/6/2010	Nitrate (As N)+Nitrite (As N)	<1	mg/L
GW	GWQ96-23A	10/6/2010	Alkalinity, Total (As CaCO3)	580	mg/L CaCO3
GW	GWQ96-23A	10/6/2010	Carbonate	<2	mg/L CaCO3
GW	GWQ96-23A	10/6/2010	Bicarbonate	580	mg/L CaCO3
GW	GWQ96-23A	10/6/2010	Specific Conductance	1200	µmhos/cm
GW	GWQ96-23A	10/6/2010	Suspended Solids	<10	mg/L
GW	GWQ96-23B	10/6/2010	Aluminum	<0.02	mg/L
GW	GWQ96-23B	10/6/2010	Arsenic	<0.001	mg/L
GW	GWQ96-23B	10/6/2010	Barium	0.1	mg/L
GW	GWQ96-23B	10/6/2010	Boron	0.14	mg/L
GW	GWQ96-23B	10/6/2010	Cadmium	<0.002	mg/L
GW	GWQ96-23B	10/6/2010	Chloride	19	mg/L
GW	GWQ96-23B	10/6/2010	Chromium	<0.006	mg/L
GW	GWQ96-23B	10/6/2010	Cobalt	<0.006	mg/L
GW	GWQ96-23B	10/6/2010	Copper	<0.006	mg/L
GW	GWQ96-23B	10/6/2010	Fluoride	2.1	mg/L
GW	GWQ96-23B	10/6/2010	Iron	1.4	mg/L
GW	GWQ96-23B	10/6/2010	Lead	<0.005	mg/L

GW	GWQ96-23B	10/6/2010	Manganese	0.36	mg/L
GW	GWQ96-23B	10/6/2010	Mercury	<0.0002	mg/L
GW	GWQ96-23B	10/6/2010	Molybdenum	<0.008	mg/L
GW	GWQ96-23B	10/6/2010	Nickel	<0.01	mg/L
GW	GWQ96-23B	10/6/2010	Selenium	0.0011	mg/L
GW	GWQ96-23B	10/6/2010	Silver	<0.005	mg/L
GW	GWQ96-23B	10/6/2010	Sulfate	<0.5	mg/L
GW	GWQ96-23B	10/6/2010	TDS	554	mg/L
GW	GWQ96-23B	10/6/2010	Uranium	<0.001	mg/L
GW	GWQ96-23B	10/6/2010	Zinc	<0.01	mg/L
GW	GWQ96-23B	10/6/2010	pH	7.85	pH units
GW	GWQ96-23B	10/6/2010	Beryllium	<0.002	mg/L
GW	GWQ96-23B	10/6/2010	Calcium	78	mg/L
GW	GWQ96-23B	10/6/2010	Magnesium	22	mg/L
GW	GWQ96-23B	10/6/2010	Potassium	1.6	mg/L
GW	GWQ96-23B	10/6/2010	Silicon	12	mg/L
GW	GWQ96-23B	10/6/2010	Sodium	110	mg/L
GW	GWQ96-23B	10/6/2010	Vanadium	<0.05	mg/L
GW	GWQ96-23B	10/6/2010	Antimony	<0.001	mg/L
GW	GWQ96-23B	10/6/2010	Thallium	<0.001	mg/L
GW	GWQ96-23B	10/6/2010	Nitrate (As N)+Nitrite (As N)	<1	mg/L
GW	GWQ96-23B	10/6/2010	Alkalinity, Total (As CaCO3)	480	mg/L CaCO3
GW	GWQ96-23B	10/6/2010	Carbonate	<2	mg/L CaCO3
GW	GWQ96-23B	10/6/2010	Bicarbonate	480	mg/L CaCO3
GW	GWQ96-23B	10/6/2010	Specific Conductance	900	µmhos/cm
GW	GWQ96-23B	10/6/2010	Suspended Solids	<10	mg/L
GW	GWQ96-22A	10/7/2010	Aluminum	<0.02	mg/L
GW	GWQ96-22A	10/7/2010	Arsenic	0.0035	mg/L
GW	GWQ96-22A	10/7/2010	Barium	0.084	mg/L
GW	GWQ96-22A	10/7/2010	Boron	0.28	mg/L
GW	GWQ96-22A	10/7/2010	Cadmium	<0.002	mg/L
GW	GWQ96-22A	10/7/2010	Chloride	75	mg/L
GW	GWQ96-22A	10/7/2010	Chromium	<0.006	mg/L
GW	GWQ96-22A	10/7/2010	Cobalt	<0.006	mg/L
GW	GWQ96-22A	10/7/2010	Copper	<0.006	mg/L
GW	GWQ96-22A	10/7/2010	Fluoride	2.7	mg/L
GW	GWQ96-22A	10/7/2010	Iron	0.32	mg/L
GW	GWQ96-22A	10/7/2010	Lead	<0.005	mg/L
GW	GWQ96-22A	10/7/2010	Manganese	0.49	mg/L
GW	GWQ96-22A	10/7/2010	Mercury	<0.0002	mg/L
GW	GWQ96-22A	10/7/2010	Molybdenum	<0.008	mg/L
GW	GWQ96-22A	10/7/2010	Nickel	<0.01	mg/L
GW	GWQ96-22A	10/7/2010	Selenium	<0.001	mg/L
GW	GWQ96-22A	10/7/2010	Silver	<0.005	mg/L
GW	GWQ96-22A	10/7/2010	Sulfate	34	mg/L
GW	GWQ96-22A	10/7/2010	TDS	564	mg/L
GW	GWQ96-22A	10/7/2010	Uranium	<0.001	mg/L
GW	GWQ96-22A	10/7/2010	Zinc	<0.01	mg/L
GW	GWQ96-22A	10/7/2010	pH	8	pH units
GW	GWQ96-22A	10/7/2010	Beryllium	<0.002	mg/L
GW	GWQ96-22A	10/7/2010	Calcium	49	mg/L
GW	GWQ96-22A	10/7/2010	Magnesium	3.9	mg/L
GW	GWQ96-22A	10/7/2010	Potassium	2.8	mg/L
GW	GWQ96-22A	10/7/2010	Silicon	13	mg/L
GW	GWQ96-22A	10/7/2010	Sodium	150	mg/L
GW	GWQ96-22A	10/7/2010	Vanadium	<0.05	mg/L
GW	GWQ96-22A	10/7/2010	Antimony	<0.001	mg/L
GW	GWQ96-22A	10/7/2010	Thallium	<0.001	mg/L
GW	GWQ96-22A	10/7/2010	Nitrate (As N)+Nitrite (As N)	<1	mg/L
GW	GWQ96-22A	10/7/2010	Alkalinity, Total (As CaCO3)	340	mg/L CaCO3
GW	GWQ96-22A	10/7/2010	Carbonate	<2	mg/L CaCO3
GW	GWQ96-22A	10/7/2010	Bicarbonate	340	mg/L CaCO3
GW	GWQ96-22A	10/7/2010	Specific Conductance	720	µmhos/cm
GW	GWQ96-22A	10/7/2010	Suspended Solids	11	mg/L
GW	GWQ96-22B	10/7/2010	Aluminum	<0.02	mg/L
GW	GWQ96-22B	10/7/2010	Arsenic	0.0057	mg/L
GW	GWQ96-22B	10/7/2010	Barium	0.11	mg/L
GW	GWQ96-22B	10/7/2010	Boron	0.24	mg/L
GW	GWQ96-22B	10/7/2010	Cadmium	<0.002	mg/L
GW	GWQ96-22B	10/7/2010	Chloride	110	mg/L
GW	GWQ96-22B	10/7/2010	Chromium	<0.006	mg/L
GW	GWQ96-22B	10/7/2010	Cobalt	<0.006	mg/L
GW	GWQ96-22B	10/7/2010	Copper	<0.006	mg/L
GW	GWQ96-22B	10/7/2010	Fluoride	3	mg/L
GW	GWQ96-22B	10/7/2010	Iron	9.3	mg/L
GW	GWQ96-22B	10/7/2010	Lead	<0.005	mg/L

GW	GWQ96-22B	10/7/2010	Manganese	1.2	mg/L
GW	GWQ96-22B	10/7/2010	Mercury	<0.0002	mg/L
GW	GWQ96-22B	10/7/2010	Molybdenum	<0.008	mg/L
GW	GWQ96-22B	10/7/2010	Nickel	<0.01	mg/L
GW	GWQ96-22B	10/7/2010	Selenium	0.0011	mg/L
GW	GWQ96-22B	10/7/2010	Silver	<0.005	mg/L
GW	GWQ96-22B	10/7/2010	Sulfate	<0.5	mg/L
GW	GWQ96-22B	10/7/2010	TDS	730	mg/L
GW	GWQ96-22B	10/7/2010	Uranium	<0.001	mg/L
GW	GWQ96-22B	10/7/2010	Zinc	<0.01	mg/L
GW	GWQ96-22B	10/7/2010	pH	7.52	pH units
GW	GWQ96-22B	10/7/2010	Beryllium	<0.002	mg/L
GW	GWQ96-22B	10/7/2010	Calcium	72	mg/L
GW	GWQ96-22B	10/7/2010	Magnesium	5.7	mg/L
GW	GWQ96-22B	10/7/2010	Potassium	3.6	mg/L
GW	GWQ96-22B	10/7/2010	Silicon	16	mg/L
GW	GWQ96-22B	10/7/2010	Sodium	200	mg/L
GW	GWQ96-22B	10/7/2010	Vanadium	<0.05	mg/L
GW	GWQ96-22B	10/7/2010	Antimony	<0.001	mg/L
GW	GWQ96-22B	10/7/2010	Thallium	<0.001	mg/L
GW	GWQ96-22B	10/7/2010	Nitrate (As N)+Nitrite (As N)	2.1	mg/L
GW	GWQ96-22B	10/7/2010	Alkalinity, Total (As CaCO3)	480	mg/L CaCO3
GW	GWQ96-22B	10/7/2010	Carbonate	<2	mg/L CaCO3
GW	GWQ96-22B	10/7/2010	Bicarbonate	480	mg/L CaCO3
GW	GWQ96-22B	10/7/2010	Specific Conductance	1200	µmhos/cm
GW	GWQ96-22B	10/7/2010	Suspended Solids	25	mg/L
GW	NP-3	10/7/2010	Aluminum	<0.02	mg/L
GW	NP-3	10/7/2010	Arsenic	<0.005	mg/L
GW	NP-3	10/7/2010	Barium	0.031	mg/L
GW	NP-3	10/7/2010	Boron	<0.04	mg/L
GW	NP-3	10/7/2010	Cadmium	<0.002	mg/L
GW	NP-3	10/7/2010	Chloride	290	mg/L
GW	NP-3	10/7/2010	Chromium	<0.006	mg/L
GW	NP-3	10/7/2010	Cobalt	<0.006	mg/L
GW	NP-3	10/7/2010	Copper	<0.006	mg/L
GW	NP-3	10/7/2010	Fluoride	0.29	mg/L
GW	NP-3	10/7/2010	Iron	0.1	mg/L
GW	NP-3	10/7/2010	Lead	<0.005	mg/L
GW	NP-3	10/7/2010	Manganese	0.015	mg/L
GW	NP-3	10/7/2010	Mercury	<0.0002	mg/L
GW	NP-3	10/7/2010	Molybdenum	<0.008	mg/L
GW	NP-3	10/7/2010	Nickel	<0.01	mg/L
GW	NP-3	10/7/2010	Selenium	0.023	mg/L
GW	NP-3	10/7/2010	Silver	<0.005	mg/L
GW	NP-3	10/7/2010	Sulfate	830	mg/L
GW	NP-3	10/7/2010	TDS	1660	mg/L
GW	NP-3	10/7/2010	Uranium	0.0015	mg/L
GW	NP-3	10/7/2010	Zinc	0.31	mg/L
GW	NP-3	10/7/2010	pH	7.57	pH units
GW	NP-3	10/7/2010	Beryllium	<0.002	mg/L
GW	NP-3	10/7/2010	Calcium	290	mg/L
GW	NP-3	10/7/2010	Magnesium	60	mg/L
GW	NP-3	10/7/2010	Potassium	3.5	mg/L
GW	NP-3	10/7/2010	Silicon	15	mg/L
GW	NP-3	10/7/2010	Sodium	110	mg/L
GW	NP-3	10/7/2010	Vanadium	<0.05	mg/L
GW	NP-3	10/7/2010	Antimony	<0.001	mg/L
GW	NP-3	10/7/2010	Thallium	<0.001	mg/L
GW	NP-3	10/7/2010	Nitrate (As N)+Nitrite (As N)	5.6	mg/L
GW	NP-3	10/7/2010	Alkalinity, Total (As CaCO3)	120	mg/L CaCO3
GW	NP-3	10/7/2010	Carbonate	<2	mg/L CaCO3
GW	NP-3	10/7/2010	Bicarbonate	120	mg/L CaCO3
GW	NP-3	10/7/2010	Specific Conductance	2000	µmhos/cm
GW	NP-3	10/7/2010	Suspended Solids	97	mg/L
GW	MW-8	10/12/2010	Aluminum	<0.02	mg/L
GW	MW-8	10/12/2010	Arsenic	0.013	mg/L
GW	MW-8	10/12/2010	Barium	<0.002	mg/L
GW	MW-8	10/12/2010	Boron	0.085	mg/L
GW	MW-8	10/12/2010	Cadmium	<0.002	mg/L
GW	MW-8	10/12/2010	Chloride	6.5	mg/L
GW	MW-8	10/12/2010	Chromium	<0.006	mg/L
GW	MW-8	10/12/2010	Cobalt	<0.006	mg/L
GW	MW-8	10/12/2010	Copper	<0.006	mg/L
GW	MW-8	10/12/2010	Cyanide	<0.005	mg/L
GW	MW-8	10/12/2010	Fluoride	1.1	mg/L
GW	MW-8	10/12/2010	Iron	<0.02	mg/L

GW	MW-8	10/12/2010	Lead	<0.005	mg/L
GW	MW-8	10/12/2010	Manganese	0.0033	mg/L
GW	MW-8	10/12/2010	Mercury	<0.0002	mg/L
GW	MW-8	10/12/2010	Molybdenum	<0.008	mg/L
GW	MW-8	10/12/2010	Nickel	<0.01	mg/L
GW	MW-8	10/12/2010	Selenium	0.0016	mg/L
GW	MW-8	10/12/2010	Silver	<0.005	mg/L
GW	MW-8	10/12/2010	Sulfate	16	mg/L
GW	MW-8	10/12/2010	TDS	287	mg/L
GW	MW-8	10/12/2010	Uranium	0.0016	mg/L
GW	MW-8	10/12/2010	Zinc	<0.01	mg/L
GW	MW-8	10/12/2010	pH	9.23	pH units
GW	MW-8	10/12/2010	Beryllium	<0.002	mg/L
GW	MW-8	10/12/2010	Calcium	2.9	mg/L
GW	MW-8	10/12/2010	Magnesium	1.1	mg/L
GW	MW-8	10/12/2010	Potassium	3.7	mg/L
GW	MW-8	10/12/2010	Silicon	14	mg/L
GW	MW-8	10/12/2010	Sodium	97	mg/L
GW	MW-8	10/12/2010	Vanadium	<0.05	mg/L
GW	MW-8	10/12/2010	Antimony	<0.001	mg/L
GW	MW-8	10/12/2010	Thallium	<0.001	mg/L
GW	MW-8	10/12/2010	Nitrate (As N)+Nitrite (As N)	<1	mg/L
GW	MW-8	10/12/2010	Alkalinity, Total (As CaCO3)	210	mg/L CaCO3
GW	MW-8	10/12/2010	Carbonate	<2	mg/L CaCO3
GW	MW-8	10/12/2010	Bicarbonate	210	mg/L CaCO3
GW	MW-8	10/12/2010	Specific Conductance	450	µmhos/cm
GW	MW-8	10/12/2010	Suspended Solids	49	mg/L
GW	LRG 04159	11/4/2010	Aluminum	<0.02	mg/L
GW	LRG 04159	11/4/2010	Arsenic	<0.001	mg/L
GW	LRG 04159	11/4/2010	Barium	0.018	mg/L
GW	LRG 04159	11/4/2010	Boron	<0.04	mg/L
GW	LRG 04159	11/4/2010	Cadmium	<0.002	mg/L
GW	LRG 04159	11/4/2010	Chloride	23	mg/L
GW	LRG 04159	11/4/2010	Chromium	<0.006	mg/L
GW	LRG 04159	11/4/2010	Cobalt	<0.006	mg/L
GW	LRG 04159	11/4/2010	Copper	<0.006	mg/L
GW	LRG 04159	11/4/2010	Fluoride	0.66	mg/L
GW	LRG 04159	11/4/2010	Iron	0.036	mg/L
GW	LRG 04159	11/4/2010	Lead	<0.005	mg/L
GW	LRG 04159	11/4/2010	Cyanide	<0.01	mg/L
GW	LRG 04159	11/4/2010	Manganese	<0.002	mg/L
GW	LRG 04159	11/4/2010	Mercury	<0.0002	mg/L
GW	LRG 04159	11/4/2010	Molybdenum	<0.008	mg/L
GW	LRG 04159	11/4/2010	Nickel	<0.01	mg/L
GW	LRG 04159	11/4/2010	Nitrogen, Nitrate (As N)	0.33	mg/L
GW	LRG 04159	11/4/2010	Selenium	0.0049	mg/L
GW	LRG 04159	11/4/2010	Silver	<0.005	mg/L
GW	LRG 04159	11/4/2010	Sulfate	220	mg/L
GW	LRG 04159	11/4/2010	TDS	730	mg/L
GW	LRG 04159	11/4/2010	Uranium	0.004	mg/L
GW	LRG 04159	11/4/2010	Zinc	0.037	mg/L
GW	LRG 04159	11/4/2010	pH	7.31	pH units
GW	LRG 04159	11/4/2010	Beryllium	<0.002	mg/L
GW	LRG 04159	11/4/2010	Calcium	110	mg/L
GW	LRG 04159	11/4/2010	Magnesium	23	mg/L
GW	LRG 04159	11/4/2010	Potassium	<1	mg/L
GW	LRG 04159	11/4/2010	Silicon	12	mg/L
GW	LRG 04159	11/4/2010	Sodium	98	mg/L
GW	LRG 04159	11/4/2010	Vanadium	<0.05	mg/L
GW	LRG 04159	11/4/2010	Antimony	<0.001	mg/L
GW	LRG 04159	11/4/2010	Thallium	<0.001	mg/L
GW	LRG 04159	11/4/2010	Nitrogen, Nitrite (As N)	<0.1	mg/L
GW	LRG 04159	11/4/2010	Alkalinity, Total (As CaCO3)	300	mg/L CaCO3
GW	LRG 04159	11/4/2010	Carbonate	<2	mg/L CaCO3
GW	LRG 04159	11/4/2010	Bicarbonate	300	mg/L CaCO3
GW	LRG 04159	11/4/2010	Specific Conductance	1100	µmhos/cm
GW	LRG 04159	11/4/2010	Suspended Solids	<10	mg/L
GW	GWQ-4	11/5/2010	Aluminum	<0.02	mg/L
GW	GWQ-4	11/5/2010	Arsenic	<0.001	mg/L
GW	GWQ-4	11/5/2010	Barium	0.057	mg/L
GW	GWQ-4	11/5/2010	Boron	<0.04	mg/L
GW	GWQ-4	11/5/2010	Cadmium	<0.002	mg/L
GW	GWQ-4	11/5/2010	Chloride	72	mg/L
GW	GWQ-4	11/5/2010	Chromium	<0.006	mg/L
GW	GWQ-4	11/5/2010	Cobalt	<0.006	mg/L
GW	GWQ-4	11/5/2010	Copper	0.0075	mg/L

GW	GWQ-4	11/5/2010	Cyanide	<0.01	mg/L
GW	GWQ-4	11/5/2010	Fluoride	0.73	mg/L
GW	GWQ-4	11/5/2010	Iron	0.059	mg/L
GW	GWQ-4	11/5/2010	Lead	<0.005	mg/L
GW	GWQ-4	11/5/2010	Manganese	0.029	mg/L
GW	GWQ-4	11/5/2010	Mercury	<0.0002	mg/L
GW	GWQ-4	11/5/2010	Molybdenum	<0.008	mg/L
GW	GWQ-4	11/5/2010	Nickel	<0.01	mg/L
GW	GWQ-4	11/5/2010	Nitrogen, Nitrate (As N)	1.8	mg/L
GW	GWQ-4	11/5/2010	Selenium	0.0059	mg/L
GW	GWQ-4	11/5/2010	Silver	<0.005	mg/L
GW	GWQ-4	11/5/2010	Sulfate	230	mg/L
GW	GWQ-4	11/5/2010	TDS	798	mg/L
GW	GWQ-4	11/5/2010	Uranium	0.0037	mg/L
GW	GWQ-4	11/5/2010	Zinc	0.14	mg/L
GW	GWQ-4	11/5/2010	pH	7.53	pH units
GW	GWQ-4	11/5/2010	Beryllium	<0.002	mg/L
GW	GWQ-4	11/5/2010	Calcium	120	mg/L
GW	GWQ-4	11/5/2010	Magnesium	25	mg/L
GW	GWQ-4	11/5/2010	Potassium	1.2	mg/L
GW	GWQ-4	11/5/2010	Silicon	11	mg/L
GW	GWQ-4	11/5/2010	Sodium	110	mg/L
GW	GWQ-4	11/5/2010	Vanadium	<0.05	mg/L
GW	GWQ-4	11/5/2010	Antimony	<0.001	mg/L
GW	GWQ-4	11/5/2010	Thallium	<0.001	mg/L
GW	GWQ-4	11/5/2010	Nitrogen, Nitrite (As N)	<0.1	mg/L
GW	GWQ-4	11/5/2010	Alkalinity, Total (As CaCO3)	310	mg/L CaCO3
GW	GWQ-4	11/5/2010	Carbonate	<2	mg/L CaCO3
GW	GWQ-4	11/5/2010	Bicarbonate	310	mg/L CaCO3
GW	GWQ-4	11/5/2010	Specific Conductance	1200	µmhos/cm
GW	GWQ-4	11/5/2010	Suspended Solids	11	mg/L
GW	IW-2	5/9/2011	Aluminum	<0.02	mg/L
GW	IW-2	5/9/2011	Arsenic	<0.001	mg/L
GW	IW-2	5/9/2011	Barium	0.037	mg/L
GW	IW-2	5/9/2011	Boron	0.081	mg/L
GW	IW-2	5/9/2011	Cadmium	<0.002	mg/L
GW	IW-2	5/9/2011	Chloride	520	mg/L
GW	IW-2	5/9/2011	Chromium	<0.006	mg/L
GW	IW-2	5/9/2011	Cobalt	0.017	mg/L
GW	IW-2	5/9/2011	Copper	<0.006	mg/L
GW	IW-2	5/9/2011	Cyanide	<0.01	mg/L
GW	IW-2	5/9/2011	Fluoride	0.62	mg/L
GW	IW-2	5/9/2011	Iron	0.36	mg/L
GW	IW-2	5/9/2011	Lead	<0.005	mg/L
GW	IW-2	5/9/2011	Manganese	3.6	mg/L
GW	IW-2	5/9/2011	Mercury	<0.0002	mg/L
GW	IW-2	5/9/2011	Molybdenum	0.021	mg/L
GW	IW-2	5/9/2011	Nickel	<0.01	mg/L
GW	IW-2	5/9/2011	Nitrogen, Nitrate (As N)	1.7	mg/L
GW	IW-2	5/9/2011	Selenium	0.031	mg/L
GW	IW-2	5/9/2011	Silver	<0.005	mg/L
GW	IW-2	5/9/2011	Sulfate	1100	mg/L
GW	IW-2	5/9/2011	TDS	2360	mg/L
GW	IW-2	5/9/2011	Uranium	0.0062	mg/L
GW	IW-2	5/9/2011	Zinc	0.023	mg/L
GW	IW-2	5/9/2011	pH	7.31	pH units
GW	IW-2	5/9/2011	Beryllium	<0.002	mg/L
GW	IW-2	5/9/2011	Calcium	370	mg/L
GW	IW-2	5/9/2011	Magnesium	110	mg/L
GW	IW-2	5/9/2011	Potassium	2.3	mg/L
GW	IW-2	5/9/2011	Silicon	28	mg/L
GW	IW-2	5/9/2011	Sodium	260	mg/L
GW	IW-2	5/9/2011	Vanadium	<0.05	mg/L
GW	IW-2	5/9/2011	Antimony	0.0032	mg/L
GW	IW-2	5/9/2011	Thallium	<0.001	mg/L
GW	IW-2	5/9/2011	Nitrogen, Nitrite (As N)	<2	mg/L
GW	IW-2	5/9/2011	Alkalinity, Total (As CaCO3)	240	mg/L CaCO3
GW	IW-2	5/9/2011	Carbonate	<2	mg/L CaCO3
GW	IW-2	5/9/2011	Bicarbonate	240	mg/L CaCO3
GW	IW-2	5/9/2011	Specific Conductance	3200	µmhos/cm
GW	IW-2	5/9/2011	Suspended Solids	20000	mg/L
GW	GWQ94-16	5/10/2011	Aluminum	<0.02	mg/L
GW	GWQ94-16	5/10/2011	Arsenic	0.0026	mg/L
GW	GWQ94-16	5/10/2011	Barium	0.038	mg/L
GW	GWQ94-16	5/10/2011	Boron	0.056	mg/L
GW	GWQ94-16	5/10/2011	Cadmium	<0.002	mg/L

GW	GWQ94-16	5/10/2011	Chloride	190	mg/L
GW	GWQ94-16	5/10/2011	Chromium	<0.006	mg/L
GW	GWQ94-16	5/10/2011	Cobalt	<0.006	mg/L
GW	GWQ94-16	5/10/2011	Copper	<0.006	mg/L
GW	GWQ94-16	5/10/2011	Cyanide	<0.01	mg/L
GW	GWQ94-16	5/10/2011	Fluoride	0.57	mg/L
GW	GWQ94-16	5/10/2011	Iron	<0.02	mg/L
GW	GWQ94-16	5/10/2011	Lead	<0.005	mg/L
GW	GWQ94-16	5/10/2011	Manganese	<0.002	mg/L
GW	GWQ94-16	5/10/2011	Mercury	<0.0002	mg/L
GW	GWQ94-16	5/10/2011	Molybdenum	<0.008	mg/L
GW	GWQ94-16	5/10/2011	Nickel	<0.01	mg/L
GW	GWQ94-16	5/10/2011	Nitrogen, Nitrate (As N)	4	mg/L
GW	GWQ94-16	5/10/2011	Selenium	0.012	mg/L
GW	GWQ94-16	5/10/2011	Silver	<0.005	mg/L
GW	GWQ94-16	5/10/2011	Sulfate	430	mg/L
GW	GWQ94-16	5/10/2011	TDS	1150	mg/L
GW	GWQ94-16	5/10/2011	Uranium	0.0023	mg/L
GW	GWQ94-16	5/10/2011	Zinc	0.011	mg/L
GW	GWQ94-16	5/10/2011	pH	7.58	pH units
GW	GWQ94-16	5/10/2011	Beryllium	<0.002	mg/L
GW	GWQ94-16	5/10/2011	Calcium	200	mg/L
GW	GWQ94-16	5/10/2011	Magnesium	49	mg/L
GW	GWQ94-16	5/10/2011	Potassium	3.1	mg/L
GW	GWQ94-16	5/10/2011	Silicon	22	mg/L
GW	GWQ94-16	5/10/2011	Sodium	74	mg/L
GW	GWQ94-16	5/10/2011	Vanadium	<0.05	mg/L
GW	GWQ94-16	5/10/2011	Antimony	<0.001	mg/L
GW	GWQ94-16	5/10/2011	Thallium	<0.001	mg/L
GW	GWQ94-16	5/10/2011	Nitrogen, Nitrite (As N)	<2	mg/L
GW	GWQ94-16	5/10/2011	Alkalinity, Total (As CaCO3)	180	mg/L CaCO3
GW	GWQ94-16	5/10/2011	Carbonate	<2	mg/L CaCO3
GW	GWQ94-16	5/10/2011	Bicarbonate	180	mg/L CaCO3
GW	GWQ94-16	5/10/2011	Specific Conductance	1600	µmhos/cm
GW	GWQ94-16	5/10/2011	Suspended Solids	<10	mg/L
GW	MW-11	5/10/2011	Aluminum	<0.02	mg/L
GW	MW-11	5/10/2011	Arsenic	0.0017	mg/L
GW	MW-11	5/10/2011	Barium	0.02	mg/L
GW	MW-11	5/10/2011	Boron	<0.04	mg/L
GW	MW-11	5/10/2011	Cadmium	<0.002	mg/L
GW	MW-11	5/10/2011	Chloride	15	mg/L
GW	MW-11	5/10/2011	Chromium	<0.006	mg/L
GW	MW-11	5/10/2011	Cobalt	<0.006	mg/L
GW	MW-11	5/10/2011	Copper	<0.006	mg/L
GW	MW-11	5/10/2011	Cyanide	<0.01	mg/L
GW	MW-11	5/10/2011	Fluoride	0.5	mg/L
GW	MW-11	5/10/2011	Iron	<0.02	mg/L
GW	MW-11	5/10/2011	Lead	<0.005	mg/L
GW	MW-11	5/10/2011	Manganese	<0.002	mg/L
GW	MW-11	5/10/2011	Mercury	<0.0002	mg/L
GW	MW-11	5/10/2011	Molybdenum	<0.008	mg/L
GW	MW-11	5/10/2011	Nickel	<0.01	mg/L
GW	MW-11	5/10/2011	Nitrogen, Nitrate (As N)	<0.1	mg/L
GW	MW-11	5/10/2011	Selenium	<0.001	mg/L
GW	MW-11	5/10/2011	Silver	<0.005	mg/L
GW	MW-11	5/10/2011	Sulfate	14	mg/L
GW	MW-11	5/10/2011	TDS	308	mg/L
GW	MW-11	5/10/2011	Uranium	0.0015	mg/L
GW	MW-11	5/10/2011	Zinc	<0.01	mg/L
GW	MW-11	5/10/2011	pH	7.54	pH units
GW	MW-11	5/10/2011	Beryllium	<0.002	mg/L
GW	MW-11	5/10/2011	Calcium	64	mg/L
GW	MW-11	5/10/2011	Magnesium	8.6	mg/L
GW	MW-11	5/10/2011	Potassium	1.4	mg/L
GW	MW-11	5/10/2011	Silicon	20	mg/L
GW	MW-11	5/10/2011	Sodium	23	mg/L
GW	MW-11	5/10/2011	Vanadium	<0.05	mg/L
GW	MW-11	5/10/2011	Antimony	<0.001	mg/L
GW	MW-11	5/10/2011	Thallium	<0.001	mg/L
GW	MW-11	5/10/2011	Nitrogen, Nitrite (As N)	<0.1	mg/L
GW	MW-11	5/10/2011	Alkalinity, Total (As CaCO3)	210	mg/L CaCO3
GW	MW-11	5/10/2011	Carbonate	<2	mg/L CaCO3
GW	MW-11	5/10/2011	Bicarbonate	210	mg/L CaCO3
GW	MW-11	5/10/2011	Specific Conductance	470	µmhos/cm
GW	MW-11	5/10/2011	Suspended Solids	<10	mg/L
GW	NP-5	5/10/2011	Aluminum	<0.02	mg/L

GW	NP-5	5/10/2011	Aluminum	<0.02	mg/L
GW	NP-5	5/10/2011	Arsenic	0.0018	mg/L
GW	NP-5	5/10/2011	Arsenic	0.0018	mg/L
GW	NP-5	5/10/2011	Barium	0.019	mg/L
GW	NP-5	5/10/2011	Barium	0.018	mg/L
GW	NP-5	5/10/2011	Boron	0.041	mg/L
GW	NP-5	5/10/2011	Boron	0.042	mg/L
GW	NP-5	5/10/2011	Cadmium	<0.002	mg/L
GW	NP-5	5/10/2011	Cadmium	<0.002	mg/L
GW	NP-5	5/10/2011	Chloride	80	mg/L
GW	NP-5	5/10/2011	Chloride	79	mg/L
GW	NP-5	5/10/2011	Chromium	<0.006	mg/L
GW	NP-5	5/10/2011	Chromium	<0.006	mg/L
GW	NP-5	5/10/2011	Cobalt	<0.006	mg/L
GW	NP-5	5/10/2011	Cobalt	<0.006	mg/L
GW	NP-5	5/10/2011	Copper	<0.006	mg/L
GW	NP-5	5/10/2011	Copper	<0.006	mg/L
GW	NP-5	5/10/2011	Cyanide	<0.01	mg/L
GW	NP-5	5/10/2011	Cyanide	<0.01	mg/L
GW	NP-5	5/10/2011	Fluoride	0.63	mg/L
GW	NP-5	5/10/2011	Fluoride	0.64	mg/L
GW	NP-5	5/10/2011	Iron	<0.02	mg/L
GW	NP-5	5/10/2011	Iron	<0.02	mg/L
GW	NP-5	5/10/2011	Lead	<0.005	mg/L
GW	NP-5	5/10/2011	Lead	<0.005	mg/L
GW	NP-5	5/10/2011	Manganese	<0.002	mg/L
GW	NP-5	5/10/2011	Manganese	<0.002	mg/L
GW	NP-5	5/10/2011	Mercury	<0.0002	mg/L
GW	NP-5	5/10/2011	Mercury	<0.0002	mg/L
GW	NP-5	5/10/2011	Molybdenum	<0.008	mg/L
GW	NP-5	5/10/2011	Molybdenum	<0.008	mg/L
GW	NP-5	5/10/2011	Nickel	<0.01	mg/L
GW	NP-5	5/10/2011	Nickel	<0.01	mg/L
GW	NP-5	5/10/2011	Nitrogen, Nitrate (As N)	4.1	mg/L
GW	NP-5	5/10/2011	Nitrogen, Nitrate (As N)	4.1	mg/L
GW	NP-5	5/10/2011	Selenium	0.0076	mg/L
GW	NP-5	5/10/2011	Selenium	0.0073	mg/L
GW	NP-5	5/10/2011	Silver	<0.005	mg/L
GW	NP-5	5/10/2011	Silver	<0.005	mg/L
GW	NP-5	5/10/2011	Sulfate	180	mg/L
GW	NP-5	5/10/2011	Sulfate	180	mg/L
GW	NP-5	5/10/2011	TDS	636	mg/L
GW	NP-5	5/10/2011	TDS	633	mg/L
GW	NP-5	5/10/2011	Uranium	0.0013	mg/L
GW	NP-5	5/10/2011	Uranium	0.0013	mg/L
GW	NP-5	5/10/2011	Zinc	0.25	mg/L
GW	NP-5	5/10/2011	Zinc	0.26	mg/L
GW	NP-5	5/10/2011	pH	7.76	pH units
GW	NP-5	5/10/2011	pH	7.81	pH units
GW	NP-5	5/10/2011	Beryllium	<0.002	mg/L
GW	NP-5	5/10/2011	Calcium	99	mg/L
GW	NP-5	5/10/2011	Magnesium	31	mg/L
GW	NP-5	5/10/2011	Potassium	2.9	mg/L
GW	NP-5	5/10/2011	Silicon	20	mg/L
GW	NP-5	5/10/2011	Sodium	43	mg/L
GW	NP-5	5/10/2011	Vanadium	<0.05	mg/L
GW	NP-5	5/10/2011	Antimony	<0.001	mg/L
GW	NP-5	5/10/2011	Thallium	<0.001	mg/L
GW	NP-5	5/10/2011	Nitrogen, Nitrite (As N)	<0.1	mg/L
GW	NP-5	5/10/2011	Alkalinity, Total (As CaCO3)	160	mg/L CaCO3
GW	NP-5	5/10/2011	Carbonate	<2	mg/L CaCO3
GW	NP-5	5/10/2011	Bicarbonate	160	mg/L CaCO3
GW	NP-5	5/10/2011	Specific Conductance	940	µmhos/cm
GW	NP-5	5/10/2011	Suspended Solids	130	mg/L
GW	NP-5	5/10/2011	Beryllium	<0.002	mg/L
GW	NP-5	5/10/2011	Calcium	100	mg/L
GW	NP-5	5/10/2011	Magnesium	32	mg/L
GW	NP-5	5/10/2011	Potassium	2.9	mg/L
GW	NP-5	5/10/2011	Silicon	20	mg/L
GW	NP-5	5/10/2011	Sodium	45	mg/L
GW	NP-5	5/10/2011	Vanadium	<0.05	mg/L
GW	NP-5	5/10/2011	Antimony	<0.001	mg/L
GW	NP-5	5/10/2011	Thallium	<0.001	mg/L
GW	NP-5	5/10/2011	Nitrogen, Nitrite (As N)	<0.1	mg/L
GW	NP-5	5/10/2011	Alkalinity, Total (As CaCO3)	160	mg/L CaCO3
GW	NP-5	5/10/2011	Carbonate	<2	mg/L CaCO3

GW	NP-5	5/10/2011	Bicarbonate	160	mg/L CaCO3
GW	NP-5	5/10/2011	Specific Conductance	930	µmhos/cm
GW	NP-5	5/10/2011	Suspended Solids	47	mg/L
GW	GWQ94-13	5/11/2011	Aluminum	<0.02	mg/L
GW	GWQ94-13	5/11/2011	Arsenic	0.0038	mg/L
GW	GWQ94-13	5/11/2011	Barium	0.037	mg/L
GW	GWQ94-13	5/11/2011	Boron	<0.04	mg/L
GW	GWQ94-13	5/11/2011	Cadmium	<0.002	mg/L
GW	GWQ94-13	5/11/2011	Chloride	290	mg/L
GW	GWQ94-13	5/11/2011	Chromium	<0.006	mg/L
GW	GWQ94-13	5/11/2011	Cobalt	<0.006	mg/L
GW	GWQ94-13	5/11/2011	Copper	<0.006	mg/L
GW	GWQ94-13	5/11/2011	Cyanide	<0.005	mg/L
GW	GWQ94-13	5/11/2011	Fluoride	0.33	mg/L
GW	GWQ94-13	5/11/2011	Iron	<0.02	mg/L
GW	GWQ94-13	5/11/2011	Lead	<0.005	mg/L
GW	GWQ94-13	5/11/2011	Manganese	<0.002	mg/L
GW	GWQ94-13	5/11/2011	Mercury	<0.0002	mg/L
GW	GWQ94-13	5/11/2011	Molybdenum	<0.008	mg/L
GW	GWQ94-13	5/11/2011	Nickel	<0.01	mg/L
GW	GWQ94-13	5/11/2011	Selenium	0.028	mg/L
GW	GWQ94-13	5/11/2011	Silver	<0.005	mg/L
GW	GWQ94-13	5/11/2011	Sulfate	800	mg/L
GW	GWQ94-13	5/11/2011	TDS	1670	mg/L
GW	GWQ94-13	5/11/2011	Uranium	0.0017	mg/L
GW	GWQ94-13	5/11/2011	Zinc	0.037	mg/L
GW	GWQ94-13	5/11/2011	pH	7.66	pH units
GW	GWQ94-13	5/11/2011	Beryllium	<0.002	mg/L
GW	GWQ94-13	5/11/2011	Calcium	310	mg/L
GW	GWQ94-13	5/11/2011	Magnesium	61	mg/L
GW	GWQ94-13	5/11/2011	Potassium	3.3	mg/L
GW	GWQ94-13	5/11/2011	Silicon	16	mg/L
GW	GWQ94-13	5/11/2011	Sodium	120	mg/L
GW	GWQ94-13	5/11/2011	Vanadium	<0.05	mg/L
GW	GWQ94-13	5/11/2011	Antimony	<0.001	mg/L
GW	GWQ94-13	5/11/2011	Thallium	<0.001	mg/L
GW	GWQ94-13	5/11/2011	Nitrate (As N)+Nitrite (As N)	6.5	mg/L
GW	GWQ94-13	5/11/2011	Alkalinity, Total (As CaCO3)	130	mg/L CaCO3
GW	GWQ94-13	5/11/2011	Carbonate	<2	mg/L CaCO3
GW	GWQ94-13	5/11/2011	Bicarbonate	130	mg/L CaCO3
GW	GWQ94-13	5/11/2011	Specific Conductance	2100	µmhos/cm
GW	GWQ94-13	5/11/2011	Suspended Solids	<10	mg/L
GW	MW-9	5/11/2011	Aluminum	<0.02	mg/L
GW	MW-9	5/11/2011	Arsenic	0.0041	mg/L
GW	MW-9	5/11/2011	Barium	0.002	mg/L
GW	MW-9	5/11/2011	Boron	0.048	mg/L
GW	MW-9	5/11/2011	Cadmium	<0.002	mg/L
GW	MW-9	5/11/2011	Chloride	13	mg/L
GW	MW-9	5/11/2011	Chromium	<0.006	mg/L
GW	MW-9	5/11/2011	Cobalt	<0.006	mg/L
GW	MW-9	5/11/2011	Copper	<0.006	mg/L
GW	MW-9	5/11/2011	Cyanide	<0.005	mg/L
GW	MW-9	5/11/2011	Fluoride	1.3	mg/L
GW	MW-9	5/11/2011	Iron	<0.02	mg/L
GW	MW-9	5/11/2011	Lead	<0.005	mg/L
GW	MW-9	5/11/2011	Manganese	<0.002	mg/L
GW	MW-9	5/11/2011	Mercury	<0.0002	mg/L
GW	MW-9	5/11/2011	Molybdenum	<0.008	mg/L
GW	MW-9	5/11/2011	Nickel	<0.01	mg/L
GW	MW-9	5/11/2011	Selenium	<0.001	mg/L
GW	MW-9	5/11/2011	Silver	<0.005	mg/L
GW	MW-9	5/11/2011	Sulfate	12	mg/L
GW	MW-9	5/11/2011	TDS	206	mg/L
GW	MW-9	5/11/2011	Uranium	0.0013	mg/L
GW	MW-9	5/11/2011	Zinc	0.048	mg/L
GW	MW-9	5/11/2011	pH	8.38	pH units
GW	MW-9	5/11/2011	Beryllium	<0.002	mg/L
GW	MW-9	5/11/2011	Calcium	12	mg/L
GW	MW-9	5/11/2011	Magnesium	1.2	mg/L
GW	MW-9	5/11/2011	Potassium	2.1	mg/L
GW	MW-9	5/11/2011	Silicon	15	mg/L
GW	MW-9	5/11/2011	Sodium	55	mg/L
GW	MW-9	5/11/2011	Vanadium	<0.05	mg/L
GW	MW-9	5/11/2011	Antimony	<0.001	mg/L
GW	MW-9	5/11/2011	Thallium	<0.001	mg/L
GW	MW-9	5/11/2011	Nitrate (As N)+Nitrite (As N)	2.1	mg/L

GW	MW-9	5/11/2011	Alkalinity, Total (As CaCO3)	120	mg/L CaCO3
GW	MW-9	5/11/2011	Carbonate	<2	mg/L CaCO3
GW	MW-9	5/11/2011	Bicarbonate	110	mg/L CaCO3
GW	MW-9	5/11/2011	Specific Conductance	300	µmhos/cm
GW	MW-9	5/11/2011	Suspended Solids	<10	mg/L
GW	NP-3	5/11/2011	Aluminum	<0.02	mg/L
GW	NP-3	5/11/2011	Arsenic	0.0029	mg/L
GW	NP-3	5/11/2011	Barium	0.032	mg/L
GW	NP-3	5/11/2011	Boron	<0.04	mg/L
GW	NP-3	5/11/2011	Cadmium	<0.002	mg/L
GW	NP-3	5/11/2011	Chloride	270	mg/L
GW	NP-3	5/11/2011	Chromium	<0.006	mg/L
GW	NP-3	5/11/2011	Cobalt	<0.006	mg/L
GW	NP-3	5/11/2011	Copper	<0.006	mg/L
GW	NP-3	5/11/2011	Cyanide	<0.005	mg/L
GW	NP-3	5/11/2011	Fluoride	0.34	mg/L
GW	NP-3	5/11/2011	Iron	0.039	mg/L
GW	NP-3	5/11/2011	Lead	<0.005	mg/L
GW	NP-3	5/11/2011	Manganese	0.022	mg/L
GW	NP-3	5/11/2011	Mercury	<0.0002	mg/L
GW	NP-3	5/11/2011	Molybdenum	<0.008	mg/L
GW	NP-3	5/11/2011	Nickel	<0.01	mg/L
GW	NP-3	5/11/2011	Selenium	0.027	mg/L
GW	NP-3	5/11/2011	Silver	<0.005	mg/L
GW	NP-3	5/11/2011	Sulfate	790	mg/L
GW	NP-3	5/11/2011	TDS	1640	mg/L
GW	NP-3	5/11/2011	Uranium	0.0015	mg/L
GW	NP-3	5/11/2011	Zinc	0.24	mg/L
GW	NP-3	5/11/2011	pH	7.69	pH units
GW	NP-3	5/11/2011	Beryllium	<0.002	mg/L
GW	NP-3	5/11/2011	Calcium	300	mg/L
GW	NP-3	5/11/2011	Magnesium	57	mg/L
GW	NP-3	5/11/2011	Potassium	3.3	mg/L
GW	NP-3	5/11/2011	Silicon	15	mg/L
GW	NP-3	5/11/2011	Sodium	120	mg/L
GW	NP-3	5/11/2011	Vanadium	<0.05	mg/L
GW	NP-3	5/11/2011	Antimony	<0.001	mg/L
GW	NP-3	5/11/2011	Thallium	<0.001	mg/L
GW	NP-3	5/11/2011	Nitrate (As N)+Nitrite (As N)	6.2	mg/L
GW	NP-3	5/11/2011	Alkalinity, Total (As CaCO3)	130	mg/L CaCO3
GW	NP-3	5/11/2011	Carbonate	<2	mg/L CaCO3
GW	NP-3	5/11/2011	Bicarbonate	130	mg/L CaCO3
GW	NP-3	5/11/2011	Specific Conductance	2100	µmhos/cm
GW	NP-3	5/11/2011	Suspended Solids	400	mg/L
GW	GWQ96-23A	5/12/2011	Aluminum	<0.02	mg/L
GW	GWQ96-23A	5/12/2011	Arsenic	<0.001	mg/L
GW	GWQ96-23A	5/12/2011	Barium	0.078	mg/L
GW	GWQ96-23A	5/12/2011	Boron	0.071	mg/L
GW	GWQ96-23A	5/12/2011	Cadmium	<0.002	mg/L
GW	GWQ96-23A	5/12/2011	Chloride	13	mg/L
GW	GWQ96-23A	5/12/2011	Chromium	<0.006	mg/L
GW	GWQ96-23A	5/12/2011	Cobalt	<0.006	mg/L
GW	GWQ96-23A	5/12/2011	Copper	<0.006	mg/L
GW	GWQ96-23A	5/12/2011	Cyanide	<0.005	mg/L
GW	GWQ96-23A	5/12/2011	Fluoride	1.7	mg/L
GW	GWQ96-23A	5/12/2011	Iron	0.043	mg/L
GW	GWQ96-23A	5/12/2011	Lead	<0.005	mg/L
GW	GWQ96-23A	5/12/2011	Manganese	0.29	mg/L
GW	GWQ96-23A	5/12/2011	Mercury	<0.0002	mg/L
GW	GWQ96-23A	5/12/2011	Molybdenum	<0.008	mg/L
GW	GWQ96-23A	5/12/2011	Nickel	<0.01	mg/L
GW	GWQ96-23A	5/12/2011	Nitrogen, Nitrate (As N)	<0.1	mg/L
GW	GWQ96-23A	5/12/2011	Selenium	0.0012	mg/L
GW	GWQ96-23A	5/12/2011	Silver	<0.005	mg/L
GW	GWQ96-23A	5/12/2011	Sulfate	74	mg/L
GW	GWQ96-23A	5/12/2011	TDS	752	mg/L
GW	GWQ96-23A	5/12/2011	Uranium	0.003	mg/L
GW	GWQ96-23A	5/12/2011	Zinc	0.02	mg/L
GW	GWQ96-23A	5/12/2011	pH	8.16	pH units
GW	GWQ96-23A	5/12/2011	Beryllium	<0.002	mg/L
GW	GWQ96-23A	5/12/2011	Calcium	150	mg/L
GW	GWQ96-23A	5/12/2011	Magnesium	42	mg/L
GW	GWQ96-23A	5/12/2011	Potassium	1.3	mg/L
GW	GWQ96-23A	5/12/2011	Silicon	14	mg/L
GW	GWQ96-23A	5/12/2011	Sodium	78	mg/L
GW	GWQ96-23A	5/12/2011	Vanadium	<0.05	mg/L

GW	GWQ96-23A	5/12/2011	Antimony	<0.001	mg/L
GW	GWQ96-23A	5/12/2011	Thallium	<0.001	mg/L
GW	GWQ96-23A	5/12/2011	Nitrogen, Nitrite (As N)	<0.1	mg/L
GW	GWQ96-23A	5/12/2011	Alkalinity, Total (As CaCO3)	600	mg/L CaCO3
GW	GWQ96-23A	5/12/2011	Carbonate	<2	mg/L CaCO3
GW	GWQ96-23A	5/12/2011	Bicarbonate	600	mg/L CaCO3
GW	GWQ96-23A	5/12/2011	Specific Conductance	1100	µmhos/cm
GW	GWQ96-23A	5/12/2011	Suspended Solids	<10	mg/L
GW	GWQ96-23B	5/12/2011	Aluminum	<0.02	mg/L
GW	GWQ96-23B	5/12/2011	Arsenic	<0.001	mg/L
GW	GWQ96-23B	5/12/2011	Barium	0.11	mg/L
GW	GWQ96-23B	5/12/2011	Boron	0.14	mg/L
GW	GWQ96-23B	5/12/2011	Cadmium	<0.002	mg/L
GW	GWQ96-23B	5/12/2011	Chloride	17	mg/L
GW	GWQ96-23B	5/12/2011	Chromium	<0.006	mg/L
GW	GWQ96-23B	5/12/2011	Cobalt	<0.006	mg/L
GW	GWQ96-23B	5/12/2011	Copper	<0.006	mg/L
GW	GWQ96-23B	5/12/2011	Cyanide	<0.005	mg/L
GW	GWQ96-23B	5/12/2011	Fluoride	2.1	mg/L
GW	GWQ96-23B	5/12/2011	Iron	0.93	mg/L
GW	GWQ96-23B	5/12/2011	Lead	<0.005	mg/L
GW	GWQ96-23B	5/12/2011	Manganese	0.34	mg/L
GW	GWQ96-23B	5/12/2011	Mercury	<0.0002	mg/L
GW	GWQ96-23B	5/12/2011	Molybdenum	<0.008	mg/L
GW	GWQ96-23B	5/12/2011	Nickel	<0.01	mg/L
GW	GWQ96-23B	5/12/2011	Nitrogen, Nitrate (As N)	<0.1	mg/L
GW	GWQ96-23B	5/12/2011	Selenium	0.0014	mg/L
GW	GWQ96-23B	5/12/2011	Silver	<0.005	mg/L
GW	GWQ96-23B	5/12/2011	Sulfate	<0.5	mg/L
GW	GWQ96-23B	5/12/2011	TDS	556	mg/L
GW	GWQ96-23B	5/12/2011	Uranium	<0.001	mg/L
GW	GWQ96-23B	5/12/2011	Zinc	0.074	mg/L
GW	GWQ96-23B	5/12/2011	pH	7.99	pH units
GW	GWQ96-23B	5/12/2011	Beryllium	<0.002	mg/L
GW	GWQ96-23B	5/12/2011	Calcium	81	mg/L
GW	GWQ96-23B	5/12/2011	Magnesium	22	mg/L
GW	GWQ96-23B	5/12/2011	Potassium	1.7	mg/L
GW	GWQ96-23B	5/12/2011	Silicon	12	mg/L
GW	GWQ96-23B	5/12/2011	Sodium	110	mg/L
GW	GWQ96-23B	5/12/2011	Vanadium	<0.05	mg/L
GW	GWQ96-23B	5/12/2011	Antimony	<0.001	mg/L
GW	GWQ96-23B	5/12/2011	Thallium	<0.001	mg/L
GW	GWQ96-23B	5/12/2011	Nitrogen, Nitrite (As N)	<0.1	mg/L
GW	GWQ96-23B	5/12/2011	Alkalinity, Total (As CaCO3)	490	mg/L CaCO3
GW	GWQ96-23B	5/12/2011	Carbonate	<2	mg/L CaCO3
GW	GWQ96-23B	5/12/2011	Bicarbonate	490	mg/L CaCO3
GW	GWQ96-23B	5/12/2011	Specific Conductance	890	µmhos/cm
GW	GWQ96-23B	5/12/2011	Suspended Solids	24	mg/L
GW	GWQ94-14	5/13/2011	Aluminum	<0.02	mg/L
GW	GWQ94-14	5/13/2011	Arsenic	0.0028	mg/L
GW	GWQ94-14	5/13/2011	Barium	0.045	mg/L
GW	GWQ94-14	5/13/2011	Boron	<0.04	mg/L
GW	GWQ94-14	5/13/2011	Cadmium	<0.002	mg/L
GW	GWQ94-14	5/13/2011	Chloride	48	mg/L
GW	GWQ94-14	5/13/2011	Chromium	<0.006	mg/L
GW	GWQ94-14	5/13/2011	Cobalt	<0.006	mg/L
GW	GWQ94-14	5/13/2011	Copper	<0.006	mg/L
GW	GWQ94-14	5/13/2011	Cyanide	0.012	mg/L
GW	GWQ94-14	5/13/2011	Fluoride	0.55	mg/L
GW	GWQ94-14	5/13/2011	Iron	<0.02	mg/L
GW	GWQ94-14	5/13/2011	Lead	<0.005	mg/L
GW	GWQ94-14	5/13/2011	Manganese	<0.002	mg/L
GW	GWQ94-14	5/13/2011	Mercury	<0.0002	mg/L
GW	GWQ94-14	5/13/2011	Molybdenum	<0.008	mg/L
GW	GWQ94-14	5/13/2011	Nickel	<0.01	mg/L
GW	GWQ94-14	5/13/2011	Nitrogen, Nitrate (As N)	2.2	mg/L
GW	GWQ94-14	5/13/2011	Selenium	0.0061	mg/L
GW	GWQ94-14	5/13/2011	Silver	<0.005	mg/L
GW	GWQ94-14	5/13/2011	Sulfate	150	mg/L
GW	GWQ94-14	5/13/2011	TDS	570	mg/L
GW	GWQ94-14	5/13/2011	Uranium	0.0015	mg/L
GW	GWQ94-14	5/13/2011	Zinc	0.052	mg/L
GW	GWQ94-14	5/13/2011	pH	7.84	pH units
GW	GWQ94-14	5/13/2011	Beryllium	<0.002	mg/L
GW	GWQ94-14	5/13/2011	Calcium	97	mg/L
GW	GWQ94-14	5/13/2011	Magnesium	27	mg/L

GW	GWQ94-14	5/13/2011	Potassium	1.8	mg/L
GW	GWQ94-14	5/13/2011	Silicon	18	mg/L
GW	GWQ94-14	5/13/2011	Sodium	49	mg/L
GW	GWQ94-14	5/13/2011	Vanadium	<0.05	mg/L
GW	GWQ94-14	5/13/2011	Antimony	<0.001	mg/L
GW	GWQ94-14	5/13/2011	Thallium	<0.001	mg/L
GW	GWQ94-14	5/13/2011	Nitrogen, Nitrite (As N)	<0.1	mg/L
GW	GWQ94-14	5/13/2011	Alkalinity, Total (As CaCO3)	210	mg/L CaCO3
GW	GWQ94-14	5/13/2011	Carbonate	<2	mg/L CaCO3
GW	GWQ94-14	5/13/2011	Bicarbonate	210	mg/L CaCO3
GW	GWQ94-14	5/13/2011	Specific Conductance	840	µmhos/cm
GW	GWQ94-14	5/13/2011	Suspended Solids	<10	mg/L
GW	GWQ94-15	5/13/2011	Aluminum	<0.02	mg/L
GW	GWQ94-15	5/13/2011	Arsenic	0.0036	mg/L
GW	GWQ94-15	5/13/2011	Barium	0.056	mg/L
GW	GWQ94-15	5/13/2011	Boron	<0.04	mg/L
GW	GWQ94-15	5/13/2011	Cadmium	<0.002	mg/L
GW	GWQ94-15	5/13/2011	Chloride	120	mg/L
GW	GWQ94-15	5/13/2011	Chromium	<0.006	mg/L
GW	GWQ94-15	5/13/2011	Cobalt	<0.006	mg/L
GW	GWQ94-15	5/13/2011	Copper	<0.006	mg/L
GW	GWQ94-15	5/13/2011	Cyanide	<0.005	mg/L
GW	GWQ94-15	5/13/2011	Fluoride	0.43	mg/L
GW	GWQ94-15	5/13/2011	Iron	<0.02	mg/L
GW	GWQ94-15	5/13/2011	Lead	<0.005	mg/L
GW	GWQ94-15	5/13/2011	Manganese	<0.002	mg/L
GW	GWQ94-15	5/13/2011	Mercury	<0.0002	mg/L
GW	GWQ94-15	5/13/2011	Molybdenum	<0.008	mg/L
GW	GWQ94-15	5/13/2011	Nickel	<0.01	mg/L
GW	GWQ94-15	5/13/2011	Nitrogen, Nitrate (As N)	2.8	mg/L
GW	GWQ94-15	5/13/2011	Selenium	0.012	mg/L
GW	GWQ94-15	5/13/2011	Silver	<0.005	mg/L
GW	GWQ94-15	5/13/2011	Sulfate	270	mg/L
GW	GWQ94-15	5/13/2011	TDS	808	mg/L
GW	GWQ94-15	5/13/2011	Uranium	0.0018	mg/L
GW	GWQ94-15	5/13/2011	Zinc	<0.01	mg/L
GW	GWQ94-15	5/13/2011	pH	7.74	pH units
GW	GWQ94-15	5/13/2011	Beryllium	<0.002	mg/L
GW	GWQ94-15	5/13/2011	Calcium	130	mg/L
GW	GWQ94-15	5/13/2011	Magnesium	38	mg/L
GW	GWQ94-15	5/13/2011	Potassium	2.3	mg/L
GW	GWQ94-15	5/13/2011	Silicon	16	mg/L
GW	GWQ94-15	5/13/2011	Sodium	68	mg/L
GW	GWQ94-15	5/13/2011	Vanadium	<0.05	mg/L
GW	GWQ94-15	5/13/2011	Antimony	<0.001	mg/L
GW	GWQ94-15	5/13/2011	Thallium	<0.001	mg/L
GW	GWQ94-15	5/13/2011	Nitrogen, Nitrite (As N)	<2	mg/L
GW	GWQ94-15	5/13/2011	Alkalinity, Total (As CaCO3)	190	mg/L CaCO3
GW	GWQ94-15	5/13/2011	Carbonate	<2	mg/L CaCO3
GW	GWQ94-15	5/13/2011	Bicarbonate	190	mg/L CaCO3
GW	GWQ94-15	5/13/2011	Specific Conductance	1200	µmhos/cm
GW	GWQ94-15	5/13/2011	Suspended Solids	<10	mg/L

APPENDIX F

JSAI CALIBRATION REPORT

APPENDIX F: JSAI CALIBRATION REPORT

MODEL OF GROUNDWATER FLOW IN THE ANIMAS UPLIFT AND PALOMAS BASIN, COPPER FLAT PROJECT, SIERRA COUNTY, NEW MEXICO

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August 15, 2014

MODEL OF GROUNDWATER FLOW IN THE ANIMAS UPLIFT AND PALOMAS BASIN, COPPER FLAT PROJECT, SIERRA COUNTY, NEW MEXICO

EXECUTIVE SUMMARY

This report documents a numerical model of groundwater flow in and around Copper Flat, near Hillsboro, New Mexico. The model was developed and calibrated based on previously available information and on new studies of the system. The calibrated model will be used to project the effects, to groundwater and surface water, of the proposed development of the Copper Flat Mine.

The report first introduces the study area then summarizes the climate and meteorology, hydrology and water balance, and geology and hydrogeology of the area. Then an overall conceptual model of the hydrological and hydrogeological system is presented, followed by a presentation of data available to confirm and calibrate the model. Next the numerical model is presented, including model structure, inputs and calibration. Finally, the sensitivity of model results to unknown parameters is evaluated.

Extensive information on the system is available, from previous studies and previous mine operations, and from new studies including the 2012 extended well field pumping test. The model accurately represents the conceptual model and accurately reproduces the calibration data, particularly the results of the 2012 well field pumping test. As a result the model is considered suitable for use in projecting the effects of future well field pumping.

The calibrated model will be used to generate projections related to the results and effects of mine development. Projections will be generated as required and reported separately. Results of interest include the following:

- Groundwater drawdown due to water-supply pumping, for selected mine development scenarios
- Effects on surface discharge to the Las Animas Creek and Rio Grande systems
- Long-term post-mining residual groundwater drawdown and effects to surface discharge
- Potential ground subsidence due to groundwater drawdown
- Open pit dewatering rates and groundwater drawdown in bedrock
- Post-mining open-pit water level and water balance
- Down-gradient migration of potential leakage from tailings and waste rock storage facilities

The large amount of information has allowed development of a model that can reliably project effects of future development. In particular, aquifer properties around the well field are relatively known, and sensitivity of the primary model projection results, groundwater drawdown and surface discharge changes due to well field pumping, to plausible variation in model inputs, is low.

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MODEL OF GROUNDWATER FLOW
IN THE ANIMAS UPLIFT AND PALOMAS BASIN,
COPPER FLAT PROJECT, SIERRA COUNTY, NEW MEXICO

1.0 INTRODUCTION

The report presents a numerical model of the hydrogeological system in the area of the Copper Flat Project (Project) near Truth or Consequences, New Mexico. The Project location is shown on Figure 1.1.

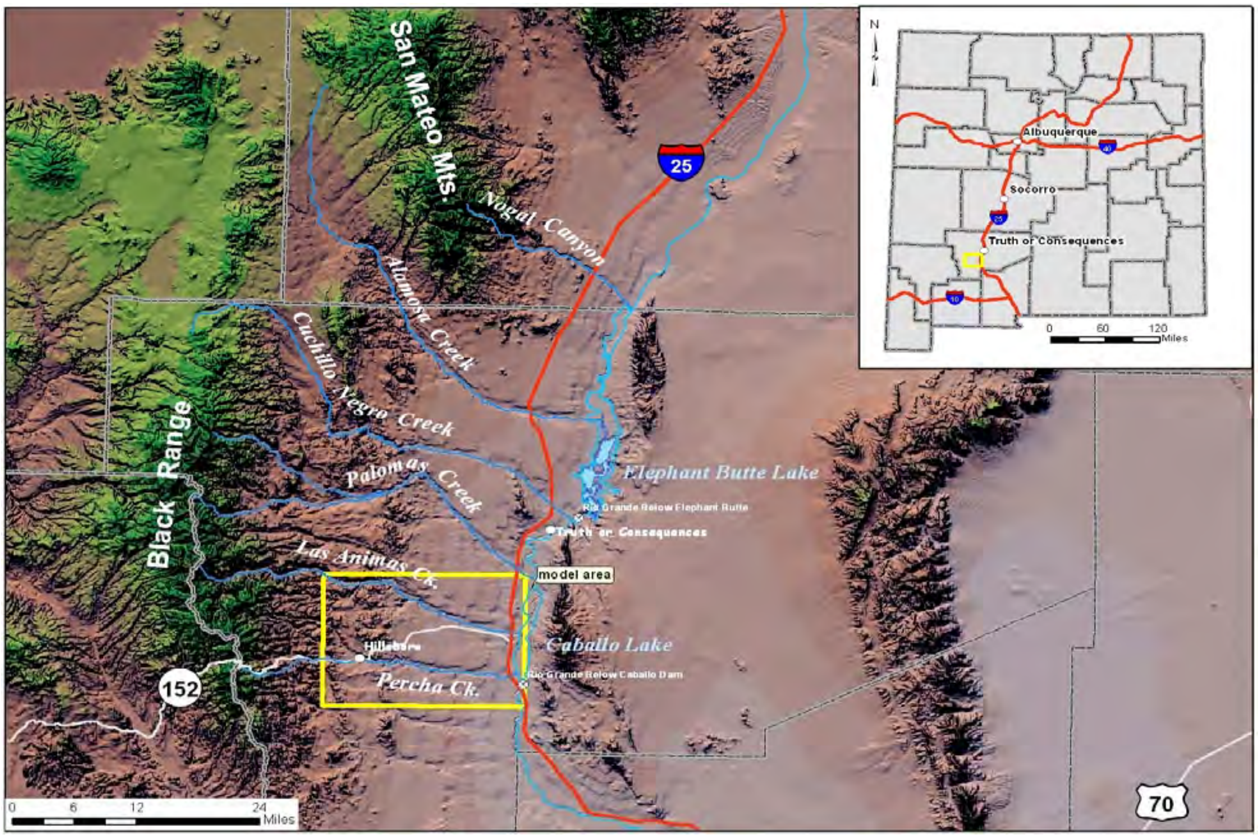


Figure 1.1. Copper Flat Project location.

The report first summarizes the climate and meteorology of the study area, then summarizes the hydrology and estimates a basin water balance. Then the geological and hydrogeological framework is presented. These are used to formulate and present a conceptual model of the system. Then the data available for model calibration are presented, followed by the details of the numerical model and results of the model calibration. Finally, sensitivity of model results to unknown parameters is evaluated. Model projections of the effects of the proposed mining project are reported separately.

2.0 CLIMATE AND METEOROLOGY

Precipitation and evaporation in the study area are examined using data from regional meteorological stations. The station at Hillsboro, New Mexico, has a long record (with at least partial data from 1893), is located nearby (about 4 miles from the Copper Flat open pit), and is at a similar elevation (5,270 ft above mean sea level (amsl)) as the Copper Flat Mine site. Locations of the Hillsboro station and other meteorological stations along the east side of the Black Range are shown on Figure 2.1.

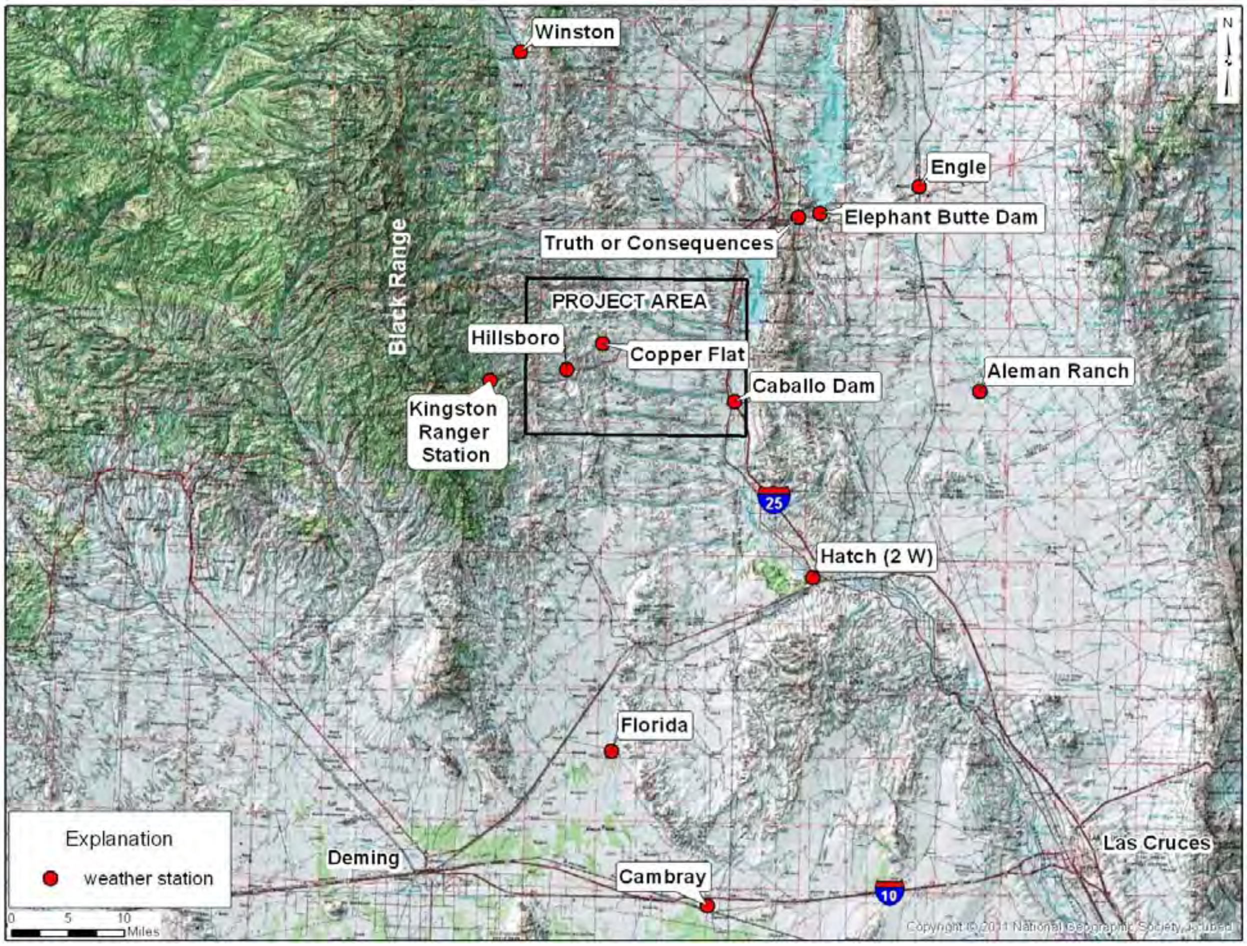


Figure 2.1. Locations of meteorological stations surrounding the Project area.

2.1 Annual Precipitation

The range of variability between wet and dry climatic conditions is seen in the annual precipitation recorded at Hillsboro from 1925 through 2010, shown on Figure 2.2. Annual precipitation ranges from less than 5 to more than 20 inches per year (in./yr) and averages about 12.5 in. Copper Flat weather station recorded 7.7 in. of precipitation in 2011, and 3.8 in. in 2012, signifying drought conditions during this period.

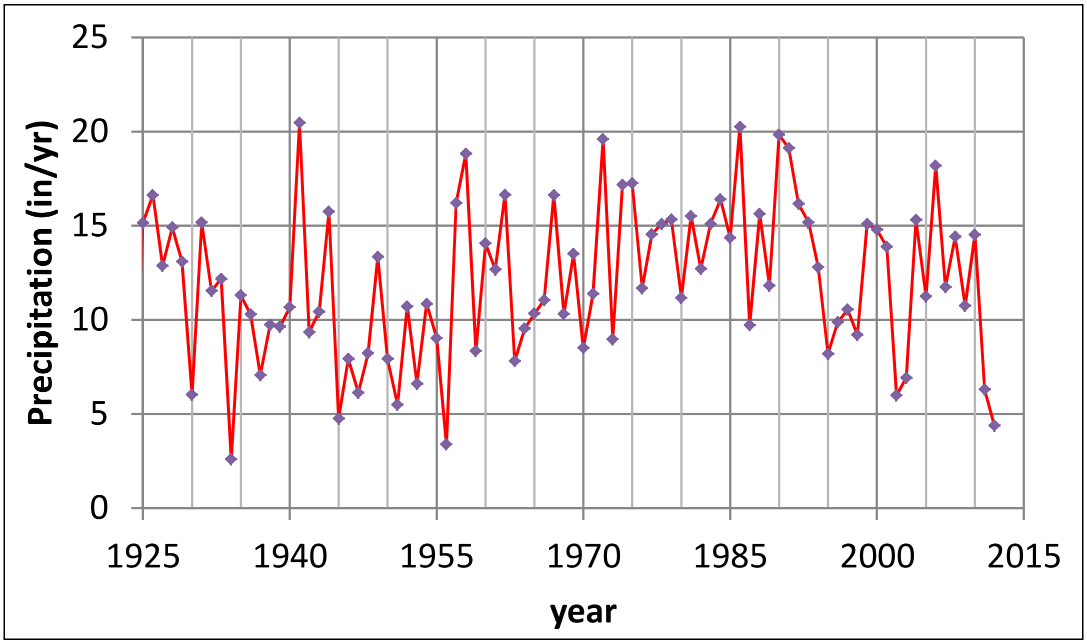


Figure 2.2. Recorded annual precipitation at Hillsboro meteorological station.

2.2 Precipitation Events

The frequency and magnitude of precipitation events are examined in the statistical distribution of daily precipitation at Hillsboro, shown on Figure 2.3. Daily precipitation of 1 in. or more occurs, on average, twice per year. Storm events of magnitude 2 in. can be expected to occur every 4 years, and the 100-year storm event is about 3.5 in.

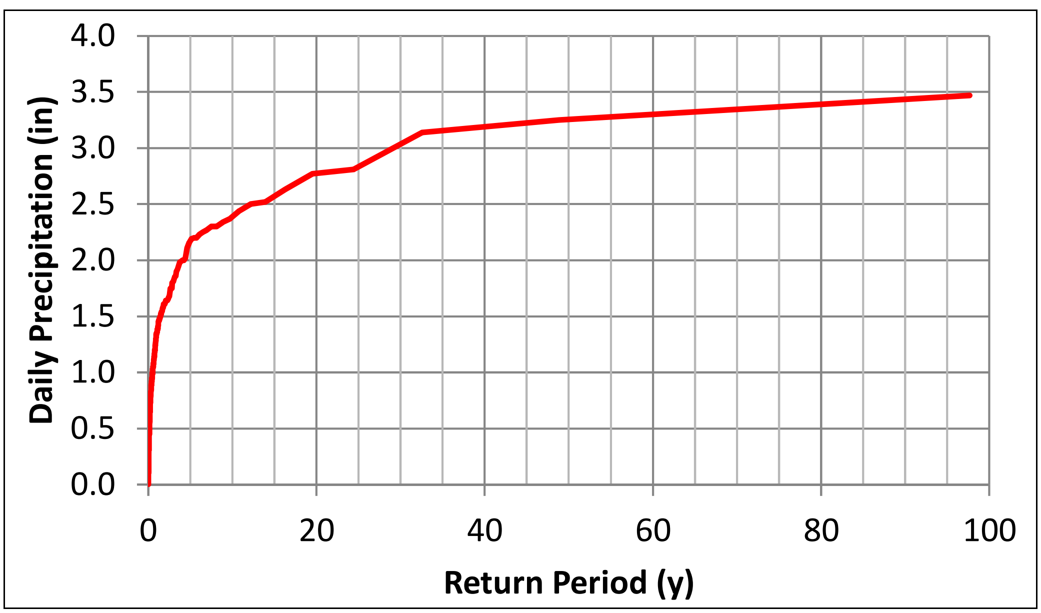


Figure 2.3. Distribution of daily precipitation at Hillsboro meteorological station.

2.3 Precipitation and Elevation

Precipitation is known to increase with elevation, and the bulk of surface-water runoff and groundwater recharge in the study area is generated by precipitation on the higher elevations of the Percha Creek and Las Animas Creek watersheds.

Mean annual precipitation was compared to elevation for other meteorological stations east of the Black Range as shown on Figure 2.4. The best-fit linear relationship estimates about 8.6 in./yr mean annual precipitation at elevation 4,000 ft amsl, and about 26.2 in./yr at elevation 10,000 ft amsl, approximately the maximum in the study area.

Given the large spatial and temporal variability of annual precipitation, the trend line shown on Figure 2.4 does not characterize precipitation patterns in any detail. It does however give realistic average precipitation rates for the study area that increase with elevation. The average annual precipitation trend shown on Figure 2.4 is used below to compute a realistic upper bound for basin water yield (water yield is a portion of total precipitation over the basin).

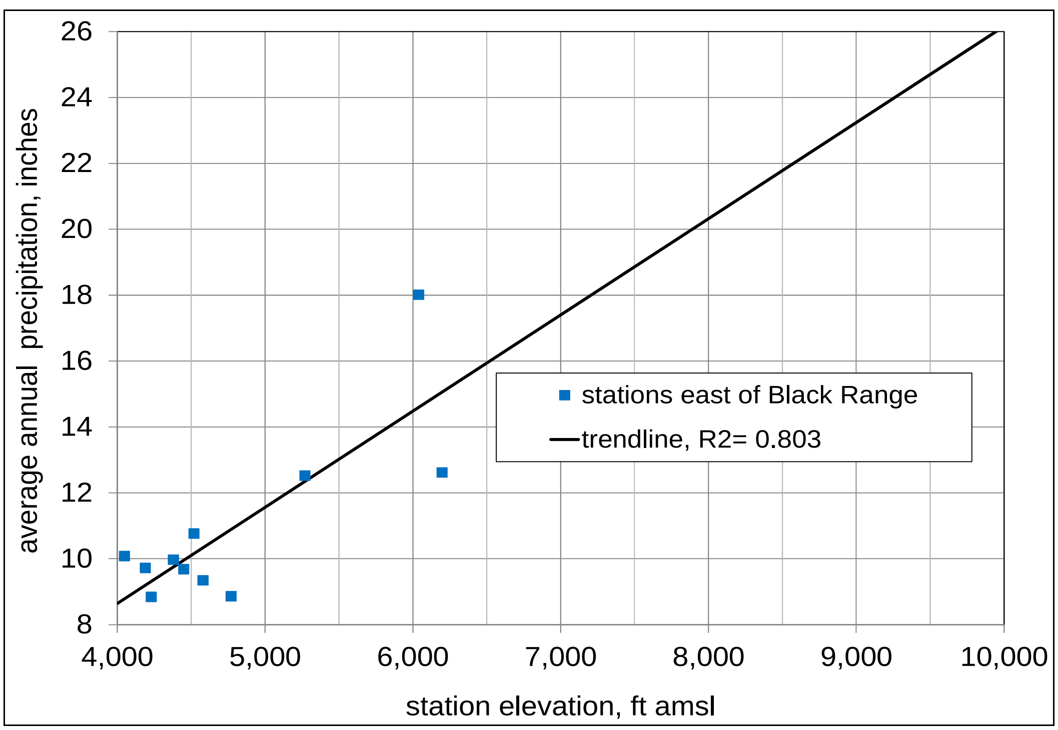


Figure 2.4. Mean annual precipitation versus elevation of meteorological station.

2.4 Evaporation and Transpiration

Most precipitation evaporates where it falls, or is consumed (transpired) by nearby vegetation. Of the remaining precipitation, most eventually discharges down-gradient as evapotranspiration (ET) from vegetated areas and open water surfaces.

Potential ET, or the maximum evaporation and plant transpiration that can occur given full availability of water, is a function of geographical and climatic conditions and is commonly estimated using the Penman-Monteith equations (Monteith, 1965). These relate maximum ET (ET_0) to meteorological parameters including temperature, relative humidity and wind speed, and to geographical parameters (altitude, latitude and time of year).

Annual ET_0 computed from results at Hillsboro meteorological station (incomplete weather data for 1997 and 1998 filled in with data from comparable years) is shown on Figure 2.5 to be about 60 in./yr. This compares well to previous estimates (SRK, 1997) of 65 in./yr of potential evaporation, and 64.6 in./yr estimated as 74 percent (an accepted conversion factor for the region (NOAA, 1982) between pan evaporation and evaporation from a normal open water surface) of Copper Flat pan evaporation (measured between October 2010 and September 2011, except for four winter months. The missing months were estimated by extrapolation of Hillsboro ET_0 data). Actual evaporation or ET is less, depending on sun and wind exposure, ground conditions, and availability of water.

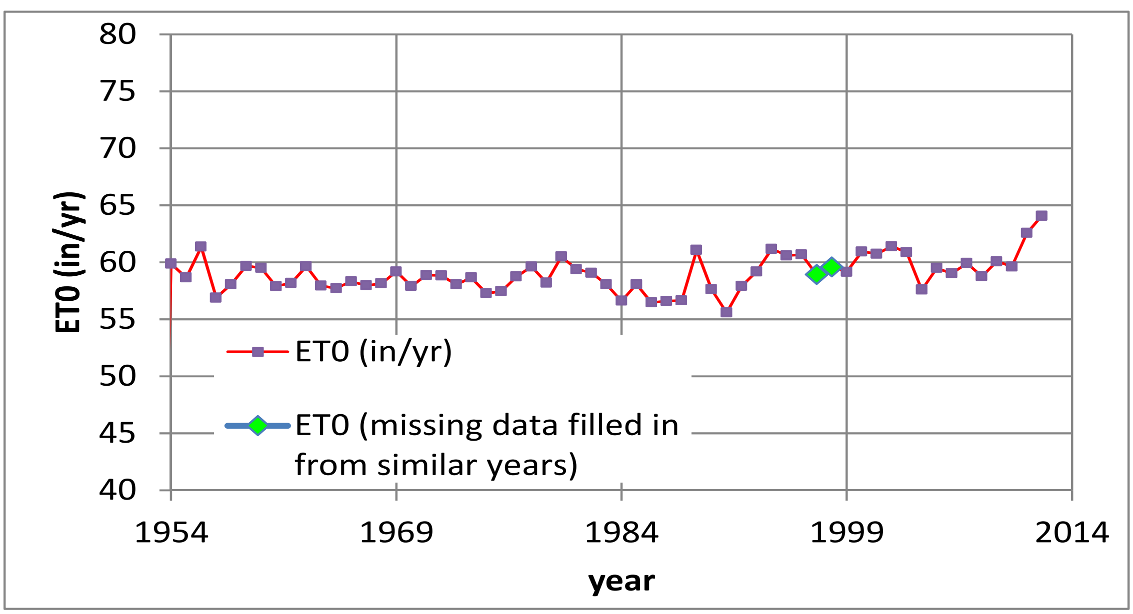


Figure 2.5. Computed Penman-Monteith evapotranspiration (ET_0) at Hillsboro meteorological station.

Evaporation in the study area is higher at lower elevations. An estimate of reservoir evaporation along the Rio Grande (Middle Rio Grande Endangered Species Collaborative, 2003) is:

$$\text{annual evaporation} = 135.8 \text{ in.} - (0.0135 \text{ in./ft amsl}) * Z,$$

where,

Z is elevation in feet above mean sea level (ft amsl).

The equation predicts evaporation of 62.4 in./yr at the Copper Flat open pit (elevation 5,440 ft amsl), in agreement with the above-presented estimates, and 79.1 in./yr at Caballo Lake (elevation 4,200 ft amsl), in agreement (equivalent to 74 percent of pan evaporation) with measurements at Caballo Dam (WRCC, 2012).

The estimated average evaporation, precipitation (from Fig. 2.4) and net evaporation for Caballo Lake and the Copper Flat open pit are presented in Table 2.1.

Table 2.1. Estimated average total and net reservoir evaporation

location	elevation (ft amsl)	mean annual precipitation (in.)	annual reservoir evaporation (in.)	net evaporation (in./yr)
Caballo Lake	4,200	9.2	79.1	69.9
Copper Flat open pit	5,440	12.8	64.6	51.8

ft amsl - feet above mean sea level

3.0 HYDROLOGY AND WATER BALANCE

Topographic basins of the study area are shown on Figure 3.1 and include Las Animas Creek and Percha Creek watersheds as well as the Grayback and Greenhorn Arroyo drainages. A portion (approximately 230 acres) of the original Grayback Arroyo watershed now drains to the Copper Flat open pit.

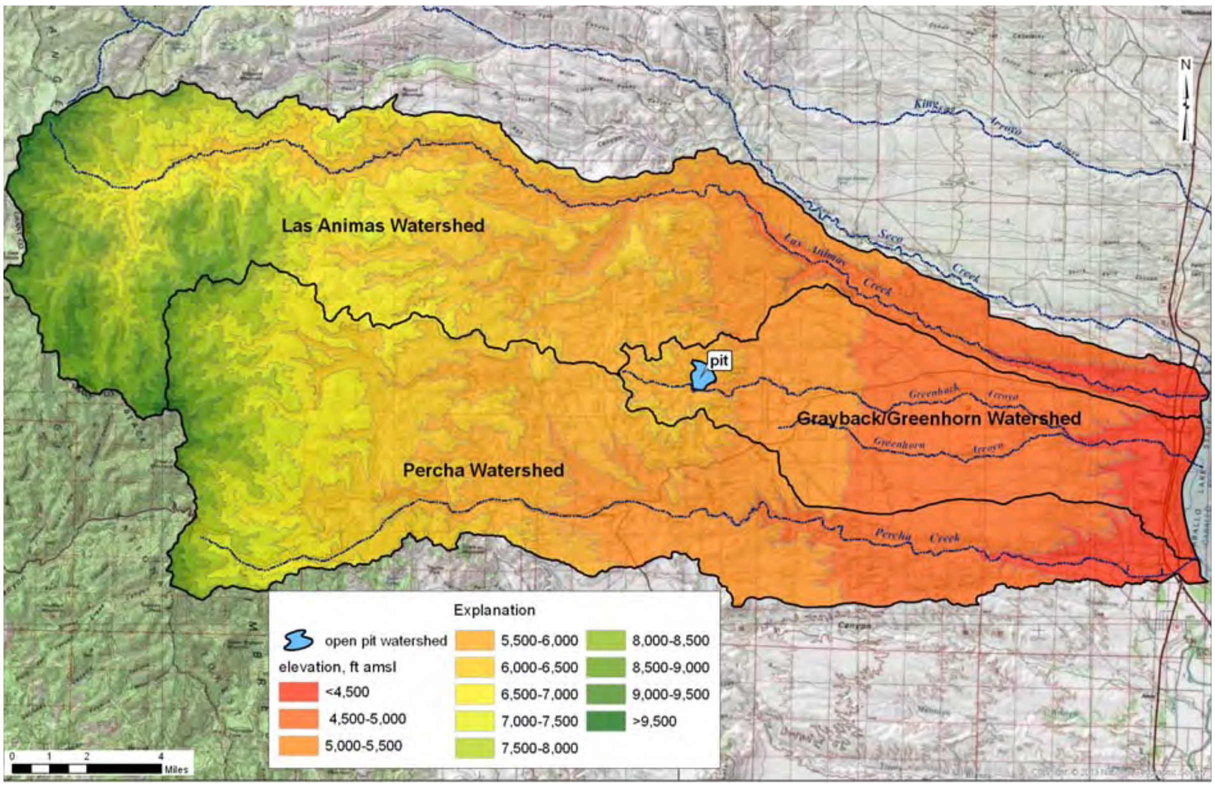


Figure 3.1. Study area watersheds.

3.1 Watershed Area and Precipitation

The areas of each of the watersheds within defined elevation bands are listed on Table 3.1. The mean annual precipitation (Fig. 2.4) estimated for the midpoint of each band is presented on Table 3.2, along with the estimated total annual volume of precipitation for each watershed.

3.2 Runoff and Groundwater Recharge

Basin water yield (surface water runoff plus groundwater recharge) is estimated here following the method of Maxey and Eakin (1949), in which estimated mean annual precipitation, a function of elevation, is correlated with an independent estimate of discharge. The result is a set of recharge factors, defined as the proportion of precipitation that becomes runoff or recharge (excess precipitation), for a given level of mean annual precipitation (an elevation band).

Table 3.1. Study area watershed areas and hypsometry

elevation range (ft amsl)	Las Animas watershed	Percha watershed	Grayback / Greenhorn watershed	open pit watershed
	area (acres)			
<4,500	2,888	3,576	4,539	
4,500-5,000	7,030	11,035	17,095	
5,000-5,500	8,412	12,614	9,708	230
5,500-6,000	14,539	14,072	2,864	
6,000-6,500	12,369	13,030	635	
6,500-7,000	10,279	8,219		
7,000-7,500	6,507	5,355		
7,500-8,000	5,808	4,159		
8,000-8,500	6,160	3,021		
8,500-9,000	6,362	1,749		
>9,000	3,305	509		
total	**83,659**	**77,339**	**34,841**	**230**

ft amsl - feet above mean sea level

Table 3.2. Study area precipitation by watershed and elevation band

midpoint elevation (ft amsl)	precipitation (in./yr)	Las Animas watershed	Percha watershed	Grayback / Greenhorn watershed	open pit watershed
		precipitation (ac-ft/yr)			
4,350	9.7	2,326	2,880	3,655	
4,750	10.8	6,345	9,961	15,431	
5,250	12.3	8,617	12,921	9,944	236
5,750	13.8	16,661	16,126	3,282	
6,250	15.2	15,679	16,516	804	
6,750	16.7	14,279	11,417		
7,250	18.1	9,832	8,091		
7,750	19.6	9,482	6,790		
8,250	21.0	10,805	5,298		
8,750	22.5	11,933	3,280		
9,500	24.7	6,802	1,048		
total		**112,761**	**94,328**	**33,116**	**236**

ft amsl - feet above mean sea level
ac-ft/yr - acre-feet per year

Some example sets of recharge factors are presented in Table 3.3. These include the formulation of Bennett and Finch (2002) used to estimate recharge in the trans-Pecos region of Texas, that was subsequently used to estimate recharge to the Salt Basin in New Mexico and Texas (JSAI, 2010), and the Davis Mountains/Salt Basin in Texas (LBG-Guyton, 2004).

Another example is that of Maxey and Eakin (1949), which studied dry, closed basins in southern Nevada, estimating discharge as playa ET. This example was modified by McDonald-Morrissey (1998) in BLM (2000), in a study of wetter, exoreic (outflowing) basins along the Carlin Trend in northern Nevada. Total basin discharge was estimated from gaged surface flows and from ET in vegetated areas.

Actual runoff and recharge are influenced by site-specific conditions including topography, soil type and thickness, land cover, and surface geology. However, in the absence of an independent estimate of discharge, the previously published estimates may indicate a potential range of basin water yield.

The above formulas suggest, respectively, a study-area water balance of 8,000 ac-ft/yr (Bennett and Finch), 30,000 ac-ft/yr (Maxey and Eakin) and 51,000 ac-ft/yr (BLM). In the absence of other information, water yield of the study area is anticipated to be within the range of these estimates, or between about 8,000 and 50,000 ac-ft/yr. This range of yield is compared below to a basin-specific estimate of discharge.

Table 3.3. Published recharge factors

midpoint elevation (ft amsl)	precipitation (in./yr)	fraction of precipitation that becomes runoff and/or recharge		
		Bennett and Finch (2002)	Maxey - Eakin (1949)	BLM (2000)
4,350	9.7	0.00	0.03	0.03
4,750	10.8	0.00	0.03	0.03
5,250	12.3	0.00	0.07	0.07
5,750	13.8	0.02	0.07	0.07
6,250	15.2	0.03	0.15	0.3
6,750	16.7	0.04	0.15	0.3
7,250	18.1	0.05	0.15	0.3
7,750	19.6	0.07	0.15	0.3
8,250	21.0	0.08	0.25	0.45
8,750	22.5	0.09	0.25	0.45
9,500	24.7	0.11	0.25	0.45

BLM - U.S. Bureau of Land Management ft amsl - feet above mean sea level

3.3 Discharge

Regional discharge from the study area occurs mainly as groundwater and surface-water discharge to Caballo Lake and the Rio Grande, and as ET discharge from riparian and irrigated areas along Las Animas and Percha Creeks. Areas of open-water evaporation and of ET discharge in the Palomas basin are shown on Figure 3.2.

Figure 3.2. Regional discharge areas.

The Caballo Lake and North Caballo Lake discharge areas shown on Figure 3.2 are only partly supplied from the study area. Water is also provided by:

- Direct contribution from the Rio Grande upstream; based on average daily discharge below Elephant Butte dam (U.S. Geological Survey (USGS) station No. 08361000) and below Caballo dam (USGS station No. 08362500) from 1938 through 2010, an average of 12,364 ac-ft/yr more water is released from Elephant Butte (into Caballo) than from Caballo.

- Runoff from the watersheds east of Caballo Lake. These basins lack large high-altitude catchment areas and yield less water than basins west of the lake. They do, however, contribute water to Caballo after major precipitation events.

- Contribution from the Palomas Creek (catchment area 233,942 ac) and Cuchillo Creek (catchment area 235,493 ac) basins north of the study area, with similar hypsometry to the study area basins. Assuming water yield proportional to (elevation-weighted) catchment area (Table 3.1), Palomas and Cuchillo Creek basins would be expected to produce about 71 percent of the total yield from the basins west of Caballo, with the study area basins contributing the remainder.

In addition to regional discharge from the Palomas Basin, local discharge areas over the Animas Uplift and in the Animas Graben include riparian areas along perennial stretches of upper Las Animas and Percha Creeks. These areas are shown on Figure 3.3 including about 600 acres in the “Percha Box” (Percha Creek above the mountain front) and about 200 acres along the Upper Animas.

Also shown on Figure 3.3 is a stretch of upper Grayback Arroyo in the area of Copper Flat. This part of Grayback does not flow perennially, but groundwater levels are close to the surface, and there is baseflow discharge to Grayback Arroyo following wet periods (S. Finch, personal communication, 2012).

Evaporation/ET for Caballo Lake and for the study area watersheds is estimated on Table 3.4; ET from irrigated crops or riparian vegetation was estimated at 36 in./yr. Net evaporation for Caballo Lake, estimated at about 70 in./yr (Table 2.1), was rounded down to 60 in./yr, to account for runoff from the east side of the lake. Net evaporation for North Caballo Lake and ET for Rio Grande riparian areas were estimated as the average of combined net Caballo evaporation and riparian ET rate, or 48 in./yr.

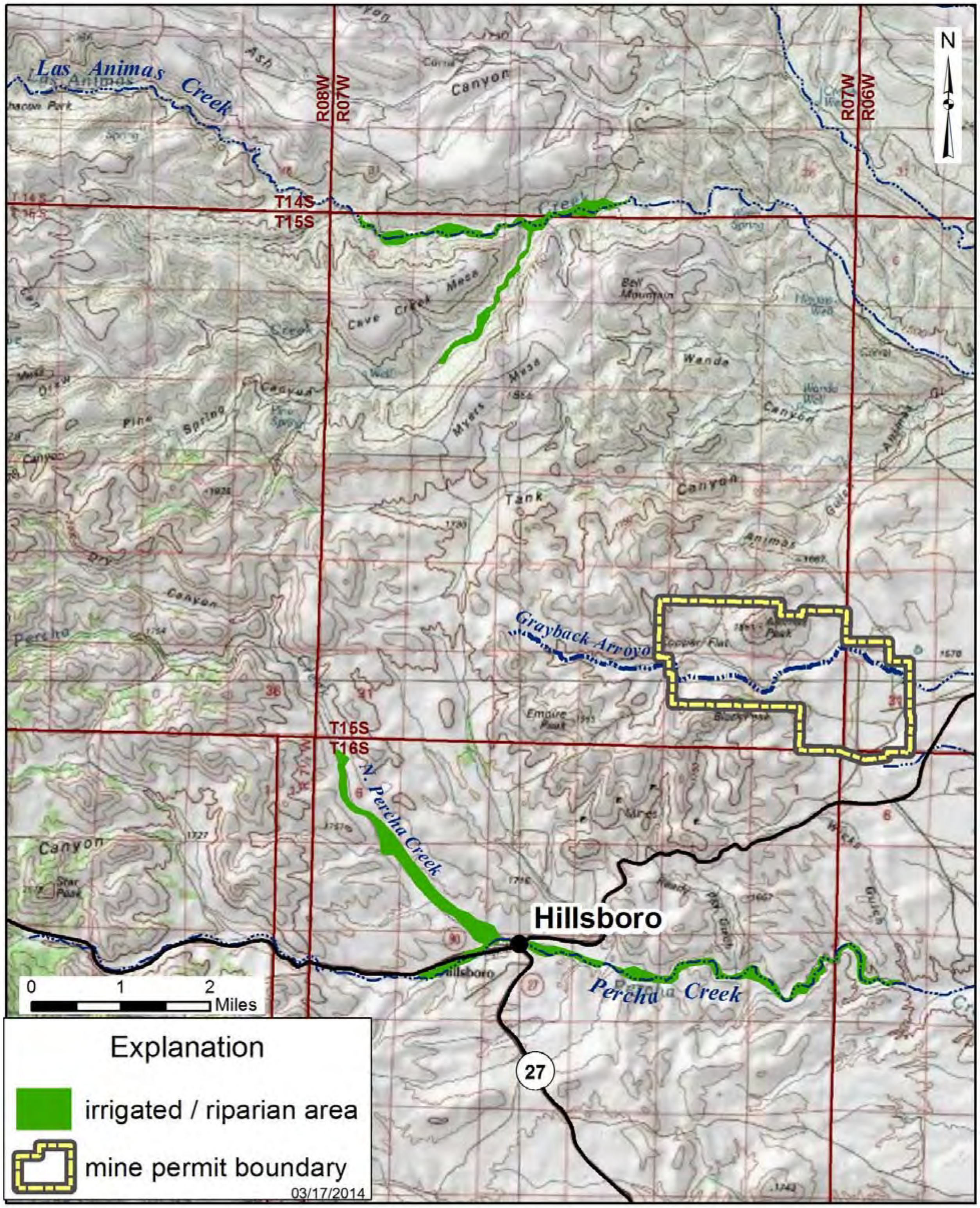


Figure 3.3. Local discharge areas.

Table 3.4. Estimated evaporation and evapotranspiration (ET)

		area (acre)	net ET (ft/yr)	net ET (ac-ft/yr)
Palomas Basin	Caballo Lake (water surface at 4,200 ft amsl)	6,344	5	31,720
	North Caballo Lake / Rio Grande	5,214	4	20,856
	Lower Las Animas Creek	1,421	3	4,263
	Lower Percha Creek	280	3	840
Animas Uplift Animas Graben	Upper Animas Creek	200	3	600
	Upper Percha Creek	600	3	1800
	Copper Flat open pit	5	4	20
	total			**60,079**

ac-ft/yr - acre-feet per year ft amsl - feet above mean sea level

3.4 Water Balance

The Caballo Lake and North Caballo Lake discharge components in Table 3.4, totaling 52,576 acre-feet per year (ac-ft/yr), are only partly supplied from the study area. In order to estimate the portion provided from the study area, the following adjustments were made:

- Based on USGS gage data discussed above (Sec. 3.3), 12,364 ac-ft/yr is assumed to be provided by the Rio Grande upstream of Caballo Lake.
- The estimated rate of evaporation from Caballo Lake was rounded down to account for runoff from the watersheds east of the lake as described above.
- Of the remaining Caballo Lake and North Caballo Lake discharge (40,212 ac-ft/yr), 71 percent was assumed to be provided by the Palomas and Cuchillo Creek Basins, as discussed above. The remainder was assumed to be generated within the study area.

Based on the discharge estimates in Table 3.4 and the adjustments listed above, an estimated water balance for the study area is presented in Table 3.5. The system receives water as runoff and recharge to the four watersheds listed in the upper part of the table. The estimated water yield of about 17,000 ac-ft/yr falls within the range of water yield (8,000-50,000 ac-ft/yr) estimated in Section 3.2 above.

The system discharges water as groundwater outflow and ET, as listed in the lower part of the table. The main component of discharge is groundwater flow to the Rio Grande / Caballo system. There is discharge of ET from three of the four watersheds, but not from Grayback/Greenhorn, which has no significant groundwater discharge area (depth to water is too great for ET of groundwater).

Table 3.5. Estimated water balance

	runoff and recharge (ac-ft/yr)	
	Las Animas Creek	11,509
	Percha Creek	7,874
	Grayback and Greenhorn Arroyos	201
	Copper Flat open pit	1
	total	**19,585**
	discharge (ac-ft/yr)	
Palomas Basin	Lower Las Animas Creek	4,263
	Lower Percha Creek	840
	discharge to Rio Grande and Caballo Reservoir	11,850
	total	**16,953**
Animas Uplift Animas Graben	Upper Animas Creek	600
	Upper Percha Creek	1800
	Copper Flat open pit	20
	total	**2,420**

ac-ft/yr - acre-feet per year

The water balance in Table 3.5 may also be compared with the water balance of the Upper Mimbres Basin, located on the opposite side of the Black Range from the study area, with a similar distribution of elevations. The average yield of the 300,000-acre basin above the Faywood gaging station is estimated (based on gaged flows) at 26,700 ac-ft/yr (White, 1930). The same per-acre water yield in the study area would be 17,450 ac-ft/yr, similar to the (regional) discharge estimate of about 17,000 ac-ft/yr from Table 3.5.

4.0 GEOLOGY AND HYDROGEOLOGY

The surface-water basins discussed above are shown on Figure 4.1, along with the smaller groundwater-flow model domain. Although most of the precipitation that recharges the groundwater system originates in the upper part of the watersheds (left-hand side of Fig. 4.1, outside of the groundwater study area), the main groundwater systems are found in sedimentary deposits downstream.

The study area consists of three major hydrogeologic zones (Fig. 4.1), shown in west-east cross-section on Figure 4.2. The three zones are 1) The sediment-filled Animas Graben west of the Animas Uplift and east of the Black Range mountain block, 2) The Animas Uplift, the bedrock in which the ore body is located, and 3) the Palomas Basin, the main sedimentary basin along the Rio Grande rift east of the Animas Uplift, in which the mine water-supply wells are located.

The Animas Graben between the Black Range and the Animas Uplift drains north to Animas Creek and south to Percha Creek via Warm Springs Valley. Santa Fe Group (SFG) sedimentary deposits overlie older sedimentary bedrock units (Fig. 4.2).

The Animas Uplift in the vicinity of Copper Flat (Fig. 4.1) consists of crystalline bedrock that conducts little water. The Copper Flat open pit and the main part of the other Project facilities, including waste rock and tailings storage facilities, would be located on the Animas Uplift. To the north and south of the Copper Flat area the Animas Uplift consists of sedimentary rocks that conduct more groundwater flow.

The Palomas (geologic) Basin lies within the Lower Rio Grande Underground Water (administrative) Basin. Parts of the waste rock and tailings storage facilities would be located overlying the western margin of the Palomas Basin. The Project water-supply wells are completed within the SFG aquifer between Las Animas Creek and Percha Creek (Fig. 4.1), and will be the main source of groundwater and surface-water effects of the Project.

The Project water-supply wells are completed within the Palomas Graben (Fig. 4.2), a significant geological and hydrogeological feature within the Palomas Basin. The feature was identified in the 1970s (Dunn, 1984), during water-supply exploration for the previous Copper Flat mine. The graben was identified as the western-most part of the Palomas basin with sufficient aquifer productivity to develop an adequate water supply.

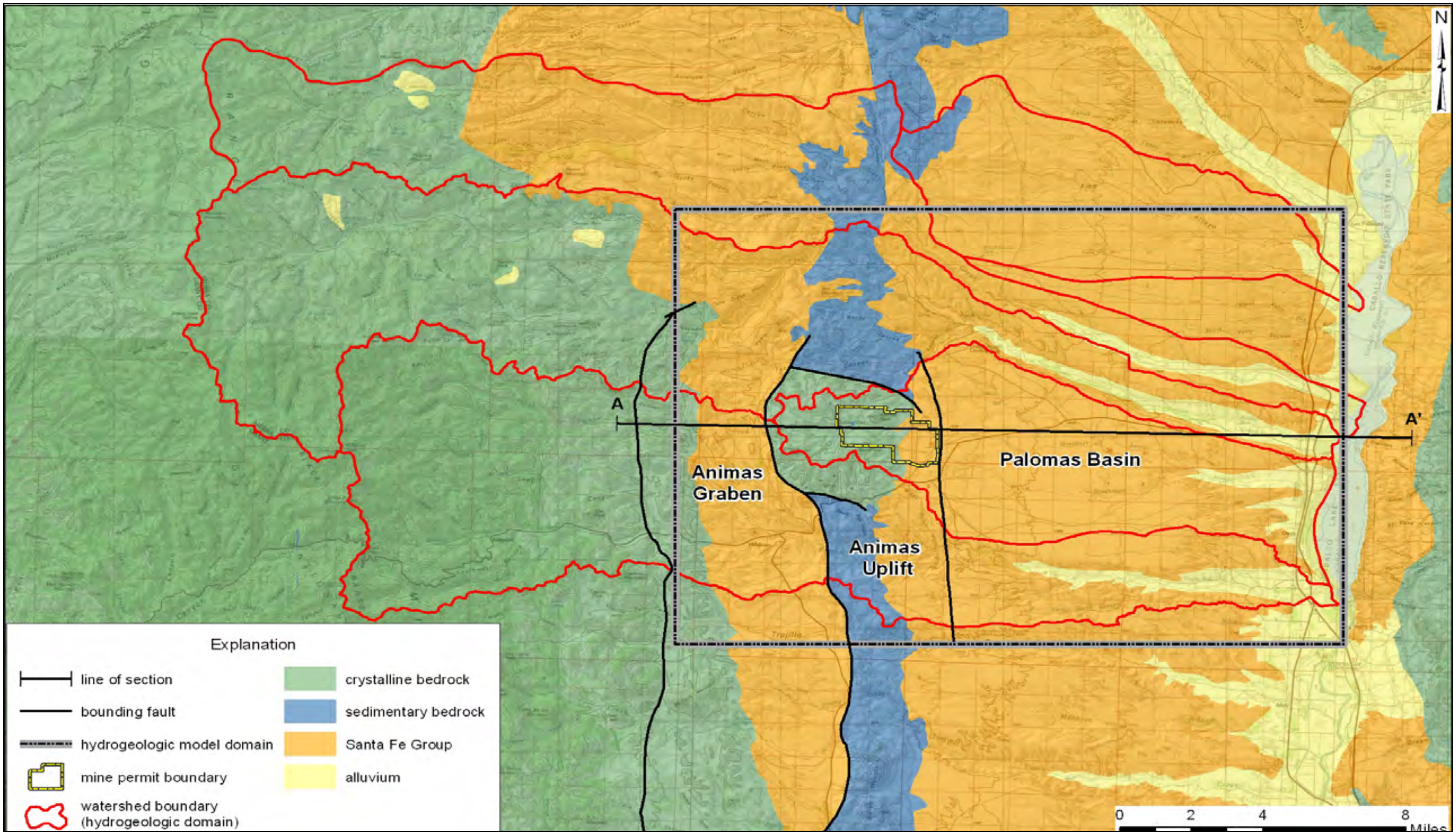


Figure 4.1. Hydrogeologic zones.

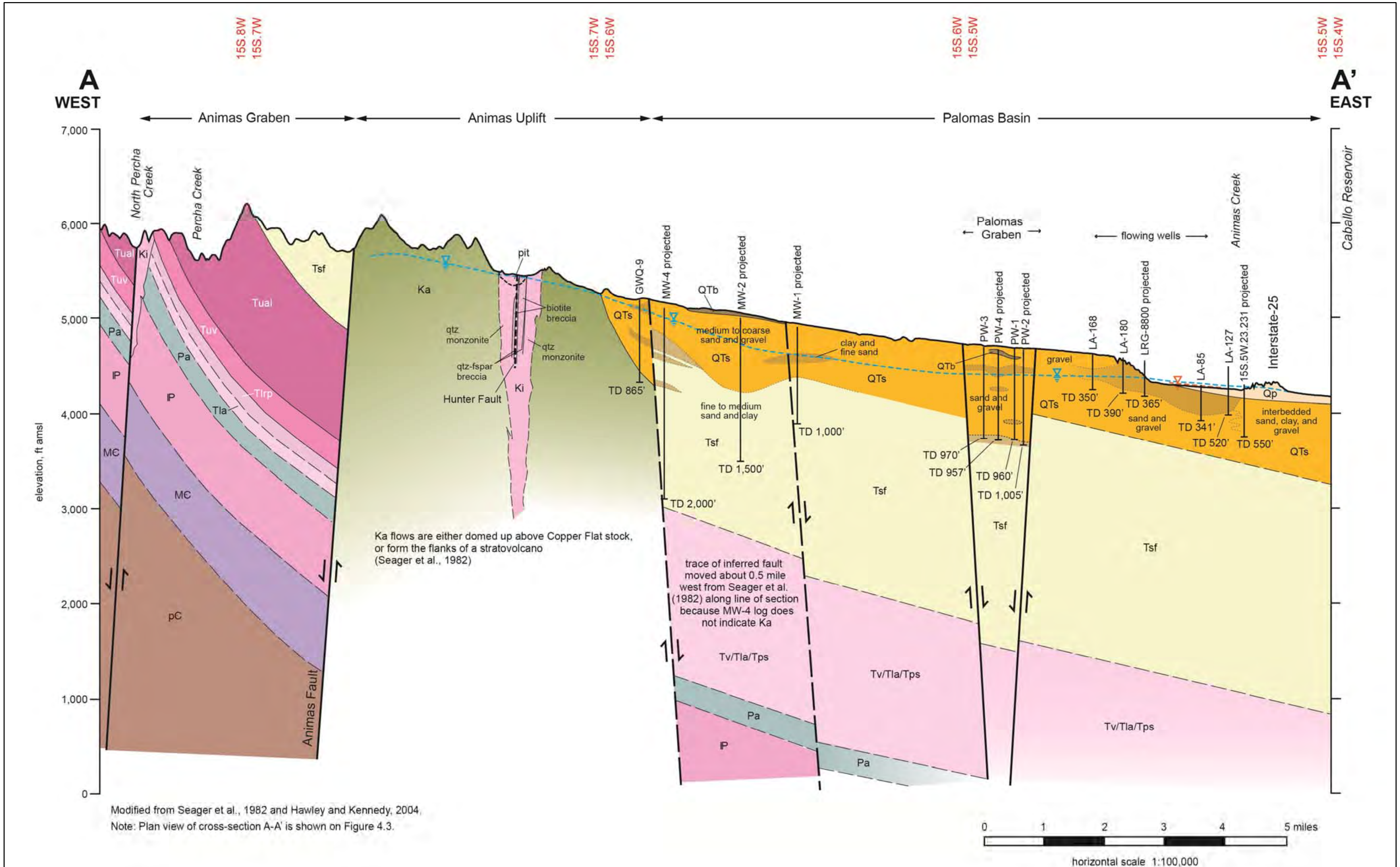


Figure 4.2. Hydrogeologic zones, west-to-east cross-section.

4.1 Geology

The geologic description is adapted from Shomaker (1993), who cites Harley (1934), Hedlund (1975), Dunn (1982), and Seager et al. (1982). An extended bibliography of geology references is presented as Appendix A. The geologic map of the study area is presented on Figure 4.3. Three major geologic subdivisions (Figs. 4.1 and 4.2), the Animas Uplift, the Animas Graben east of the Black Range, and the Palomas Basin, are described below.

4.1.1 Animas Uplift

The Animas Uplift is an upthrown block, ranging from less than 2 to about 4 miles wide, bounded by north-south trending faults (Fig. 4.1). The Copper Flat ore body is located within a nearly circular remnant of a Cretaceous-age andesite volcano about 4 miles in diameter that is part of the Animas Uplift. Drilling has shown that andesite is present to a depth of more than 3,000 ft (Dunn, 1982, p. 314).

The hills surrounding Copper Flat, referred to as the Hillsboro Hills, consist of Cretaceous-age andesite flows, breccias, and volcaniclastic rocks that were erupted from the volcano (McLemore, 2001; Raugust and McLemore, 2004).

The volcano intrudes through the Paleozoic-age sedimentary rock sequence. The andesite is bounded on the north and south by Paleozoic-age limestone, and on the east by the SFG sediments of the Palomas Basin, in fault contact. On the west, the andesite body is in fault contact with Paleozoic-age limestone, Tertiary-age volcanic rocks, and overlying SFG sediments of the Animas Graben (Fig. 4.2).

The ore body itself is in the Copper Flat quartz monzonite stock, within the body of andesite. The quartz monzonite porphyry intruded the vent of the volcano, and then dikes and mineralized veins intruded the monzonite porphyry and radiated outward from the porphyry into faults and fracture zones in the andesite. The porphyry copper deposit is concentrated within a breccia pipe in the quartz monzonite stock.

4.1.2 Graben West of Animas Uplift

West of the Animas Uplift, between it and the Black Range, lies a half-graben in which Tertiary-age alluvial-fan deposits, sandstones, and mudstones of the SFG overlie Tertiary-age volcanic rocks and Paleozoic-age sedimentary rocks. Dips are eastward, and the half-graben is bounded on the east by normal faults. The Santa Fe beds may reach a thickness of 1,000 ft on the east side of the half-graben (Seager et al., 1982, sheet 2).

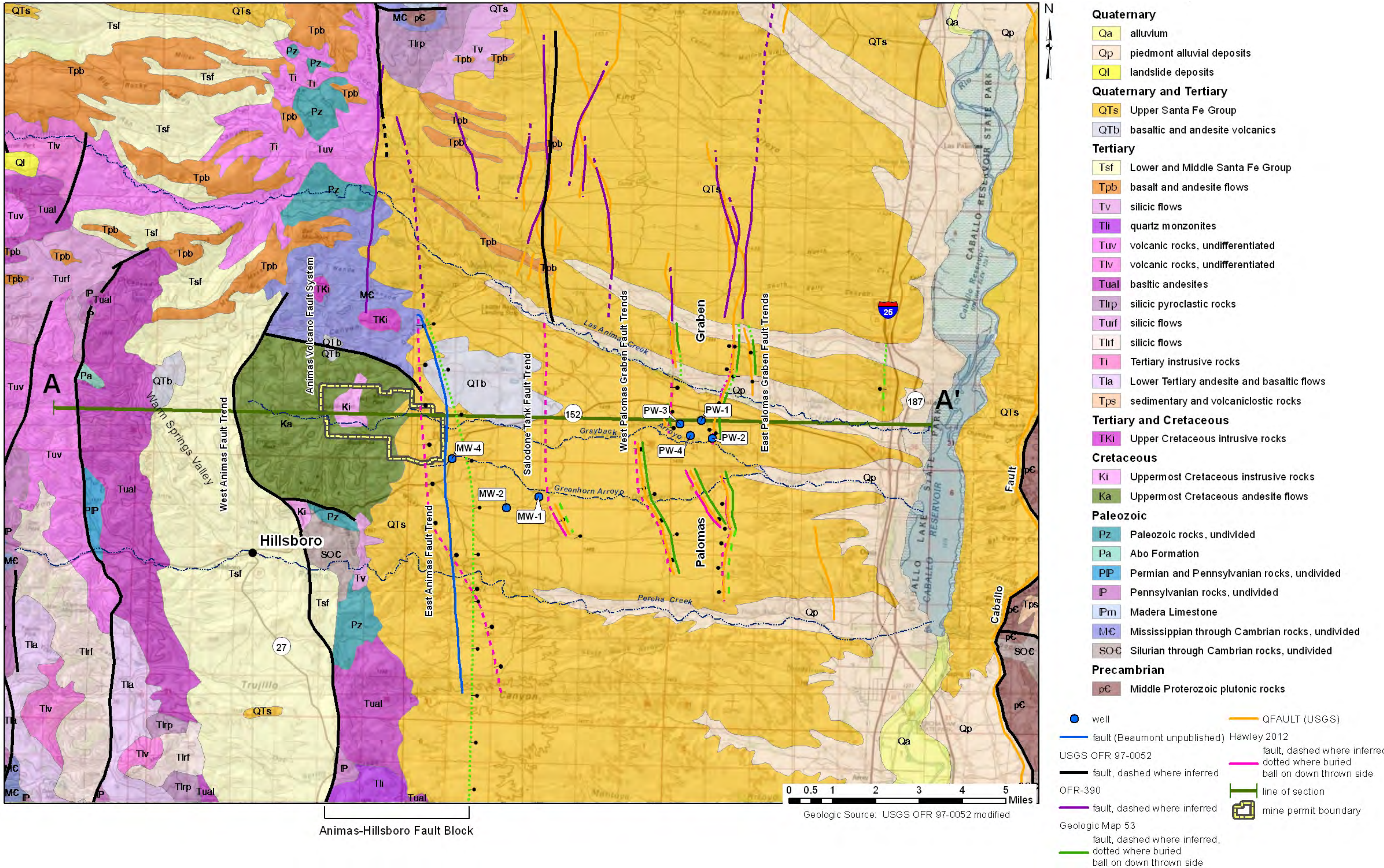


Figure 4.3. Geologic map of study area.

4.1.3 Palomas Basin

The Palomas Basin is a sediment-filled structural trough about 35 miles long by 12 miles wide. It is part of the Rio Grande rift, a north-south trending zone of approximately east-west oriented extension that bisects the state of New Mexico. The extension is caused by the Colorado Plateau crustal block pulling away from the High Plains block, which stretches and thins the Earth's crust in the area of the rift (Seager and Morgan, 1979).

Rio Grande rift extension began in southern New Mexico about 36 million years ago in late Eocene time, with the rate of extension peaking between 16 and 10 million years ago, in Miocene time (Lozinsky, 1986; Mack, 2004). The axial basins (such as the Palomas Basin) are in the form of half-grabens that are tilted strongly toward the east or the west, depending on which side of the main rift fault the basin is located.

The Palomas Basin is an eastward-tilted half graben as evidenced by gravity data and by geologic mapping of eastward dips of Santa Fe Group beds along the western edge of the basin (Lozinsky, 1986). The basin is defined between the north-south trending Caballo and Animas-Hillsboro fault blocks (Fig 4.3; Kelley, 1955; Kelley and Silver, 1952). Most of the displacement has occurred on the east side of the Palomas Basin along the Caballo Fault (the main rift fault system).

Basin-fill thickness is probably greater than 6,000 ft along the eastern side of the Palomas Basin (Lozinsky, 1986, figure 2). Basin-fill thickness is greater than 2,000 ft at well MW-4 (Fig. 4.3), located in the thinner western part of the basin, near the Animas Uplift.

The sedimentation of the Palomas Basin occurred contemporaneously with the down-dropping of the half graben and the rise of the Animas Uplift (Mack, 2004). Las Animas and Percha Creeks were established prior to structural development of the Animas Uplift and maintained the water course by channel cutting through the bedrock units, and downstream deposition of fluvial sediments in the Palomas Basin (Mack, 2004).

North-south extensional faulting followed the formation of the Palomas Basin and deposition of the majority of the Santa Fe Group sediments. North-south faults within the Santa Fe Group Sediments have been mapped by Kelley et al. (unpublished, 1979), Seager et al. (1982), Harrison et al. (1993), and Hawley (unpublished, 2012).

North-south extensional faulting formed the Palomas Graben (Figs. 4.2 and 4.3) which filled with sediments that are coarser-grained than the Santa Fe Group sediments on either side. The Palomas Graben was identified as a productive aquifer, and the Copper Flat well field was completed within it in the mid-1970s.

The faults forming the Palomas Graben are mapped from Percha Creek north to about Palomas Creek. However, similar north-south trending faults mapped by Harrison et al. (1993) suggest the Palomas Graben may continue as far north as the San Mateo Mountains (Hawley, personal communication, 2012). The graben is thought to be an ancestral tributary of the Rio Grande which joins the main channel south of the study area.

The mapped individual fault segments (Fig. 4.3) form several continuous north-south fault trends. A summary of the fault trends, from west to east, follows:

1. West Animas Fault Trend – north-south fault that forms boundary between Animas half-graben and west side of Animas Uplift. Normal fault downthrown on the west side. Primary references Murray (1959); Hedlund (1975).

2. Animas Volcano Fault System – faults formed around andesite volcano, downthrown on exterior side of volcano. Primary references Harley (1934); Hedlund (1975); Dunn (1982).

3. East Animas Fault Trend – north-south normal fault that forms boundary between Animas Uplift and Palomas Basin. Downthrown on east side. Mapped as inferred fault at slightly different longitude by Seager et al. (1982) than by Hawley (2012). Key references include Harrison et al. (1993), Beaumont (2011), JSAI (2011a), and Hawley (2012). Work performed by JSAI (2011a) and Beaumont (2011) is based on analysis of well logs and lineaments identified from aerial photographs.

4. Saladone Tank Fault Trend – north-south normal fault down thrown on the east side. Mapped by Kelley et al. (1979), Seager et al. (1982), Harrison et al. (1993), and Hawley (2012).

5. West Palomas Graben Fault Trends – north-south normal faults downthrown on the east side. Forms western boundary of the Palomas Graben. Faults mapped by Kelley et al. (1979), Seager et al. (1982), Harrison et al. (1993), and Hawley (2012).

6. East Palomas Graben Fault Trends – north-south normal faults downthrown on the west side. Forms eastern boundary of the Palomas Graben. Faults mapped by Kelley et al. (1979), Seager et al. (1982), Harrison et al. (1993), and Hawley (2012).

4.2 Hydrogeology

Hydrogeologic units, aquifer characteristics, and recharge and discharge locations are discussed below for the three geologic subdivisions of the study area. A hydrogeologic map of the study area is shown with surface water features and mapped springs on Figure 4.4.

Some of the mapped springs, such as “Las Animas Creek Community Spring” (Murray, 1959) and “LA-52” (Davie and Spiegel, 1967), were identified long ago and may no longer flow. However, the locations identified within the Santa Fe Group lie along the main faults, demonstrating the structural controls on groundwater flow.

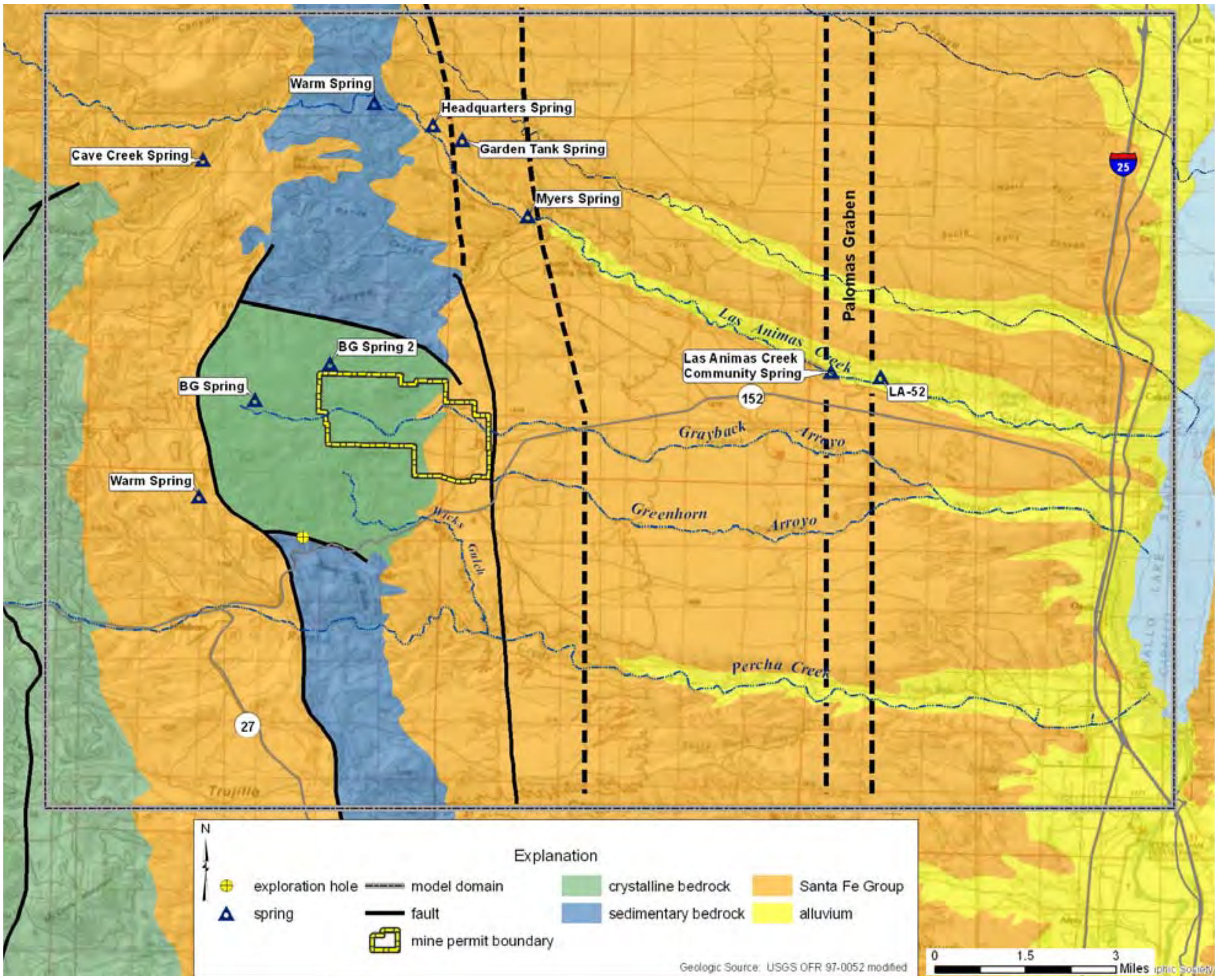


Figure 4.4. Hydrogeologic units and mapped spring locations.

4.2.1 Animas Uplift

Hydrogeologic units in the Animas Uplift include the relatively impermeable andesite and monzonite of the Copper Flat area and the relatively permeable carbonate rocks and other sedimentary rocks to the north and south of Copper Flat.

Groundwater recharge from local precipitation to the quartz monzonite and andesite is limited by low hydraulic conductivity. Recharge to the limestone outcrop areas north and south of the andesite is greater. Recharge to the limestone also includes infiltration of runoff generated at higher elevation, from the Las Animas Creek and Percha Creek watersheds.

Groundwater discharges from the limestone at the foot of the uplift, as spring flow (Fig. 4.4) and base flow to Percha and Las Animas Creeks. Groundwater discharges from the andesite as subsurface flow across the fault contacts with the Palomas Basin, and as evaporation from the open pit.

The existing Copper Flat open pit, which the New Mexico Copper Corporation (NMCC) proposes to expand, was excavated in 1982 by Quintana Minerals. The Quintana pit was excavated to a maximum depth corresponding to elevation 5,400 ft amsl. The current water level in the pit is about 5,439 ft amsl (April 2013). The pre-mining groundwater level (without lake evaporation) was about 5,450 ft amsl (JSAI, 2011b).

The low hydraulic conductivity of the quartz monzonite and andesite is reflected in the low pumping rates required in 1982 to dewater the Quintana pit. The dewatering rate required to maintain the greater-than 45-ft drawdown, in an excavation about 100 ft by 200 ft in area at maximum depth, was estimated at 22 gallons per minute (gpm) (Shomaker, 1993). SRK (1997) reports pumping rates up to 50 gpm. The range in reported dewatering rates was likely due to the variability of precipitation and runoff to the pit.

The low conductivity of the andesite and monzonite are confirmed below in the evaluation of the pit water balance (Sec. 5.4) and in the results of the 2011 pit-area pressure-injection testing (Sec. 5.4.1). It can be expected that the hydraulic conductivity of rock deeper in the andesite and quartz monzonite will have still lower hydraulic conductivity, because of the decrease in weathering effects and the closing of fractures with depth. The andesite acts as a hydrologic containment vessel for the existing and proposed open pits.

The radiating dikes and veins may be inferred to have relatively low conductivity as well. Several mine shafts in Wicks Gulch (Fig. 4.4) were examined, and found to be almost full of water; if there were significant hydraulic conductivity, either along fractures or through the rock matrix, water levels would be closer to the elevation of nearby surface channels.

Away from the andesite body, where the Animas Uplift consists of fractured, predominantly limestone and dolomite bedrock, it is likely that significant permeability has developed by the combination of fracturing and enlargement of fracture-openings by dissolution of carbonate minerals. This hypothesis is supported by the account of an air-drilled exploration hole (Fig. 4.4) in SW/4 SE/4 Sec. 3, T. 16 S., R. 7 W, which was abandoned because large water production overcame the capacity of the compressor to continue circulation (Sonny Hale, personal communication). The well is close to the fault which offsets the andesite against the predominantly limestone Paleozoic-age section.

4.2.2 Graben West of Animas Uplift

Local precipitation, and runoff from the Black Range, provide groundwater recharge to the graben. Discharge occurs mainly as spring flow and possibly also as subsurface discharge to the Animas Uplift. Spring flow in the Warm Springs drainage discharges as base flow to Percha Creek. The emergence of water at Warm Springs (Fig. 4.4) at the eastern edge of the graben demonstrates that the andesite of the Animas Uplift acts at depth as a barrier to flow from the graben. Groundwater in the graben flows west to east across the Animas Uplift, south toward Percha Creek and north toward Las Animas Creek, flowing around the body of low-permeability andesite (Fig. 4.4).

The contrast between the chemical makeup of water from Warm Springs, as compared with water from wells and springs within the Animas Uplift (Newcomer and Finch, 1993), indicates that the source of Warm Springs water is not within the uplift, as might otherwise be inferred from the relative heads at the spring and at wells and springs within the uplift (Fig. 4.4).

4.2.3 Palomas Basin

Water recharges the Palomas Basin at its western edge, through alluvial fans at the edge of the Animas Uplift, including infiltration of runoff from Greenhorn and Grayback Arroyos and infiltration of base flow and runoff from the upper catchments of Las Animas and Percha Creeks.

Groundwater flows mainly east toward the Rio Grande and Caballo Lake. Calibration of the groundwater-flow model (Sec. 6.0) presented below also suggests that there is a north-to-south component of groundwater flow within the Palomas graben, discharging toward the Rio Grande system south of the study area.

Besides discharging to the Rio Grande and Caballo, groundwater also discharges locally, by pumping, from flowing wells, and as evapotranspiration from irrigated and riparian vegetated areas along Las Animas Creek and Percha Creek. The principal water-bearing sediments of the Palomas Basin are (1) alluvial-fan deposits, fluvial sands and gravels of the Santa Fe Group, and (2) alluvium in the inner valleys of the Rio Grande and principal tributaries (Hawley and Kennedy, 2004).

Davie and Spiegel (1967, p. 9) describe the Santa Fe Group in Las Animas Creek area as consisting of (a) an alluvial fan facies, interfingering eastward with (b) a clay facies, possibly representing the distal or deltaic beds of the alluvial fan facies, which in turn interfingers with (c) an axial river facies consisting of well-sorted sand and gravel containing well-rounded quartzite pebbles. The sediments are stratified and in general dip to the east.

Geologic logs from wells along Las Animas Creek provide evidence that the coarse-grained sediments in the Palomas Graben are overlain by a clay layer that creates perched groundwater conditions in the alluvium along Animas Creek.

Stratification and heterogeneity of the SFG creates confined conditions at depth in the lower Palomas Basin. Seepage along Percha Creek, Grayback Arroyo, Greenhorn Arroyo, and Las Animas Creek alluvial systems recharges the SFG sediments in the upper basin and the recharge pressures the stratified sediments down-dip, creating upward vertical gradients in the lower basin. Overlying clay beds create artesian conditions in the basin down-dip of recharge zones.

Artesian pressures are relatively low, generally less than 10 ft of head above land surface. A survey of artesian wells (Shomaker, unpublished) from 1993 has been updated (JSAI, 2011c), indicating reduction of artesian flow and pressure over 18 years. The history and effects of artesian discharge are discussed further below.

4.3 Hydrogeologic Conceptual Model

The hydrogeologic system described above is summarized on Figure 4.5, a map of hydrogeologic units, and on Figure 4.6, a map of the boundary conditions (inflows and outflows of water) on the system. The hydrogeologic units (Fig. 4.5) and boundary conditions (Fig. 4.6) presented form the basis of the numerical groundwater-flow model.

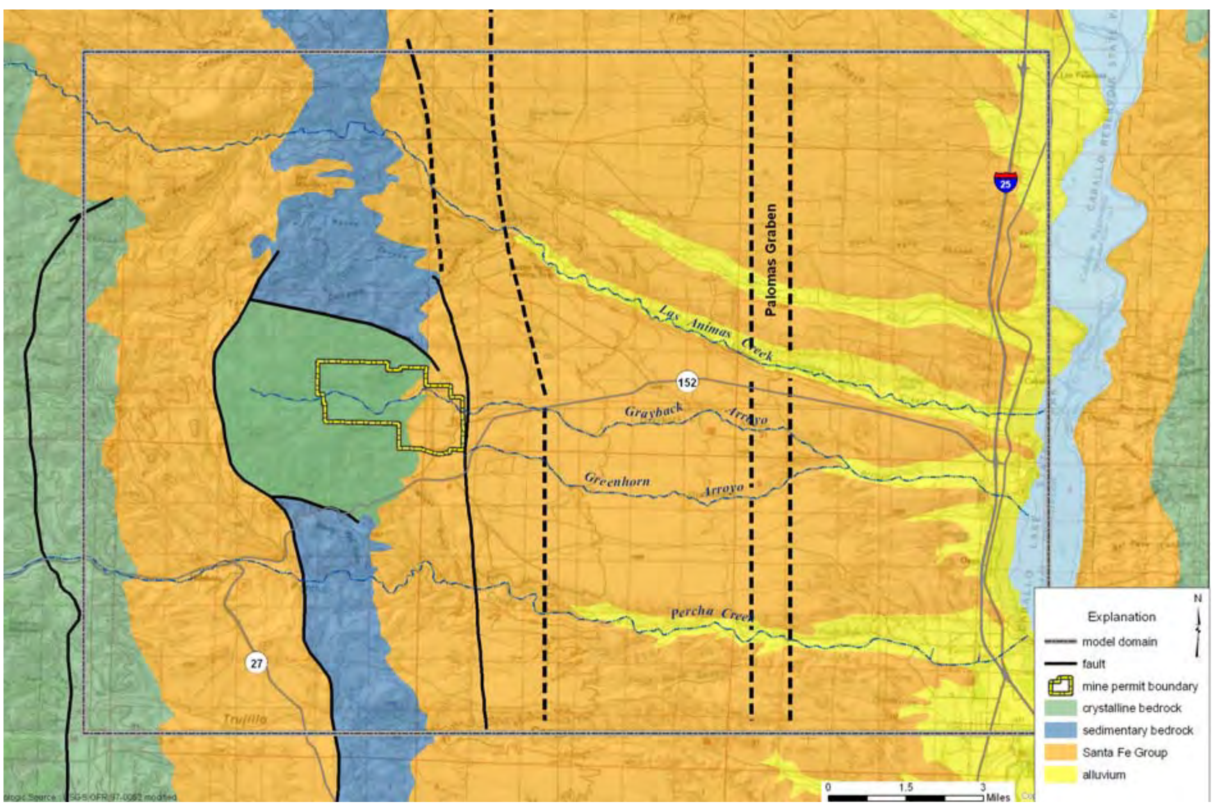


Figure 4.5. Hydrogeologic map of study area.

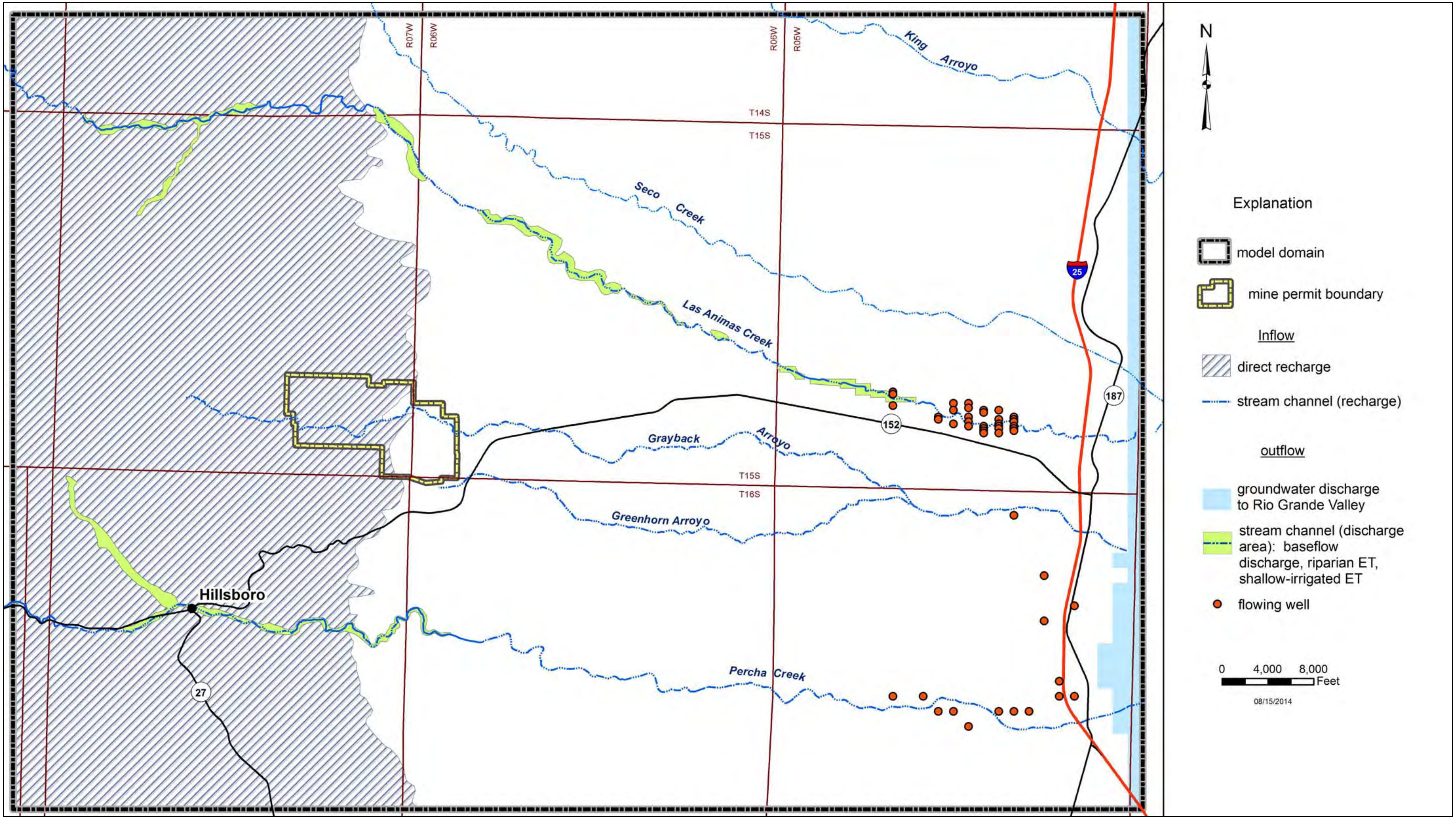


Figure 4.6. Hydrogeologic boundary conditions

5.0 CALIBRATION DATA

This section describes the data on aquifer stresses and responses available to guide the development and calibration of a numerical groundwater-flow model. These include information on (1) regional water levels, (2) the Palomas Graben and the area of the water-supply wells (well field), (3) the former tailings facility, (4) the open pit, and (5) the artesian zone in the lower Las Animas Creek and lower Percha Creek basins.

5.1 Regional Water Levels

Locations of wells and water-level measurements are presented with recent (December, 2012) potentiometric surface contours on Figure 5.1. Interpreted contours are shown for three aquifers: (1) bedrock and SFG of the Animas Uplift and Animas Graben, (2) the SFG aquifer of the Palomas Basin, and (3) the shallow alluvial aquifer along Las Animas Creek. Groundwater levels range from above 5,800 ft amsl at the western edge of the Animas graben to about 4,200 ft amsl at Caballo Lake.

Piezometers and production wells discussed below are shown on Figure 5.2. Available well construction diagrams are presented in Appendix B.

5.2 Well Field Area

The NMCC water supply wells (PW-1, PW-2, PW-3, and PW-4) were constructed and tested in 1975-80 (Green and Halpenny, 1976, 1980). Local transmissivity of the SFG aquifer is estimated below from the PW-1 and PW-2 test data. Effects of the period of well field operation, from March through June 1982, are then discussed. Next, results of a 1994 pumping test of MW-9, evaluating vertical transmission of effects, is presented. Finally, results of the 2012 aquifer test are discussed.

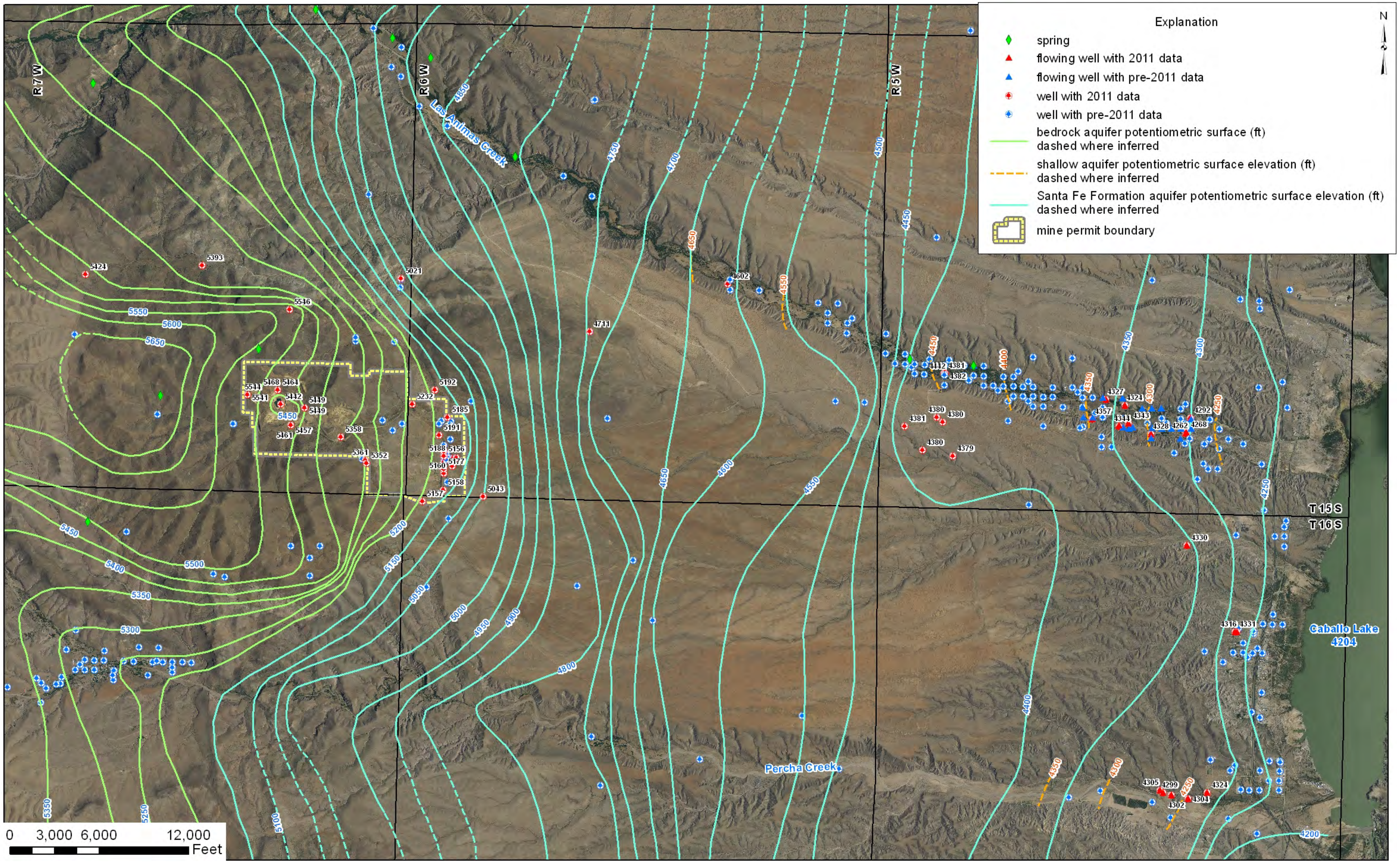


Figure 5.1. Regional water-level measurements and potentiometric surface contours.

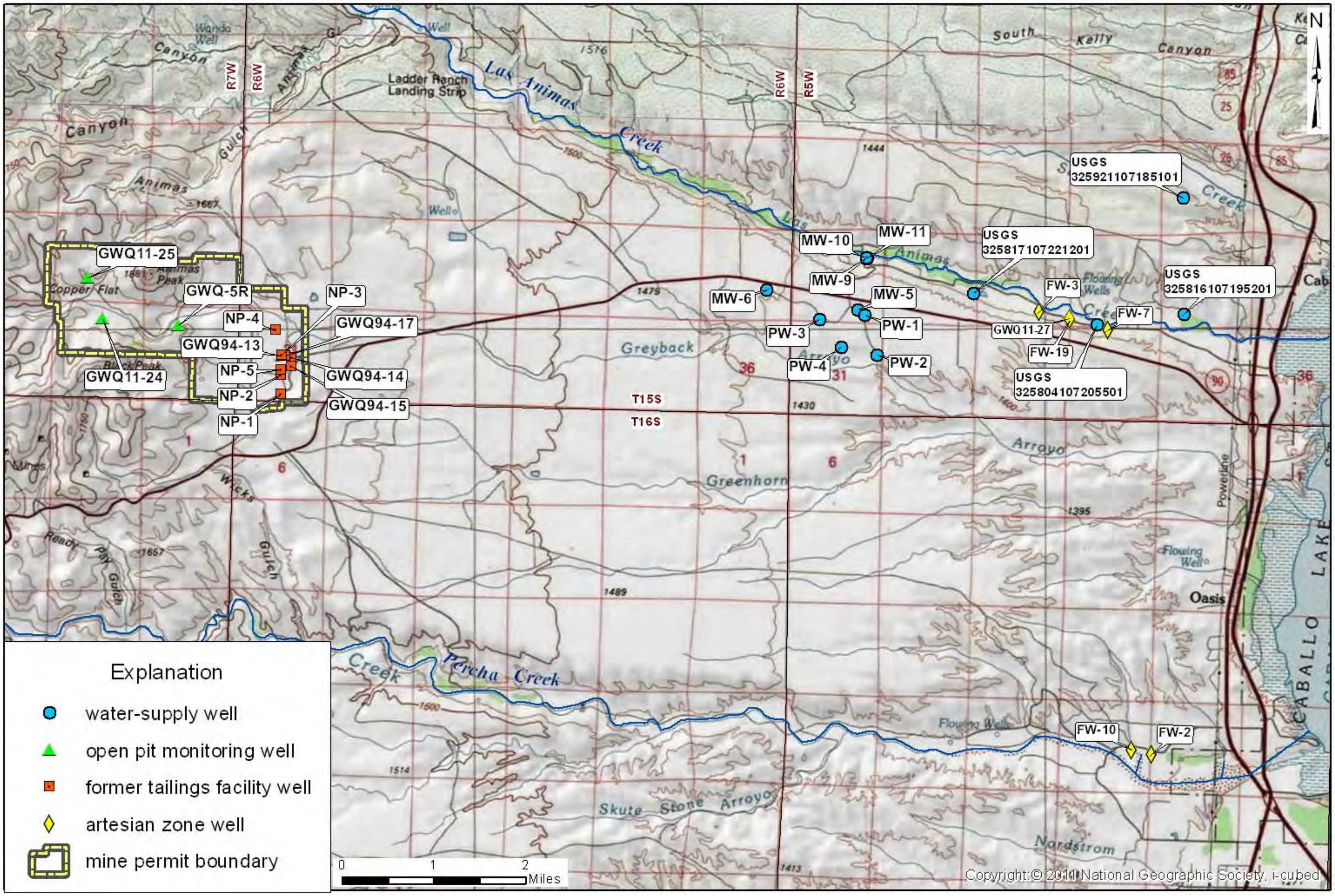


Figure 5.2. Well locations.

5.2.1 Initial Production Well Testing, 1975-1976

PW-2 was pumped at 2,020 gpm for 72 hours in January 1976 (Appendix C1). Measured drawdown and recovery at observation wells PW-1 and MW-5 are shown on Figures 5.3 and 5.4. Aquifer transmissivity is estimated at about 20,000 ft^2/day by matching the solution of Theis (1938) to measured drawdown and recovery at PW-1 and MW-5 (WDC, 1976).

Measured drawdown and recovery at the pumping well PW-2, is shown on Figure 5.5, along with the Theis solution match. In addition, because the PW-2 curves exhibit a shape characteristic of a leaky confined aquifer, the modified Theis solution of Hantush (1956) is shown as an alternate analysis.

PW-1 was pumped at 1,500 gpm for 70 hours in December 1975 (WDC, 1976). Measured drawdown and recovery at observation well MW-5 are shown on Figure 5.6. Aquifer transmissivity of about 17,000 ft^2/day is estimated by matching the solution of Theis (1938) to measured drawdown and recovery at MW-5, and to measured recovery at the pumping well PW-1, shown on Figure 5.7. In addition, the PW-1 curves exhibit a "leaky" shape and a Hantush curve match is shown as an alternate analysis.

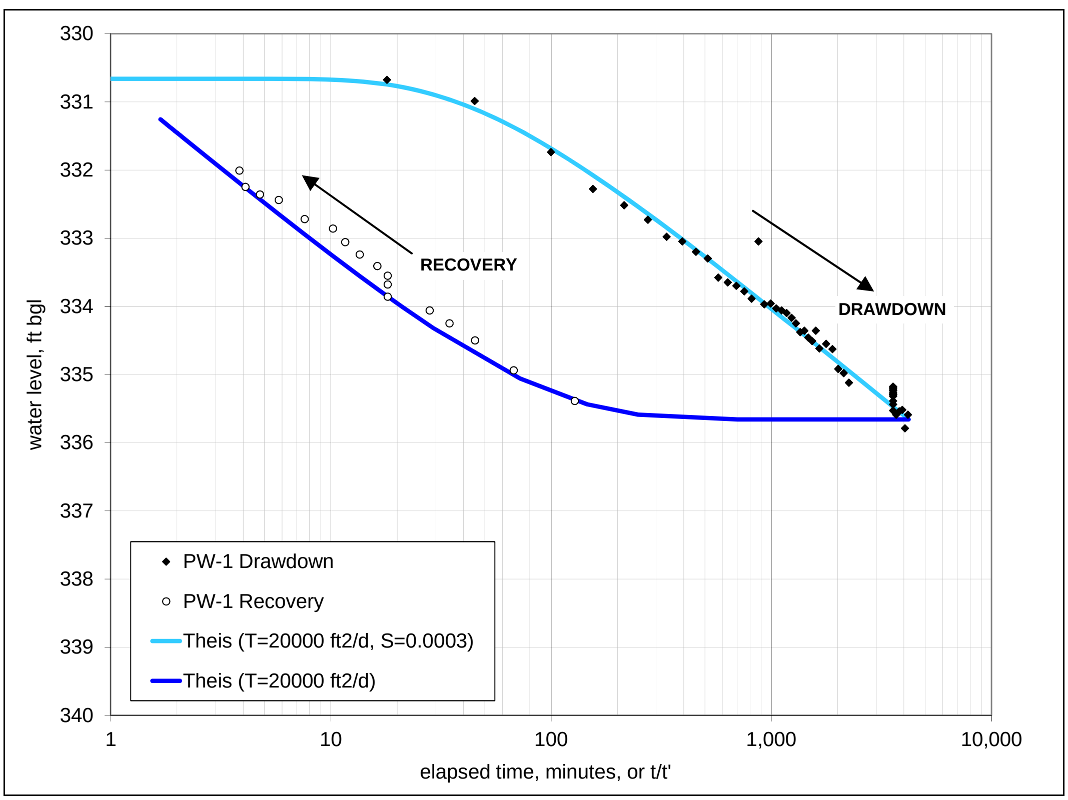


Figure 5.3. Drawdown and recovery in PW-1 during January 1976 PW-2 pumping test.

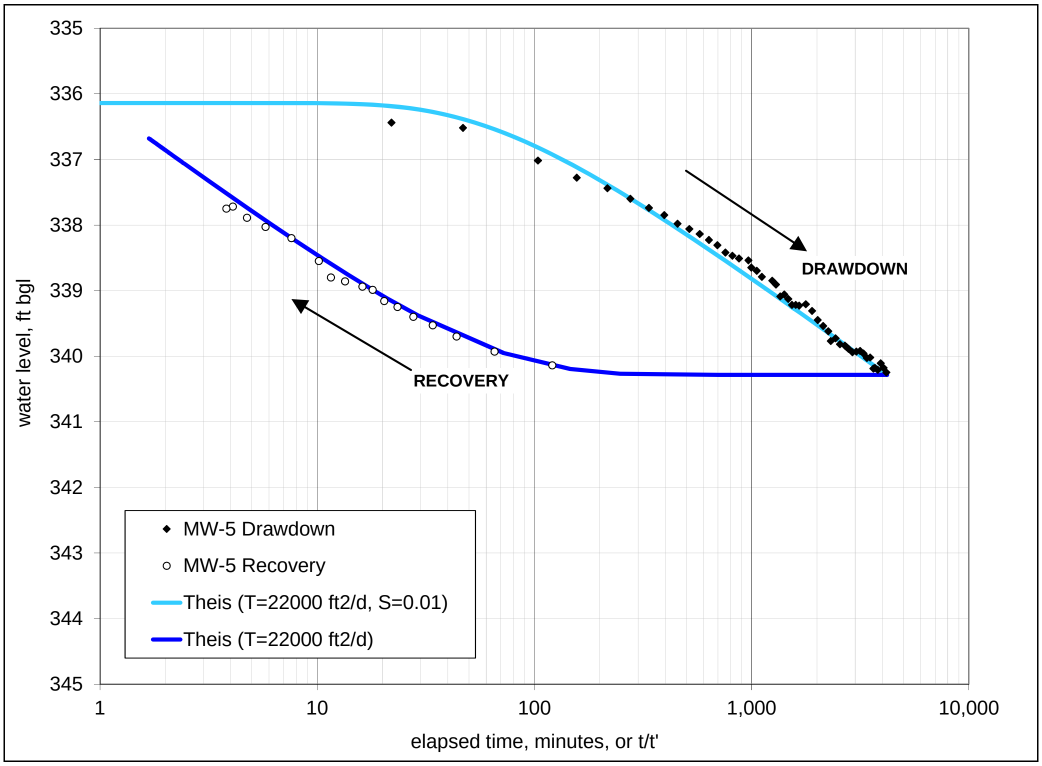


Figure 5.4. Drawdown and recovery in MW-5 during January 1976 PW-2 pumping test.

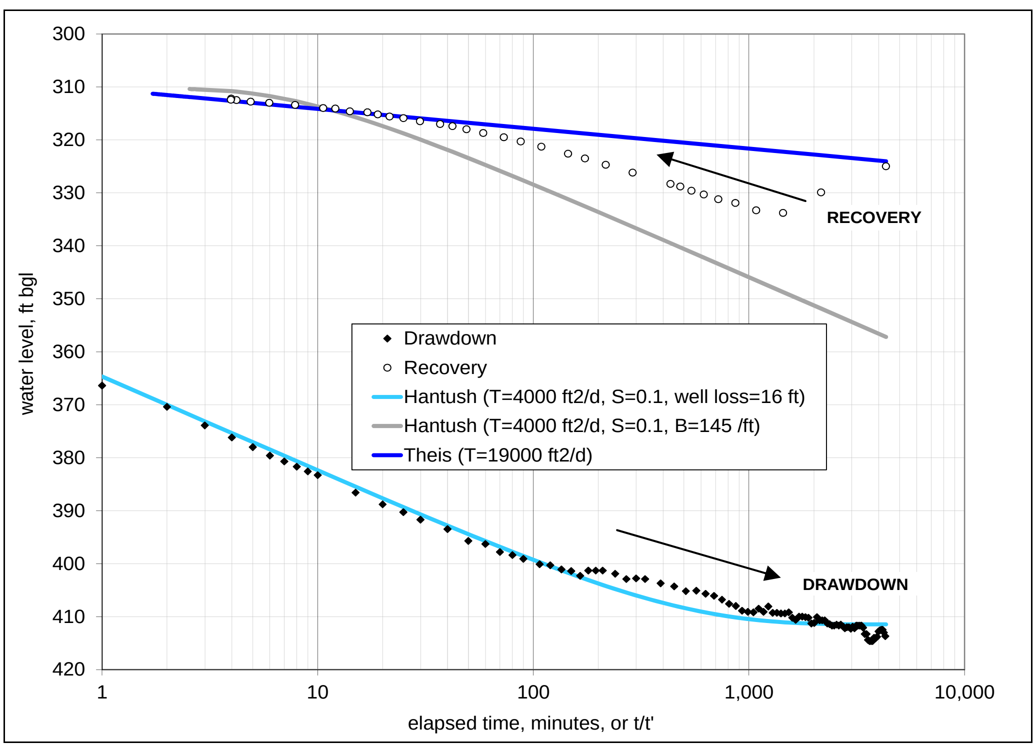


Figure 5.5. Drawdown and recovery in PW-2 during January 1976 PW-2 pumping test.

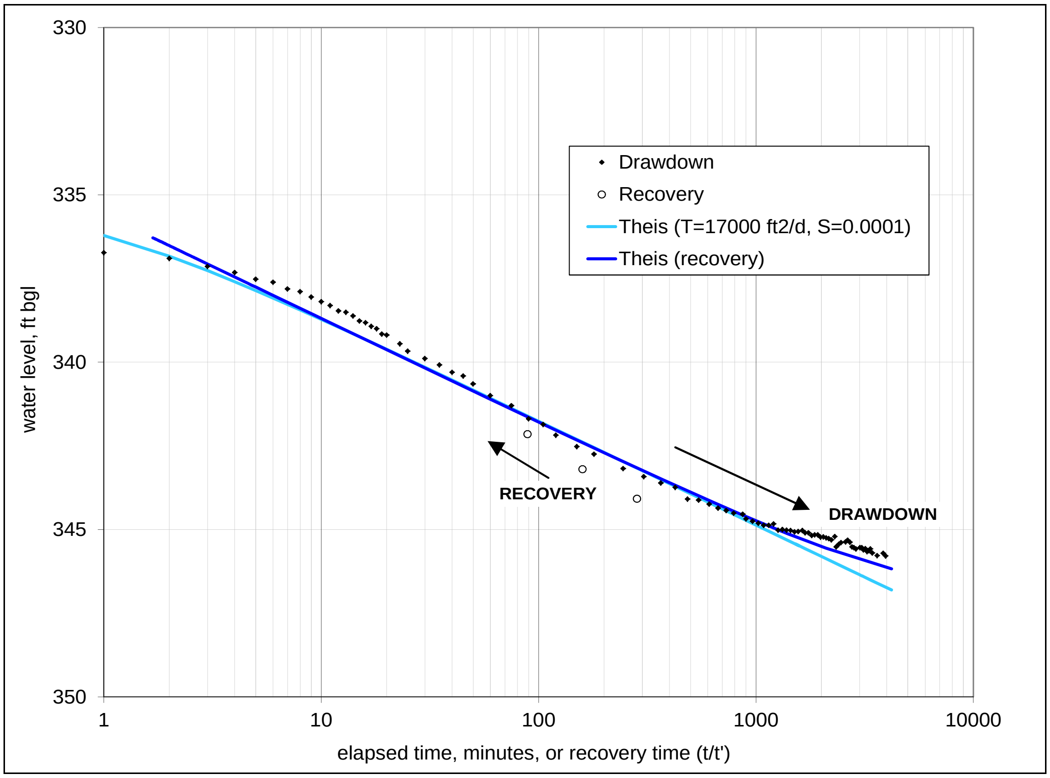


Figure 5.6. Drawdown and recovery in MW-5 during December 1975 PW-1 pumping test.

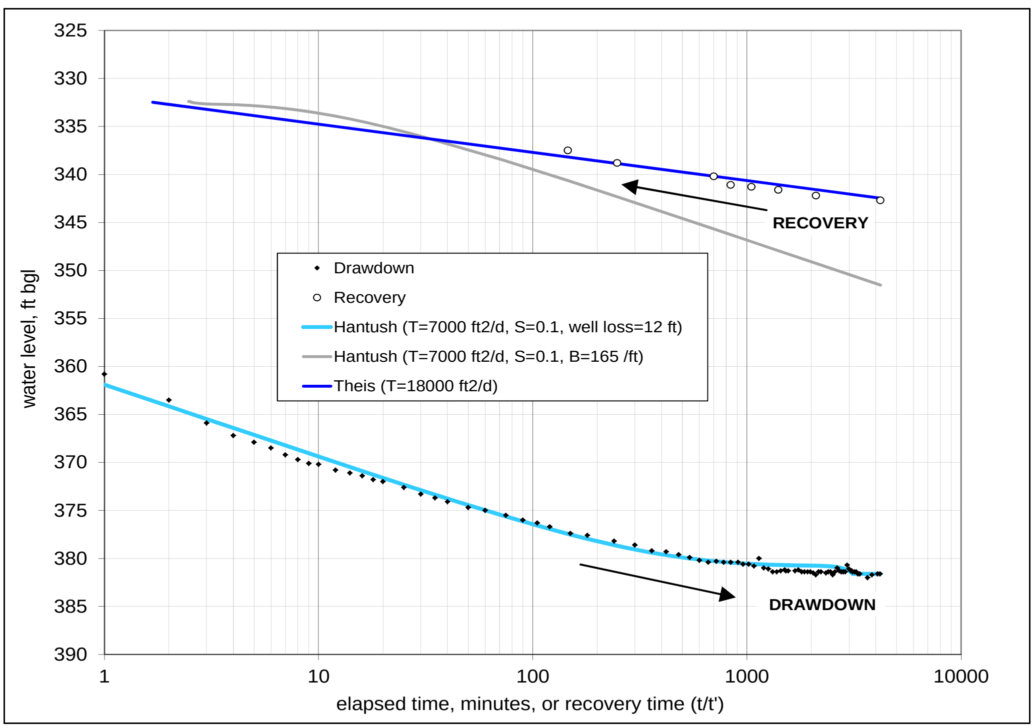


Figure 5.7. Drawdown and recovery in PW-1 during December 1975 PW-1 pumping test.

5.2.2 Period of Mine Operation, 1982

The well field was operated for 4 months from March through June 1982, at an average pumping rate of 2,272 gpm. Some pumping, averaging 40 gpm, continued for 16 months more. Average pumping rates (Bailey, 2010) are presented in Table 5.1. Total volume pumped for 1980-83 was 1,317 ac-ft.

Water levels measured in MW-5, in the immediate area of the production wells, are shown along with well field pumping on Figure 5.8, showing about 20 ft of water level drawdown due to pumping.

West of the well field, no response to pumping can be seen in water levels at MW-6, shown on Figure 5.9.

Long-term water-level trends from MW-6 show a slow rise of approximately 170 ft over 30 years. When compared to other wells in the region, water-quality data indicates groundwater from MW-6 has an anomalously high sodium chloride component. Furthermore, there are mapped north-south fault traces in the immediate vicinity of MW-6 (Seager, et al. 1982; Hawley, 2012).

Water Development Corporation (1975) reported the following: "the anomalous highs to which the water level recovered indicated that the well was being recharged by an unknown source of water (either perched water or possibly slow seepage up the well bore from the sand stringers underlying the clay layer) and that the aquifer materials were too plugged with drilling mud to allow this water to move freely into the formation."

Over time, as MW-6 was pumped, the well slowly developed and became hydraulically connected to sodium-chloride groundwater locally upwelling along an extensional fault zone. Sodium-chloride groundwater is known to upwell along structures in the Rio Grande Rift (Witcher et al., 2004). In conclusion, the observed groundwater head and water level trend from MW-6 is not representative of the regional Santa Fe Group aquifer system.

Table 5.1. Recorded average well field pumping in gallons per minute

1980	1	Jul-82	70	Mar-83	29
1981	1	Aug-82	43	Apr-83	31
Jan-82	29	Sep-82	60	May-83	68
Feb-82	29	Oct-82	34	Jun-83	26
Mar-82	1,817	Nov-82	40	Jul-83	43
Apr-82	3,042	Dec-82	43	Aug-83	25
May-82	1,501	Jan-83	43	Sep-83	16
Jun-82	2,727	Feb-83	48	Oct-83	29

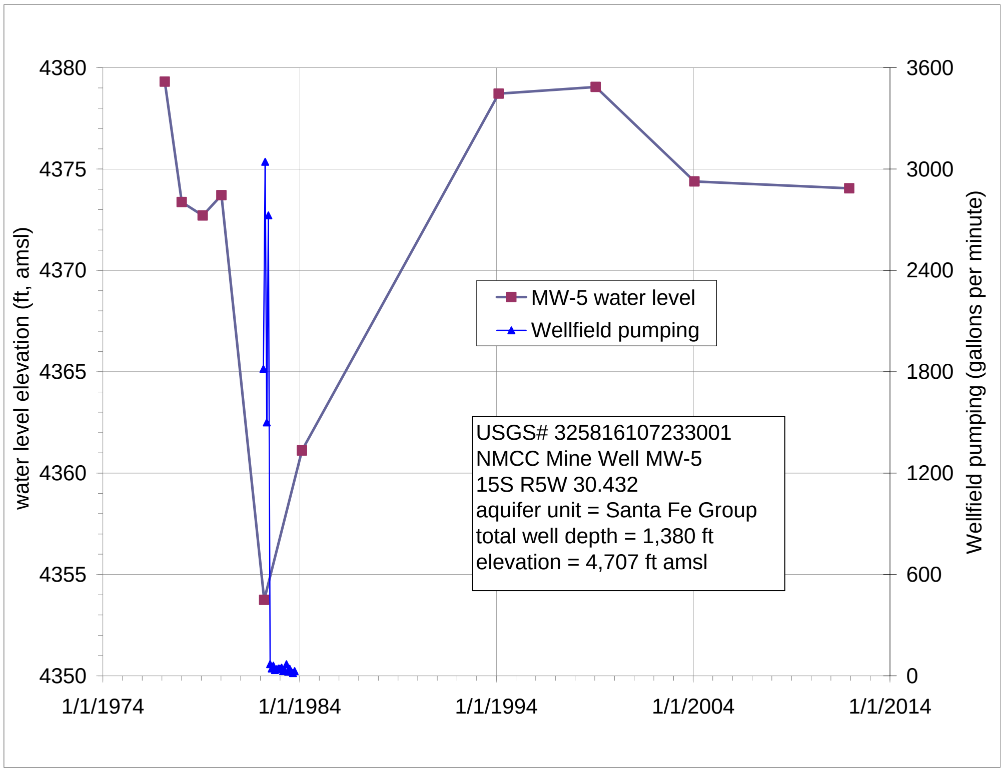


Figure 5.8. Well field pumping history and water level in MW-5.

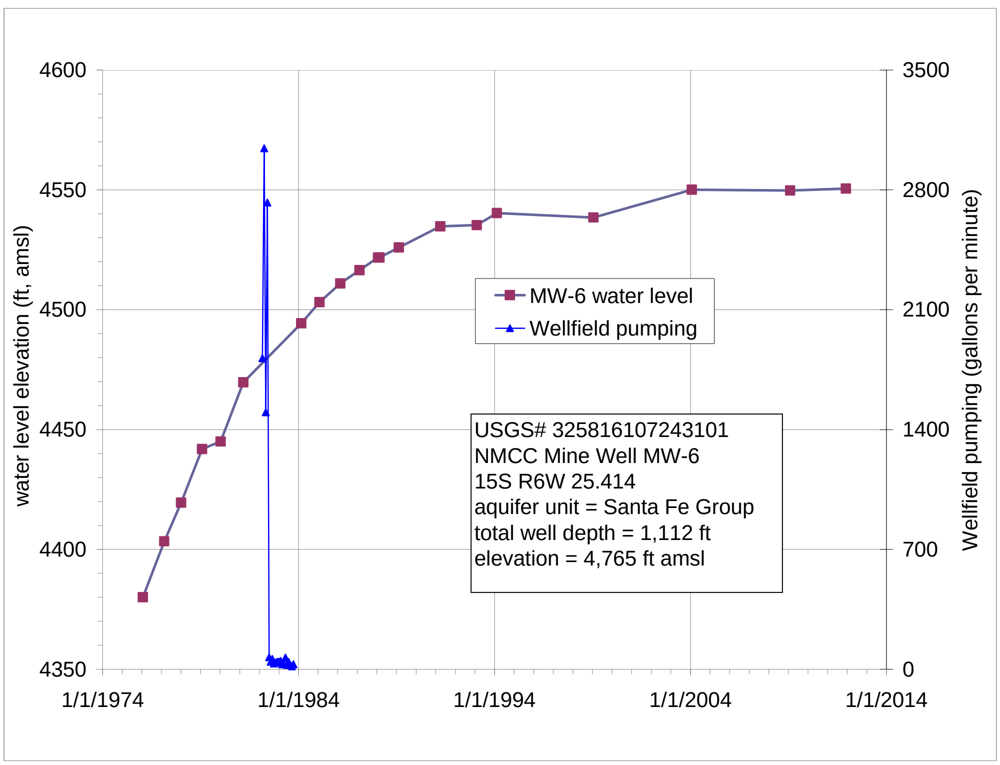


Figure 5.9. Well field pumping history and water level in MW-6.

Water levels in four wells monitored by the USGS, located east of the well field along Las Animas Creek and Seco Creek (Fig. 5.2), are shown on Figure 5.10 along with the recorded well field pumping. There is no clear response to pumping seen in any of the wells.

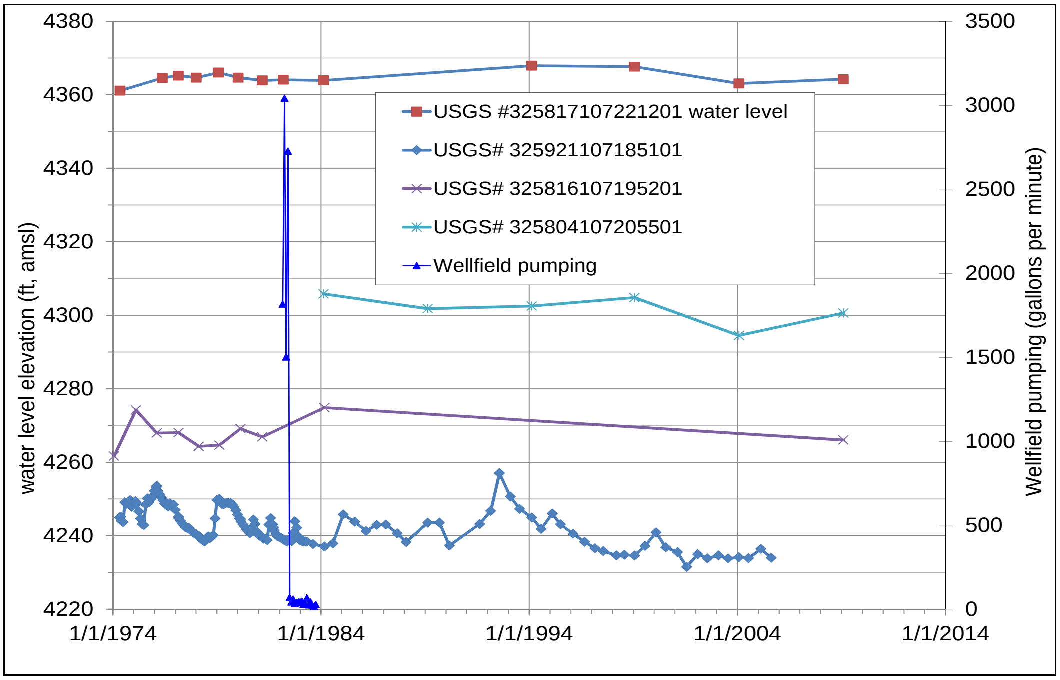


Figure 5.10. Well field pumping history and water level in USGS wells.

5.2.3 MW-9 Test, October 1994

Well MW-9, in the Palomas Graben near Las Animas Creek (Fig. 5.2.), is completed at a depth of about 250 ft. MW-10 and MW-11 are each about 50 horizontal ft from MW-9. MW-10 is completed at a depth of 125 ft and MW-11 at 37 ft. Responses at MW-10 and MW-11 to pumping at MW-9 therefore characterize the resistance to vertical flow through the SFG and alluvial aquifers.

In order to characterize vertical hydraulic communication between the SFG and alluvial aquifers (Adrian Brown Consultants, 1996), MW-9 was pumped at 90 gpm for 24 hours (Appendix C2). Drawdown and recovery at MW-9 are presented on Figure 5.11 along with a matching Hantush leaky-aquifer type-curve corresponding with transmissivity of 900 ft^2/day.

Drawdown and recovery in MW-10 are shown on Figure 5.12, showing a small response (<1 ft) to pumping, indicating possible limited vertical transmission of effects, but also showing more fluctuation due to background influences than drawdown in response to pumping. No response to pumping was detected in the shallow alluvium well MW-11; water levels rose during the test, as shown on Figure 5.13 (no analytical curves are shown on Figures 5.12 and 5.13, as the measured data show no drawdown-recovery trends to analyze).

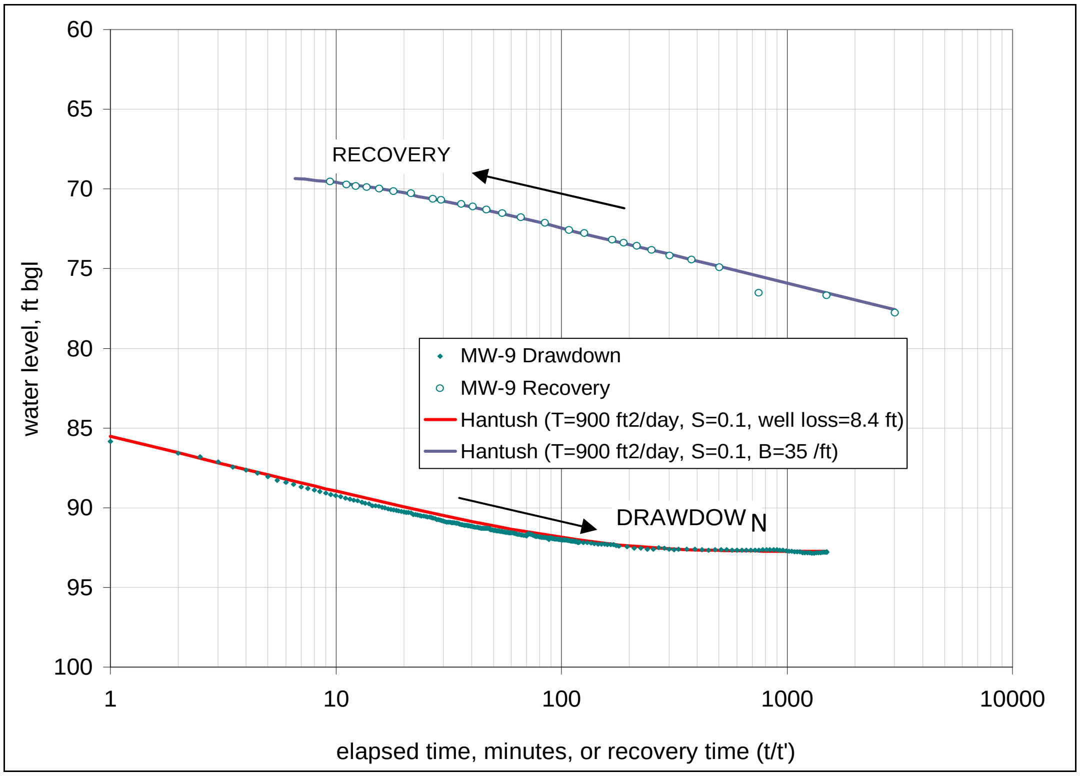


Figure 5.11. Drawdown and recovery in MW-9 during 1994 pumping test.

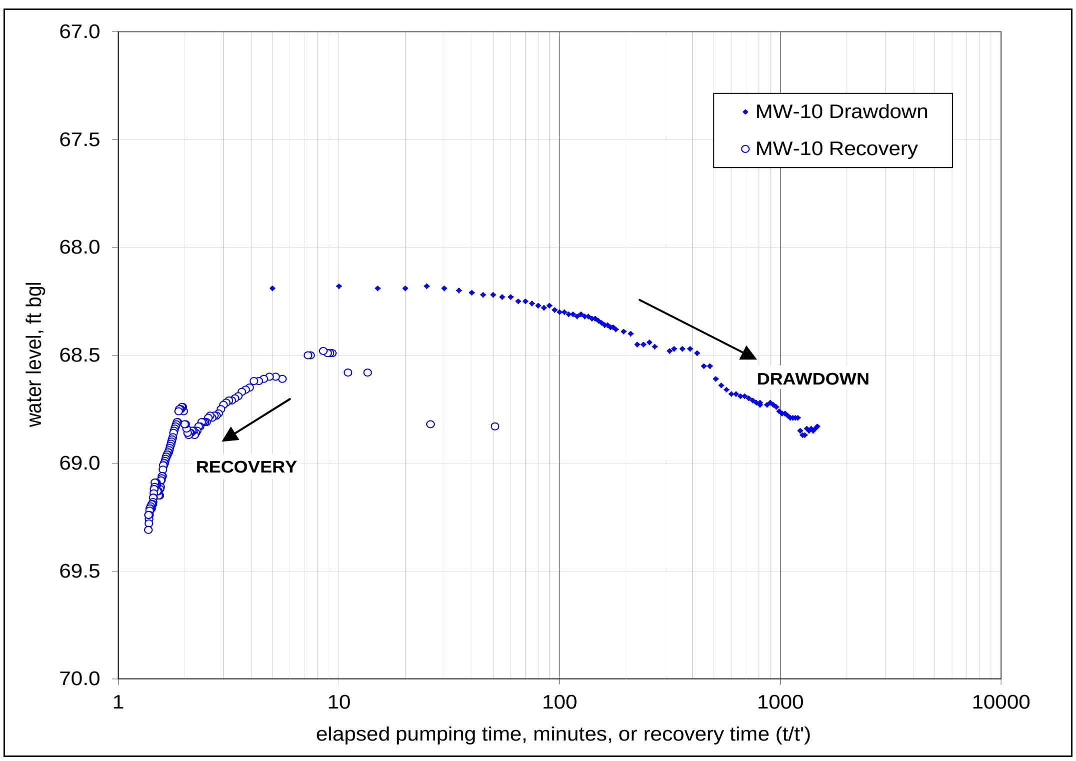


Figure 5.12. Drawdown and recovery in MW-10 during and after 1994 pumping of MW-9.

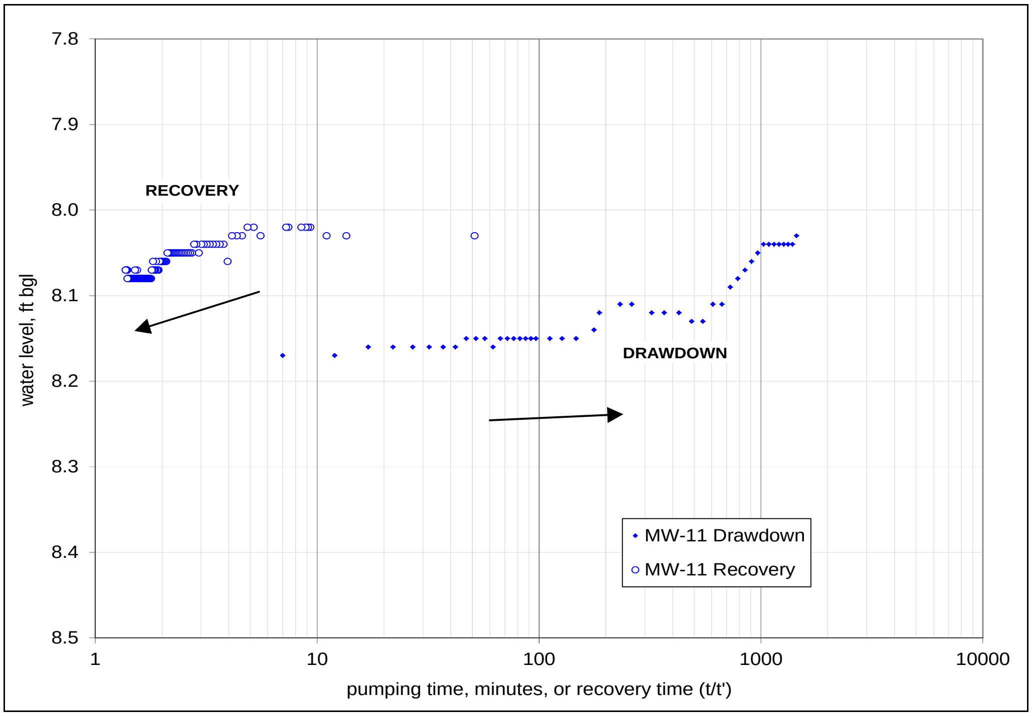


Figure 5.13. Drawdown and recovery in MW-11 during and after 1994 pumping of MW-9.

5.2.4 December, 2012 Aquifer Test

Pumping of wells PW-1 and PW-3 began on 19 November 2012 with initial testing of the pumps, circuitry and plumbing. Sustained pumping began on 3 December, was interrupted by technical difficulties on 8 December, resumed on 10 December and continued until 21 December 2012. Recorded pumping periods and rates are shown on Figure 5.14. Measured pumping-well and observation-well water levels are presented in Appendix C3. Due to the multiple pumping wells, periods and rates, the 2012 aquifer test is not easily characterized using the analytical type curves shown on Figures 5.3 through 5.7 and 5.11 above.

In addition, the analytical type curves do not reflect the particular geometry of the aquifer including the Palomas Graben. Wells within the Palomas Graben did not respond to pumping as they would in an extensive aquifer; initial drawdown was rapid and followed a semi-linear trend with time. Initial post-pumping water-level recovery was also rapid. These drawdown and recovery responses to pumping are characteristic of a high-transmissivity, semi-isolated hydrogeologic unit of finite size (the Palomas Graben).

The 2012 test is analyzed using the numerical model (Section 6.4.3 below). Measured responses in the pumping and observation wells shown on Figure 5.15 were used to calibrate the aquifer parameters for the numerical model, particularly the aquifer parameters of the Palomas Graben (Table 6.1 below) and the conductive properties of the graben-bounding faults (Table 6.2).

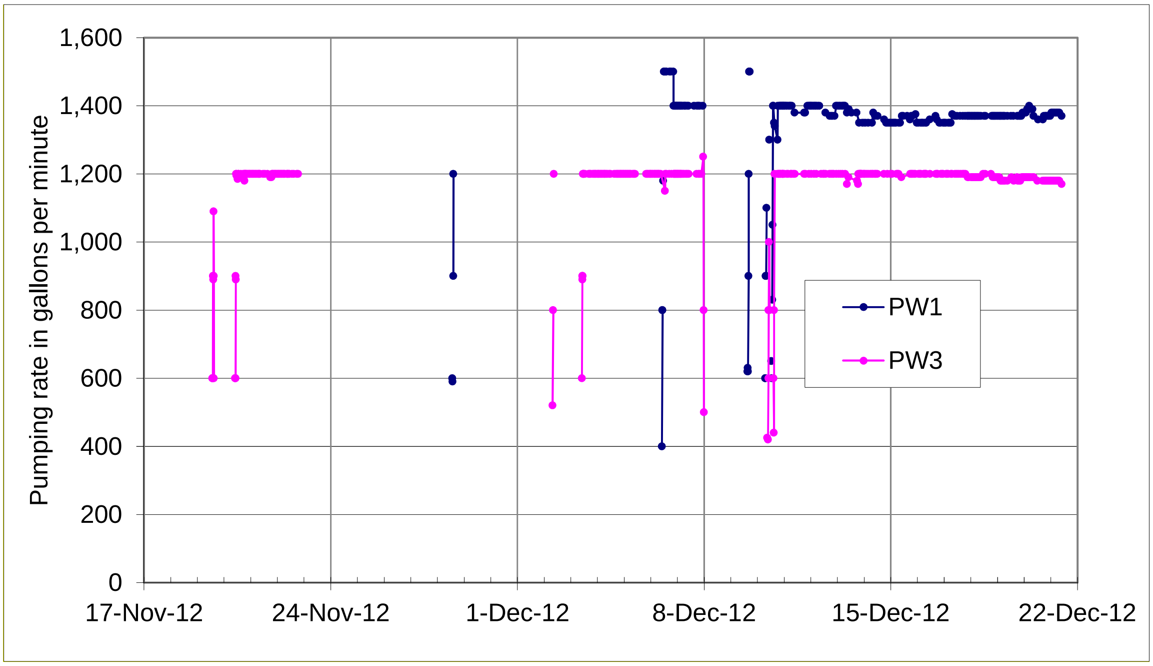


Figure 5.14. Measured aquifer test pumping rates.

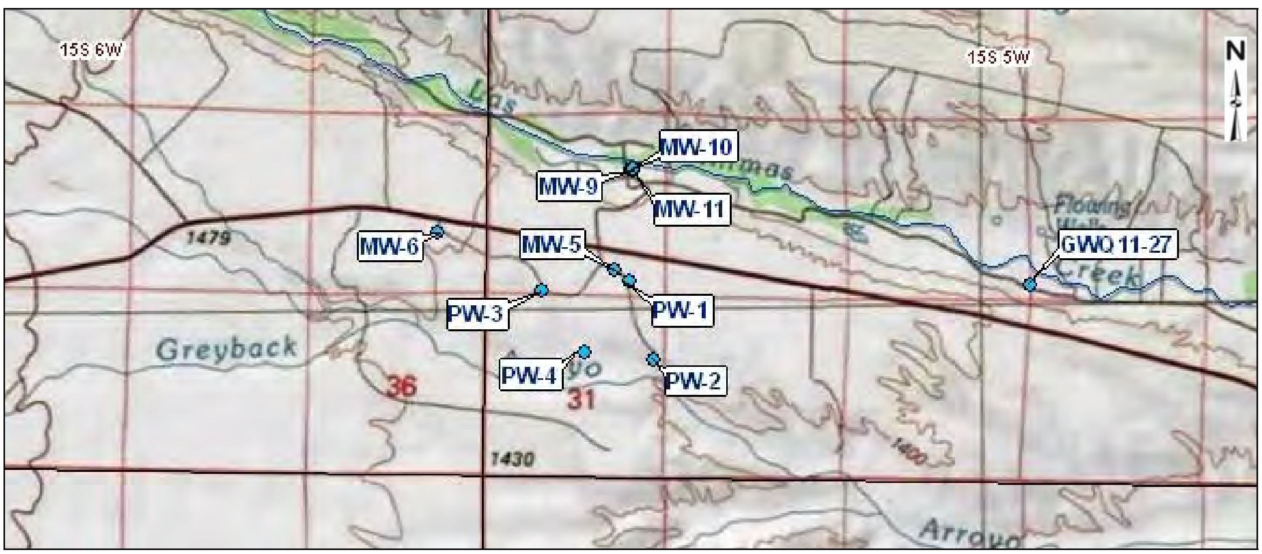


Figure 5.15. Aquifer test pumping and observation wells.

5.3 Tailings Impoundment Area

During and after the period of mine operations in 1982, the groundwater system beneath the unlined tailings facility was recharged by seepage from the tailings, in the portion of the impoundment overlying alluvium. Measured tailings-area (Fig. 5.2) water levels, shown on Figure 5.16, indicate 60 to 70 ft of water-level rise that has persisted to the present, indicating a fault, or other barrier to flow, holding the water in place.

Transmissivity in the range of 100 to 240 ft^2/day is estimated for this area at the edge of the SFG aquifer, based on the results of a 1994 aquifer test at well GWQ94-17, presented below.

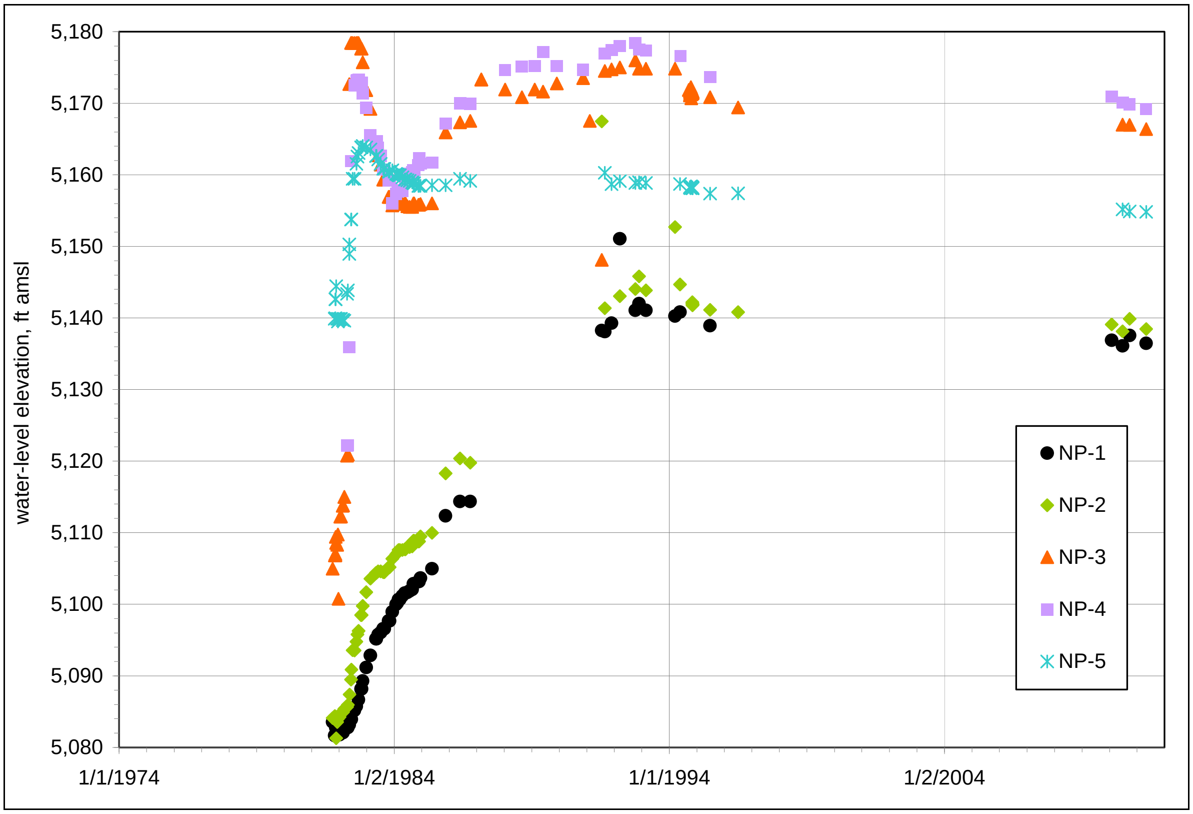


Figure 5.16. Tailings-area water levels.

5.3.1 GWQ94-17 Test, November 1994

As part of an investigation of leakage from, and groundwater flow beneath, the existing tailings impoundment (Adrian Brown Consultants, 1996), well GWQ94-17 was pumped at 23 gpm for 4,688 minutes (3.3 days), with responses measured in GWQ-13, GWQ-14 and GWQ-15 (Fig. 5.2). Complete test results are presented as Appendix C4.

Drawdown and recovery in GWQ-13 and GWQ-14 are presented on Figures 5.17 and 5.18 respectively, along with analytical (Theis, 1938) solutions. Drawdown in GWQ-15 is presented on Figure 5.19 (recovery data were unavailable) along with two Theis solutions, respectively matching distinct early and late-time trends and showing a range of possible transmissivity. Recovery in the pumping well GWQ-17 is presented on Figure 5.20 (pumping water level was constant at about 123 ft).

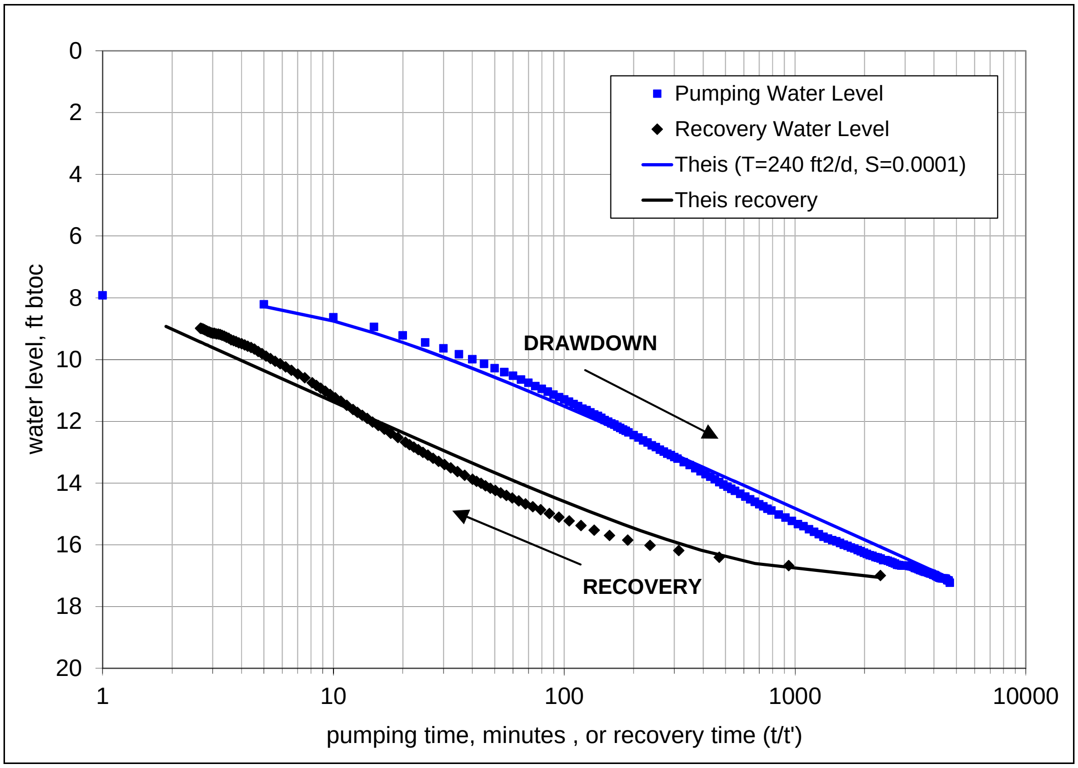


Figure 5.17. Drawdown and recovery in GWQ-13 during 1994 GWQ-17 pumping test.

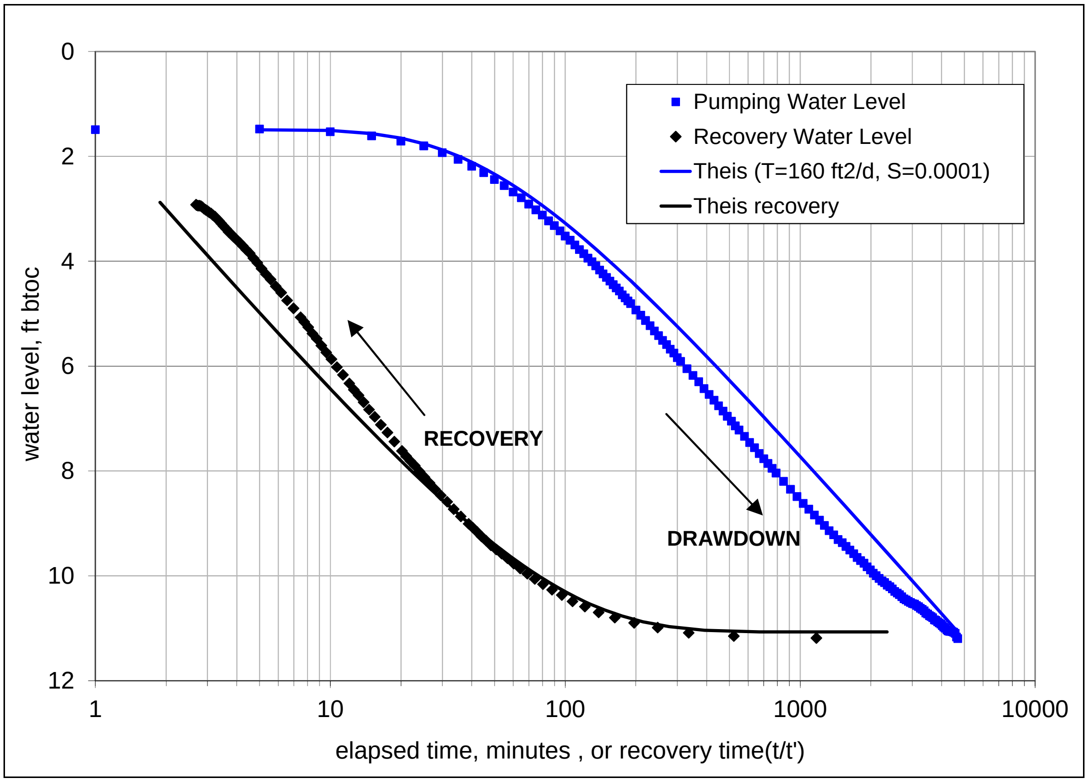


Figure 5.18. Drawdown and recovery in GWQ-14 during 1994 GWQ-17 pumping test.

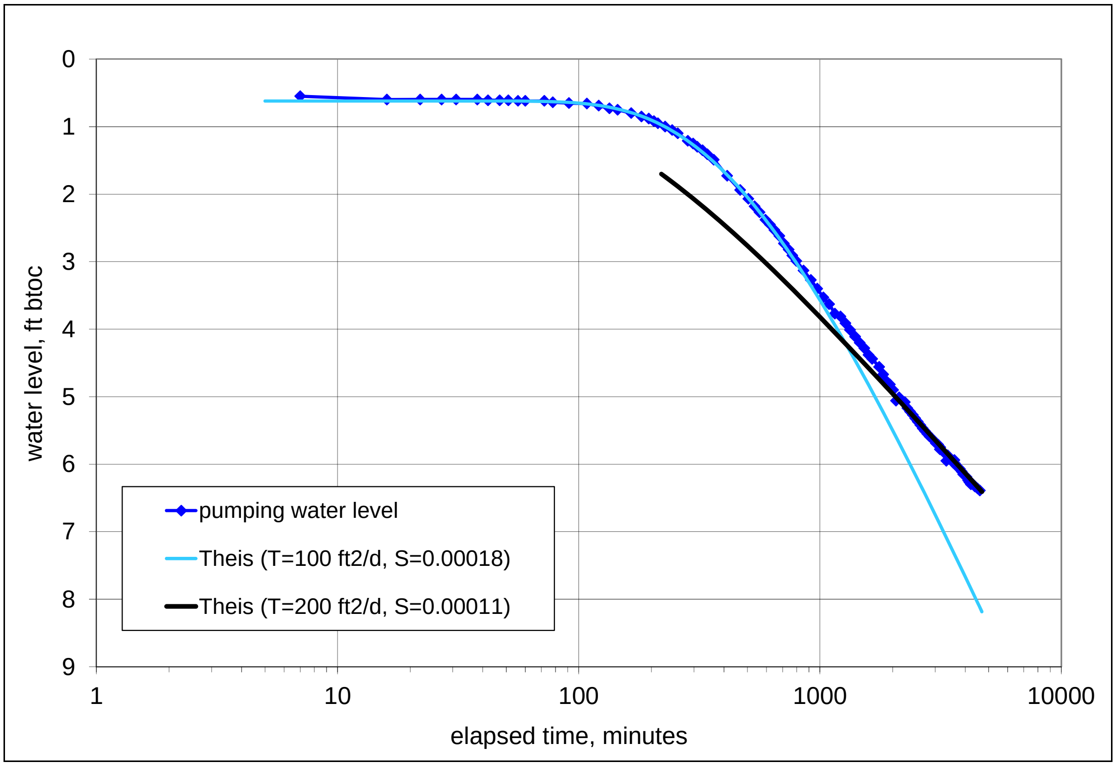


Figure 5.19. Drawdown in GWQ-15 during 1994 GWQ-17 pumping test.

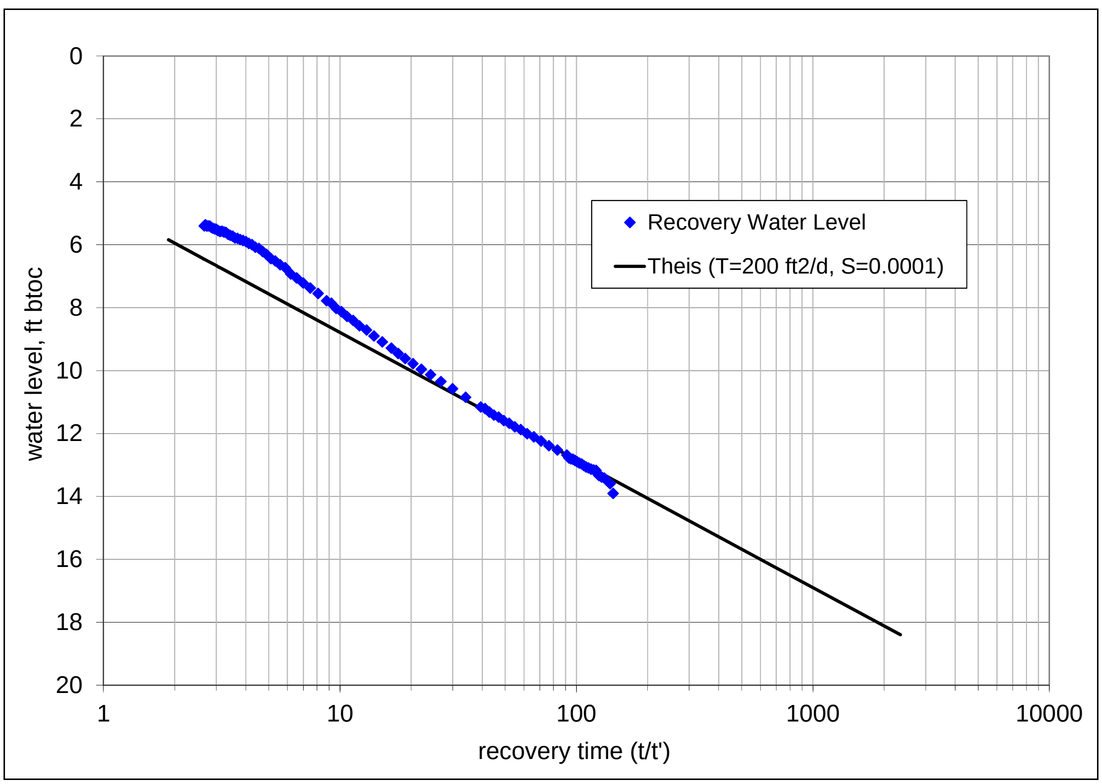


Figure 5.20. Recovery in GWQ-17 after 1994 pumping test.

5.4 Open Pit Area

The historical water level in the open pit has ranged between 5,435 and 5,450 ft amsl, corresponding to a water-surface area between 5 and 14 acres. Based on an evaporation rate of 64.6 in./yr (Table 2.1), annual open-pit evaporation has ranged from about 16 gpm to 45 gpm.

This discharge is supported by a combination of groundwater inflow, direct precipitation and runoff. Based on precipitation records it is estimated that the annual pit water balance (16 to 45 gpm of discharge by evaporation) is provided by 6 to 10 gpm of groundwater inflow and the rest (6 to 40 gpm) by precipitation and runoff.

The groundwater inflow component would increase with future pit expansion and dewatering. The post-mining open pit, larger and deeper than the existing pit, would have a larger groundwater inflow and larger evaporation.

Current pit water levels are below 5,440 ft amsl, with water balance in the low range of the estimate. The pit is a hydrologic sink, as shown on the contour map of the local piezometric surface, Figure 5.21.

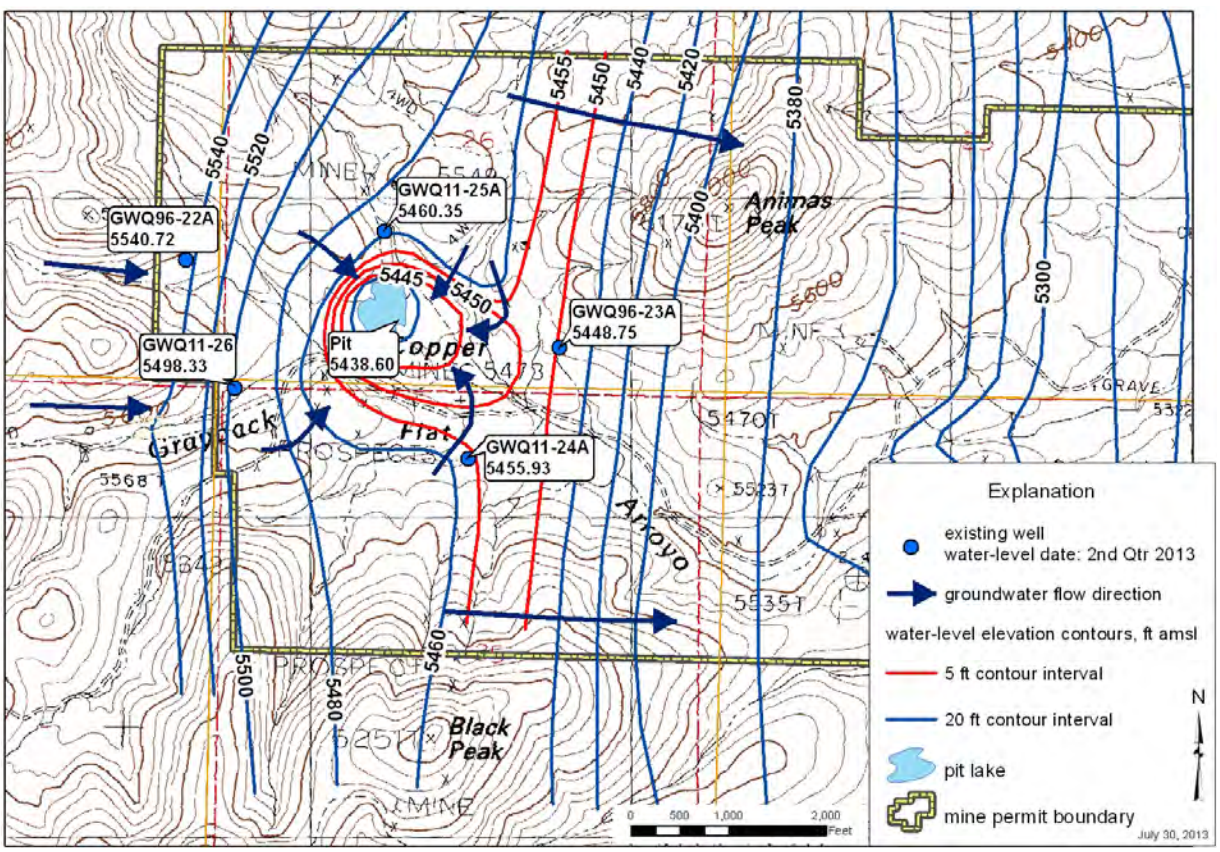


Figure 5.21. Measured pit-area groundwater levels.

5.4.1 Pit Area Pressure-Injection Tests, September 2011

Pressure-injection testing in the bedrock around the pit, in wells GWQ 5-R, GWQ 11-24, and GWQ 11-25 (Appendix C5), is summarized in Table 5.2. Apparent permeability of the bedrock ranges from near zero, to about 0.1 ft/day in the most fractured zones.

Table 5.2. Summary of pressure-injection test results

borehole and zone	depth interval (ft)	apparent permeability	
		(cm/sec)	(ft/day)
GWQ 5-R, Zone 1	64-100	~0	~0
GWQ 11-24, Zone 1	100-147	7×10^{-6}	0.02
GWQ 11-24, Zone 2	150-197	3.0×10^{-5}	0.085
GWQ 11-24, Zone 3	204-251	4.9×10^{-5}	0.14
GWQ 11-25, Zone 1	100-148	~0	~0
GWQ 11-25, Zone 2	150-198	2.9×10^{-5}	0.081
GWQ 11-25, Zone 3	207-251	2.6×10^{-5}	0.074

cm/sec - centimeters per second

5.5 Flowing Wells

The first artesian wells in the study area were drilled in the late 1930s. Most of the artesian wells were drilled prior to the New Mexico Office of the State Engineer (NMOSE) declaration of Las Animas Creek and Lower Rio Grande Underground Water Basins in 1968 and 1980, respectively.

Flow from selected artesian wells (Fig. 5.2) has been measured by Murray (1959), Davie and Spiegel (1967), JSAI (1995), and JSAI (2011c). A summary of aggregate measured artesian flow rates is presented in Table 5.3. Note that the "total artesian flow" estimates in Table 5.3 considered only a partial sample of flowing wells in the area; total artesian discharge for the study area is greater than the flows presented in Table 5.3.

Table 5.3. Summary of measured artesian flow rates

source	number of wells	year	total artesian flow (gpm)	comments
Murray (1959)	23	1946	460	included Percha, Las Animas Creek, and Oasis areas
Davie and Spiegel (1967)	29	1966	1,186	Las Animas Creek area only
JSAI (1995)	12	1995	1,319	survey limited to accessible wells with owner permission
JSAI (2011c)	21	2011	222	survey limited to accessible wells with owner permission

JSAI - John Shomaker & Associates, Inc. gpm - gallons per minute

Construction details for the artesian wells are limited, but it appears a number of artesian wells were drilled without proper annular seals to prevent flow of water from the artesian zone into the overlying alluvium and stream channels. Furthermore, many of the artesian wells were never valved, and therefore left open to flow continuously at the land surface. Valves to regulate artesian flow, and metering, have been conditions to permits since the State Engineer declaration of the basin.

Over the last 50 years significant changes in flow rates have been observed in the few artesian wells that have time-series data. Measured artesian flow rates over time are presented in Figure 5.22, showing declines in flow rates from individual wells (except, apparently, from FW-7) along Percha and Las Animas Creeks.

There are many factors that affect artesian flow, including time of year, climatic conditions, and water level in Caballo Reservoir. Some wells may have been modified, repaired, or re-drilled. Upward leakage via artesian wells and open flow, however, appear to be mainly responsible for the long-term decline in artesian flow rates.

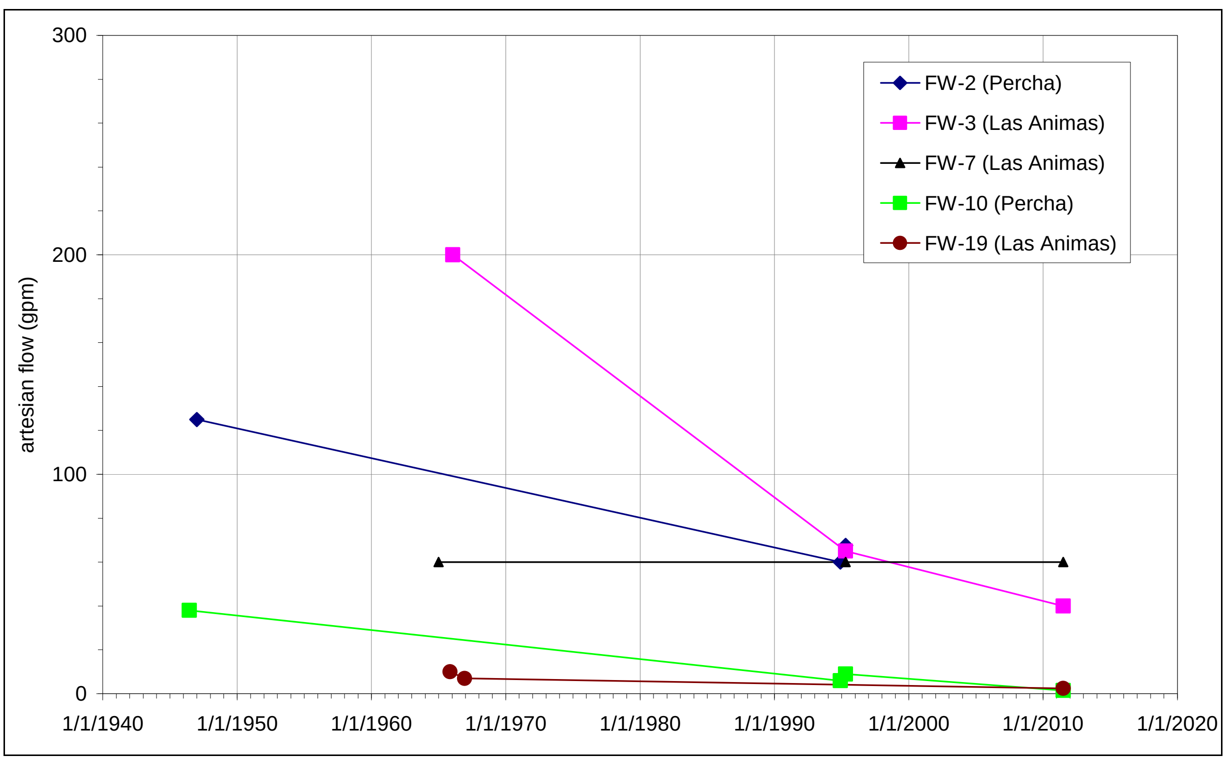


Figure 5.22. Measured artesian flow rates.

6.0 NUMERICAL MODEL

The computer program used for the hydrologic model is a version of the U.S. Geological Survey *Modular Three-Dimensional Finite Difference Ground-Water Flow Model, MODFLOW* (McDonald and Harbaugh, 1988). Modifications to the original computer program are documented in Appendix D.

Inputs to the model include (1) hydraulic parameters that control the flow of water within the model domain, and (2) boundary conditions that control the addition and removal of water to and from the model domain.

Several model simulations were developed representing different time periods and conditions:

1. **Steady-state**: Represents hypothetical pre-development steady conditions, used as starting condition for the pre-mining transient simulation.
2. **Pre-mining** (transient): Simulates the period 1940 to mid-1980, including the effect of flowing artesian wells on the system.
3. **Mining and post-mining**: Simulates the period from mid-1980 through November, 2012 including the brief period of mine operation in 1982 and the post-mining period.
4. **Aquifer test**: Simulates the period from the start of the 2012 well-field pumping test (late November, 2012), through year 2014.
5. **Future-mining scenarios**: Simulate the estimated water demand for selected scenarios. In addition, a no-mining scenario simulates continued background conditions. The effects of each mining scenario, including groundwater level drawdown and surface-discharge reduction, were evaluated by comparing results of each simulation to the equivalent results of the no-mining scenario.
6. **Future-post-mining scenarios**: Simulate the post-mining period for each future-mining (and no-mining) scenario, including continued surface-discharge effects and recovery of water levels in the SFG aquifer and in the open pit.

6.1 Model Discretization

The model grid, consisting of 87 rows, 109 columns, and 4 layers, is shown on Figure 6.1. Horizontal grid spacing ranges from 200 ft in the pit area, increasing to 1/4 mile (1,320 ft) away from the mine. Layer 1 is active only along lower Las Animas and Percha Creeks and near the axis of the Rio Grande, representing the shallow aquifer composed of alluvium and SFG sediments, with modeled thickness ranging from 100 to 200 ft. Layers 2 through 4 represent the SFG aquifer and different bedrock units, with modeled thicknesses ranging from 500 to 3,000 ft (Table 6.1).

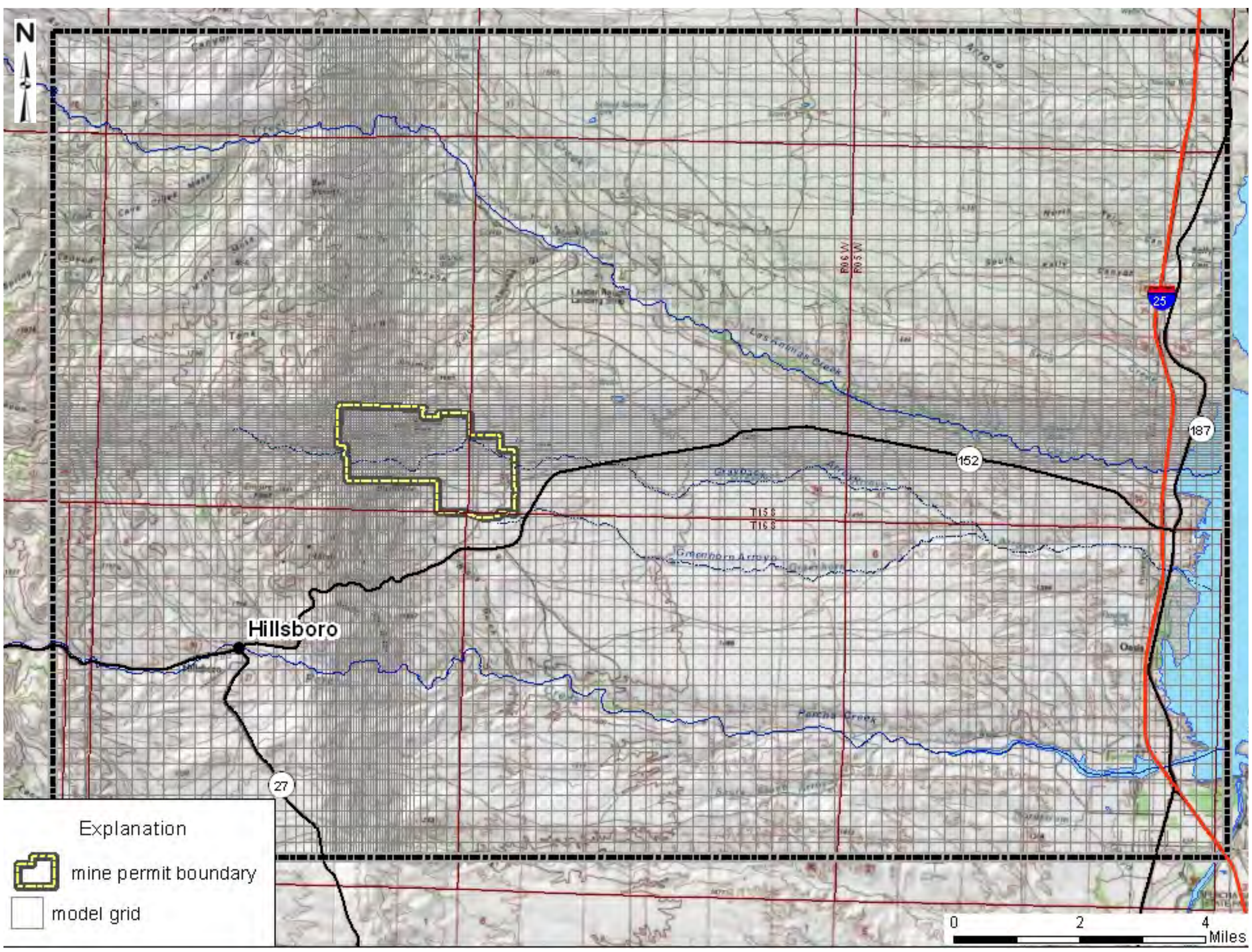


Figure 6.1. Model domain and grid.

6.2 Aquifer Parameters

Hydrogeologic units and fault barriers represented in each model layer are shown for layers 1 and 2 on Figures 6.2 and 6.3, and for layers 3 and 4 on Figures 6.4 and 6.5. Modeled aquifer parameters for each unit are shown on Table 6.1. Conductances of modeled fault barriers are shown on Table 6.2.

The layer 1 zones shown on Figure 6.2 include the shallow aquifer alluvium-SFG package along Las Animas Creek and a second, thicker zone along lower Animas, lower Percha and the Rio Grande Valley. Modeled aquifer parameters are shown on Table 6.1.

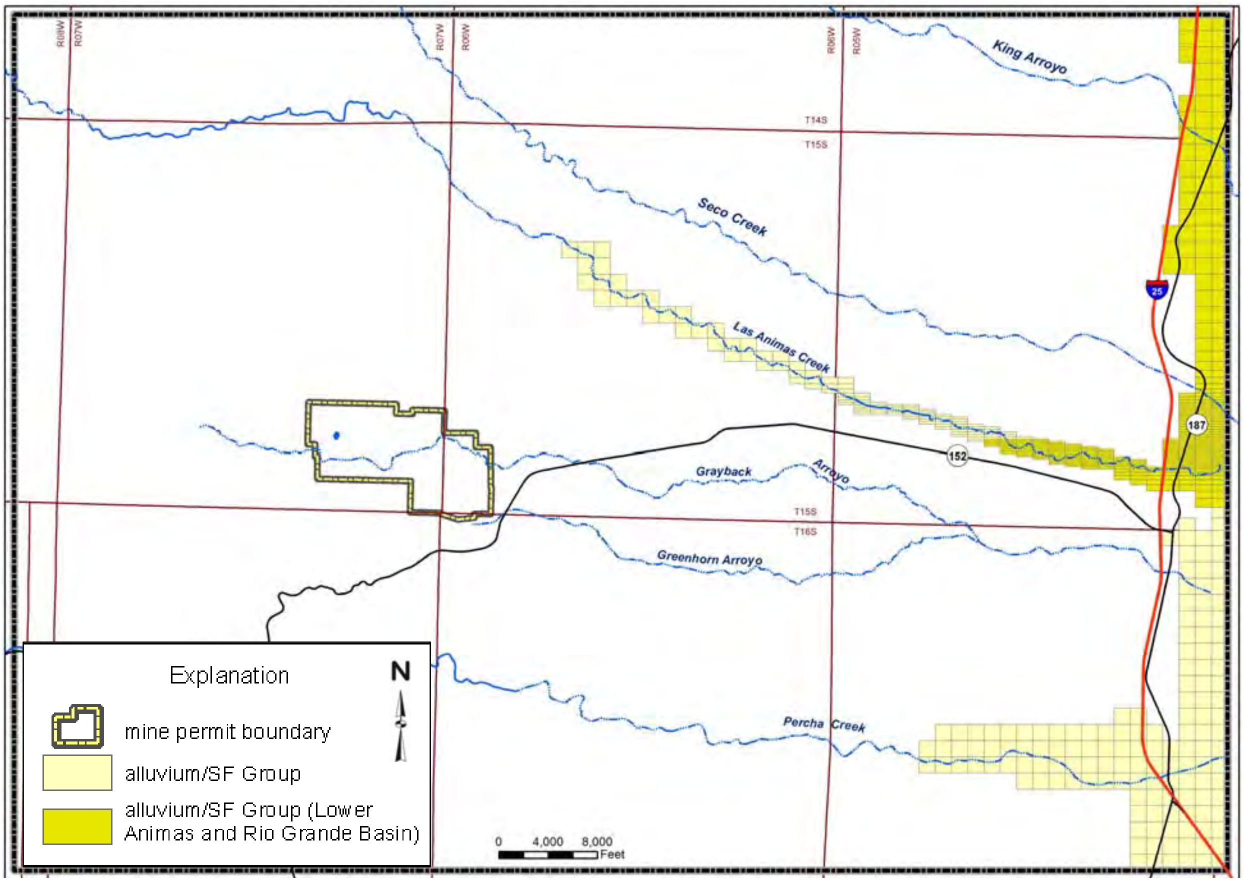


Figure 6.2. Layer 1 hydrogeologic zones

The modeled aquifer parameters (Table 6.1) include a high-transmissivity zone representing the Palomas Graben (Figs. 6.3, 6.4, and 6.5). The 2012 aquifer test results and subsequent model calibration further support the existence of the feature. Aquifer parameters of the graben (Table 6.1) and conductances of its bounding faults (Table 6.2) are based mainly on model calibration to the 2012 aquifer test results (Section 6.4.3 below).

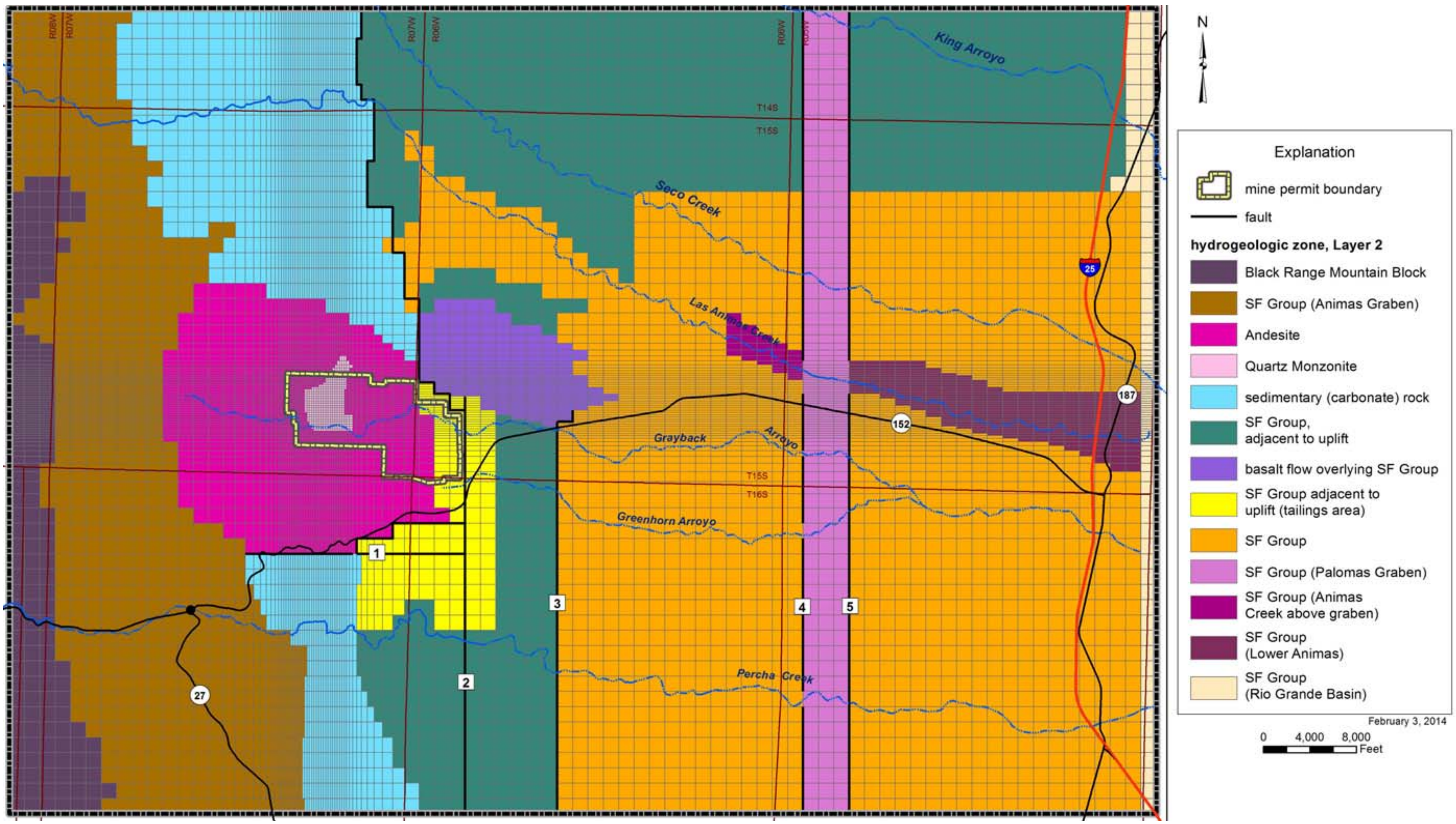


Figure 6.3. Layer 2 hydrogeologic zones.

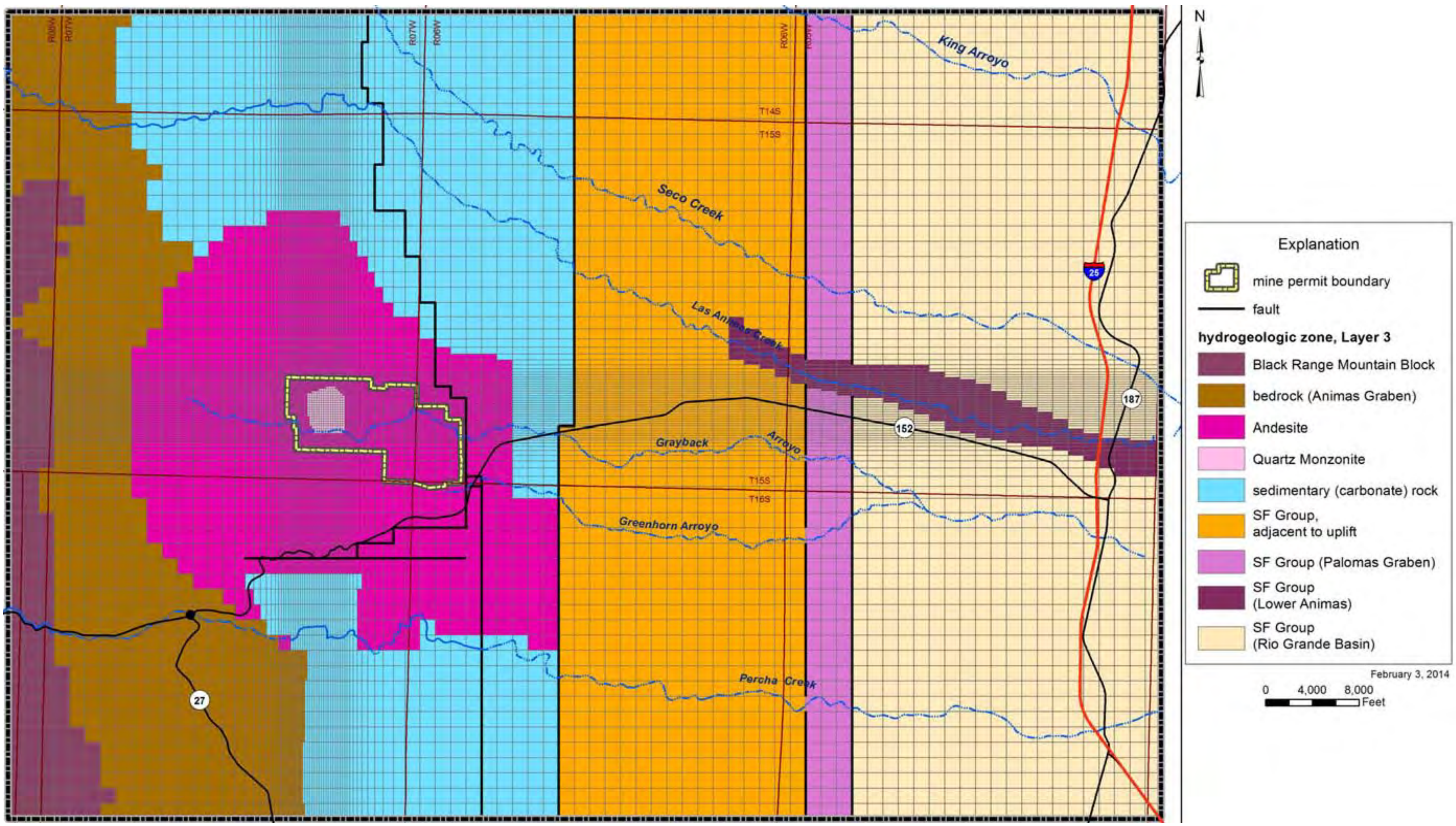


Figure 6.4. Layer 3 hydrogeologic zones.

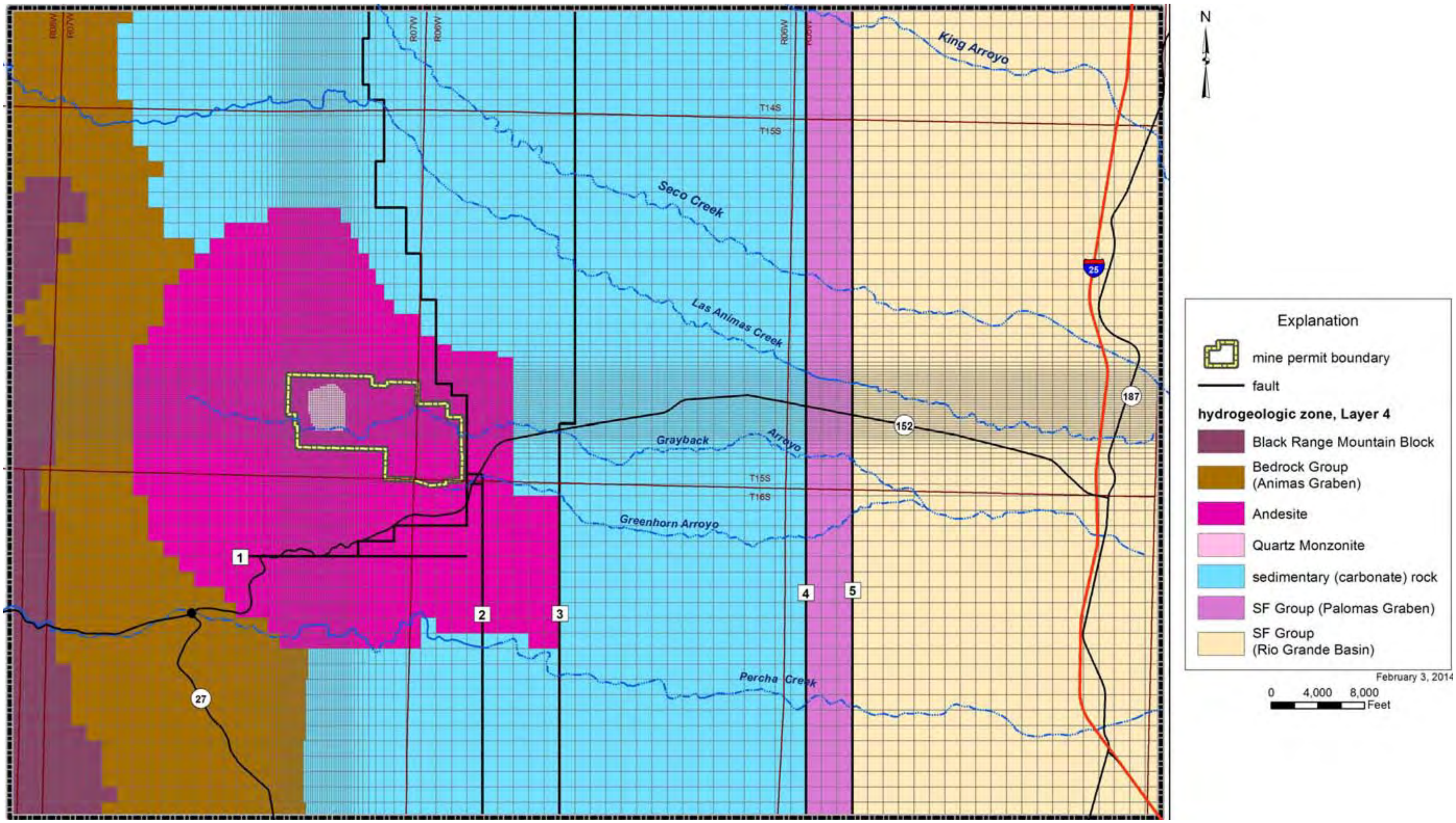


Figure 6.5. Layer 4 hydrogeologic zones.

The modeled aquifer parameters shown on Table 6.1 are based primarily on calibration of the model as a representation of the real system that is consistent with the different sources of information presented in Sections 3, 4 and 5 above. The model calibration results are presented below.

Different aquifer parameters are known with different degrees of certainty. Plausible ranges for different parameters, and the sensitivity of model results to variation of parameters within the plausible range, are discussed in Section 7 below.

Table 6.1. Modeled aquifer parameters

Hydrogeologic Unit	Transmissivity (ft^2/dy)	Saturated Thickness (ft)	Hydraulic Conductivity (ft/dy)	Vertical Anisotropy (ratio)	Specific Yield (%)	Storage Coefficient (%)
Layer 1						
Alluvium / SF Group	2,400	50	48.0	1.25E-04	10%	
Alluvium / SF Group (Lower Animas and Rio Grande Basin)	10,000	200	50.0	1.60E-04	10%	
Layer 2						
Black Range Mountain Block	2	1,000	0.002	0.01	0.1%	0.1%
SF Group (Animas Graben)	500	500	1.000	0.01	10%	10%
Andesite	2	1,000	0.002	0.01	0.1%	0.1%
Quartz Monzonite	2	1,000	0.002	0.01	0.1%	0.1%
Sedimentary (carbonate) rock	80	1,000	0.080	0.01	0.5%	0.5%
SF Group adjacent to uplift, edge of basin	200	1,000	0.200	1.0	5%	5%
SF Group adjacent to uplift (Upper Animas)	40	200	0.200	0.01	5%	5%
Basalt flow overlying SF Group	0.2	200	0.001	0.01	1%	1%
SF Group	900	1,000	0.900	0.01	10%	0.1%
SF Group (Palomas Graben)	1000	1000	10.000	1.0	10%	0.2%
SF Group (Animas Creek above graben)	2000	200	10.000	0.0001	10%	0.1%
SF Group (Lower Animas)	20000	1,000	20.000	0.01	10%	0.1%
SF Group (Rio Grande Basin)	20000	1000	20.000	1.0	10%	0.1%
Layer 3						
Black Range Mountain Block	2	2,000	0.001	0.01		0.01%
Bedrock (Graben)	700	1,000	0.700	0.01		0.01%
Andesite	2	2,000	0.001	0.01		0.01%
Quartz Monzonite	2	2,000	0.001	0.01		0.01%
Sedimentary (carbonate) rock	100	2,000	0.050	0.01		0.01%
SF Group, adjacent to uplift	400	2,000	0.200	0.01		0.4%
SF Group (Palomas Graben))	8,000	2,000	4.000	1.0		0.4%
SF Group, lower Animas	10,000	1,000	10.000	0.01		0.1%
SF Group (Rio Grande Basin)	800	2,000	0.400	0.01		0.4%
Layer 4						
Black Range Mountain Block	3	3,000	0.001	0.01		0.01%
Bedrock (Graben)	100	2,000	0.050	0.01		0.01%
Andesite	3	3,000	0.001	0.01		0.01%
Quartz Monzonite	3	3,000	0.001	0.01		0.01%
Sedimentary (carbonate) rock	150	3,000	0.050	0.01		0.01%
SF Group (Palomas Graben)	2,000	3,000	0.667	0.01		1%
SF Group (Rio Grande Basin)	2,000	3,000	0.667	0.01		0.6%

The modeled fault barriers are based on geologic interpretation and on model calibration. The barriers mainly represent a series of parallel north-south trending faults (Hawley, personal communication, 2012). The barriers shown on Figures 6.3 through 6.5 are simulated with conductance (transmissivity / fault thickness) shown on Table 6.2. The fault barriers include (Fig. 6.3):

1. A fault along the south side of the andesite cone, separating andesite from carbonate rock (Animas volcano fault system).
2. The mountain front fault (East Animas fault trend), generally following the bedrock / SFG contact, but running east of an embayment of SFG in the area of the 1982 tailings impoundment.
3. A parallel fault, east of the mountain front (Saladone Tank fault trend).
4. The west boundary of the Palomas Graben (West Palomas Graben Fault trend).
5. The east boundary of the Palomas Graben (East Palomas Graben Fault trend).

Conductance of the fault south of the andesite was based on the rapid change of water levels from the andesite to Percha Creek. Conductance of the mountain-front fault was based in part on the sustained elevated water levels in the vicinity of the tailings impoundment. The Saladone tank fault trend conductance was based on regional water-level gradient.

The Palomas graben-bounding fault conductances were based mainly on results of the 2012 aquifer test (Section 6.4.3 below). The west graben-bounding fault is simulated as a strong barrier to flow using a small conductance. The east graben-bounding fault is simulated as a weak barrier to flow using a large conductance; resistance to flow across the east edge of the graben is accomplished mostly by the simulated permeability contrast.

Table 6.2. Modeled fault barrier conductance

	fault	section	layer 2 conductance (ft/day)	layers 3-4 conductance (ft/day)
1.	andesite south boundary		1.0E-04	2.0E-05
2.	mountain-front fault	north	8.0E-02	1.2E-01
		mountain front center: andesite, TSF embayment	5.0E-03	1.0E-10
		south	5.0E-08	2.0E-07
3.	Saladone Tank trend		1.0E-03	1.0E-03
4.	Palomas Graben west		1.0E-08	1.0E-08
5.	Palomas Graben east		1.0E+00	1.0E+00

6.3 Boundary Conditions

Model boundary conditions fall under the categories of (1) natural boundary conditions including direct recharge, stream-channel runoff and infiltration, base flow discharge, evapotranspiration and groundwater discharge to the Rio Grande Basin, and (2) anthropogenic boundary conditions including flowing wells, mine water-supply wells, the current and future open pits, and infiltration from the 1982 tailings impoundment.

Anthropogenic boundary conditions in the shallow systems along Animas Creek and Percha Creek are for purposes of the model considered natural boundary conditions. The different discharges from the shallow systems, including natural ET, crop ET supplied by wells or surface diversions, pumping from wells for stock or domestic use, and discharge from flowing wells, are difficult to distinguish.

The natural boundary conditions are applied to all model simulations: steady-state, historical pre-mining, historical mining and post-mining, aquifer test, future mining, and future post-mining.

The anthropogenic boundary conditions are applied to the historical pre-mining (flowing wells only) and historical mining and post-mining (flowing wells, mine water-supply wells, open pit and tailings infiltration) simulations as described below.

Different anthropogenic boundary conditions (future water-supply pumping, future open pit) apply to the future mining and future post-mining simulations, which are reported separately.

6.3.1 Natural Boundary Conditions

Natural boundary conditions represented in the model are shown on Figure 6.6 and include the following:

- Direct recharge of precipitation to groundwater is represented as a specified-flow boundary condition, using MODFLOW module RCH. Direct recharge rates are shown on Figure 6.6.

- Stream-channel runoff, infiltration of stream flow to groundwater, and discharge of groundwater to stream channels, are represented using module RIV2. In addition to simulation of Las Animas Creek, Percha Creek, and Grayback and Greenhorn Arroyos, model calibration required consideration of runoff in Seco Creek and King Arroyo to the north of the main study area watersheds.

- ET from riparian zones along Animas and Percha Creeks is represented using module EVT. (Irrigated ET, taken from surface water or shallow wells, is simulated as part of the shallow system using the head-dependent discharge (RIV2) boundary conditions along the stream channels.)

- Groundwater discharge to the Rio Grande Basin and Caballo Reservoir is simulated with head-dependent boundary conditions using module GHB.
- Groundwater flow in the Palomas Graben, into the model domain at the north end and out at the south end, is simulated with head-dependent boundary conditions using module GHB.

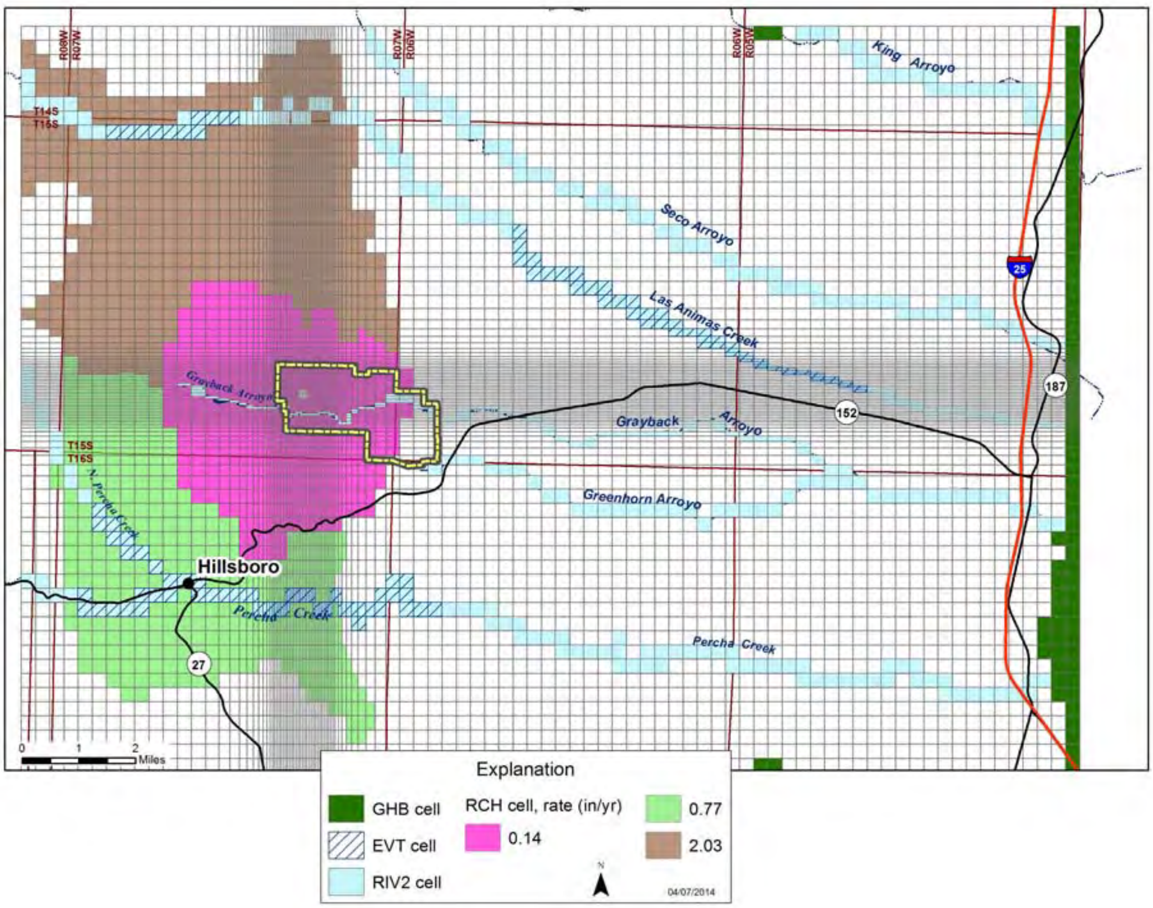


Figure 6.6. Natural boundary conditions.

RIV2 cells are grouped into reaches to define the stream network; each reach defines a length of stream, with a defined downstream reach, and total flow is tracked downstream. Infiltration to groundwater from RIV2 cells is limited to the simulated stream flow. Base flow discharge from groundwater to RIV2 cells is added to the total flow available for infiltration downstream.

Runoff is added at the upstream end of each reach. For each cell within a reach, infiltration to groundwater or discharge from groundwater is computed, and the resulting total flow, if any, is passed to the next cell downstream.

Flow between RIV2 cells and the corresponding aquifer model cell is computed based on RIV2 cell conductance, multiplied by either (1) the stream stage-aquifer head difference (aquifer in contact with stream bed) or (2) the stream stage-streambed bottom difference (aquifer below stream bed). Infiltration to the aquifer is further limited to the amount of simulated flow available in the stream.

The model reproduces the observed pattern of stream flow in the region; runoff is generated in the mountain watersheds, flows downstream until it crosses the mountain front, where it recharges the Santa Fe Group aquifer. Farther below the mountain front, streams flow only after storm events. Still further downstream, near the bottom of the basin, the streams emerge again as groundwater enters the channels as base flow.

The stream reaches defined are listed on Table 6.3, along with simulated annual runoff to each reach. RIV2 cell parameters include elevation and conductance. Conductance is computed from the length of stream in each cell and from hydraulic conductivity and thickness of the underlying material. Modeled RIV2 cell hydraulic conductivities are listed by reach and material, in downstream order, on Table 6.3. Elevation for RIV2 cells was determined from USGS topographic maps. Thickness of streambed was assumed at 1 ft.

EVT cell parameters include ET surface elevation, annual average potential ET rate of 64.6 in./yr and extinction depth of 15 ft. ET from each EVT cell is computed as the potential ET rate whenever water level is at or above the ET surface elevation (depth-to-water of zero), decreasing linearly to zero at the extinction depth. ET is zero for water levels below the extinction depth.

GHB cells simulate groundwater flow from the model area to the Rio Grande basin. GHB cell parameters include elevation, specified at 4,200 ft amsl, and conductance, calibrated at 100 ft^2/day in the north part (rows 1-60), 10,000 ft^2/day along the axis of Las Animas Creek (rows 61-73), and 1,000 ft^2/day in the south part, adjacent to Caballo Reservoir. Flow is computed as the product of GHB conductance and the difference between GHB elevation and aquifer head in the model cell.

Table 6.3. Stream reach specifications

reach No.	name	downstream reach	runoff (ac-ft/yr)	streambed hydraulic conductivity (ft/day)	underlying material
1	Upper Percha	2	5,249	0.001 1	bedrock SFG (graben)
2	Lower Percha	none	0	0.001 1 0.1 10 20	bedrock SFG (graben) carbonate bedrock (uplift) SFG alluvium
3	Las Animas	none	7,898	1 0.1 1 24	SFG (graben) carbonate bedrock (uplift) SFG alluvium
4	Grayback	6	74	0.001 1	bedrock SFG
5	Upper Greenhorn	6	66	1	SFG
6	Lower Greenhorn	none	0	10	alluvium
7	Seco Creek	none	18	0.15 0.8 20	SFG SFG (Las Animas Creek) alluvium
8	King Arroyo	none	0	0.15 20	SFG alluvium

ac-ft/yr - acre-feet per year
SFG - Santa Fe Group

6.3.2 Anthropogenic Boundary Conditions

Anthropogenic boundary conditions represented in the model include discharge from artesian wells, pumping from mine water supply wells, infiltration beneath the 1982 (historical) tailings impoundment, and the open pit. Locations of model-simulated anthropogenic boundary conditions are shown on Figure 6.7.

Flow from artesian wells was simulated as drain (head-dependent, outflow only) boundary conditions with MODFLOW module DRN. Flow from each DRN cell is computed as the product of DRN conductance (assumed at 1,000 ft^2/day, or 5.2 gpm/ft of head above the discharge elevation) and aquifer cell head minus DRN elevation. Flow is zero when aquifer cell head is below DRN elevation.

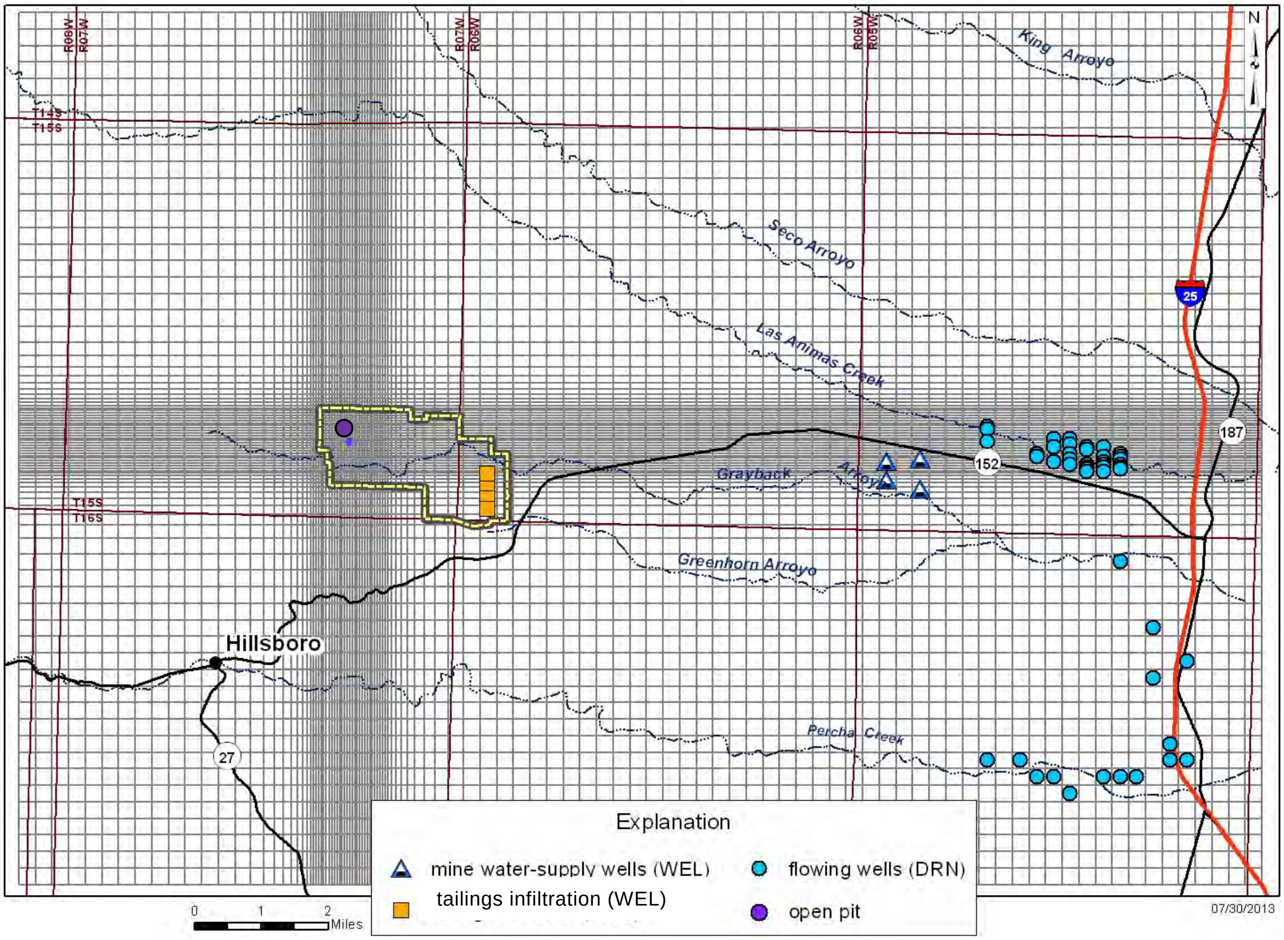


Figure 6.7. Anthropogenic boundary conditions.

Historical pumping from mine water supply wells was simulated as specified-flow boundary conditions with MODFLOW module WEL. Pumping rates were specified from Table 5.1. Pumping during the 2012 aquifer test was simulated using module LAK2, in order to simulate in-bore water levels in the pumping wells.

Infiltration from the historical tailings impoundment was also simulated as specified-flow boundary conditions using WEL. Infiltration rates were estimated based on model calibration, constrained by an upper limit based on the amount of water actually added to the impoundment (Fig. 6.8).

Water level and water balance of the open pit were simulated using MODFLOW module LAK2. The geometry of the existing pit is represented in the historical post-mining simulation, as shown by the actual and simulated pit water stage – area curves presented on Figure 6.9 (Note that Figure 6.9 does not represent model calibration; it simply verifies the accurate simulation of the current pit geometry.).

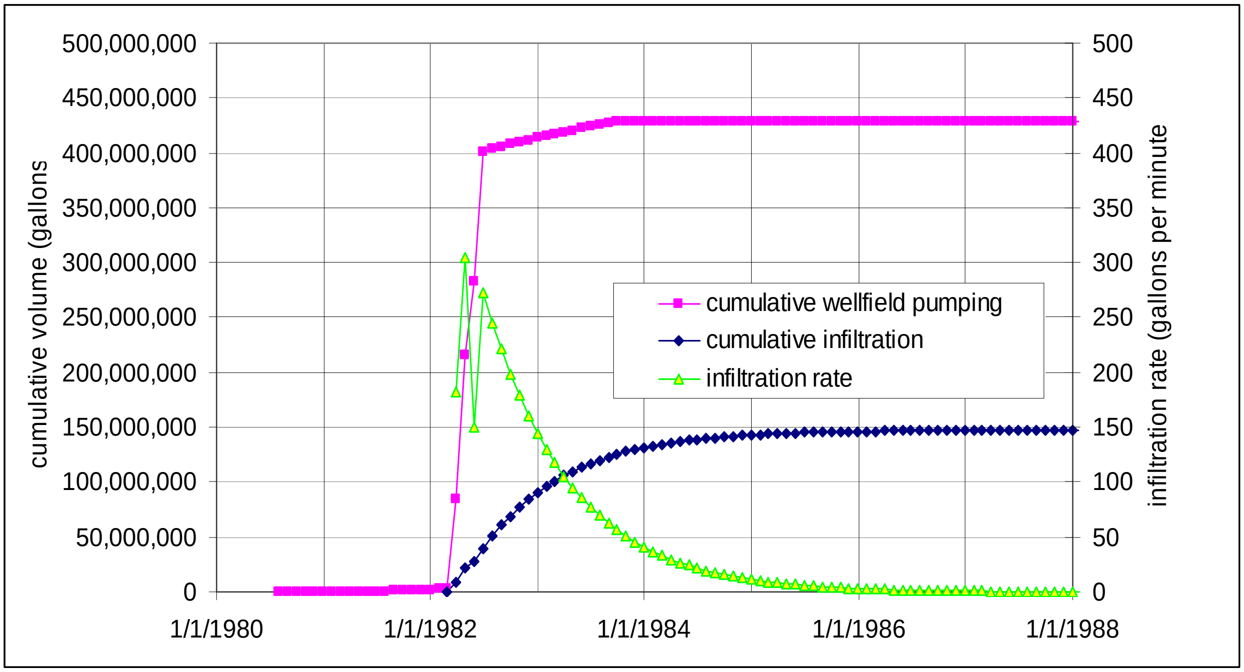


Figure 6.8. Modeled historical tailings infiltration.

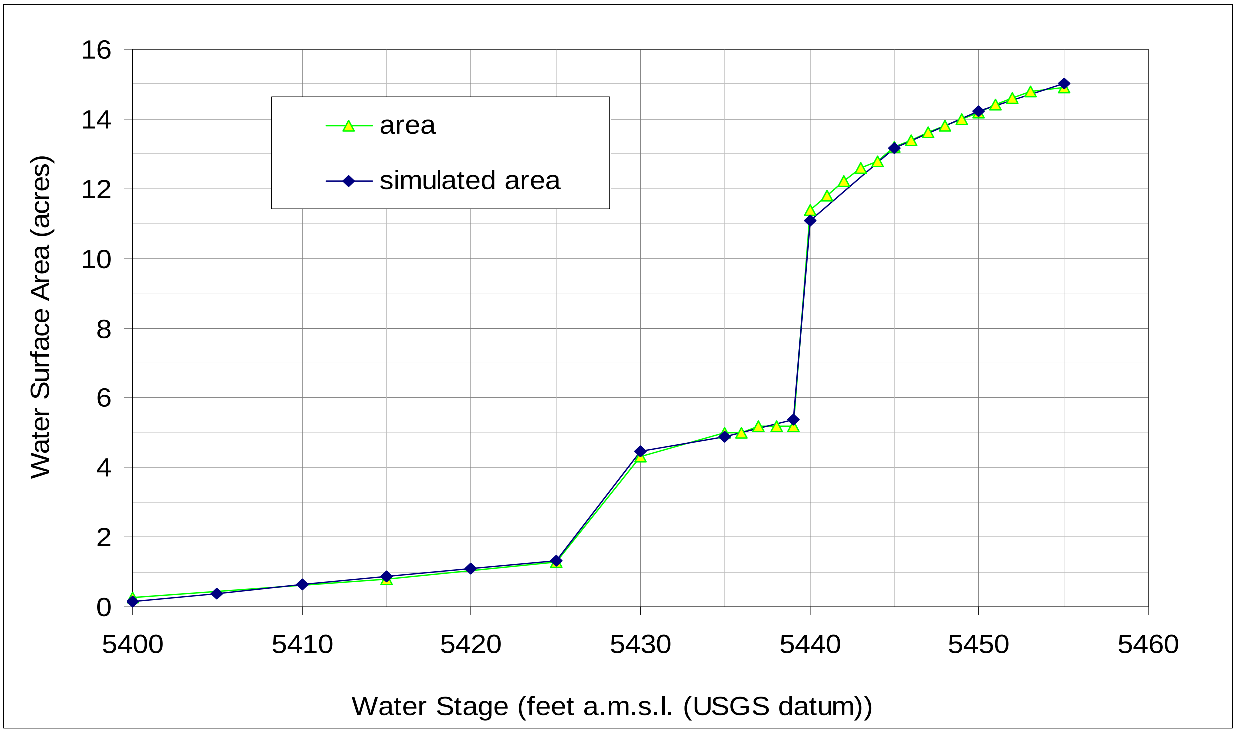


Figure 6.9. Existing open pit water elevation - water surface area relationship.

Hydrologic parameters for the open pit, including monthly average precipitation and evaporation rates, and runoff coefficients for the pit walls and for the 230-acre pit watershed, are listed on Table 6.4.

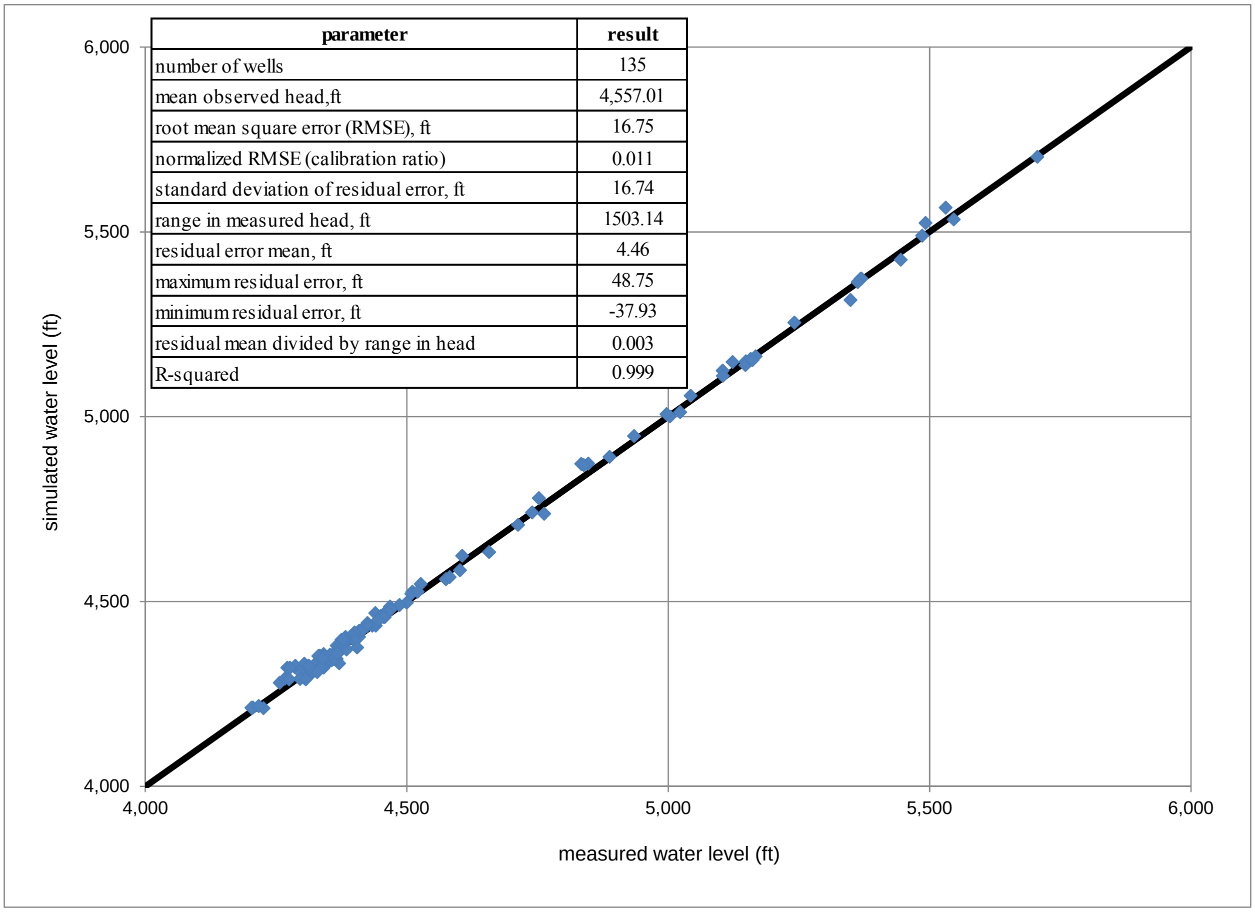
Table 6.4. Simulated open-pit hydrologic parameters

meteorological parameters		
month	**average precipitation (inches)**	**average evaporation (inches)**
Jan	0.6	3.2
Feb	0.6	4.2
Mar	0.4	6.4
Apr	0.3	7.1
May	0.5	8.4
Jun	0.7	10.7
Jul	2.3	7.8
Aug	2.5	4.5
Sep	2.1	4.6
Oct	1.2	3.0
Nov	0.6	2.8
Dec	0.8	2.1
total	12.5	64.6
runoff coefficients		**(percent of precipitation)**
pit wall		0.30
watershed		0.05

6.4 Model Results and Calibration

6.4.1 Steady-State Simulation

Estimated and simulated steady-state water levels are compared on Figure 6.10. The simulated steady-state basin water balance is shown on Table 6.5. Contours of the simulated steady-state water table are shown on Figure 6.11.



parameter	result
number of wells	135
mean observed head,ft	4,557.01
root mean square error (RMSE), ft	16.75
normalized RMSE (calibration ratio)	0.011
standard deviation of residual error, ft	16.74
range in measured head, ft	1503.14
residual error mean, ft	4.46
maximum residual error, ft	48.75
minimum residual error, ft	-37.93
residual mean divided by range in head	0.003
R-squared	0.999

Figure 6.10. Comparison of measured and simulated water levels.

Table 6.5. Simulated steady-state water balance

	watershed				TOTAL
	Animas	**Percha**	**Grayback / Greenhorn**	**Seco / King**	
direct recharge	2,811	825	61	0	3,697
runoff	8,720	7,052	140	18	15,931
groundwater inflow	0	0	0	1,827	1,827
TOTAL IN (ac-ft/yr)					**21,455**
Riparian ET (Palomas Basin)	1052	0	0	0	1052
Riparian ET (Animas Uplift, Animas Graben)	617	1,730	0	0	2347
Crop ET, domestic, etc.	4193	1074	0	0	5267
groundwater discharge	3589	3339	2487	3374	12789
TOTAL OUT (ac-ft/yr)					**21,455**

ac-ft/yr - acre-feet per year

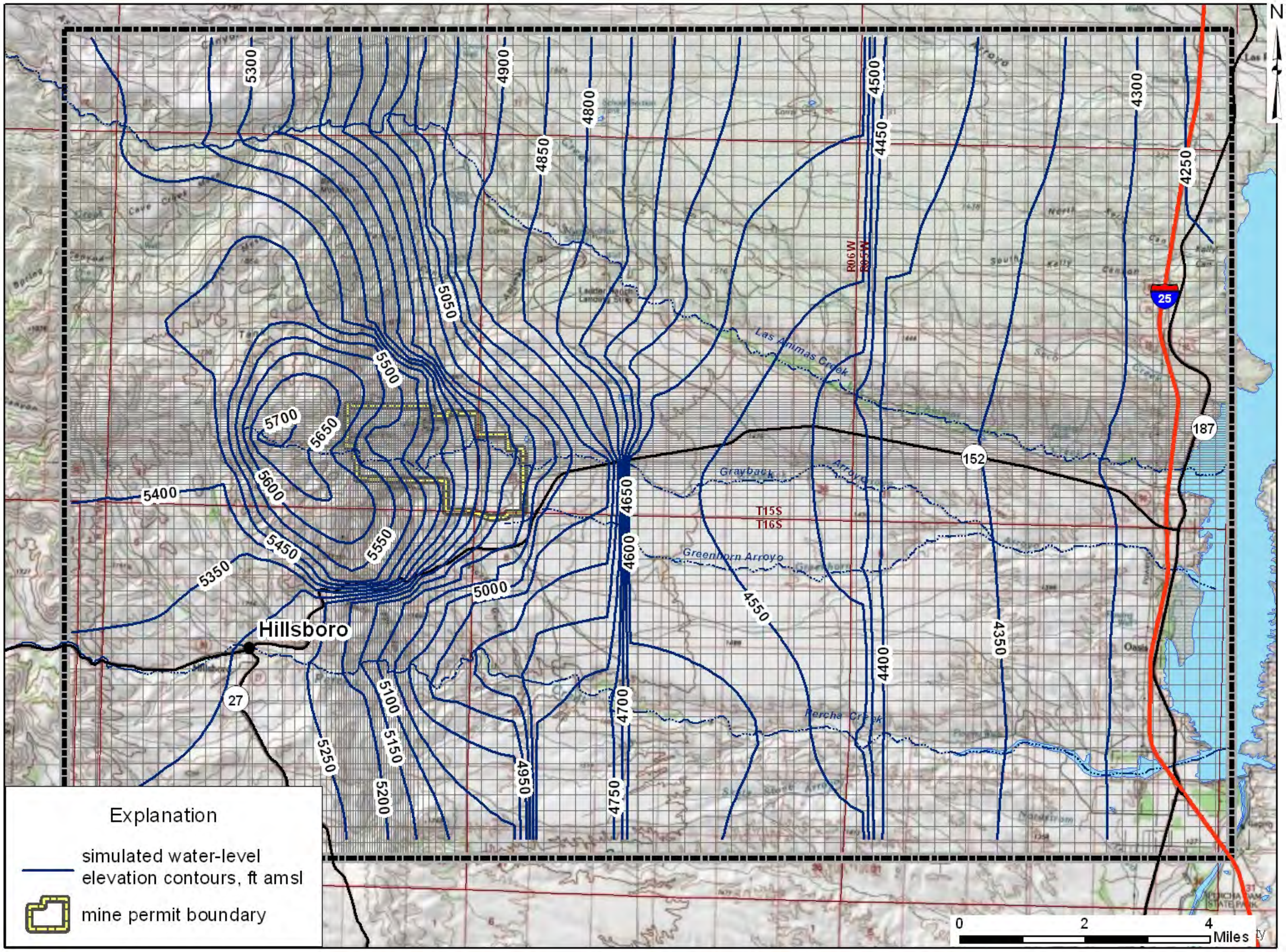


Figure 6.11. Contours of simulated 2012 groundwater levels.

6.4.2 Historical Transient Simulation

The historical transient simulations include the pre-mining (1940 to June 1980), and mining and post-mining (June 1980 to November 2012) simulations. Measured and simulated water-level hydrographs are compared for calibration well locations shown on Figure 6.12. Measured and simulated water levels are presented on Figures 6.13 through 6.27.

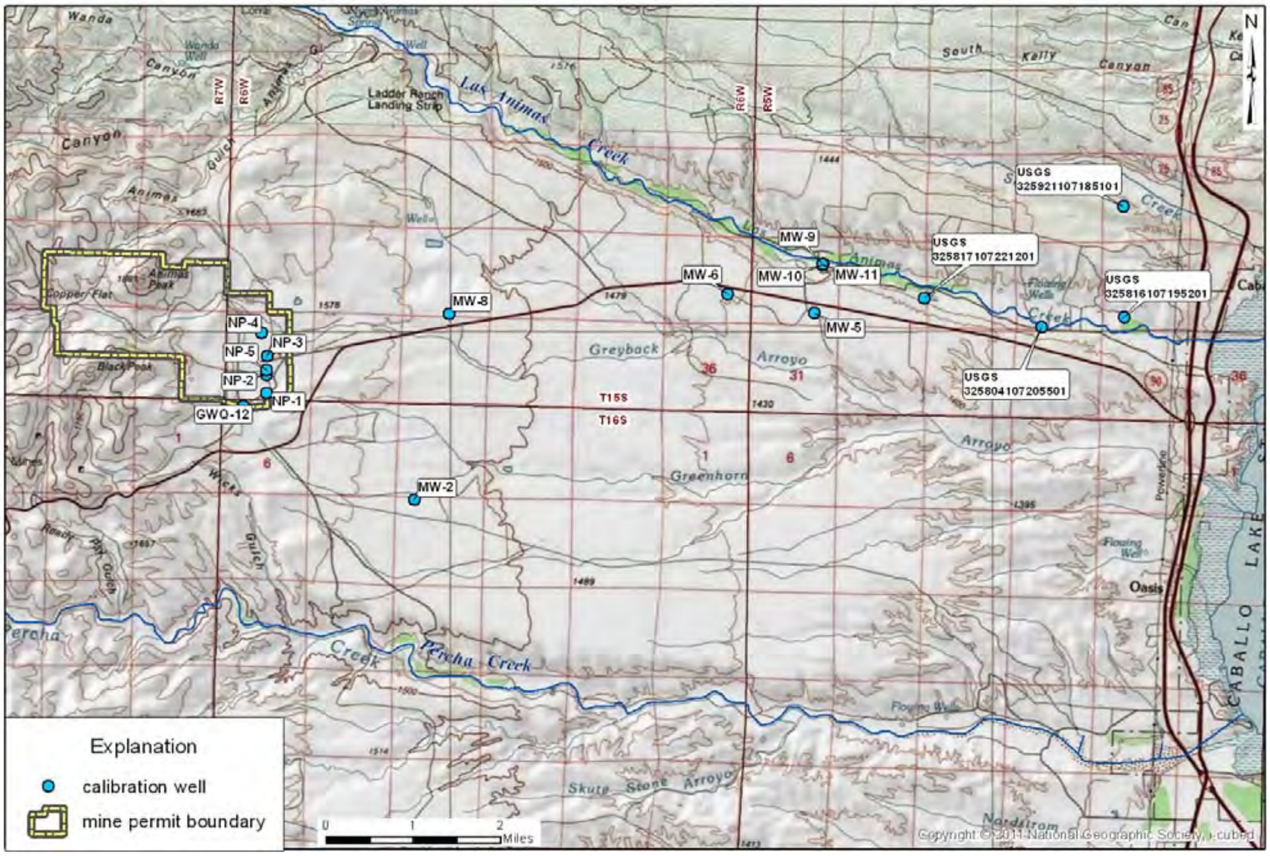


Figure 6.12. Locations of measured water-level hydrographs.

Measured and simulated water levels near the well field, at MW-5, are presented on Figure 6.13, showing drawdown and recovery in response to the period of well field operation in 1982. Measured and simulated water-level changes are in agreement. The small difference (~10 ft) between measured and simulated water-level elevations is appropriate, considering the range of water levels represented by a single model cell, and the fact that the well is not at the cell center.

Measured and simulated water levels west of the well field, at MW-6, are shown on Figure 6.14. The 35-year, 175-ft rise in the measured MW-6 water level (discussed in Section 5.2.2 above) is not simulated in the model.

Measured and simulated water levels north of the well field along Las Animas Creek, at MW-9, -10 and -11, are shown on Figure 6.15. The measured water levels include data from the mid-1990s as well as data from 2012. The vertical gradient measured between the shallow well (MW-11) and the deeper wells (MW-10 and -9) is reproduced in the model.

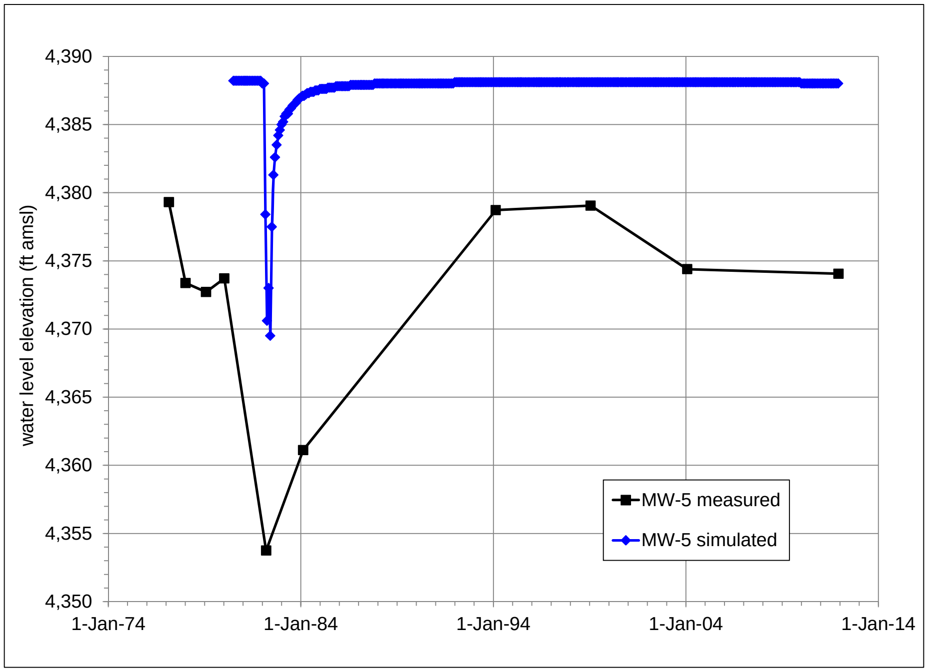


Figure 6.13. Measured and simulated water-level hydrographs in MW-5.

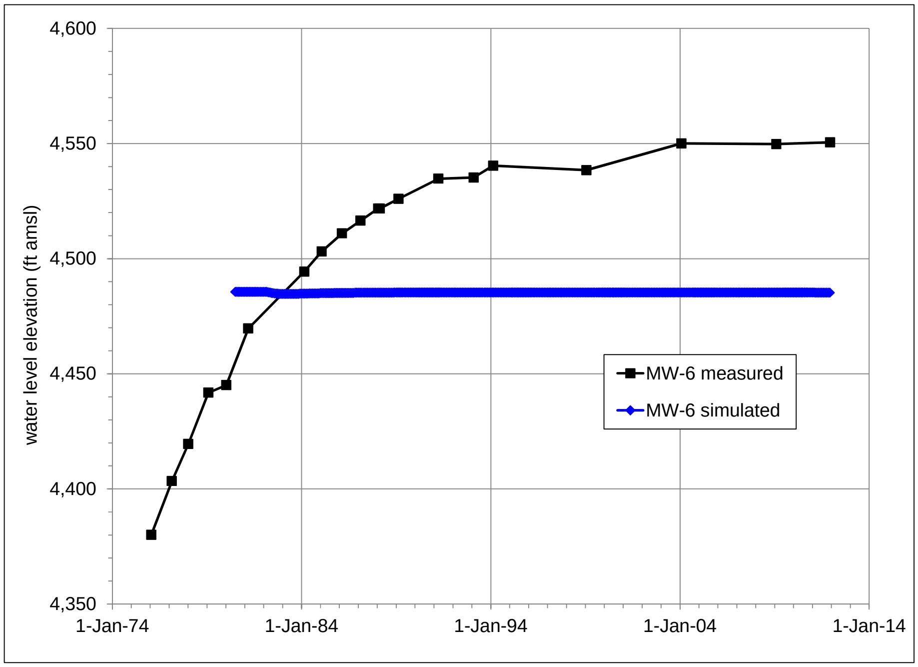


Figure 6.14. Measured and simulated water-level hydrographs in MW-6.

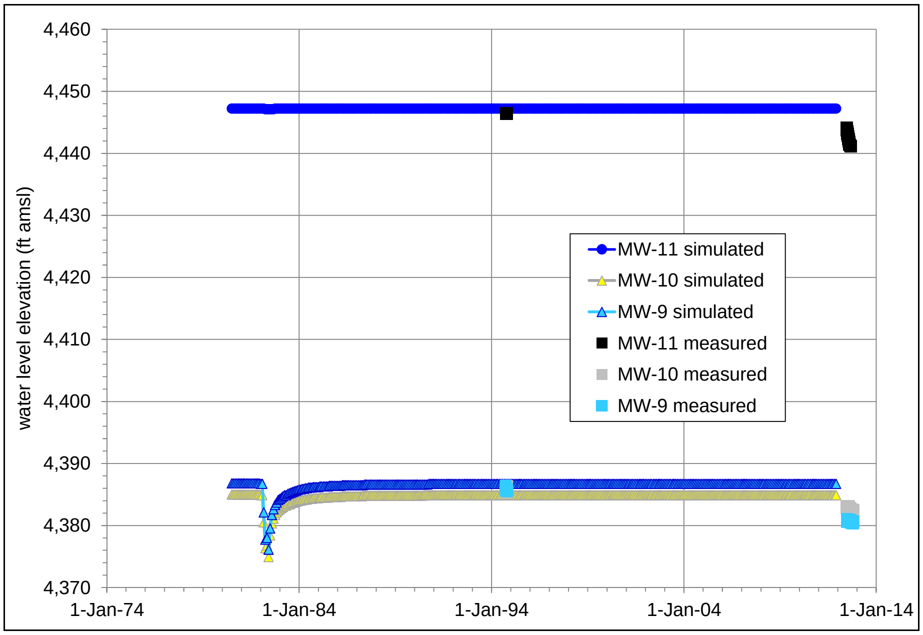


Figure 6.15. Measured and simulated water-level hydrographs in MW-9, MW-10, and MW-11.

Measured and simulated water levels farther down Las Animas Creek (Fig. 5.2) are shown on Figures 6.16 through 6.19. The background variation in the measured water levels reflects unidentified local and temporal stresses that are not simulated in the model. The model simulates the measured water levels generally within the range of water-level variation found in a single model cell in this area. The simulation is acceptably accurate considering the water-level variation within a single cell and the not-simulated local processes affecting the measured water level.

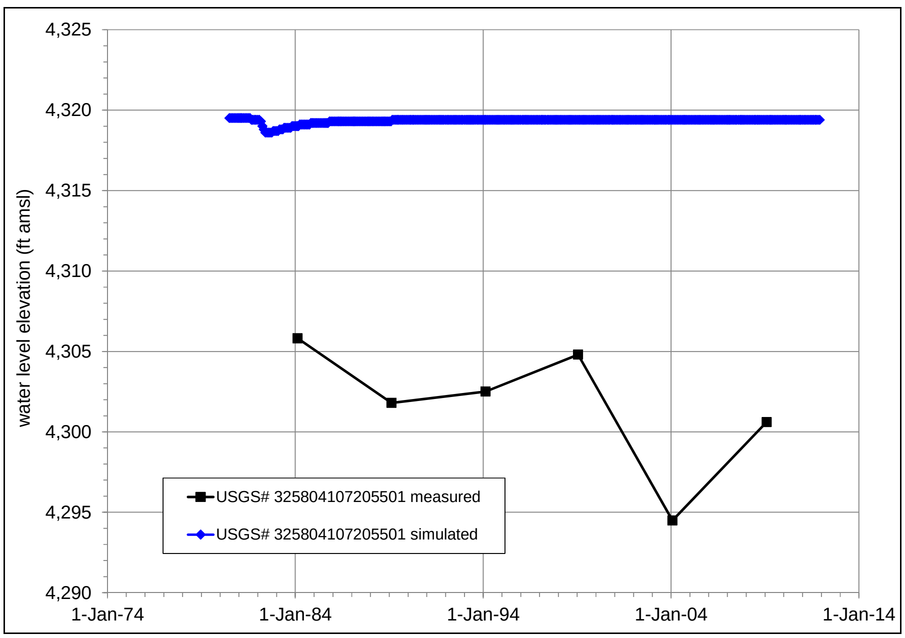


Figure 6.16. Measured and simulated water-level hydrographs in USGS No. 325804107205501.

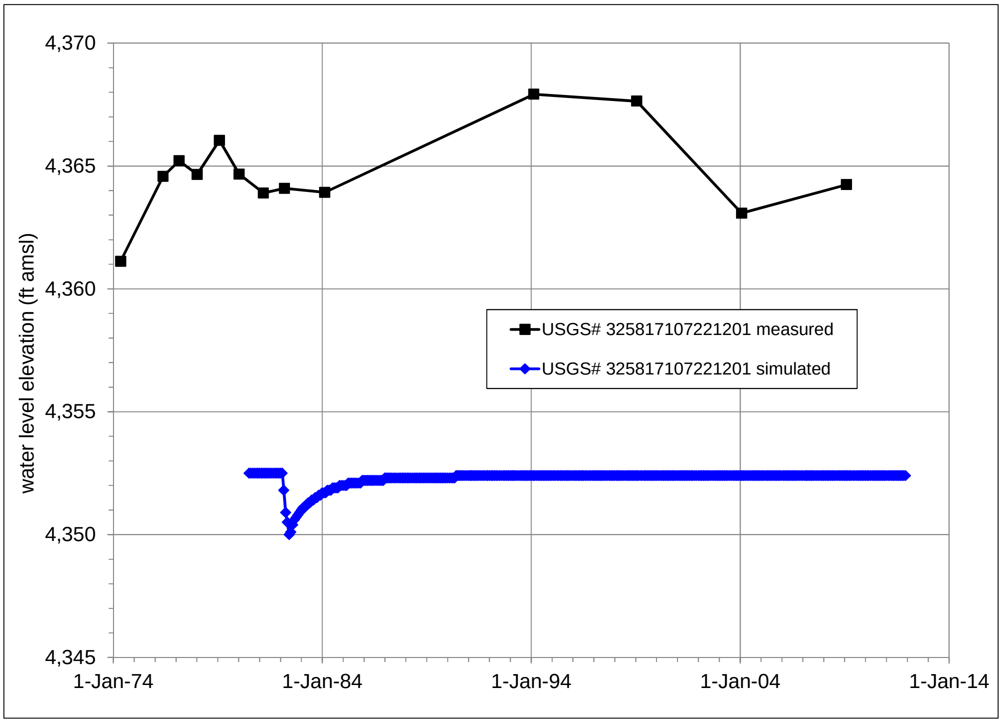


Figure 6.17. Measured and simulated water-level hydrographs in USGS No. 325817107221201.

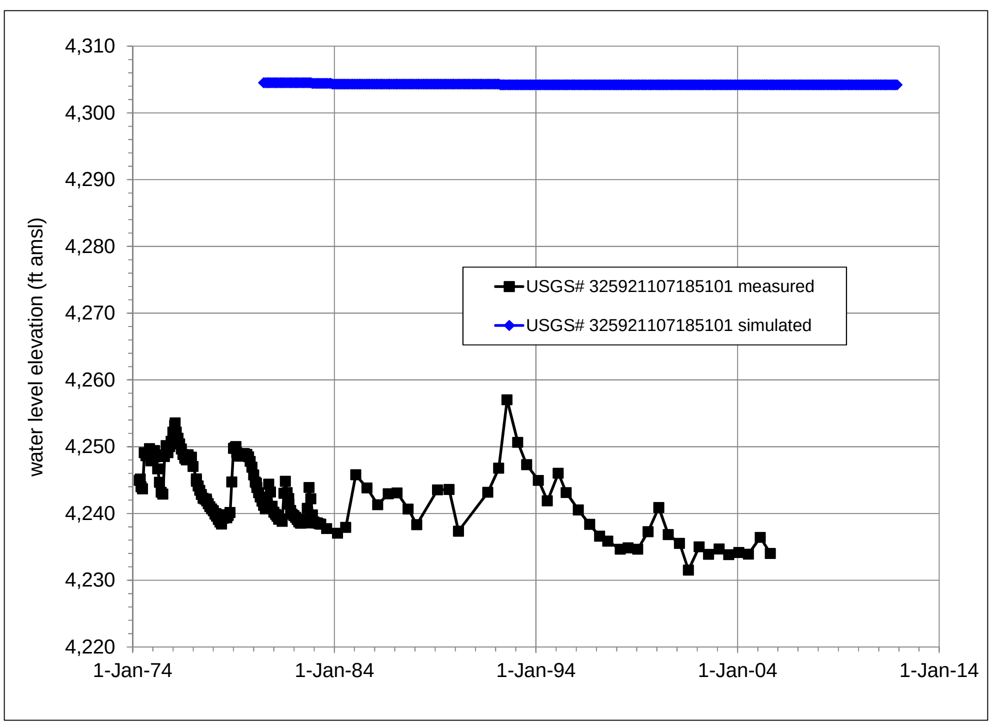


Figure 6.18. Measured and simulated water-level hydrographs in USGS No. 325921107185101.

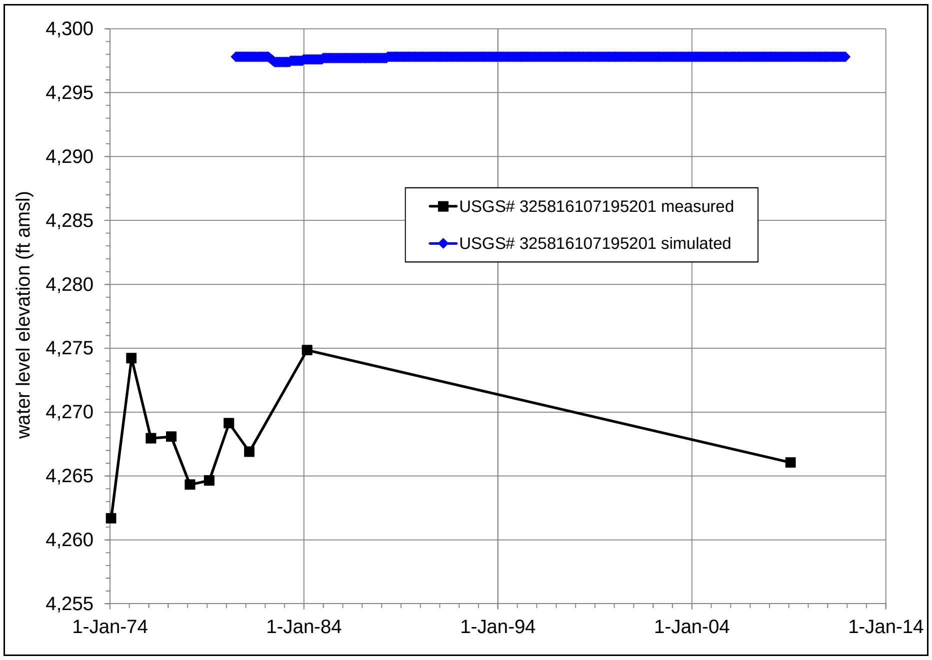


Figure 6.19. Measured and simulated water-level hydrographs in USGS No. 325816107195201.

Measured and simulated water levels downstream of the tailings impoundment (Fig. 5.2), at MW-2 and MW-8, are shown on Figures 6.20 and 6.21, also showing substantial background water-level fluctuations not simulated in the model. The simulation is acceptably accurate considering the amount of water-level variation within a single cell and the not-simulated local processes affecting the measured water level.

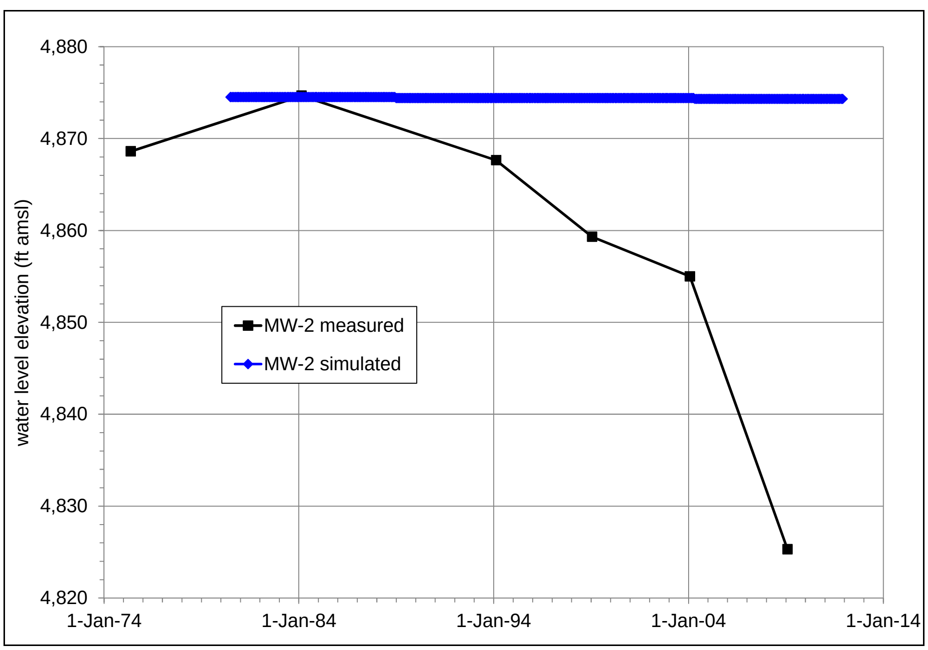


Figure 6.20. Measured and simulated water-level hydrographs in MW-2.

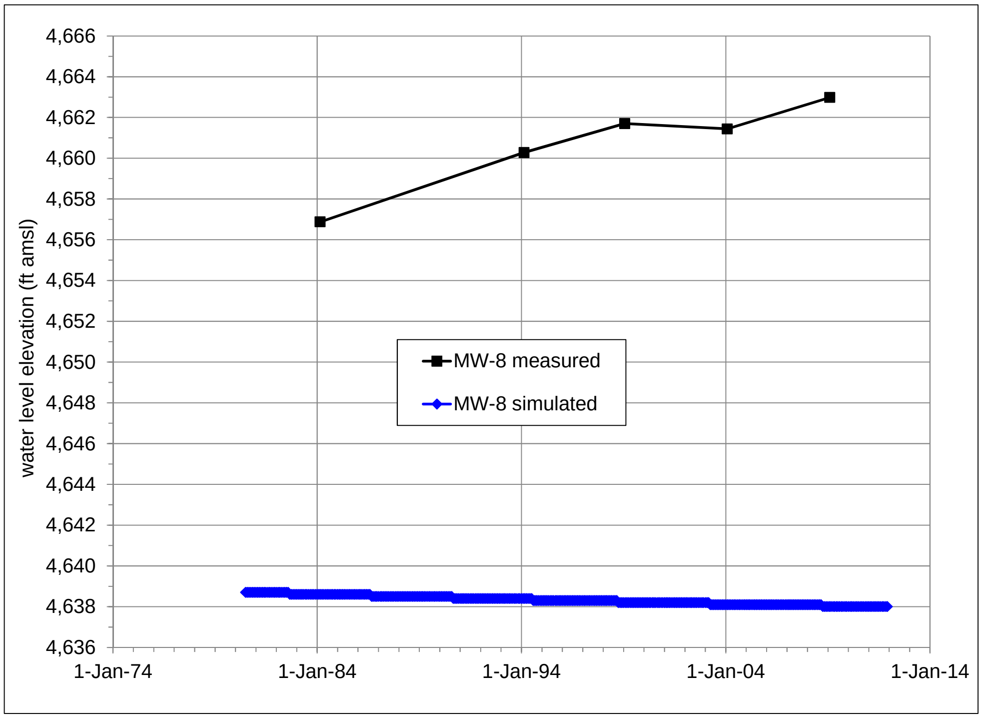


Figure 6.21. Measured and simulated water-level hydrographs in MW-8.

Measured and simulated water levels in the vicinity of the 1982 tailings impoundment (Fig. 5.2) are shown on Figures 6.22 through 6.27. The model reproduces the phenomenon of sustained elevated water levels measured in the vicinity of the impoundment, caused by a fault barrier to the east. The barrier appears to largely contain seepage from the tailings within the fault-bounded block.

Simulated water levels do not exactly match the measured, which indicate even less flow across the fault barrier than is simulated. The measured water levels also reflect unknown local processes and uncertainty in measurements taken over several periods. However the major feature, that of sustained elevated water levels caused by the dam effect of the fault barrier, is reproduced. Seepage from the tailings has mainly been contained behind the fault and has not flowed down gradient.

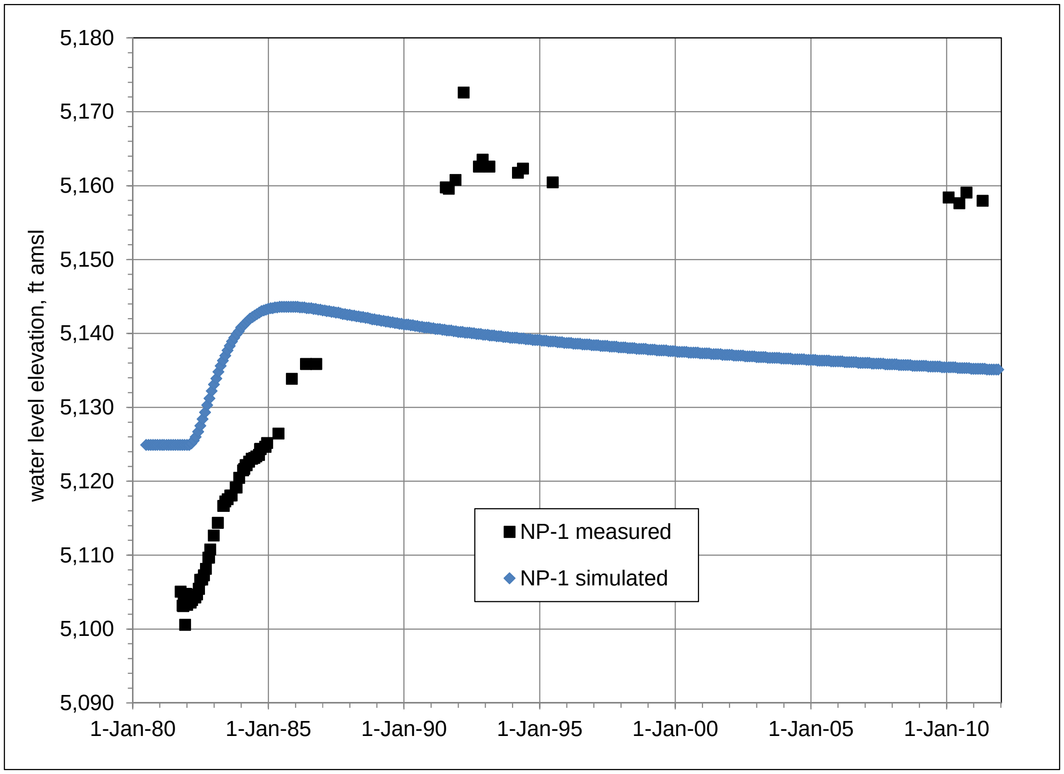


Figure 6.22. Measured and simulated water-level hydrographs in NP-1.

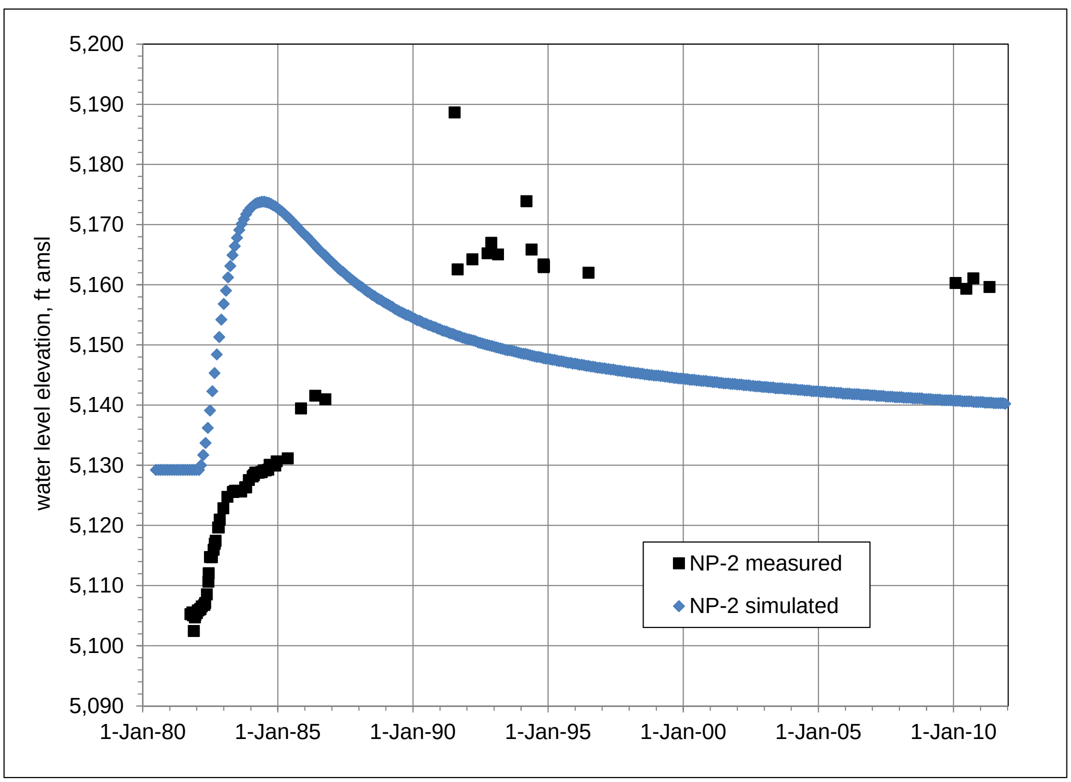


Figure 6.23. Measured and simulated water-level hydrographs in NP-2.

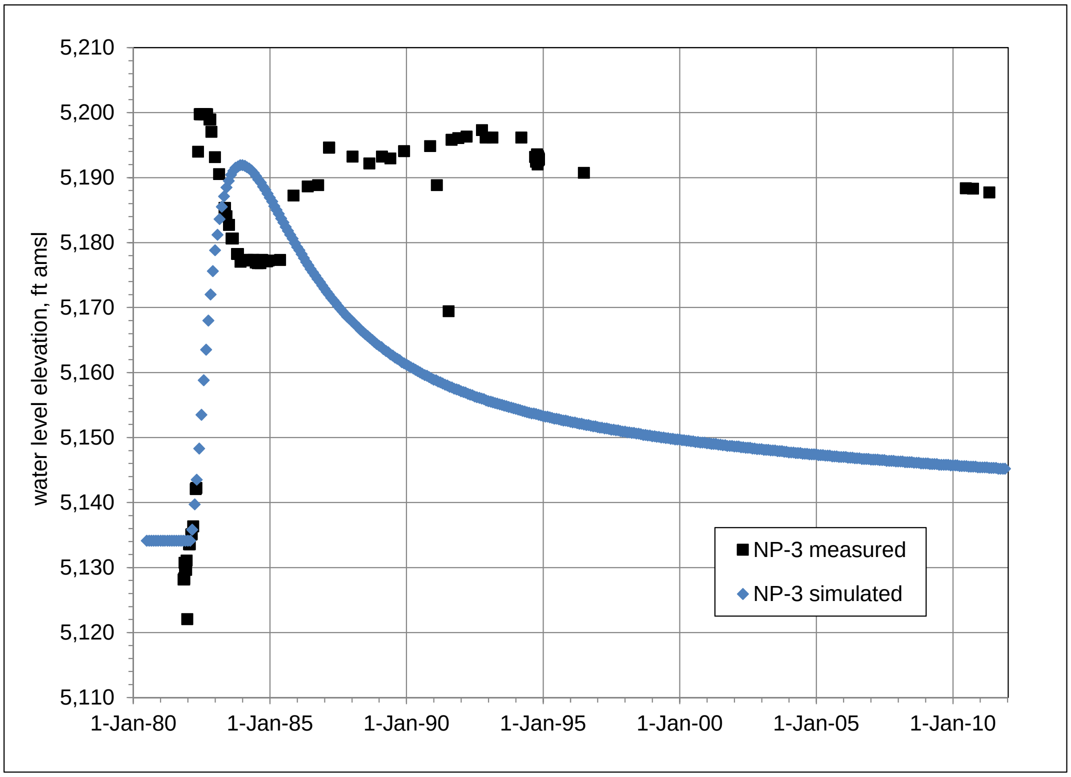


Figure 6.24. Measured and simulated water-level hydrographs in NP-3.

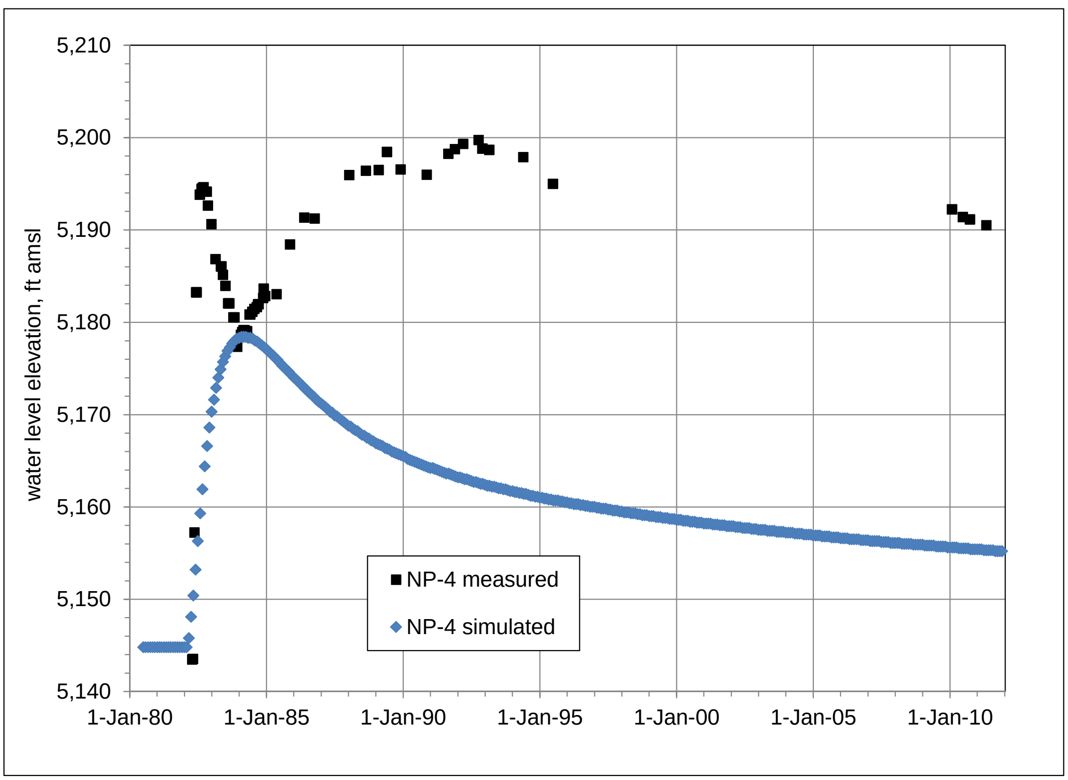


Figure 6.25. Measured and simulated water-level hydrographs in NP-4.

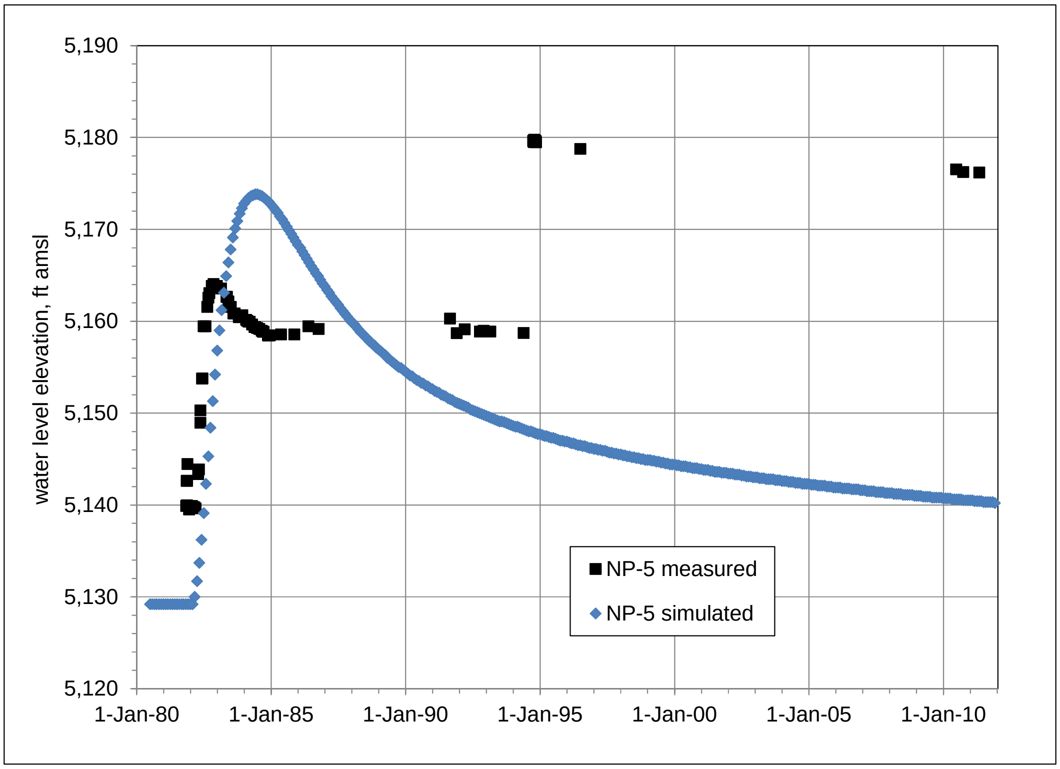


Figure 6.26. Measured and simulated water-level hydrographs in NP-5.

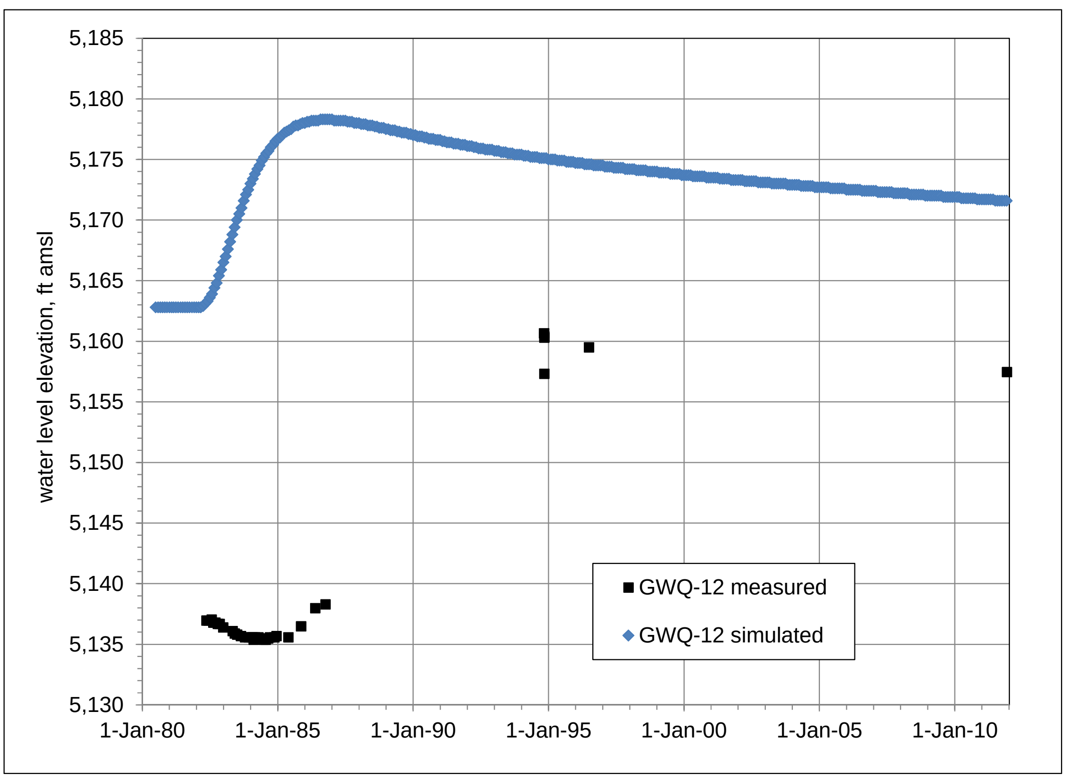


Figure 6.27. Measured and simulated water-level hydrographs in GWQ-12.

Simulated water level and water balance for the current open pit are shown on Table 6.6, indicating general agreement with current measured pit water level and estimated pit water balance. The future (larger and deeper) open pit, both during dewatering and after mining, will have more groundwater inflow with a larger water surface and more evaporation.

Table 6.6. Simulation results for current open pit

water level (ft amsl)	5,433	
water surface area (acres)	4.8	
simulated annual average water balance		
	ac-ft/yr	**gpm**
precipitation and runoff	18.4	11.4
groundwater inflow	6.7	4.2
TOTAL IN (ac-ft/yr)	**25.1**	**15.5**
evaporation out	25.1	15.5
TOTAL OUT (ac-ft/yr)	**25.1**	**15.5**

ac-ft/yr - acre-feet per year

The model correctly simulates the location of graining stream reaches, in the upper parts of the Animas Creek and Percha Creek watersheds over the Animas Uplift. Below the uplift, the streams generally lose flow to the SFG aquifer. However, in the alluvial aquifer along lower Animas Creek, and in the lowest parts of Percha Creek and Greenhorn Arroyo, the model simulates alternating gaining and losing river segments. This is partly an artifact of model discretization (caused by the relatively large change in river stage from cell to cell), but also reflects the reality of a water table that is close to land surface and may rise above the stream bed intermittently or seasonally, causing the stream to flow.

Simulated total flowing-well discharge over time for the study area is shown on Figure 6.28. There are no data for calibrating the total flowing-well discharge, except that the simulated flow should exceed the totals shown on Table 5.3 (and does). The model result represents the known background (independent of the Project) trend of drawdown in the model area. The model-simulated artesian well locations are shown on Figure 6.29, indicating which locations were still flowing (in the model) as of November, 2012.

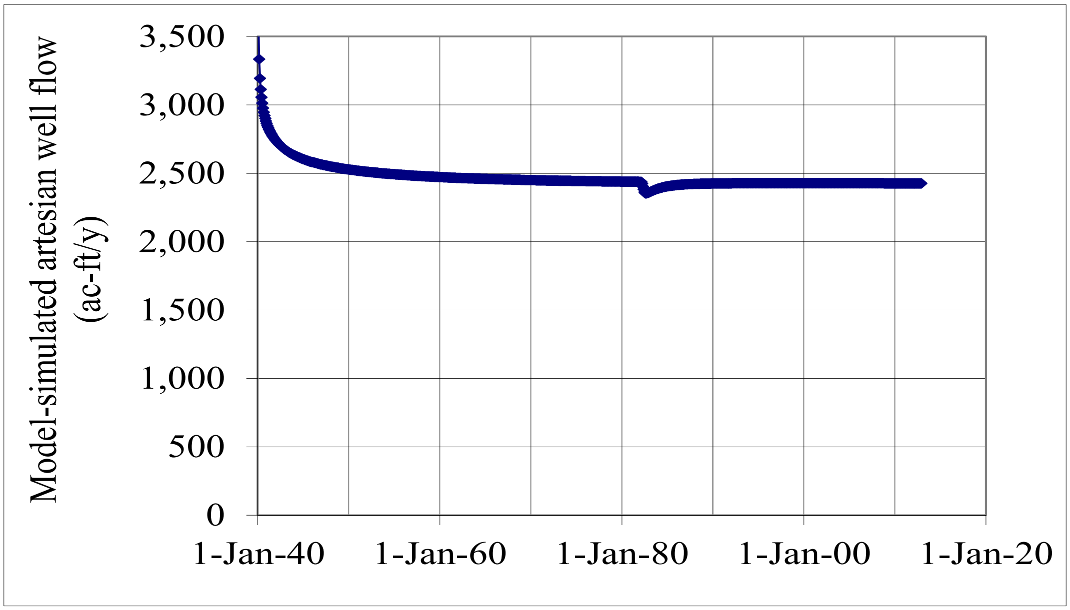


Figure 6.28. Simulated artesian well discharge.

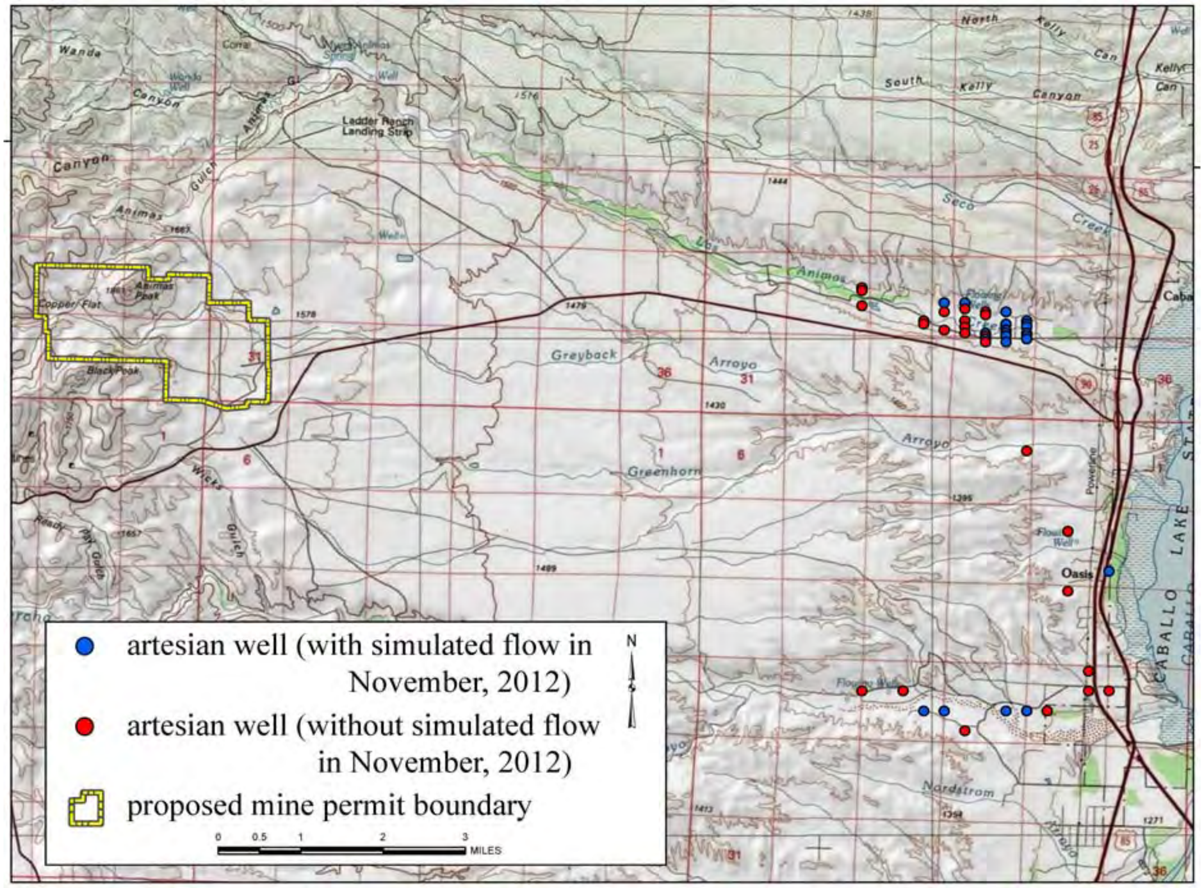


Figure 6.29. Simulated artesian wells, discharging and not discharging in November 2012.

6.4.3 Aquifer Test Simulation

Pumping of wells PW-1 and PW-3 began in late November 2012 and continued, with two stops and starts, until 21 December 2012. Recorded pumping periods and rates (Fig. 5.14) were simulated in the model using MODFLOW module LAK2 (JSAI, 2010), which simulates water level inside the pumping bores in addition to the withdrawal from the aquifer. Water-level responses were measured at locations shown on Figure 6.30. Measured and simulated aquifer test drawdown and recovery are presented on Figures 6.31 through 6.39.

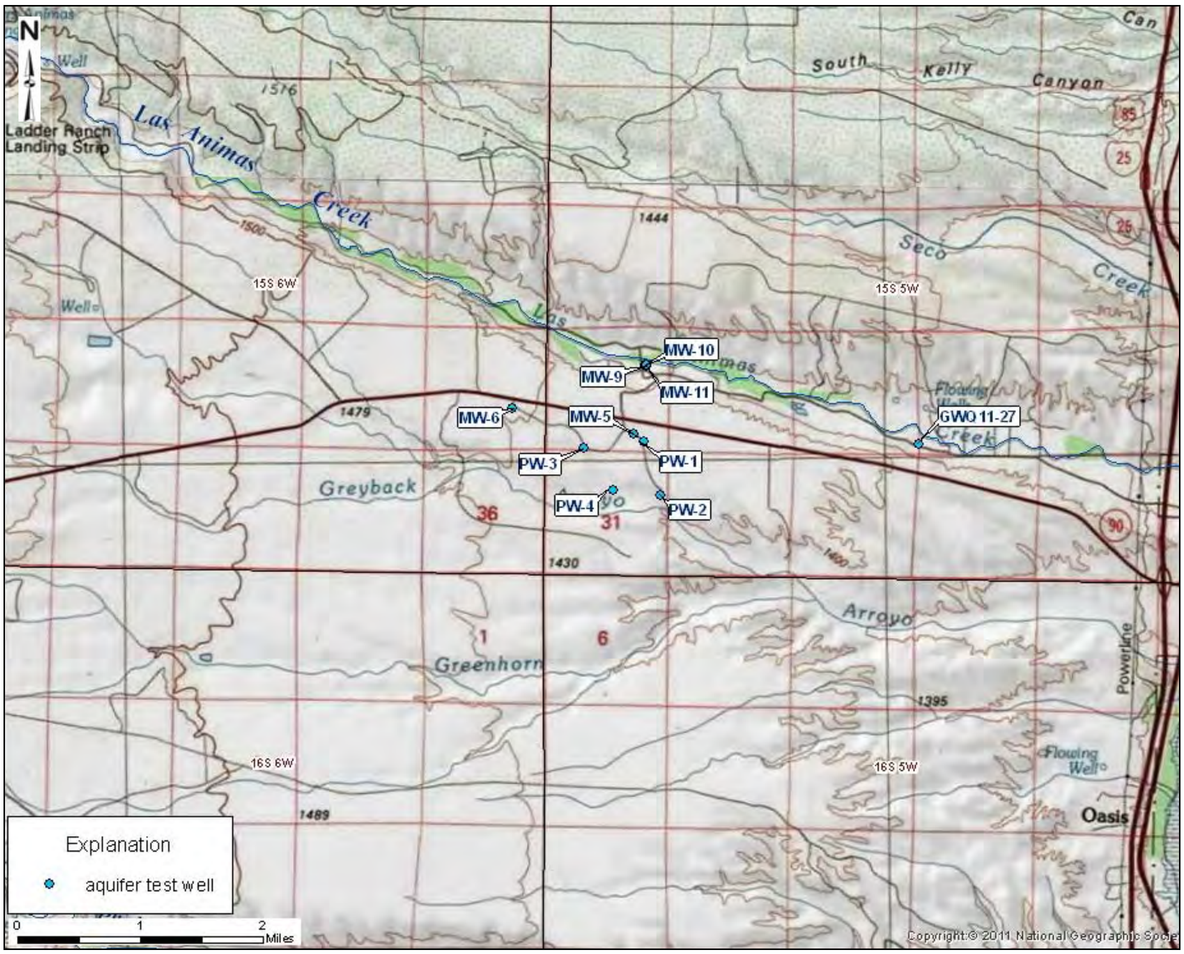


Figure 6.30. 2012 aquifer test pumping and observation locations.

Measured and simulated drawdown in the pumping wells, PW-1 and PW-3, are shown on Figures 6.31 and 6.32. Simulated water levels in the well-bore, and in the adjacent aquifer, are shown on both figures. The simulated and measured well-bore water levels agree, although the measured water level in PW-3 shows an unexplained additional decline, late in the pumping period, that is not simulated in the model. The difference between well-bore and aquifer water levels characterizes the well losses and pumping efficiency of PW-1 and PW-3.

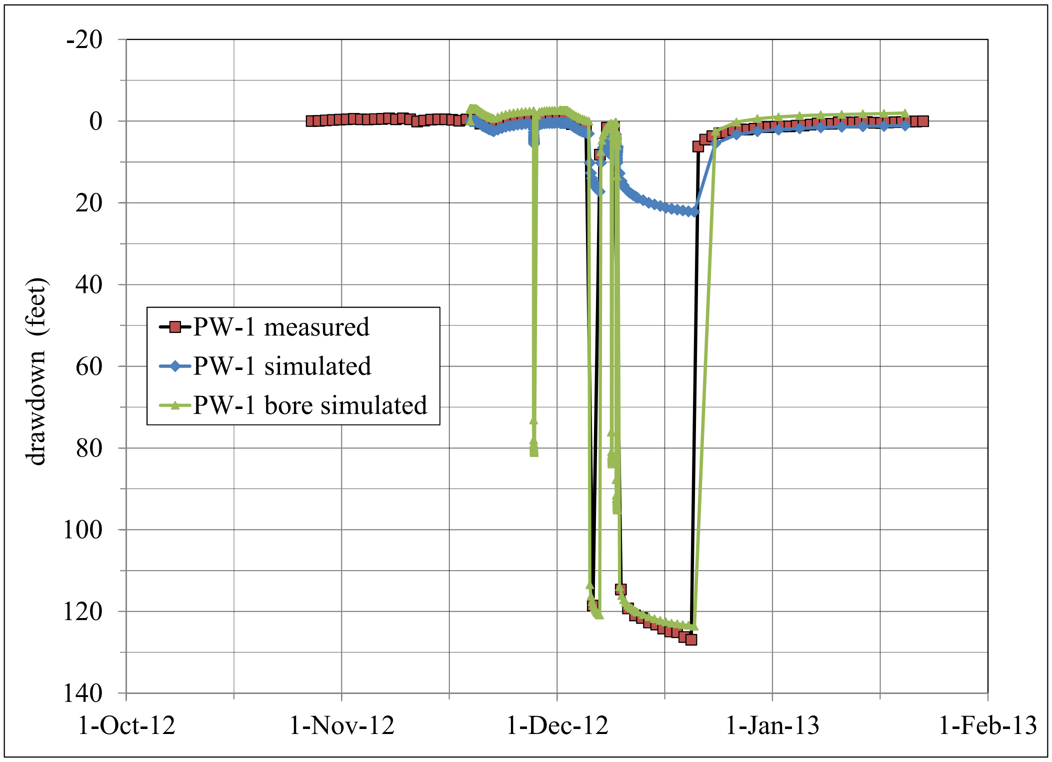


Figure 6.31. Measured and simulated water-level hydrographs in PW-1.

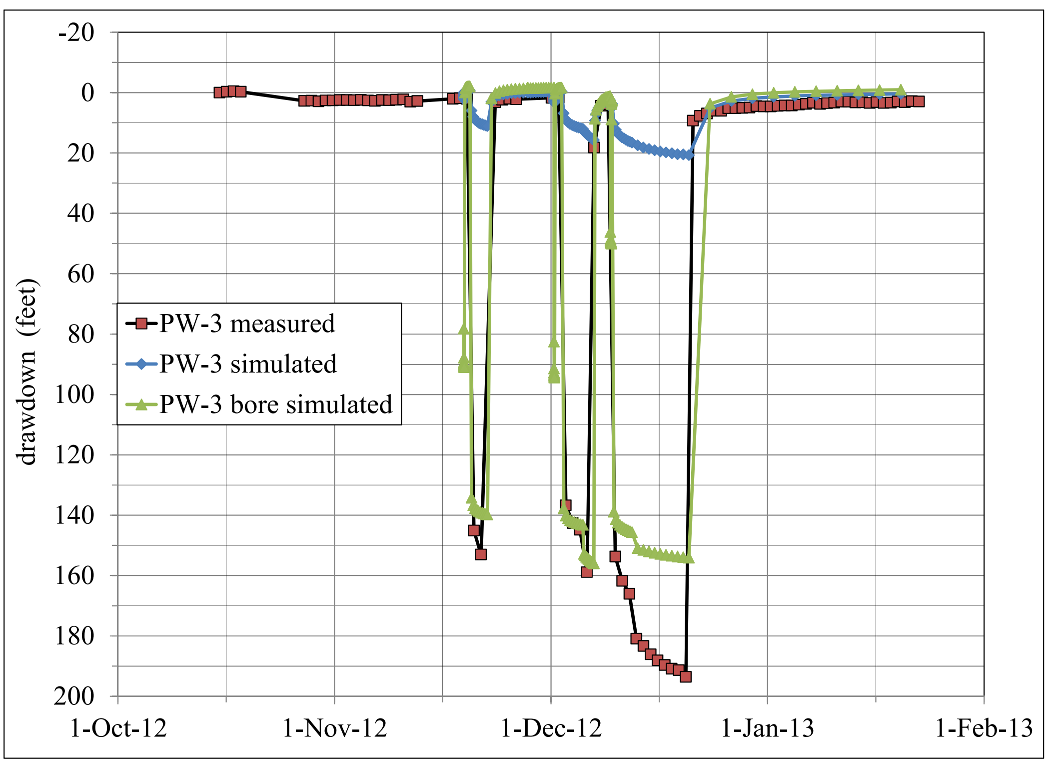


Figure 6.32. Measured and simulated water-level hydrographs in PW-3.

Measured and simulated drawdown elsewhere in the well field area, at PW-2, PW-4, and MW-5, are shown on Figures 6.33, 6.34, and 6.35. For unknown local reasons, measured drawdown in PW-2 (Fig. 6.34) is less than simulated, and less than would be expected from the results at PW-2 (Fig. 6.33) and MW-5 (Fig. 6.35).

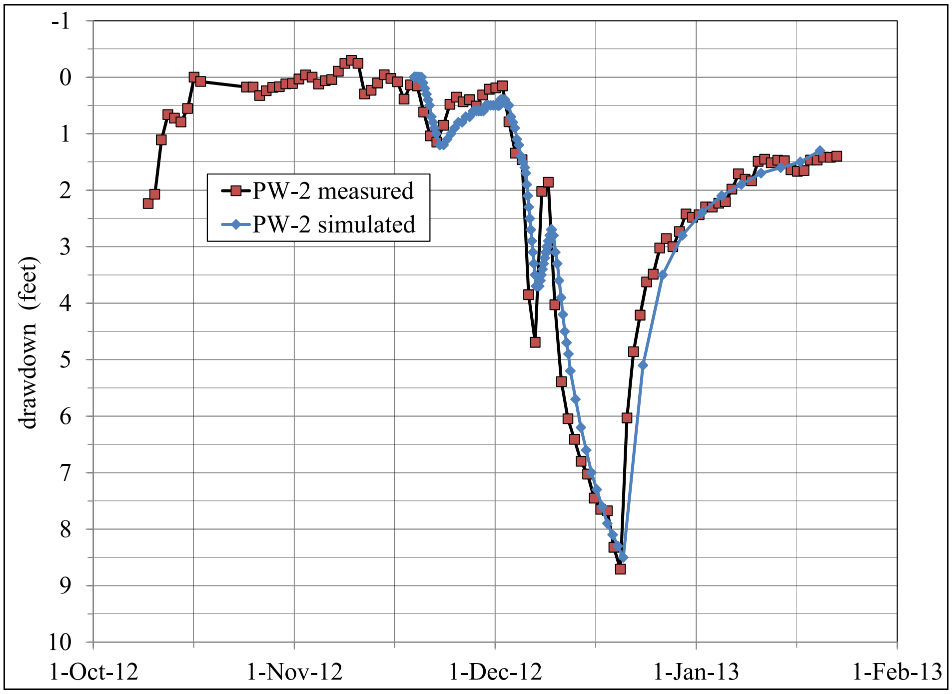


Figure 6.33. Measured and simulated water-level hydrographs in PW-2.

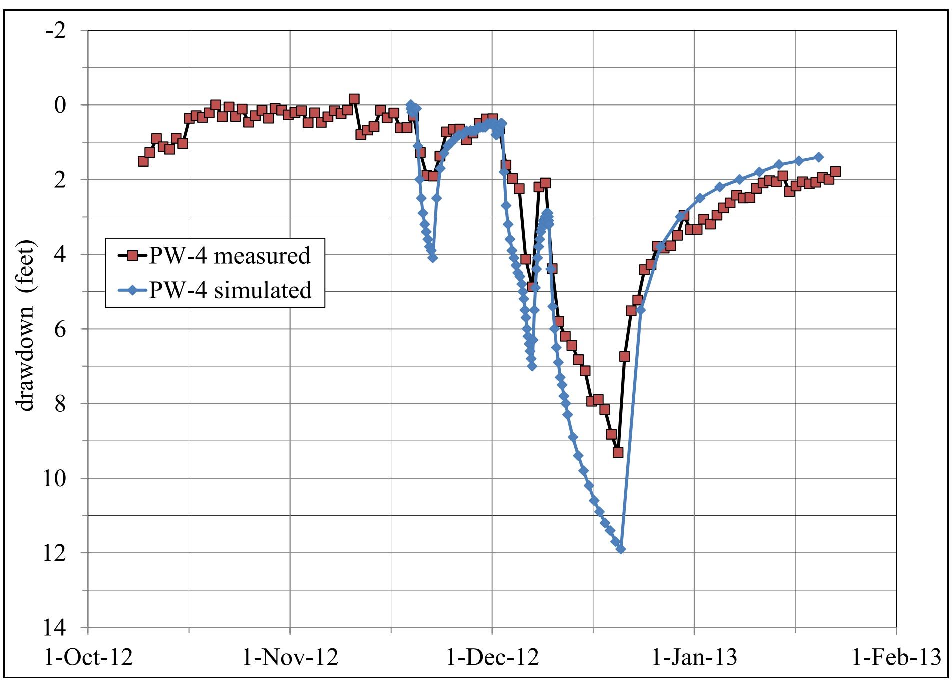


Figure 6.34. Measured and simulated water-level hydrographs in PW-4.

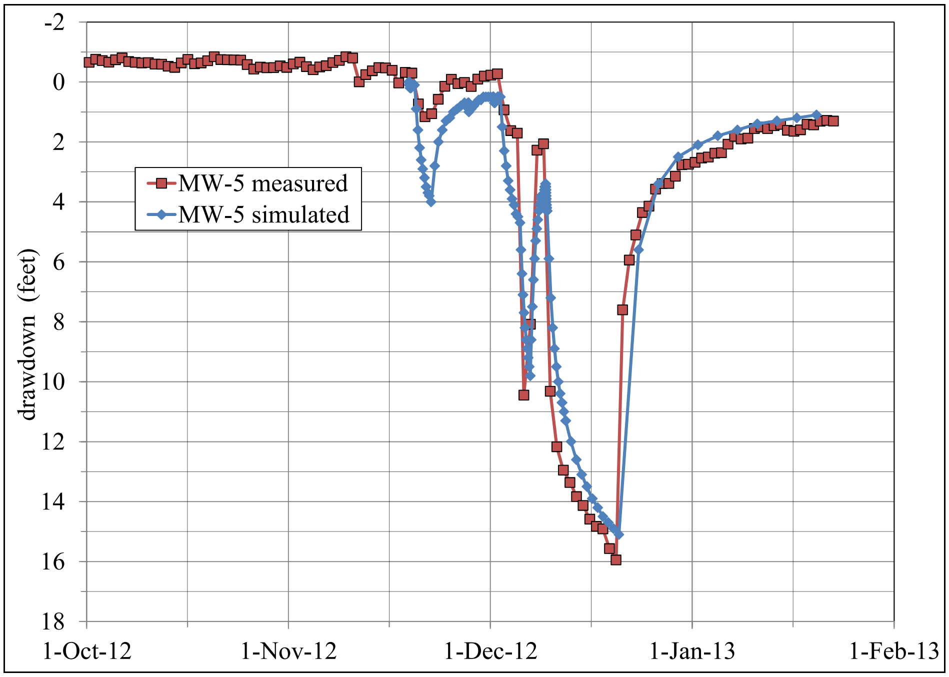


Figure 6.35. Measured and simulated water-level hydrographs in MW-5.

The rapid initial response, semi-linear drawdown trend and rapid recovery measured in the well field area is not characteristic of the response in an extensive aquifer, but in a limited-size, high-permeability unit (the Palomas graben) partly isolated from surrounding hydrogeologic units.

This response is reproduced in the model using a combination of (1) leaky fault barriers bounding the Palomas Graben, (2) high permeability within the graben and (3) lower permeability units adjacent to the graben. The combination reproduces both the aquifer test response and the overall background water levels and gradients in the basin.

Measured and simulated drawdown north of the well field along Las Animas Creek (Fig. 6.30) is shown for the SFG aquifer (wells MW-9 and MW-10) on Figure 6.36 and for the alluvium (well MW-11) on Figure 6.37.

The sharp initial drawdown and rapid recovery in the SFG aquifer is similar to that in the other Palomas Graben wells (Figs. 6.31 through 6.35). The response in the SFG aquifer (Fig. 6.36), and the lack of response in the alluvium (Fig. 6.37) are both reproduced in the model.

Instead of responding to the aquifer test, measured water levels in the very shallow (37 ft) well MW-11 (Fig. 6.37) can be seen to be rising before and throughout the test, due to some local influence, such as a neighboring well stopping pumping.

Measured and simulated drawdown east of the well field, at GWQ11-27 (Fig. 6.30), is shown on Figure 6.38. The model-simulated response is not as rapid or as large as the apparent measured response, but the figure also shows substantial background water-level fluctuation that is not part of the aquifer test response.

Measured and simulated drawdown west of the well field, at MW-6 (Fig. 6.30), is shown on Figure 6.39. The measured data shown on the figure consist of the highest water level measured each day; actual water levels in MW-6, an actively-used pumping well, fluctuate over tens of feet as the pump starts and stops. The data shown on the figure correspond to the water level measured each morning, just before the pump was started.

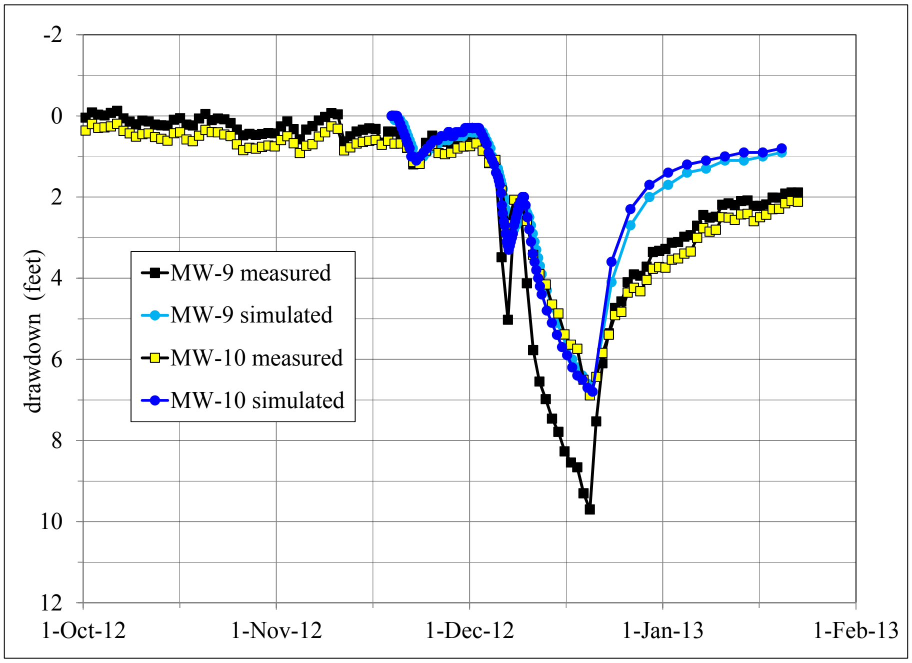


Figure 6.36. Measured and simulated water-level hydrographs in MW-9 and MW-10.

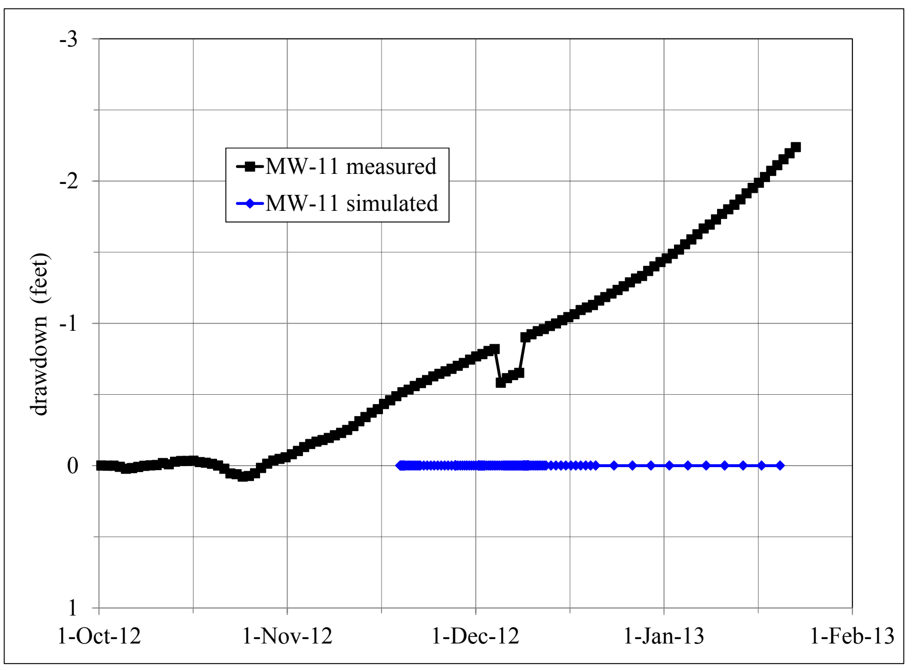


Figure 6.37. Measured and simulated water-level hydrographs in MW-11.

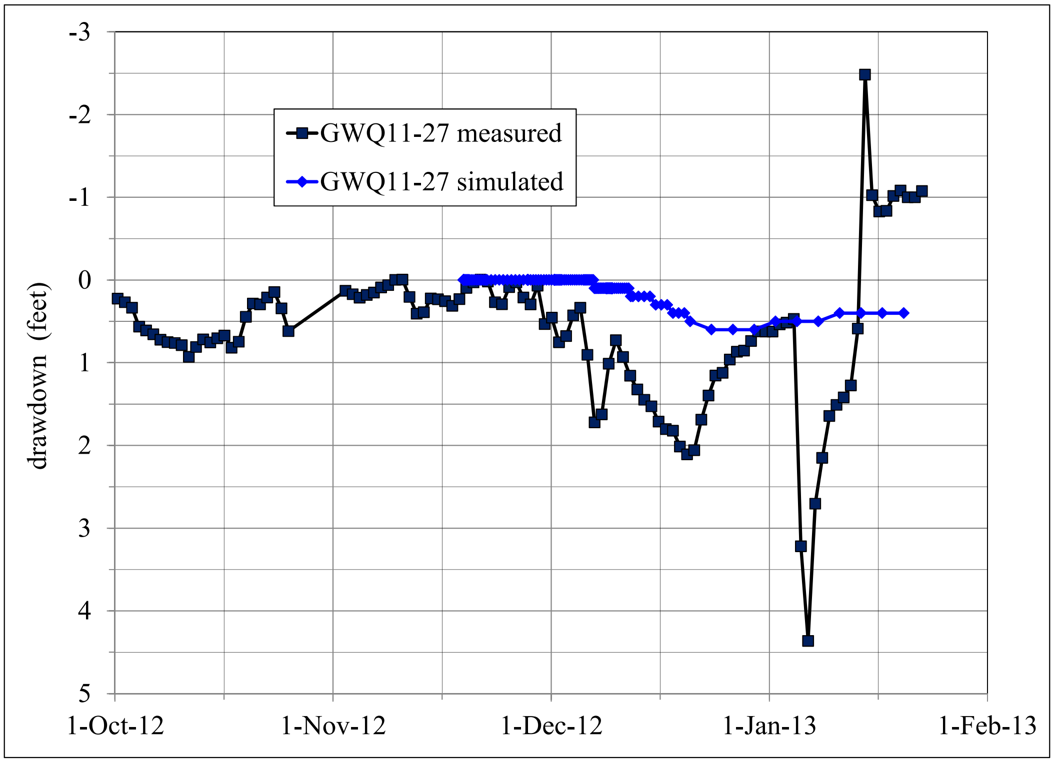


Figure 6.38. Measured and simulated water-level hydrographs in GWQ11-27.

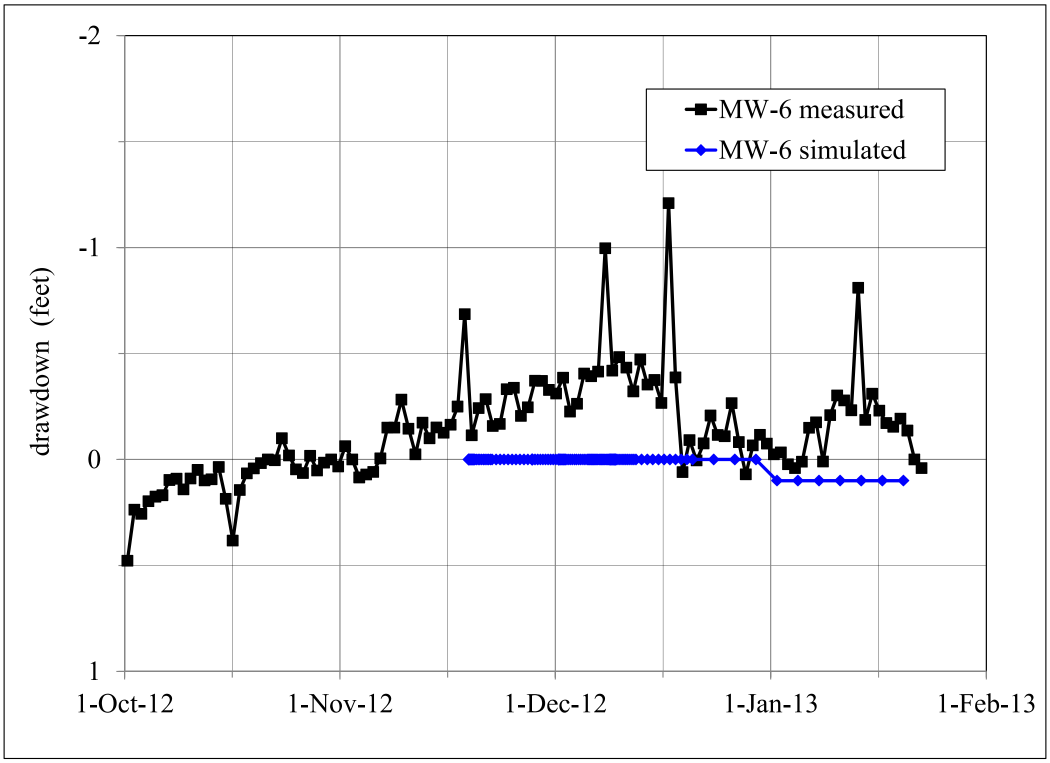


Figure 6.39. Measured and simulated water-level hydrographs in MW-6.

7.0 SENSITIVITY OF MODEL RESULTS

The sensitivity of model results to different parameters is discussed below.

First, the sensitivity of calibration results to model parameters is presented. These indicate which parameters are known with more confidence, or better constrained by data, and which are more unknown or uncertain. This helps to define a range of plausible values for each parameter.

Then the sensitivity of model projection results, within the plausible range of values for different parameters, is evaluated, to indicate a probable range of results. This quantifies the level of uncertainty in the model predictions and defines a range of likely outcomes.

7.1 Sensitivity of Calibration Results

The sensitivity of results to changes in model parameters was investigated during development of the model, in order to improve model calibration. An example of this is given on Figure 7.1, showing the simulation of the 2012 aquifer test for different modeled levels of vertical anisotropy in the Palomas Graben.

The results suggest important vertical flow upward into the strata from which the wells pump. The sediments filling the Palomas Graben are therefore modeled as an isotropic unit, with equal horizontal and vertical permeability (Table 6.1).

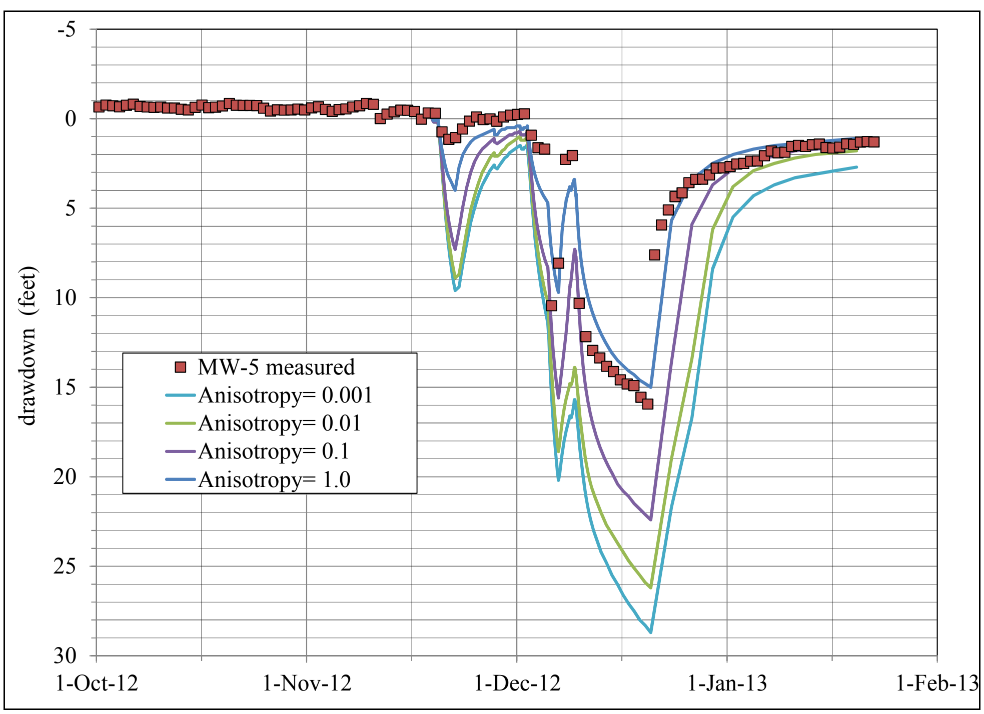


Figure 7.1. Simulated aquifer-test drawdown in well MW-5 for different vertical anisotropy values.

A related example is shown on Figure 7.2, showing the simulation of the 2012 aquifer test for different horizontal permeability of the Palomas Graben. Results show improved calibration for higher permeability. The final modeled permeability was 10 ft/d for the strata in which the well field is completed, with a total aquifer transmissivity of 20,000 ft^2/d (Table 6.1).

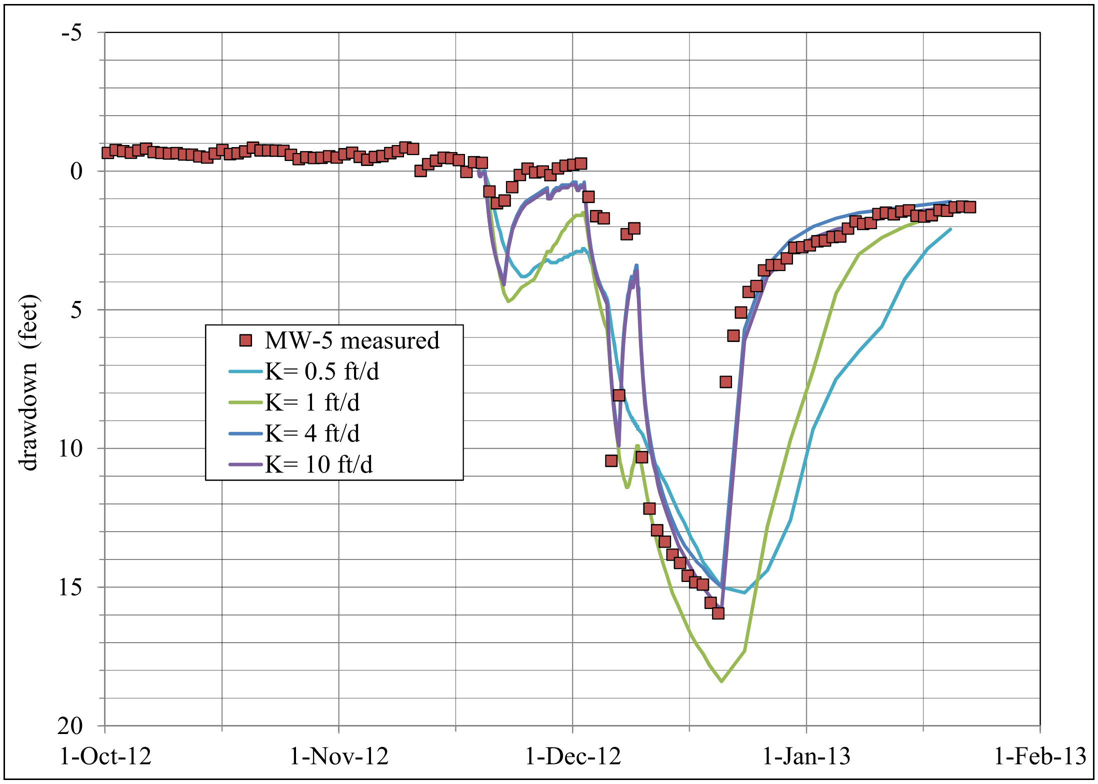


Figure 7.2. Simulated aquifer-test drawdown in well MW-5 for different hydraulic conductivity values.

Another example tests the conceptual model of a linearly extensive Palomas Graben. Figure 7.3 presents simulated 2012 aquifer test drawdown at observation well MW-5, with and without the north-south (GHB) boundary conditions in the Palomas Graben. The model calibration suggests that, if there were no significant north-south flow path in the graben, there would have been more aquifer test drawdown, with slower water-level recovery.

Based on the aquifer test results and model calibration, the Palomas Graben appears to be a linear feature of significant north-south extent; the aquifer test drawdown was characteristic of the response of a semi-infinite linear feature of finite width.

Based on the sensitivity results above, the transmissivity and vertical anisotropy of the highly-transmissive Palomas Graben are considered to be relatively well-known parameters, whose range of possible values is constrained by data.

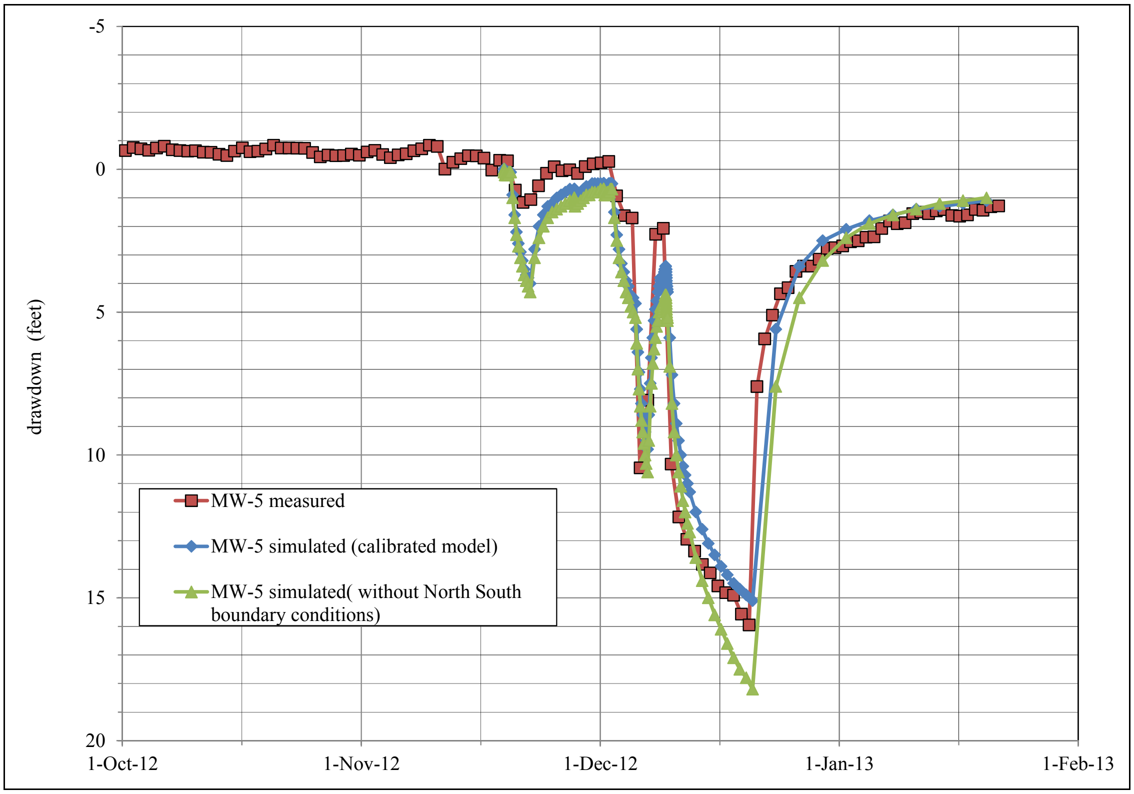


Figure 7.3. Simulated aquifer-test drawdown in well MW-5 with and without Palomas Graben boundary conditions

The hydraulic characteristics of the faults bounding the Palomas Graben are also reasonably known:

- The east bounding fault is weakly resistant to flow (Table 6.2). Based on model calibration, the resistance is not greater than simulated. The east bounding fault could be simulated with zero resistance (and compensating reduced transmissivity east of the graben), with little effect on calibration or projection results.

- The west bounding fault is strongly resistant to flow (Table 6.2). This resistance is important to overall model calibration (Fig. 6.10) and to aquifer test calibration. Simulating greater resistance (smaller conductance on Table 6.2) across the already low-permeability fault makes little difference to calibration or projection results. Simulating less resistance to the west degrades the model calibration and slightly attenuates the projected effects east of the graben.

Away from the Palomas Graben, the properties of the SFG aquifer are less well-known. However, based on aquifer test results and model calibration information the SFG aquifer along Animas Creek (Fig. 6.2) is identified to be similarly transmissive (Table 6.1).

The properties of the alluvial aquifer along Animas Creek are not known in detail, but the alluvium can be assumed to be conductive and to have substantial storage capacity. Measured historical water levels at MW-9, MW-10 and MW-11, results of the 1994 MW-9 pumping test (Fig. 5.13), and results of the 2012 well field pumping test (Fig. 6.37), all show that the alluvial aquifer does not respond readily to pumping in the underlying SFG aquifer.

To summarize the constraints on parameters:

1. Properties of the SFG sediments in the Palomas Graben are reasonably well-known based on calibration to aquifer test results. The graben aquifer is relatively transmissive both horizontally and vertically.

2. Properties of the SFG sediments along Animas Creek are somewhat known based on aquifer test results and other model calibration. The SFG aquifer along Animas Creek is also relatively transmissive.

3. Properties of the alluvial aquifer along Animas Creek are somewhat known, based on overall model calibration and on general material properties. Multiple aquifer test results (Sections 5.2.2, 5.2.3, and 5.2.4) indicate that the alluvial aquifer is substantially isolated from the SFG aquifer.

The above constraints narrow the plausible ranges of the main model result (the projection of groundwater drawdown and surface discharge reduction, resulting from proposed operation of the well field). The sensitivity of this result to variation of model parameters within plausible ranges is discussed below.

7.2 Sensitivity of Projection Results

The sensitivity of model projections to unknown parameters is of importance in evaluating the effects of the proposed project. Because model projections are reported separately, this report does not present results of specific projections. The general sensitivity of all projection scenarios to unknown parameters is discussed here.

The main effects of the project would be associated with pumping of the well field, including groundwater drawdown and surface discharge changes. The high-transmissivity features of the Palomas Graben and the SFG aquifer along Animas Creek largely control the pattern of groundwater drawdown and the effects on discharge. The projected groundwater drawdown spreads throughout the high-transmissivity features, and magnitude of drawdown is proportional to the total volume of water pumped. The discharge effects develop over the life of mine and dissipate over a similar period.

This basic result is controlled by the known high-transmissivity features. Variations of aquifer parameters for these features, within plausible ranges, do not change the basic result, and can only marginally affect the shape and size of the drawdown cone and the timing of the discharge changes. This was confirmed during model calibration by comparing the results of different preliminary projection scenarios, using different preliminary model versions.

While the basic result is insensitive to changes in aquifer parameter values, variation in the model boundary conditions controlling groundwater discharge to the Rio Grande Basin (MODFLOW module GHB) can have more effect. The conductance of the GHB boundaries (Sec. 6.3.1) were adjusted both up and down one order of magnitude, and results of a sample projection compared to results obtained using the calibrated model.

An increase in the already-large conductance does not substantially change model results; the GHB boundaries are simulated with sufficiently large conductance that they function essentially as constant-head boundary conditions, maintaining a constant water level along the east edge of the model domain.

A decrease in GHB conductance, however, reduces simulated discharge to the Rio Grande system, and increases simulated discharge to the Animas Creek and Percha Creek systems. Projected effects on discharge to the Rio Grande system are smaller, and projected effects on discharge to the Animas Creek and Percha Creek systems are larger. Total discharge and total effect on discharge are unchanged.

In summary, the aquifer properties near the well field are relatively well-known, due to the 2012 aquifer test. The aquifer properties farther away do not substantially affect the size or shape of the predicted groundwater drawdown cone, or its rate of dissipation. The identified high-transmissivity units govern the propagation of groundwater drawdown and the resulting water balance effects.

Reasonable variation in boundary condition parameters such as GHB conductance do not substantially change the overall projected effects, but can affect the predicted distribution of those effects between groundwater discharge to the Rio Grande system and discharge to the Animas Creek and Percha Creek systems.

8.0 CONCLUSIONS

A numerical model of groundwater flow in and around Copper Flat, near Hillsboro, New Mexico was developed and calibrated based on previously available information and on new studies of the system. The calibrated model will be used to project the effects, to groundwater and surface water, of the proposed development of the Copper Flat mine.

First, the climate and meteorology, hydrology and water balance, and geology and hydrogeology, of the study area were summarized. Then a conceptual model of the hydrological and hydrogeological system was presented. Important hydrogeological features are the high-transmissivity Palomas Graben and a high-transmissivity zone along the axis of Animas Creek.

Next, the data available to confirm and calibrate the model were presented. Extensive information is available, from previous studies and previous mine operations, and from new studies including the 2012 extended well field test and the 2011 pit-area pressure-injection testing. The large amount of information has allowed development of a model that can reliably project effects of future development.

Next the numerical model was presented, including model structure, inputs and calibration. The model accurately represents the conceptual model and accurately reproduces the calibration data, particularly the results of the 2012 extended well field pumping test. As a result the model is considered suitable for use in projecting the effects of future well field pumping.

Finally the sensitivity of model results to unknown parameters was evaluated. The existing information, including the 2012 aquifer test, characterizes the main SFG aquifer units and narrows the range of parameter uncertainty in the vicinity of the well field. Sensitivity of the primary model projection results, groundwater drawdown and surface discharge changes due to well field pumping, is low.

The calibrated model will be used to generate projections related to the results and effects of mine development. Projections will be generated as required and reported separately. Results of interest include the following:

- Groundwater drawdown due to water-supply pumping, for selected mine development scenarios
- Effects on surface discharge to the Las Animas Creek and Rio Grande systems
- Long-term post-mining residual groundwater drawdown and effects to surface discharge
- Potential ground subsidence due to groundwater drawdown
- Open pit dewatering rates and groundwater drawdown in bedrock
- Post-mining open-pit water level and water balance
- Down-gradient migration of potential leakage from tailings and waste rock storage facilities

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APPENDICES

Appendix A.

Geological Bibliography

Selected References on the Caballo–Copper Flat Area and Adjacent Parts of the Palomas Basin and Rincon Valley, Sierra and Doña Ana Counties, New Mexico

August 2012 Compilation by John W. Hawley, Ph.D., Senior Hydrogeologist, N.M. Water Resources Research Institute, N.M. State University
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Appendix B.

Well Construction Diagrams

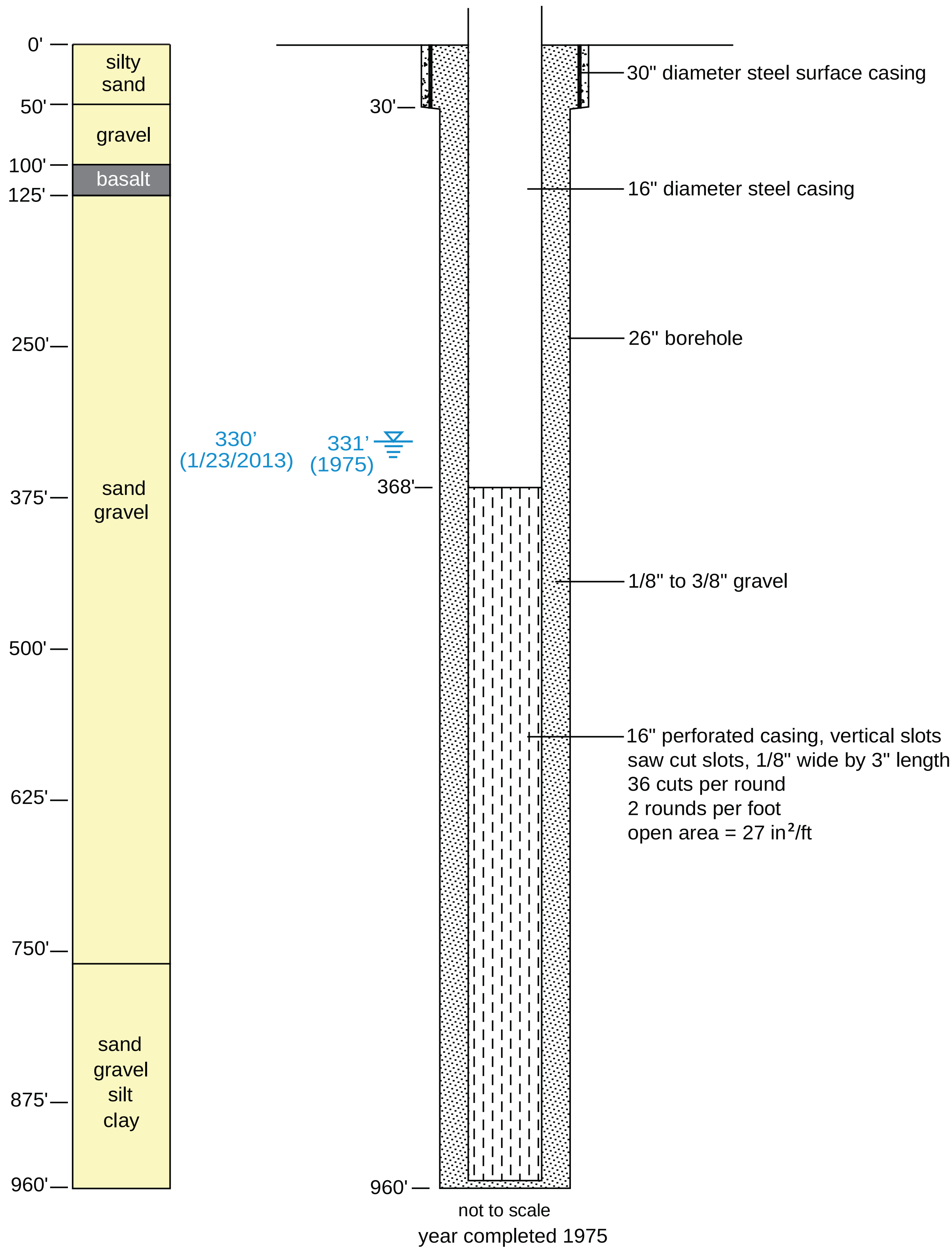


Figure B1. Well completion diagram for LRG-4652 (PW-1), Copper Flat Mine, Sierra County, New Mexico.

8-21-2013; DA/PW

JOHN SHOMAKER & ASSOCIATES, INC.

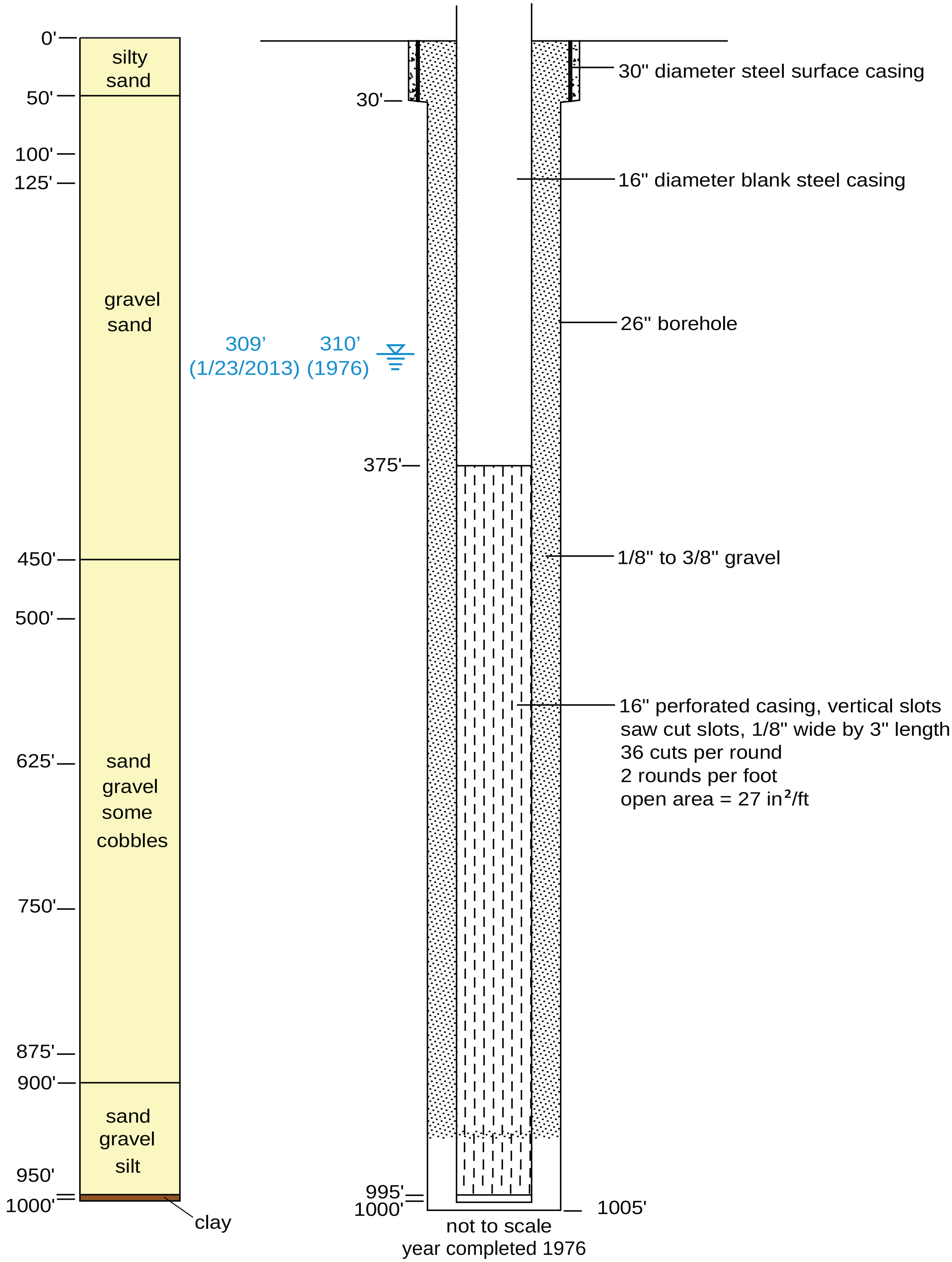


Figure B2. Well completion diagram for LRG-4652-S (PW-2), Copper Flat Mine, Sierra County, New Mexico.

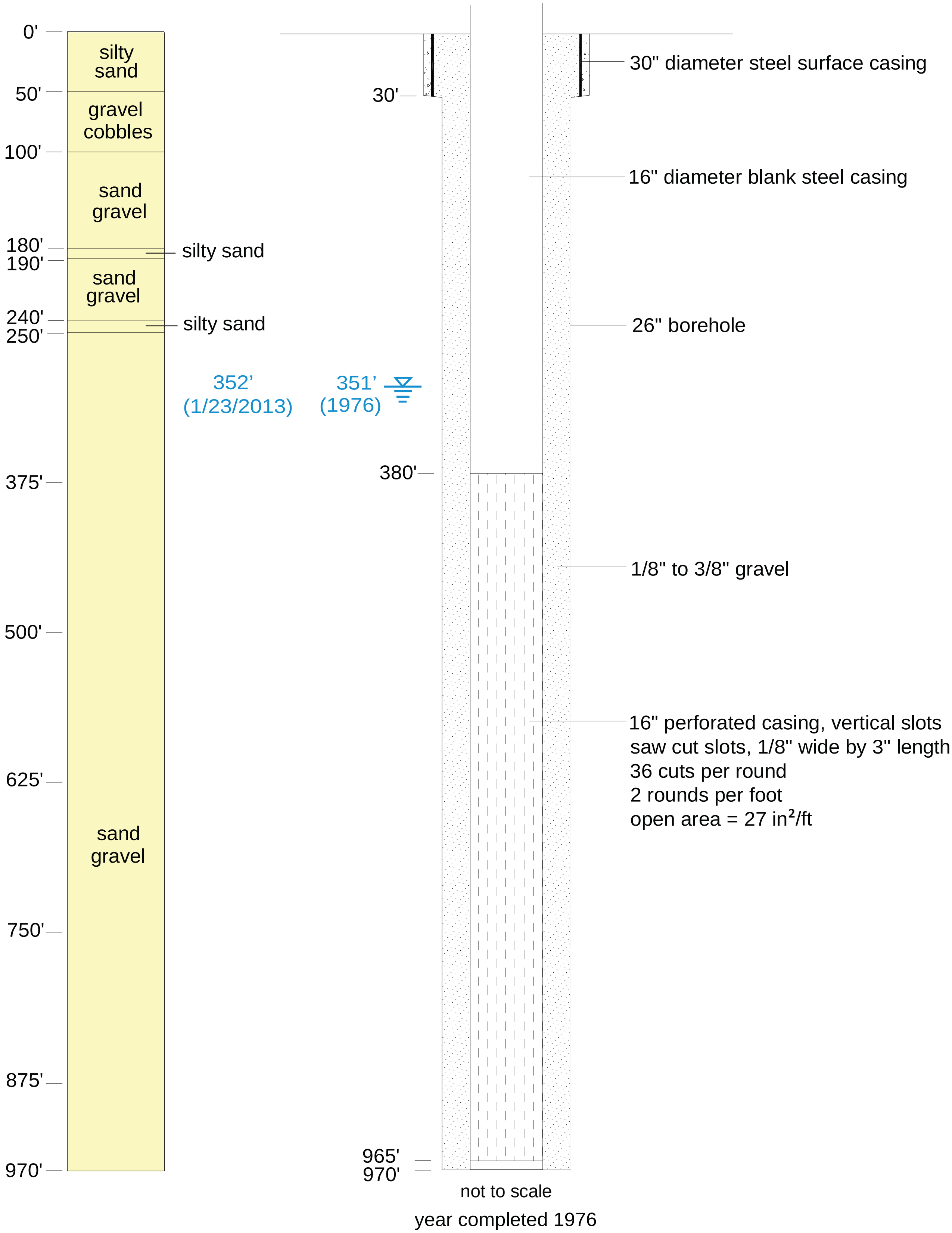


Figure B3. Well completion diagram for LRG-4652-S-2 (PW-3), Copper Flat Mine, Sierra County, New Mexico.

8-21-2013; DA/PW

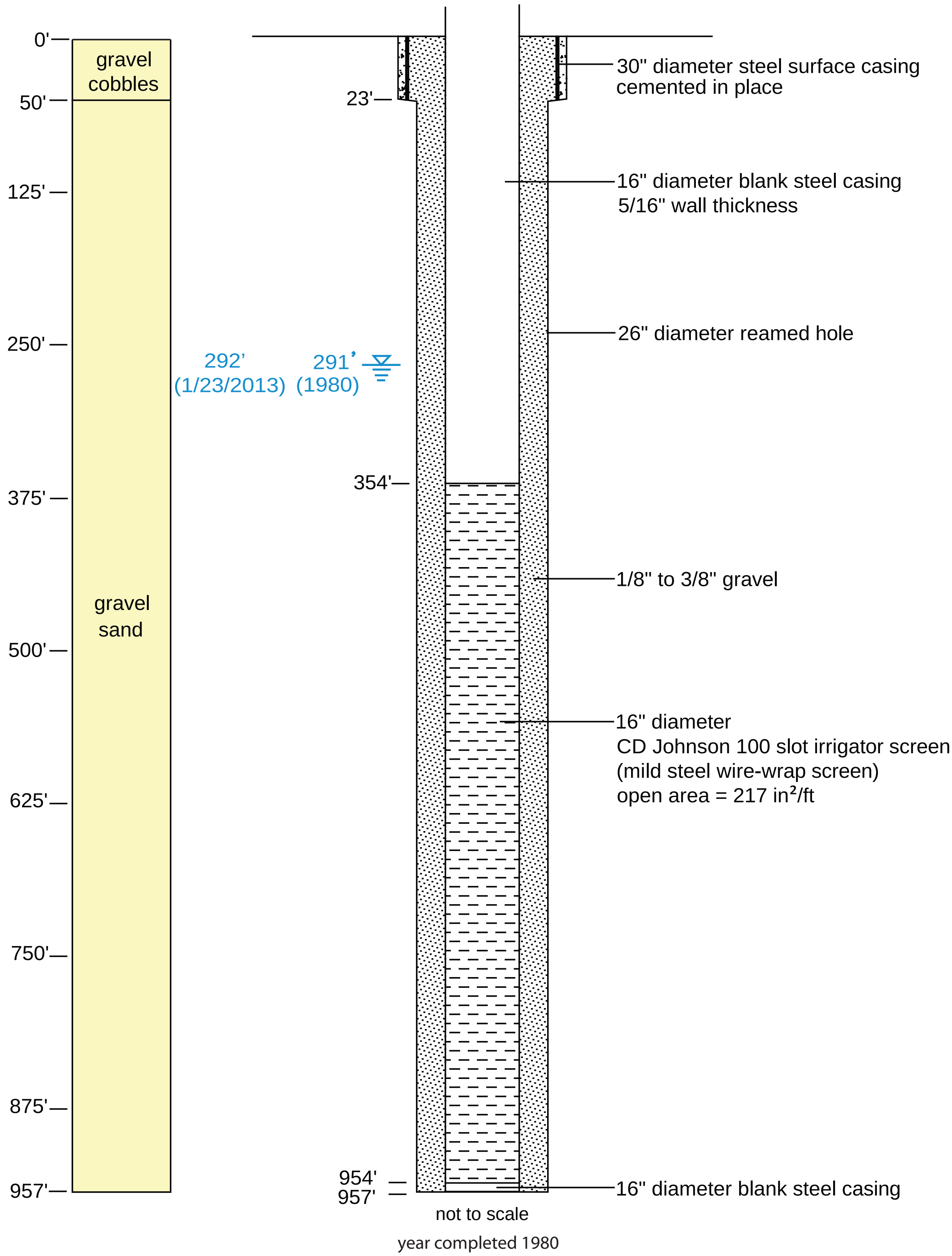


Figure B4. Well completion diagram for LRG-4652-S-3 (PW-4), Copper Flat Mine, Sierra County, New Mexico.

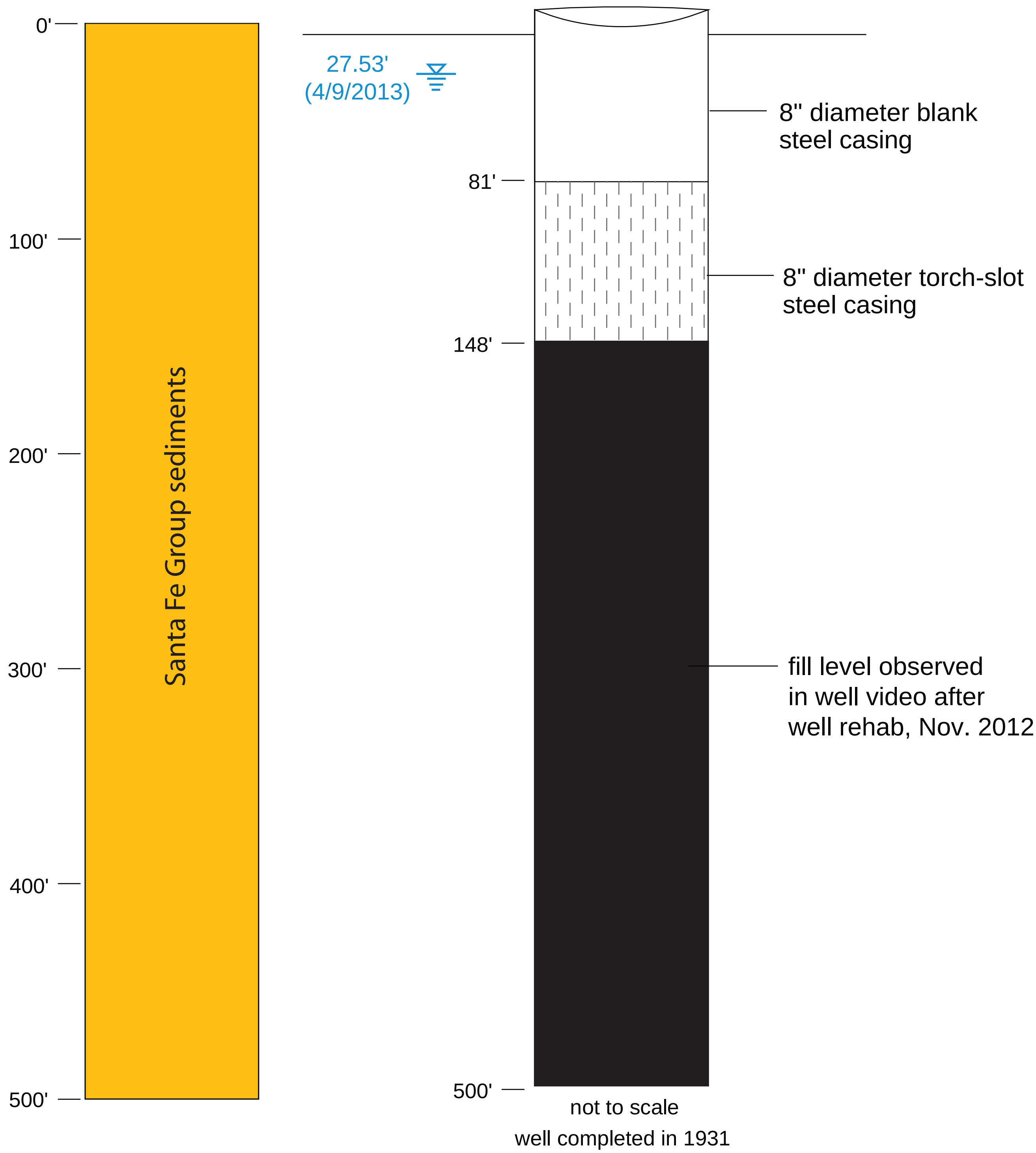


Figure B5. Well completion diagram for LRG-4652-S-4 (GWQ-8),
Copper Flat Mine, Sierra County, New Mexico.

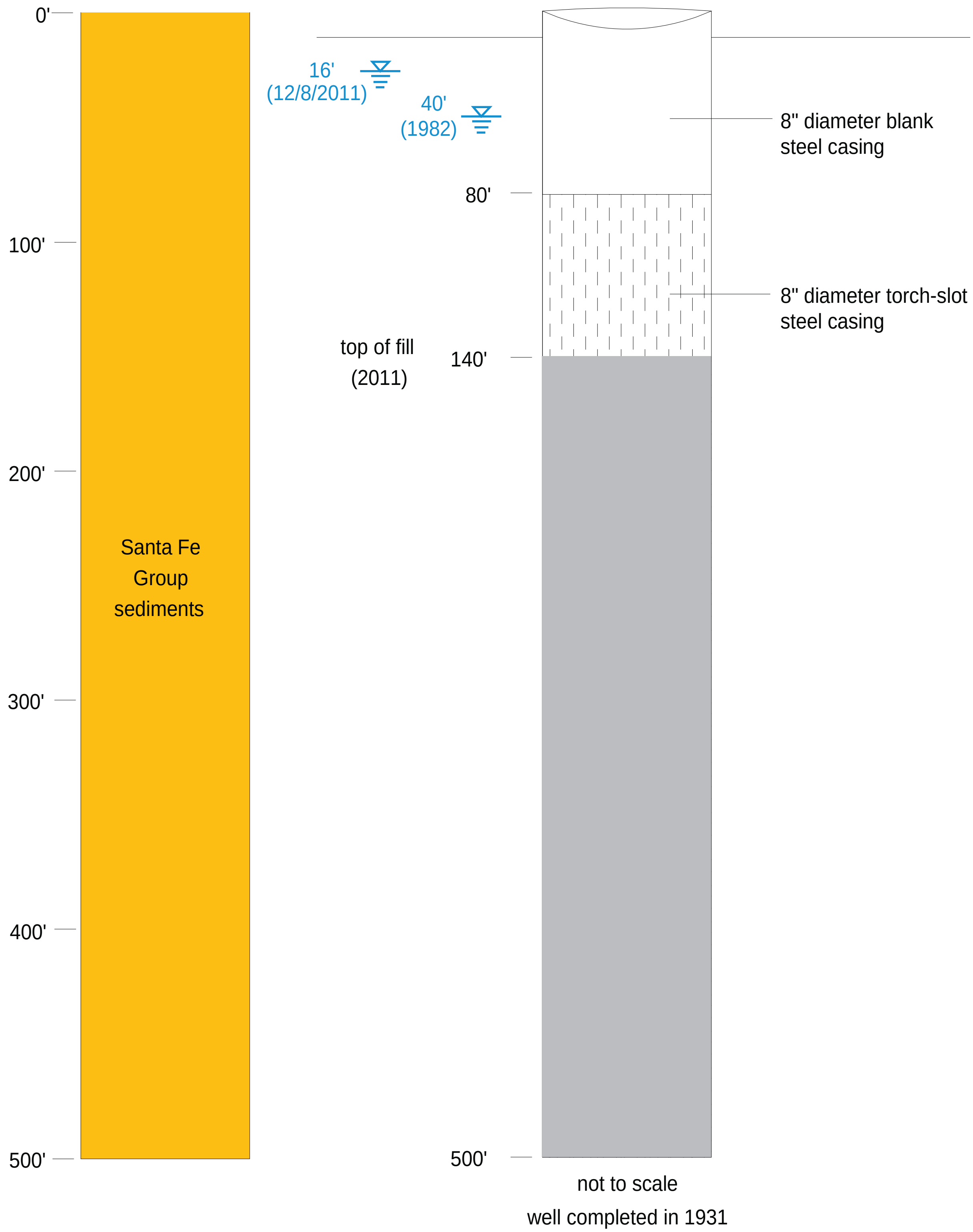


Figure B6. Well completion diagram for LRG-4652-S-5 (McCravery-Grayback), Copper Flat Mine, Sierra County, New Mexico.

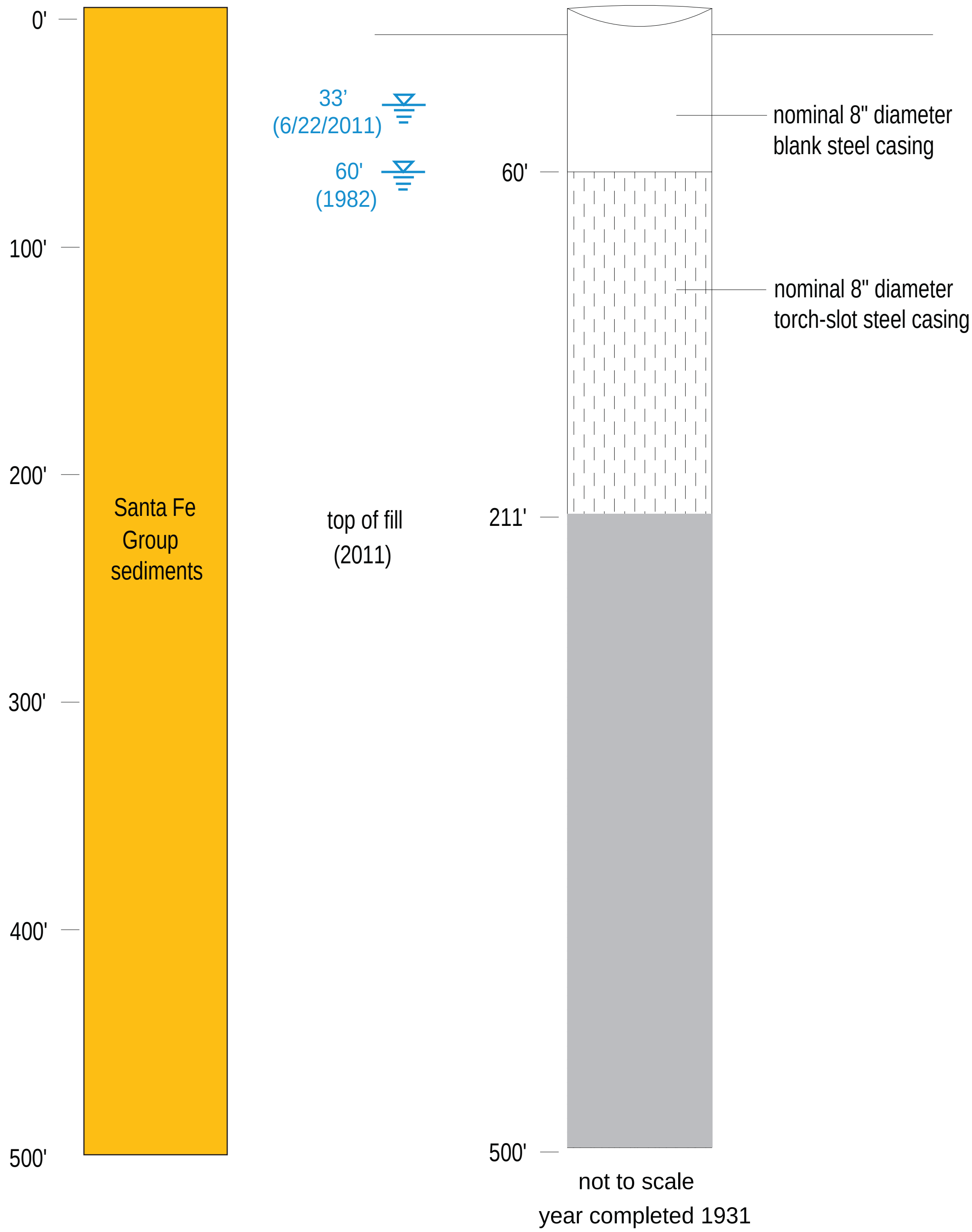


Figure B7. Well completion diagram for LRG-4652-S-6 (GWQ-2), Copper Flat Mine, Sierra County, New Mexico.

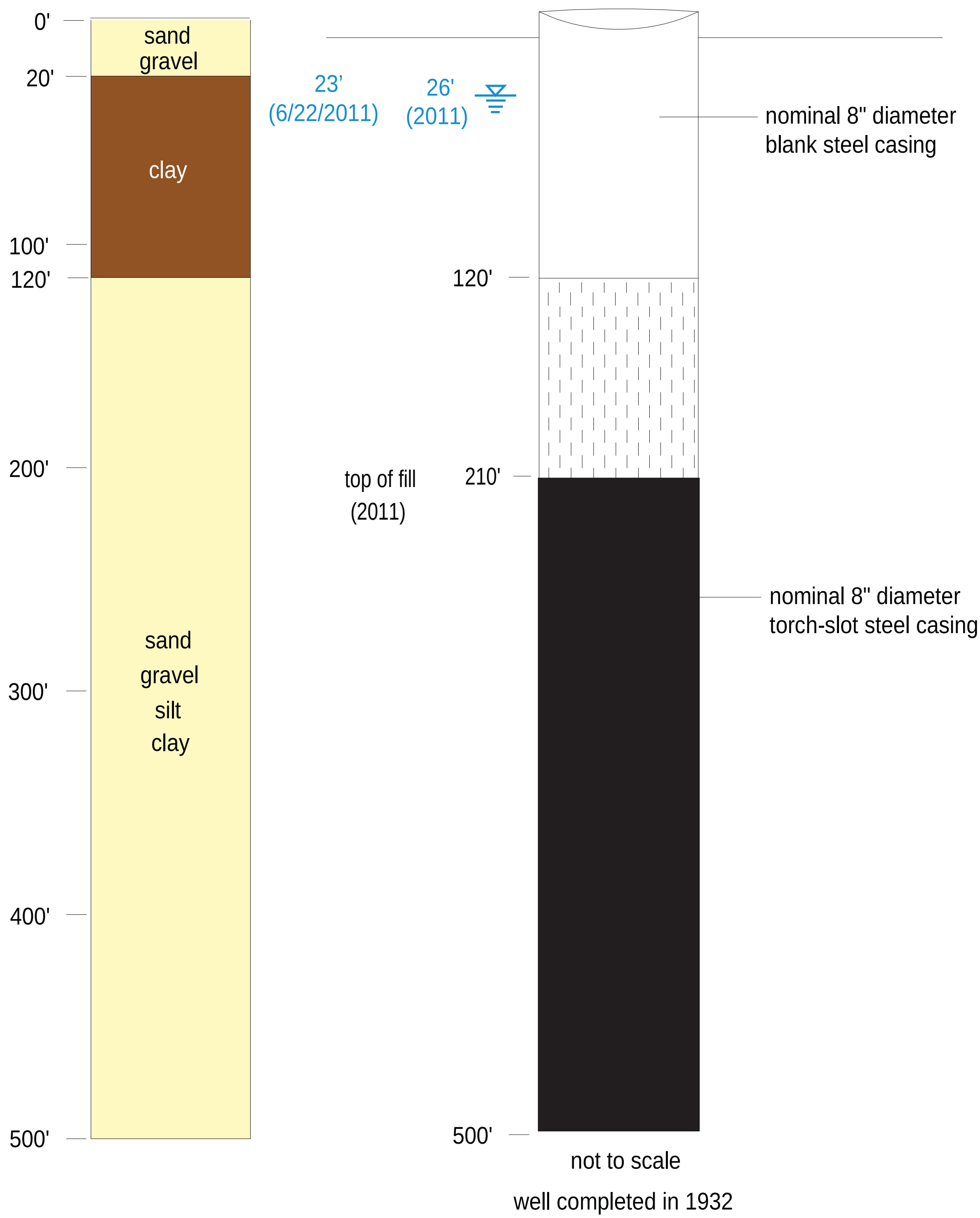


Figure B8. Well completion diagram for LRG-4652-S-7 (Irwin Well), Copper Flat Mine, Sierra County, New Mexico.

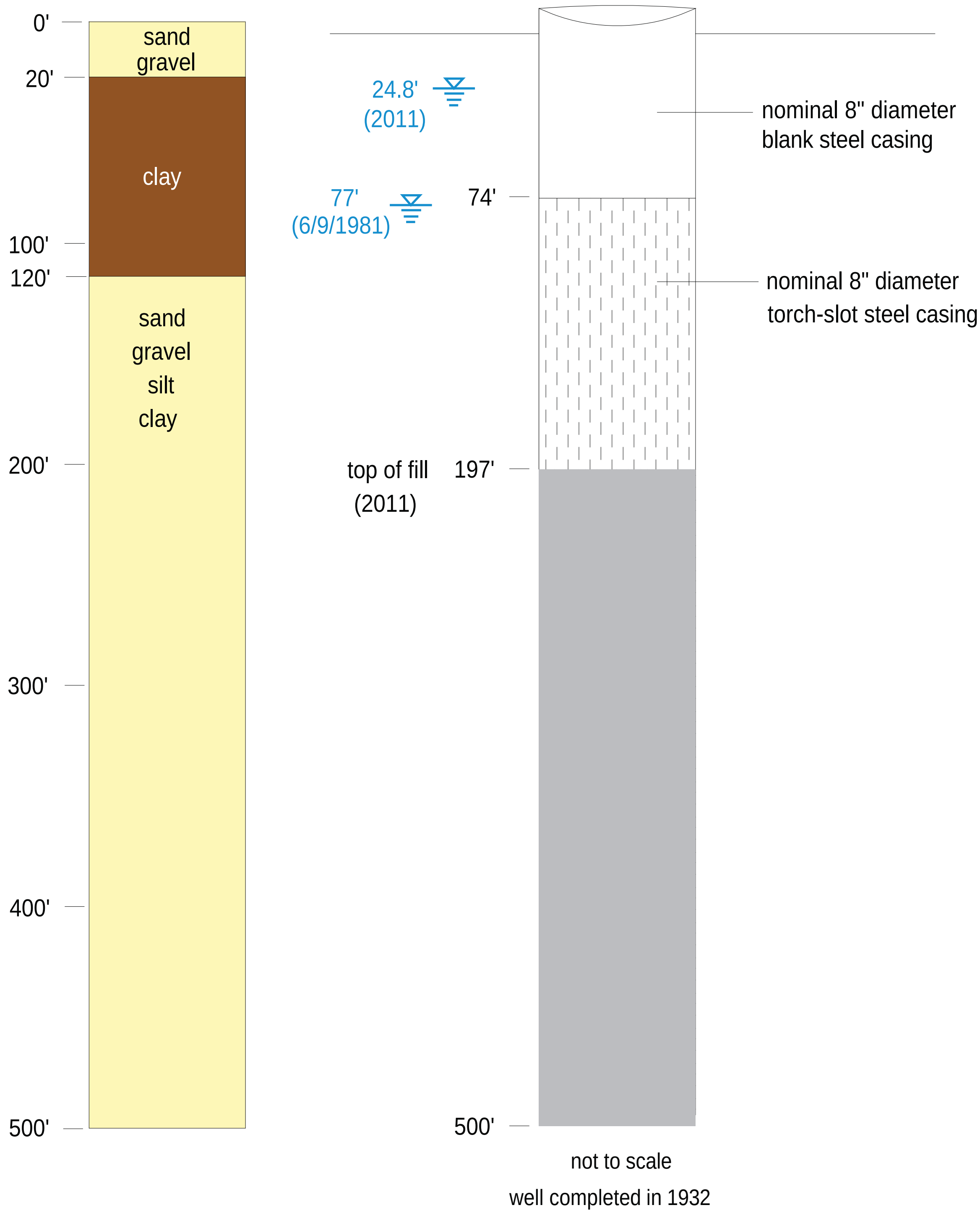


Figure B9. Well completion diagram for LRG-4652-S-8 (GWQ-7, Office Well), Copper Flat Mine, Sierra County, New Mexico.

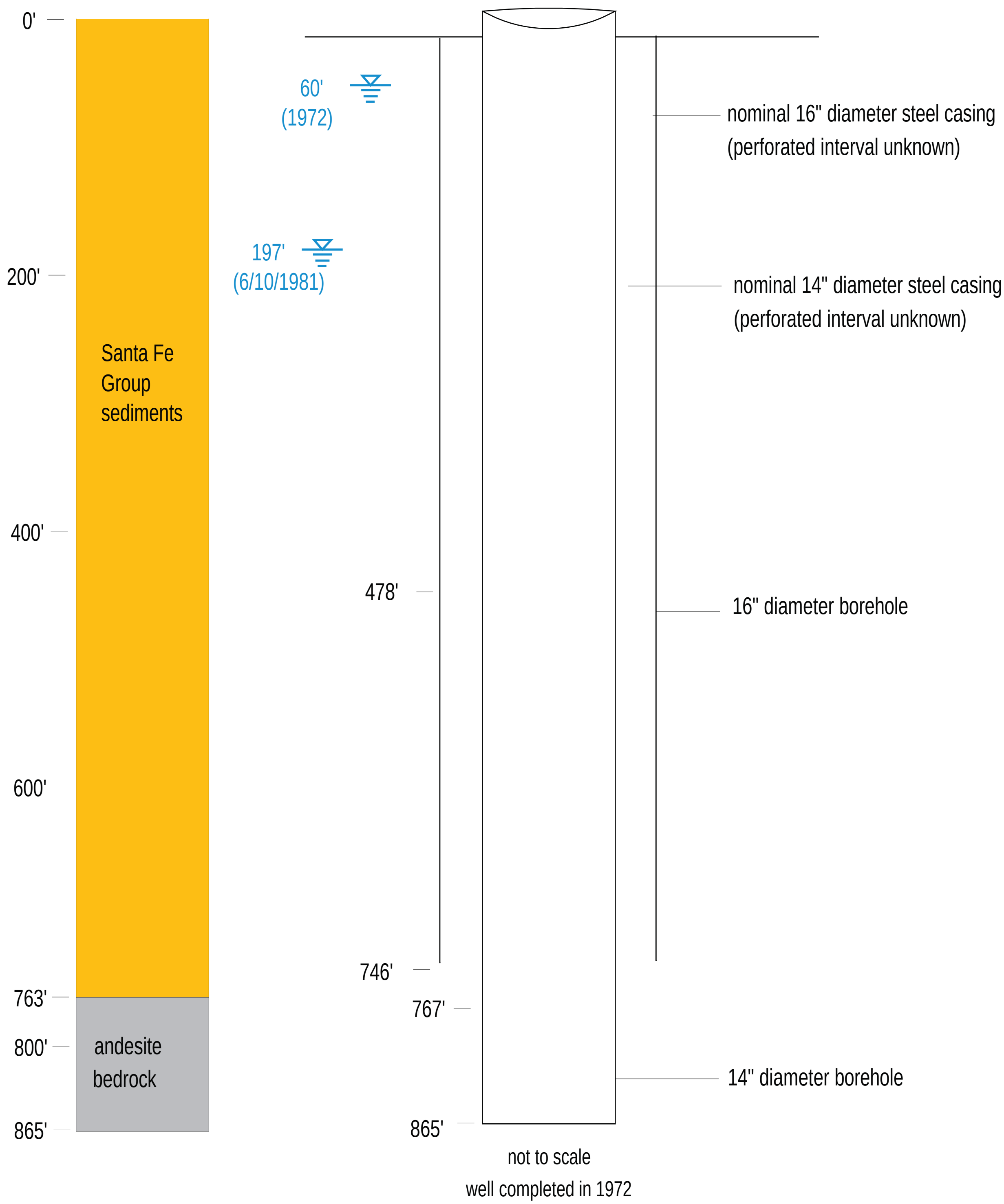


Figure B10. Well completion diagram for LRG-4652-S-9 (GWQ-9, South Inspiration, Well IDW-1), Copper Flat Mine, Sierra County, New Mexico.

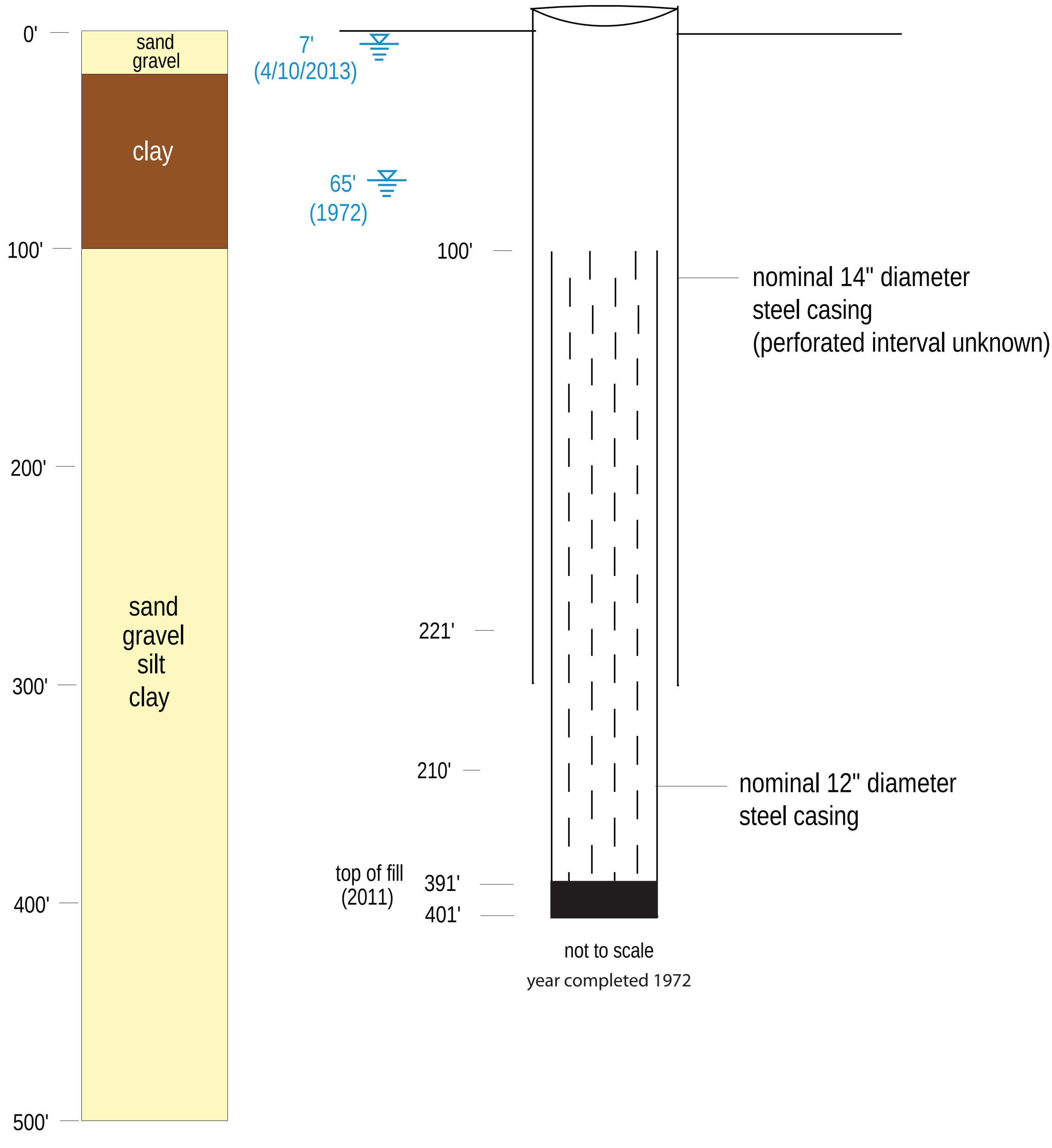


Figure B11. Well completion diagram for LRG-4652-S-10 (GWQ-1, North Inspiration, Well IDW-2, S-10), Copper Flat Mine, Sierra County, New Mexico.

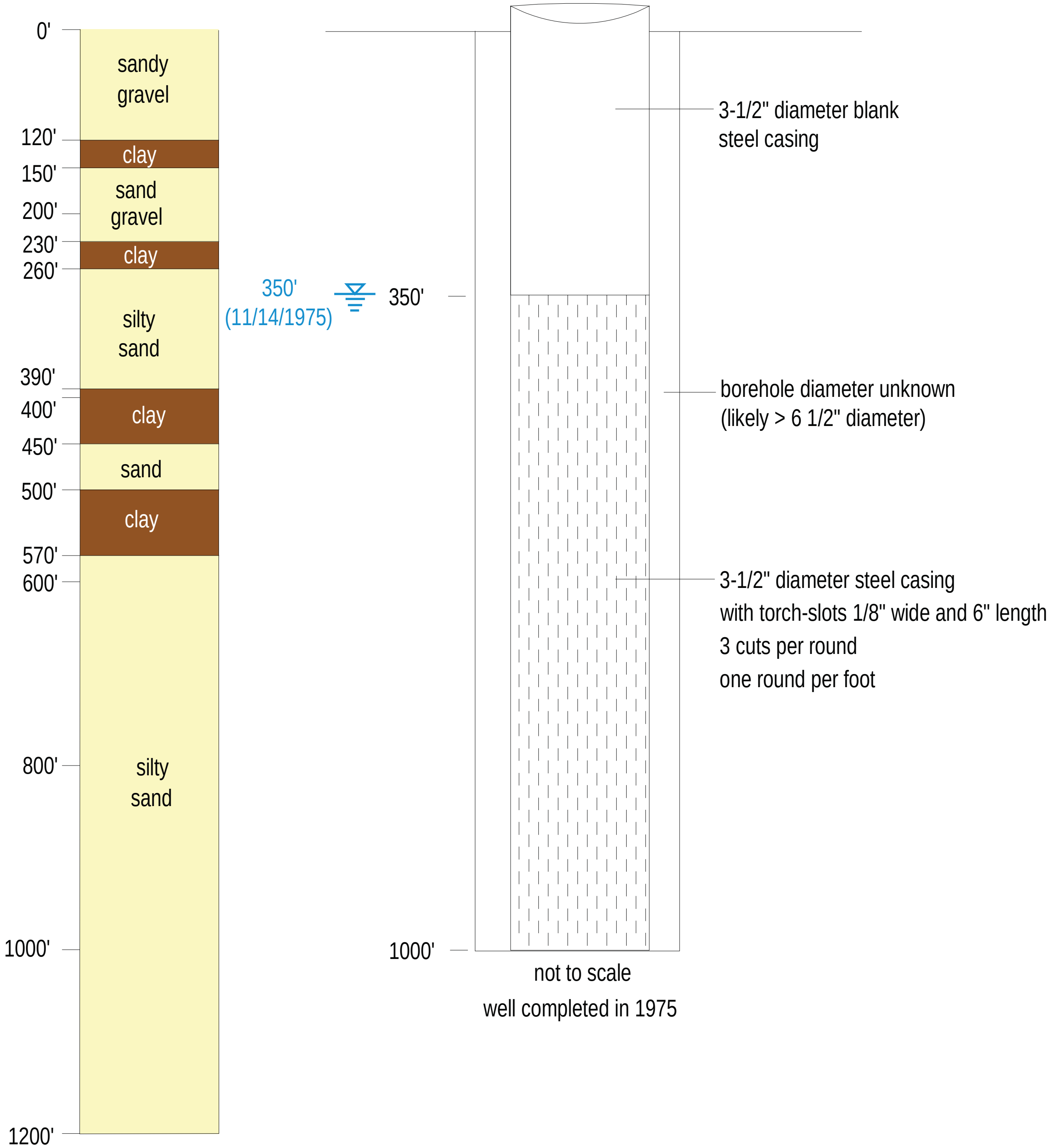


Figure B12. Well completion diagram for LRG-4652-S-11 (MW-1), Copper Flat Mine, Sierra County, New Mexico.

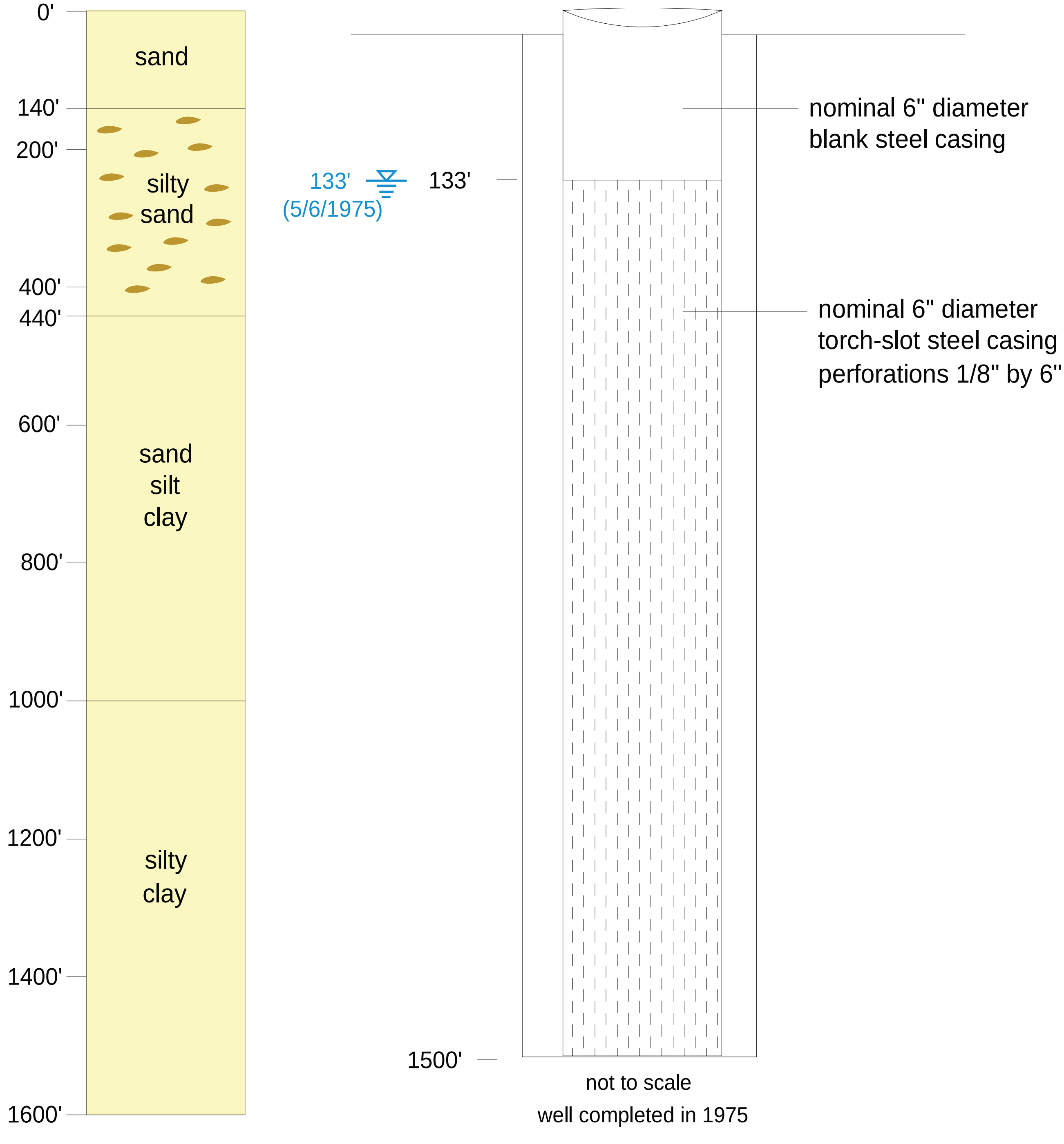


Figure B13. Well completion diagram for LRG-4652-S-12 (MW-2), Copper Flat Mine, Sierra County, New Mexico.

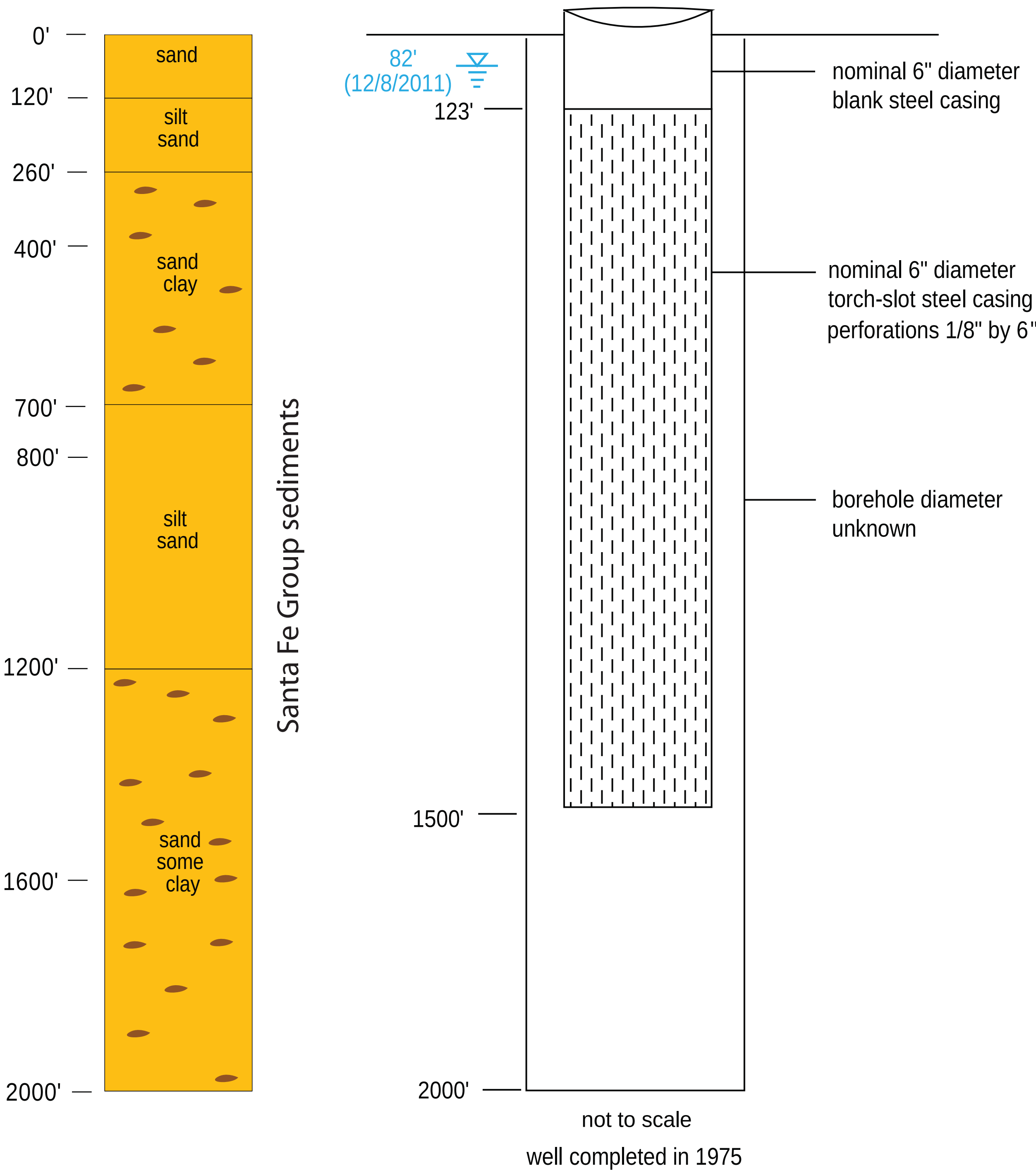


Figure B14. Well completion diagram for LRG-4652-S-13 (MW-4), Copper Flat Mine, Sierra County, New Mexico.

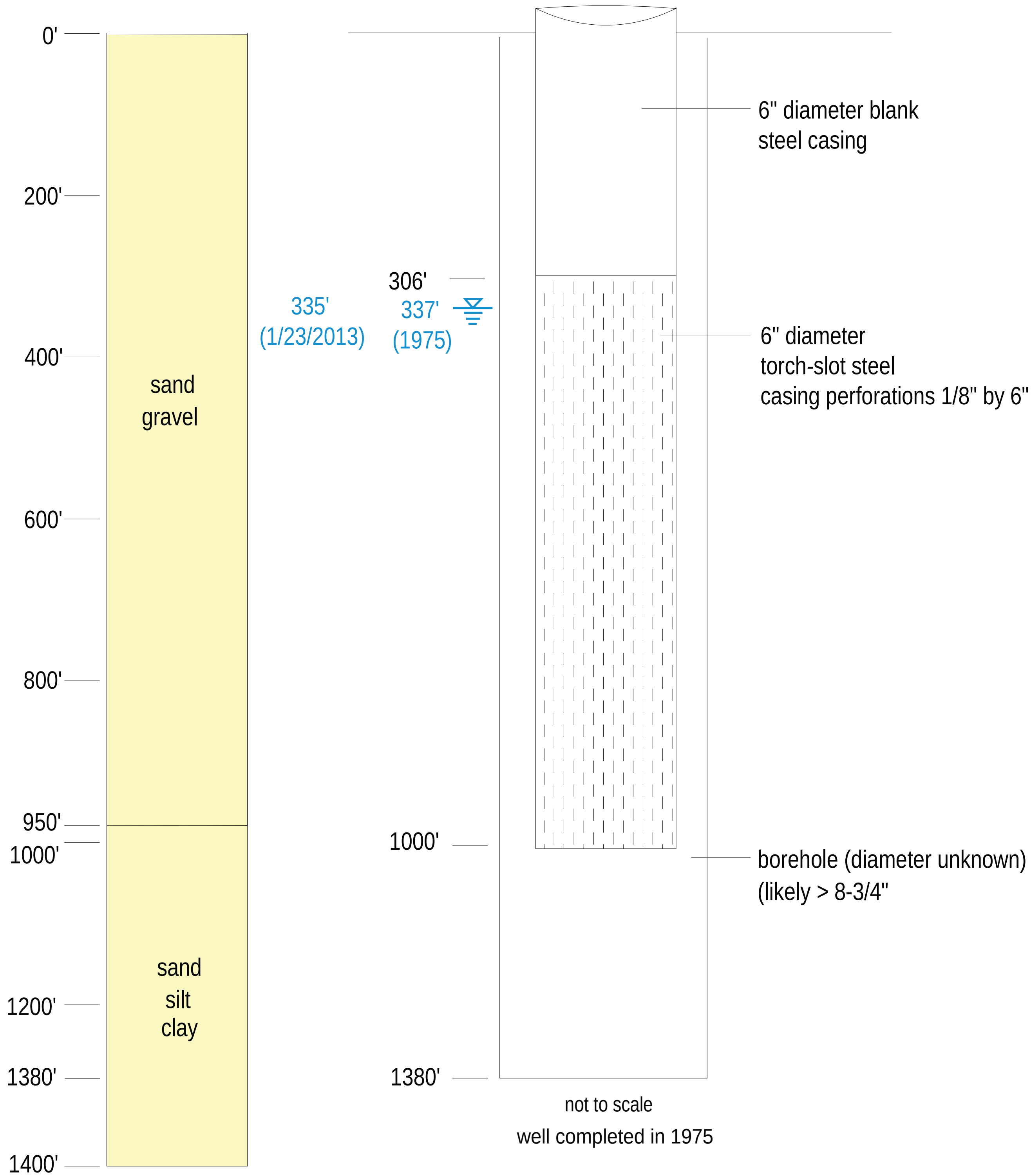


Figure B15. Well completion diagram for LRG-4652-S-14 (MW-5), Copper Flat Mine, Sierra County, New Mexico.

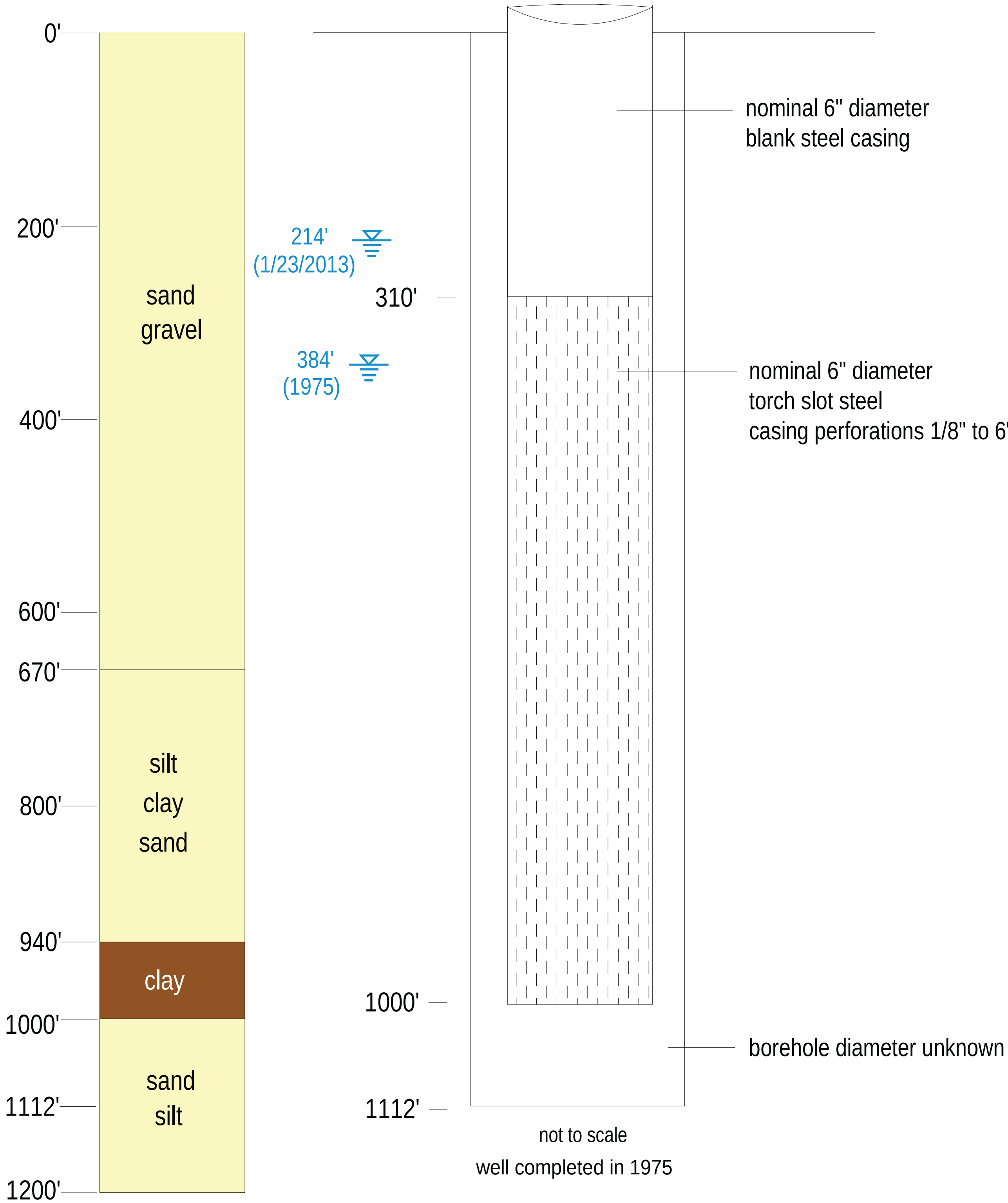


Figure B16. Well completion diagram for LRG-4652-S-15 (MW-6),
Copper Flat Mine, Sierra County, New Mexico.

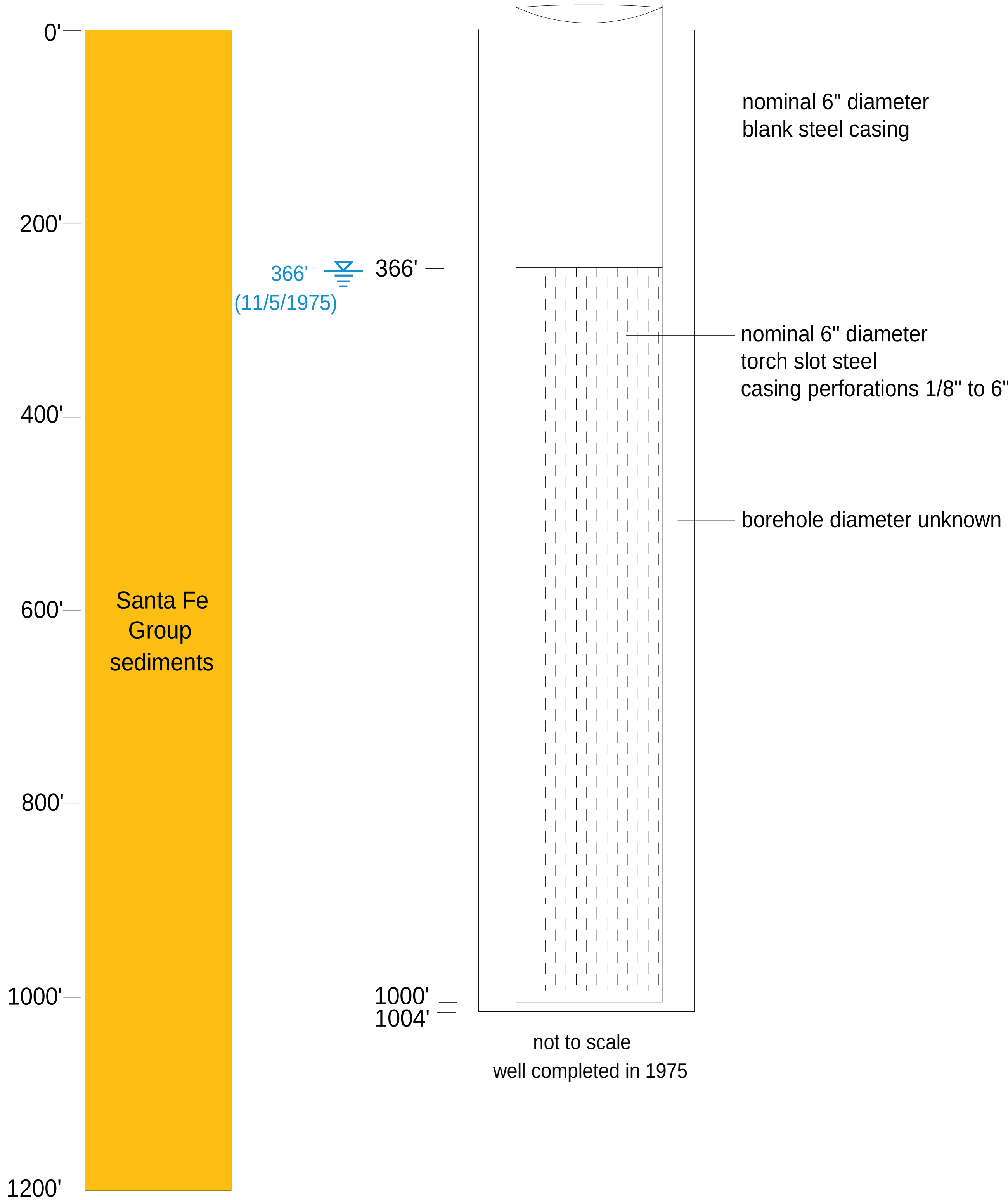


Figure B17. Well completion diagram for LRG-4652-S-16 (MW-8), Copper Flat Mine, Sierra County, New Mexico.

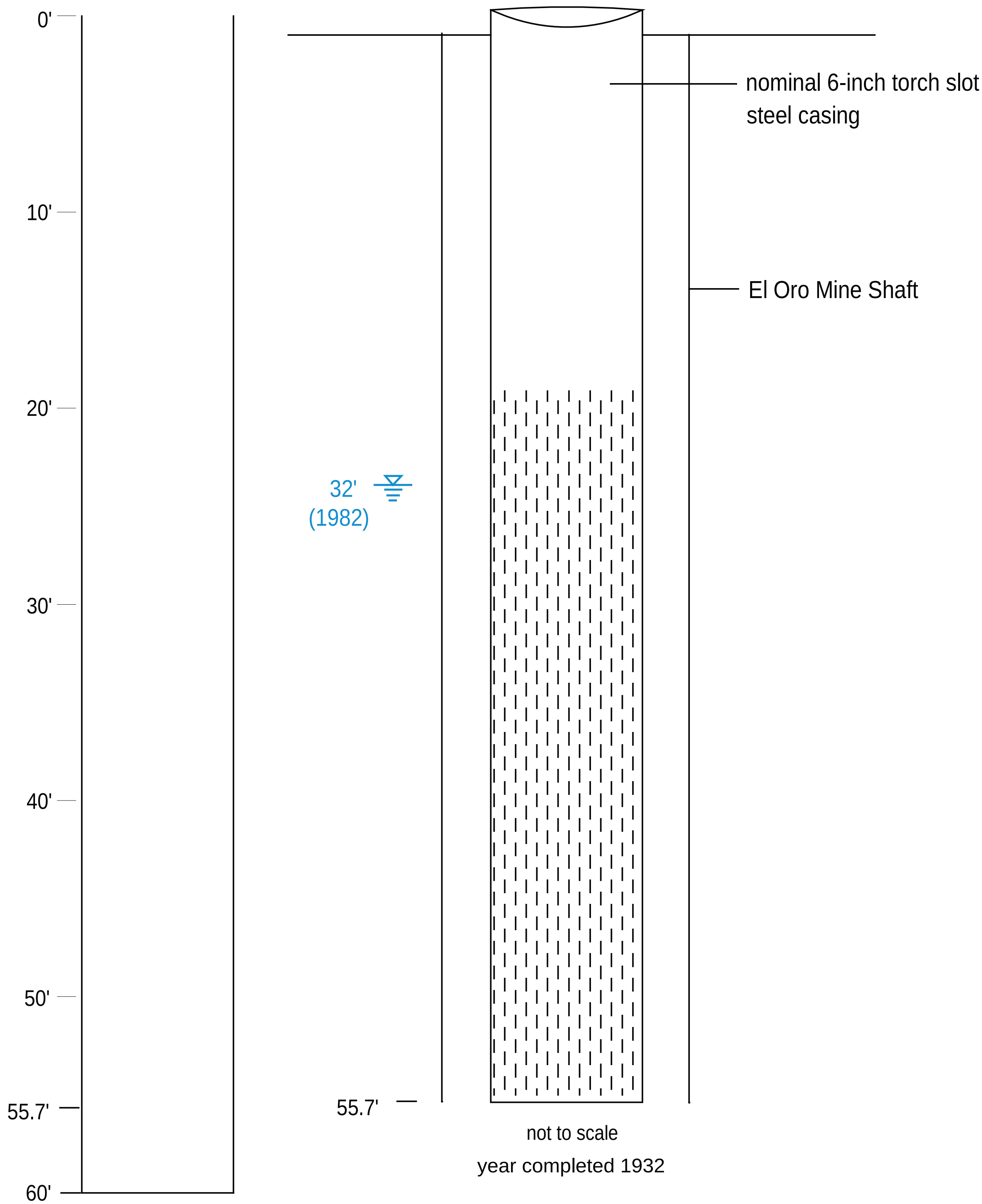
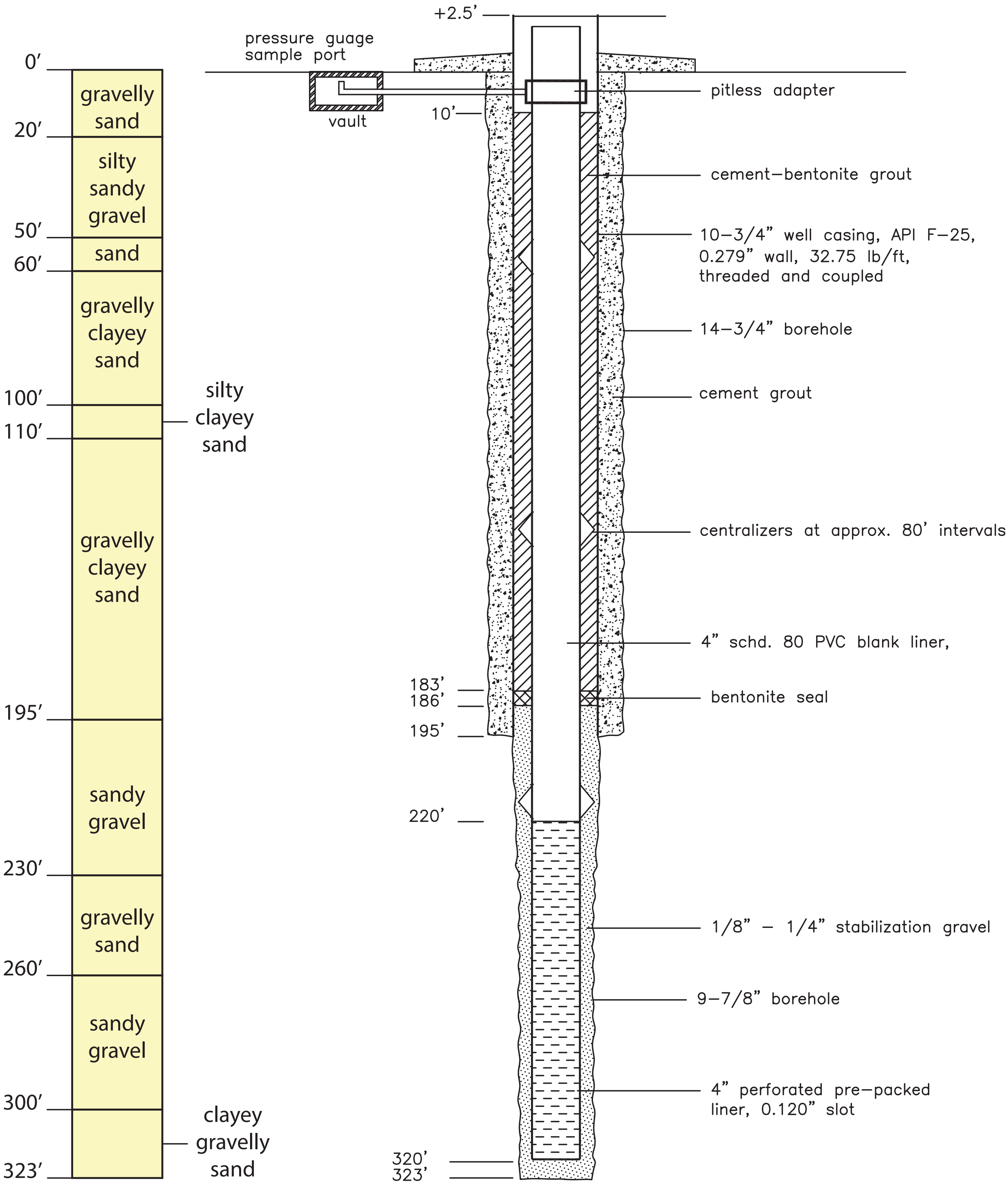


Figure B18. Well completion diagram for LRG-4654 (Old El Oro, Dolores), Copper Flat Mine, Sierra County, New Mexico.



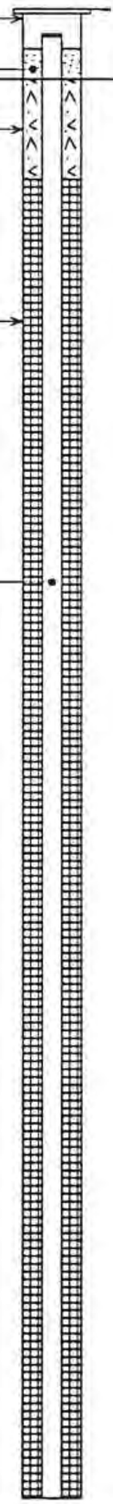
not to scale
depths approximate
completed December 21, 2012
flowed at 19.5 gpm with a close in pressure of 15 psi

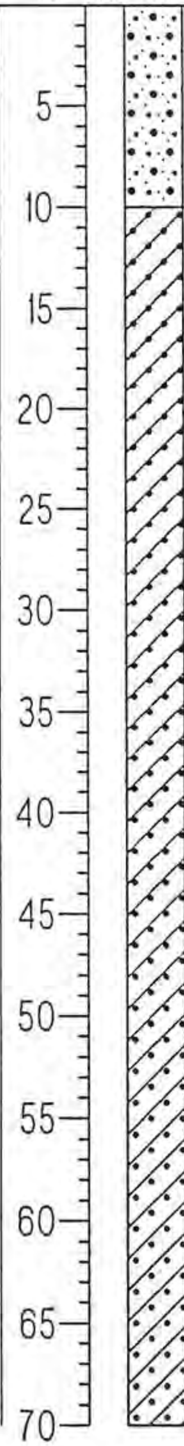
Figure B19. Well completion diagram for GWQ-11-27 (LA 00228 POD 1), Copper Flat Mine, Sierra County, New Mexico

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-9

WELL DIAGRAM	PH / Temp. (c)	Conductivity (uS/m)	Water Prod. (gpm)	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION





0-10', Soil/gravel, dark brown, w/abundant, silt, sand, cobbles/pebbles, wet @ 8'

7.75', ENCOUNTERED GROUNDWATER

10'-30', Alluvial gravels, varying amounts of silt/clay, sand & silt, abundant pebbles/cobbles very poorly sorted, Oxidized, wet

30'-40', Gravel, brown-slightly red brown, within clayey matrix very poorly sorted, min.-mod. sand, Oxidized, wet

40'-48', Gravel, as above with less clay/silt matrix.

48'-52', Gravel, brown-red brown within clay/silt matrix, min.-mod. sand very poorly sorted, wet.

52'-53.5', Gravel, as at 40'-48', relatively clean

53.5'-65', Gravel, brown-red brown, moderate-abundant clay/silt matrix, minor sand, very poorly sorted; wet

65'-75', clay, dark red-brown, w/min.-mod. sand & pebbles, no cobbles, moist-wet, very smooth drilling

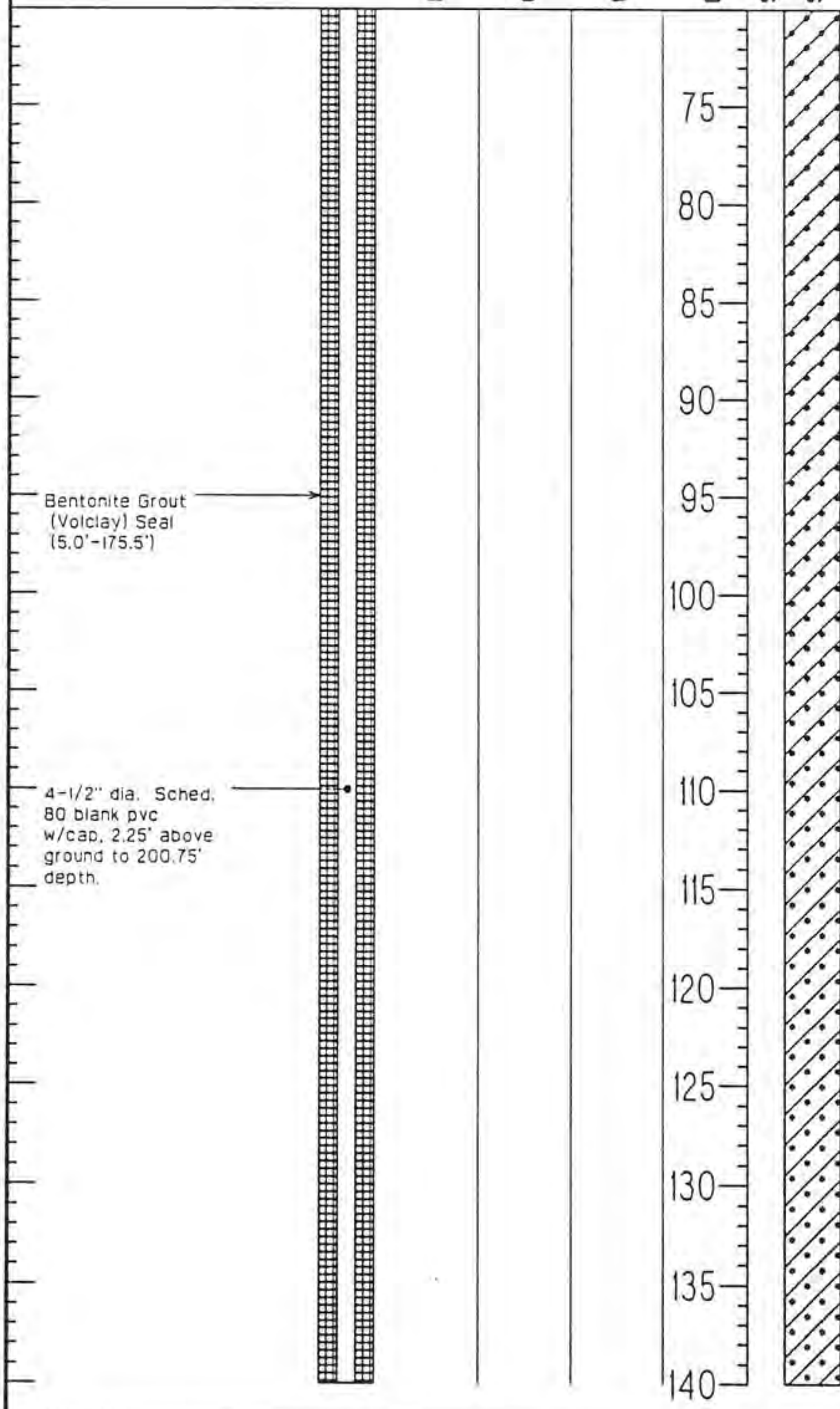
PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N713191.10, E603249.22 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607M9)
GEOLOGIST C.W.
DRILL RIG Air Rotary

DRILLING COMPANY Beylik Drilling
DATE DRILLED 09/20/94 - 09/26/94
SURFACE ELEVATION 4440.14
TOTAL DEPTH OF HOLE 252.50 Feet
WATER LEVEL Static, from TOC on 11/7/94: 71.05 Feet

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-9

WELL DIAGRAM | PH / Temp. (c) | Conductivity (uS/m) | Water Prod. (gpm) | DEPTH (ft) | SAMPLES | SYMBOLS | MATERIALS DESCRIPTION



75'-80', Gravel, very clayey/silty matrix, red-brown, trace-min. sand, very poorly sorted, wet

80'-112', Gravel, light-med brown-grey brown, min.-mod. clay/silt, min.-mod. sand, wet. Very clayey zone @ 80'-82'.

112'-114', Gravel, med. brown-red brown in clayey matrix, min.-mod. sand, wet.

114'-117', Gravel, dark brown-red brown, min.- mod. clay/silt, trace sand, wet.

117'-118', As at 114-117 with abundant clay/silt.

118'-125', Gravel, med. red brown, min.-mod. clay/silt matrix, trace-min. sand, Oxidized.

125'-130', Gravel, dark brown-red brown, abundant clay/silt matrix, min. sand, Oxidized

130'-150', Gravel, med. red brown, mod. silt/clay matrix, very poorly sorted, Oxidized.

PROJECT Copper Flat - Hillsboro, N.M.
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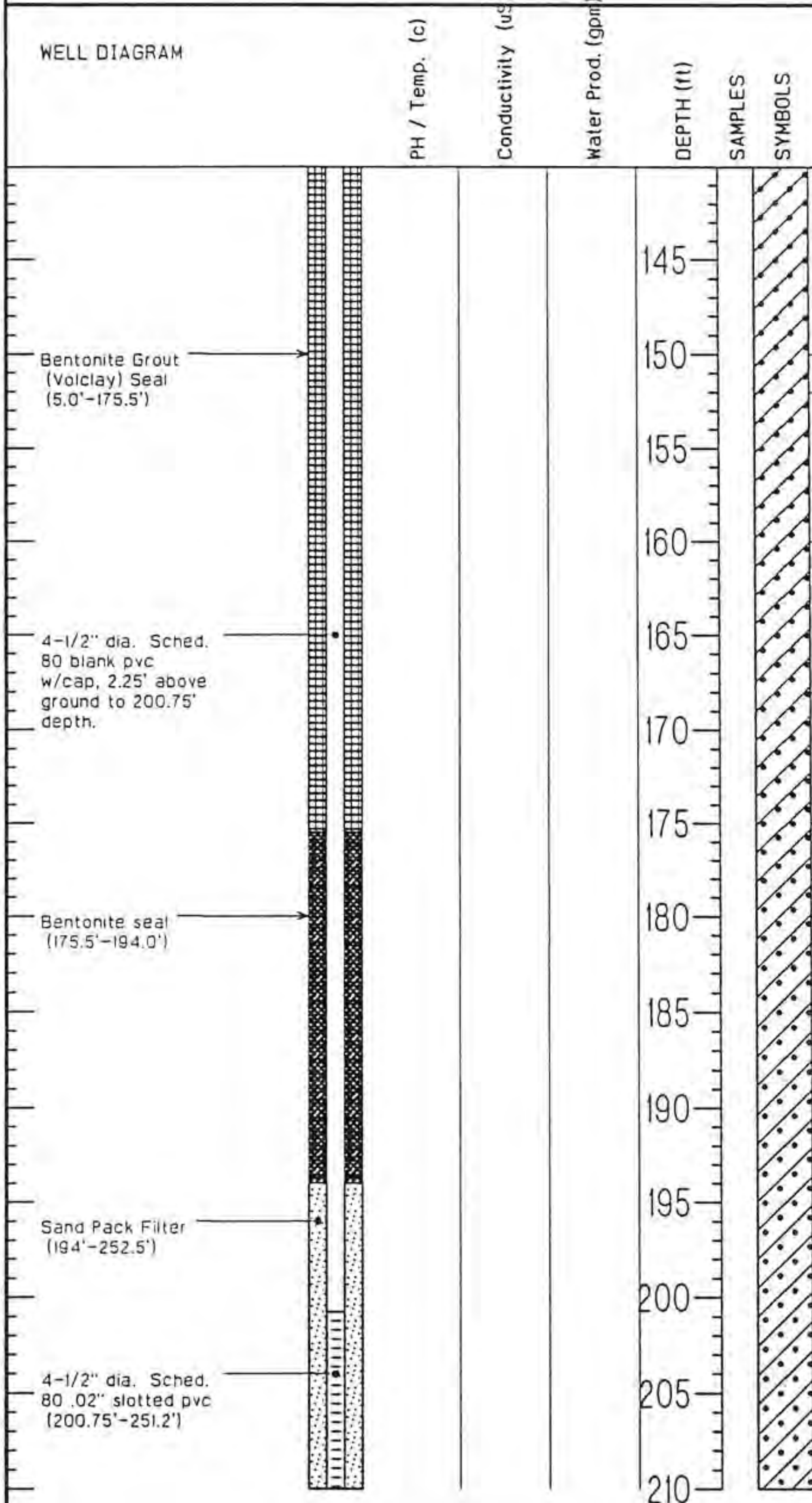
DRILLING COMPANY Beylik Drilling
DATE DRILLED 09/20/94 - 09/26/94
SURFACE ELEVATION 4440.14
TOTAL DEPTH OF HOLE 252.50 Feet
WATER LEVEL Static, from TOC on 11/7/94: 71.05 Feet

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-9



MATERIALS DESCRIPTION

130'-150', Gravel, med. red brown, mod. silt/clay matrix, very poorly sorted, Oxidized.

150'-152', Gravel as above w/abundant clay/silt matrix.

152'-160', Gravel, med. red brown, mod. clay/silt matrix material (less than @ 150-152)

160'-168', Gravel, dark red brown, abundant clay/silt matrix

168'-175', Gravel, medium brown-red brown, min.- mod. clay/silt matrix (most of matrix material washed out of cuttings)

175'-176', Sand in clay/silt matrix, med-very coarse, minor pebbles.

176'-178', Gravel, dark grey brown - red brown, w/min. - mod. clay/silt matrix, wet w/mod. sand.

178'-180', Gravel, brown-red brown, mod. sand, mod.-abundant clay/silt, Oxidized.

180'-192', Gravel, red brown, min.- mod. sand, min.- mod. clay/silt matrix, wet.

192'-202', Gravel, dark brown-red brown, mod.- abundant clay/silt matrix.

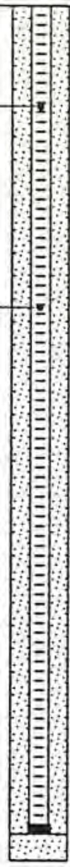
202'-253', Gravel, light-red brown, w/mod. sand, abundant pebbles/cobbles, min.- mod. clay/silt matrix, very poorly sorted, Oxidized, very uniform throughout zone, wet.

PROJECT Copper Flat - Hillsboro, N.M.	DRILLING COMPANY Beylik Drilling
LOCATION N713191.10, E603249.22 N.M. S.P.C.	DATE DRILLED 09/20/94 - 09/26/94
JOB NUMBER 68607 (ref: 68607M9)	SURFACE ELEVATION 4440.14
GEOLOGIST C.W.	TOTAL DEPTH OF HOLE 252.50 Feet
DRILL RIG Air Rotary	WATER LEVEL Static, from TOC on 11/7/94: 71.05 Feet

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-9

WELL DIAGRAM



4-1/2" dia. Sched. 80 .02" Slotted PVC (200.75'-251.2')

Sand Pack Filter (194'-252.5')

DEPTH (ft)	PH / Temp. (c)	Conductivity (uS/m)	Water Prod. (gpm)
230	7.93 / 20	250	23
	8.07 / 21	240	24
235	8.42 / 22	250	20
240	8.23 / 22	230	100
	7.83 / 22	330	30 - 40

DEPTH (ft): 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 265, 270, 275, 280

SAMPLES

SYMBOLS

MATERIALS DESCRIPTION

202'-253', Gravel, light-red brown, w/mod. sand, abundant pebbles/cobbles, min.-mod. clay/silt matrix, very poorly sorted, Oxidized, very uniform throughout zone, wet.

Total depth = 252.5'

Total depth = 252.5'

WELL DEVELOPMENT DATA

DATE: Oct. 6, 1994

FLOW: 50 gpm

TIME (hrs.): 1.5

PROJECT Cooper Flat - Hillsboro, N.M.

LOCATION N713191.10, E603249.22 N.M. S.P.C.

JOB NUMBER 68607 (ref: 68607M9)

GEOLOGIST C.W.

DRILL RIG Air Rotary

DRILLING COMPANY Beylik Drilling

DATE DRILLED 09/20/94 - 09/26/94

SURFACE ELEVATION 4440.14

TOTAL DEPTH OF HOLE 252.50 Feet

WATER LEVEL Static, from TOC on 11/7/94: 71.05 Feet

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-10

WELL DIAGRAM

- 8" dia. Steel Pipe w/locking well cap, approx. 3.5' above surface
- Sand
- Cement Grout Seal (0-10')
- Bentonite Grout (Volclay) Seal (10'-65.7')
- 4-1/2" dia. Sched. 80 Blank pvc w/cap, 2.29' above ground to 80.36' depth

PH / TEMP. (c)	Conductivity (uS/m)	Water Prod. (gpm)	DEPTH (ft)
8.3 / 24	400	3-5	20
		0	25
		0	40
7.7 / 17	500	< 3	50

MATERIALS DESCRIPTION

0 - 12', Gravelly soil, dark brown w/abundant cobbles & pebbles, and moderately abundant sand, silt soil, very poorly sorted, Oxidized, dry to 7.75'

Groundwater encountered @ 7.75'

12'-22', Gravel - medium brown-light red brown, min-mod clay/silt, Oxidized, wet

22'-24', Red-brown, abundant cobbles/pebbles, min-mod sand, abundant silt, Oxidized, no water

24-34.5', clay, brown-red brown, min pebbles, min-mod cobbles, "dry"

34.5-40', Gravel, grey brown, abundant brown-red brown clay/silt, Oxidized, "dry", tr-min sand

40-60', Gravel: med brown-red brown, abundant cobbles/pebbles, min-mod med-very coarse sand, "dry", Oxidized

PROJECT: Copper Flat - Hillsboro, N.M.	DRILLING COMPANY: Beylik Drilling
LOCATION: N719968.25, E636740.99 N.M. S.P.C.	DATE DRILLED: 10/94
JOB NUMBER: 68607 (ref: 68607M10)	SURFACE ELEVATION: 4439.27
GEOLOGIST: CW	TOTAL DEPTH OF HOLE: 128.0 Feet
DRILL RIG: Air Rotary	WATER LEVEL: Static, from TOC on 11/7/94: 70.625 Feet

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-10

WELL DIAGRAM

- Bentonite (65.7'-76.5')
- 4-1/2" dia. Sched. 80 .02" Slotted pvc (80.36'-124.5')
- Sand Pack Filter (76.5'-128')

PH / TEMP. (c)	Conductivity (uS/m)	Water Prod. (gpm)	DEPTH (ft)	MATERIALS DESCRIPTION
			40-60	40'-60', Gravel: med brown-red brown, abundant cobbles/pebbles, min-mod med-very coarse sand, "dry", Oxidized
		0	60	60-64', Gravel, med brown, within clay/silt matrix, WET (not saturated)
			65	64-78', Clay med brown-grey brown, w/some red brown zones, min-mod sand, wet (not saturated) does not produce water on drilling
			70	
			75	
7.6 / 19	400	< .5	80	78-83', Clay, as above w/slight increase in cobbles/pebbles & trace water
			85	83-83.5', Gravel, medium brown-grey brown w/clay/silt matrix, produces 2-3 gpm water on drilling
				83.5-87', Gravel, medium brown-red brown, abundant clay/silt matrix, mod sand, Oxidized
7.8 / 21	300	< 1	90	87-95', Gravel: medium brown, abundant clay/silt matrix produces 1/2-1 gpm on drilling
			95	95-105', Gravel - medium brown - w/abundant clay/silt, mod-abundant sand, 1 1/2-2 gpm water when blowing
7.8 / 20	300	1.5-2	100	
7.6 / 20	300	2 - 2.5		
7.3 / 20	300	3 - 3.5		
			105	105-115', Gravel - medium brown-grey brown, abundant clay/silt matrix, minor sand, produces 1 1/2-2 gpm on drilling
7.8 / 19	300	1 - 1.5	110	

PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N719968.25, E636740.99 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607M10)
GEOLOGIST CW
DRILL RIG Air Rotary
DRILLING COMPANY Beylik Drilling
DATE DRILLED 10/94
SURFACE ELEVATION 4439.27
TOTAL DEPTH OF HOLE 128.0 Feet
WATER LEVEL Static, from TOC on 11/7/94: 70.625 Feet

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-10

WELL DIAGRAM

4-1/2" dia. Sched. 80 .02" Slotted pvc (80.36'-124.5')

Sand Pack Filter (76.5'-128')

Total depth = 128'

NOTE: Well developed 10/07/94 for 2.25 hrs. at 25 to 30 gpm

PH / TEMP. (c)	Conductivity (uS/m)	Water Prod. (gpm)	DEPTH (ft)
7.6 / 19	300	< .5	
			115
7.9 / 19.5	300	< .5	120
7.8 / 20.5	300	< 1	125
			130
			135
			140
			145
			150
			155
			160
			165

SAMPLES | SYMBOLS

MATERIALS DESCRIPTION

105-115', Gravel - medium brown-grey brown, abundant clay/silt matrix, minor sand, produces 1 1/2-2 gpm on drilling

115-128, Gravel - medium brown-grey brown, abundant clay/silt matrix, mod-abundant sand, produces less than 1 gpm on drilling

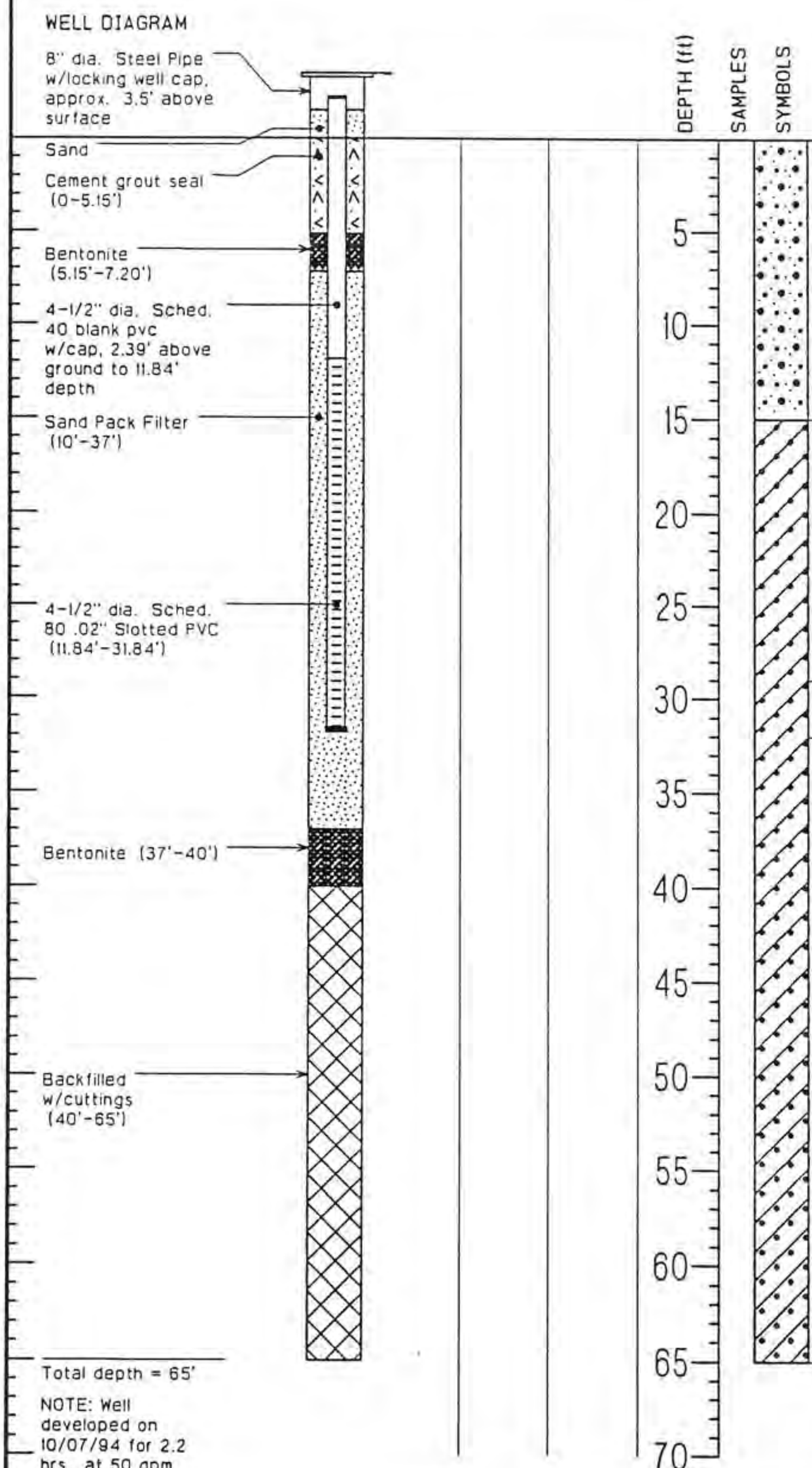
Total depth = 128'

PROJECT Copper Flat - Hillsboro, N.M.
LOCATION N719968.25, E636740.99 N.M. S.P.C.
JOB NUMBER 68607 (ref: 68607M10)
GEOLOGIST CW
DRILL RIG Air Rotary

DRILLING COMPANY Beylik Drilling
DATE DRILLED 10/94
SURFACE ELEVATION 4439.27
TOTAL DEPTH OF HOLE 128.0 Feet
WATER LEVEL Static, from TOC on 11/7/94: 70.625 Feet

Steffen Robertson and Kirsten
Engineering and Environmental Consultants

LOG OF MONITORING WELL MW-11



MATERIALS DESCRIPTION

0-15', Soil and gravel, dark brown, abundant cobbles, min.- mod. sand, wet @ 15'.

15'-29', Gravel: med. dark brown, silty soil matrix w/mod. clay, wet.

29'-32', Clay/silt, med. dark brown, moist - damp, (not saturated) abundant cobbles/pebbles, min.- mod. sand.

32'-65', Clay, as above but "dry"

Total depth = 65'

PROJECT: Copper Flat - Hillsboro, N.M.	DRILLING COMPANY: Beylik Drilling
LOCATION: N713751.31, E603378.24 N.M. S.P.C.	DATE DRILLED: 10/11/94
JOB NUMBER: 68607 (ref: 68607M11)	SURFACE ELEVATION: 4439.48
GEOLOGIST: CW	TOTAL DEPTH OF HOLE: 65 Feet
DRILL RIG: Air Rotary	WATER LEVEL: Static, from TOC on 11/7/94: 10.65 Feet

Appendix C1.

Initial PW- Well Pumping Tests, 1975-1980

BD - 1
P.G.D. - 1
NB - 1
MHM - 1

Water Development Corporation

CONSULTANTS IN WATER RESOURCES

3938 SANTA BARBARA AVENUE
TUCSON, ARIZONA 85711

PHONE: 602-326-1133
CABLE: WADEVCO, TUCSON

RECEIVED
FEB 19 1976
QUINTANA

February 17, 1976

W. E. S.
FEB 20 1976

Mr. W. E. Saegart , President
Quintana Minerals Corporation
2475 North Jack Rabbit Avenue
Tucson, Arizona 85705

Dear Bill:

The purpose of this letter is to give a brief summary of the test results for the three production wells drilled for Quintana's Copper Flat Project.

Production Well No. 1 was tested for 70 hours at 1,500 gpm. Initial static water level was 331.8 feet. The final pumping water level was 381.6 feet giving a drawdown of 49.8 feet and a specific capacity of 30.1 gpm per foot of drawdown. Water levels were measured in MW-5 during the test on Production Well No. 1. At the end of 70 hours of pumping the decline in MW-5 amounted to 9.10 feet.

Production Well No. 2 was tested for 72 hours at a discharge rate of 2,020 gpm. Static water level at the beginning of the test was 310.4 feet and the final pumping water level was 413.7 feet giving a drawdown of 103.3 feet and a specific capacity of 19.6 gpm per foot of drawdown. During the test on Production Well No. 2 water levels were measured in MW-5 and Production Well No. 1. During the 72 hours of pumping the decline in MW-5 amounted to 3.82 feet and the decline in Production Well No. 1 amounted to 4.93 feet.

Production Well No. 3 was tested at a rate of 1,500 gpm for 72 hours Initial static water level was 350.8 feet and the final pumping water level was 454.2 feet. Drawdown amounted to 103.4 feet giving a specific capacity of 14.5 gpm per foot of drawdown. Water levels were measured in MW-5, MW-6, and Production Wells 1 and 2 during the test on Production Well No. 3. After 72 hours of pumping the declines were 2.07 feet in Production Well No. 1, 1.46 feet in Production Well No. 2, 2.04 feet in MW-5, and 0.51 feet in MW-6. Prior to and during the early stage of the test water levels were rising in MW-6. As MW-6 had recently been used to supply water for drilling the data for MW-6 are not considered valid.

In terms of specific capacity, Production Well No. 1 is the best well and we consider that this well could be operated at a discharge in the range of 1,800 to 2,000 gpm if necessary. We could not test it at this rate due to pump limitations and for the subsequent tests a larger pump was installed. Well No. 2 is the next best well. At a discharge rate of 2,020 gpm entrained air was beginning to appear in this well and we consider that a more reasonable pumping rate for this well would be in the range of 1,600 to 1,800 gpm. Well No. 3 was producing considerable entrained air at 1,500 gpm and we recommend that, unless necessary, this well not be pumped at a rate in excess of 1,000 to 1,200 gpm. During development this well had a specific capacity of about 20 gpm per foot of drawdown at 1,000 gpm.

The source of entrained air encountered in Production Wells 2 and 3 is from cascading water coming through the perforations and falling to the pumping water level. The deeper the pumping water level is below the top of the perforations the greater the amount of entrained air. We anticipated that this would be a problem in all of the production wells but due to the excellent specific capacity of Production Well No. 1 there was no entrained air at a discharge rate of 1,500 gpm. With a higher discharge rate it is considered likely that some air will appear in the discharge of this well.

The only guaranteed way to eliminate all entrained air from a well discharge is to install blank casing to a depth greater than the anticipated pumping water level. Due to the lenticular nature of the water bearing materials and the indication from the geophysical logs that some of the more productive materials were the shallower sediments, this would result in a substantial reduction in discharge and specific capacity. Thus, if maximum quantity of water is desired, it becomes necessary to produce some entrained air also. By going to deep pump settings a portion of the entrained air can be forced out of the water before it reaches the pump intake.

We are presently preparing a basic-data report on the production wells and an interpretive report related to the effect of operating the well field for a sustained period of time using aquifer coefficients as calculated from the test data. Based on raw data from the well tests we consider at the present time that the existing well field has the following range of capacity:

62,4

Production Well No. 1	1,800 gpm to 2,000 gpm
Production Well No. 2	1,600 gpm to 1,800 gpm
Production Well No. 3	1,000 gpm to 1,200 gpm
Total	4,400 gpm to 5,000 gpm

Upon completion of our calculations related to well interference and long-term operation of the well field it may be necessary to modify the above figures. The modification, if necessary, is not considered likely to be substantial. Final selection of pumps and rates at which to operate each well should be delayed until reasonably accurate figures for mill water requirements are available.

Sincerely yours,

Don

Donald K. Greene

DKG/cm

GPM x 60 x 24 x 60% = GPD

1 FT = 43,560 FT²/ACRE x 7.5 GAL/FT³

326,700 GAL/AC-FT.

2374

6700 GPM x 60 x 24 x 60% x 3

2,112,912,000 GPY Allowed.

6467 AC-FT/YR.

PW 1

PW 2

PW 3

WATER DEVELOPMENT CORPORATION

BASIC-DATA REPORT
QUINTANA MINERALS CORPORATION
COPPER FLAT PROJECT
PRODUCTION WELLS,
HILLSBORO, NEW MEXICO

By
D. K. Greene and L. C. Halpenny

Tucson, Arizona
April 1976

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FIGURES

1: Map of a portion of Township 15 South, Ranges 5 and 6 West, Sierra County, New Mexico, showing locations of production wells and MW-5 and MW-6 2

BASIC-DATA REPORT

QUINTANA MINERALS CORPORATION
COPPER FLAT PROJECT PRODUCTION WELLS
HILLSBORO, NEW MEXICO

By

D. K. Greene and L. C. Halpenny

GENERAL INFORMATION

A total of three production wells have been drilled to furnish the water supply for ore processing and other uses at the Copper Flat Project. Locations of the wells are shown on Figure 1 and legal descriptions are as follows:

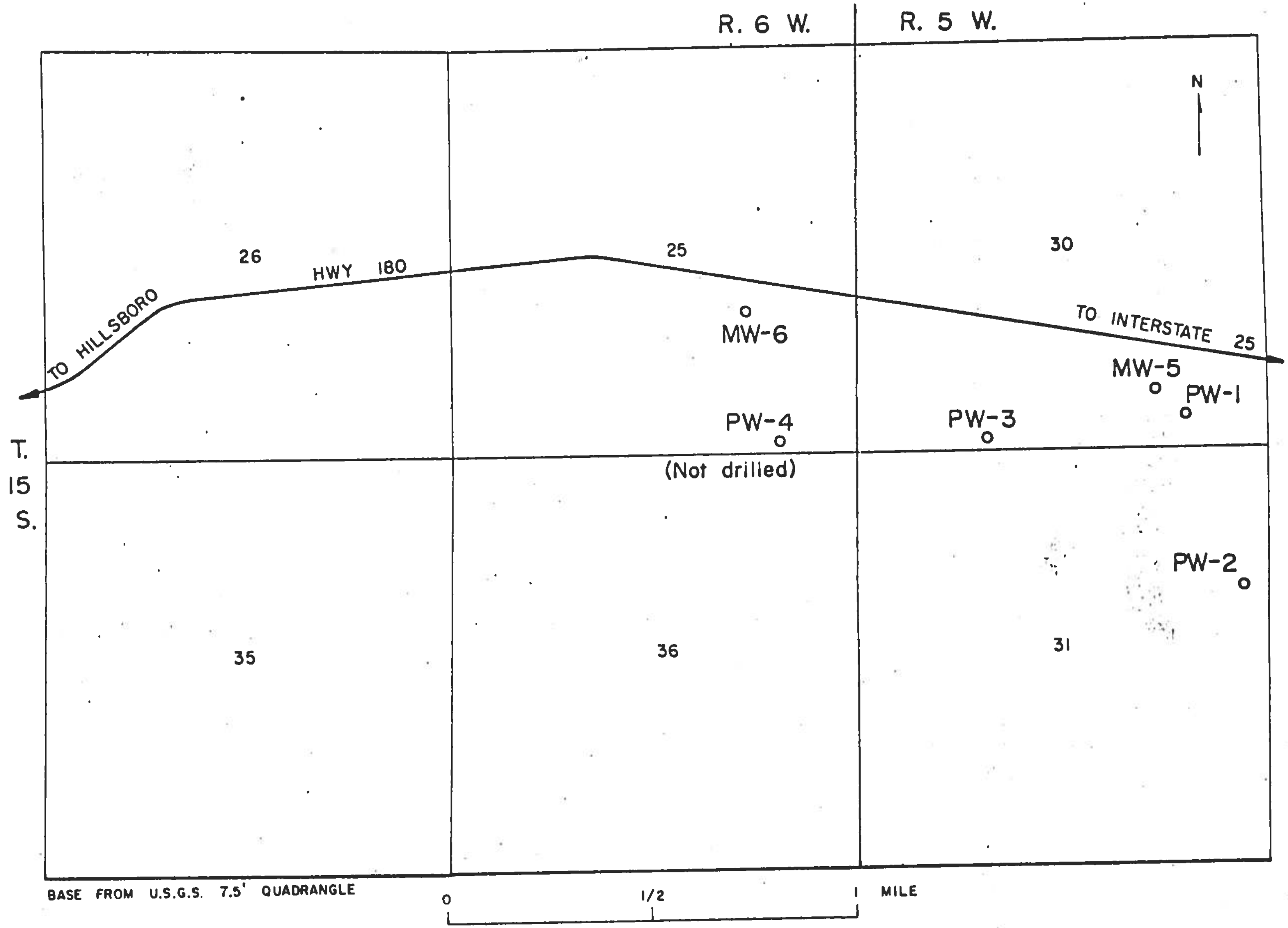

FIGURE 1.--MAP OF A PORTION OF TOWNSHIP 15 SOUTH, RANGES 5 AND 6 WEST, SIERRA COUNTY, NEW MEXICO, SHOWING LOCATIONS OF PRODUCTION WELLS AND MW-5 AND MW-6.

Production Well No. 1 (PW-1) SW¼ SE¼ SE¼, Sec. 30, T.15 S., R.5 W.

Production Well No. 2 (PW-2) NE¼ SE¼ NE¼, Sec. 31, T.15 S., R.5 W.

Production Well No. 3 (PW-3) SW¼ SE¼ SW¼, Sec. 30, T.15 S., R.5 W.

The well field is located approximately 7.5 miles east of the proposed concentrator site and it will be necessary to pipe water this distance.

The wells were drilled by B. C. & M. Drilling, Inc. of Mesa, Arizona using reverse air rotary equipment, during the period December 1975-January 1976. Prior to start of drilling 30 feet of 30-inch diameter, 5/16-inch wall thickness, surface pipe was installed and cemented in at each site using an auger rig. During this phase of work a site for a fourth production well (PW-4) (see Figure 1) was prepared. This site was not drilled.

The general procedure in constructing the production wells was to drill a 26-inch diameter hole in one pass, install a 16-inch, 5/16-inch wall thickness, blank and perforated casing assembly with centering guides approximately every 100 feet, gravel pack the annular space with 1/8 to 3/8-inch gravel, and develop the well with the drilling rig by jetting and washing with the compressor. The perforations were vertical saw-cut slots 1/8-inch wide by 3-inches long with 36 cuts per round and two rounds per foot. Total open area amounted to about 27 square inches per foot.

Details on depth drilled, casing installed, etc., for each of the three production wells are as follows:

Production Well No. 1

Depth drilled	960 feet
Casing installed	
Blank	0 to 368 feet
Perforated	368 to 951 feet
Gravel installed	109 yards
Rig development time	33.5 hours
Gravel slippage during rig development	41 feet

Production Well No. 2

Depth drilled	1,005 feet
Casing installed	
Blank	0 to 376 feet
Perforated	376 to 995 feet
Gravel installed	116 yards
Rig development time	28 hours
Gravel slippage during rig development	43 feet

Production Well No. 3

Depth drilled	970 feet
Casing installed	
Blank	0 to 380 feet
Perforated	380 to 965 feet
Gravel installed	116 yards
Rig development time	35.5 hours
Gravel slippage during rig development	17 feet

Following completion of rig development each well was further developed and then tested with a diesel powered turbine pump supplied by Western Pump and Supply Company of Deming, New Mexico. Data obtained during this phase of the investigation are included in the following sections of this report along with logs and water analyses for each production well.

Quintana Minerals Corporation
2475 NORTH JACK RABBIT AVENUE
TUCSON, ARIZONA 85705
602/622-4801

Bob Donegan
Property Manager

FILE MEMORANDUM

TO: W. E. Saegart
P. G. Dunn
M. W. Hood

April 26, 1976

Hillsboro-Copper Flat
Water Wells

FROM: B. G. Donegan

Following are corrected elevations for the water wells given by Gordon McLain in telephone conversation today:

	PW 1	4693
	PW 2	4670
	PW 3	4717
(Proposed)	PW 4	4745
	MW 5	4700

The above are based on QMC elevation datum.

Bob Donegan

Bob Donegan

BD/ln

H[illegible]sboro - Water
Extra file copies

Water Development Corporation

CONSULTANTS IN WATER RESOURCES

3938 Santa Barbara Avenue
Tucson Arizona 85711

Phone 602-326-1133
Cable WADEVCO Tucson

May 16, 1977

Mr. W. F. Saegart - President
Quintana Minerals Corporation
2475 North Jack Rabbit Avenue
Tucson, Arizona 85705

Re: Copper Flat Project, effect of pumping from wells

Dear Mr. Saegart:

In reply to your request for our opinion on the hydrology of the area of the Copper Flat Project water well field and the effect of pumping for 15 years from that well field, we submit the following information as an addendum to the opinions given in our April 1976 report entitled "Report on development of ground-water supply for Quintana Minerals Corporation Copper Flat Project, Hillsboro, New Mexico":

Extent of Cone of Depression

The aquifer characteristics of the Santa Fe Formation in the vicinity of the well field were developed from extended pumping of Production Wells 1, 2, and 3, and in our opinion are as follows:

Coefficient of transmissivity:	100,000 gal/day/ft
Long-term coefficient of storage:	0.10 dimensionless

The aquifer is less permeable westward toward the mountain front, based on data from test holes drilled during the exploration phase of the water well-field development program. The change toward finer-grained materials westward is gradual. No sharp barrier was found. The mathemathics of evaluating behavior of aquifers are amenable to analysis when a "negative barrier" of impermeable bedrock, or partially permeable materials occurs in one direction or more from a center of well pumping. However, for a gradational change in one or more directions it is necessary to assume the change is abrupt and is at a specified distance from the center of pumping. For this well field we have assumed that at a distance of one mile west of the center of pumping there is an abrupt change in the coefficient of transmissivity from 100,000 gpd/ft on the east side of a north-south line to 20,000 gpd/ft on the west side. The method for evaluating the effect upon water levels in an aquifer of a complete or partial line barrier is to assume the existence of an "image well" at a site on a line from the center of pumping perpendicular across the barrier, at a distance from the center of pumping equal to twice the distance from the center of pumping to the barrier.

We have made calculations of the drawdowns in water level in the Santa Fe aquifer along a north-south line through the center of pumping. These calculations are based on withdrawal of water from the well field during the first year at 6,000 gpm and for the next 14 years at 2,000 gpm. The calculations include the effect of the partial negative barrier westward. The results of the calculations are as follows:

Distance From the Center of Pumping (ft)	Decline of Water Levels in the Santa Fe Formation After 1 Year (ft)	After 15 Years (ft)
5,000	13.6	18.5
10,000	5.4	13.7
20,000	.3	7.6
30,000	--	4.5
40,000	--	2.6
50,000	--	1.4
60,000	--	.6
70,000	--	.3
100,000	--	--

Decline of water levels eastward from the center of pumping would be less than the preceding tabulated figures because the effects of the assumed barrier decrease eastward.

Source of Recharge for Santa Fe Aquifer

The data given in our 1976 report include sea-level elevations of the water table (p. 18) and a discussion of the various factors affecting the water levels as determined (p. 19-21). The gradient of the water table as indicated by the water levels discussed in the report is clearly downward from west to east toward the Rio Grande, flattening eastward from about 200 feet per mile near the mountain front, decreasing to about 100 feet per mile and then to about 10 feet per mile in the vicinity of the well field. The eastward down-gradient direction of the water table indicates that ground water in the Santa Fe Formation is moving eastward, which in turn indicates that the sources of ground-water recharge are to the west. The north-south alignment of the water table contours indicates that the recharge is fairly uniform and is not concentrated in one place. In the western United States, hydrologic investigations during the past half century have indicated that ground-water recharge from rain falling directly on the desert floors is not great but that runoff in desert washes and mountain-front recharge are the major factors in replenishing the ground-water supply. In our opinion, the sources of recharge for the Santa Fe aquifer in the vicinity of the well field are infiltration of runoff from desert flood flows in Greyback Arroyo, Greenhorn Arroyo, Las Animas Creek, and Percha Creek plus mountain-front recharge.

Effect Upon Water Levels Along Animas Creek

Our April 1976 report discusses the fact that water levels in wells in the valley of Animas Creek are shallower than water levels in deep wells in the Santa Fe Formation by about 80 to 150 feet (p. 21-22). We consider that, although Las Animas Creek is a source of recharge to the Santa Fe Formation aquifer system, the low vertical permeability in the upper part of the Santa Fe Formation slows down the vertical percolation and permits existence of a perched shallow water table in the permeable younger sediments of the ancestral Las Animas Creek.

When water is moving vertically downward underground, the hydraulic head that is a component of that movement is 100 percent, one foot per foot. The factor that controls the downward rate of movement is the permeability of the materials through which the water is moving. If the upper portion of the Santa Fe Formation were highly permeable, all water in the younger alluvium along Las Animas Wash would readily sink, leaving the Las Animas Creek sediments dry and causing a higher water level in the underlying Santa Fe deposits.

Because of the existence of this blanket of finer-grained sediments between the coarse materials underlying Las Animas Creek and the permeable facies of the Santa Fe Formation from which the well field will produce, a water-level decline of about 18 feet in the Santa Fe Formation beneath the axis of Las Animas Creek after 15 years of pumping is not likely to lower water levels in shallow wells tapping the younger Las Animas Creek shoestring aquifer. The vertical gradient cannot increase above 100 percent and that is the gradient now, based on the data collected during the investigation in 1975-1976.

The chapter on quality of water in our 1976 report indicated a difference in chemical character exists between the shallow ground water along Las Animas Creek and the deeper ground water in the Santa Fe Formation (p. 24 and 27, Fig. 10 on p. 26). This confirms our opinion that there is not a direct connection between ground water in the two aquifer systems.

Subsurface Channels Within Santa Fe Formation

Geological field work during the course of our investigation in 1975-1976 indicated the existence of a coarser facies within the uppermost part of the Santa Fe Formation along an axis roughly from north-northwest to south-southeast visible in the canyon walls of Las Animas Creek and Lower Percha Creek. The Quintana well field is situated within this zone. The uppermost visible coarse-grained portion of the formation is underlain by a finer-grained zone which in turn is underlain by a coarser zone. The Quintana wells produce from the lower coarse zone. It is not known whether the trend of this lower coarse zone also is northwest-southeast. We have found no geological nor hydrological evidence of an "underground stream" trending in any direction. Instead the data indicate the well field is situated in a more permeable zone within the Santa Fe Formation, with ground water movement from west to east.

Were there to exist an underground stream along an axis from north-northwest to south-southeast, with recharge from a source somewhere to the north-northwest, pumping from the well field would not affect water levels upgradient beyond about 13 miles as shown in the tabulation set forth in a preceding part of this letter.

Respectfully submitted,
Water Development Corporation

By ______________________
Leonard C. Halpenny, President

PRODUCTION WELL NO. 1
CUTTING LOG

(Prepared by B. Y. Kim, Geologist, Quintana Minerals Corporation)

Depth From (ft)	To	Pebble	Granule	Coarse Sand	Medium Sand	Fine Sand	Silt and Clay
30	50				30%	60%	10%
50	70	40%	50%	10%			
70	90	Minor	70%-80%	20%-30%	Minor	Minor	Minor
90	110	60%	30%	10%			
110	140	Minor	40%	40%	10%	5%	5%
140	160	60%	30%	10%			
160	180	20%	70%	10%			
180	200		Minor	20%	30%	30%	20%
200	220	10%	50%	40%			
220	240		Minor	20%	30%	20%	30%
240	250		60%	30%	Minor	5%	5%
250	270			Minor	10%-20%	40%	40%-50%
270	290	20%	40%	35%	Minor	Minor	5%
290	300		Minor	20%	30%	20%	30%
300	340		60%	30%	Minor	5%	5%
340	360		Minor	20%	20%	30%	30%
360	620	Minor	40%-70%	10%-30%	Minor	5%-15%	5%-15%
620	640		5%	5%	20%	30%	40%
640	660		40%	40%	Minor	10%	10%-20%
660	670	30%	40%	20%			10%
670	760	20%	40%	20%	Minor	5%	15%
760	770		5%	5%	20%	30%	40%
770	790	20%	40%	20%	Minor	5%	15%
790	800		Minor	10%	20%	40%	30%
800	960		40%-60%	10%-30%	5%	5%	20%

Well cuttings 360-620 feet generally uniform with coarse material (0.5mm) 60%-90%.

A few peanut-sized gravel at 880-890 feet with less amount of fine material; marked increase of fine material at 910-920 feet.

PRODUCTION WELL NO. 1
CUTTING LOG
(continued)

The following size ranges have been established from Wentworth Scale for classification of clastic sedimentary rock. The above log has been done by visual estimation according to the scale.

Pebble	Above 4 mm
Granule	2 mm - 4 mm
Coarse Sand	Very coarse - 1 mm - 2 mm Coarse - 0.5 mm - 1 mm (1/2 mm - 1 mm)
Medium Sand	0.25 mm - 0.5 mm (1/4 mm - 1/2 mm
Fine Sand	Fine - 0.125 mm - 0.25 mm (1/4 mm 1/8 mm) Very fine - 0.0625 mm - 0.125 mm (1/8 mm - 1/16 mm)
Silt and Clay	Less than 0.0625 mm (less than 1/16 m

PRODUCTION WELL NO. 1
DRILLERS LOG

Depth From (ft)	Depth To (ft)	Sample Description
30	45	Fine silt.
45	50	Sand and silt.
50	55	Very hard rock.
55	90	Sand and rock.
90	105	Gravel and trace of clay.
105	115	Basalt, sand, little clay.
115	125	Basalt, sand.
125	135	Sand, clay, and some basalt.
135	155	Sand and rock.
155	165	Rock and some sand.
165	175	Small gravel and sand.
175	185	Clay with 5% sand.
185	195	Clay with 25% sand, some gravel.
195	206	Clay with gravel, 5% sand.
206	216	Gravel pediment with sand.
216	218	Clay.
218	222	Gravel pediment with 5% sand.
222	245	Clay.
245	255	Sand with cobbles, very hard.
255	265	Clay with 2% sand.
265	275	Sandy clay.
275	285	Sand and gravel.
285	295	Gravel and sand.
295	305	Sand and gravel with 80% clay.
305	315	Sand, gravel, and clay.
315	320	Gravel and clay.
320	325	Gravel, rock, and clay.
325	335	Basalt and rock.
335	340	Gravel and rock.
340	345	Clay and gravel.
345	355	Clay.
355	360	Clay and sand.
360	375	Sand and rock.
375	390	Sand, gravel, and clay.
390	406	Sand, rock, and clay.
406	415	Clay, sand, and gravel.
415	435	Sand and gravel.

PRODUCTION WELL NO. 1
DRILLERS LOG
(continued)

Depth From - To (ft)	Sample Description
435 - 445	Sand and some gravel.
445 - 469	Sand and little clay.
469 - 475	Sand and rock.
475 - 495	Pediment gravels, some sand.
495 - 505	Clay, 20% gravel.
505 - 525	Clay and gravel.
525 - 555	Sand and gravel.
555 - 565	Sand and 80% clay.
565 - 575	Sand, gravel, and some clay.
575 - 585	Sand and gravel.
585 - 590	Clay, sand, and gravel.
590 - 595	Sand and gravel.
595 - 605	Gravel and clay.
605 - 615	Clay, sand, and gravel.
615 - 620	Gravel and sand.
620 - 625	Sand.
625 - 630	Sand, gravel, 90% clay.
630 - 635	Clay.
635 - 645	Sand, 95% clay.
645 - 655	Sand, 35% clay.
655 - 665	Clay 50%, sand 50%.
665 - 675	Coarse sand 35%, gravel 35%, clay 30%.
675 - 685	Coarse sand, gravel.
685 - 709	Coarse sand 50%, gravel 20%, clay 30%.
709 - 715	Coarse sand 50%, gravel 10%, clay 40%.
715 - 725	Coarse sand 70%, gravel 20%, clay 10%
725 - 765	Gravel, clay, and sand.
765 - 785	Clay and gravel.
785 - 797	Sand, gravel, and clay.
797 - 805	Clay, sand, and gravel.
805 - 815	Sand 75%, gravel 10%, clay 15%.
815 - 835	Sand, gravel, and clay.
835 - 845	Sand 80%, gravel 15%, clay 5%.
845 - 850	Sand, clay, and gravel.
850 - 858	Sand and clay.
858 - 860	Clay and sand.
860 - 875	Sand.
875 - 888	Sand, some clay.

PRODUCTION WELL NO. 1
DRILLERS LOG
(continued)

Depth From - To (ft)	Sample Description
888 - 895	Sand, gravel, and clay.
895 - 905	Sand and clay.
905 - 917	Sand and gravel.
917 - 935	Clay 85%, gravel 5%, sand 10%.
935 - 947	Clay, gravel, and sand.
947 - 960	Clay, sand, and gravel.

PRODUCTION WELL NO. 1

DEVELOPMENT DATA

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-18-75	09:48	329.3		Measuring with sounder. Measuring point top of 3/4-inch tube 1.65 feet above top of surface pipe. Surface pipe approximately 0.2 feet above land surface.
	10:00			Pump on. Eight-inch pump with bowls set at 550 feet. Discharge pipe 10-inch, orifice 6-inch.
	10:01	357.9		Decreasing RPM.
	10:02	348.9	370	Muddy, silty.
	10:03	345.3	395	
	10:04	344.4	370	Trace of sand.
	10:12	346.3	395	Clearing some.
	10:13			Increased RPM.
	10:14	350.0	500	
	10:15	350.6	500	Some mud, silt, trace of sand.
	10:20	352.1	500	
	10:27	352.4	500	
	10:44	353.1	500	Clearing.
	10:55			Surge.
	10:58			Lowering impellers.
	11:00			Pump on.
	11:05	350.3	500	Some color.
	11:12			Fairly clear, surge twice.
	11:18		760	Muddy, silty, no sand.
	11:19	358.8		
	11:25	360.8	760	Considerable color, silty.
	11:40	362.3	773	Clearing.
	11:45			T = 76° F, K = 350 micromhos.
	11:50	362.7	773	Fairly clear, surge twice.
	11:56			Silty.
	11:58		760	Clearing.
	12:00	356.9	760	

PRODUCTION WELL NO. 1

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-18-75	12:15	358.7	760	Fairly clear.
	12:22	359.0	760	T = 76° F, K = 340+ micromhos.
	12:23			Surge twice.
	12:30			Little mud and silt.
	12:33			Clearing.
	12:35	355.9	760	Fairly clear.
	12:40			Surge twice.
	12:47			Some color, no sand.
	12:50			Clearing.
	13:19	356.7	760	Surge twice.
	14:07	356 2	760	Clear, surge twice.
	14:15			Little color.
	14:18	353.1	760	Clear.
	14:20			Surge, change to 8-inch orifice.
	14:27			Pump on.
	14:29			Some color, no sand.
	14:30	358.4	1,040	
	14:35	361.6		
	14:52	363.7	1,060	Slight color.
	14:58	364.2	1,060	Surge.
	15:05			Fair amount of color, silt, no sand.
	15:08			Clearing.
	15:10	362.1	1,040	T = 76° F, K = 350 micromhos.
	15:30	363.8	1,050	Surge.
	15:35			Fair amount of color, silt.
	15:40			Clearing.
	15:58	361.8	1,030	Clear, surge twice.
	16:03			Some color, silt.
	16:28	363.5	1,060	Clear, surge twice.
	16:33			Some color, silt.
	16:37			Clearing.
	17:00	362.8	1,050	

PRODUCTION WELL NO. 1

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-18-75	17:05	378.6	1,500	Some color, no sand.
	17:10			Considerable color, silt.
	17:13	382.5	1,471	Lot of color, silt, $<$0.1 cc/l sand.
	17:19	382.2	1,438	
	17:28	382.6	1,421	
	17:38	382.5	1,404	Surge.
	17:45			Some color, silt.
	18:00	387.0	1,500	Surge twice.
	18:30		1,500	Surge.
	19:00		1,500	Surge.
	19:30		1,500	Surge.
	19:50	386.0	1,500	
	20:10			Surge twice.
	20:15		1,500	Some color.
	20:38	385.1	1,500	Clear, surge.
	21:07	383.6	1,493	Clear, surge twice.
	21:12			Some color, no sand.
	21:38	382.0	1,486	T = 76°F, K = 340 micromhos, clear, surge twice.
	21:45			Some color.
	22:20	381.2	1,493	Clear, surge twice.
	22:25			Some color.
	23:04	381.2	1,507	Clear, surge twice.
	23:10			Some color, silt.
	23:35	379.9	1,500	Clear, surge twice.
	23:40			Some color.
12-19-75	00:05	378.9	1,493	Clear, surge twice.
	00:10			Little color.
	00:30	378.4	1,493	Clear, surge twice.
	00:34	375.1	1,500	
	00:55	378.9	1,500	Clear, surge twice.
	01:05	375.7	1,500	Clear.
	01:40	378.6	1,500	Clear, surge twice.
	02:10	377.8	1,500	Clear, surge twice.

PRODUCTION WELL NO. 1

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-19-75	02:40	377.4	1,493	Clear, surge twice.
	03:10	377.0	1,500	Clear, surge twice.
	03:40	376.6	1,486	Clear, surge twice.
	04:10	376.3	1,493	Clear, surge twice.
	04:45	376.3	1,500	Clear, surge twice.
	05:15	375.7	1,493	Clear, surge twice.
	05:45	376.1	1.500	Clear, surge twice.
	06:15	376.6	1,500	Clear, surge twice.
	06:45	376.6	1,500	Clear, surge twice.
	07:00	377.0	1,500	Clear, surge twice.
	07:05			Very little color.
	07:30	376.0	1,493	Clear.
	07:35			T = 76° F, K = 340 micromhos.
	08:28	376.0	1,500	Clear.
	08:29			Increase RPM.
	08:30	380.9	1,641	
	08:32			Some color.
	08:33			Clearing.
	08:45	382.1	1,641	Clear, surge.
	08:50			Some color, then clear.
	09:00	381.5	1,634	Clear.
	09:15	381.9	1,634	Clear.
	09:18			T = 76° F, K = 340 micromhos.
	09:30	382.2	1,627	
	09:50	382.5	1,627	Clear.
	10:00			Pump off.
	10:01	338.4		
	10:02	338.1		
	10:03	339.8		
	10:04	339.3		
	10:05	338.6		
	10:06	338.3		
	10:07	337.8		

PRODUCTION WELL NO. 1

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-19-75	10:08	337.5		
	10:09	337.2		
	10:10	336.8		
	10:15	335.7		
	10:20	335.0		
	10:30	334.1		
	10:38	333.4		
	12:09	330.4		
	13:18	329.8		
	14:03	329.5		
	15:40	329.1		
	15:47	332.77		Measured with chain.

PRODUCTION WELL NO. 1

TEST DATA

cofpw1.wk1

time (min) C6..c98
WL d6..d98
MW-5 WL e6..e98

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-20-75	08:00	331.82		Measured with chain. Same measuring point as for development.
	09:22	331.82		Measured with chain.
	09:32	331.8		Set sounder at 331.8.
	11:00	331.8 −1.85 = 330.0 GL		Pump on. Same setting as for development.
	11:01	360.8	1,500	
	11:02	363.5	1,500	
	11:03	365.9	1,500	
	11:04	367.2	1,500	
	11:05	367.9	1,500	
	11:06	368.5	1,500	Clear.
	11:07	369.2	1,500	
	11:08	369.7	1,500	
	11:09	370.1	1,500	
	11:10	370.2	1,500	
	11:12	370.8	1,500	
	11:14	371.1	1,500	
	11:16	371.4	1,500	
	11:18	371.8	1,500	
	11:20	372.0	1,500	
	11:25	372.6	1,500	
	11:30	373.3	1,500	
	11:35	373.7	1,500	
	11:40	374.1	1,500	
	11:50	374.7	1,500	
	12:00	375.0	1,500	
	12:15	375.5	1,500	
	12:30	376.0	1,500	
	12:45	376.3	1,500	
	13:00	376.7	1,500	
	13:30	377.4	1,500	
	14:00	377.6	1,500	
	15:00	378.2	1,500	

PRODUCTION WELL NO. 1

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-20-75	16:00	378.6	1,500	Clear.
	17:00	379.2	1,500	
	18:00	379.3	1,500	
	19:00	379.6	1,500	
	20:00	379.9	1,500	
	21:00	380.2	1,500	
	22:00	380.4	1,500 +	Decrease RPM.
	23:00	380.3	1,500	
	24:00	380.4	1,500	
12-21-75	01:00	380.4	1,500	
	01:50			T = 76° F, K = 340 micromhos.
	02:10	380.4	1,500	
	03:00	380.6	1,500	
	04:00	380.6	1,500	
	05:00	380.8	1,500	
	06:00	380.0	1,486	Increase RPM.
	06:50			T = 76° F, K = 340 micromhos.
	07:00	381.0	1,500	
	08:00	381.1	1,500	
	09:00	381.4	1,500	
	10:00	381.4	1,500 +	Decrease RPM.
	11:00	381.3	1,500	
	12:00	381.2	1,500	
	13:00	381.3	1,500	
	13:15			T = 76° F, K = 340 micromhos.
	14:20	381.3	1,500 -	Increase RPM.
	15:00	381.3	1,500	
	16:00	381.2	1,500	
	17:00	381.4	1,500	
	18:00	381.4	1,500	
	19:00	381.4	1,500	
	20:00	381.4	1,500	

PRODUCTION WELL NO. 1

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-21-75	21:00	381.5	1,500	
	22:00	381.7	1,500 +	Decrease RPM.
	23:00	381.4	1,500	
	24:00	381.4	1,500	
12-22-75	02:00	381.5	1,500	
	03:00	381.4	1,500	
	04:00	381.4	1,500	
	05:00	381.7	1,500	
	06:00	381.4	1,486	Increase RPM.
	07:00	381.0	1,500	
	08:00	381.3	1,500	
	09:00	381.4	1,500 +	Decrease RPM.
	10:00	381.4	1,500	
	11:00	381.4	1,500	
	12:00	380.7	1,500 -	Increase RPM.
	13:00	381.1	1,500	
	14:00	381.3	1,500	
	14:30	381.3	1,500	
	15:00	381.4	1,500	
	16:00	381.4	1,500	
	17:00	381.4	1,500	
	18:00	381.6	1,500	
	19:10	381.6	1,500	
	24:00	382.0	1,500	
12-23-75	03:00	381.7	1,500	
	07:00	381.6	1,500	
	08:45	381.6	1,500	$T = 76^{o}F$, K = 340 micromhos. Collected water samples
	09:00			Pump off.
	09:01	340.9		
	09:02	342.7		
	09:03	342.2		
	09:04	341.6		
	09:05	341.3		
	09:06	341.1		
	09:07	340.2		
	09:18	338.8		
	09:30	337.5		

PRODUCTION WELL NO. 1

TEST DATA

(Observation Well MW-5 Water Levels)

Date	Hour	Depth to Water (ft)	Remarks
12-18-75	07:55	335.58	Measured with chain. Measuring point top of 6-inch casing approximately 1 foot above land surface.
	08:10	335.57	Measured with chain. Set sounder with tape mark at 335.57.
	10:00		PW-1 pump on for development.
	10:52	337.15	
	14:48	339.33	
12-19-75	07:40	344.03	
	09:12	344.54	
	10:00		PW-1 pump off.
	10:24	342.18	
	12:06	338.91	
	13:22	338.22	
	14:10	337.95	
	15:32	337.63	
12-20-75	07:43	336.73	Measured with chain. Set sounder with tape mark at 336.73.
	09:46	336.69	
	11:00	336-69	PW-1 pump on for test.
	11:01	336.73	
	11:02	336.90	
	11:03	337.14	
	11:04	337.32	
	11:05	337.52	
	11:06	337.61	
	11:07	337.81	
	11:08	337.89	
	11:09	338.05	
	11:10	338.19	
	11:11	338.31	
	11:12	338.47	
	11:13	338.51	
	11:14	338.62	

PRODUCTION WELL NO. 1

TEST DATA

(Observation Well MW-5 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
12-20-75	11:15	338.77	
	11:16	338.82	
	11:17	338.93	
	11:18	339.00	
	11:19	339.16	
	11:20	339.19	
	11:23	339.45	
	11:25	339.67	
	11:30	339.89	
	11:35	340.08	
	11:40	340.30	
	11:45	340.41	
	11:50	340.65	
	12:00	341.00	
	12:15	341.30	
	12:30	341.69	
	12:45	341.86	
	13:00	342.18	
	13:30	342.52	
	14:00	342.75	
	15:05	343.18	
	16:05	343.42	
	17:05	343.61	
	18:05	343.74	
	19:05	344.09	
	20:05	344.12	
	21:10	344.24	
	22:10	344.36	
	23:10	344.43	
12-21-75	00:10	344.51	
	01:30	344.54	
	02:00	344.68	
	03:05	344.75	
	04:05	344.81	

PRODUCTION WELL NO. 1

TEST DATA

(Observation Well MW-5 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
12-21-75	05:05	344.87	
	06:05	344.87	
	07:05	344.83	
	08:05	345.02	
	09:05	345.00	
	10:05	345.02	
	11:05	345.03	
	12:05	345.07	
	13:05	345.06	
	14:15	345.03	
	15:05	345.10	
	16:05	345.10	
	17:05	345.18	
	18:05	345.16	
	19:05	345.16	
	20:05	345.23	
	21:05	345.22	
	22:05	345.25	
	23:05	345.27	
12-22-75	00:05	345.31	
	01:25	345.21	
	02:00	345.52	
	03:05	345.44	
	04:05	345.39	
	06:05	345.37	
	07:05	345.32	
	08:05	345.38	
	09:05	345.52	
	10:05	345.54	
	11:05	345.58	
	13:10	345.54	
	14:10	345.54	
	15:05	345.61	
	16:05	345.57	

PRODUCTION WELL NO. 1

TEST DATA

(Observation Well MW-5 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
12-22-75	17:05	345.66	
	18:05	345.63	
	19:05	345.58	
12-23-75	00:10	345.70	
	03:10	345.78	
	07:10	345.71	
	08:50	345.79	
	09:00		PW-1 pump cff.
	09:14	344.08	
	09:25	343.20	
	09:45	342.15	

BC
LABORATORIES Inc.
OIL - CORES - SOIL - WATER
3016 UNION AVENUE
BAKERSFIELD, CALIFORNIA 93305
Phone (805) 325-7475
J. J. EGLIN, Reg. Chem. Engr.

Submitted By: Water Development Corporation
3839 Santa Barbara Ave.
Tucson, Arizona 85711

Date Reported: 1/16/76
Date Received: 1/8/76
Laboratory No.: 9939

Marked: Quintana No. 1 12/23/75 08:45 T: 76° K: 340

WATER ANALYSIS

Sample Description:

pH	7.8
E.C. Micromhos/cm ($K \times 10^6$) @ 25°C (salinity)	
Resistivity, Ohm M^2/M	

Constituents, P. P. M. (parts per million)

Boron, (B)	
Calcium, (Ca)	22.
Magnesium, (Mg)	2.8
Sodium, (Na)	38.
Potassium, (K)	4.5
Carbonates, (CO_3)	0.
Bicarbonates, (HCO_3)	144.6
Chlorides, (Cl)	16.3
Sulphates, (SO_4)	10.
Nitrate, (NO_3)	3.53
Fluoride, (F)	0.46
Total Iron, (Fe)	
Copper, (Cu)	
Manganese, (Mn)	
Chromium, (Cr)	
Zinc, (Zn)	
Aluminum, (Al)	
Silica, (SiO_2)	
Lithium, (Li)	
Lead, (Pb)	
Phenol	
Sulfides as H_2S	
Total Hardness as $CaCO_3$	
Oil (chloroform extractable)	
Total Dissolved Solids	217. @ 180°F.
Total Suspended Solids	

BC LABORATORIES Inc.

By: J. J. Eglin

PRODUCTION WELL NO. 2
CUTTING LOG

(Prepared by B. Y. Kim, Geologist, Quintana Minerals Corporation)

Depth From (ft)	To	Pebble	Granule	Coarse Sand	Medium Sand	Fine Sand	Silt and Clay
30	40			50%	20%	10%	20%
40	100	Minor	40%-60%	30%-50%			Minor
100	110		40%	10%	10%	20%	20%
110	150		40%	40%	5%	5%	10%
150	160		10%	20%	20%	25%	25%
160	210	Minor	50%-60%	40%-50%			Minor
210	250			10%	20%	30%	40%
250	260	Minor	60%	20%	5%	5%	10%
260	270			10%	20%	40%	30%
270	290	20%	60%	20%			Minor
290	300		10%	30%	20%	20%	20%
300	310	20%	70%	10%			Minor
310	330	Minor	30%	50%	5%	5%	10%
330	370		Minor	20%	20%	30%	30%
370	440		30%	40%	10%	10%	10%
440	450			Minor	30%	50%	20%
450	900	0%-20%	20%-40%	20%-30%	0%-10%	10%-20%	10%-20%
900	910		5%	15%	20%	20%	30%
910	920	20%	50%	Minor	Minor	10%	20%
920	960	Minor	20%-30%	30%-40%	10%	10%-20%	20%
960	970	Minor	50%	30%	Minor	Minor	20%
970	990		20%	20%	10%	20%	30%
990	1005			Minor	Minor	Minor	90%

No sample from 530-540 feet; 20% pebble at 610-620 feet.

Average for the above interval 450-900 feet:

10%	30%	30%	5%	10%	15%

PRODUCTION WELL NO. 2
CUTTING LOG
(continued)

The following size ranges have been established from Wentworth Scale for classification of clastic sedimentary rock. The above log has been done by visual estimation according to the scale.

Pebble	Above 4 mm
Granule	2 mm - 4 mm
Coarse Sand	Very coarse - 1 mm - 2 mm Coarse - 0.5 mm - 1 mm (1/2 mm - 1 mm)
Medium Sand	0.25 mm - 0.5 mm (1/4 mm - 1/2 mm)
Fine Sand	Fine - 0.125 mm - 0.25 mm (1/4 mm - 1/8 mm) Very fine - 0.0625 mm - 0.125 mm (1/8 mm - 1/16 mm)
Silt and Clay	Less than 0.0625 mm (less than 1/16 mm

PRODUCTION WELL NO. 2
DRILLERS LOG

Depth From (ft)	Depth To (ft)	Sample Description
45	65	Sand, rock, and gravel.
65	105	Sand and gravel.
105	115	Clay and sand.
115	125	Sand and gravel.
125	135	Sand, gravel, and clay.
135	145	Sand and gravel.
145	155	Sand, gravel, and clay.
155	165	Clay and gravel.
165	215	Sand and gravel.
215	225	Clay and fine sand.
225	250	Clay and sand.
250	255	Clay and gravel.
255	265	Cobbles, gravel, and sand.
265	275	Clay with 10% rock.
275	285	Gravel and sand.
285	295	Sand and gravel.
295	305	Clay and sand.
305	315	Sand and gravel.
315	325	Sand, gravel, and 2% clay.
325	335	Sand, gravel, and 15% clay.
335	345	Clay.
345	355	Clay and 5% sand.
355	365	Clay, sand, and gravel.
365	375	Clay and fine sand.
375	385	Clay, sand, and gravel.
385	415	Sand, gravel, and clay.
415	435	Sand, gravel, and trace of clay.
435	445	Sand and clay.
445	455	Clay with sand.
455	465	Clay 50%, sand 50%.
465	475	Clay and sand.
475	485	Sand 60%, gravel 35%, clay 5%.
485	495	Sand 90%, clay 10%.
495	505	Sand, clay, and gravel.
505	515	Sandy clay with caliche, gravel.
515	525	Sandy clay with caliche, some gravel.

PRODUCTION WELL NO. 2
DRILLERS LOG
(continued)

Depth From (ft)	To	Sample Description
525	540	Sand and clay.
540	550	Gravel 90%, clay 10%.
550	553	Gravel 70%, clay 30%.
553	555	Gravel 80%, clay 20%.
555	560	Gravel and clay.
560	565	Gravel 60%, clay 40%.
565	575	Sand and gravel.
575	580	Sand 80%, clay 20%.
580	583	Gravel 70%, clay 30%.
583	585	Gravel 80%, clay 20%.
585	590	Clay 70%, sand 30%.
590	600	Rock, clay, and gravel.
600	605	Rock 50%, clay 50%.
605	610	Gravel.
610	613	Gravel 10%, clay.
613	620	Sand, 20% clay.
620	625	Clay and gravel, hard.
625	635	Gravel, 5% clay.
635	640	Rock, 10% clay, and sand.
640	643	Rock, basalt, hard.
643	645	Clay and some sand.
645	675	Gravel 50%, clay 50%
675	701	Clay, sand, and gravel.
701	705	Gravel 65%, clay 35%.
705	710	Gravel 50%, clay 50%.
710	720	Clay 55%, gravel 45%.
720	725	Gravel 60%, clay 40%.
725	735	Gravel 65%, clay 35%.
735	750	Gravel 70%, clay 30%.
750	765	Sand,80%, clay 20%.
765	775	Gravel 80%, clay 20%.
775	789	Gravel 90%, clay 10%.
789	795	Clay, sand, and gravel.
795	800	Sand and clay.
800	805	Clay and sand.
805	835	Sand and gravel, clay 65%.
835	855	Clay, sand, and gravel.

PRODUCTION WELL NO. 2
DRILLERS LOG
(continued)

Depth From To (ft)	Sample Description
855 - 865	Gravel.
865 - 885	Gravel 85%, clay 15%.
885 - 905	Coarse sand,85%, clay 15%.
905 - 915	Clay 65%, coarse sand 35%.
915 - 925	Gravel, sand, and clay, equal amounts.
925 - 935	Clay 40%, gravel 30%, sand 30%.
935 - 945	Clay 75%, sand 25%.
945 - 955	Clay 90%, sand 10%.
955 - 965	Gravel, sand, clay stringers.
965 - 975	Gravel and sand, 10% clay.
975 - 985	Gravel 50%, clay 50%.
985 - 995	Sand 60%, clay 40%.
995 -1005	Clay.

PRODUCTION WELL NO. 2

DEVELOPMENT DATA

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-10-76	12:36	309.4		Measuring with sounder. Measuring point top of 3/4-inch tube 0.95 foot above top of surface pipe. Surface pipe approximately 0.5 foot above land surface.
	12:44	309.4		
	12:45			Pump on. Ten-inch pump with bowls set at 460 feet Discharge pipe 10-inch, orifice 6-inch.
	12:47	331.8	550	Dirty.
	12:48	331.3		
	12:50	331.7		Lot of color, 0.5 cc/l, fine sand, soapy.
	12:58	332.2	550	Color decreasing, 0.1 cc/l fine sand, soapy.
	13:08	333.3	568	Color decreasing, 0.1 cc/l fine sand,
	13:09			Pump off.
	13:11	284.3		
	13:12	305.7		
	13:13	309.7		
	13:14	310.5		
	13:15	310.8		
	13:19	310.6		
	13:20			Pump on.
	13:24	333.0	550	Lot of color, 0.3 cc/l fine sand.
	13:30	333.7	550	Clearing some, 0.1 cc/l fine sand.
	13:40	334.6	559	Muddy, silty.
	14:00		550	Fairly clear, surge once.
	14:07		550	Lot of color, 0.3 cc/l fine sand.

PRODUCTION WELL NO. 2

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-10-76	14:35	332.4	520	Fairly clear, surge once, change to 8" orifice.
	14:42	374.7	1,040	
	14:45			Lot of color, less than 0.1 cc/l sand.
	15:00	351.4	1,016	Fairly clear, surge once.
	15:05			Lot of color, silt, less than 0.1 cc/l fine sand.
	15:30	352.3	1,040	Fairly clear, surge twice.
	15:37			Lot of color, silt, 0.1 cc/l fine sand.
	16:00	351.4	1,040	Fairly clear, surge twice.
	16:08			Lot of color, silt, 0.2 cc/l fine sand.
	16:30	349.8	1,040	Fairly clear, surge twice.
	16:47			Lot of color, silt, 0.3 cc/l fine sand.
	17:00	349.2	1,016	Fairly clear, surge twice.
	17:10	365.9	1,500	Lot of color, silt, 0.1 cc/l fine sand.
	17:30	373.2	1,500	Fairly clear, surge twice.
	17:38			Lot of color, silt, 0.1 cc/l fine sand. T = 74°F, K = 370 micromhos.
	18:00	372.1	1,486	Fairly clear, surge twice.
	18:07			Lot of color, silt.
	18:30	371.9	1,486	Fairly clear, surge twice.
	19:00	371.4	1,486	Surge twice.
	19:30	370.9	1,500	Surge twice.
	20:00	367.4	1,486	Surge twice.
	20:30	369.4	1,500	Fairly clear, surge twice.
	20:35			Less than 0.01 cc/l fine sand.
	21:00	369.1	1,486	Surge twice, straw color, clears quickly.
	21:30	369.0	1,486	Surge twice, slight color.

PRODUCTION WELL NO. 2

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-10-76	22:00	369.0	1,500	Surge twice, clear.
	22:30	369.0	1,486	Surge twice, straw color.
	23:00	368.4	1,486	Surge twice, clear.
	23:30	369.0	1,500	Surge twice, clear.
	24:00	368.4	1,486	Surge twice, straw color. Increase RPM.
01-11-76	00:30	394.6	1,940	Surge twice, some color.
	01:00	395.0	1,928	Surge twice, straw color, clears quickly. Entrained air showing in discharge.
	01:30	395.8	1,928	Surge twice, straw color.
	02:00	396.7	1,928	Surge twice, straw color.
	02:30	397.4	1,928	Surge twice, straw color.
	03:00	398.0	1,928	Surge twice, straw color.
	03:30	399.9	1,928	Surge twice, straw color.
	04:00	400.0	1,920	Surge twice, straw color, clears quickly.
	04:30	399.9	1,928	Surge twice, some color.
	05:00	399.8	1,928	Surge twice, some color.
	05:30	398.1	1,928	Surge twice, some color.
	06:00	397.4	1,928	Surge twice, straw color, clears quickly.
	06:30	400.0	1,970	Surge twice, some color.
	07:00	404.4	1,970	Surge twice, considerable color.
	07:30	400.9	1,940	Fairly clear, surge twice.
	07:37			Some color, silt.
	08:00	398.2	1,920	Clear, surge twice.
	08:06			Some color, clearing within 2 minutes.
	08:30	399.0	1,940	Clear, surge twice
	09:07			Some color, increase RPM.
	09:10		2,115	Clearing.
	09:15	412.0	2,212	More color showing, no sand.
	09:30	419.0	2,200	Clear, surge twice.

PRODUCTION WELL NO. 2

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-11-76	09:37			Some color, clearing in 2 minutes.
	10:00	419.0	2,200	Clear, surge twice.
	10:08			Some color, less than 0.1 cc/l sand. Clearing in 2 minutes.
	10:30	418.7	2,212	Clear.
	10:37			Some color, clearing in 2 minutes, no sand.
	10:40			T = 76^{o} F, K = 350 micromhos.
	11:00	418.0	2,200	Clear, surge twice.
	11:07			Some color, clearing in 2 minutes, no sand.
	11:30	417.6	2,200	Clear, surge twice.
	11:37			Some color, clearing in 2 minutes, no sand.
	12:00	418.7	2,200	Clear, surge twice.
	12:07			Some color, clearing in 2 minutes, no sand.
	12:40	412.7	2,115	Clear.
	12:45			Pump off.
	12:46	321.9		
	12:47	326.5		
	12:48	330.6		
	12:49	330.0		
	12:50	328.9		
	12:51	328.0		
	12:52	327.3		
	12:53	326.5		
	12:54	325.8		
	12:55	325.2		
	13:00	322.8		
	13:05	321.3		
	13:10	320.2		
	13:15	319.3		
	13:51	316.1		
	16:06	312.8		

PRODUCTION WELL NO. 2

cufpw2.wk1

time = c6..c102
Pwl = d6..d102

TEST DATA

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-12-76	08:46	310.4 -1.45= 309.0 GL		Measuring with sounder. Same measuring point as for development.
	09:30			Pump on. Same setting as for development.
	09:31	366.4	2,020	Clear.
	09:32	370.4	2,020	
	09:33	373.9	2,020	
	09:34	376.2	2,020	
	09:35	378.0	2,020	
	09:36	379.6	2,020	
	09:37	380.7	2,020	
	09:38	381.7	2,020	
	09:39	382.6	2,020	
	09:40	383.3	2,020	
	09:45	386.6	2,020	
	09:50	388.8	2,020 +	Decrease RPM.
	09:55	390.3	2,020	
	10:00	391.7	2,020	Entrained air in discharge.
	10:10	393.5	2,020	
	10:20	395.7	2,020	
	10:30	396.3	2,020	
	10:40	397.8	2,020	
	10:50	398.4	2,020	
	11:00	399.1	2,020	
	11:17	400.1	2,020	
	11:30	400.3	2,020	
	11:45	401.1	2,020	
	12:00	401.4	2,020	
	12:15	402.3	2,040	Decrease RPM.
	12:30	401.3	2,020	
	12:45	401.3	2,020	
	13:00	401.3	2,020	
	13:17			T = 75°F, K = 335 micromhos.

PRODUCTION WELL NO. 2

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-12-76	13:30	401.9	2,020	
	14:00	402.9	2,020	
	14:30	402.8	2,020 -	Increase RPM.
	15:00	402.9	2,020	
	16:00	403.7	2,020	
	17:00	404.3	2,020 -	Increase RPM.
	18:00	405.2	2,020	
	19:00	405.1	2,020	
	20:00	405.7	2,020	
	21:00	406.1	2,020	
	22:00	406.8	2,020	
	23:00	407.6	2,020	
	24:00	408.0	2,020	
01-13-76	01:00	408.9	2,020	
	02:00	409.1	2,020	
	03:00	409.2	2,020 +	Decrease RPM.
	04:00	408.5	2,020	
	05:00	409.1	2,020	
	06:00	408.1	2,020 -	Increase RPM.
	07:00	409.3	2,020	
	08:00	409.3	2,020	
	09:00	409.4	2,020	
	10:00	409.4	2,020	
	11:00	409.2	2,020	
	12:00	410.2	2,020	
	13:00	410.6	2,020	
	13:50		2,020 +	T = 76°F, K = 350 micromhos. Decrease RPM.
	14:00	410.0	2,020	
	15:00	410.0	2,020	
	16:00	410.1	2,020	
	17:00	410.2	2,020	
	18:00	411.3	2,020	
	19:00	411.2	2,020	
	20:00	410.1	2,020	

PRODUCTION WELL NO. 2

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-13-76	21:00	410.7	2,020	
	22:00	410.7	2,020	
	23:00	410.7	2,020	
	24:00	411.3	2,020	
01-14-76	01:00	411.4	2,020	
	02:00	411.7	2,020	
	03:00	411.7	2,020	
	04:00	411.5	2,020	
	05:00	411.7	2,020	
	06:00	411.5	2,020 -	Increase RPM.
	07:15	411.9	2,020	
	08:00	412.2	2,020	
	09:00	412.0	2,020	
	10:00	412.0	2,020	
	11:00	412.3	2,020	
	12:00	411.9	2,020	
	13:00	412.2	2,020	
	14:00	411.7	2,020	
	15:00	411.7	2,020	
	16:00	411.7	2,020	
	17:00	411.7	2,020	
	18:00	412.1	2,020	
	19:00	413.3	2,020 +	Decrease RPM.
	20:00	413.3	2,020 +	Decrease RPM.
	20:05			T = 76° F, K = 350 mhos.
	21:00	414.4	2,020	
	22:00	414.6	2,020	
	23:00	414.6	2,020 +	Decrease RPM.
	24:00	414.6	2,020	
01-15-76	01:00	414.0	2,020	
	02:00	414.1	2,020	
	03:00	413.8	2,020	
	04:00	412.8	2,020	
	05:00	412.6	2,020	

PRODUCTION WELL NO. 2

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-15-76	06:00	412.5	2,020	
	07:00	412.5	2,020	
	08:00	413.0	2,020	
	08:30			T = 76° F, K = 350 micromhos. Collected water samples.
	09:00	413.7	2,020	
	09:30			Pump off.
	09:31	325.0		
	09:32	329.9		
	09:33	333.8		
	09:34	333.3		
	09:35	331.9		
	09:36	331.2		
	09:37	330.3		
	09:38	329.6		
	09:39	328.8		
	09:40	328.3		
	09:45	326.2		
	09:50	324.7		
	09:55	323.5		
	10:00	322.6		
	10:10	321.3		
	10:20	320.3		
	10:30	319.5		
	10:45	318.7		
	11:00	318.0		
	11:15	317.4		
	11:30	317.0		
	12:00	316.5		
	12:30	315.9		
	13:00	315.6		
	13:30	315.2		
	14:00	314.8		
	15:00	314.6		

PRODUCTION WELL NO. 2

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-15-76	16:00	314.1		
	17:00	314.0		
	20:00	313.4		
	24:00	313.0		
01-16-76	04:00	312.8		
	08:00	312.5		
	09:45	312.2		
	09:50	312.42		Measured with chain.

PRODUCTION WELL NO. 2.

TEST DATA

(Observation Well PW-1 Water Levels)

Date	Hour	Depth to Water (ft)	Remarks
01-11-76	13:28	333.36	Measured with chain, spotty. Measuring point hole in plate 0.87 foot above top of surface pipe. Surface pipe approximately 0.2 foot above land surface.
	13:35	333.24	Measured with chain, spotty.
	16:00	332.04	Measured with chain. Water level is recovering from development of PW-2.
01-12-76	08:27	330.76	Measured with chain. Set sounder with tape mark at 330.76.
	09:11	330.66	
	09:30		PW-2 pump on for test.
	09:48	330.68	
	10:15	330.99	
	11:10	331.74	
	12:05	332.28	
	13:05	332.52	
	14:05	332.73	
	15:05	332.98	
	16:05	333.05	
	17:05	333.20	
	18:05	333.30	
	19:05	333.58	
	20:05	333.65	
	21:05	333.70	
	22:05	333.78	
	23:05	333.89	
01-13-76	00:05	334.05	
	01:00	333.97	
	02:05	333.96	
	03:05	334.03	
	04:05	334.06	
	05:05	334.10	
	06:08	334.17	
	07:05	334.25	

PRODUCTION WELL NO. 2

TEST DATA

(Observation Well PW-1 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
01-13-76	08:05	334.38	
	09:05	334.36	
	10:05	334.46	
	11:05	334.51	
	12:05	334.36	
	13:05	334.62	
	15:05	334.55	
	17:07	334.63	
	19:05	334.92	
	21:05	334.98	
	23:05	335.12	
01-14-76	01:05	335.19	
	03:05	335.23	
	05:05	335.27	
	07:20	335.18	
	08:05	335.21	
	09:05	335.24	
	11:05	335.29	
	13;05	335.30	
	15:05	335.29	
	17:05	335.32	
	19:05	335.39	
	21:05	335.44	
	23:05	335.53	
01-15-76	01:05	335.59	
	03:05	335.54	
	05:05	335.52	
	07:05	335.49	
	09:05	335.59	
	09:30		PW-2 pump off.
	10:03	335.39	
	10:33	334.94	
	11:05	334.50	
	11:35	334.25	

PRODUCTION WELL NO. 2

TEST DATA

(Observation Well PW-1 Water Levels) (continued)

Date	Hour	Depth to Water (ft)	Remarks
01-15-76	12:05	334.06	
	12:35	333.86	
	13:05	333.68	
	13:35	333:55	
	14:05	333.41	
	15:05	333.24	
	16:05	333.06	
	17:05	332.86	
	20:05	332.72	
01-16-76	00:05	332.44	
	04:05	332.36	
	08:05	332.25	
	10:04	332.01	

PRODUCTION WELL NO. 2

TEST DATA

(Observation Well MW-5 Water Levels)

Date	Hour	Depth to Water (ft)	Remarks
01-11-76	13:45	338.14	Measured with chain, Measuring point top of 6-inch casing approximately 1 foot above land surface.
	15:54	337.57	Measured with chain. Water level is recovering from development of PW-2.
01-12-76	08:00	336.52	Measured with chain. Set sounder with tape mark at 336.52.
	09:15	336.43	
	09:30		PW-2 pump on for test.
	09:52	336.44	
	10:17	336.52	
	11:14	337.02	
	12:07	337.28	
	13:07	337.44	
	14:07	337.60	
	15:07	337.74	
	16:07	337.85	
	17:07	337.98	
	18:07	338.06	
	19:07	338.14	
	20:07	338.23	
	21:07	338.31	
	22:08	338.42	
	23:07	338.47	
01-13-76	00:07	338.51	
	01:37	338.54	
	02:07	338.65	
	03:07	338.70	
	04:07	338.79	
	06:16	338.85	
	07:07	338.91	
	08:07	339.09	
	09:07	339.06	
	10:07	339.13	

PRODUCTION WELL NO. 2

TEST DATA

(Observation Well MW-5 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
01-13-76	11:07	339.22	
	12:07	339.22	
	13:07	339.23	
	15:07	339.21	
	17:09	339.31	
	19:07	339.45	
	21:07	339.54	
	23:07	339.62	
01-14-76	01:07	339.77	
	03:07	339.73	
	05:07	339.82	
	07:22	339.84	
	08:07	339.86	
	09:07	339.89	
	11:07	339.94	
	13:07	339.93	
	15:10	339.92	
	17:07	339.96	
	19:07	340.03	
	21:07	340.02	
	23:07	340.19	
01-15-76	01:07	340.18	
	03:07	340.21	
	05:07	340.11	
	07:07	340.18	
	09:07	340.25	
	09:30		PW-2 pump off.
	10:05	340.14	
	10:35	339.93	
	11:08	339.70	
	11:37	339.53	
	12:07	339.40	
	12:37	339.25	
	13:07	339.16	

PRODUCTION WELL NO. 2

TEST DATA

(Observation Well MW-5 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
01-15-76	13:37	338.99	
	14:07	338.94	
	15:07	338.86	
	16:07	338.80	
	17:07	338.55	
	20:05	338.20	
01-16-76	00:07	338.03	
	04:07	337.89	
	08:07	337.72	
	10:19	337.75	

BC

LABORATORIES Inc.

OIL - CORES - SOIL - WATER

3016 UNION AVENUE
BAKERSFIELD, CALIFORNIA 93305
Phone (805) 325-7475

J. J. EGLIN, Reg. Chem. Engr.

ubmitted By: Water Development Corp.
3938 Santa Barbara Ave.
Tucson, Arizona 85711

Date Reported: 2/16/76
Date Received: 2/3/76
Laboratory No.: 10752

larked: Quintana #2 1/15/76 08:30 T: 76°F. K: 350

WATER ANALYSIS

ample Description:

pH ---------------		8.1
.C. Micromhos/cm (K x 10^6) @ 25°C (salinity)---------		310.
esistivity, Ohm M^2/M		

..stituents, P. P. M. (parts per million)

.B) -		
alcium, (Ca) ----------------		21.
Magnesium, (Mg)----------------		3.4
odium, (Na) ----------------		39.
otassium, (K) ----------------		4.3
Carbonates, (CO_3) ----------------		0.
Bicarbonates, (HCO_3) -------------		153.1
Chlorides, (Cl) ----------------		17.0
ulphates, (SO_4) ----------------	(-)	5.
Nitrate, (NO_3) ----------------		3.53
Fluoride, (F) ----------------		0.66
Total Iron, (Fe)		
Copper, (Cu)		
Manganese, (Mn)		
Chromium, (Cr)		
Zinc, (Zn)		
Aluminum, (Al)		
Silica, (SiO_2)		
Lithium, (Li)		
Lead, (Pb)		
Phenol		
Sulfides as H_2S		
Total Hardness as $CaCO_3$		
Oil (chloroform extractable)		
. Dissolved Solids -------------		257. @ 180°F.
..spended Solids		

B C LABORATORIES Inc.

By J. J. Eglin

PRODUCTION WELL NO. 3
CUTTING LOG

(Prepared by B. Y. Kim, Geologist, Quintana Minerals Corporation)

Depth From - To (ft)	Pebble	Granule	Coarse Sand	Medium Sand	Fine Sand	Silt and Clay
30 - 50		30%	50%	5%	5%	10%
50 - 60	90%	10%				
60 - 80	Minor	60%	20%	Minor	5%	15%
80 - 100	90%	10%				
100 - 180	10%-30%	50%-70%	5%-15%	Minor	5%	10%
180 - 190			Minor	20%	40%	40%
190 - 210	Minor	40%	30%	5%	5%	20%
210 - 220			10%	20%	40%	20%
220 - 240	Minor	50%	40%			10%
240 - 250			10%	20%	40%	30%
250 - 260		50%	40%	Minor		10%
260 - 270		10%	20%	10%	20%	20%
270 - 330	10%-20%	50%-60%	20%	Minor	Minor	10%
330 - 350		10%	30%-40%	0%-10%	20%	30%
350 - 380	0%-10%	40%-50%	30%-40%	Minor	Minor	0%-10%
380 - 390		10%	30%	10%	20%	20%
390 - 450		30%-40%	30%-40%	0%-10%	0%-10%	10%-20%
450 - 460			10%	30%	30%	30%
460 - 760	Minor	20%-40%	20%-30%	0%-10%	10%-20%	10%-30%
(Representative Sample:	Minor	30%	30%	5%	10%	20%)
760 - 830		10%-20%	30%-40%	0%-10%	10%-20%	20%
830 - 910		20%-30%	30%-40%	10%	20%	10%
910 - 970		10%-20%	20%-30%	10%-20%	10%-20%	20%

Peanut-size angular pebbles at 80-100 feet, probably broken pieces from larger boulder.

Sample 120-180 missing.

Pebble-containing samples: 670-680 (20%)
710-720 (10%)
610-620 (5%)

Toward the bottom of the hole, gradual decrease of coarse material (granule and coarse sand) has been noticed.

PRODUCTION WELL NO. 3
CUTTING LOG
(continued)

The following size ranges have been established from Wentworth Scale for classification of clastic sedimentary rock. The above log has been done by visual estimation according to the scale.

Pebble	Above 4 mm
Granule	2 mm - 4 mm
Coarse Sand	Very coarse - 1 mm - 2 mm Coarse - 0.5 mm - 1 mm (1/2 mm - 1 mm)
Medium Sand	0.25 mm - 0.5 mm (1/4 mm - 1/2 mm)
Fine Sand	Fine - 0.125 mm - 0.25 mm (1/4 mm - 1/8 mm) Very fine - 0.0625 mm - 0.125 mm (1/8 mm - 1/16 mm)
Silt and Clay	Less than 0.0625 mm (less than 1/16 mm)

PRODUCTION WELL NO. 3
DRILLERS LOG

Depth From (ft)	To	Sample Description
40	55	Sand 85%, gravel.
55	65	Gravel, 10% sand.
65	75	Gravel, 20% sand.
75	165	Sand and gravel.
165	185	Sand 70%, gravel 25%, clay 5%.
185	195	Clay.
195	200	Sand, 5% clay.
200	205	Clay.
205	215	Sand, 50%, gravel 45%, clay 5%.
215	225	Clay, 10% sand.
225	235	Sand 55%, gravel 40%, clay 5%.
235	250	Sand and gravel.
250	255	Sand, 80% clay.
255	265	Sand and gravel, 5% clay.
265	275	Sand, 70% clay.
275	339	Sand and gravel.
339	345	Clay 80%, sand 20%.
345	355	Clay 75%, sand 20%, gravel 5%.
355	369	Sand 90%, gravel 10%.
369	375	Clay 60%, gravel 30%, sand 10%.
375	385	Sand 65%, clay 25%, gravel 10%.
385	399	Clay 60%, sand 40%.
399	405	Sand 90%, clay 10%.
405	415	Sand 50%, gravel 50%.
415	425	Sand 50%, gravel 40%, clay 10%.
425	429	Sand, gravel, and clay.
429	435	Gravel 65%, sand 30%, clay 5%.
435	455	Sand, gravel, and clay.
455	465	Clay and little sand.
465	475	Clay, gravel, and sand.
475	495	Gravel 60%, sand 20%, clay 20%.
495	505	Sand and gravel.
505	525	Sand 50%, clay 50%.
525	535	Gravel 50%, sand 50%.
535	545	Sand 65%, clay 25%, gravel 10%.
545	555	Sand 50%, clay 50%.
555	565	Sand, 30% clay.

PRODUCTION WELL NO. 3
DRILLERS LOG
(continued)

Depth From (ft)	To	Sample Description
565	575	Sand and gravel.
575	590	Sand, gravel, and clay.
590	595	Sand and gravel, some clay.
595	605	Sand, gravel, and clay.
605	615	Sand and gravel, some clay.
615	625	Sand and gravel, 70% clay.
625	655	Sand and gravel.
655	665	Sand 70%, clay 30%.
665	675	Sand 85%, gravel 10%, clay 5%.
675	685	Gravel 60%, sand 20%, clay 20%.
685	699	Sand 50%, gravel 25%, clay 25%.
699	705	Sand 50%, gravel 48%, clay 2%.
705	715	Gravel 45%, coarse sand 45%, clay 10%.
715	728	Sand 80%, gravel 10%, clay 10%.
728	745	Sand, gravel, and clay.
745	756	Sand 85%, clay.
756	817	Sand, gravel, and clay.
817	835	Clay 80%, gravel 10%, sand 10%.
835	847	Sandy clay 98%, gravel 2%.
847	855	Sand 70%, gravel 30%.
855	865	Sand 80%, gravel 15%, clay 5%.
865	878	Clay 55%, gravel 35%, sand 10%.
878	895	Sand, gravel, and clay.
895	905	Sand and gravel.
905	945	Gravel 50%, sand 30%, clay 20%.
945	955	Clay 50%, sand 30%, gravel 20%.
955	965	Clay 95%, sand 5%.
965	970	Clay 90%, sand 10%.

PRODUCTION WELL NO. 3

DEVELOPMENT DATA

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-22-76	12:54	350.6		Measuring with sounder. Measuring point top of 3/4-inch tube 0.95 feet above top of surface pipe. Surface pipe approximately 1 foot above land surface.
	13:00			Pump on. Ten-inch pump with bowls set at 500 feet. Discharge pipe 10-inch, orifice 6-inch.
	13:02	391.8	520	
	13:03	390.1		Dirty, lot of color.
	13:04	389.7	520	
	13:05	389.3		
	13:07	390.1	520	Lot of color, silt, 0.5 cc/l sand and silt.
	13:10	390.6		
	13:15	390.9	520	Clearing, less than 0.1 cc/l sand.
	13:20			Surge.
	13:25			Some color and silt, less than 0.1 cc/l fine sand.
	13:30	391.2	520	Clearing.
	13:36			Fairly clear, surge twice.
	13:44			Considerable color, 0.2 cc/l fine sand.
	13:47	386.4	520	
	13:55	388.6	520	Fairly clear, surge twice.
	14:05			Some color, silt.
	14:15	385.4	520	Fairly clear, surge twice.
	14:23			Some color, silt, less than 0.1 cc/l fine sand.
	14:30	383.3	520	Fairly clear, surge twice.
	14:37			Some color, silt, 0.1 cc/l fine sand.

PRODUCTION WELL NO. 3

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-22-76	14:45	382.0	520	Fairly clear, surge twice.
	14:58			Some color, silt, less than 0.1 cc/l fine sand.
	15:00	380.4	520	Fairly clear, silt, surge twice.
	15:08			Some color, no sand.
	15:15	379.4	520	Fairly clear, surge twice.
	15:30	378.4	520	Fairly clear, surge twice.
	15:45	377.9	520	Fairly clear, surge twice.
	16:00	377.7	520	Fairly clear, surge twice.
	16:15	377.6	520	Fairly clear, surge twice.
	16:30	377.4	520	Fairly clear, surge twice, change to 8-inch orifice.
	16:33			Pump on, increase RPM.
	16:35	402.7	1,000	Considerable color, 0.1 cc/l fine sand.
	16:40	403.0	1,000	
	16:45	403.8	1,000	Fairly clear, surge twice.
	16:53			Considerable color, silt, 0.1 cc/l fine sand.
	17:00	403.8	1,000	Fairly clear, surge twice.
	17:07			Considerable color, silt, 0.1 cc/l fine sand.
	17:10			T = 76^{o}F, K = 370 micromhos.
	17:15	403.1	1,000	Fairly clear, surge twice.
	17:22			Considerable color, silt, 0.1 cc/l fine sand.
	17:30	402.5	1,000	Fairly clear, surge twice.
	17:37			Considerable color, silt, 0.1 cc/l fine sand.
	17:45	401.4	1,000	Fairly clear, surge twice.
	17:52			Some color, silt, 0.15 cc/l fine sand.
	18:00	402.0	1,000	Fairly clear, surge twice.
	18:07			Some color, silt, 0.15 cc/l fine sand.

PRODUCTION WELL NO. 3

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-22-76	18:15	400.6	1,000	Fairly clear, surge twice.
	18:22			Some color, silt, 0.1 cc/l fine sand.
	18:30	399.7	1,000	Fairly clear, surge twice.
	18:37			Some color, silt, 0.1 cc/l fine sand.
	18:45	399.7	1,000	Fairly clear, surge twice.
	18:52			Some color, silt, less than 0.1 cc/l fine sand.
	19:00	399.4	1,000	Fairly clear, surge twice.
	19:08			Some color, silt, less than 0.1 cc/l fine sand.
	19:15	399.2	1,000	Fairly clear, surge twice.
	19:22			Some color, silt, 0.1 cc/l fine sand.
	19:30	398.3	1,000	Fairly clear, surge twice.
	19:37			Some color, silt, 0.1 cc/l fine sand.
	19:45	398.4	1,000	Fairly clear, surge twice.
	19:52			Some color, silt, less than 0.1 cc/l fine sand.
	20:00	398.6	1,000	Fairly clear, surge twice, increase RPM.
	20:07	428.5	1,500	Considerable color, 0.1 cc l fine sand.
	20:09	438.7		
	20:15	446.6	1,500	Dirty, 0.1 cc/l fine sand, considerable entrained air in discharge.
	20:30	447.0	1,486	Clearing, surge twice.
	20:37			Lot of color, silt, 0.2 cc/l fine sand.
	20:45	443.9	1,455	Fairly clear, surge twice.
	20:52			Lot of color, silt, 0.2 cc.l fine sand.

PRODUCTION WELL NO. 3

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-22-76	21:00	446.1	1,500	Fairly clear, surge twice.
	21:07			Lot of color, silt, 0.1 cc/l fine sand.
	21:15	444.8	1,500	Fairly clear, surge twice.
	21:22			Lot of color, silt, less than 0.1 cc/l fine sand.
	21:30	444.1	1,500	Fairly clear, surge twice.
	21:37			Lot of color, silt.
	21:45	441.1	1,471	Fairly clear, surge twice.
	21:53			Considerable color, silt, less than 0.1 cc/l fine sand.
	22:00	442.0	1,486	Fairly clear, surge twice.
	22:30	446.6	1,500	Fairly clear, surge twice.
	23:00	446.5	1,500	Fairly clear, surge twice.
	23:30	446.9	1,486	Fairly clear, surge twice.
	23:38			Considerable color, silt, no sand.
	24:00	446.4	1,500	Fairly clear, surge twice.
01-23-76	00:07			Lot of color, silt, no sand.
	00:30	446.9	1,500	Fairly clear, surge twice.
	00:38			Lot of color, silt, no sand.
	01:00	447.0	1,500	Fairly clear, surge twice.
	01:07			Lot of color, silt.
	01:30			Engine stopped, broken throttle linkage.
	01:36			Throttle repaired, second surg
	01:40			Lot of color, silt, no sand.
	02:00	447.1	1,500	Fairly clear, surge twice.
	02:07			Lot of color, silt, no sand.
	02:30	447.2	1,500	Fairly clear, surge twice.
	03:00	447.8	1,500	Fairly clear, surge twice.
	03:37		1,500	
	04:00	448.0	1,500	Fairly clear, surge twice.
	04:07		1,500	
	04:30	447.4	1,500	Fairly clear, surge twice.

PRODUCTION WELL NO. 3

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-23-76	04:37		1,500	
	05:00	447.2	1,500	Fairly clear, surge twice.
	05:07		1,500	
	05:30	447.3	1,500	Fairly clear, surge twice.
	05:37		1,500	
	06:00	449.3	1,500	Fairly clear, surge twice.
	06:07		1,500	
	06:30	447.4	1,500	Fairly clear, surge twice.
	06:37		1,500	Considerable color, silt, no sand.
	07:00	447.4	1,500	Clear, surge twice, increase RPM.
	07:09	463.1	1,809	Fairly dirty, 0.3 cc/l fine sand.
	07:11	470.2	1,809	Fairly dirty, lot of entrained air.
	07:15			Ohmmeter fluctuating badly. Starts at 460 feet.
	07:31		1,641	Manometer ± 1 inch, well is not surging.
	07:33			Fairly clear, surge twice.
	08:30	454.7	1,669	Clear, Ohmmeter and Manometer fluctuating, surge twice.
	08:32			Some color, silt, no sand.
	09:00	452.1	1,543	Clear, surge twice.
	09:08			Some color, silt, no sand.
	09:10			Engine stopped, broken throttle linkage.
	09:15			Throttle repaired.
	09:30	453.1	1,613	Clear, surge twice, reduce RP
	10:02			Little color, silt, no sand.
	10:04		1,500	
	10:30	448.2	1,515	Clear, reduce RPM.
	11:00	448.0	1,500	

PRODUCTION WELL NO. 3

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-23-76	11:11			T = 76° F, K = 360 microm-hos.
	11:30	448.0	1,500	Clear.
	11:58	448.4	1,500	Clear.
	12:00			Pump off.
	12:01	421.1		
	12:02	396.3		
	12:03	365.2		
	12:04	354.0		
	12:05	354.2		
	12:16	352.7		
	12:15	352.1		

PRODUCTION WELL NO. 3

TEST DATA

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-24-76	07:46	350.8		Measuring with sounder. Same measuring point as for development.
	08:59	350.8 -1.95 = 348.9 GL		
	09:00			Pump on. Same setting as for development.
	09:01	421.4	1,500	
	09:02	424.6	1,500	Some color.
	09:03	428.2	1,500	
	09:04	431.1	1,500	
	09:05	432.6	1,500	Clear.
	09:06	433.5	1,500	
	09:07	434.5	1,500	
	09:08	435.6	1,500	
	09:09	436.2	1,500	
	09:10	436.9	1,500	
	09:11	437.6	1,500	
	09:12	437.8	1,500	
	09:13	438.0	1,500	
	09:14	438.5	1,500	
	09:15	439.0	1,500	
	09:16	440.0	1,515	Decrease RPM.
	09:17	439.6	1,500	
	09:18	439.6	1,500	
	09:19	439.8	1,500	
	09:20	440.0	1,500	
	09:25	441.0	1,500	
	09:30	441.6	1,500	
	09:35	441.9	1,500	
	09:40	442.0	1,500	
	09:50	443.4	1,500	
	10:00	443.5	1,500	
	10:15	444.5	1,500 -	Increase RPM.
	10:30	445.0	1,500	Considerable entrained air in discharge.
	10:45	445.9	1,500	

PRODUCTION WELL NO. 3

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-24-76	11:00	446.0	1,500 +	Decrease RPM.
	11:30	446.6	1,500	
	12:00	446.6	1,500	
	12:03			T = 76^{o}, K = 360 microm-hos.
	12:30	448.4	1,500	
	13:00	449.5	1,500	
	13:30	449.0	1,500 -	Increase RPM.
	14:00	449.1	1,500	
	15:00	448.7	1,500 +	Decrease RPM.
	16:00	448.9	1,500	
	17:00	449.8	1,515	Decrease RPM.
	18:00	448.4	1,486	Increase RPM.
	19:00	499.4	1,500	
	20:00	450.4	1,500	
	21:00	450.9	1,500	
	22:00	451.5	1,500	
	23:00	451.8	1,500	
	24:00	452.2	1,500	
01-25-76	01:00	452.2	1,500	
	02:00	452.2	1,500	
	03:00	452.4	1,500	
	04:00	452.4	1,500	
	05:00	452.7	1,500	
	06:00	453.0	1,500	
	07:00	453.7	1,500	
	08:00	452.3	1,500	
	09:00	451.7	1,486	Increase RPM.
	10:00	452.4	1,500	
	11:00	452.4	1,500	
	12:00	453.0	1,500 -	Increase RPM.
	12:25	453.2	1,500	
	12:36	453.2	1,500	Changed sounders.
	13:00	453.86	1,500	
	14:00	454.83	1,500 +	Decrease RPM.

PRODUCTION WELL NO. 3

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-25-76	14:40			T = 76°, K = 360 microm-hos.
	15:00	452.50	1,500	
	16:00	452.59	1,500	
	17:00	453.81	1,500	
	18:00	454.26	1,500	
	19:00	453.73	1,500	
	20:00	454.16	1,500	
	21:00	455.38	1,500	
	22:00	456.12	1,500 +	Decrease RPM.
	23:00	456.36	1,500	
	24:00	456.46	1,500	
01-26-76	01:00	455.86	1,500	
	02:01	455.71	1,500	
	03:00	455.76	1,500	
	04:00	455.71	1,500	
	05:00	455.66	1,500	
	06:00	455.46	1,500	
	07:00	455.56	1,500 +	Decrease RPM.
	08:00	454.49	1,500	
	09:00	454.86	1,500	
	10:00	455.40	1,500	
	11:00	455.34	1,500	
	12:00	455.50	1,500	
	13:00	455.80	1,500	
	13:40		1,500 +	Decrease RPM.
	14:00	455.77	1,500	
	15:00	455.76	1,500	
	16:00	456.87	1,500	
	17:00	455.70	1,500	
	18:00	455.42	1,486	Increase RPM.
	19:00	456.19	1,500 -	Increase RPM.
	20:00	457.03	1,500	
	21:00	457.14	1,500	
	22:00	457.14	1,500	

PRODUCTION WELL NO. 3

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
01-26-76	23:00	457.31	1,500	
	24:00	457.0	1,500	
01-27-76	01:00	456.96	1,500	
	02:00	456.98	1,500	
	03:00	455.66	1,500	
	04:00	455.96	1,500	
	05:00	455.96	1,500	
	06:05	457.66	1,500	
	07:00	455.26	1,500	
	08:00	453.71	1,500	
	08:50			T = 76°, K = 360 micromhos. Collected water samples.
	08:55	454.16	1,500	
	09:00			Pump off.
	09:01	337.06		
	09:02	346.23		
	09:03	356.86		
	09:04	356.38		
	09:05	356.46		
	09:06	356.35		
	09:07	356.09		
	09:08	355.90		
	09:09	355.72		
	09:10	355.54		
	09:15	354.84		
	09:20	354.32		
	09:25	354.02		
	09:30	353.80		
	09:40	353.53		
	09:50	353.32		
	10:00	352.98		
	10:15	352.89		
	11:00	352.49		
	18:44	351.24		
01-28-76	07:42	350.66		

PRODUCTION WELL NO. 3

TEST DATA

(Observation Well PW-1 Water Levels)

Date	Hour	Depth to Water (ft)	Remarks
01-22-76	11:49	330.91	Measured with chain. Measuring point hole in plate over casing 0.87 foot above top of surface pipe. Surface pipe approximately 0.2 foot above land surface.
	13:00		PW-3 pump on for development.
01-23-76	10:55	331.94	Measured with chain.
	12:00		PW-3 pump off.
01-24-76	08:13	330.77	Measured with chain. Set sounder with tape mark at 330.77.
	09:00		PW-3 pump on for test.
	09:10	330.77	
	09:30	330.87	
	09:45	330.96	
	10:00	330.98	
	10:15	331.10	
	10:35	331.10	
	11:05	331.22	
	11:55	331.33	
	13:12	331.42	
	14:15	331.45	
	15:15	331.51	
	16:15	331.55	
	17:18	331.62	
	18:23	331.67	
	20:13	331.77	
	22:13	331.85	
01-25-76	00:13	331.96	
	02:13	332.11	
	04:13	332.11	
	06:15	332.13	
	08:15	332.08	
	10:15	332.15	
	12:15	332.13	

PRODUCTION WELL NO. 3

TEST DATA

(Observation Well PW-1 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
01-25-76	14:15	332.11	
	16:12	332.15	
	18:15	332.21	
	20:15	332.27	
	22:50	332.36	
01-26-76	00:30	332.37	
	02:30	332.38	
	06:30	332.49	
	08:28	332.58	
	10:13	332.74	
	12:17	332.72	
	14:11	332.67	
	16:10	332.66	
	18:15	332.68	
	20:05	332.70	
01-27-76	00:10	332.74	
	02:15	332.76	
	05:55	332.78	
	08:20	332.84	
	09:00		PW-3 pump off.
	10:35	332.44	
	18:55	331.73	
01-28-76	08:06	331.47	

PRODUCTION WELL NO. 3

TEST DATA

(Observation Well PW-2 Water Levels)

Date	Hour	Depth to Water (ft)	Remarks
01-22-76	11:58	309.93	Measured with chain. Measuring point hole in plate above casing 0.7 foot above top of surface pipe. Surface pipe approximately 0.5 foot above land surface.
	13:00		PW-3 pump on for development.
01-23-76	10:45	310.31	Measured with chain.
	12:00		PW-3 pump off.
01-24-76	08:31	309.67	Measured with chain. Set sounder with tape mark at 309.67.
	09:00		PW-3 pump on for test.
	09:05	309.67	
	09:25	309.67	
	09:40	309.67	
	09:55	309.71	
	10:10	309.74	
	10:25	309.75	
	10:40	309.77	
	11:00	309.81	
	11:50	309.84	
	13:16	309.89	
	14:20	309.91	
	15:20	309.94	
	16:20	309.98	
	17:24	310.02	
	18:30	310.07	
	20:16	310.12	
	22:16	310.18	
01-25-76	00:16	310.22	
	02:16	310.27	
	04:18	310.31	
	06:20	310.40	
	08:20	310.42	
	10:20	310.46	

PRODUCTION WELL NO. 3

TEST DATA

(Observation Well PW-2 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
01-25-76	12:20	310.46	
	14:20	310.43	
	16:16	310.43	
	18:20	310.48	
	20:20	310.55	
	23:00	310.67	
01-26-76	00:35	310.65	
	02:35	310.72	
	06:35	310.83	
	08:33	310.90	
	10:17	311.01	
	12:23	311.00	
	14:15	310.92	
	16:15	310.96	
	18:20	310.99	
	20:10	311.01	
01-27-76	00:15	311.04	
	02:20	311.11	
	06:00	311.12	
	08:25	311.13	
	09:00		PW-3 pump off.
	10:40	311.04	
	19:00	310.65	
01-28-76	08:17	310.43	

PRODUCTION WELL NO. 3

TEST DATA

(Observation Well MW-5 Water Levels)

Date	Hour	Depth to Water (ft)	Remarks
01-22-76	11:41	336.67	Measured with chain. Measuring point top of 6-inch casing approximately 1 foot above land surface.
	13:00		PW-3 pump on for development.
01-23-76	11:03	337.68	Measured with chain.
	12:00		PW-3 pump off.
01-24-76	07:57	336.52	Measured with chain. Set sounder wit· tape mark at 336.52.
	09:00		PW-3 pump on for test.
	09:13	336.52	
	09:34	336.64	
	09:50	336.70	
	10:04	336.71	
	10:24	336.77	
	10:36	336.83	
	11:07	336.91	
	11:57	337.01	
	13:10	337.07	
	14:12	337.11	
	15:12	337.14	
	16:12	337.24	
	17:15	337.29	
	18:20	337.33	
	20:08	337.42	
	22:08	337.49	
01-25-76	00:08	337.53	
	02:08	337.60	
	04:08	337.67	
	06:10	337.76	
	08:10	337.76	
	10:10	337.83	
	12:10	337.82	
	14:10	337.79	
	16:10	337.90	
	18:10	337.82	

PRODUCTION WELL NO. 3

TEST DATA

(Observation Well MW-5 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
01-25-76	20:10	337.94	
	22:50	338.01	
01-26-76	00:25	338.03	
	02:25	338.06	
	06:25	338.17	
	08:25	338.26	
	10:10	338.28	
	12:12	338.29	
	14:09	338.28	
	16:08	338.30	
	18:10	338.34	
	20:00	338.39	
01-27-76	00:05	338.41	
	02:10	338.42	
	05:50	338.43	
	08:10	338.56	
	09:00		PW-3 pump off.
	10:30	338.18	
	18:50	337.41	
01-28-76	07:54	337.10	

PRODUCTION WELL NO. 3

TEST DATA

(Observation Well MW-6 Water Levels)

Date	Hour	Depth to Water (ft)	Remarks
01-22-76	12:22	386.84	Measuring with sounder. Inside of casing too wet to use chain. Measuring point top of 6-inch casing approximately 1 foot above land surface. MW-6 was used to supply drilling water for drilling production wells.
	13:00		PW-3 pump on for development.
01-23-76	10:14	386.67	
	12:00		PW-3 pump off.
01-24-76	07:34	386.41	
	09:00		PW-3 pump on for test.
	09:20	386.41	
	11:06	386.40	
	12:08	386.38	
	13:04	386.33	
	14:07	386.33	
	15:07	386.33	
	16:07	386.32	
	17:09	386.35	
	18:09	386.34	
	20:05	386.32	
	22:05	386.29	
01-25-76	00:05	386.32	
	02:05	386.35	
	04:05	386.39	
	06:05	386.43	
	08:05	386.49	
	10:05	386.53	
	12:05	386.50	
	14:05	386.47	
	16:05	386.41	
	18:05	386.46	
	20:05	386.54	
	22:24	386.63	

PRODUCTION WELL NO. 3

TEST DATA

(Observation Well MW-6 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
01-26-76	00:15	386.64	
	02:15	386.63	
	06:20	386.74	
	08:20	386.80	
	10:06	386.82	
	12:07	386.82	
	14:05	386.78	
	16:04	386.79	
	18:05	386.77	
	19:56	386.84	
	24:00	386.86	
01-27-76	02:05	386.87	
	05:45	386.88	
	08:05	386.92	
	09:00		PW-3 pump off.
	10:10	386.87	
	18:38	386.81	
01-28-76	07:29	386.77	

BC
LABORATORIES Inc.
OIL - CORES - SOIL - WATER
3016 UNION AVENUE
BAKERSFIELD, CALIFORNIA 93305
Phone (805) 325-7475
J. J. EGLIN, Reg. Chem. Engr.

Submitted By: Water Development Corp.
3938 Santa Barbara Ave.
Tucson, Arizona 85711

Date Reported: 2/16/76
Date Received: 2/3/76
Laboratory No.: 10753

Marked: Quintana #3 1/27/76 08:50 T: 76°F. K: 360

WATER ANALYSIS

Sample Description:

pH		8.0
E.C. Micromhos/cm ($K \times 10^6$) @ 25°C (salinity)		330.
Resistivity, Ohm M^2/M		

Constituents, P. P. M. (parts per million)

(B)		
Calcium, (Ca)		22.5
Magnesium, (Mg)		2.7
Sodium, (Na)		44.
Potassium, (K)		5.1
Carbonates, (CO_3)		0.
Bicarbonates, (HCO_3)		158.0
Chlorides, (Cl)		24.1
Sulphates, (SO_4)	(-)	5
Nitrate, (NO_3)		2.60
Fluoride, (F)		0.64
Total Iron, (Fe)		
Copper, (Cu)		
Manganese, (Mn)		
Chromium, (Cr)		
Zinc, (Zn)		
Aluminum, (Al)		
Silica, (SiO_2)		
Lithium, (Li)		
Lead, (Pb)		
Phenol		
Sulfides as H_2S		
Total Hardness as $CaCO_3$		
Oil (chloroform extractable)		
[illegible] Dissolved Solids		243. @ 180°F.
[illegible] Suspended Solids		

BC LABORATORIES Inc.

By J. J. Eglin

WATER DEVELOPMENT CORPORATION

BASIC-DATA REPORT
QUINTANA MINERALS CORPORATION
COPPER FLAT PROJECT
PRODUCTION WELL NO. 4,
HILLSBORO, NEW MEXICO

By
D. K. Greene and L. C. Halpenny

Tucson, Arizona
December 1980

BASIC-DATA REPORT

QUINTANA MINERALS CORPORATION
COPPER FLAT PROJECT PRODUCTION WELL NO. 4, HILLSBORO, NEW MEXICO

By

D. K. Greene and L. C. Halpenny

GENERAL INFORMATION

A fourth production well (PW-4) has been drilled to assist in furnishing the water supply for ore processing and other uses at the Copper Flat Project. Location of PW-4 along with PW-1, PW-2, and PW-3, is shown on Figure 1. The legal description of PW-4 is as follows:

NW$\frac{1}{4}$ SW$\frac{1}{4}$ NE$\frac{1}{4}$, Sec. 31, T. 15 S., R. 5 W.

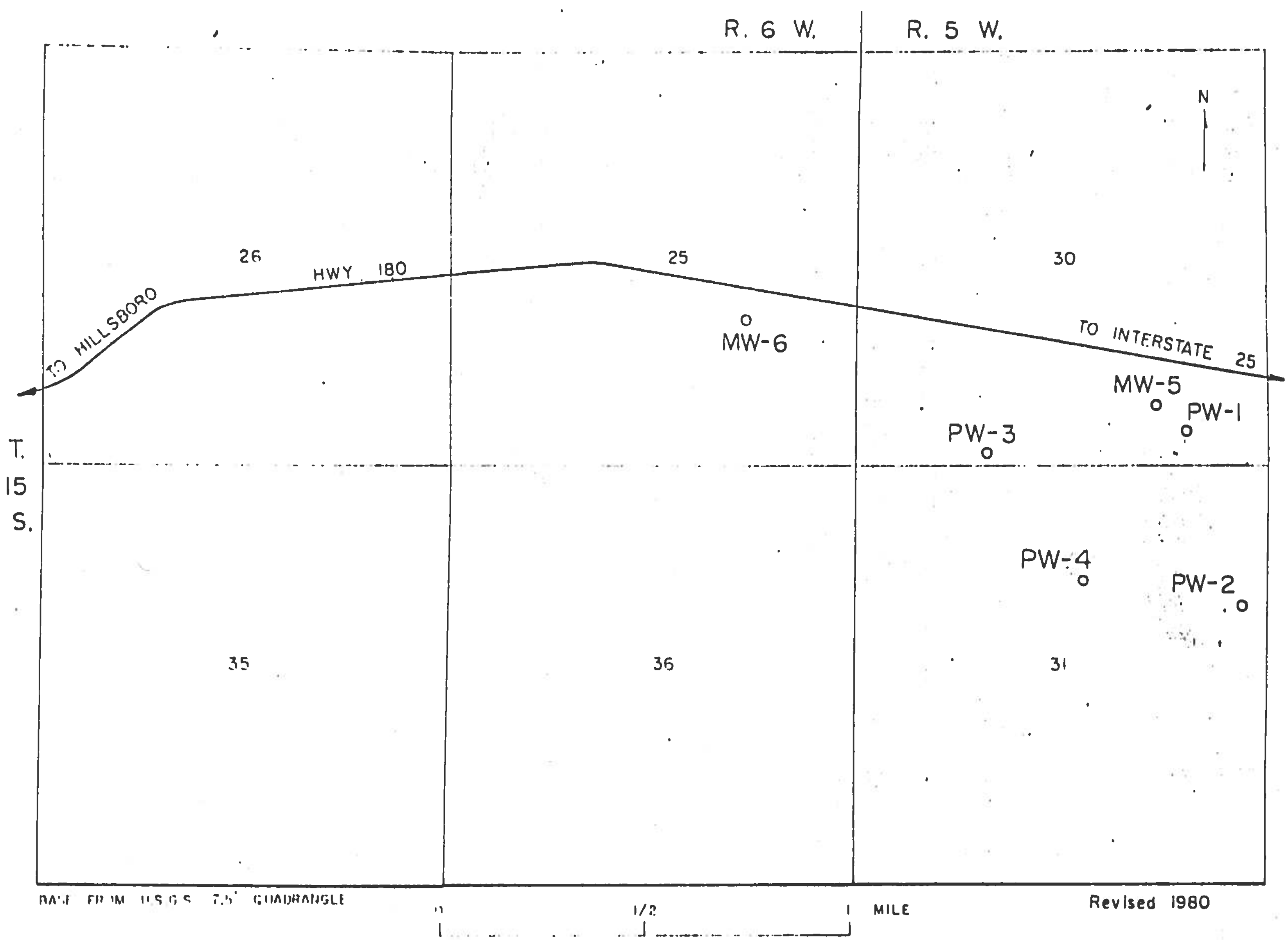

FIGURE 1.--MAP OF A PORTION OF TOWNSHIP 15 SOUTH, RANGES 5 AND 6 WEST, SIERRA COUNTY, NEW MEXICO, SHOWING LOCATIONS OF PRODUCTION WELLS AND MW-5 AND MW-6.

PW-4 was drilled by R. L. Guffey, Inc., Drilling Contractors of Las Cruces, New Mexico using rotary equipment and the conventional method of drilling. Considerable difficulty was encountered in drilling the upper 100 feet of hole due to boulders. A 12-inch pilot hole was drilled through this section and down to 400 feet. From 400 feet a 9-7/8-inch pilot hole was drilled to bottom depth of 957 feet. Following pilot hole drilling a 23-foot joint of 30-inch diameter surface pipe was set and cemented in place. The hole was then reamed to an ultimate diameter of 26 inches to a depth of 954 feet. An 18-inch pilot bit extended ahead of the 22-inch bit giving a hole diameter of 18-inches from 954 to 957 feet.

The hole was cased with 16-inch OD, 5/16-inch wall thickness, blank casing and 16-inch OD Johnson 100 slot Irrigator Screen. Open area in the Irrigator Screen amounts to 217 square inches per lineal foot. A 3-foot section of 16-inch OD, 5/16 inch wall thickness, blank casing was welded to the bottom of the Irrigator Screen. This section of casing is tapered on the bottom end. The annular space was gravel packed with 1/8 to 3/8-inch gravel and the well was developed with the drilling rig by washing, jetting, and bailing.

Details on depth drilled, casing installed, etc., for PW-4 are as follows:

Depth drilled	957 feet
Casing installed	
Blank	0 to 354 feet
Screen	354 to 954 feet
Blank	954 to 957 feet
Gravel installed	110 yards
Rig development time	39 hours
Gravel slippage during rig development	55 feet

Upon completion of rig development the well was further developed and tested with a diesel powered turbine pump furnished by Western Pump and Supply Company of Deming, New Mexico. Data obtained during this phase of work are included in the following sections of this report along with logs for the well.

PRODUCTION WELL NO. 4
DRILLER'S LOG

(Prepared by R. L. Guffey, Inc. Drilling Contractors)

Depth From (ft)		To	Sample Description
0	-	23	Boulder gravel some clay
23	-	38	Hard black rock stks, clay
38	-	56	Stks. hard black rock gravel boulder some clay
56	-	73	Gravel some boulders and clay
73	-	96	Gravel and clay with boulders
96	-	156	Clay and gravel stks gravel
156	-	198	Gravel some sand with clay and clay stks.
198	-	233	Gravel and sand stks of red clay
233	-	275	Clay (red) stks gravel
275	-	281	Sand sandy clay
281	-	293	Clay stks gravel embedded in clay
293	-	309	Gravel some sand stks clay
309	-	407	Sand small gravel stks clay (sandy)
407	-	422	Clay stks gravel calcareous and sand
422	-	446	Clay some gravel embedded
446	-	532	Gravel and sand some clay stks
532	-	560	Gravel (larger) with clay
560	-	610	Gravel sand with some clay
610	-	764	Gravel some (clean) with clay stks, drilled tight
764	-	783	Gravel, gravel embedded in clay
783	-	805	Gravel some sand with clay
805	-	825	Gravel and clay (Bentonite)
825	-	835	Gravel clean with sand
835	-	877	Clay with gravel embedded
877	-	896	Gravel clean some clay lens
896	-	925	Gravel fine with sand (some clean)
925	-	957	Gravel embedded in clay

PRODUCTION WELL NO. 4

WADEVCO LOG

Depth From (ft)	To	Sample Description
0	20	Angular fragments of boulders which are exposed at land surface, 1/4" to 1/2" +.
20	30	Angular fragments of boulders, 1/4" to 1/2" +. Small amount of medium to coarse sand.
30	40	Angular fragments of boulders, 1/4" to 1/2" +.
40	50	Angular rock fragments, 1/8" to 1/4". Some silt and very fine sand.
50	70	Angular rock fragments, 1/4" to 1/2" +.
70	90	Angular rock fragments, 1/8" to 1/2" +. Some fine to medium sand.
90	100	Angular rock fragments, 1/8" to 1/2" +.
100	110	Angular rock fragments, 1/8" to 1/2" +. Some silt and clay.
110	120	Primarily angular rock fragments, 1/8" to 1/2". Few fragments are rounded.
120	130	Primarily angular rock fragments, 1/4" to 1/2". Several fragments of clay with embedded sand and gravel.
130	140	Angular rock fragments, ± 1/8". Some medium to very fine sand, silt, and clay.
140	160	Angular rock fragments, 1/8" to 1/4". Some medium to very fine sand, silt, and clay.
160	170	Angular rock fragments, 1/8" to 1/4". Some coarse to very fine sand.
170	180	Angular rock fragments, ± 1/8". Some coarse to very fine sand.
180	200	Medium to very coarse sand and gravel up to 1/8". Some silt.
200	220	Angular rock fragments, ± 1/8". Some coarse to very fine sand.
220	230	Angular rock fragments, 1/8" to 1/4". Some very coarse to fine sand.
230	240	Angular rock fragments, ± 1/8". Some very coarse to fine sand.
240	250	Angular rock fragments, 1/8" to 1/4". Some very coarse to fine sand.

PRODUCTION WELL NO. 4

WADEVCO LOG
(continued)

Depth From (ft)	To	Sample Description
250	260	Angular rock fragments, 1/8" to 1/4". Some very coarse to fine sand and silt. Several fragments of clay ± 1/8".
260	280	Angular rock fragments, ± 1/8". Some very coarse to fine sand.
280	300	Angular rock fragments, 1/8" to 1/4". Some very coarse to fine sand.
300	310	Angular rock fragments, 1/8" to 1/4". Some very coarse to fine sand. Several clay fragments ± 1/8".
310	330	Gravel up to ± 1/8" with fine to very coarse sand. Several rock fragments ± 1/4". Several clay fragments ± 1/8".
330	340	Medium to very coarse sand with gravel up to 1/8". Few angular rock fragments ± 1/4".
340	360	Fine to very coarse sand and gravel. Some silt.
360	390	Very coarse sand and gravel. Some fine to medium sand.
390	400	Very coarse sand and gravel. Some fine to medium sand. Few small fragments of clay.
400	420	Angular rock fragments 1/4" to 1/2". Some medium to very coarse sand and gravel.
420	450	Very coarse sand and gravel to ± 1/8". Few rock fragments ± 1/4". Some medium to coarse sand.
450	460	Very coarse sand and gravel to ± 1/8". Some medium to fine sand. Few fragments of clay. Some silt.
460	490	Very coarse sand and gravel to ± 1/8". Some medium to fine sand.
490	500	Very coarse sand and gravel to ± 1/8". Some medium to fine sand. Several fragments of black vesicular material with sand grains embedded in some vesicles.
500	530	Very coarse sand and gravel to ± 1/8". Some medium to fine sand.
530	560	Angular rock fragments, 1/8" to 1/2" with fine to very coarse sand. Some silt.

PRODUCTION WELL NO. 4

WADEVCO LOG
(continued)

Depth From (ft)	To	Sample Description
560	590	Very coarse sand and gravel to ± 1/8". Fair number of angular rock fragments in 1/4" to 1/2" range. Several fragments of clay up to 1/2". Some silt.
590	620	Very coarse sand and gravel up to ± 1/8". Some medium to very fine sand and silt.
620	700	Very coarse sand and gravel up to ± 1/8". Some medium to fine sand.
700	730	Medium to very coarse sand with some gravel up to ± 1/8". Some fine sand and silt.
730	740	Medium to very coarse sand with some gravel up to ± 1/8". Some fine sand, silt, and clay fragments.
740	750	Medium to very coarse sand with some gravel up to ± 1/8".
750	760	Coarse to very coarse sand with some gravel up to ± 1/8". Some fine to medium sand.
760	780	Coarse to very coarse sand with some gravel up to ± 1/8". Some fine to medium sand. Several fragments of clay.
780	800	Very coarse sand and gravel up to ± 1/8". Some medium to fine sand.
800	810	Coarse to very coarse sand with some gravel up to ± 1/8". Some fine to medium sand. Few fragments of clay.
810	820	Very coarse sand and gravel up to ± 1/8". Several angular rock fragments ± 1/4". Some fine to medium sand and silt.
820	840	Very coarse sand and gravel up to ± 1/8". Some fine to medium sand.
840	850	Medium to very coarse sand and gravel up to ± 1/8". Several rock fragments ± 1/4". Silt and numerous fragments of clay.
850	870	Very fine to medium sand and silt with fragments of clay. Some coarse to very coarse sand with gravel up to ± 1/8".

PRODUCTION WELL NO. 4

WADEVCO LOG
(continued)

Depth From (ft)	To	Sample Description
870	880	Coarse to very coarse sand and gravel up to ± 1/8", Some fine to medium sand.
880	900	Coarse to very coarse sand. Some fine to medium sand.
900	910	Very fine to coarse sand.
910	920	Very fine to medium sand with some coarse sand.
920	957	Samples missing. Refer to Driller's Log.

PRODUCTION WELL NO. 4

DEVELOPMENT DATA

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
11-30-80	16:15	290.82		Measured with chain. Measuring point top of 3/4-inch pipe 0.86 foot above top of surface pipe. Surface pipe approximately 0.5 foot above land surface.
12-01-80	07:35	290.87		Measured with chain.
	07:50	290.9		Measuring with sounder.
	09:50	290.9		
	10:15			Pump on. Ten-inch pump to 350-feet. Eight inch pump 350 to 550 feet. Top of 13.5 inch bowls set at 550 feet. Discharge pipe 10-inch. Orifice 7-inch.
	10:16	326.6		
	10:17	309.4	550	
	10:20	309.2		
	10:21	309.2	550	
	10:24		550	Lot of mud. 2.5 cc/l fine to very fine sand.
	10:25	309.5		
	10:28		550	Clearing some. 0.3 cc/l fine to very fine sand.
	10:30	309.4		
	10:38	309.4		
	10:40			Fairly clear. Slight mud color. < 0.1 cc/l very fine sand.
	10:44		550	Fairly clear. < 0.1 cc/l very fine sand.
	10:45	309.7		
	10:47			Surge once.
	10:52			Lot of mud. 1.5 cc/l medium to very fine sand.
	10:55			Lot of mud. 2.5 cc/l fine to very fine sand.

PRODUCTION WELL NO. 4

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-01-80	10:56	310.6		
	11:05	310.7		Lot of mud. <0.1 cc/l very fine sand.
	11:11		550	Clearing some. <0.1 cc/l very fine sand.
	11:12	310.7		
	11:19			Fairly clear. <0.1 cc/l very fine sand.
	11:20			Surge once.
	11:25		550	Lot of mud. 2.5 cc/l fine to very fine sand.
	11:27			Still lot of mud. 1.0 cc/l fine to very fine sand.
	11:29	310.5		
	11:32			Less mud. <0.1 cc/l very fine sand.
	11:38	310.6		
	11:40		550	Less mud. <0.1 cc/l very fine sand.
	11:49			Fairly clear. Surge once.
	11:54		550	Lot of mud. 1.3 cc/l fine to very fine sand.
	11:56			Lot of mud. 0.9 cc/l fine to very fine sand.
	11:58			Lot of mud. 0.15 cc/l fine to very fine sand.
	12:00	310.9	550	
	12:11		550	Still muddy. <0.1 cc/l very fine sand.
	12:15			Fairly clear. Surge once.
	12:19		812	Lot of mud. 1.5 cc/l medium to very fine sand.
	12:21			Lot of mud. 0.5 cc/l fine to very fine sand.
	12:23	324.1		
	12:27		812	Still muddy. <0.1 cc/l fine to very fine sand.

PRODUCTION WELL NO. 4

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-01-80	12:32	324.7		
	12:34			Fairly clear. Surge once.
	12:37			Lot of mud. 0.6 cc/l medium to very fine sand.
	12:38			Lot of mud. 1.2 cc/l fine to very fine sand.
	12:40		812	Lot of mud. 0.3 cc/l fine to very fine sand.
	12:34	324.0		
	12:52	324.4		
	12:53			Fairly clear. < 0.1 cc/l very fine sand.
	12:54			Surge twice.
	12:59			Lot of mud. 1.0 cc/l fine to very fine sand.
	13:00			Lot of mud. 0.6 cc/l fine to very fine sand.
	13:01		812	Lot of mud. 0.1 cc/l fine to very fine sand.
	13:03			Still muddy. 0.1 cc/l fine to very fine sand.
	13:12	323.8		
	13:15			Fairly clear. Surge twice.
	13:21			Lot of mud. 1.5 cc/l medium to very fine sand.
	13:23		812	Lot of mud. 0.1 cc/l fine to very fine sand.
	13:27			Still muddy. < 0.1 cc/l fine to very fine sand.
	13:29	323.1		
	13:31			Fairly clear. Surge twice.
	13:36			Lot of mud. 1.0 cc/l medium to fine sand.
	13:38			Lot of mud. 0.9 cc/l very fine sand and silt.
	13:47	322.5	812	Fairly clear. Surge twice.

PRODUCTION WELL NO. 4

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-1-80	13:53		812	Lot of mud. 1.5 cc/l medium to very fine sand.
	13:55			Lot of mud. 0.15 cc/l fine to very fine sand.
	13:59		812	Still some mud. < 0.1 cc/l very fine sand.
	14:02	321.8		
	14:03			Fairly clear. Surge twice.
	14:08			Lot of mud. 0.5 cc/l medium to very fine sand.
	14:10		812	Lot of mud. 0.2 cc/l very fine sand and silt.
	14:18	321.2		
	14:20		812	Clearing some.
	14:22			Fairly clear. Surge twice.
	14:27		1,001	Lot of mud. 0.3 cc/l medium to very fine sand.
	14:28			Lot of mud. 0.3 cc/l medium to very fine sand.
	14:30			Still muddy. 0.1 cc/l very fine sand.
	14:32	329.0		
	14:40	329.8	1,001	
	14:41			Fairly clear. Surge twice.
	14:46			Lot of mud. 0.6 cc/l medium to very fine sand.
	14:48			Lot of mud. 0.1 cc/l very fine sand and silt.
	14:58	329.2	1,001	
	14:59			Fairly clear. Surge twice.
	15:04			Considerable mud and color. 0.5 cc/l medium to very fine sand.
	15:06		1,001	Considerable mud and color. 0.1 cc/l very fine sand.
	15:14	328.2	1,001	

PRODUCTION WELL NO. 4

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-01-80	15:15			Fairly clear. Surge twice.
	15:20			Considerable mud and color. 0.2 cc/l medium to fine sand.
	15:22		1,001	Considerable mud and color. 0.1 cc/l very fine sand.
	15:29	327.8	1,001	
	15:30			Fairly clear. Surge twice.
	15:35			Considerable mud and color. 0.2 cc/l fine to very fine sand.
	15:37			Considerable mud and color. < 0.1 cc/l very fine sand.
	15:44	327.2	1,001	
	15:45			Fairly clear. Surge twice.
	15:50			Considerable mud and silt. 0.2 cc/l medium to very fine sand.
	15:52			Considerable mud and silt. 0.1 cc/l very fine sand and silt.
	15:59	326.5	1,001	
	16:00			Fairly clear. Surge twice.
	16:05			Considerable mud and silt. 0.1 cc/l fine to very fine sand.
	16:07			Considerable mud and silt. 0.1 cc/l very fine sand and silt.
	16:14	326.2	1,001	
	16:15			Fairly clear. Surge twice.
	16:17			Considerable mud and silt. 0.2 cc/l fine to very fine sand.
	16:19			Considerable mud and silt. 0.1 cc/l very fine sand and silt.
	16:29	326.1	1,001	
	16:30			Fairly clear. Surge twice.
	16:35		1,251	Lot of mud and silt. 0.2 cc/l fine to very fine sand.
	16:44	335.9		
	16:45			Fairly clear. Surge twice.

PRODUCTION WELL NO. 4

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-01-80	16:50			Lot of mud and color. 0.15 cc/l fine to very fine sand.
	16:52			Lot of mud and silt. < 0.1 cc/l very fine sand.
	16:59	335.9	1,251	
	17:00			Fairly clear. Surge twice.
	17:29	336.7	1,251	
	17:30			Fairly clear. Surge twice.
	17:35			Lot of color. 0.1 cc/l very fine sand.
	17:44	335.5	1,251	
	17:45			Fairly clear. Surge twice.
	17:59	335.4	1,251	Surge twice.
	18:00		1,404	Changed to 8-inch orifice.
	18:05	337.9	1,404	Fairly clear.
	19:00	341.2		Surge twice. Some color 0.1 cc/l very fine sand.
	19:15	339.9	1,370	Some color. 0.1 cc/l very fine sand.
	19:39	339.6	1,370	Surge twice. Some color.
	19:43		1,404	Some color. 0.2 cc/l very fine sand.
	20:00	339.9	1,387	Surge twice.
	20:05		1,404	Clear, then some color.
	20:30	339.5	1,370	Clearing.
	20:35		1,529	Clear, then some color.
	21:00	346.9	1,543	Some color. Surge twice.
	21:07			T = 76°F; K = 360 micromhos. < 0.1 cc/l very fine sand.
	21:30	346.7	1,500	Clearing. Surge twice.
	21:37			Clear, then color. < 0.1 cc/l very fine sand.
	22:03	345.9	1,500	Clear. Surge twice.
	22:10		1,529	Clear, then some color. 0.1 cc/l very fine sand.
	22:30	345.2	1,529	Clearing. Very little color. Surge twice.

PRODUCTION WELL NO. 4

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-01-80	23:07		1,613	Color, clearing fast. No sand.
12-02-80	01:00	348.3	1,585	Clear. Surge twice.
	01:07		1,613	Color, < 0.1 cc/l very fine sand.
	01:30	346.5	1,557	Clear. Surge twice.
	01:37	[illegible]	1,613	Some color. Clearing fast. < 0.1 cc/l very fine sand.
	02:00	345.0	1,529	Clear. Surge twice.
	02:05		1,613	Clear, then some color. < 0.1 cc/l very fine sand.
	02:35	350.2	1,627	Clear. Surge twice.
	02:40		1,697	Clear, then color. < 0.1 cc/l very fine sand.
	03:30	352.6	1,697	Clear. Surge twice.
	03:35			Color. Clearing. No sand. T = 76°F; K = 380 micromhos.
	04:00	352.7	1,711	Surge twice.
	04:07			Color. No sand.
	04:30	352.3	1,711	Surge twice.
	04:37		1,791	Clear, then some color. No sand.
	05:30	355.9	1,791	Clear. Surge twice.
	05:37		1,791	Some color. No sand.
	06:00	356.2	1,791	Clear. Surge twice.
	06:07		1,791	Color. No sand.
	06:30	356.9	1,795	
	07:10	356.2	1,791	Clear. Surge twice.
	07:15		1,865	Color. No sand.
	07:24	357.4	1,865	Clear. Surge twice.
	07:30			Color. No sand.
	07:31			Starting to clear.
	07:42	358.3	1,865	Clear. Surge twice.
	07:48			Color. No sand.
	07:52	357.2	1,865	Clear. Surge twice.
	07:57			Color. No sand.
	07:59			Clearing.
	08:05			Surge twice.

PRODUCTION WELL NO. 4

DEVELOPMENT DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-02-80	08:11			Color. No sand.
	08:15	357.0	1,865	Surge twice.
	08:21		2,005	Color. No sand.
	08:23		1,975	Clear.
	08:25	359.2		
	08:28		1,975	Clear. Surge twice.
	08:31		1,975	Slight color.
	08:32			Clearing.
	08:34			Clear.
	08:35	359.0	1,975	
	08:36			Reduced rpm.
	08:39	355.7	1,809	Clear.
	08:48			T = 76°F; K = 380 micromhos.
	08:53	356.8		
	09:23	357.6	1,823	Clear.
	09:40	357.5	1,809	Clear. No sand.
	09:55	357.6	1,809	Clear. No sand.
	10:05	357.7	1,808	Clear. No sand.
	10:15			Pump off.
	10:16	292.2		
	10:17	299.7		
	10:18	299.4		
	10:19	298.9		
	10:20	298.4		
	10:32	295.7		
	10:45	295.2		

PRODUCTION WELL NO. 4

TEST DATA

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-03-80	07:25	291.75		Measured with chain. Same measuring point as for development.
	07:30	291.7 -1.36 = 290.3 GL		Measuring with sounder.
	07:45	291.7		
	08:00			Pump on. Same setting as for development.
	08:01	337.8	1,711	Some color.
	08:02	341.9		Some color. Trace of sand.
	08:03	343.4	1,711	Clearing. No sand.
	08:04	344.4		
	08:05	344.9	1,711	
	08:06	345.5		Slight mud color. Few grains of sand.
	08:07	345.9		
	08:08	346.3	1,711	
	08:09	346.5		Clear. No sand.
	08:10	346.7	1,711	
	08:11	346.9		
	08:12	347.2		
	08:13	347.6		
	08:14	347.6	1,711	
	08:15	347.6		
	08:16	347.6		
	08:17	348.0		
	08:18	348.2	1,711	Clear. No sand.
	08:19	348.3		
	08:20	348.3		
	08:21	348.4		
	08:22	348.5	1,711	
	08:24	348.8		
	08:26	348.9		
	08:28	348.9		
	08:30	349.0		
	08:32	349.0		
	08:34	349.2	1,711	

PRODUCTION WELL NO. 4

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-03-80	08:36	349.6		
	08:38	349.7		
	08:40	349.7		
	08:44	349.9		Clear. No sand.
	08:46	349.9	1,711	
	08:48	350.1		T = 76°F; K = 380 microm-hos.
	08:50	350.3		
	08:52	350.3		
	08:54	350.4		
	08:56	350.5	1,711	
	08:58	350.7	1,711 +	Decreased rpm slightly.
	09:00	350.6		
	09:05	350.4		
	09:10	350.6		
	09:15	351.1	1,725	Decreased rpm slightly.
	09:20	351.0	1,711 +	Decreased rpm slightly.
	09:25	351.0		
	09:30	351.1		
	09:35	351.2	1,711 +	Decreased rpm slightly.
	09:40	351.2	1,711	
	09:50	351.3	1,711	
	10:00	351.5	1,711	
	10:10	351.5	1,711	
	10:20	351.8	1,711 +	Decreased rpm slightly.
	10:30	351.7	1,711 +	Decreased rpm slightly.
	10:40	351.7	1,711	
	10:50	351.9	1,711	
	11:00	351.8	1,711 -	Increased rpm slightly.
	11:20	351.9	1,711	
	11:30	352.3	1,711	
	11:45	352.3	1,711 +	Decreased rpm slightly.
	12:00	352.3	1,711	
	12:15	352.5	1,711 +	Decreased rpm slightly.
	12:30	352.4	1,711	
	13:00	352.7	1,711	

PRODUCTION WELL NO. 4

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-03-80	13:30	352.7	1,711	
	14:00	352.8	1,711	
	14:30	352.8	1,711	
	15:00	353.0	1,711	
	15:30	353.0	1,711	
	16:00	353.2	1,711	
	16:05			T = 76°F; K = 380 micromhos.
	16:30	353.3	1,711	
	17:00	353.4	1,711	
	17:30	353.4	1,711	
	18:00	353.5	1,711	
	18:30	353.4	1,711	
	19:00	353.4	1,711	
	19:30	353.4	1,711	
	20:00	353.9	1,711 +	Decreased rpm slightly.
	20:30	353.7	1,711	
	21:00	353.4	1,697	Increased rpm slightly.
	21:30	353.6	1,711	
	22:00	353.9	1,711	
	22:30	353.8	1,711	
	23:00	353.8	1,711	T = 76°F; K = 380 micromhos.
	23:30	354.1	1,711	
12-04-80	00:00	354.5	1,711	
	00:30	354.6	1,711	
	01:00	354.9	1,711	
	01:30	355.0	1,711 +	Decreased rpm slightly.
	02:00	355.3	1,711 +	Decreased rpm slightly.
	02:30	355.5	1,725	Decreased rpm slightly.
	03:00	354.5	1,711	
	03:30	354.5	1,711 +	Decreased rpm slightly.
	04:00	354.3	1,711	
	04:30	354.3	1,711	
	04:46			Engine stopped, wire to fuel pump solenoid broke.

PRODUCTION WELL NO. 4

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-04-80	04:50	298.9		
	04:51	298.7		
	04:52	298.3		
	04:53	298.1		
	04:54	297.9		
	04:55	297.7		
	04:56	297.6		Pump back on.
	05:00	348.7	1,711	
	05:22	352.8	1,711	
	05:30	353.1	1,711	
	06:00	353.7	1,711	
	06:30	354.0	1,711 +	Decreased rpm slightly.
	07:00	353.7	1,711	
	07:30	353.9	1,711	
	07:45			T = 76°F; K = 380 micromhos. Collected samples.
	07:55	353.4	1,711	
	08:00			Pump off.
	08:01	283.1		
	08:02	299.0		
	08:03	299.8		
	08:04	299.4		
	08:05	299.1		
	08:06	298.7		
	08:07	298.5		
	08:08	298.3		
	08:09	298.0		
	08:10	297.8		
	08:11	297.6		
	08:12	297.5		
	08:13	297.4		
	08:14	297.2		
	08:15	297.2		
	08:20	296.7		
	08:25	296.2		
	08:30	296.0		

PRODUCTION WELL NO. 4

TEST DATA
(continued)

Date	Hour	Depth to Water (ft)	Discharge (gpm)	Remarks
12-04-80	08:35	295.8		
	08:40	295.5		
	08:45	295.5		
	08:50	295.2		
	08:55	295.1		
	09:00	295.0		
	09:10	294.9		
	09:20	294.6		
	09:30	294.5		
	09:40	294.4		
	09:50	294.3		
	10:00	294.2		
	10:15	294.0		
	10:30	293.8		
	10:45	293.8		
	11:00	293.7		
	11:30	293.5		

PRODUCTION WELL NO. 4

TEST DATA

(Observation Well PW-1 Water Levels)

Date	Hour	Depth to Water (ft)	Remarks
11-17-80	11:35	329.04	Measured with chain. Measuring point hole in plate over casing 0.87 foot above top of surface pipe. Surface pipe approximately 0.2 foot above land surface.
11-30-80	15:08	328.76	Measured with chain.
	15:28		Set wire with tape mark at 328.76.
12-01-80	08:09	328.68	
	10:15		PW-4 on for development.
	17:18	329.24	
12-02-80	02:15	330.21	
	09:07	330.70	
	10:15		PW-4 off.
12-03-80	07:25	329.44	
	08:00		PW-4 on for test.
	08:28	329.49	
	09:00	329.71	
	09:20	329.82	
	09:35	329.90	
	09:50	329.94	
	10:10	330.02	
	10:25	330.06	
	10:45	330.13	
	11:25	330.24	
	11:40	330.26	
	12:40	330.42	
	13:40	330.51	
	14:40	330.61	
	15:40	330.68	
	16:40	330.76	
	17:40	330.86	
	19:10	330.95	
	20:10	331.06	
	21:10	331.13	
	22:10	331.43	
	23:10	331.22	

PRODUCTION WELL NO. 4

TEST DATA
(Observation Well PW-1 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
12-04-80	00:10	331.24	
	01:10	331.25	
	02:10	331.30	
	03:10	331.33	
	04;10	331.34	
	05:10	331.29	
	06:10	331.32	
	07:10	331.39	
	08:00		PW-4 off.
	08:45	331.21	
	09:00	331.14	
	09:15	331.07	
	09:30	331.00	
	10:15	330.85	
	10:30	330.78	
	11:10	330.67	

PRODUCTION WELL NO. 4

TEST DATA

(Observation Well PW-2 Water Levels)

Date	Hour	Depth to Water (ft)	Remarks
11-17-80	11:50	307.46	Measured with chain. Measuring point hole in plate over casing 0.90 foot above top of surface pipe. Surface pipe approximately 0.5 foot above land surface.
11-30-80	15:40	307.29	Measured with chain.
	15:55		Set wire with tape mark at 307.29.
12-01-80	08:15	307.32	
	10:15		PW-4 on for development.
	17:22	307.97	
12-02-80	02:25	309.74	
	06:50	310.40	
	09:15	310.71	
	10:15		PW-4 off.
12-03-80	07:32	308.79	
	08:00		PW-4 on for test.
	08:33	308.94	
	09:05	309.10	
	09:25	309.18	
	09:40	309.23	
	09:55	309.31	
	10:15	309.42	
	10:30	309.49	
	10:50	309.57	
	11:30	309.71	
	11:45	309.77	
	12:45	310.01	
	13:45	310.13	
	14:45	310.35	
	15:45	310.52	
	16:45	310.73	
	17:45	310.92	
	19:15	311.17	
	20:15	311.30	
	21:15	311.46	

PRODUCTION WELL NO. 4

TEST DATA
(Observation Well PW-2 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
12-03-80	22:15	311.58	
	23:15	311.67	
12-04-80	00:15	311.76	
	01:15	311.83	
	02:15	311.91	
	03:15	311.98	
	04:15	312.07	
	05:15	312.04	
	06:15	312.17	
	07:15	312.22	
	08:00		PW-4 off.
	08:50	312.01	
	09:05	311.93	
	09:20	311.82	
	09:35	311.74	
	10:20	311.44	
	10:35	311.33	
	11:30	311.10	

PRODUCTION WELL NO. 4

TEST DATA

(Observation Well PW-3 Water Levels)

Date	Hour	Depth to Water (ft)	Remarks
11-17-80	11:10	353.22	Measured with chain. Measuring point hole in plate over casing 1.3 feet above surface pipe. Surface pipe approximately 1 foot above land surface.
11-30-80	14:23	352.92	Measured with chain.
	14:55		Set wire with tape at 352.92.
12-01-80	08:03	352.80	
	10:15		PW-4 on for development.
	17:13	353.18	
12-02-80	02:15	353.93	
	06:44	354.20	
	09:00	354.29	
	10:15		PW-4 off.
12-03-80	07:39	353.43	
	08:00		PW-4 on for test.
	08:23	353.47	
	08:55	353.64	
	09:30	353.77	
	09:45	353.79	
	10:00	353.83	
	10:20	353.86	
	10:35	353.91	
	11:20	353.98	
	11:35	354.01	
	12:35	354.06	
	13:35	354.12	
	14:35	354.16	
	15:35	354.24	
	16:35	354.28	
	17:35	354.34	
	19:05	354.41	
	20:05	354.48	
	21:05	354.57	
	22:05	354.59	
	23:05	354.65	

PRODUCTION WELL NO. 4

TEST DATA
(Observation Well PW-3 Water Levels)
(continued)

Date	Hour	Depth to Water (ft)	Remarks
12-04-80	00:05	354.63	
	01:05	354.65	
	02:05	354.68	
	03:05	354.69	
	04:05	354.74	
	05:05	354.67	
	06:05	354.74	
	07:05	354.78	
	08:00		PW-4 off.
	08:55	354.60	
	09:10	354.55	
	09:25	354.51	
	10:10	354.40	
	10:25	354.37	
	10:45	354.31	

Appendix C2.

MW-9 Pumping Test, 1994

APPENDIX C

LAS ANIMAS CREEK

PUMPING TEST

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Attachment 1 Details of well installations
Attachment 2 Results of water level monitoring

1. INTRODUCTION

Water supply for the Copper Flat project is to be drawn from Santa Fe Formation alluvium in the valley of the Rio Grande. Water is to be removed from four wells approximately one mile north of the Las Animas Creek valley. This valley contains a shallow aquifer and an intermittent stream, which supply water for a wide range of agricultural and water supply activities, as well as support a major stand of deciduous trees.

In order to evaluate the extent to which the stream flow and the water in the shallow aquifer may be affected by the drawdown from the nearby pumping wells, a major pumping test was designed and performed in Animas Creek. This test comprised the installation of a pumping well in the main Santa Fe aquifer, located some 200 feet below the ground surface in the valley. Water was pumped from this well to create a drawdown which would simulate the drawdown expected from the production pumping. The response to this pumping was monitored in one well completed at the top of the saturated section in the Santa Fe formation, at a depth of approximately 80 feet. In addition, the response of the overlying Las Animas Creek shallow aquifer was monitored by one specially completed shallow monitor well, as well as a total of seven other shallow private wells in the area. The pumping test was performed in October, 1994. This appendix presents the test approach, test results, and an interpretation of the results.

2. APPROACH

The pumping test was performed in the Las Animas Creek Valley at the point closest to the mine's water supply wells, as shown in Figure 1. The test location geology comprises 20-60 feet of reworked gravels which form a recent alluvium layer, overlying several thousand feet of Santa Fe Group gravels, sands, and silts.

A number of nearby private wells draw water from the Las Animas Creek alluvium, most are less than 100 feet deep, tapping the recent alluvium. Water levels in these wells are typically within a few feet of ground surface, and appear to be associated with stream levels (when the stream flows). This aquifer provides groundwater for domestic and stock watering wells in the area. Several wells are completed at approximately 100 feet or greater. These wells display a chemical signature distinct from the alluvial well water and a water level about 50 feet lower than the shallow wells.

Las Animas Creek is an intermittent stream. The stream was flowing when sampled in August 1994, but was not flowing at the time of the pumping test in October 1994. Water quality is generally good.

3. TEST ARRANGEMENT

Figure 2 shows the locations of the three wells which were installed for the test. Details of each well are provided in Attachment 1. The three wells were completed as follows:

1. Pumping well MW-9. The pumping well is MW-9. This well is drilled to a depth of 252.5 feet through the Las Animas Creek alluvium into the Santa Fe Formation. It is open to the formation from 194 feet to total depth. The well was screened with 4 ½ inch Schedule 80

slotted PVC, and cased with 4 ½ inch Schedule 80 blank PVC pipe. The well was fitted with a 100 gpm submersible pump.

2. Monitor well MW-10. MW-10 is located approximately 50 feet east of MW-9. It was drilled to a depth of 125 feet, and screened between 76.5 feet and total depth in the Santa Fe alluvium.

3. Monitor well MW-11. MW-11 is located approximately 50 feet southeast of MW-9. MW-11was initially drilled to a depth of 65 feet. After logging the hole, it was backfilled to a depth of 37 feet, sealed with bentonite, and screened from 7 to 37 feet BGS with a gravel pack.

Figure 3 shows the generalized geology of the three wells. The initial water levels are shown for reference.

In addition to these three wells, the test was monitored by measuring water levels in nearby domestic, irrigation, and water supply wells. The wells used were as follows:

Well Name	Location Relative to MW-9	Drilling method	Approx. Depth (ft)
Irwin House- "Birdie"	250 feet southwest	Hand dug	40
Irwin Yard- "Concrete"	150 feet due south	Hand dug	30
Exten	1250 feet west	Hand dug	25
Nicholson	1350 feet east	Hand dug	25
Cox	2200 feet east	Drilled	112
Darling	2700 feet east	Hand dug	25
PW-1	3400 feet south	Drilled	1000

4. TEST RESULTS

4.1 Pre-test activities

Prior to the test, all wells were measured daily for 17 days, to establish a trend for groundwater levels (if any).

4.2 Pumping Test Operation

The test was operated by starting the pump generator on October 13, 1994 at 12:30 p.m. Initially water was discharged to a location approximately 200 feet from the well. It was discovered that this location was too close to the monitor wells, as the water level began to rise slightly in MW-11. The test was temporarily shut down on October 14 from 13:32 to 16:30 to change the location of the discharge, with the new discharge point being located approximately one mile from the pumping well. During operating periods, the pumped flow rate averaged 90 gpm. Flows are shown on Figure 4. The test ended at 09:00 on October 17. Water levels were measured every day for 12 days following the test.

Water levels were monitored using water level sounders, which were calibrated against each other to the nearest one hundredth foot. Reading frequency depended on the changes in the levels; pre- and post-test levels were generally read daily, while test rates ranged from hourly to once per shift. Results of water level monitoring are presented in Attachment 2.

4.3 Rainfall event

On October 14, a nearby rain gauge measured 1 inch of rain in 2.5 hours in the Las Animas Creek drainage basin. The creek began to flow, and water levels in the wells changed in response to the rain and the flow.

5. RESULTS

5.1 Flows

Flows from the pumped well (MW-09) were recorded using a flow meter. The results are presented in Figure 4. The flow fluctuated somewhat, with an average flow rate of 90 gpm.

5.2 Heads

Heads were measured in all project wells, but were measured more frequently in the three main wells installed for the project. The results are as follows:

1. MW-09. The initial water level elevation in the pumping well was approximately 4,375 feet. The response of MW-9 to pumping is indicated in Figure 5. As can be seen, drawdown was rapid and reversible, and reached approximately 24 feet at the end of the test. Specific capacity of the well was 3.75 gpm/ft.
2. MW-10. The initial water level elevation in the deeper of the two monitor wells was 4,376 feet, about the same as the pumping well. The response to the pumping is indicated in Figure 6. A drawdown of approximately 1 foot was recorded at the well, although it is possible that this value was affected by the rainfall which occurred late in the test.
3. MW-11. The initial water elevation in the shallowest well, completed in the Las Animas Creek alluvium, was 4,435 feet, approximately 60 feet higher than the two deeper wells. The response of the level in MW-11 during the test is presented in Figure 7 (note very expanded vertical scale on this graph). The rise in water level after the start of the test on October 14 is due to the local discharge of water on the ground nearby. There is no evidence that pumping in MW-9 effected a head change in MW-11 at any time during the test; the level in the well was falling prior to the test, and continued to fall after it.

In addition to monitoring the three main wells, a total of seven other wells were monitored. All were relatively shallow, and all were near the pumping well. Figure 9 presents a magnified view of the pumping test wells' head responses. The general trend of these well results is as follows:

1. a small rise for the first few days after pumping began
2. a return to the previous rate of decrease after the rise.

Prior to the pumping test, the "Birdie" shallow aquifer well was falling at 0.02 ft/day. After the discharge incident, the rate of decline remained the same. There is no identifiable evidence of any impact on these wells of the drawdown created by MW-09.

5.3 PW-1 Response

To check if there was any effect of the drawdown in the extraction wells, pumping well PW-1 was monitored. This well is located 3500 feet to the south of MW-9. The water level elevation in this well was 4375 feet for the period during which the test was run. During the test, the water level in PW-1 did not change in any way attributable to MW-9.

6. ANALYSIS OF RESPONSES

6.1 MW-09 response

The hydraulic characteristics of the aquifer tapped by MW-09 have been estimated by a variety of non-equilibrium methods, using the Aqtesolve Package (Gerahty and Miller, 1995). Three approaches were used to analyze the first 24 hour drawdown period, with the following results (Figure 10, Figure 11, and Figure 12):

Method	**Cooper-Jacob**	**Theis**	**Hantush**	**Average**
Transmissivity (ft^2/min)	0.6086	0.5779	0.5666	0.5700
Storage Coefficient	$3.3x10^{-5}$	$6.1x10^{-5}$	$7.3x10^{-5}$	$5x10^{-5}$
Horizontal hydraulic conductivity (ft/yr)	6,400	6,075	5,960	6,000
Vertical hydraulic conductivity (ft/yr)	n/a	n/a	60	60

The Hantush analysis is particularly interesting, as the fit is good between the observed and the predicted behavior. In this analysis, it is assumed that there is leaky flow through an aquitard (on the bottom or top of the aquifer, or both). The vertical hydraulic conductivity of the leaky aquitards can be estimated from the response. The value obtained is 60 ft/yr. The vertical to horizontal anisotropy ratio obtained for the test is 100:1.

In summary, it would appear that MW-09 is located in a material with a hydraulic conductivity of approximately 6,000 ft/yr, with a storage coefficient of $5x10^{-5}$, and a ratio of horizontal hydraulic conductivity to vertical hydraulic conductivity of 100:1. These values are very similar to the calibrated values which have been used in the modeling (Appendix D).

6.2 Las Animas Creek aquitard conductivity

The conductivity of the aquitard below the Las Animas Creek alluvium can be estimated by consideration of the head difference in the aquifer. The vertical head gradient between MW-11 (completed in the Las Animas Creek alluvium) and MW-10 (completed in the Santa Fe Formation) can be computed as follows: 60'?

Head difference MW-10 to MW-11 = 23 feet

Thickness of low permeability layer = 50 feet

Head gradient = 23/50 = 0.46

This is a substantial vertical gradient. From modeling, it appears that there is approximately 13 miles of Las Animas Creek bottom land, with an average width of 2,000 feet. The total flow down the valley appears to be in the order of 2,000 gpm. If half of the water were to seep from the upper alluvium to the lower through the low permeability layer between the two wells above, then the hydraulic conductivity would have to be: evidence? but in the lower part, it seeps up!

$$K = Q/iA$$

where: K = hydraulic conductivity (ft/yr)

Q = flow (1,000 gpm or $70\text{x}10^6$ cuft/yr)

i = hydraulic gradient = 0.46

A = flow area (5 square miles or $150\text{x}10^6$ square feet)

Applying the values produces a vertical hydraulic conductivity estimate of 1.0 ft/yr, or about 10^{-6} cm/sec. This is the vertical conductivity of a clayey material.

6.3 Water Chemistry

As a part of the evaluation, water chemistry was sampled from the test wells. The results are included in the data presented in Appendix E. The chemistry of the water is summarized below:

Parameter	Units	MW-9	MW-10	MW-11	PW-1
TDS	mg/L	190	310	314	217
HCO_3	mg/L	149	262	263	144
SO_4	mg/L	12	25	21	10
Ca	mg/L	12	59	63	22
Na	mg/L	54	29	23	38
Mg	mg/L	1	8	10	n/a

The chemistry of wells MW-10 and MW-11 are very similar, indicating that the water in the upper portion of the Santa Fe aquifer is provided by seepage from the overlying Las Animas Creek alluvium through a low permeability layer to the MW-10 level. Conversely, the chemistry of MW-9 differs from MW-10 and MW-11, and is very similar to PW-1. This suggests MW-9 comprises underflow beneath Las Animas Creek, not flow from it.

6.4 Conceptual Model

Based on the observations from the Las Animas Creek pump test a conceptual flow model of this system has been developed and quantified:

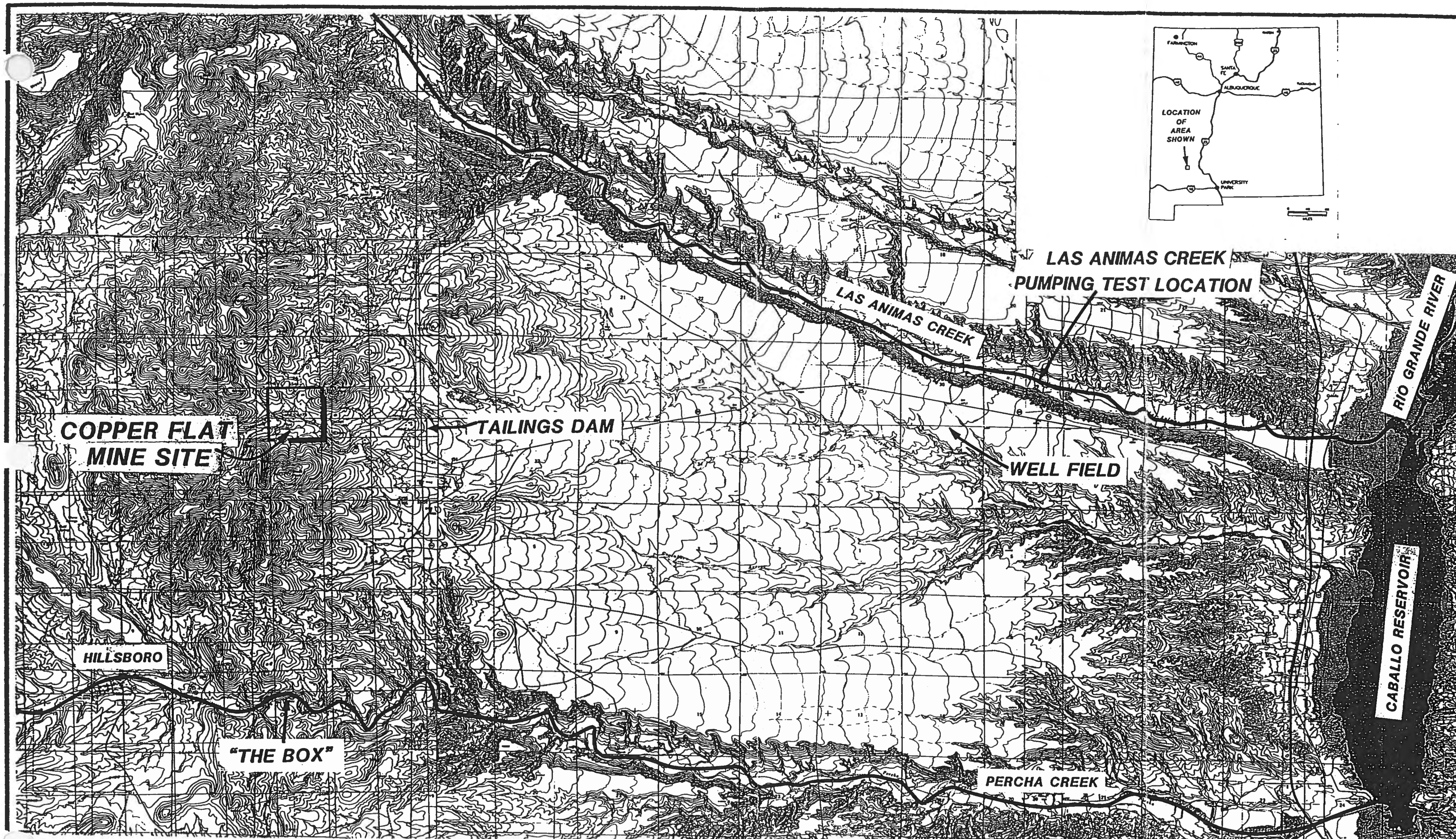
1. Water flows along Las Animas Creek, filling the associated alluvial aquifer.
2. Water leaks from the Las Animas Creek alluvial aquifer through the underlying clayey material. Analysis of this flow and the head gradient identified in the test produces a vertical hydraulic conductivity of 1 ft/yr.
3. This infiltrating water then meets with, and mixes with, water in the main Santa Fe aquifer. This aquifer is made up of relatively high permeability material, with a lateral hydraulic conductivity of about 6,000 ft/yr. The vertical permeability of this material is approximately 100 times less than its effective horizontal conductivity.

This system provides the explanation as to why the Las Animas alluvium remains saturated; the low conductivity of the underlying clayey material is sufficiently low to prevent water from leaving the alluvium, even under the strong vertical head which exists through the layer.

7. CONCLUSIONS

The Las Animas Creek alluvial system pump test has established that the creek and the associated alluvium is prevented from leaving the valley by a low permeability zone beneath the alluvial aquifer. This zone is estimated to have an hydraulic conductivity of no more than 1 ft/yr. The lower material in the Santa Fe aquifer is comprised of layers of high horizontal hydraulic conductivity materials (K = 6,000 ft/yr) and layers of low vertical conductivity aquitards (K = 60 ft/yr, or 1/100 of the horizontal conductivity).

While there is some evidence to suggest that the material between the Las Animas Creek alluvium is unsaturated (Attachment 1) the testing data does not provide a demonstration of a widespread unsaturated material beneath the creek bed.

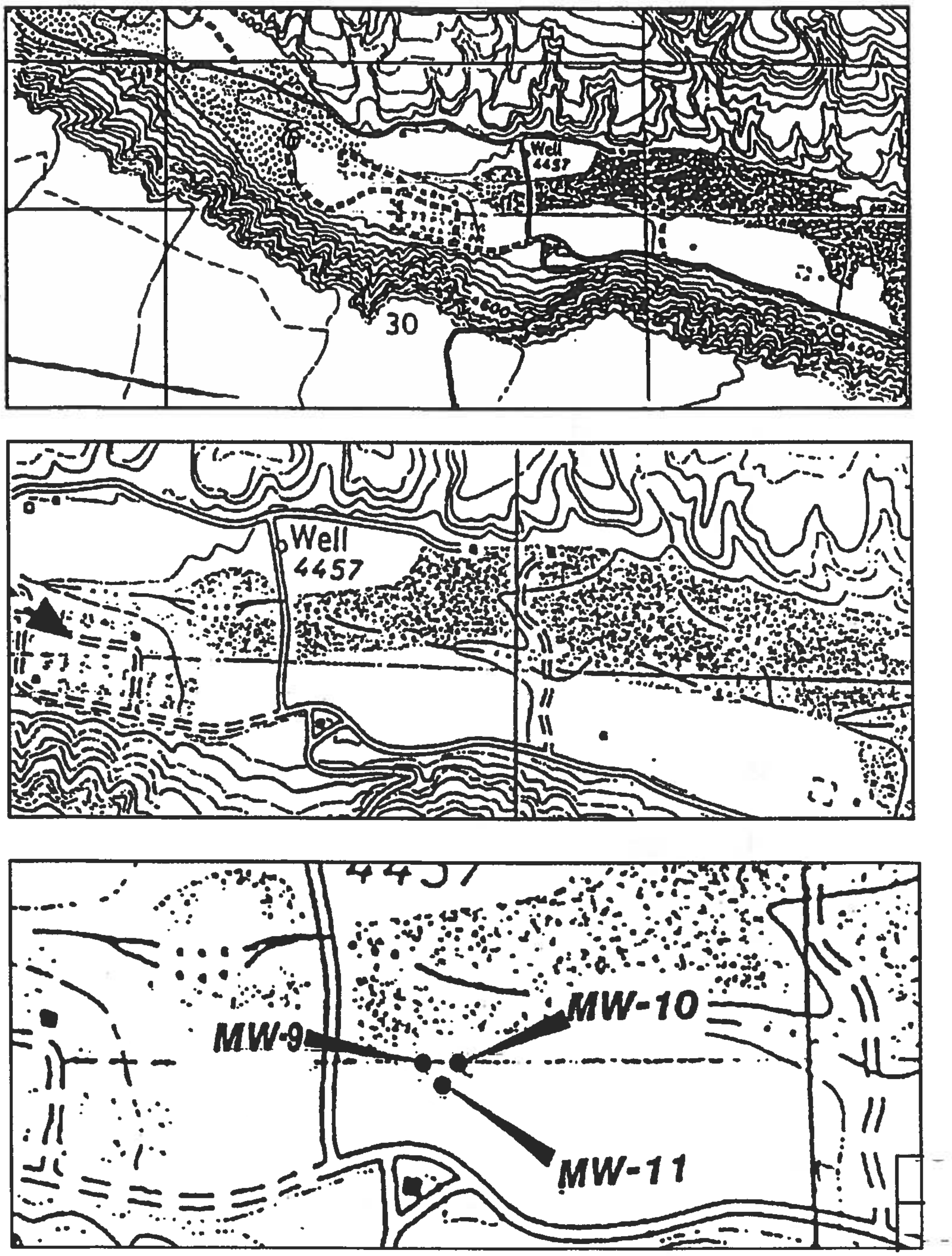


ADRIAN BROWN CONSULTANTS, INC.

LOCATION MAP

Figure 1

Figure 2 Pump test location map



1" = 2000'

1" = 1000'

1" = 500'

Figure 3 Generalized geology of pumping test wells

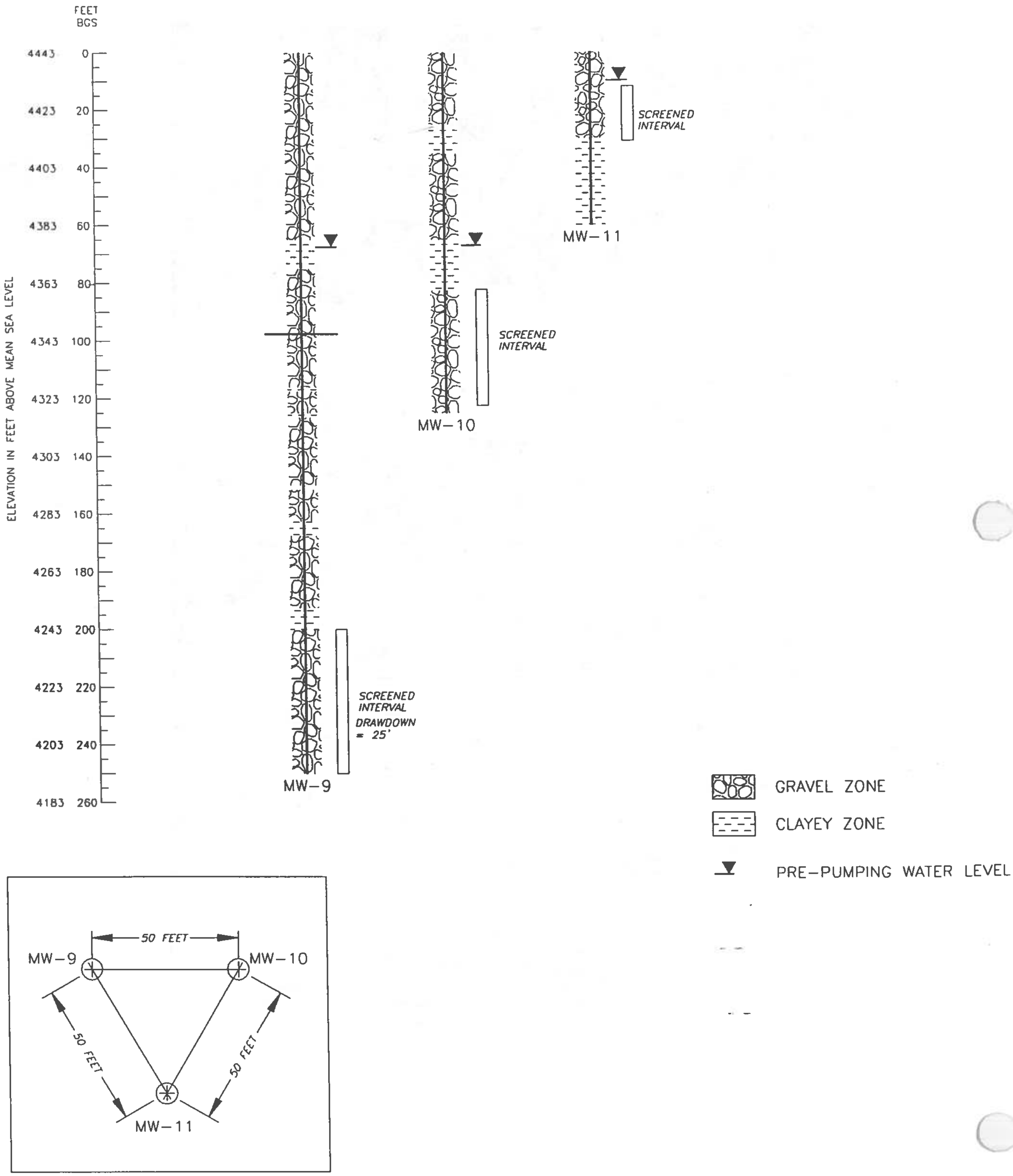


Figure 4 Flow from MW-9

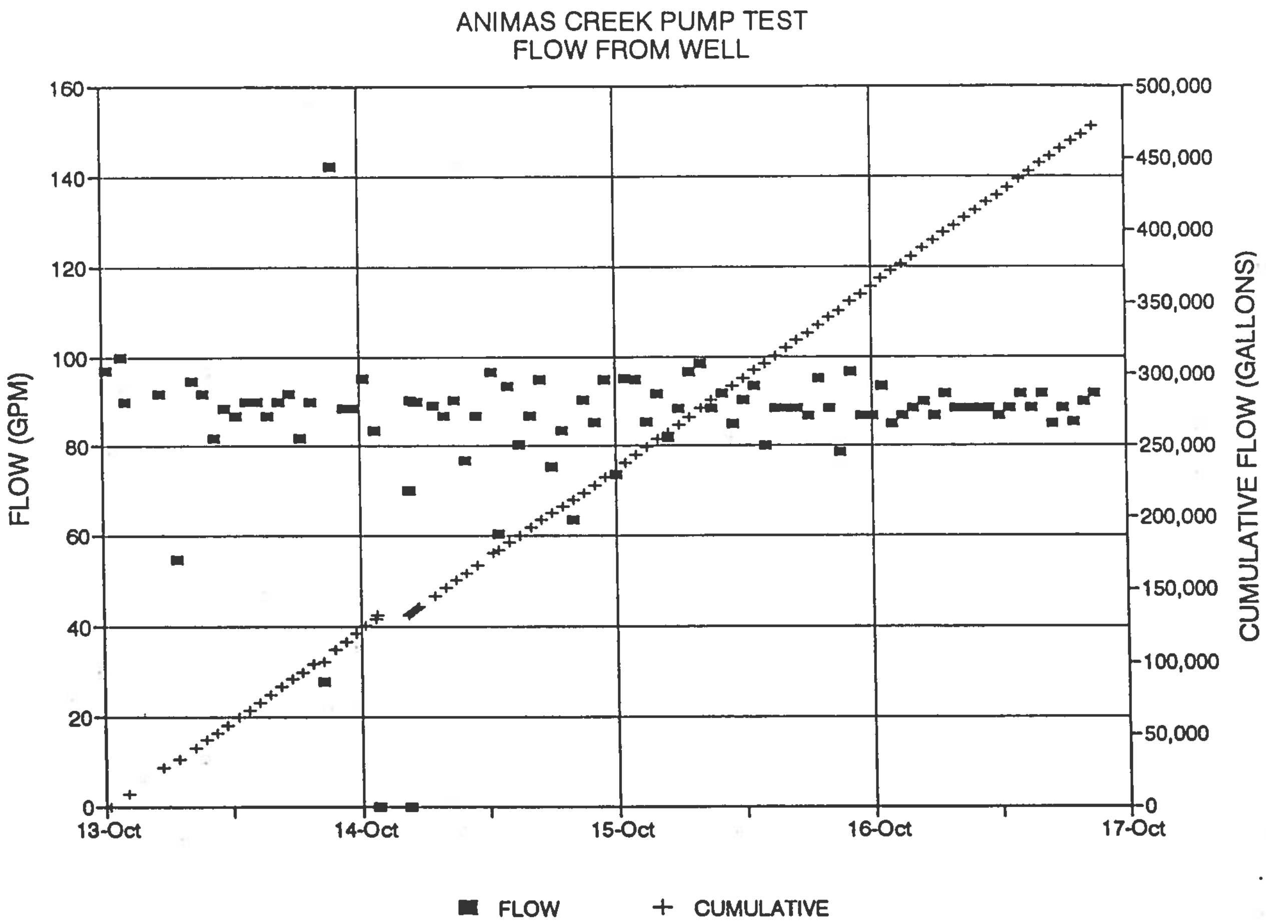


Figure 5 Drawdown in MW-9

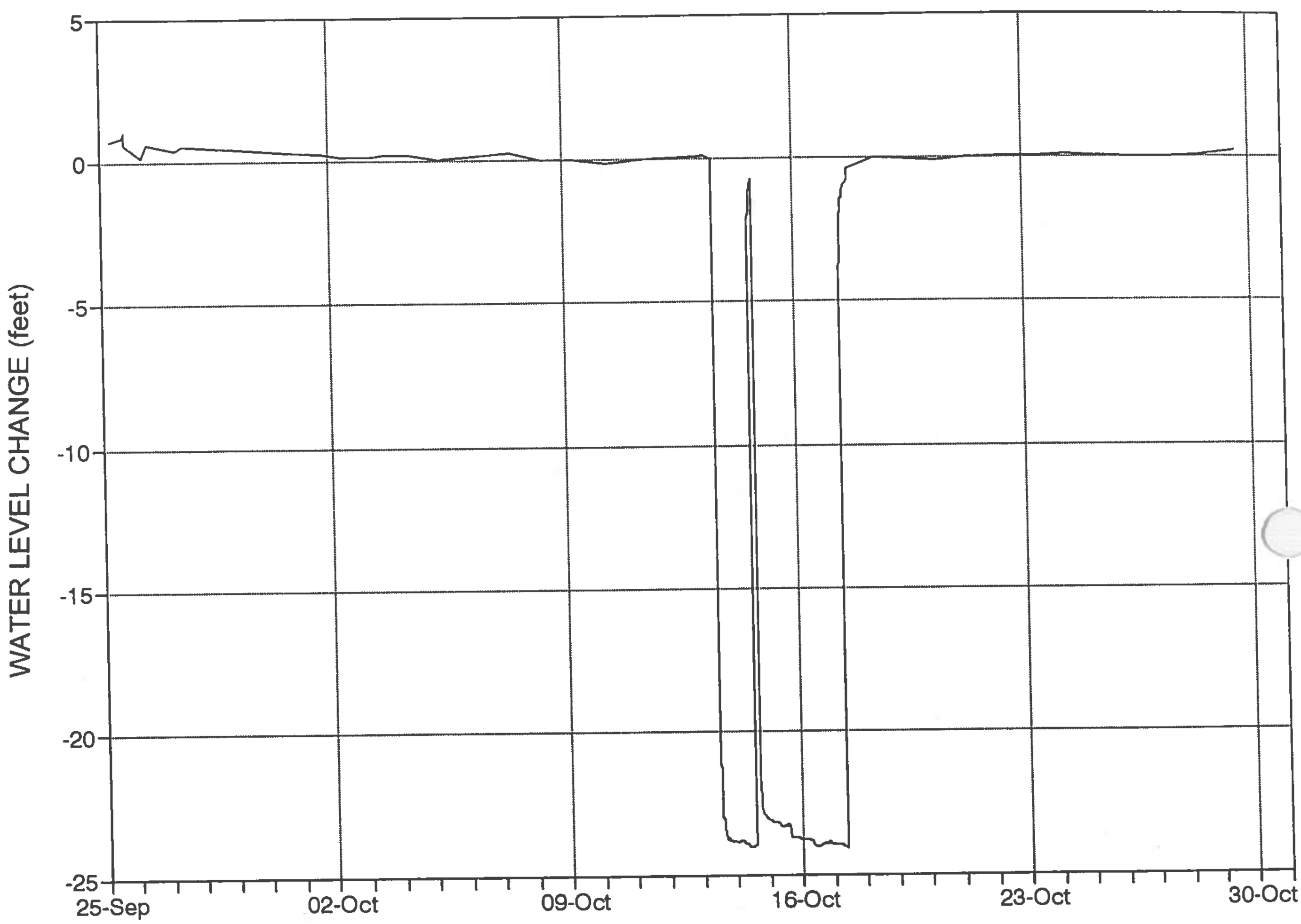


Figure 6 Drawdown in MW-10

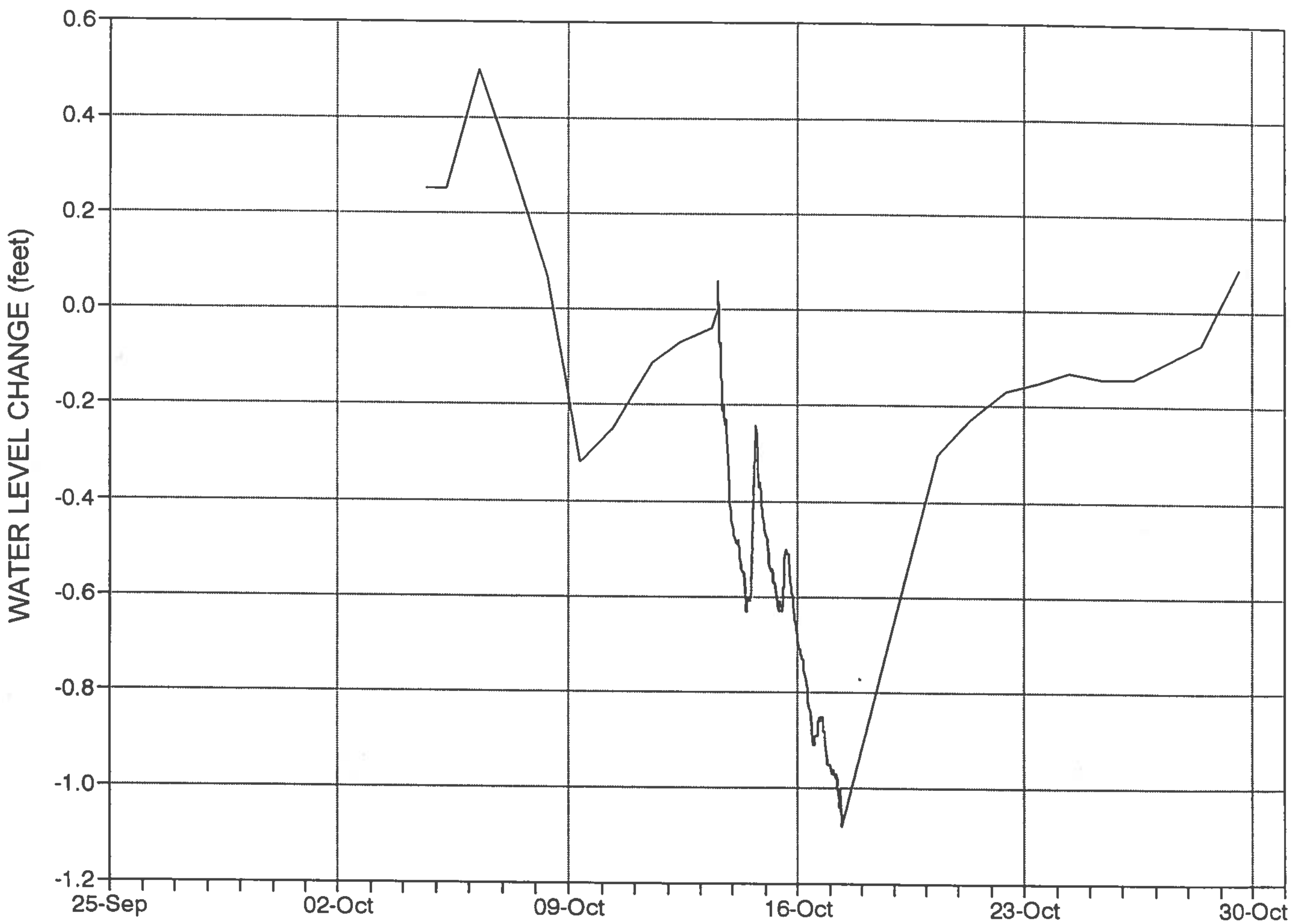


Figure 7 Drawdown in MW-11

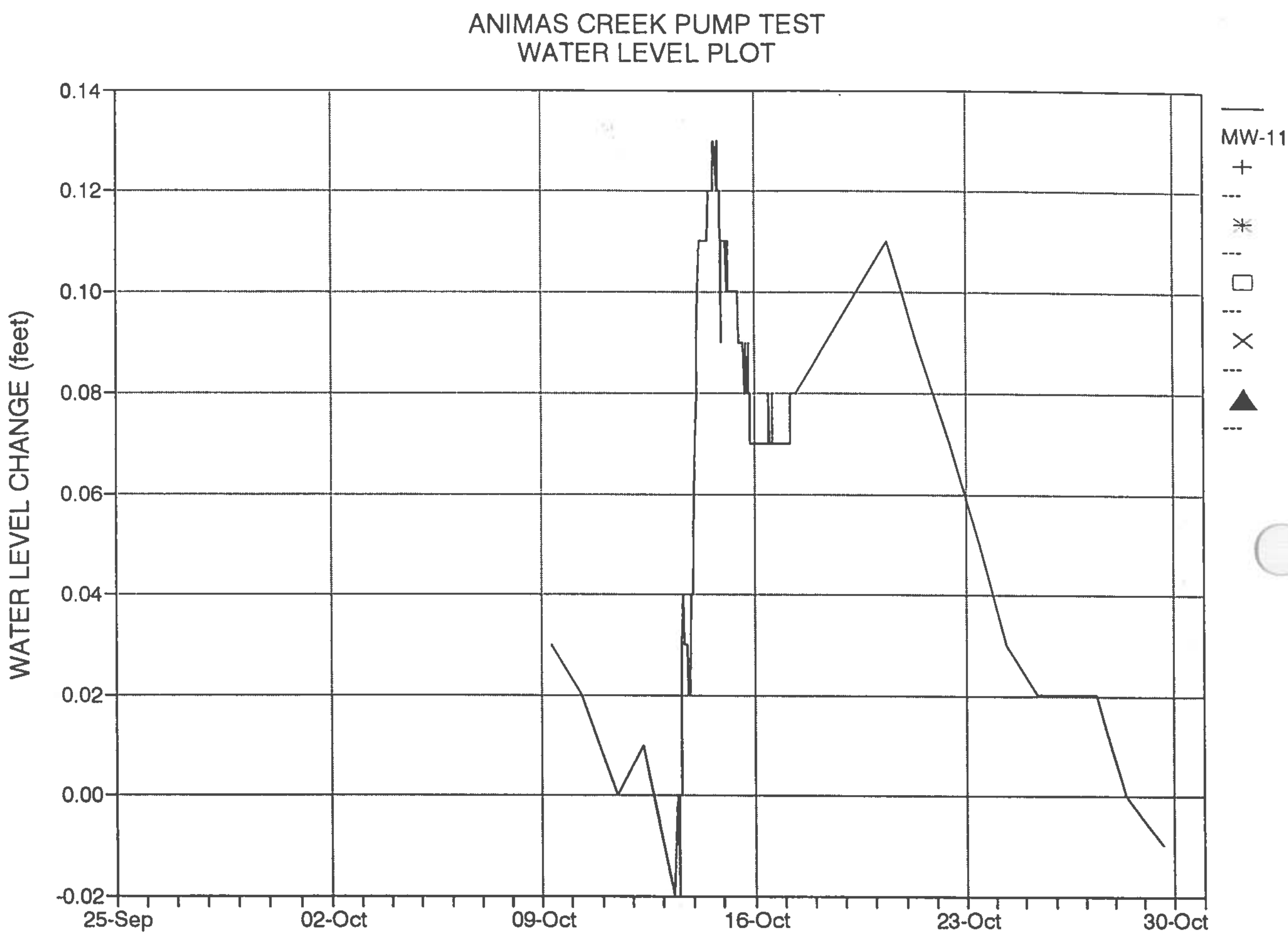


Figure 8 Water elevations in test wells

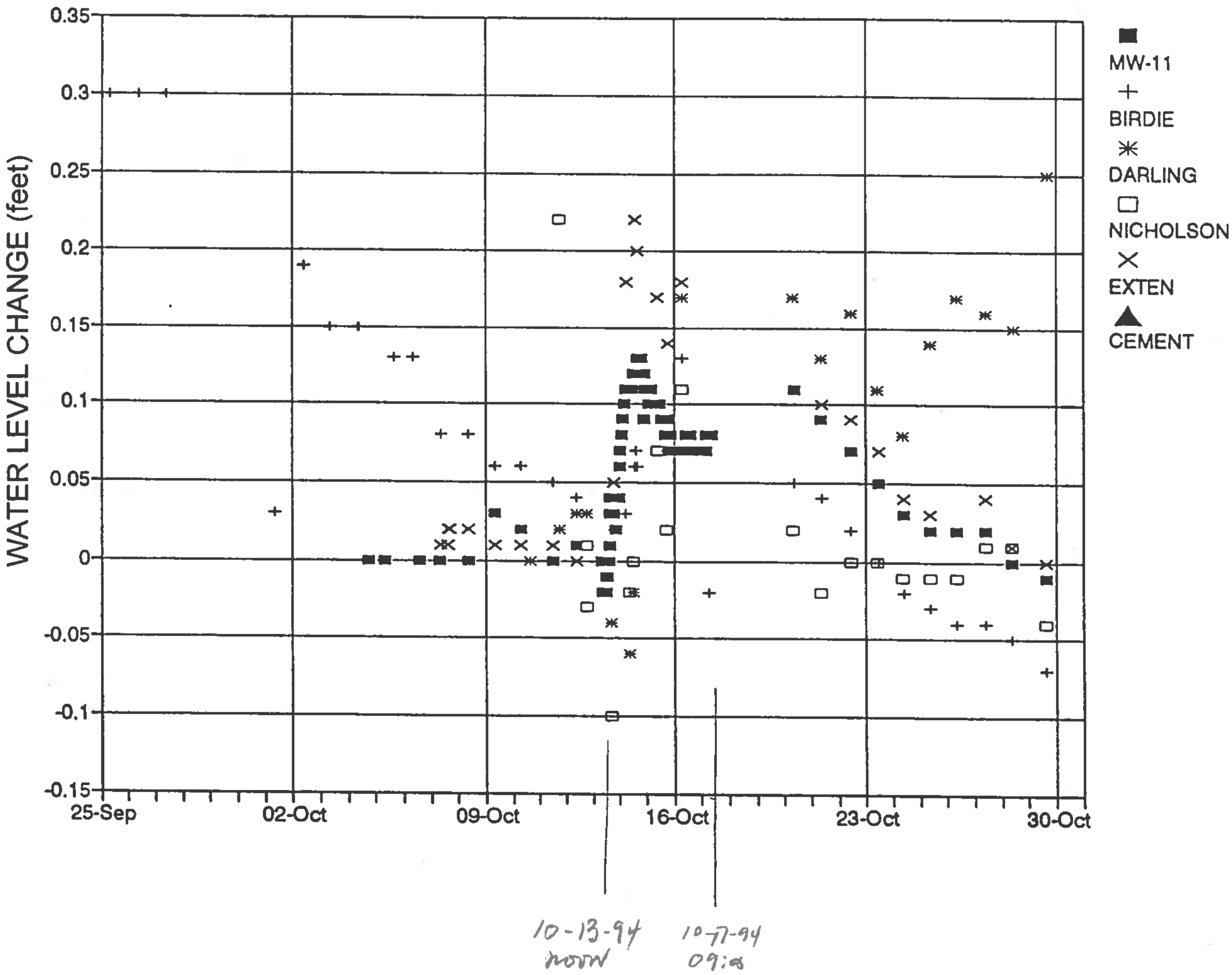


Figure 9 Head changes for test wells

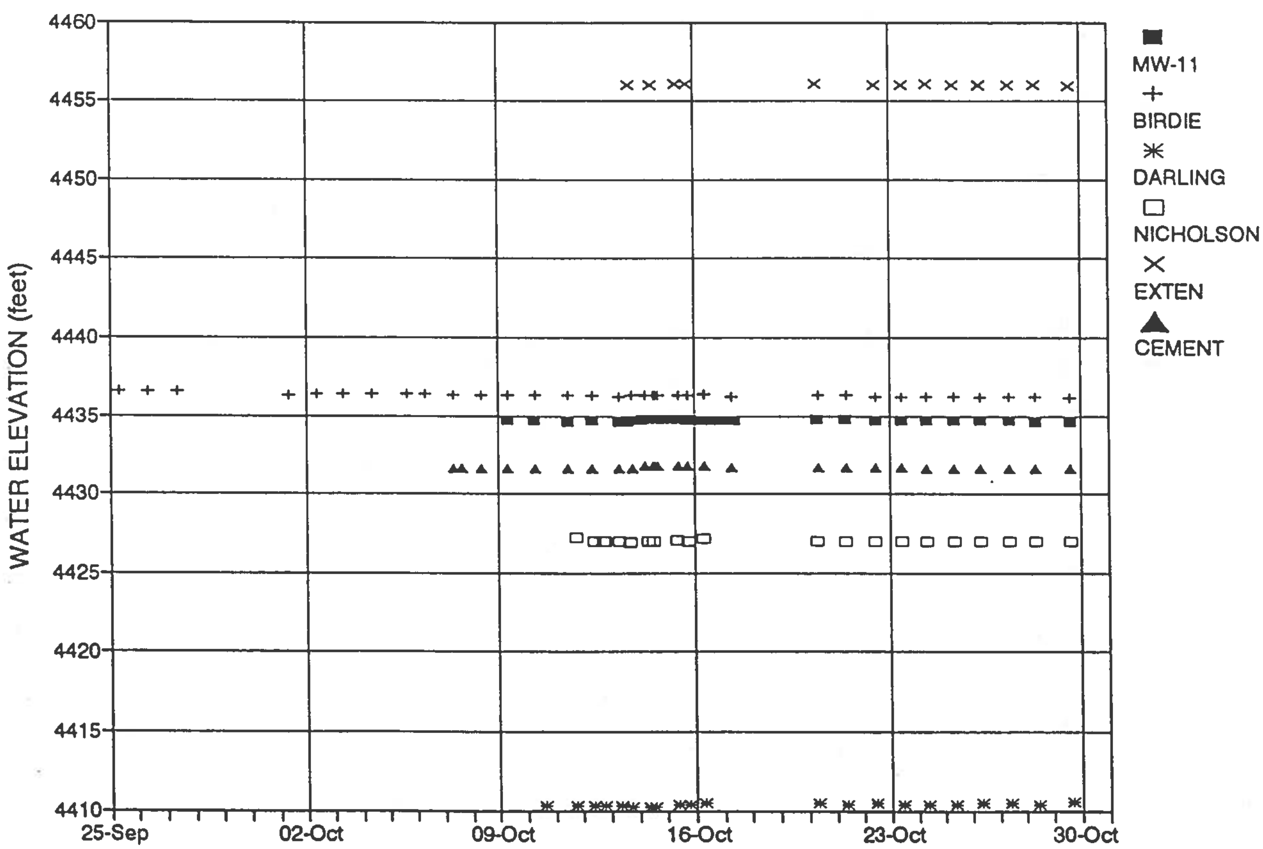


Figure 10 Cooper- Jacob drawdown analysis plot

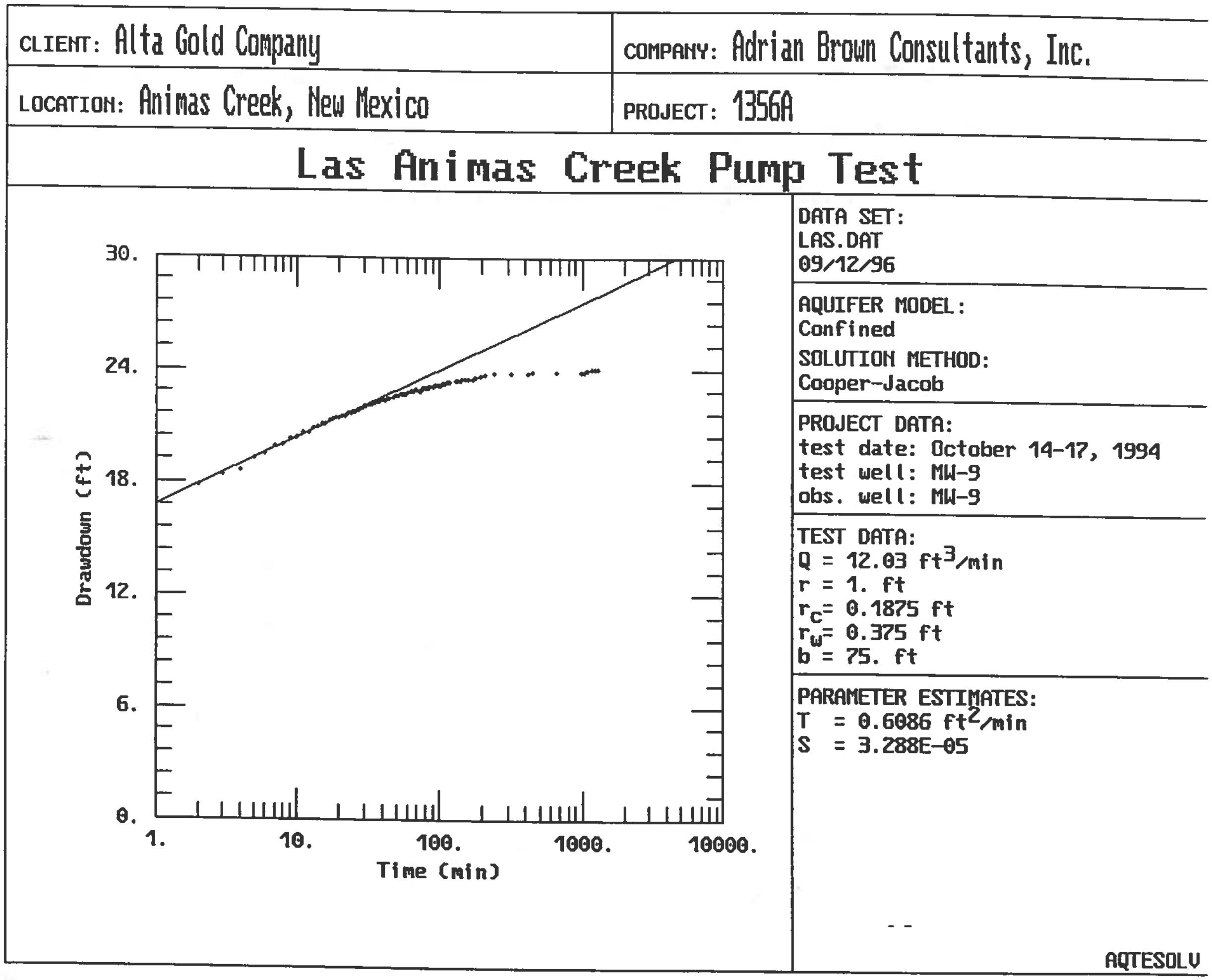


Figure 11 Theis drawdown analysis plot

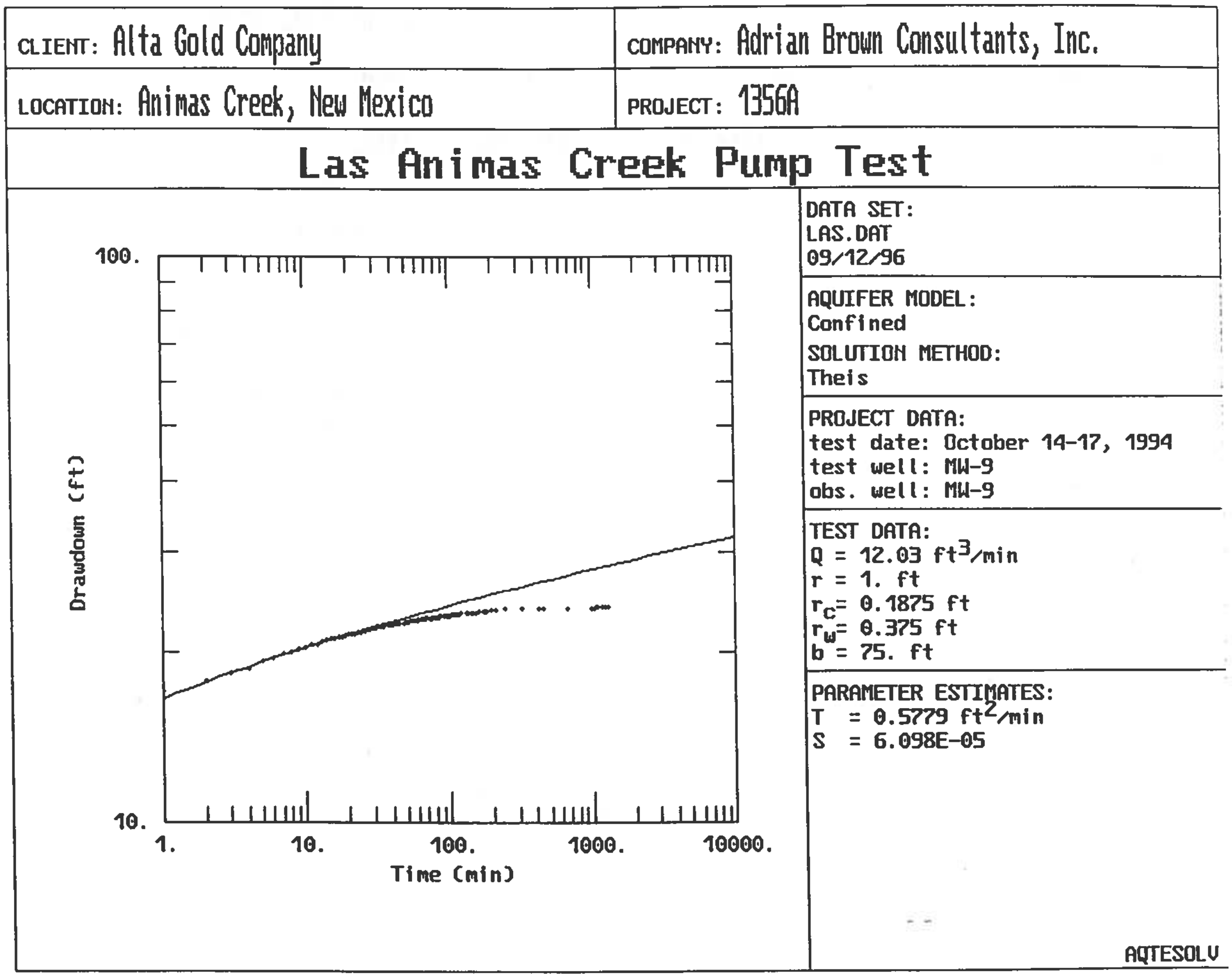
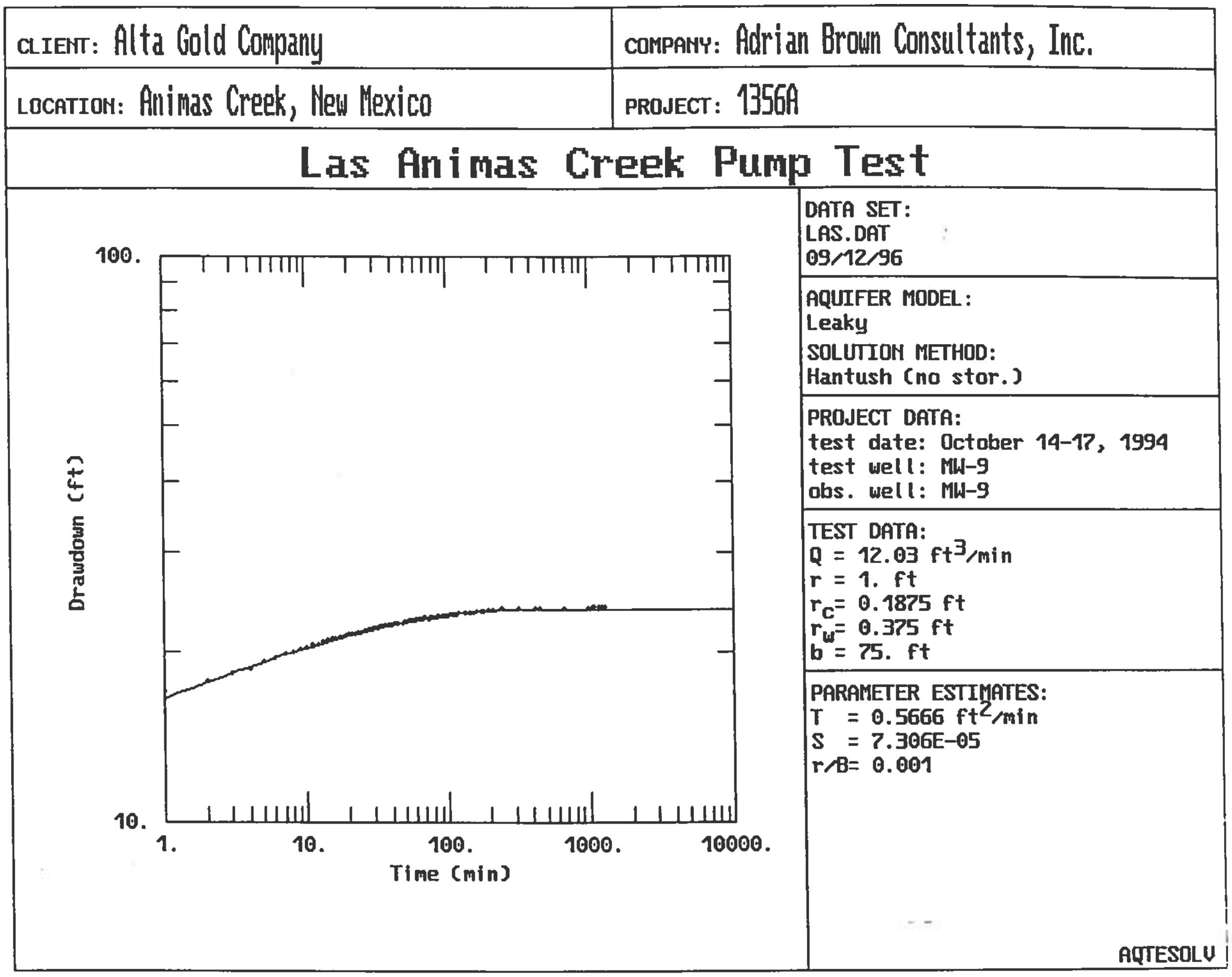


Figure 12 Hantush leaky aquifer drawdown analysis plot



Appendix C3.

TSF-Area Pumping Test, 1994

APPENDIX G
TAILINGS DAM AREA PUMPING TEST

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Attachment G-1 Tailings dam area pumping test response curves
Attachment G-2 Tailings dam area aquifer test water level data

G.1 INTRODUCTION

A seven-day aquifer test was conducted in the vicinity of the tailings dam of the Copper Flat Mine, to determine the hydraulic characteristics of the aquifer(s) in this area. This section describes the pump test activities, and includes a discussion of the selection of the pumping well and observation wells, schedule of operations, operation of the test, water discharge and water quality issues. The aquifer test analysis is summarized in Section G.4 of this report.

An understanding of the site-specific geology is critical to the interpretation of the pumping test results. The deposits in the vicinity of the tailings dam are comprised of relatively recent sands and gravel contained within a clay/silt matrix, all of which overlie the Santa Fe Group sediments, which are similar in nature. A distinctive clay/silty clay unit is found at depths ranging from approximately 10 to 30 feet below ground surface and ranges in thickness from 25 to over 100 feet. This clay/silty clay unit, characterized by a distinctive red to red-brown color and dry to slightly moist with uniform composition and consistency, provides an effective hydrologic barrier between the upper alluvial sediments and those representing the Santa Fe Group.

Volcanic rocks (basalt and/or rhyolite) were commonly encountered above the clay unit during the drilling of the project boreholes. One borehole (GWQ94-16), however, encountered basalt beneath the clay. Unlike the clay observed in other boreholes, the clay/silty clay in GWQ94-16 was uncharacteristically thinner and was accompanied by significant amounts of gravel and moisture. Based on the gravelly nature of the clay, the relative superposition in the borehole, and the eastward dip of the sediments, the relatively shallow clay/silty clay located above the basalt in borehole GWQ94-16 may actually be reworked material from an upgradient clay source which was deposited over the basalt. The stratigraphy observed in all other boreholes clearly indicates that basalt and/or rhyolite was flowed out above the thick clay unit.

The alluvial units above and below the clay unit are similar in nature, although the gravel unit below the clay contains more matrix material. Because of the abundant matrix material, the lower unit is more poorly sorted and the lower aquifer has a lower permeability in those zones where clay or silty clay predominate.

G.2 WELL SELECTION

One pumping well and 13 observation wells were employed during the aquifer test. Figure G-1 shows the well locations and Table G-1 presents pertinent information for each of the wells used for data collection.

G.2.1 Pumping Well

Well GWQ94-17 was drilled and completed in October 1994. The borehole was drilled to a total depth of 158 feet and the well is screened from 120-150 feet below ground surface. Static water level in the well is on the order of 3 feet below ground surface. Well GWQ94-17 was chosen for pumping for the following reasons:

1. Central location relative to observation wells.

2. Casing diameter (4") was sufficient for pump installation.

3. Discharge water could be easily routed to discharge point.

4. Sulfate concentrations were low enough to pump without concern of immediately exceeding discharge standards.

5. Screened in a horizon of suitable water production.

6. Screen located beneath the red clay aquitard that separates the shallow aquifer from the underlying aquifer.

Discharge water from GWQ94-17 was piped through 600 feet of 3-inch layflat vinyl pipe that passed under the county road through a corrugated-steel culvert to a concrete sump. The sump is connected by an underground concrete culvert to a concrete-lined pit, located approximately 1500 feet southwest of the pumping well. Figure G-2 shows a schematic of the system.

G.2.2 Observation Wells

Observation wells were selected based on their proximity to the pumping well, their screened intervals, and their potential to exhibit a response in water levels during the pumping test.

The nearest observation well, GWQ94-13, is located 190 feet west-southwest of the pumping well, and is screened from 75 to 105 feet below ground surface. Observation well GWQ94-14, located 390 feet east-southeast of the pumping well, is screened from 127.5 to 157.5 feet. Observation well GWQ94-15 is 713 feet southeast of the pumping well, and is screened from 112 to 142 feet. Well GWQ94-16 is among the shallowest observation wells (screened from 25 to 45 feet below ground surface) and is located 423 feet southwest of pumping well GWQ94-17. The deepest observation well, GWQ94-20, is screened from 288 to 338 feet, and is located 264 feet northwest of the pumping well. Observation well GWQ94-21 has separate completions at

213-263 feet (A) and 285-315 feet (B), and is located 621 feet east of the pumping well.

Limited completion information was available for the six observation wells installed prior to the 1994 field program. Observation well GWQ-11 is located approximately 405 feet southwest of the pumping well and is completed to a depth of 76 feet. Observation wells NP-2 and NP-5 are located approximately 1130 and 735 feet south-southwest of the pumping well, and have total depths of 110 and 41 feet, respectively. Observation well IW-1 has a total depth of 67 feet and is located 239 feet west of the pumping well. Observation well IW-2, 248 feet northwest of the pumping well, is completed to 45 feet.

Water levels in wells GWQ94-18 and GWQ94-19 were not monitored during the pumping test since both wells were dry or nearly dry.

G.3 AQUIFER TEST

G.3.1 Aquifer Pumping Test Operations

Well GWQ94-17 was pumped for a total of 78.14 hours, starting at 10:50 on Tuesday, November 8, 1994 and ending at 16:58 on Friday, November 11, 1994. The average flow rate during the test was 23 gpm. The flowrate was not sufficient to activate the inline flowmeter at the wellhead, so flowrate was measured at the concrete sump discharge point approximately hourly using a bucket and stopwatch. The flowrate remained steady throughout the test until the pump was shut off.

G.3.2 Monitoring

Water level changes during the pumping portion of the aquifer test were monitored manually for wells GWQ94-17, GWQ-11, GWQ94-15, GWQ94-16, GWQ94-21A, GWQ94-21B, NP-2, NP-3, NP-5, IW-1, and IW-2 using an electronic water level sounder. The remaining wells (GWQ94-13, GWQ94-14, and GWQ94-20) were monitored automatically, during the pumping portion of the aquifer test, using pressure transducers attached to data logging units. Manual readings were collected every 5 to 10 minutes for about the first hour, every 15 to 20 minutes for the next 3 to 4 hours, and at least hourly for the remainder of the test. Automatic pressure transducer readings were collected every minute during the pumping period.

During the recovery portion of the test, water levels were measured at 5-minute intervals in wells GWQ94-14 and GWQ94-13 using pressure transducers. The pressure transducer that was set in GWQ94-20 during the pumping period of the test was transferred to GWQ94-21A for the recovery test. Water level recovery was also monitored in the pumping well at 5-minute intervals, using a pressure transducer. Recovery was monitored for 2.5 days, from 16:58 on Friday, November 11, 1994 to approximately 16:00 on Sunday, November 13.

A summary of these monitoring activities is presented in Figure G-3. The pre-pumping static water level data and aquifer test water level data are presented in the Attachments A-5 and G-2, respectively. A major storm event occurred, in which 6.5 inches of rain were gauged at the tailings dam from the morning of November 11, 1994 to the evening of November 12, 1994 (Irwin, personal communication). This recharge event may have affected the recovery of the water levels in the observation wells.

G.3.3 Observations

G.3.3.1 Pumping Well GWQ94-17

Well GWQ94-17 was pumped at a rate of 23 gpm for a total of 78.14 hours. The steady-state drawdown of 125 feet was acheived in 31 minutes of pumping. The plot of drawdown versus time, presented in Figure G-4, indicates that the pump operated continuously during the test.

G.3.3.2 Discharge

The well discharged a total of just under 108,000 gallons into the concrete-lined pit, located approximately 1500 feet south-southwest of the pumping well. Observation well NP-2, located approximately 50 feet from the northwest corner of the pit, was monitored during the test to determine whether the concrete pit was leaking and if so, how much effect it had on the local groundwater table. The water levels in NP-2 during the test period are shown in Figure G-5, and do not exhibit effects from leakage. However, the drop in water level in the concrete pit after the pump was shut off indicated that the pit leaked approximately 5000 gallons/day.

G.3.3.3 Water Quality

The quality of the discharge water was monitored periodically during the test. Sulfate ranged from a low of 180 mg/l to a high of 360 mg/l, with concentrations peaking eight hours into the test and decreasing as the test progressed. Temperature readings were affected by the sun incidence on the discharge pipe and were not representative of the groundwater temperature. The pH of the water stabilized at approximately 7.4 and the conductivity ranged from a low of 990 μS to a high of 1110 μS. Water quality parameters measured at the discharge pipe are summarized in Table G-2.

G.3.4 Test Results

G.3.4.1 Shallow Aquifer System

The shallow aquifer system hosts numerous wells, including the shallow (<80 feet) monitoring wells near the tailings dam.

None of the shallow observation wells monitored during the pumping test showed a response to pumping at GWQ94-17, indicating that in this area there is no hydraulic connection between the upper, shallow alluvial aquifer and the lower aquifer in the Santa Fe Group. The plots of drawdown in the observation wells versus time during the pumping test are presented in Attachment G-1. The shallow observation wells are IW-1, IW-2, NP-5, GWQ-11, and GWQ94-16.

G.3.4.2 Santa Fe Group Aquifer System

Two types of response were observed in the Santa Fe Group aquifer system due to stressing by pumping at GWQ94-17. Theis type responses were demonstrated at wells GWQ94-13, GWQ94-14, GWQ94-21A, GWQ94-21B and NP-3. An attenuated response was demonstrated at observation well GWQ94-15, in the form of a slower, flatter drawdown curve.

The response in observation well GWQ94-20 was influenced by recharge of the well following development on November 3, 1994. The well is completed in a low-permeability zone and is slow to equilibrate following pumping/development. Therefore, data collected from GWQ94-20 during the pumping test are considered invalid for analysis purposes. The water level plots versus time for all other monitoring wells observed during the aquifer test are shown in the Attachment G-1.

G.3.4.3 Bedrock Flow System

Although no deep bedrock wells were installed or monitored during this study, some knowledge of the deep bedrock system is discernible through investigation of the local geology of the area. Water that enters the various limestone beds of the upper Paleozoic rocks in the north-trending Animas Uplift moves downdip along bedding plane and solution openings until it reaches the zone of saturation, then moves laterally along the strike of permeable strata toward points of discharge in the principal stream valleys, which in this case are Las Animas Creek and Seco Creek (Davies and Spiegel, 1967).

G.4 ANALYSIS AND INTERPRETATION

The transmissivity of the aquifer appears to be approximately 1400 gpd/ft with a storage coefficient of 2.5 x 10^{-4}, based on a Theis analysis, and is representative of a confined aquifer of moderate permeability. Plots from the Theis evaluation are presented in Figures G-6 and G-7. The estimated efficieny of the pumping well, GWQ94-17, is approximately 25% based on the drawdown in the pumping well versus the water levels in the observation wells. This suggests that the aquifer is sufficiently tight to create large head losses in the formation as the groundwater flows radially into the wellbore. Additional well losses could be caused by the well design and completion.

The aquifer test did not positively identify any fixed-head or no-flow boundaries. The test did confirm that wells that penetrate the clay layer are hydraulically connected to the pumping well. Response of those observation wells were, in general, well-modeled by a Theis-type response. Wells that are completed above the confining clay layer (shallow aquifer) were not affected by the pumping activity at GWQ94-17.

Well GWQ94-14 displayed an unusually quick response and more rapid drawdown possibly indicating the presence of a higher permeability paleo-channel that connects GWQ94-14 to GWQ94-17.

In addition to performing an integrated, detailed Theis analysis on the suite of observation wells, data from individual observation wells were analyzed using the aquifer test analysis software package, AQTESOLV (Geraghty and Miller, Inc.). Table G-3 presents the transmissivity and storativity values derived using various methods, and the plots of drawdown versus time are included in Attachment G-1.

Table G-1 Observations Wells Used During the Tailings Dam Area Aquifer Test

WELL ID	TD (feet)	ELEV. (toc) QMC[3]	r (feet)	TOP OF SCREEN (feet bgs)	BOTTOM OF SCREEN (feet bgs)	SCREEN LENGTH (feet)	PIPE DIAM. (in.)	STATIC WATER LEVEL (feet btoc) 11/7/94
GWQ-11	76	5174.87	≈405	na	na	na	3	17.04
GWQ94-13	112	5179.05	190	75	105	30	4.5	8.02
GWQ94-14	158	5171.41	390	127.5	157.5	30	4.5	1.585
GWQ94-15	148	5161.64	713	112	142	30	4	0.63
GWQ94-16	48	5176.02	423	25	45	20	4	18.23
GWQ94-17[1]	158	5176.97	0	120	150	30	4	5.32
GWQ94-20	340	5181.97	264	288	338	50	4.5	20.315
GWQ94-21A	320	5171.28	621	213	263	50	2	4.58
GWQ94-21B	320	5170.79	621	285	315	30	2	3.945
NP-2	110	5171.38	≈1130	na	na	na	2	29.46
NP-3	79.3[2]	5178.42	≈239	na	na	na	2	7.07
NP-5	41.2[2]	5177.45	≈735	na	na	na	2	19.67
IW-1	67[2]	5177.68	239	na	na	na	4	20.55
IW-2	45	5186.54	438	na	na	na	4	33.585

[1] Pumping well
[2] Measured prior to groundwater sampling
[3] Elevations relative to project datum (Quintana Minerals Corp.)
TD = total depth of borehole
r = distance to the pumping well (feet)
bgs = below ground surface
toc = top of casing
btoc = below top of casing
na = information not available

Table G-2 Summary of Water Quality during Pumping of GWQ94-17

DATE	TIME	TEMPERATURE (deg-C)	pH	CONDUCTIVITY (um/cm)	SULFATE CONCENTRATION (mg/l)
11/8/94	12:14	21	7.4	1110	225
11/8/94	13:22	21	7.4	1050	180
11/8/94	15:15	19.5	7.4	1050	210
11/8/94	17:25	19	7.4	1030	350
11/8/94	18:10	18	7.4	1030	360
11/9/94	07:18	--	7.3	1050	300
11/9/94	12:24	--	7.3	1020	240
11/9/94	14:35	--	7.3	990	250
11/9/94	13:57	--	7.3	1010	240
11/10/94	12:40	--	7.4	1030	280
11/10/94	14:35	--	7.4	1000	220

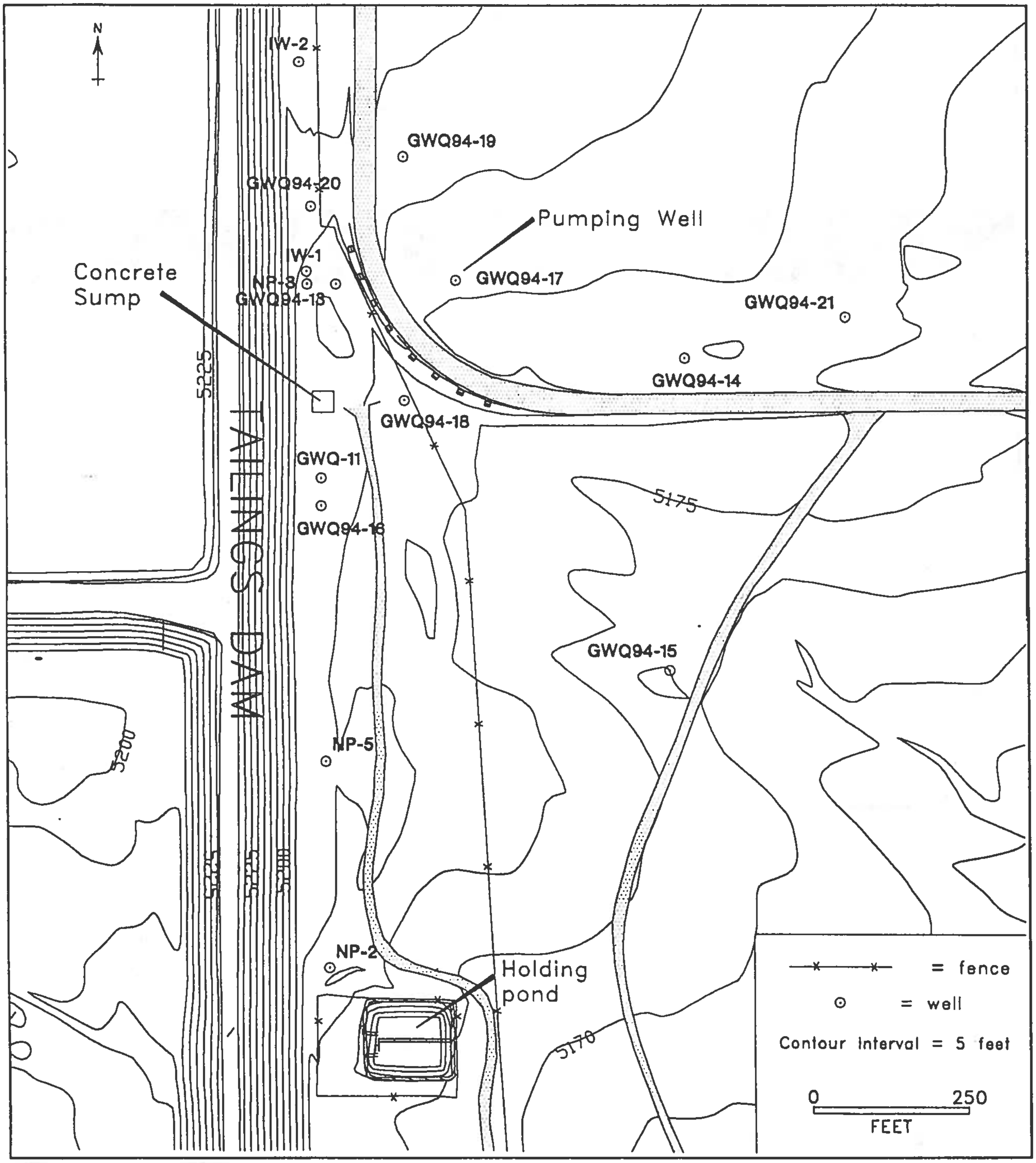


Figure G-1 Well location map for tailings dam area pumping test

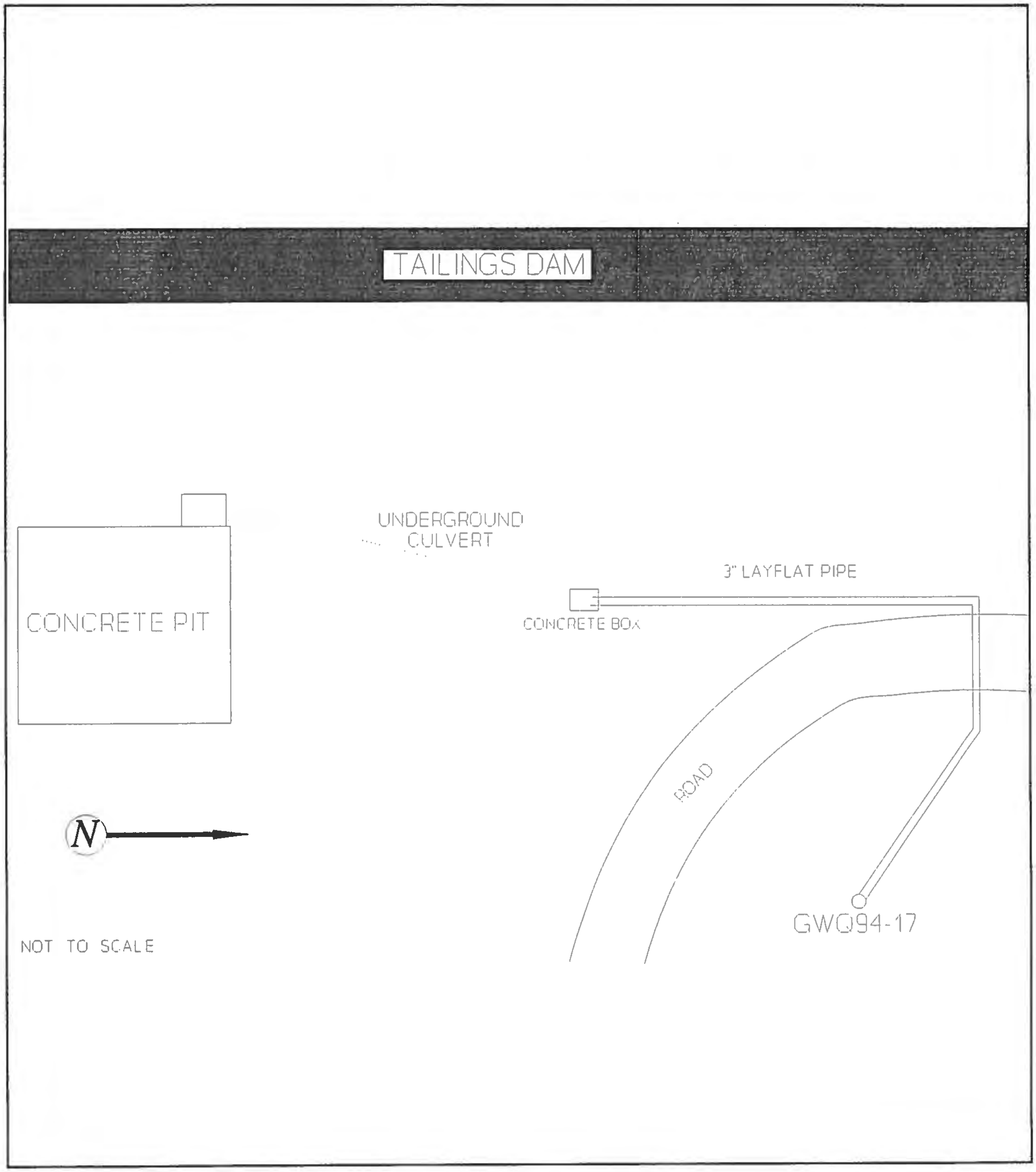


Figure G-2 Schematic of pumping test system

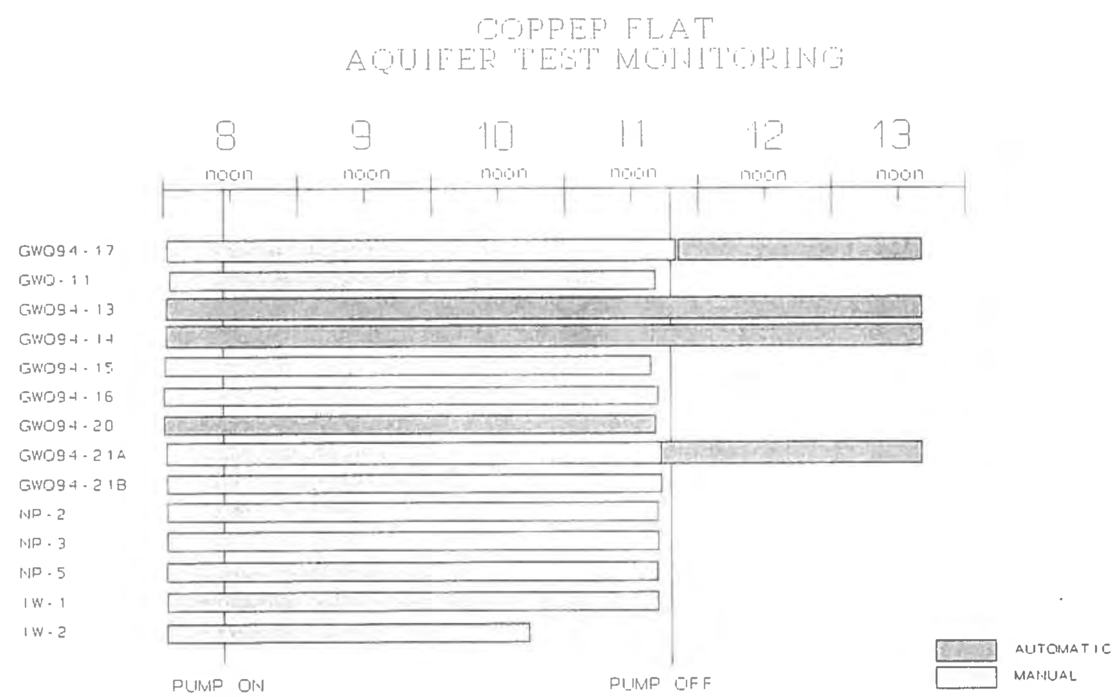
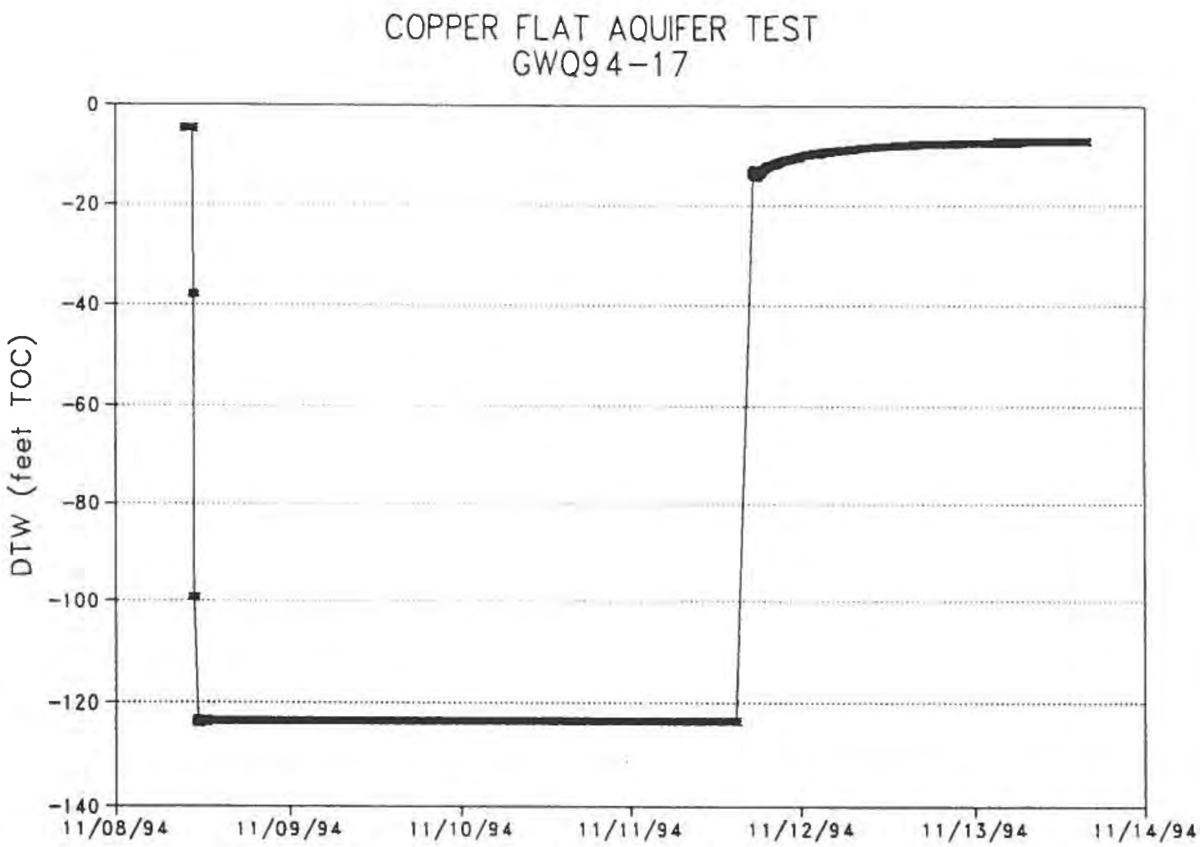


Figure G-3 Copper Flat tailings dam aquifer test monitoring


COPPER FLAT AQUIFER TEST
GWQ94-17
DTW (feet TOC)
0
-20
-40
-60
-80
-100
-120
-140
11/08/94
11/09/94
11/10/94
11/11/94
11/12/94
11/13/94
11/14/94

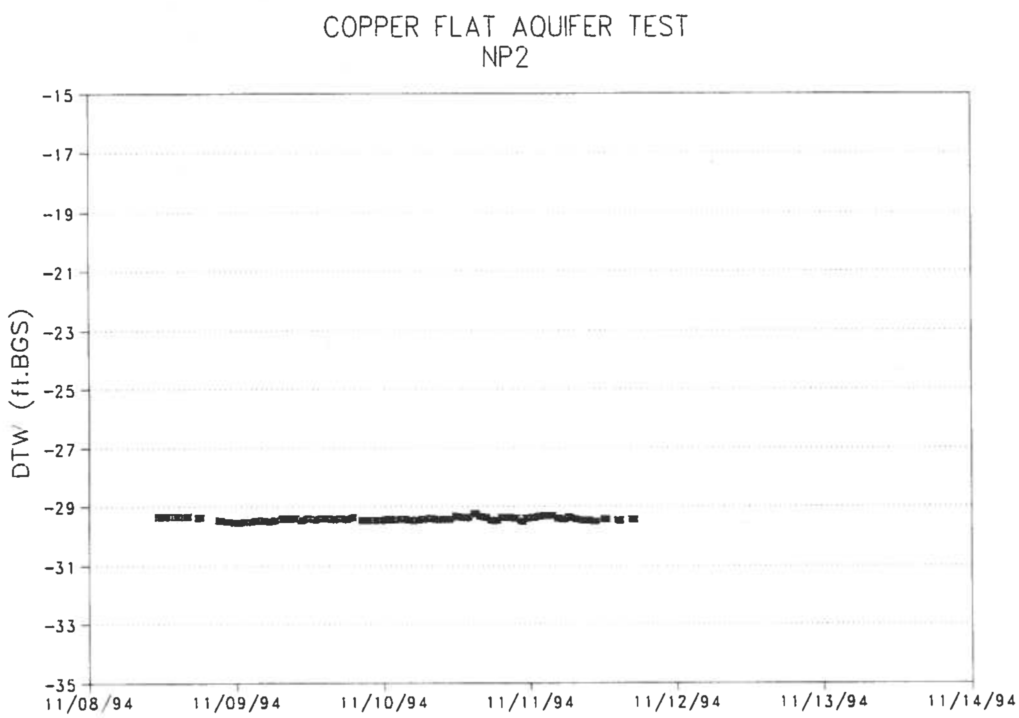


Figure G-5 Water levels in observation well NP-2

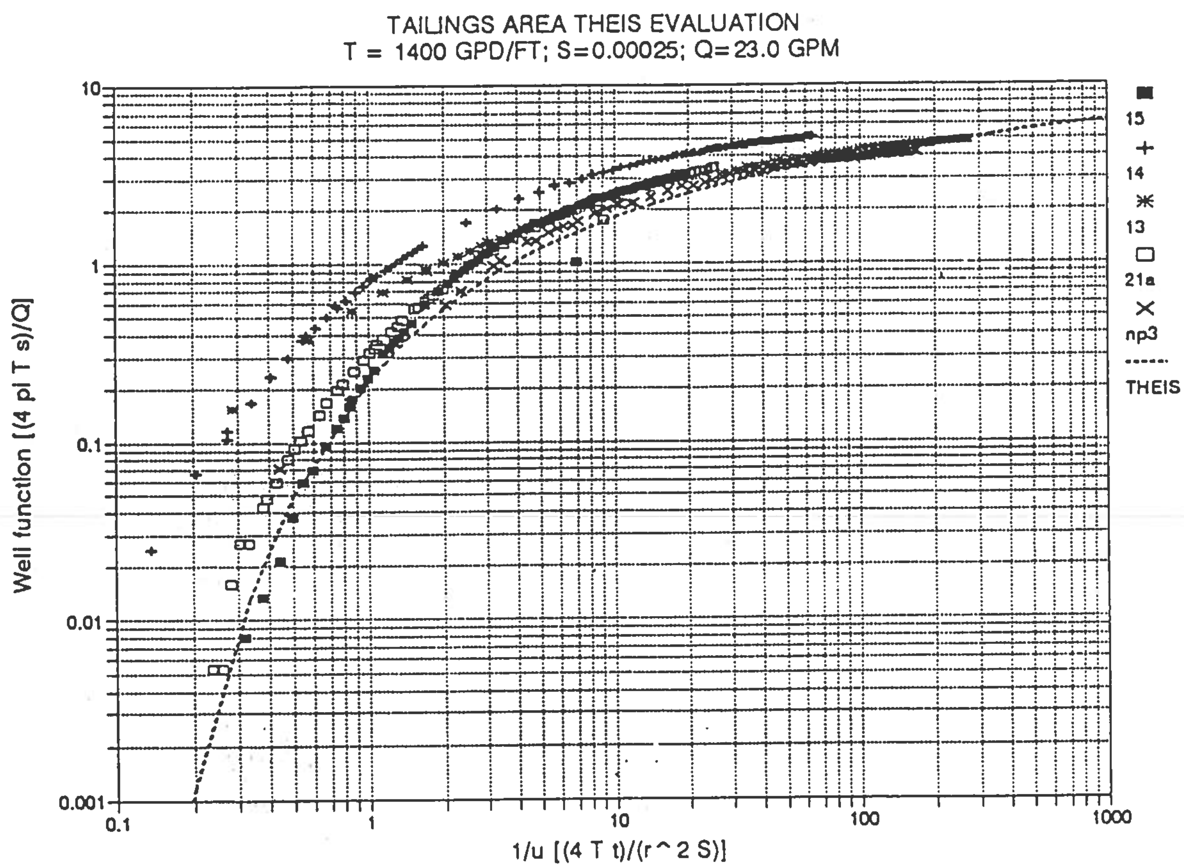


Figure G-6 Theis evaluation for tailings dam area pumping test, T=1400 gpd/ft

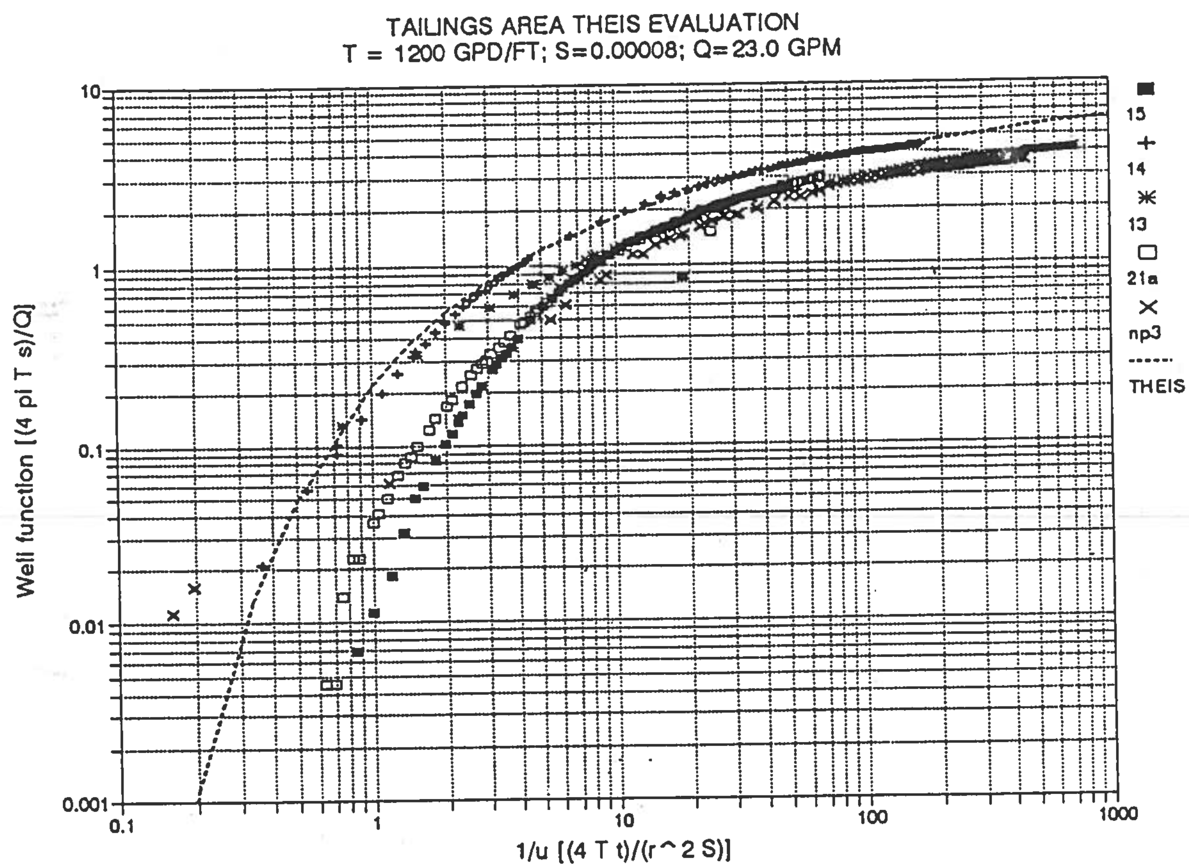


Figure G-7 Theis evaluation for tailings dam area pumping test, T=1200 gpd/ft

Table G-3 Aquifer Test Analysis Results

WELL ID	SOLUTION	TRANSMISSIVITY (gpd/ft)	STORATIVITY
GWQ94-13	Theis	1658	1.1×10^{-4}
	Jacob-Cooper straight-line	1540	1.2×10^{-4}
GWQ94-14	Theis	1148	8.1×10^{-5}
	Jacob-Cooper straight-line	1177	6.9×10^{-5}
GWQ94-15	Theis	1259	1.5×10^{-4}
	Hantush - leaky con. w/o storage	1168	1.7×10^{-4}
	Jacob-Cooper straight-line	1299	1.3×10^{-4}
GWQ94-21A	Theis	1147	1.7×10^{-4}
	Jacob-Cooper straight-line	1272	1.4×10^{-4}
GWQ94-21B	Theis	1068	2.8×10^{-4}
	Jacob-Cooper straight-line	1086	2.4×10^{-4}
Integrated Approach[1]	Theis	1400	2.5×10^{-4}

[1]See text and Figures B-6 and B-7

Appendix C4.

2012 Aquifer Test Results

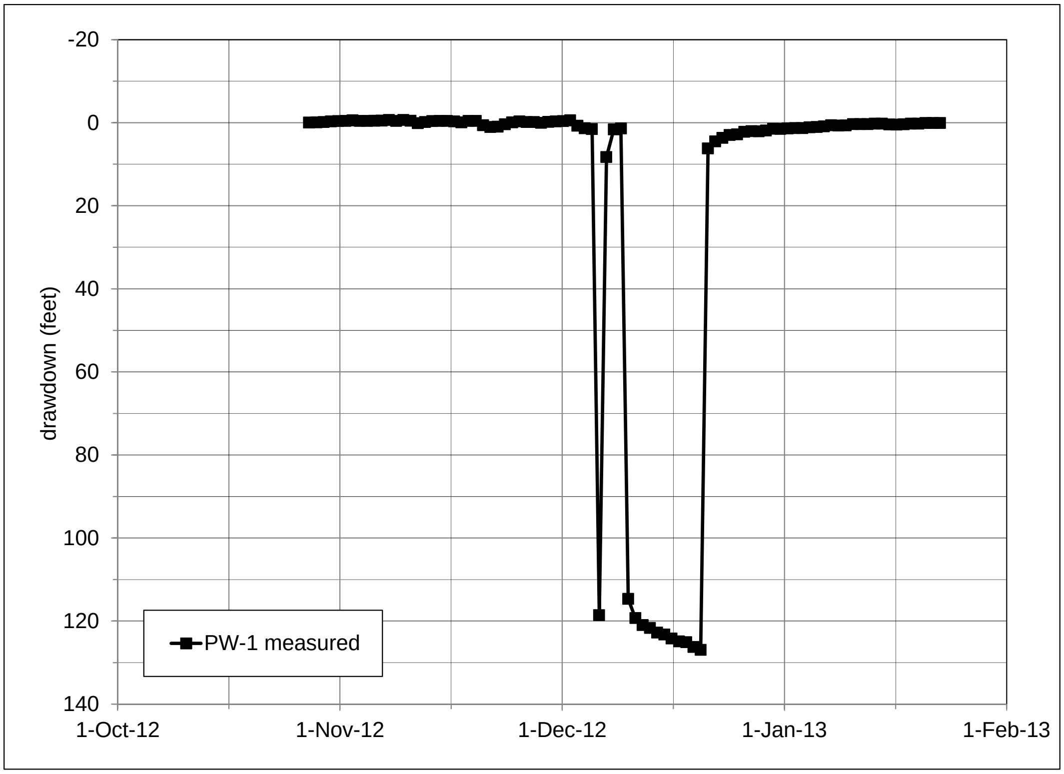


Figure C4-1. Aquifer test hydrograph PW-1.

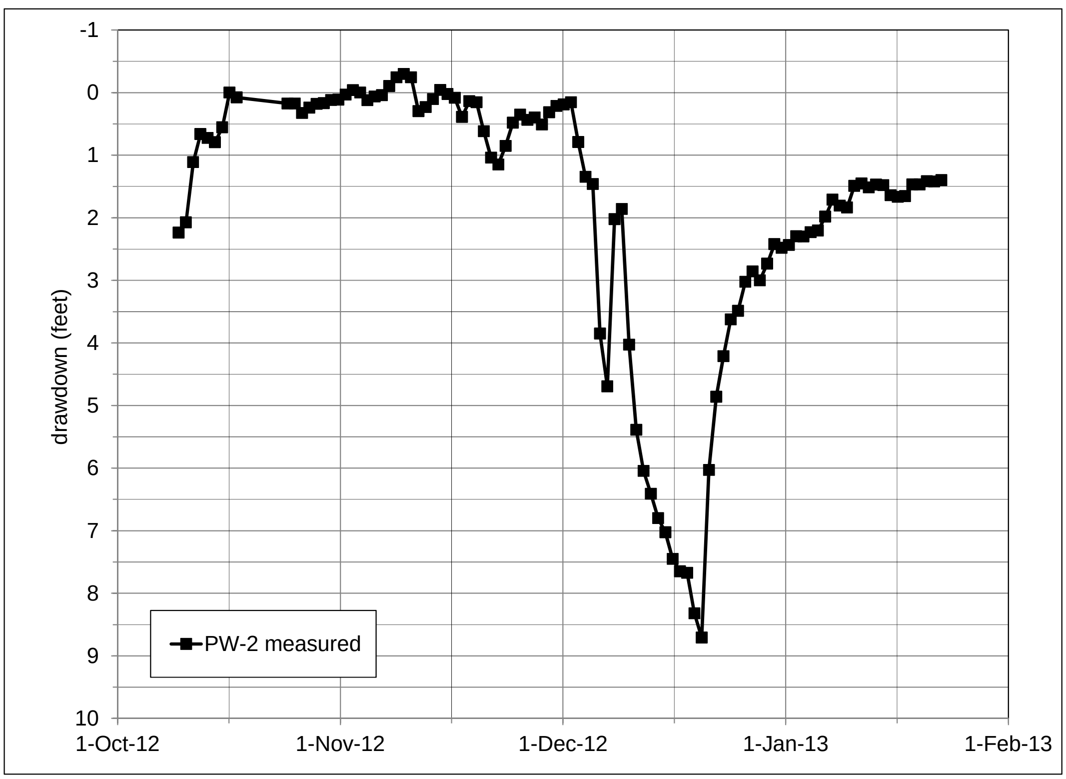


Figure C4-2. Aquifer test hydrograph PW-2.

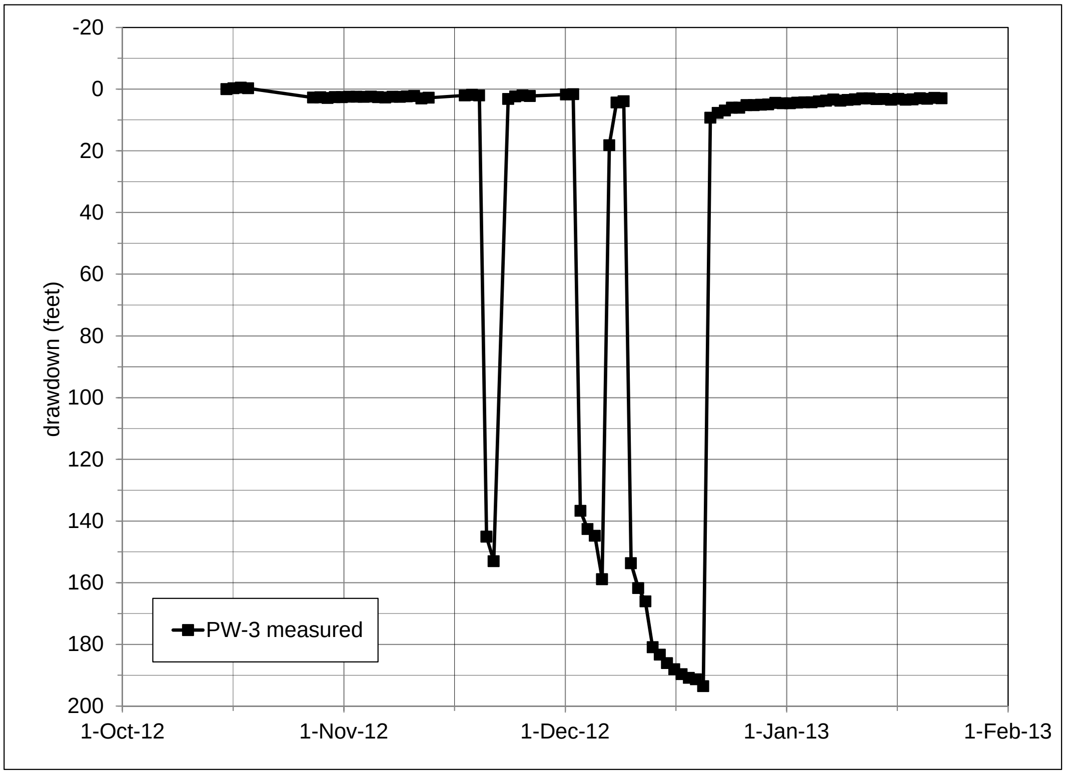


Figure C4-3. Aquifer test hydrograph PW-3.

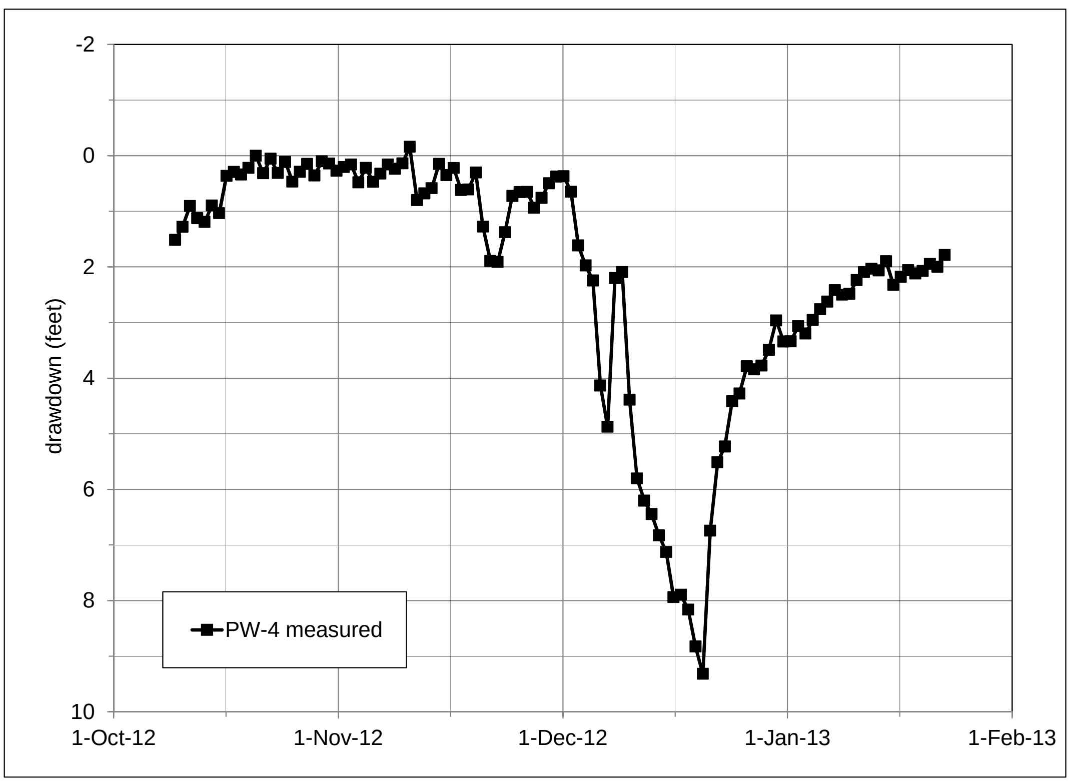


Figure C4-4. Aquifer test hydrograph PW-4.

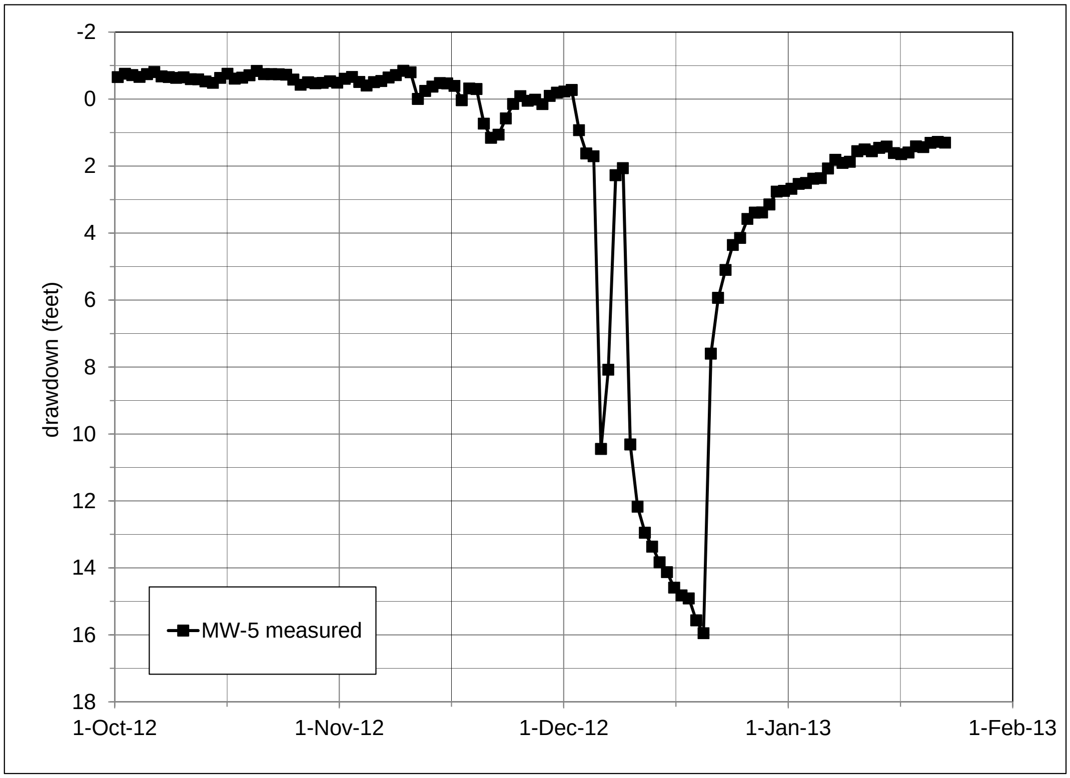


Figure C4-5. Aquifer test hydrograph MW-5.

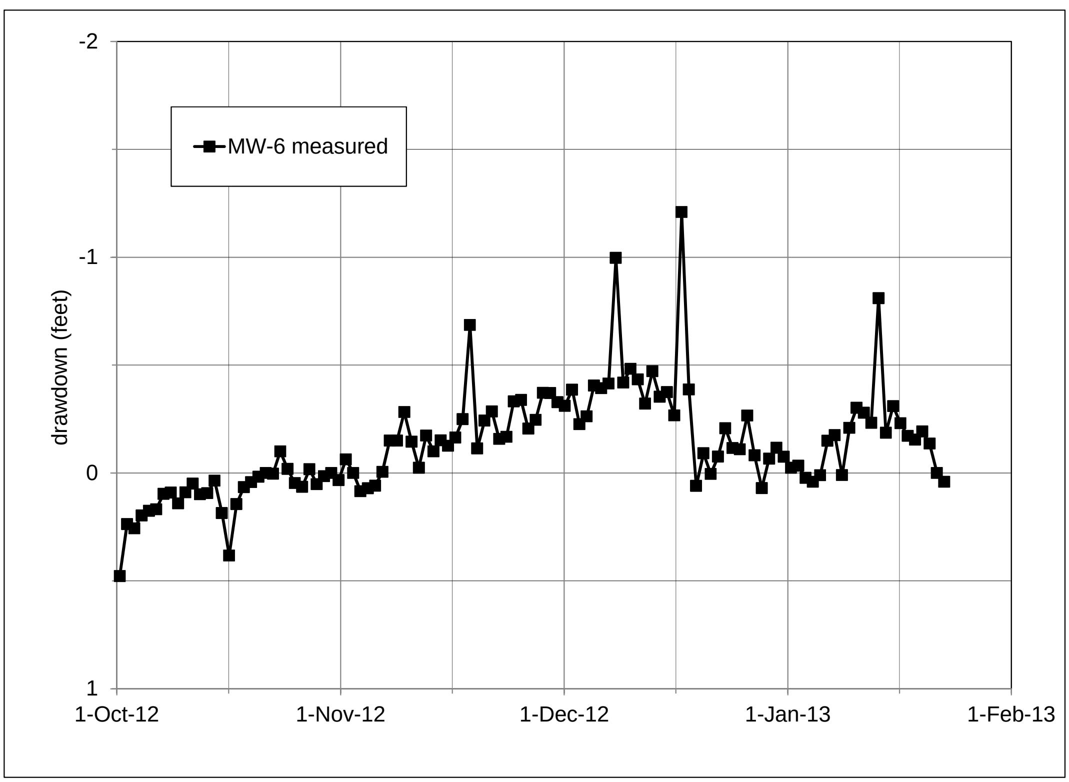


Figure C4-6. Aquifer test hydrograph MW-6.

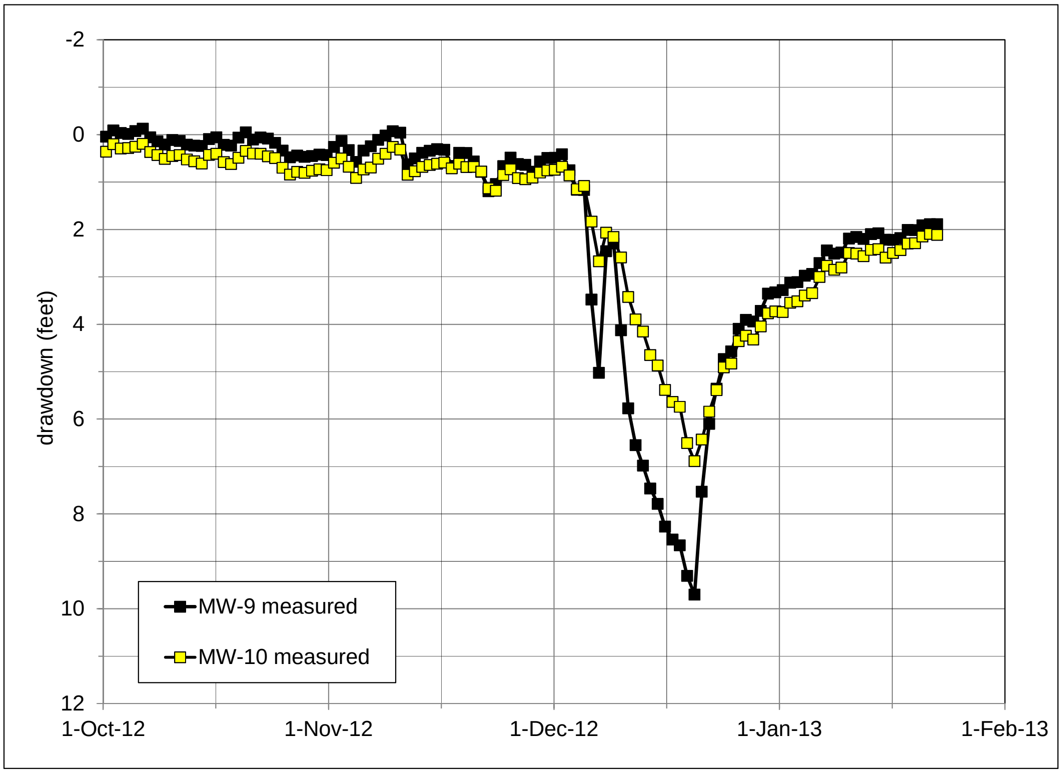


Figure C4-7. Aquifer test hydrograph MW-10.

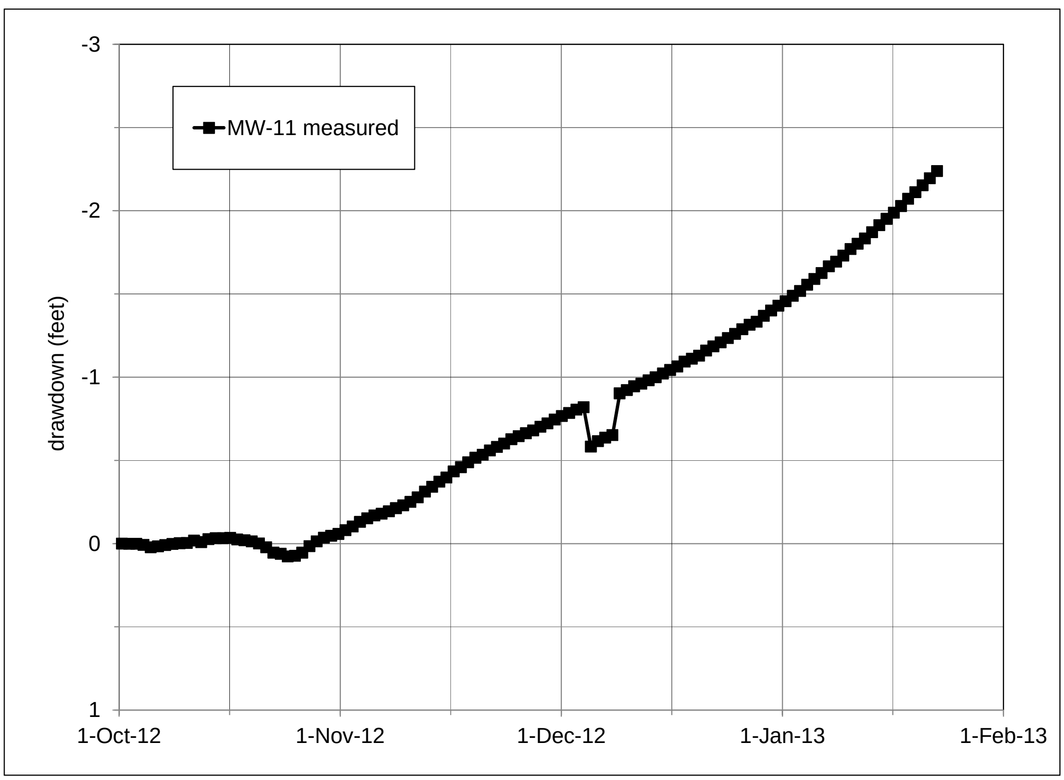


Figure C4-8. Aquifer test hydrograph MW-11.

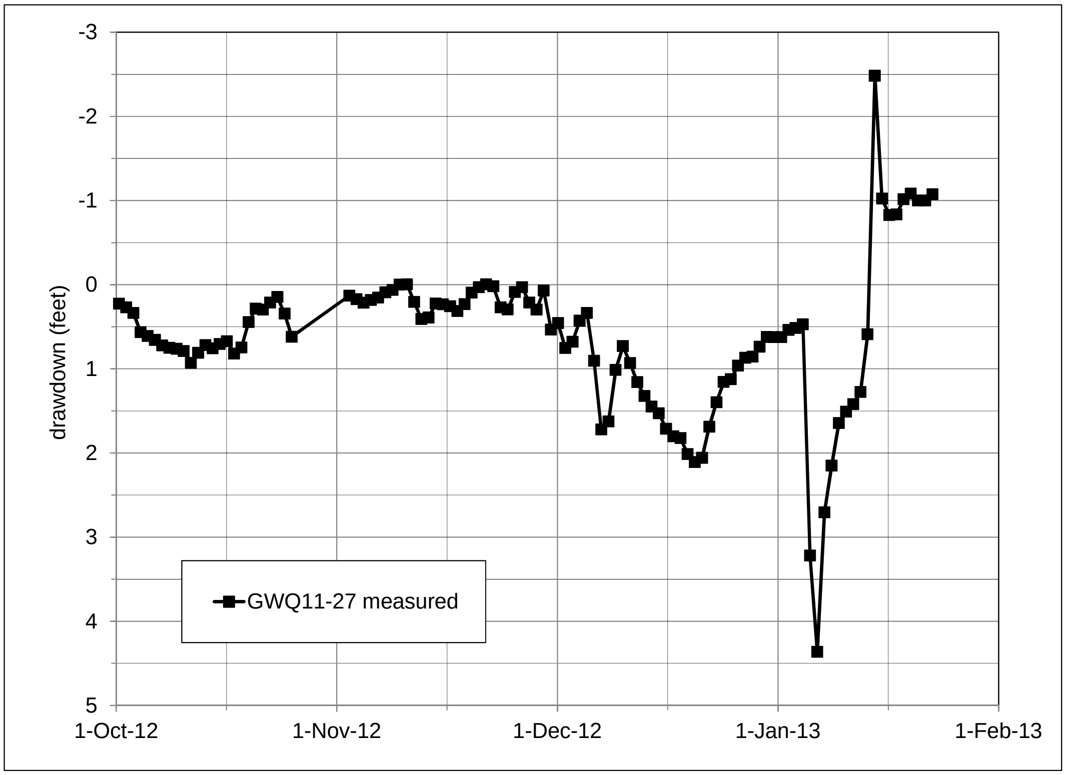


Figure C4-9. Aquifer test hydrograph GWQ11-27.

Appendix C5.

Pit Area Pressure-Injection Tests, September 2011

ESTIMATED HYDRAULIC CONDUCTIVITY OF PRESSURE-INJECTION TEST ZONES BOREHOLES GWQ 5-R, GWQ 11-24, AND GWQ 11-25 COPPER FLAT MINE SIERRA COUNTY, NEW MEXICO

by

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September 2011

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September 2011

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Figure 6. Pressure injection test, New Mexico Copper GWQ 11-24, Zone 2 (150-197 ft), Series 1 and 2, July 30, 2011.

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Figure 11. Apparent permeability from pressure injection test, New Mexico Copper GWQ 11-25, Zone 2 (150-197.7 ft), Series 1, 2, and 3, August 16, 2011.

Figure 12. Pressure injection test, New Mexico Copper GWQ 11-25, Zone 3 (207-251 ft), Series 1, 2 and 3, August 24, 2011.

Figure 13. Apparent permeability from pressure injection test, New Mexico Copper GWQ 11-25, Zone 3 (207-251 ft), Series 1, 2 and 3, August 24, 2011.

APPENDIX
(follow illustrations)

Basic data for pressure-injection tests

ESTIMATED HYDRAULIC CONDUCTIVITY OF PRESSURE-INJECTION TEST ZONES BOREHOLES GWQ 5-R, GWQ 11-24, AND GWQ 11-25 COPPER FLAT MINE, SIERRA COUNTY, NEW MEXICO

INTRODUCTION

Pressure-injection tests were conducted during drilling of three boreholes (later reamed and completed as monitor wells), New Mexico Copper GWQ 5-R, GWQ-11-24, and GWQ-11-25. One zone was tested in GWQ 5-R, and three zones were tested in each of the other two boreholes. The tests were carried out between July 27 and August 31, 2011. Test equipment was provided and operated by the drilling contractor, WDC Exploration. Jeffrey J. Kelsch of John Shomaker & Associates recorded the data. Figure 1 is a map showing the locations.

The locations, logs and descriptions of the three monitor wells may be found in other reports. Well GWQ 5-R is completed in Cretaceous-age andesite, in the SE/4 NE/4 NW/4, Sec. 36, T. 15 S., R. 7 W. GWQ 11-24 and GWQ 11-25 are completed in Cretaceous-age intrusive rocks, in the SE/4 NE/4 NW/4 of Sec. 35, and the SW/4 NE/4 SW/4 of Sec. 26, respectively, of T. 15 S., R. 7 W.

TEST METHOD AND INTERPRETATION

The tests were conducted using a variation on the standard Lugeon test (Lugeon, 1933; Houlsby, 1976), for estimating average hydraulic conductivity of rock masses. In each of the three vertical, 3-3/4-in. boreholes, one or more zones were isolated between the bottom of the hole as it was at the time of the test, and a packer run on 1-in. standard-pipe tubing. In all but one case (GWQ 5-R), the test zone was below the water table and the rock mass was saturated at the beginning of the test.

For most of the tests, a Moyno progressing-cavity pump, reportedly rated at 10 gpm maximum flow and 350 psi maximum pressure, was used to inject water. One test employed a centrifugal pump, which was then replaced by the Moyno pump. The lengths of the test zones ranged from 36 ft to 48 ft, as indicated in Table 1 below. The injection rate was metered as clear water was pumped through the tubing into the open interval of the borehole at constant pressure, in 10-minute steps, first at increasing pressure and then at decreasing pressure. Basic data from the tests are given in the Appendix. In most cases, three series of measurements, at the same injection-pressure steps, were taken.

Injection rate was measured with a new, calibrated meter. Pressure in the tubing was measured with a 4-1/2-in.-dial, 0-300 psi, NIST certified gauge with 10-psi increments. Data were recorded each minute during each 10-minute pumping step.

The standard Lugeon test method is based on a sequence of five, 10-minute measurements of injection rate, three at increasing pressure, followed by two at decreasing pressure. The procedure for this project differed from the standard method in that many more measurements were made, with smaller increments of pressure between them, as suggested by Quiñones-Rozo (2010). This variation provides data for a more complete interpretation. In all cases, the higher pressures in the sequence of steps exceeded the fracture-gradient pressure at the depth of the open interval of the borehole, and existing fractures were dilated as water was pumped into them, or new fractures were created.

For each step, total head above the pre-test water level in the borehole was calculated as the sum of the gauge pressure in the tubing, the height of the gauge above ground level, and the depth to the static water level in the borehole, less the friction loss in the tubing at the specific injection rate. The friction loss was calculated by the standard Hazen-Williams formula with a constant for steel pipe of 100.

Hydraulic conductivity was calculated using the Lugeon relationship, which is empirically defined as the conductivity required for maintenance of an injection rate of 1 liter per minute per meter of open interval in the borehole, under a reference water pressure of 10 bars. One Lugeon unit is equivalent to 1.3×10^{-5} cm/sec, 0.03685 ft/day (Fell et al., 2005). For convenience, the calculations were made in terms of total added head in pounds per square inch (psi), and injection rates in gallons per minute (gpm).

Plots of injection rate versus total head above the pre-test water level in the borehole, and of apparent hydraulic conductivity (permeability) against total head, are given in Figures 1 through 12 for the tests in which the pumping rate was measurable.

RESULTS AND CONCLUSIONS

GWQ 5-R

One injection zone, from the bottom of the packer at 64 ft to the bottom of the borehole at 100 ft, was tested. Although the hole was almost full of fluid at the time of the test, later water-level measurements indicate that the natural static water level is about 48 ft. No flow was measured until the total head above the water level at the beginning of the test (5.6 ft below land surface, probably more than 40 ft above the natural water level) had reached more than 200 ft of water (87 psi; see Fig. 1). The injection rate was small, but increased rapidly, above that pressure. In a pressure step at 120 psi gauge pressure, fluid began to move up the hole above the packer, and the well began to flow, indicating that the packer seal had failed. An attempt was made to complete the test, but only very small injection rates could be maintained and it is clear from Figure 1 that any measurable fluid injected was entering dilated fractures. The test interval took no more fluid at declining pressures after the total head fell below about 340 ft of water, at about 110 psi gauge pressure.

The apparent hydraulic conductivity (permeability) was calculated at zero for the steps up to a head of about 200 ft of water, and then rose rapidly at higher pressures (Fig. 2). All of the measured injection that did occur was undoubtedly into fractures dilated by the high test pressures, and the actual hydraulic conductivity (permeability) is extremely low. This conclusion is reinforced by the fact that, at the beginning of the test, the water level in the borehole was 5.6 ft below land surface, even though later measurements in the completed well indicate that the hole would have been dry to a depth of 48 ft. No attempt was made to replicate the test.

Table 1. Summary of hydraulic conductivity (permeability) estimates

borehole and zone	depth interval, ft	apparent permeability		
		Lugeon units	cm/sec	ft/day
GWQ 5-R, Zone 1	64-100	~0	~0	~0
GWQ 11-24, Zone 1	100-147	0.5	7×10^{-6}	0.02
GWQ 11-24, Zone 2	150-197	2.3	3.0×10^{-5}	0.085
GWQ 11-24, Zone 3	204-251	3.8	4.9×10^{-5}	0.14
GWQ 11-25, Zone 1	100-148	~0	~0	~0
GWQ 11-25, Zone 2	150-198	2.2	2.9×10^{-5}	0.081
GWQ 11-25, Zone 3	207-251	2.0	2.6×10^{-5}	0.074

GWQ 11-24, Zone 1

This zone extended from the packer, at 100 ft, to 147 ft. Three series of injection tests were conducted, the first two with a centrifugal pump and the third with the Moyno positive-displacement pump. Plots of injection rate against total head are shown on Figure 3. In Series 1, the injection rates at increasing pressure were close to a line passing through the origin of the graph (Fig. 1), indicating that dilation of fractures was not significant until total head exceeded 200 ft or more, and the apparent permeability (Fig. 2) was roughly constant at around 0.5 Lugeon units (7×10^{-6} cm/sec, or 0.02 ft/day). Late in the first series, above total heads of around 210 ft of water, with about 75 psi gauge pressure, the injection rates began to increase sharply (Fig. 3), and it is probable that dilation of fractures was occurring.

In the subsequent two series of injection measurements, the rates were successively higher at corresponding pressures, and apparent permeability was greater (Fig. 4). In the third series, at the highest injection rates, the decreasing trend of apparent permeability indicates that head loss due to turbulent flow, as water flowed to and entered discrete fractures, played a significant role. The value of around 0.5 Lugeon units (7×10^{-6} cm/sec, or 0.02 ft/day), based on the first series of measurements, is likely to be most nearly representative.

GWQ 11-24, Zone 2

The packer was set at 150 ft and the bottom of the hole was at 197 ft. The injection rates in the first series of measurements were high compared with the other tests (see Fig. 5), but the plot of injection rates against total head does not extrapolate back through the origin. This may be attributable to turbulent-flow losses, or to significant dilation of fractures that occurred, and flow into the rock mass begun, even as the hole was filling and before pressure began to show on the gauge. This seems improbable at such low total heads. Although not reflected in the field notes, a more probable explanation is that some leakage around the packer was occurring.

In the second series of measurements (Fig. 5), the injection rates were directly proportional to total head, and the increasing-pressure plot extrapolates back almost through the origin, suggesting that the packer was sealing properly. Injection rates were somewhat greater during the decreasing-pressure part of the series, which may be attributable to some fracture dilation that occurred at the highest pressures during the increasing-pressure part of the test, and persisted.

The plot of apparent permeability against total head (Fig. 6) shows a steep decline with increasing injection rate for the first series of measurements, which might be indicative of large and increasing influence of turbulent flow, but is more likely a consequence of leakage around the packer as mentioned above. In the second series, in contrast, the apparent permeability is nearly constant, representing nearly laminar-flow conditions, at about 2.3 Lugeon units for increasing pressures. The representative permeability is likely to be 2.3 Lugeon units (3.0×10^{-5} cm/sec, or 0.085 ft/day).

GWQ 11-24, Zone 3

In this zone, the packer was set at 204 ft and the bottom of the borehole was at 251 ft. For the first four steps at increasing pressure in the first series of measurements, for total head up to about 170 ft, the injection rates plot approximately on a line that extrapolates back through the origin (Fig. 7), indicating that no fracture-dilation occurred. The apparent-permeability plot, projected back to the value at zero head (Fig. 8) suggests a value of about 0.6 Lugeon units, and a small turbulent-flow effect.

After total head exceeded about 170 ft in the first series of measurement, the injection rate increased markedly (Fig. 7), indicating that a fracture or fractures had opened under the increasing pressure, or more probably in this case, that temporary clogging of a fracture or the skin effect of drilling-fluid solids had been overcome. The pattern of injection rates as the pressures continued to increase and then decrease in the first series of measurements, and the identical pattern in the second and third series of measurements (see Fig. 7), suggest that fracture(s) did not close as the pressure was reduced, and that the initial sharp rise in injection rates during the first series was attributable to clearing of clogging or skin effect.

The plots of injection rate against total head for points representing measurements after the original breakthrough do not, however, extrapolate back through the origin. A loss of about 1.6 gpm, equivalent to about 93 ft of head differential, is indicated. The water level in the well at the beginning of the test, however, compares closely with later measurements, and it is not likely that a difference between the natural head and the head at the beginning of the test would account for the discrepancy. The most likely explanation seems to be that some water leaked around the packer, perhaps through a fracture open at both ends of the packer element.

Figure 8 shows the calculated values of permeability versus total head. Discounting the earliest measurements in Series 1, and assuming that turbulent-flow conditions account for the negative slope of the plot, and also assuming that the leakage around the packer is actually proportional to the injection rate, leads to a projection at zero total head, where no turbulence or leakage would exist, of about 3.8 Lugeon units (4.9×10^{-5} cm/sec, or 0.14 ft/day).

GWQ 11-25, Zone 1

A zone from 100 to 148 ft was isolated between the packer and the bottom of the borehole. No water was measured as being injected into the test zone until the gauge pressure reached 150 psi, representing a total head above the water level in the hole at the beginning of the test of about 375 ft, equivalent to 163 psi. This pressure is far in excess of any probable fracture-gradient pressure at 100 ft, and it seems clear that the hydraulic conductivity of the rock was extremely low before fractures were induced or opened by the injection pressure. The remainder of the test was not considered valid for estimation of permeability.

GWQ 11-25, Zone 2

Zone 2 extended from the packer at 150 ft to the bottom of the hole at 198 ft. Injection rates during the first series of measurements were approximately proportional to total head, except for a relative rise in injection rate at heads above about 240 ft (Fig. 9). In the second and third series of measurements, injection rates increased and became directly proportional to total head, and the plot of injection rate against total head extrapolates back through the origin, with zero flow at zero additional head. Probably this sequence reflects some clearing of clogging by drilling-fluid solids.

The apparent permeability plot (Fig. 10) appears to reflect a decrease in turbulent-flow effects from Series 1 to Series 3. Projection of the apparent permeability for Series-3 measurements back to the value at zero additional head, where no turbulent-flow effect would be seen, suggests a representative permeability of about 2.2 Lugeon units (2.9 x 10^{-5} cm/sec or 0.081 ft/sec).

GWQ 11-25, Zone 3

This zone extended from the packer at 207 ft to the bottom of the hole at 251 ft. The injection rate was approximately proportional to total head at values of head up to about 180 ft during the first series of measurements (Fig. 11), but the plot appears to project back to a rate greater than zero at zero head, suggesting some leakage. At higher pressures, the injection rate increased very sharply, indicating dilation of fractures, and the injection rates at descending values of total head fell below the rates at corresponding heads during the increasing-pressure phase of the test, suggesting that some plugging of fractures had occurred. In the second and third series of measurements, the injection-rate versus total-head plots were very similar, and in each series they were similar for increasing and decreasing rates. The sharp rise in rate indicative of fracture dilation occurred at a higher total head, and projections of the plots pass nearly through the origin.

The apparent-permeability plot (Fig. 12) shows the influence of turbulent flow in all three series. Projection of the low total-head points back to a value at zero total head, suggests that a representative permeability may be about 2.0 Lugeon units (2.6 x 10^{-5} cm/sec or 0.074 ft/day).

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Quiñones-Rozo, C., 2010, Lugeon test interpretation, revisited: United States Society on Dams, 30th Annual Conference Proceedings, pp. 405-414.

ILLUSTRATIONS

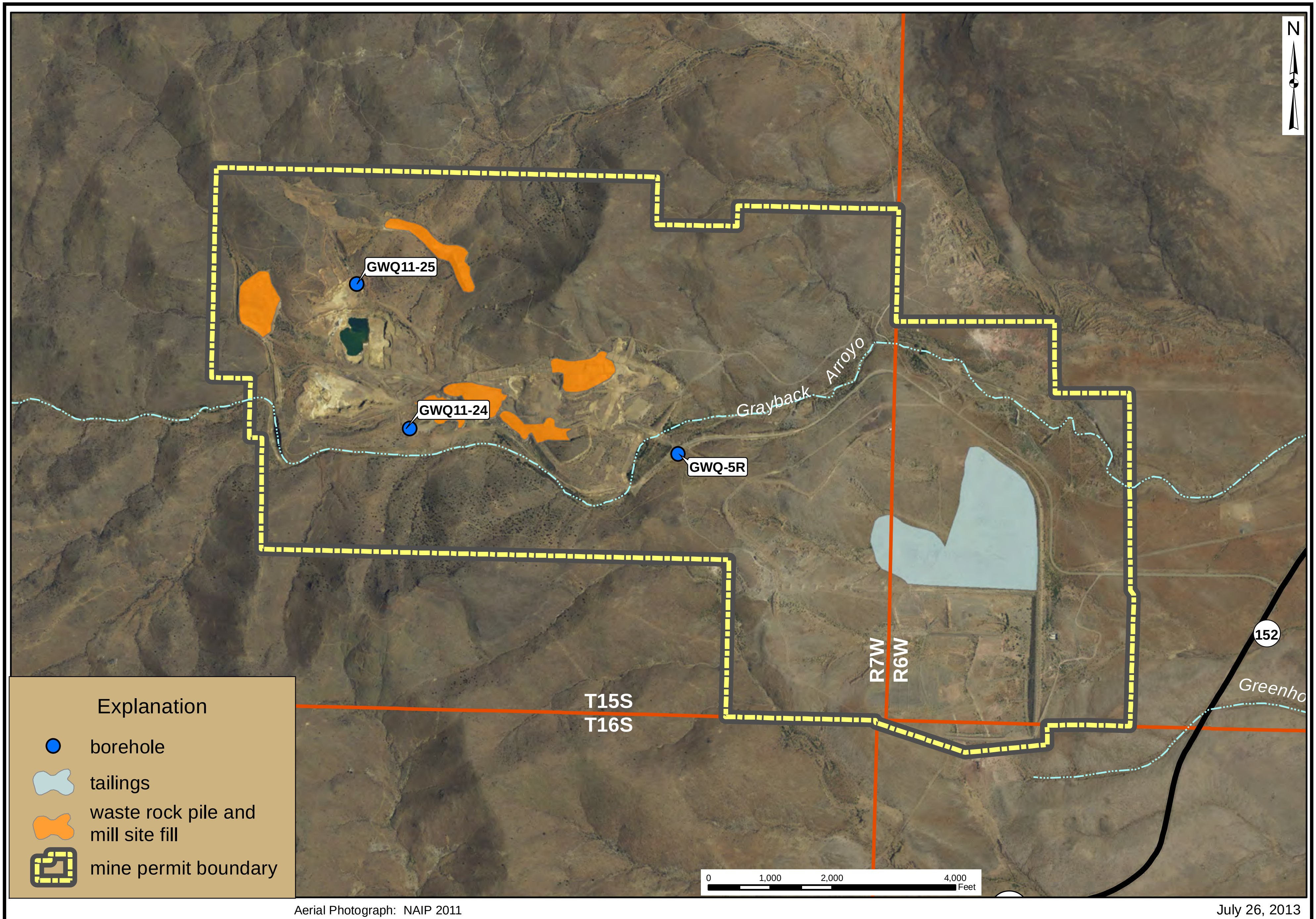

Figure 1. Aerial photograph showing locations of three boreholes and facilities associated with the former Copper Flat Mine operated by Quintana Minerals, Sierra County, New Mexico.

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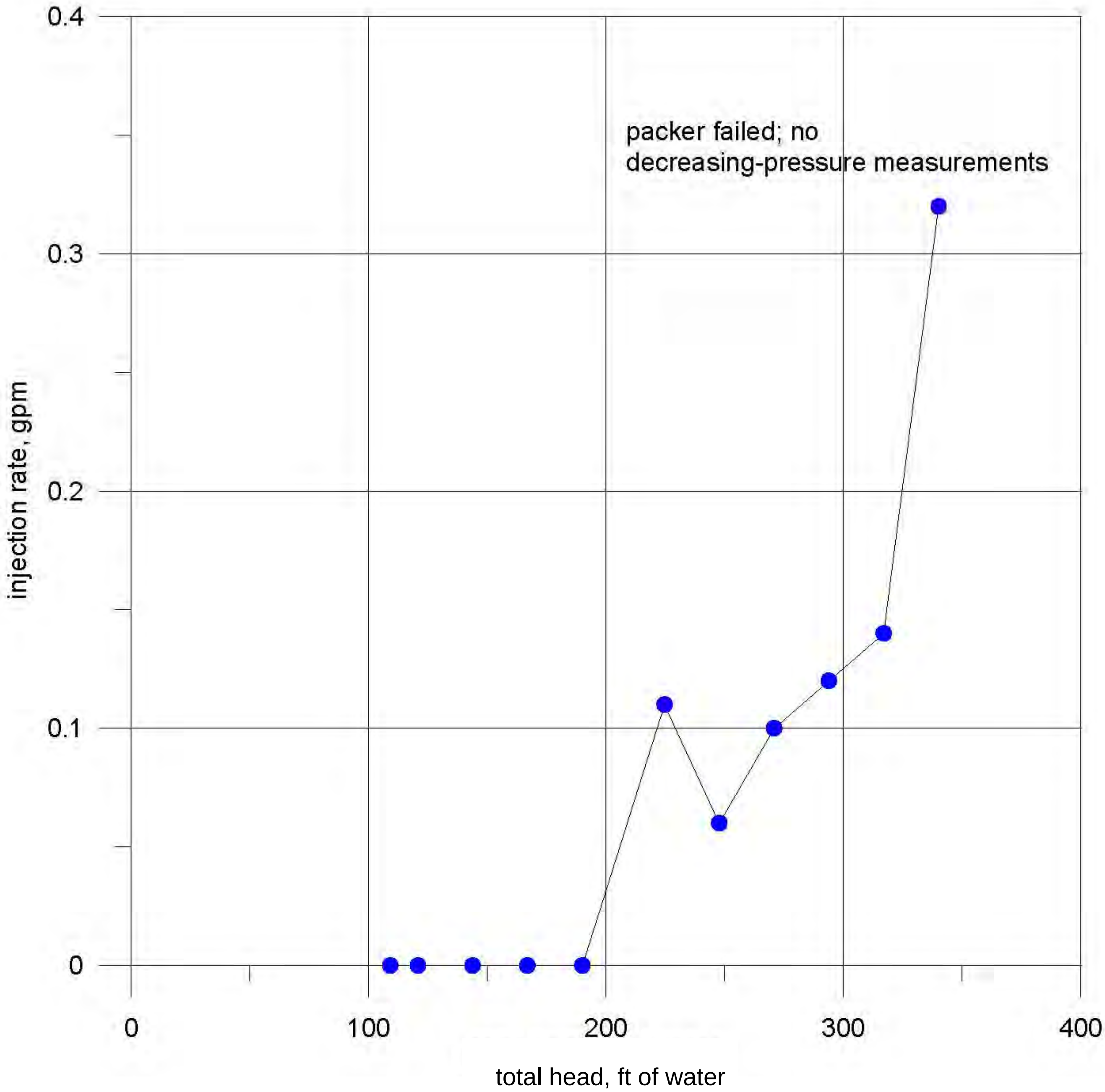

Figure 2. Pressure injection test, New Mexico Copper GWQ 5-R, Zone 1 (64-100 ft), Series 1, August 31, 2011.

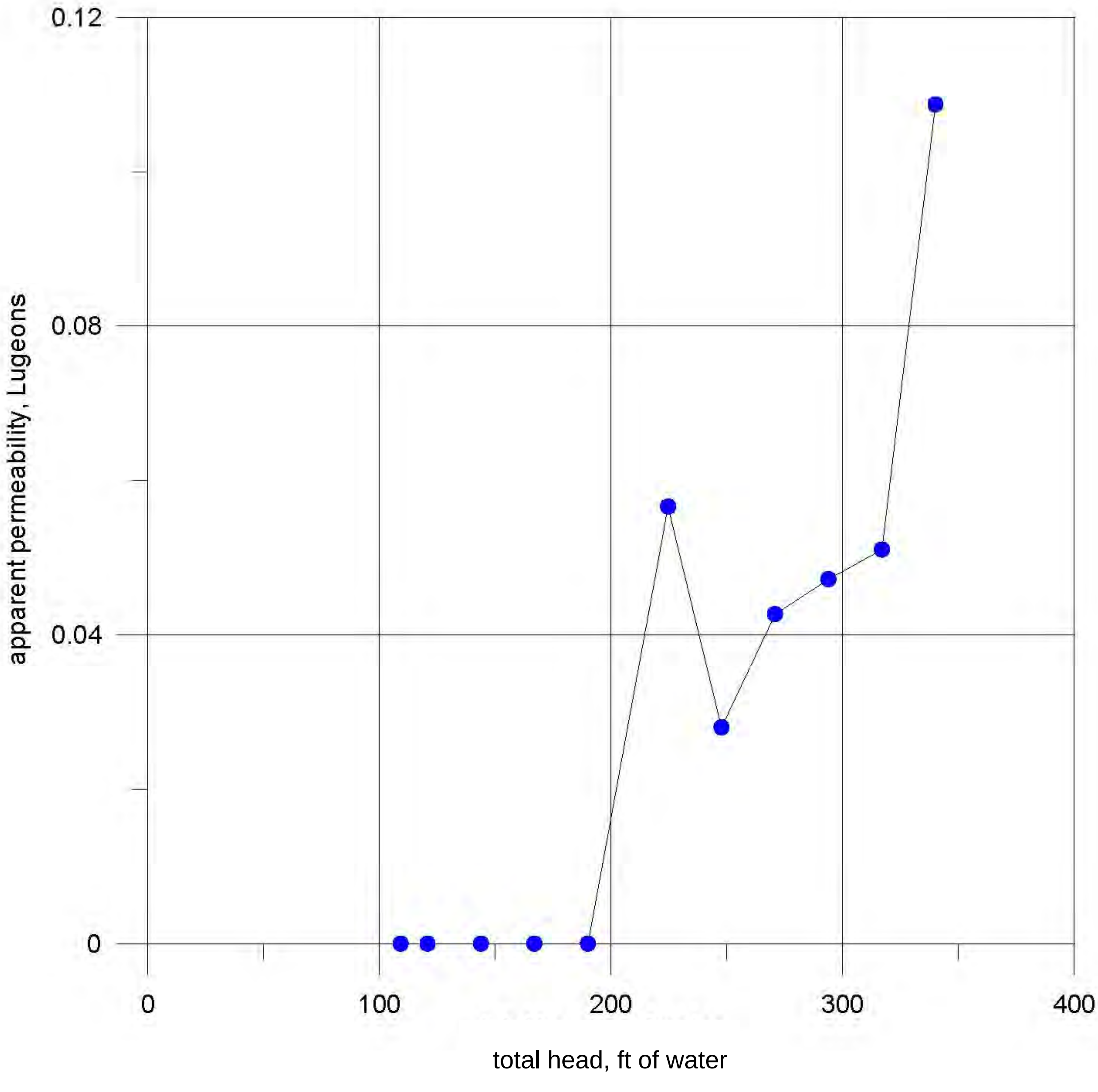

Figure 3. Apparent permeability from pressure injection test, New Mexico Copper GWQ 5-R, Zone 1 (64-100 ft), Series 1, August 31, 2011.

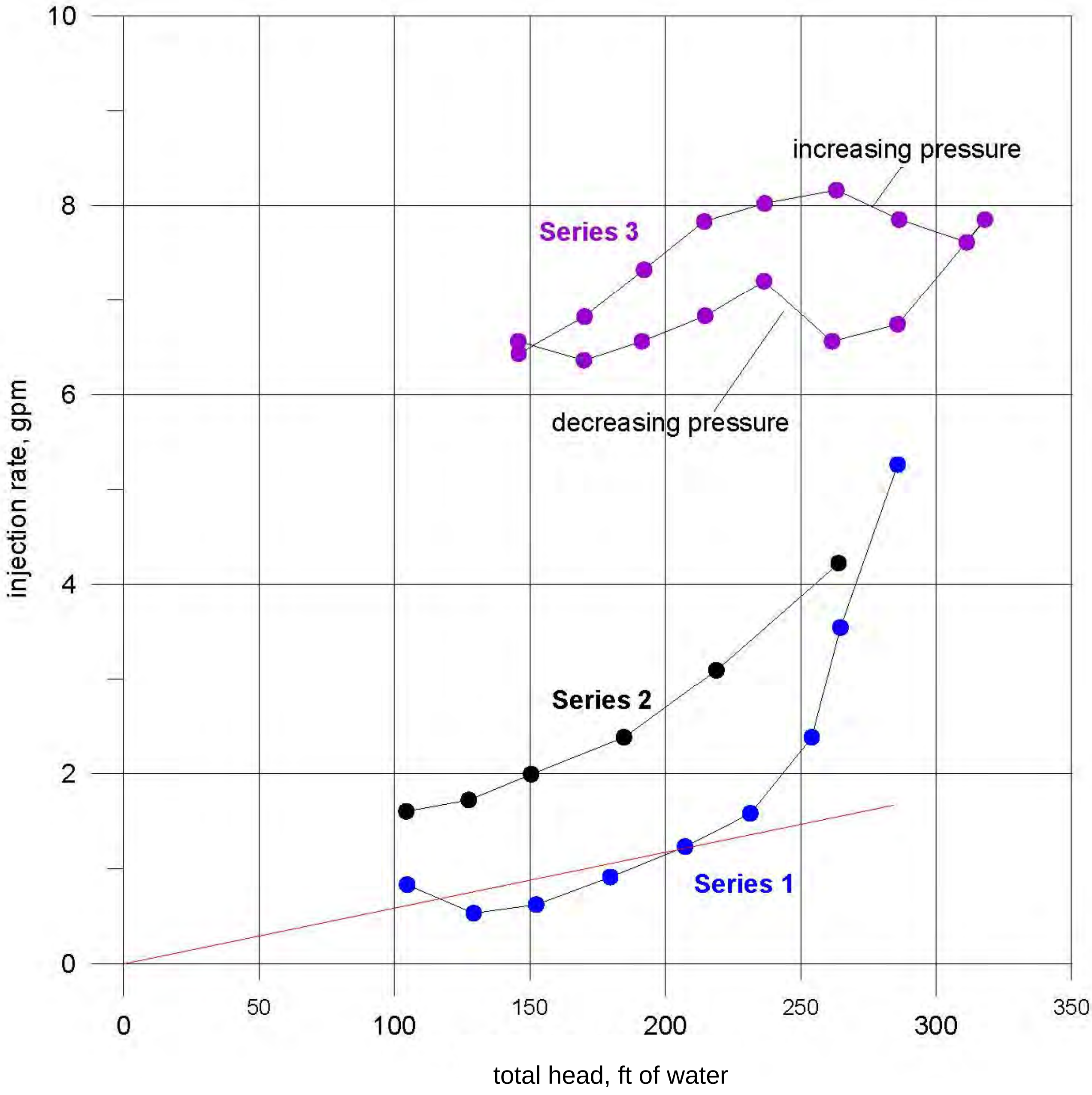

Figure 4. Pressure injection tests, New Mexico Copper GWQ 11-24, Zone 1 (100-147 ft), Series 1 and 2 (centrifugal pump), and Series 3 (positive displacement pump), July 27, 2011.

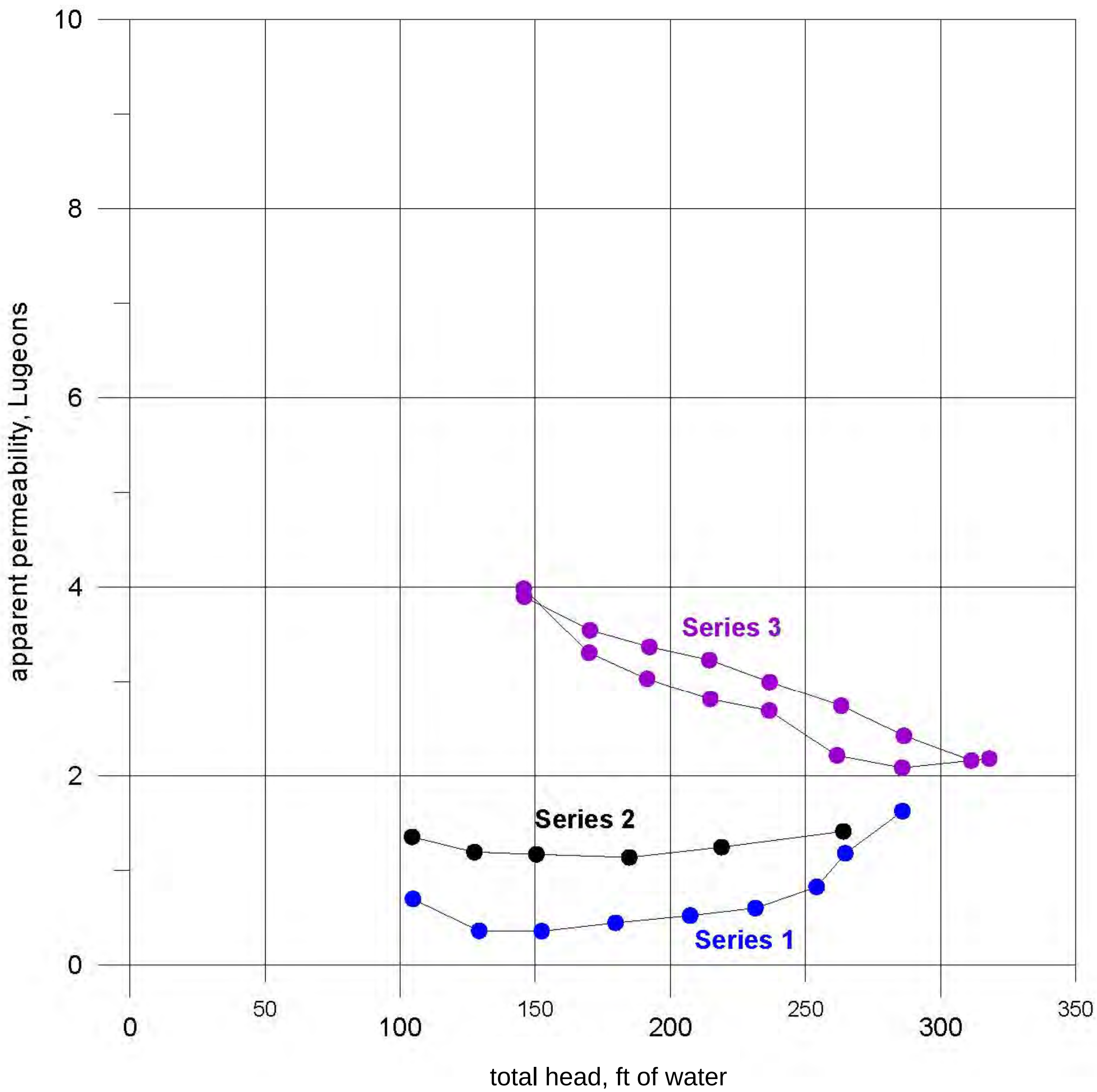

Figure 5. Apparent permeability from pressure injection tests, New Mexico Copper GWQ 11-24, Zone 1 (100-147 ft), Series 1 and 2 (centrifugal pump), and Series 3 (positive displacement pump), July 27, 2011.

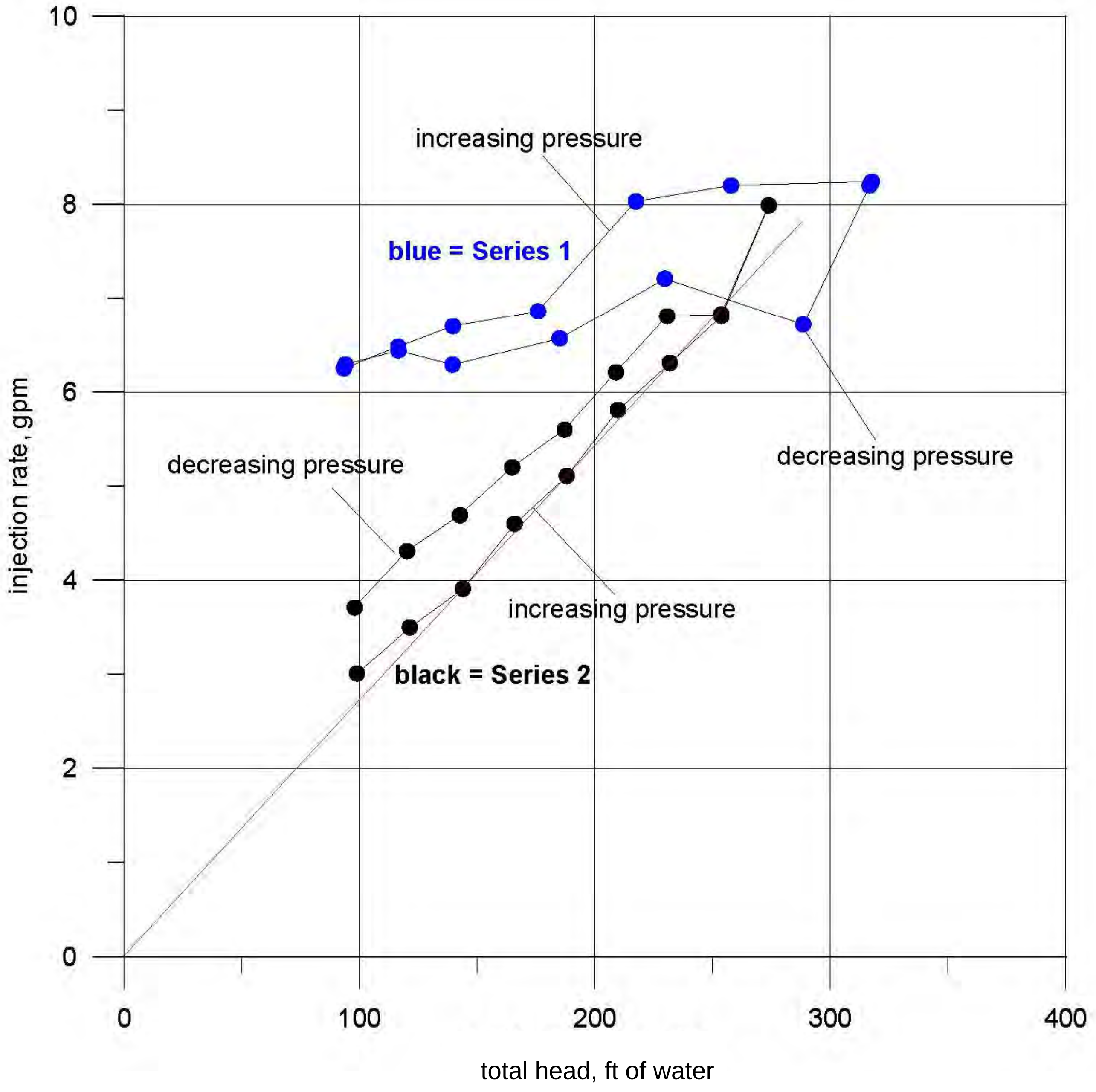

Figure 6. Pressure injection test, New Mexico Copper GWQ 11-24, Zone 2 (150-197 ft), Series 1 and 2, July 30, 2011.

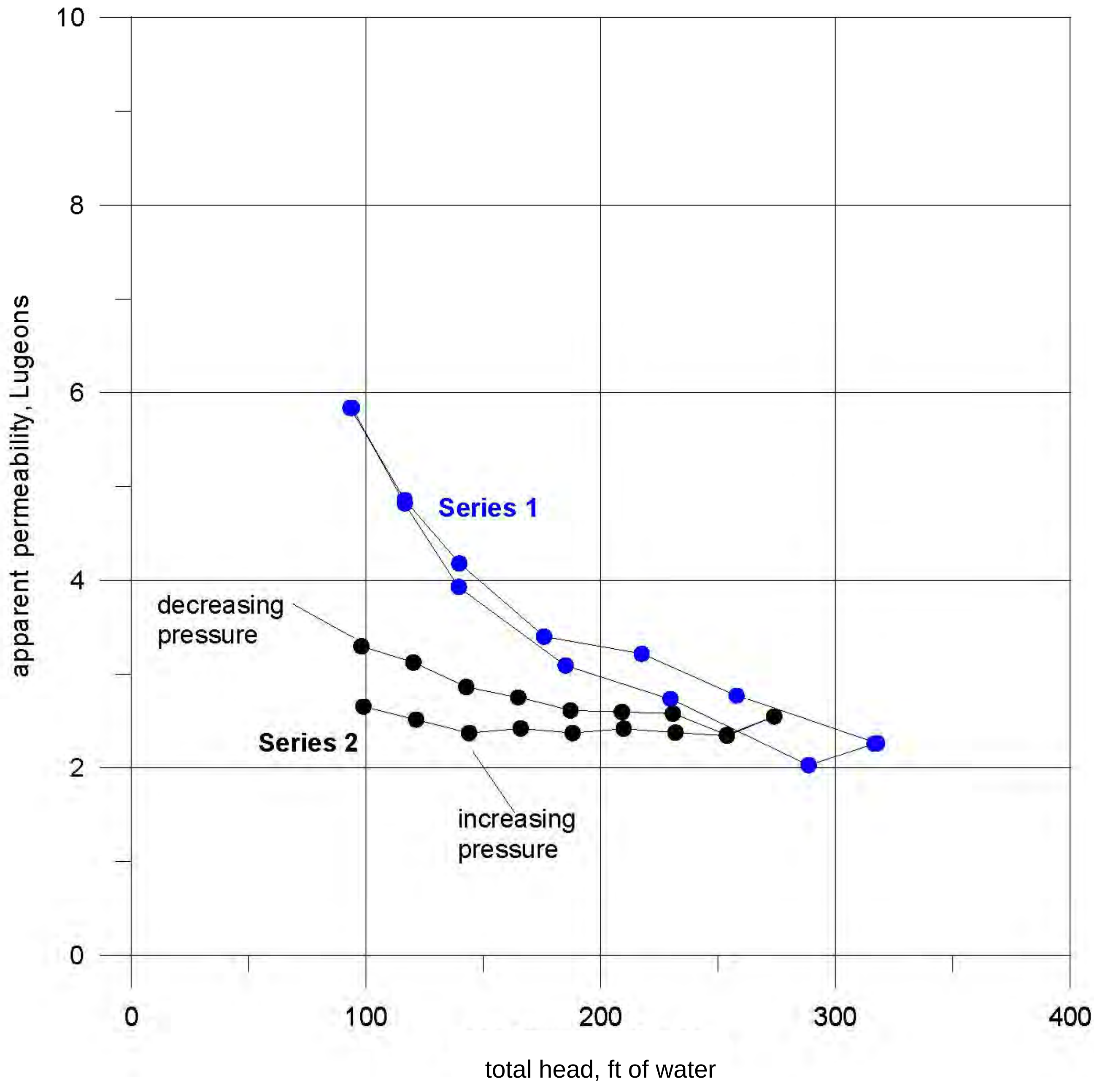

Figure 7. Apparent permeability from pressure injection test, New Mexico Copper GWQ 11-24, Zone 2 (150-197 ft), Series 1 and 2, July 30, 2011.

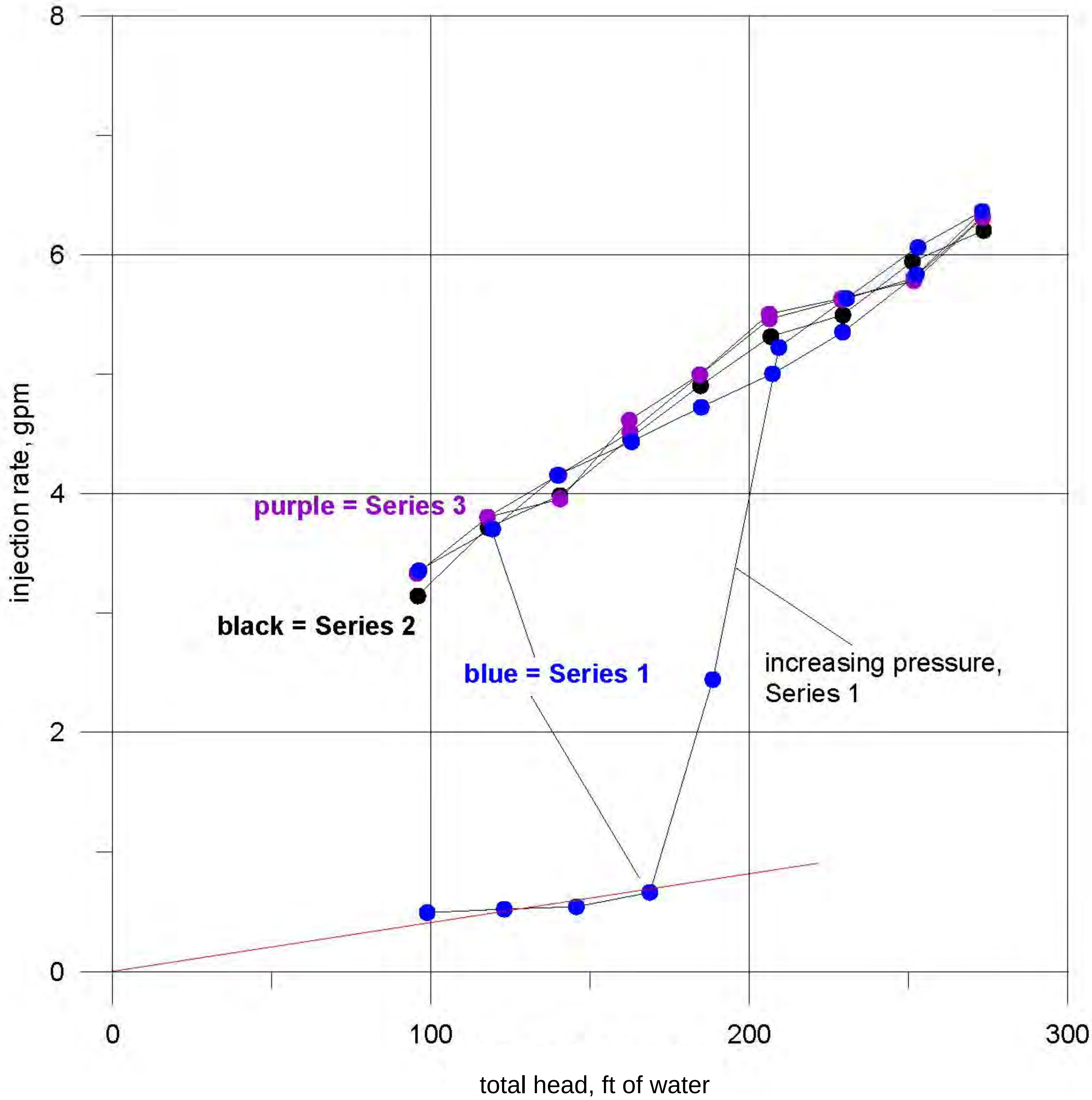

Figure 8. Pressure injection test, New Mexico Copper GWQ 11-24,
Zone 3 (204-251 ft), Series 1, 2, and 3, August 1, 2011.

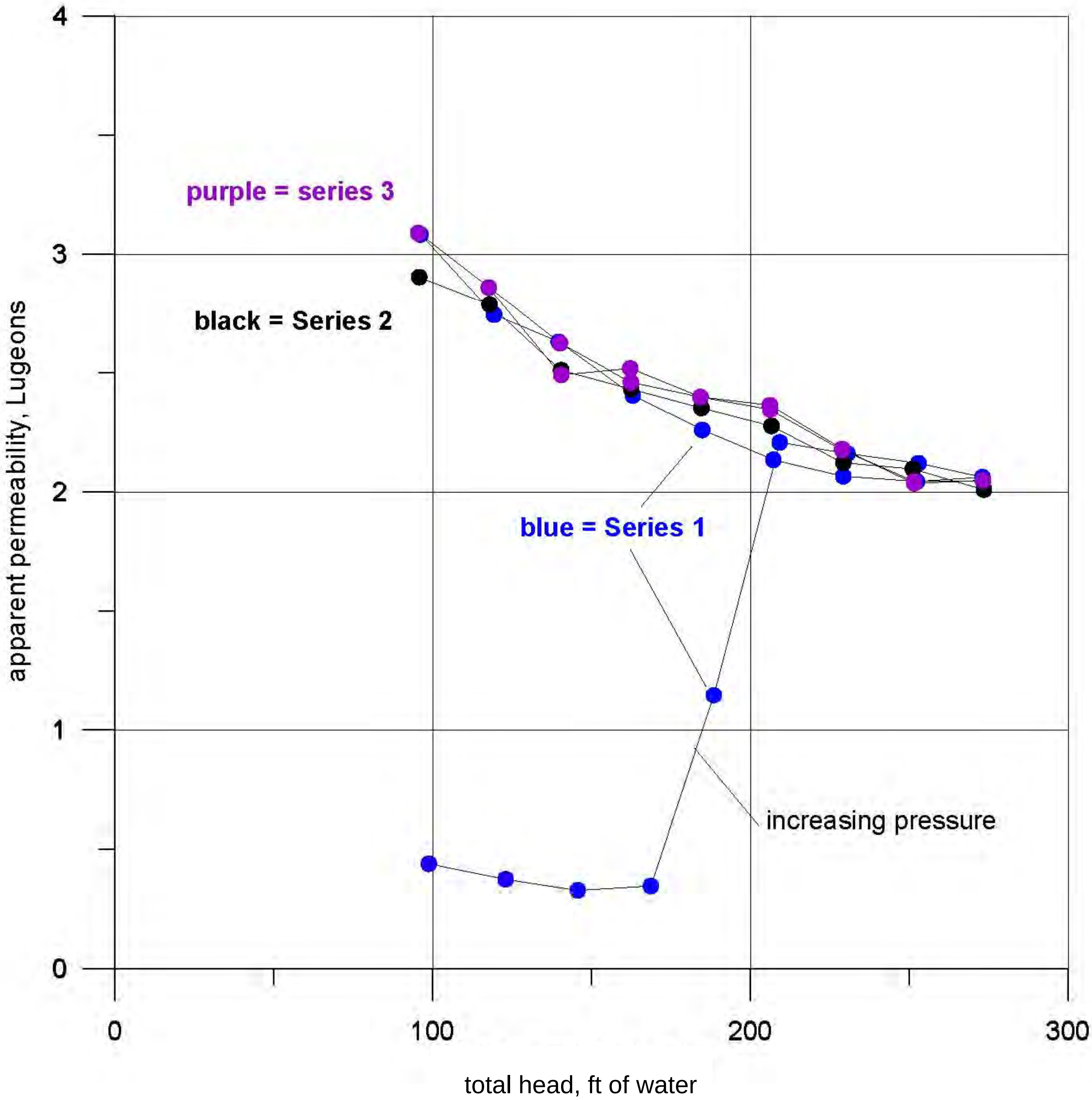

Figure 9. Apparent permeability from pressure injection test, New Mexico Copper GWQ 11-24, Zone 3 (204-251 ft), Series 1, 2, and 3, August 1, 2011.

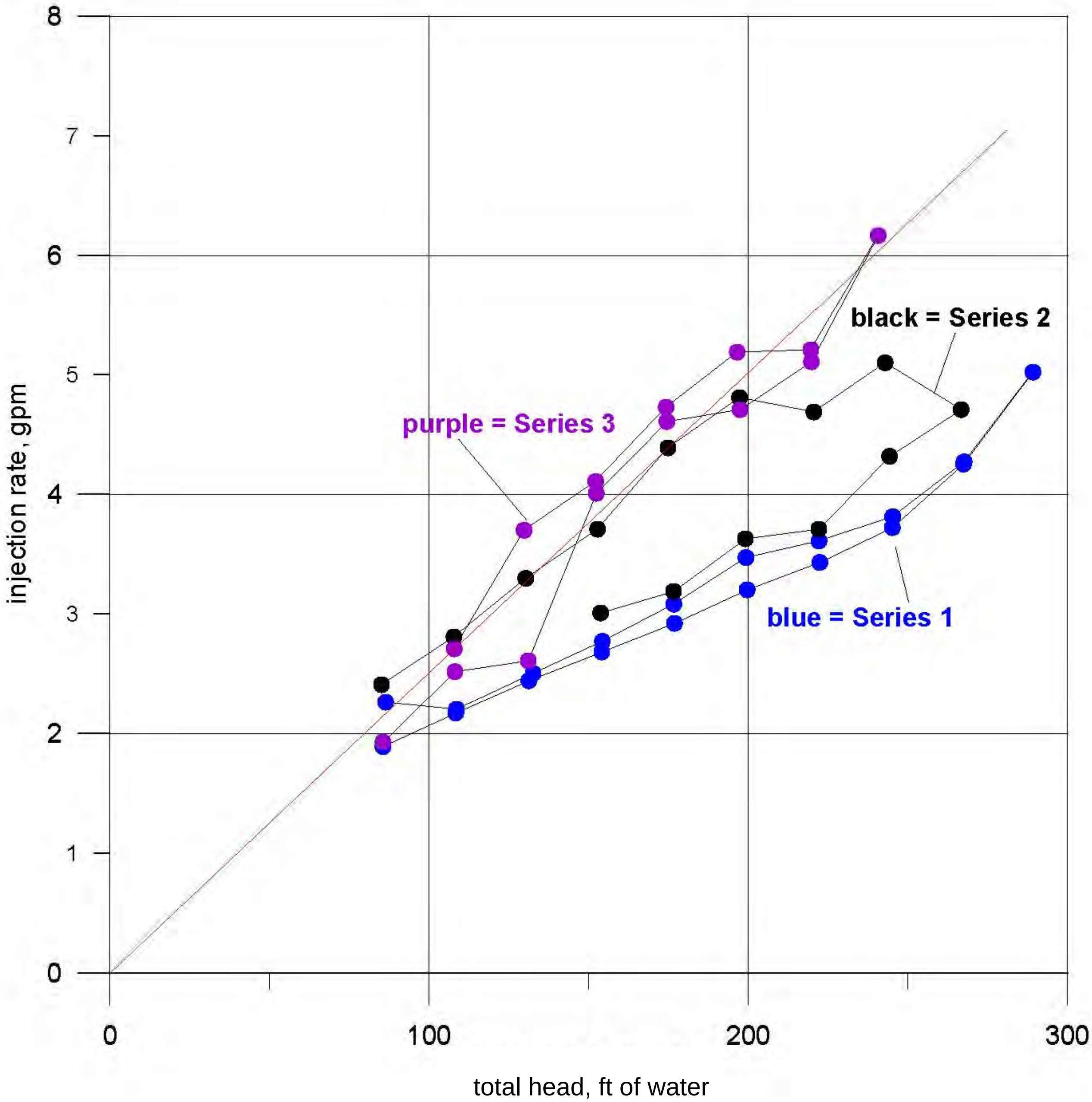

Figure 10. Pressure injection test, New Mexico Copper GWQ 11-25, Zone 2 (150-197.7 ft), Series 1, 2, and 3, August 16, 2011.

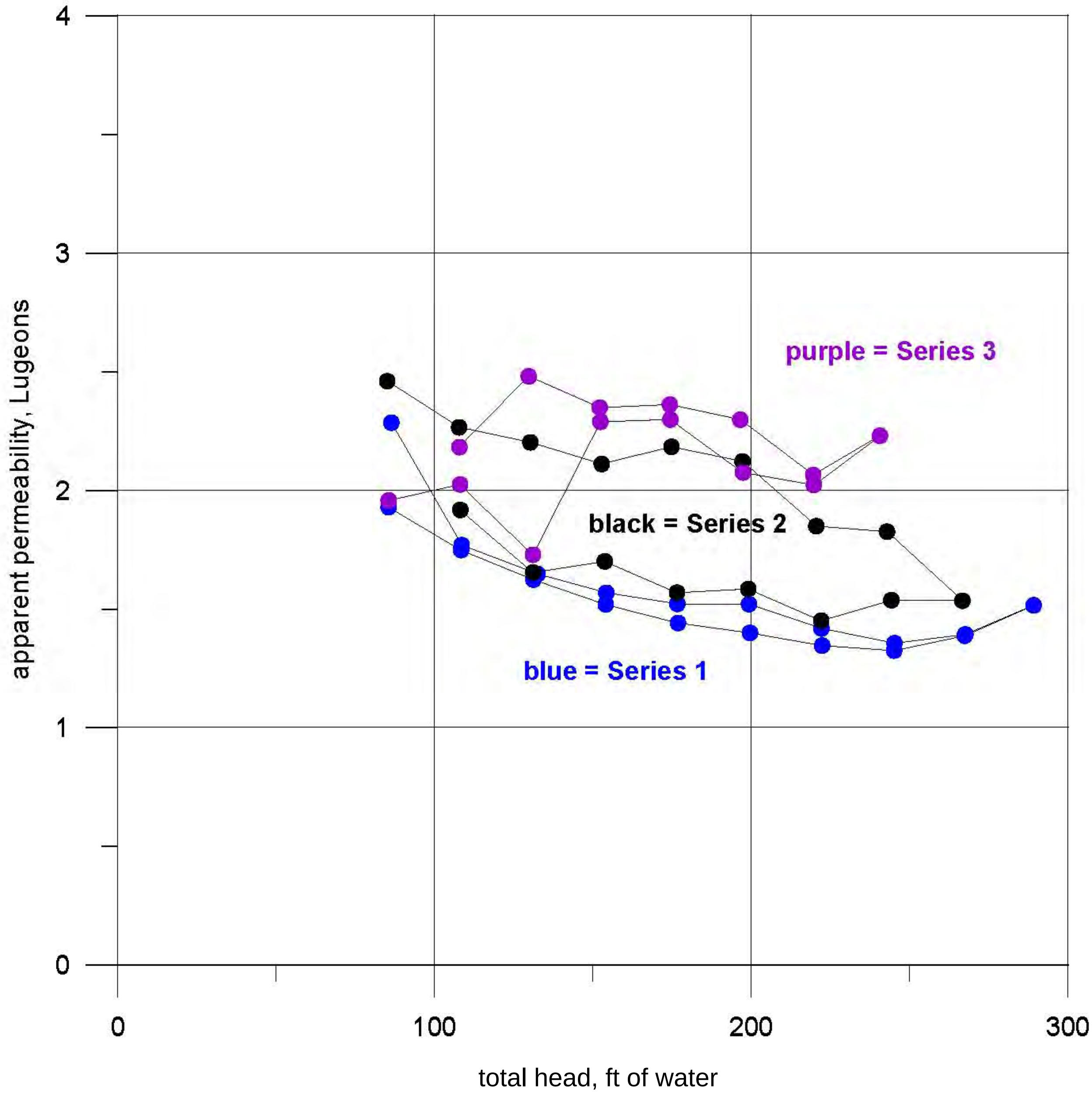

Figure 11. Apparent permeability from pressure injection test, New Mexico Copper GWQ 11-25, Zone 2 (150-197.7 ft), Series 1, 2, and 3, August 16, 2011.

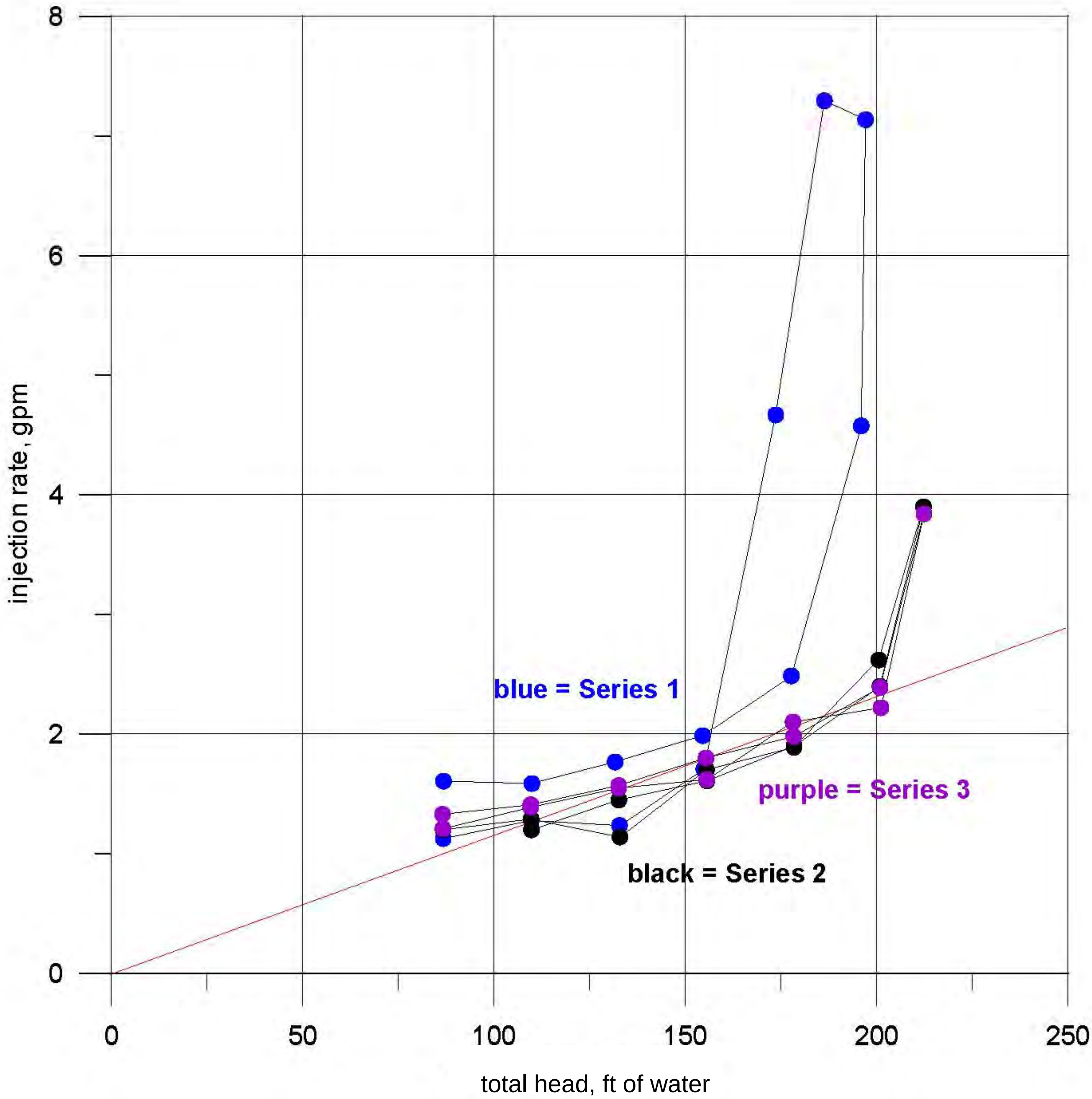

Figure 12. Pressure injection test, New Mexico Copper GWQ 11-25,
Zone 3 (207-251 ft), Series 1, 2 and 3, August 24, 2011.

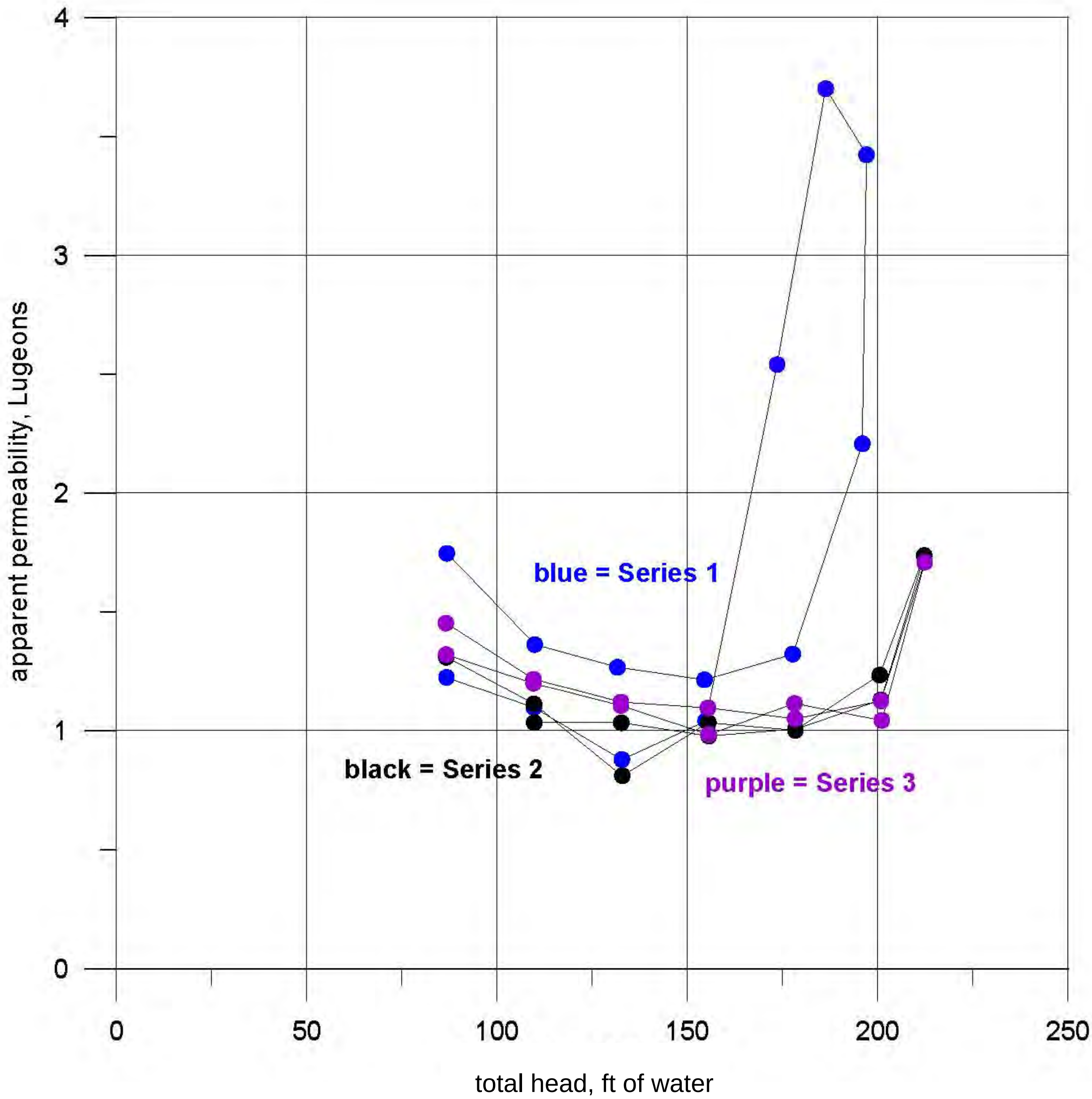

Figure 13. Apparent permeability from pressure injection test, New Mexico Copper GWQ 11-25, Zone 3 (207-251 ft), Series 1, 2, and 3, August 24, 2011.

APPENDIX

Appendix.

Basic data for pressure-injection tests

JOHN SHOMAKER & ASSOCIATES, INC.
WATER-RESOURCE AND ENVIRONMENTAL CONSULTANTS
2611 BROADBENT PARKWAY NE
ALBUQUERQUE, NEW MEXICO 87107
(505) 345-3407, FAX (505) 345-9920
WWW.SHOMAKER.COM

Date	8/31/2011
Client	New Mexico Copper Corp
Project	Copper Flat
Well Name	GWQ 5-R
Hydrologist	JJK

later WLs indicate dry to 100 ft; use (64+100)/2

Starting Water Level (ft bgl)	5.6 (not representative of Static)
Elevation (ft GL)	
Injection Interval (ft bgl)	64 to 100
Bore/Casing Depth (ft bgl)	100
Packer Dia	2 inch
Bore/Casing Dia	3-3/4 inch
Injection Pipe Dia	1 inch
Pressure gauge height above GL	4 ft

Time 24 hr.	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
11:25	0		6000		10	0	Packer at 200 psi
11:26	1	1	6000	0.00	10	0	
11:27	2	2	6000	0.00	10	0	
11:28	3	3	6000	0.00	10	0	
11:29	4	4	6000	0.00	10	0	
11:30	5	5	6000	0.00	10	0	
11:31	6	1	6000	0.00	20	0	
11:32	7	2	6000	0.00	20	0	
11:33	8	3	6000	0.00	20	0	
11:34	9	4	6000	0.00	20	0	
11:35	10	5	6000	0.00	20	0	
11:36	11	1	6000	0.00	30	0	
11:37	12	2	6000	0.00	30	0	
11:38	13	3	6000	0.00	30	0	
11:39	14	4	6000	0.00	30	0	
11:40	15	5	6000	0.00	30	0	
11:41	16	1	6000	0.00	40	0	
11:42	17	2	6000	0.00	40	0	
11:43	18	3	6000	0.00	40	0	
11:44	19	4	6000	0.00	40	0	
11:45	20	5	6000	0.00	40	0	
11:46	21	1	6000	0.00	50	0	
11:47	22	2	6000	0.00	50	0	
11:48	23	3	6000	0.00	50	0	
11:49	24	4	6000	0.00	50	0	
11:50	25	5	6000	0.00	50	0	
11:51	26	1	6000	0.00	60	0	
11:52	27	2	6000	0.00	60	0	
11:53	28	3	6000.3	0.30	60	0.3	
11:54	29	4	6000.3	0.00	60	0.3	
11:55	30	5	6000.5	0.20	60	0.5	
11:56	31	1	6000.7	0.2	60	0.7	
11:57	32	2	6000.9	0.2	60	0.9	
11:58	33	3	6001	0.1	60	1	
11:59	34	4	6001.1	0.1	60	1.1	
12:00	35	5	6001.1	0	60	1.1	
12:01	36	1	6001.2	0.1	70	1.2	
12:02	37	2	6001.2	0	70	1.2	
12:03	38	3	6001.2	0	70	1.2	
12:04	39	4	6001.3	0.1	70	1.3	
12:05	40	5	6001.3	0	70	1.3	
12:06	41	6	6001.5	0.2	70	1.5	
12:07	42	7	6001.5	0	70	1.5	
12:08	43	8	6001.5	0	70	1.5	
12:09	44	9	6001.7	0.2	70	1.7	

Time 24 hr.	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
12:10	45	10	6001.7	0	70	1.7	
12:11	46	1	6001.9	0.2	80	1.9	
12:12	47	2	6002	0.1	80	2	
12:13	48	3	6002.1	0.1	80	2.1	
12:14	49	4	6002.1	0	80	2.1	
12:15	50	5	6002.1	0	80	2.1	
12:16	51	6	6002.4	0.3	80	2.4	
12:17	52	7	6002.4	0	80	2.4	
12:18	53	8	6002.5	0.1	80	2.5	
12:19	54	9	6002.7	0.2	80	2.7	
12:20	55	10	6002.7	0	80	2.7	
12:21	56	1	6002.8	0.1	90	2.8	
12:22	57	2	6003	0.2	90	3	
12:23	58	3	6003	0	90	3	
12:24	59	4	6003.2	0.2	90	3.2	
12:25	60	5	6003.2	0	90	3.2	
12:26	61	6	6003.3	0.1	90	3.3	
12:27	62	7	6003.4	0.1	90	3.4	
12:28	63	8	6003.6	0.2	90	3.6	
12:29	64	9	6003.7	0.1	90	3.7	
12:30	65	10	6003.9	0.2	90	3.9	
12:31	66	1	6004	0.10	100	4	
12:32	67	2	6004.2	0.20	100	4.2	
12:33	68	3	6004.2	0.00	100	4.2	
12:34	69	4	6004.5	0.30	100	4.5	
12:35	70	5	6004.7	0.20	100	4.7	
12:36	71	1	6004.7	0	100	4.7	
12:37	72	2	6004.9	0.2	100	4.9	
12:38	73	3	6005.1	0.2	100	5.1	
12:39	74	4	6005.1	0	100	5.1	
12:40	75	5	6005.3	0.2	100	5.3	
12:41	76	1	6005.7	0.4	110	5.7	
12:42	77	2	6006	0.3	110	6	
12:43	78	3	6006.4	0.4	110	6.4	
12:44	79	4	6006.6	0.2	110	6.6	
12:45	80	5	6006.9	0.3	110	6.9	
12:46	81	6	6007.3	0.4	110	7.3	
12:47	82	7	6007.7	0.4	110	7.7	
12:48	83	8	6007.9	0.2	110	7.9	
12:49	84	9	6008.2	0.3	110	8.2	
12:50	85	10	6008.5	0.3	110	8.5	
12:51	86	1	6011.2	2.7	120	11.2	Fluid moving up hole
12:52	87	2	6013.8	2.6	122	13.8	
12:53	88	3	6016.2	2.4	115	16.2	Fluid at top of conductor
12:54	89	4	6021.2	5	113	21.2	
12:55	90	5	6026.3	5.1	110	26.3	
12:56	91	6	6032	5.7	110	32	
12:57	92	7	6037.6	5.6	110	37.6	
12:58	93	8	6043.5	5.9	110	43.5	
12:59	94	9	6049.2	5.7	110	49.2	Approximatly 5 + gallons flowing at surface
13:00	95	10	6055	5.8	110	55	Stop pump
13:01	96		6055	0		NA	Packer pressure has dropped to 160
13:02	97		6055	0		NA	
13:03	98		6055	0		NA	
13:04	99		6055	0		NA	
13:05	100		6055	0		NA	
13:06	101		6055	0		NA	Attempt to reinflate packer and stabilize

Time 24 hr.	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
13:07	102		6055	0		NA	
13:08	103		6055	0		NA	
13:09	104		6055	0		NA	
13:10	105		6055	0		NA	Unable to stabilize packer psi
13:11	106		6055	0		NA	
13:12	107		6055	0		NA	
13:13	108		6055	0		NA	
13:14	109		6055	0		NA	
13:15	110		6055	0		NA	
13:16	111		6055	0		NA	
13:17	112		6055	0		NA	
13:18	113		6055	0		NA	
13:19	114		6055	0		NA	
13:20	115		6055	0		NA	Pull and replace packer
13:21	116		6055	0		NA	
13:22	117		6055	0		NA	
13:23	118		6055	0		NA	
13:24	119		6055	0		NA	
13:25	120		6055	0		NA	
13:26	121		6055	0		NA	
13:27	122		6055	0		NA	
13:28	123		6055	0		NA	
13:29	124		6055	0		NA	
13:30	125		6055	0		NA	
13:31	126		6055	0		NA	
13:32	127		6055	0		NA	
13:33	128		6055	0		NA	
13:34	129		6055	0		NA	
13:35	130		6055	0		NA	
13:36	131		6055	0		NA	
13:37	132		6055	0		NA	
13:38	133		6055	0		NA	
13:39	134		6055	0		NA	
13:40	135		6055	0		NA	
13:41	136		6055	0		NA	
13:42	137		6055	0		NA	
13:43	138		6055	0		NA	
13:44	139		6055	0		NA	
13:45	140		6055	0		NA	
13:46	141		6055	0		NA	
13:47	142		6055	0		NA	
13:48	143		6055	0		NA	
13:49	144		6055	0		NA	
13:50	145		6055	0		NA	
13:51	146		6055	0		NA	
13:52	147		6055	0		NA	
13:53	148		6055	0		NA	
13:54	149		6055	0		NA	
13:55	150		6055	0		NA	
13:56	151		6055	0		NA	
13:57	152		6055	0		NA	
13:58	153		6055	0		NA	
13:59	154		6055	0		NA	New packer installed and inflated to 200 psi
14:00	155	1	6057	2	100	55	Filling hose and 1 inch
14:01	156	2	6057.4	0.4	110		
14:02	157	3	6057.5	0.1	110		
14:03	158	4	6057.5	0	125		
14:04	159	5	6057.5	0	123		

Time 24 hr.	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
14:05	160	6	6057.5	0	120		
14:06	161	7	6057.5	0	120		Pump shear pin fails
14:07	162	8	6057.5	0	0		Stop to repair pump
14:08	163		6057.5	0	0		
14:09	164		6057.5	0	0		
14:10	165		6057.5	0	0		
14:11	166		6057.5	0	0		
14:12	167		6057.5	0	0		
14:13	168		6057.5	0	0		
14:14	169		6057.5	0	0		
14:15	170		6057.5	0	0		
14:16	171		6057.5	0	0		
14:17	172		6057.5	0	0		
14:18	173		6057.5	0	0		
14:19	174		6057.5	0	0		
14:20	175		6057.5	0	0		
14:21	176		6057.5	0	0		
14:22	177		6057.5	0	0		
14:23	178		6057.5	0	0		
14:24	179		6057.5	0	0		
14:25	180		6057.5	0	0		
14:26	181		6057.5	0	0		
14:27	182		6057.5	0	0		
14:28	183		6057.5	0	0		
14:29	184		6057.5	0	0		
14:30	185		6057.5	0	0		
14:31	186		6057.5	0	0		
14:32	187		6057.5	0	0		
14:33	188		6057.5	0	0		
14:34	189		6057.5	0	0		
14:35	190		6057.5	0	0		
14:36	191		6057.5	0	0		
14:37	192		6057.5	0	0		
14:38	193		6057.5	0	0		
14:39	194		6057.5	0	0		
14:40	195		6057.5	0	0		
14:41	196		6057.5	0	0		
14:42	197		6057.5	0	0		
14:43	198		6057.5	0	0		
14:44	199		6057.5	0	0		
14:45	200		6057.5	0	0		
14:46	201		6057.5	0	0		
14:47	202		6057.5	0	0		
14:48	203		6057.5	0	0		
14:49	204		6057.5	0	0		
14:50	205		6057.5	0	0		
14:51	206		6057.5	0	0		
14:52	207		6057.5	0	0		
14:53	208		6057.5	0	0		
14:54	209		6057.5	0	0		
14:55	210		6057.5	0	0		
14:56	211		6057.5	0	0		
14:57	212		6060	2.5	0		Test pump to ground
14:58	213		6067.5	7.5	0		
14:59	214		6075	7.5	0		
15:00	215		6082.5	7.5	0		
15:01	216		6082.5	0	0		
15:02	217		6082.5	0	0		

Time 24 hr.	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
15:03	218		6082.5	0	0		
15:04	219		6082.5	0	0		
15:05	220		6082.5	0	0		
15:06	221		6082.5	0	0		
15:07	222		6082.5	0	0		
15:08	223		6082.5	0	0		
15:09	224		6082.5	0	0		
15:10	225		6082.5	0	0		
15:11	226	1	6082.7	0.2	120	55.2	
15:12	227	2	6082.9	0.2	120	55.4	
15:13	228	3	6083	0.1	120	55.5	
15:14	229	4	6083	0	120	55.5	
15:15	230	5	6083.2	0.2	120	55.7	
15:16	231	6	6083.3	0.1	120	55.8	
15:17	232	7	6083.3	0	120	55.8	
15:18	233	8	6083.3	0	120	55.8	
15:19	234	9	6083.3	0	120	55.8	
15:20	235	10	6083.3	0	120	55.8	
15:21	236	1	6083.3	0	130	28.3	
15:22	237	2	6083.3	0	130	28.3	
15:23	238	3	6083.4	0.1	130	28.4	
15:24	239	4	6083.4	0	130	28.4	
15:25	240	5	6083.4	0	130	28.4	
15:26	241	6	6083.4	0	130	28.4	
15:27	242	7	6083.4	0	130	28.4	
15:28	243	8	6083.4	0	130	28.4	
15:29	244	9	6083.5	0.1	130	28.5	
15:30	245	10	6083.5	0	130	28.5	
15:31	246	1	6083.5	0	150	28.5	
15:32	247	2	6083.5	0	150	28.5	
15:33	248	3	6083.6	0.1	150	28.6	1 inch injection pipe pushing up
15:34	249	4	6083.7	0.1	150	28.7	
15:35	250	5	6083.7	0	150	28.7	Packer pressure moving up 240
15:36	251	6	6083.7	0	150	28.7	
15:37	252	7	6083.7	0	150	28.7	Packer pressure moving up 260
15:38	253	8	6083.7	0	150	28.7	
15:39	254	9	6083.9	0.2	150	28.9	Packer pressure moving up 290
15:40	255	10	6084	0.1	150	29	
15:41	256	1	6084	0	130	29	
15:42	257	2	6084	0	130	29	
15:43	258	3	6084.2	0.2	130	29.2	
15:44	259	4	6084.2	0	130	29.2	
15:45	260	5	6084.2	0	130	29.2	Packer pressure down to 260
15:46	261	6	6084.2	0	130	29.2	
15:47	262	7	6084.3	0.1	130	29.3	
15:48	263	1	6084.3	0	120	29.3	
15:49	264	2	6084.3	0	120	29.3	
15:50	265	3	6084.3	0	120	29.3	
15:51	266	4	6084.3	0	120	29.3	
15:52	267	5	6084.3	0	120	29.3	
15:53	268	6	6084.3	0	120	29.3	
15:54	269	7	6084.3	0	120	29.3	
15:55	270	8	6084.3	0	120	29.3	
15:56	271	9	6084.3	0	120	29.3	
15:57	272	10	6084.4	0.1	120	29.4	
15:58	273	1	6084.4	0	110	29.4	
15:59	274	2	6084.4	0	110	29.4	

Time 24 hr.	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
16:00	275	3	6084.4	0	110	29.4	
16:01	276	4	6084.5	0.1	110	29.5	
16:02	277	5	6084.5	0	110	29.5	
16:03	278	1	6084.5	0	100	29.5	
16:04	279	2	6084.5	0	100	29.5	
16:05	280	3	6084.5	0	100	29.5	
16:06	281	4	6084.5	0	100	29.5	
16:07	282	5	6084.5	0	100	29.5	
16:08	283	1	6084.5	0	90	29.5	
16:09	284	2	6084.5	0	90	29.5	
16:10	285	3	6084.5	0	90	29.5	
16:11	286	4	6084.5	0	90	29.5	
16:12	287	5	6084.5	0	90	29.5	
16:13	288	1	6084.5	0	80	29.5	
16:14	289	2	6084.5	0	80	29.5	
16:15	290	3	6084.5	0	80	29.5	
16:16	291	4	6084.5	0	80	29.5	
16:17	292	5	6084.5	0	80	29.5	
16:18	293	1	6084.5	0	70	29.5	
16:19	294	2	6084.5	0	70	29.5	
16:20	295	3	6084.5	0	70	29.5	
16:21	296	4	6084.5	0	70	29.5	
16:22	297	5	6084.5	0	70	29.5	
16:23	298	1	6084.5	0	60	29.5	
16:24	299	2	6084.5	0	60	29.5	
16:25	300	3	6084.5	0	60	29.5	
16:26	301	4	6084.5	0	60	29.5	
16:27	302	5	6084.5	0	60	29.5	
16:28	303	1	6084.5	0	50	29.5	
16:29	304	2	6084.5	0	50	29.5	
16:30	305	3	6084.5	0	50	29.5	
16:31	306	4	6084.5	0	50	29.5	
16:32	307	5	6084.5	0	50	29.5	
16:33	308	1	6084.5	0	40	29.5	
16:34	309	2	6084.5	0	40	29.5	
16:35	310	3	6084.5	0	40	29.5	
16:36	311	4	6084.5	0	40	29.5	
16:37	312	5	6084.5	0	40	29.5	
16:38	313	1	6084.5	0	30	29.5	
16:39	314	2	6084.5	0	30	29.5	
16:40	315	3	6084.5	0	30	29.5	
16:41	316	4	6084.5	0	30	29.5	
16:42	317	5	6084.5	0	30	29.5	
16:43	318	6	6084.5	0	20	29.5	
16:44	319	7	6084.5	0	20	29.5	
16:45	320	8	6084.5	0	20	29.5	
16:46	321	9	6084.5	0	20	29.5	
16:47	322	10	6084.5	0	20	29.5	

Repeated steps summarized								
psi increased		psi decreased		psi increased		psi decreased		Notes
Injection rate, gals	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	
								No duplicat test performed

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Date	**7/21/2011**
Client	**New Mexico Copper Corp**
Project	**Copper Flat**
Well Name	**GWQ 11-24 Zone 1**
Hydrologist	**JJK**

Starting Water Level (ft bgl)	**54.61**	**Packer Dia**	**2 inch**
Elevation (ft GL)		**Bore/Casing Dia**	**3-3/4 inch**
Injection Interval (ft bgl)	**100 to 147**	**Injection Pipe Dia**	**1 inch**
Bore/Casing Depth (ft bgl)	**147**	**Pressure gauge height above GL**	**4 ft**

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
8:25	0		9		20	0	20 psi
8:26	1	1	9.8	0.80	20	0.8	
8:27	2	2	10.59	0.79	20	1.59	
8:28	3	3	11.4	0.81	20	2.4	
8:29	4	4	12.2	0.80	20	3.2	
8:30	5	5	13.1	0.90	20	4.1	
8:31	6	6	14	0.90	20	5	
8:32	7	7	14.8	0.80	20	5.8	
8:33	8	8	15.6	0.80	20	6.6	
8:34	9	9	16.5	0.90	20	7.5	
8:35	10	10	17.3	0.80	20	8.3	Average 0.83 gpm
8:36	11	1	17.8	0.5	30	8.8	30 psi
8:37	12	2	18.3	0.5	32	9.3	
8:38	13	3	18.9	0.6	30	9.9	
8:39	14	4	19.6	0.7	31	10.6	
8:40	15	5	20	0.4	30	11	
8:41	16	6	20.5	0.5	32	11.5	
8:42	17	7	21	0.5	31	12	
8:43	18	8	21.5	0.5	30	12.5	
8:44	19	9	22.1	0.6	30	13.1	
8:45	20	10	22.6	0.5	30	13.6	Average 0.53 gpm
8:46	21	1	23.22	0.62	40	14.22	Attempt 40 psi. Oscillating + - 5 psi
8:47	22	2	23.8	0.58	40	14.8	
8:48	23	3	24.4	0.6	40	15.4	
8:49	24	4	25	0.6	40	16	
8:50	25	5	25.6	0.6	40	16.6	
8:51	26	6	26.3	0.7	40	17.3	
8:52	27	7	26.9	0.6	40	17.9	
8:53	28	8	27.5	0.6	40	18.5	
8:54	29	9	28.1	0.6	42	19.1	
8:55	30	10	28.8	0.7	44	19.8	Average 0.62 gpm
8:56	31	1	29.7	0.9	50-55	20.7	Attempt 50 psi. Oscillating + - 5 psi
8:57	32	2	30.6	0.9	50-55	21.6	
8:58	33	3	31.5	0.9	50-55	22.5	
8:59	34	4	32.4	0.9	50-55	23.4	
9:00	35	5	33.3	0.9	50-55	24.3	
9:01	36	6	34.3	1	50-55	25.3	
9:02	37	7	35.2	0.9	50-55	26.2	
9:03	38	8	36.2	1	50-55	27.2	
9:04	39	9	37	0.8	50-55	28	
9:05	40	10	37.9	0.9	50-55	28.9	Average 0.91 gpm
9:06	41	1	39.1	1.2	60	30.1	Attempt 60 psi. Oscillating + - 8 psi
9:07	42	2	40.3	1.2	65	31.3	
9:08	43	3	41.5	1.2	65	32.5	
9:09	44	4	42.8	1.3	65	33.8	

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
9:10	45	5	44	1.2	65	35	
9:11	46	6	45.3	1.3	65	36.3	
9:12	47	7	46.6	1.3	65	37.6	
9:13	48	8	47.8	1.2	65	38.8	
9:14	49	9	49	1.2	65	40	
9:15	50	10	50.2	1.2	65	41.2	Average 1.23 gpm
9:16	51	1	51.8	1.6	75	42.8	Attempt 70 psi Oscillating + - 10 to 12 psi
9:17	52	2	53.4	1.6	75	44.4	
9:18	53	3	55	1.6	75	46	
9:19	54	4	56.5	1.5	75	47.5	
9:20	55	5	58	1.5	75	49	
9:21	56	6	59.6	1.6	75	50.6	
9:22	57	7	61	1.4	75	52	
9:23	58	8	62.5	1.5	75	53.5	
9:24	59	9	64.1	1.6	75	55.1	
9:25	60	10	66	1.9	75	57	Average 1.58 gpm
9:26	61	1	68.4	2.4	85	59.4	Attempt 80 psi Oscillating + - 10 to 20 psi
9:27	62	2	70.7	2.3	85	61.7	
9:28	63	3	73	2.3	85	64	
9:29	64	4	75.5	2.5	85	66.5	
9:30	65	5	78	2.5	85	69	
9:31	66	6	80.3	2.3	85	71.3	
9:32	67	7	82.7	2.4	85	73.7	
9:33	68	8	85	2.3	85	76	
9:34	69	9	87.4	2.4	85	78.4	
9:35	70	10	89.8	2.4	85	80.8	Average 2.38 gpm
9:36	71	1	93.32	3.52	90	84.32	Attempt 90 psi Oscillating + - 20 to 30 psi
9:37	72	2	96.8	3.48	90	87.8	
9:38	73	3	100	3.2	90	91	
9:39	74	4	103.5	3.5	90	94.5	
9:40	75	5	107	3.5	90	98	
9:41	76	6	110.5	3.5	90	101.5	
9:42	77	7	114.2	3.7	90	105.2	
9:43	78	8	117.8	3.6	90	108.8	
9:44	79	9	121.4	3.6	90	112.4	
9:45	80	10	125.2	3.8	90	116.2	Average 3.54 gpm
9:46	81	1	130.4	5.2	100	121.4	Valve fully open readings on gauge 85 to 118
9:47	82	2	135.8	5.4	100	126.8	Test abandoned at 90 minutes due to excess
9:48	83	3	141	5.2	100	132	fluctuation in pressure gauge.
9:49	84	4	146.3	5.3	100	137.3	
9:50	85	5	151.5	5.2	100	142.5	
9:51	86	6	156.8	5.3	100	147.8	
9:52	87	7	162	5.2	100	153	
9:53	88	8	167.3	5.3	100	158.3	
9:54	89	9	172.5	5.2	100	163.5	
9:55	90	10	177.8	5.3	100	168.8	Average 5.26 gpm

Second attempt on 7-26-2011 with centrifugal pump

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
7:44	0		180				
7:45	1	1	181.6	3.8	20	1.6	
7:46	2	2	183.1	1.5	20	3.1	
7:47	3	3	184.7	1.6	20	4.7	
7:48	4	4	186.4	1.7	20	6.4	

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
7:49	5	5	188	1.6	20	8	
7:50	6	6	189.7	1.7	20	9.7	
7:51	7	7	191.2	1.5	20	11.2	
7:52	8	8	192.8	1.6	20	12.8	
7:53	9	9	194.5	1.7	20	14.5	
7:54	10	10	196	1.5	20	16	Average 1.6 gpm
7:55	11	1	197.7	1.7	30	17.7	
7:56	12	2	199.5	1.8	30	19.5	
7:57	13	3	201.3	1.8	30	21.3	
7:58	14	4	203	1.7	30	23	
7:59	15	5	204.6	1.6	30	24.6	
8:00	16	6	206.4	1.8	30	26.4	
8:01	17	7	208	1.6	30	28	
8:02	18	8	209.7	1.7	30	29.7	
8:03	19	9	211.5	1.8	30	31.5	
8:04	20	10	213.2	1.7	30	33.2	Average 1.72 gpm
8:05	21	1	215.2	2	40	35.2	
8:06	22	2	217.3	2.1	40	37.3	
8:07	23	3	219.2	1.9	40	39.2	
8:08	24	4	221	1.8	40	41	
8:09	25	5	223	2	40	43	
8:10	26	6	225.1	2.1	40	45.1	
8:11	27	7	227.2	2.1	40	47.2	
8:12	28	8	229.3	2.1	40	49.3	
8:13	29	9	231.1	1.8	40	51.1	
8:14	30	10	233.1	2	40	53.1	Average 1.99 gpm
8:15	31	1	235.5	2.4	50 - 60	55.5	Gauge reading from 45 to 65 psi
8:16	32	2	237.9	2.4	50 - 60	57.9	
8:17	33	3	240	2.1	50 - 60	60	
8:18	34	4	242.4	2.4	50 - 60	62.4	
8:19	35	5	244.9	2.5	50 - 60	64.9	
8:20	36	6	247.2	2.3	50 - 60	67.2	
8:21	37	7	249.6	2.4	50 - 60	69.6	
8:22	38	8	252	2.4	50 - 60	72	
8:23	39	9	254.5	2.5	50 - 60	74.5	
8:24	40	10	256.9	2.4	50 - 60	76.9	Average 2.38 gpm
8:25	41	1	260	3.1	65 - 75	80	Gauge reading from 60 to 80 psi
8:26	42	2	263.1	3.1	65 - 75	83.1	
8:27	43	3	266.3	3.2	65 - 75	86.3	
8:28	44	4	269.3	3.1	65 - 75	89.3	
8:29	45	5	272.3	3	65 - 75	92.3	
8:30	46	6	275.4	3.1	65 - 75	95.4	
8:31	47	7	278.4	3	65 - 75	98.4	
8:32	48	8	281.5	3.1	65 - 75	101.5	
8:33	49	9	284.7	3.2	65 - 75	104.7	
8:34	50	10	287.8	3.1	65 - 75	107.8	Average 3.09 gpm
8:35	51	1	292	4.2	80 - 100	112	Gauge reading from 65 to 115
8:36	52	2	296.1	4.1	80 - 100	116.1	Test abandoned at 60 minutes due to excess
8:37	53	3	300	3.9	80 - 100	120	fluctuation in pressure gauge
8:38	54	4	304.2	4.2	80 - 100	124.2	
8:39	55	5	308.5	4.3	80 - 100	128.5	
8:40	56	6	312.9	4.4	80 - 100	132.9	
8:41	57	7	317.2	4.3	80 - 100	137.2	
8:42	58	8	321.5	4.3	80 - 100	141.5	
8:43	59	9	325.8	4.3	80 - 100	145.8	
8:44	60	10	330	4.2	80 - 100	150	Average 4.22 gpm

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
Third attempt on 7-27-2011 with screw pump							
Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
11:20	0	0	350		40	0	
11:21	1	1	356.2	6.2	40	6.2	
11:22	2	2	362.73	6.53	40	12.73	
11:23	3	3	369.3	6.57	40	19.3	
11:24	4	4	375.8	6.5	40	25.8	
11:25	5	5	382.3	6.5	40	32.3	
11:26	6	6	388.6	6.3	40	38.6	
11:27	7	7	395.1	6.5	40	45.1	
11:28	8	8	401.6	6.5	40	51.6	
11:29	9	9	408	6.4	40	58	
11:30	10	10	414.3	6.3	41	64.3	6.43 average gpm
11:31	11	1	421.1	6.8	50	71.1	Gauge oscillating + - 3 psi
11:32	12	2	427.9	6.8	50	77.9	
11:33	13	3	434.8	6.9	51	84.8	
11:34	14	4	441.7	6.9	51	91.7	
11:35	15	5	448.6	6.9	52	98.6	
11:36	16	6	455.4	6.8	50	105.4	
11:37	17	7	462.2	6.8	52	112.2	
11:38	18	8	469	6.8	51	119	
11:39	19	9	475.8	6.8	50	125.8	
11:40	20	10	482.5	6.7	52	132.5	6.82 average gpm
11:41	21	1	489.9	7.4	60	139.9	Gauge oscillating + - 3 psi
11:42	22	2	497.2	7.3	61	147.2	
11:43	23	3	504.4	7.2	61	154.4	
11:44	24	4	511.8	7.4	62	161.8	
11:45	25	5	519.2	7.4	62	169.2	
11:46	26	6	526.4	7.2	61	176.4	
11:47	27	7	533.7	7.3	60	183.7	
11:48	28	8	541	7.3	60	191	
11:49	29	9	548.3	7.3	60	198.3	
11:50	30	10	555.7	7.4	61	205.7	7.32 average gpm
11:51	31	1	563.6	7.9	70	213.6	Gauge oscillating + - 3 psi
11:52	32	2	571.4	7.8	71	221.4	
11:53	33	3	579.1	7.7	70	229.1	
11:54	34	4	587	7.9	70	237	
11:55	35	5	594.9	7.9	71	244.9	
11:56	36	6	602.9	8	72	252.9	
11:57	37	7	610.7	7.8	72	260.7	
11:58	38	8	618.5	7.8	70	268.5	
11:59	39	9	626.3	7.8	70	276.3	
12:00	40	10	634	7.7	72	284	7.83 average gpm
12:01	41	1	642	8	81	292	Gauge oscillating + - 3 psi
12:02	42	2	650.1	8.1	81	300.1	
12:03	43	3	658.2	8.1	80	308.2	
12:04	44	4	666	7.8	80	316	
12:05	45	5	674	8	80	324	
12:06	46	6	682.2	8.2	80	332.2	
12:07	47	7	690.3	8.1	81	340.3	
12:08	48	8	698.2	7.9	82	348.2	
12:09	49	9	706.1	7.9	80	356.1	
12:10	50	10	714.2	8.1	81	364.2	8.02 average gpm

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
12:11	51	1	722.4	8.2	90	372.4	Gauge oscillating + - 4 psi
12:12	52	2	730.5	8.1	92	380.5	
12:13	53	3	738.5	8	94	388.5	
12:14	54	4	746.8	8.3	95	396.8	
12:15	55	5	755	8.2	92	405	
12:16	56	6	763.1	8.1	92	413.1	
12:17	57	7	771.3	8.2	91	421.3	
12:18	58	8	779.3	8	92	429.3	
12:19	59	9	787.5	8.2	93	437.5	
12:20	60	10	795.8	8.3	91	445.8	8.16 average gpm
12:21	61	1	803.7	7.9	100	453.7	Gauge oscillating + - 5 psi
12:22	62	2	811.4	7.7	101	461.4	
12:23	63	3	819.2	7.8	102	469.2	
12:24	64	4	827	7.8	101	477	
12:25	65	5	834.9	7.9	103	484.9	
12:26	66	6	842.8	7.9	104	492.8	
12:27	67	7	850.9	8.1	102	500.9	
12:28	68	8	858.6	7.7	104	508.6	
12:29	69	9	866.5	7.9	102	516.5	
12:30	70	10	874.3	7.8	101	524.3	7.85 average gpm
12:31	71	1	881.9	7.6	110	531.9	Gauge oscillating + - 5 psi
12:32	72	2	889.3	7.4	112	539.3	
12:33	73	3	896.9	7.6	114	546.9	
12:34	74	4	904.7	7.8	112	554.7	
12:35	75	5	912.3	7.6	115	562.3	
12:36	76	6	919.9	7.6	112	569.9	
12:37	77	7	927.6	7.7	112	577.6	
12:38	78	8	935	7.4	112	585	
12:39	79	9	942.7	7.7	113	592.7	
12:40	80	10	950.4	7.7	114	600.4	7.61 average gpm
12:41	81	1	958.3	7.9	115	608.3	Gauge oscillating + - 5 psi
12:42	82	2	966	7.7	116	616	
12:43	83	3	973.9	7.9	115	623.9	
12:44	84	4	981.8	7.9	116	631.8	
12:45	85	5	989.6	7.8	117	639.6	
12:46	86	6	997.7	8.1	115	647.7	
12:47	87	7	1005.4	7.7	115	655.4	
12:48	88	8	1013.1	7.7	117	663.1	
12:49	89	9	1021	7.9	115	671	
12:50	90	10	1028.9	7.9	116	678.9	7.85 average gpm
12:51	91	1	1035.6	6.7	101	685.6	Gauge oscillating + - 5 psi
12:52	92	2	1042.4	6.8	100	692.4	
12:53	93	3	1049	6.6	102	699	
12:54	94	4	1055.8	6.8	101	705.8	
12:55	95	5	1062.6	6.8	100	712.6	
12:56	96	6	1069.4	6.8	102	719.4	
12:57	97	7	1076.2	6.8	100	726.2	
12:58	98	8	1083	6.8	101	733	
12:59	99	9	1089.7	6.7	102	739.7	
13:00	100	10	1096.3	6.6	100	746.3	6.74 average gpm
13:01	101	1	1102.9	6.6	90	752.9	Gauge oscillating + - 4 psi
13:02	102	2	1109.5	6.6	89	759.5	
13:03	103	3	1116	6.5	90	766	
13:04	104	4	1122.6	6.6	89	772.6	
13:05	105	5	1129	6.4	90	779	
13:06	106	6	1135.5	6.5	91	785.5	
13:07	107	7	1142	6.5	90	792	

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
13:08	108	8	1148.6	6.6	92	798.6	
13:09	109	9	1155.2	6.6	91	805.2	
13:10	110	10	1161.9	6.7	91	811.9	6.56 average gpm
13:11	111	1	1169	7.1	80	819	Gauge oscillating + - 4 psi
13:12	112	2	1176.2	7.2	79	826.2	
13:13	113	3	1183.4	7.2	80	833.4	
13:14	114	4	1190.5	7.1	81	840.5	
13:15	115	5	1197.8	7.3	81	847.8	
13:16	116	6	1205	7.2	80	855	
13:17	117	7	1212.3	7.3	78	862.3	
13:18	118	8	1219.6	7.3	80	869.6	
13:19	119	9	1226.7	7.1	79	876.7	
13:20	120	10	1233.9	7.2	81	883.9	7.2 average gpm
13:21	121	1	1240.9	7	68	890.9	Gauge oscillating + - 3 psi
13:22	122	2	1247.8	6.9	69	897.8	
13:23	123	3	1254.6	6.8	70	904.6	
13:24	124	4	1261.3	6.7	71	911.3	
13:25	125	5	1268	6.7	70	918	
13:26	126	6	1274.9	6.9	71	924.9	
13:27	127	7	1281.9	7	70	931.9	
13:28	128	8	1288.7	6.8	70	938.7	
13:29	129	9	1295.5	6.8	71	945.5	
13:30	130	10	1302.2	6.7	72	952.2	6.86 average gpm
13:31	131	1	1308.9	6.7	60	958.9	Gauge oscillating + - 3 psi
13:32	132	2	1315.5	6.6	60	965.5	
13:33	133	3	1322	6.5	59	972	
13:34	134	4	1328.5	6.5	60	978.5	
13:35	135	5	1335.1	6.6	60	985.1	
13:36	136	6	1341.6	6.5	60	991.6	
13:37	137	7	1348	6.4	59	998	
13:38	138	8	1354.7	6.7	61	1004.7	
13:39	139	9	1361.2	6.5	60	1011.2	
13:40	140	10	1367.8	6.6	60	1017.8	6.56 average gpm
13:41	141	1	1374.2	6.4	50	1024.2	
13:42	142	2	1380.9	6.7	50	1030.9	
13:43	143	3	1387	6.1	50	1037	
13:44	144	4	1393.2	6.2	50	1043.2	
13:45	145	5	1399.6	6.4	51	1049.6	
13:46	146	6	1406	6.4	50	1056	
13:47	147	7	1412	6	50	1062	
13:48	148	8	1418.5	6.5	51	1068.5	
13:49	149	9	1424.9	6.4	52	1074.9	
13:50	150	10	1431.4	6.5	51	1081.4	6.36 average gpm
13:51	151	1	1438	6.6	40	1088	
13:52	152	2	1444.5	6.5	40	1094.5	
13:53	153	3	1451	6.5	40	1101	
13:54	154	4	1457.7	6.7	39	1107.7	
13:55	155	5	1464.2	6.5	40	1114.2	
13:56	156	6	1470.8	6.6	40	1120.8	
13:57	157	7	1477.3	6.5	41	1127.3	
13:58	158	8	1483.9	6.6	41	1133.9	
13:59	159	9	1490.4	6.5	40	1140.4	
14:00	160	10	1497	6.6	40	1147	6.56 average gpm

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Date	**7/30/2011**
Client	**New Mexico Copper Corp**
Project	**Copper Flat**
Well Name	**GWQ 11-24 Zone 2**
Hydrologist	**JJK**

Starting Water Level (ft bgl)	**53.5**	**Packer Dia**	**2 inch**
Elevation (ft GL)		**Bore/Casing Dia**	**3-3/4 inch**
Injection Interval (ft bgl)	**150 to 197**	**Injection Pipe Dia**	**1 inch**
Bore/Casing Depth (ft bgl)	**197**	**Pressure gauge height above GL**	**1 ft**

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
11:00	0		70				New meter
11:01	1	1	76.2	6.2	20	6.2	
11:02	2	2	82.3	6.1	20	12.3	
11:03	3	3	88.5	6.2	20	18.5	
11:04	4	4	94.7	6.2	20	24.7	
11:05	5	5	100.8	6.1	20	30.8	
11:06	6	6	107.2	6.4	20	37.2	
11:07	7	7	113.4	6.2	20	43.4	
11:08	8	8	119.6	6.2	20	49.6	
11:09	9	9	126	6.4	20	56	
11:10	10	10	132.5	6.5	20	62.5	6.25 gpm average for 20 psi
11:11	11	1	139	6.5	30	69	Up to approximately 30 psi
11:12	12	2	145.5	6.5	30	75.5	
11:13	13	3	152.1	6.6	30	82.1	
11:14	14	4	158.4	6.3	30	88.4	
11:15	15	5	164.9	6.5	30	94.9	
11:16	16	6	171.2	6.3	30	101.2	
11:17	17	7	177.7	6.5	30	107.7	
11:18	18	8	184	6.3	30	114	
11:19	19	9	190.5	6.5	32	120.5	
11:20	20	10	197.3	6.8	30	127.3	6.48 gpm average for 30 psi
11:21	21	1	204	6.70	40	134	Up to approximately 40 psi
11:22	22	2	210.6	6.60	40	140.6	
11:23	23	3	217.3	6.70	41	147.3	
11:24	24	4	224	6.70	40	154	
11:25	25	5	230.4	6.40	40	160.4	
11:26	26	6	237.1	6.70	41	167.1	
11:27	27	7	243.9	6.80	42	173.9	
11:28	28	8	250.6	6.70	41	180.6	
11:29	29	9	257.4	6.80	40	187.4	
11:30	30	10	264.3	6.90	40	194.3	6.70 gpm average for 40 psi
11:31	31	1	271.2	6.9	55	201.2	Up to approximately 55 psi
11:32	32	2	278.1	6.9	55	208.1	
11:33	33	3	285.0	6.9	55	215	
11:34	34	4	291.8	6.8	55	221.8	
11:35	35	5	298.5	6.7	56	228.5	
11:36	36	6	305.4	6.9	55	235.4	
11:37	37	7	312.4	7	56	242.4	
11:38	38	8	319.3	6.9	59	249.3	
11:39	39	9	326	6.7	59	256	
11:40	40	10	332.9	6.9	58	262.9	6.86 gpm average for 55 psi
11:41	41	1	340.4	7.5	70	270.4	Up to approximately 75 psi
11:42	42	2	348.5	8.1	75	278.5	
11:43	43	3	356.7	8.2	76	286.7	

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
11:44	44	4	364.6	7.9	76	294.6	
11:45	45	5	372.8	8.2	76	302.8	
11:46	46	6	380.7	7.9	76	310.7	
11:47	47	7	388.9	8.2	76	318.9	
11:48	48	8	397	8.1	77	327	
11:49	49	9	405	8	77	335	
11:50	50	10	413.2	8.2	77	343.2	8.03 gpm average for 75 psi
11:51	51	1	421.5	8.3	90	351.5	Up to approximately 95 psi
11:52	52	2	429.8	8.3	90	359.8	
11:53	53	3	438	8.2	91	368	
11:54	54	4	446.1	8.1	93	376.1	
11:55	55	5	454.3	8.2	94	384.3	
11:56	56	6	462.6	8.3	95	392.6	
11:57	57	7	470.6	8	95	400.6	
11:58	58	8	478.8	8.2	96	408.8	
11:59	59	9	486.9	8.1	95	416.9	
12:00	60	10	495.2	8.3	94	425.2	8.2 gpm average for 95 psi
12:01	61	1	503.4	8.2	115	433.4	Up to approximately 120 psi
12:02	62	2	511.7	8.3	118	441.7	
12:03	63	3	520	8.3	120	450	
12:04	64	4	528.3	8.3	120	458.3	
12:05	65	5	536.7	8.4	120	466.7	
12:06	66	6	545	8.3	120	475	
12:07	67	7	553.2	8.2	120	483.2	
12:08	68	8	561.5	8.3	120	491.5	
12:09	69	9	569.5	8	120	499.5	
12:10	70	10	577.6	8.1	120	507.6	8.24 gpm average for 120 psi
12:11	71	1	585.8	8.2	120 to 123	515.8	Valve fully open.
12:12	72	2	594	8.2	120 to 123	524	
12:13	73	3	602.2	8.2	120 to 124	532.2	
12:14	74	4	610.4	8.2	120 to 122	540.4	
12:15	75	5	618.7	8.3	119 to 121	548.7	
12:16	76	6	626.8	8.1	119	556.8	
12:17	77	7	635	8.2	118	565	
12:18	78	8	643.2	8.2	118	573.2	
12:19	79	9	651.5	8.3	119	581.5	
12:20	80	10	659.6	8.1	120	589.6	8.2 gpm average for 120 psi
12:21	81	1	666.3	6.7	105	596.3	Down to approximately 100 psi
12:22	82	2	673.1	6.8	100 to 105	603.1	
12:23	83	3	679.8	6.7	100 to 105	609.8	
12:24	84	4	686.4	6.6	100 to 105	616.4	
12:25	85	5	693.2	6.8	100 to 105	623.2	
12:26	86	6	700	6.8	100 to 105	630	
12:27	87	7	706.7	6.7	100 to 105	636.7	
12:28	88	8	713.5	6.8	100 to 105	643.5	
12:29	89	9	720.1	6.6	100 to 105	650.1	
12:30	90	10	726.8	6.7	100 to 105	656.8	6.72 gpm average for 100 psi
12:31	91	1	734	7.2	80	664	Down to approximately 80 psi
12:32	92	2	741.2	7.2	80	671.2	
12:33	93	3	748.3	7.1	75 to 80	678.3	
12:34	94	4	755.6	7.3	75 to 80	685.6	
12:35	95	5	762.9	7.3	75 to 80	692.9	
12:36	96	6	770.1	7.2	75 to 80	700.1	
12:37	97	7	777.4	7.3	75 to 80	707.4	
12:38	98	8	784.6	7.2	75 to 80	714.6	
12:39	99	9	791.7	7.1	75 to 80	721.7	

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
12:40	100	10	798.9	7.2	75 to 80	728.9	7.21 gpm average for 80 psi
12:41	101	1	805.5	6.6	60	735.5	Down to approximately 60 psi
12:42	102	2	812.1	6.6	55 to 60	742.1	
12:43	103	3	818.9	6.8	55 to 60	748.9	
12:44	104	4	825.3	6.4	55 to 60	755.3	
12:45	105	5	831.9	6.6	55 to 60	761.9	
12:46	106	6	838.4	6.5	55 to 60	768.4	
12:47	107	7	845	6.6	55 to 60	775	
12:48	108	8	851.5	6.5	55 to 60	781.5	
12:49	109	9	858.2	6.7	55 to 60	788.2	
12:50	110	10	864.6	6.4	55 to 60	794.6	6.57 gpm average for 60 psi
12:51	111	1	871	6.4	40	801	Down to approximately 40 psi
12:52	112	2	877.3	6.3	40	807.3	
12:53	113	3	883.6	6.3	40	813.6	
12:54	114	4	890	6.4	40	820	
12:55	115	5	896.3	6.3	40	826.3	
12:56	116	6	902.3	6	40	832.3	
12:57	117	7	908.5	6.2	40	838.5	
12:58	118	8	914.8	6.3	40	844.8	
12:59	119	9	921.1	6.3	40	851.1	
13:00	120	10	927.5	6.4	40	857.5	6.29 gpm average for 40 psi
13:01	121	1	933.92	6.42	30	863.92	Down to approximately 30 psi
13:02	122	2	940.4	6.48	30	870.4	
13:03	123	3	946.8	6.4	30	876.8	
13:04	124	4	953.2	6.4	31	883.2	
13:05	125	5	959.6	6.4	30	889.6	
13:06	126	6	966	6.4	30	896	
13:07	127	7	972.5	6.5	31	902.5	
13:08	128	8	979	6.5	30	909	
13:09	129	9	985.4	6.4	30	915.4	
13:10	130	10	991.9	6.5	30	921.9	6.44 gpm average for 30 psi
13:11	131	1	998.3	6.4	20	928.3	Down to approximately 20 psi
13:12	132	2	1004.6	6.3	20	934.6	
13:13	133	3	1010.9	6.3	20	940.9	
13:14	134	4	1017.3	6.4	21	947.3	
13:15	135	5	1023.5	6.2	22	953.5	
13:16	136	6	1029.8	6.3	20	959.8	
13:17	137	7	1036.1	6.3	20	966.1	
13:18	138	8	1042.3	6.2	20	972.3	
13:19	139	9	1048.5	6.2	20	978.5	
13:20	140	10	1054.8	6.3	20	984.8	6.29 gpm average for 20 psi

Repeated steps summarized

psi increased		psi decreased		psi increased		psi decreased		Notes
Injection rate, gals	Injection pressure, psi	Injection rate, gals	Injection pressure, psi	Injection rate, gals	Injection pressure, psi	Injection rate, gals	Injection pressure, psi	
3.00	20.0	6.82	90.0					Set pressure. Wait 1 minute
3.49	30.0	6.80	80.0					average over 2 minutes. Repeat
3.90	40.0	6.20	70.0					
4.59	50.0	5.59	60.0					
5.10	60.0	5.19	50.0					
5.80	70.0	4.68	40.0					
6.30	80.0	4.30	30.0					
6.80	90.0	3.70	20.0					
7.98	100.0							

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Date	8/1/2011
Client	New Mexico Copper Corp
Project	Copper Flat
Well Name	GWQ 11-24 Zone 3
Hydrologist	JJK

Starting Water Level (ft bgl)	51.42
Elevation (ft GL)	
Injection Interval (ft bgl)	204 to 251
Bore/Casing Depth (ft bgl)	251

Packer Dia	2 inch
Bore/Casing Dia	3-3/4 inch
Injection Pipe Dia	1 inch
Pressure gauge height above GL	1 ft

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
11:50	0		2910		20	0	
11:51	1	1	2911	1.00	20	1	
11:52	2	2	2912.1	1.10	20	2.1	
11:53	3	3	2913	0.90	20	3	
11:54	4	4	2913.3	0.30	20	3.3	
11:55	5	5	2913.5	0.20	20	3.5	
11:56	6	6	2913.8	0.30	20	3.8	
11:57	7	7	2914.1	0.30	20	4.1	
11:58	8	8	2914.4	0.30	20	4.4	
11:59	9	9	2914.7	0.30	21	4.7	
12:00	10	10	2914.9	0.20	20	4.9	0.49 gpm average for 20 psi
12:01	11	1	2915.4	0.5	30	5.4	Up to approximately 30 psi
12:02	12	2	2915.9	0.5	31	5.9	
12:03	13	3	2916.4	0.5	30	6.4	
12:04	14	4	2917.1	0.7	31	7.1	
12:05	15	5	2917.6	0.5	31	7.6	
12:06	16	6	2918.1	0.5	31	8.1	
12:07	17	7	2918.7	0.6	31	8.7	
12:08	18	8	2919.2	0.5	30	9.2	
12:09	19	9	2919.6	0.4	31	9.6	
12:10	20	10	2920.1	0.5	30	10.1	0.52 gpm average for 30 psi
12:11	21	1	2920.8	0.7	38	10.8	Up to approximately 40 psi
12:12	22	2	2921.4	0.6	40	11.4	
12:13	23	3	2921.9	0.5	40	11.9	
12:14	24	4	2922.3	0.4	40	12.3	
12:15	25	5	2922.8	0.5	39	12.8	
12:16	26	6	2923.3	0.5	41	13.3	
12:17	27	7	2923.8	0.5	40	13.8	
12:18	28	8	2924.4	0.6	43	14.4	
12:19	29	9	2924.9	0.5	41	14.9	
12:20	30	10	2925.5	0.6	42	15.5	0.54 gpm average for 40 psi
12:21	31	1	2926.3	0.8	50	16.3	Up to approximately 50 psi
12:22	32	2	2927.2	0.9	51	17.2	
12:23	33	3	2928	0.8	52	18	
12:24	34	4	2928.6	0.6	50	18.6	
12:25	35	5	2929.2	0.6	50	19.2	
12:26	36	6	2929.8	0.6	50	19.8	
12:27	37	7	2930.4	0.6	50	20.4	
12:28	38	8	2931	0.6	50	21	
12:29	39	9	2931.5	0.5	51	21.5	
12:30	40	10	2932.1	0.6	50	22.1	0.66 gpm average for 50 psi
12:31	41	1	2932.6	0.5	59	22.6	
12:32	42	2	2933.4	0.8	60	23.4	
12:33	43	3	2934	0.6	60	24	

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
12:34	44	4	2934.8	0.8	60 to 25	24.8	psi drops to 25
12:35	45	5	2935.5	0.7	25 to 60	25.5	adjust valves to maintain 60 psi
12:36	46	6	2940	4.5	60	30	
12:37	47	7	2943.5	3.5	50 to 60	33.5	adjust valves to maintain 60 psi
12:38	48	8	2947.2	3.7	50 to 60	37.2	adjust valves to maintain 60 psi
12:39	49	9	2952	4.8	60	42	
12:40	50	10	2956.5	4.5	59	46.5	2.44 gpm average for 60 psi
12:41	51	1	2961.5	5	70	51.5	
12:42	52	2	2968.8	7.3	71	58.8	
12:43	53	3	2971	2.2	72	61	
12:44	54	4	2973.9	2.9	70 to 60	63.9	psi drops to 60
12:45	55	5	2981.5	7.6	60 to 70	71.5	adjust valves to maintain 70 psi
12:46	56	6	2987	5.5	70	77	
12:47	57	7	2992.5	5.5	72	82.5	
12:48	58	8	2998	5.5	72	88	
12:49	59	9	3003.5	5.5	70	93.5	
12:50	60	10	3008.7	5.2	71	98.7	5.22 gpm average for 70 psi
12:51	61	1	3015	6.3	81	105	
12:52	62	2	3020.5	5.5	82	110.5	
12:53	63	3	3026	5.5	82	116	
12:54	64	4	3032	6	81	122	
12:55	65	5	3037.5	5.5	82	127.5	
12:56	66	6	3042.9	5.4	82	132.9	
12:57	67	7	3048.8	5.9	80	138.8	
12:58	68	8	3054	5.2	79	144	
12:59	69	9	3059.5	5.5	79	149.5	
13:00	70	10	3065	5.5	79	155	5.63 gpm average for 80 psi
13:01	71	1	3071	6	92	161	Gauge is oscillating + or - 3 psi
13:02	72	2	3077.5	6.5	90	167.5	
13:03	73	3	3083.6	6.1	92	173.6	
13:04	74	4	3090	6.4	92	180	
13:05	75	5	3095.9	5.9	92	185.9	
13:06	76	6	3102	6.1	90	192	
13:07	77	7	3108.7	6.7	90	198.7	
13:08	78	8	3113.8	5.1	90	203.8	
13:09	79	9	3119.9	6.1	90	209.9	
13:10	80	10	3125.6	5.7	91	215.6	6.06 gpm average for 90 psi
13:11	81	1	3132	6.4	100	222	Gauge is oscillating + or - 5 psi
13:12	82	2	3138.5	6.5	100	228.5	
13:13	83	3	3145	6.5	100	235	
13:14	84	4	3151.4	6.4	100	241.4	
13:15	85	5	3157.5	6.1	100	247.5	
13:16	86	6	3163.7	6.2	100	253.7	
13:17	87	7	3170.3	6.6	100	260.3	
13:18	88	8	3176.3	6	100	266.3	
13:19	89	9	3182.8	6.5	100	272.8	
13:20	90	10	3189.2	6.4	100	279.2	6.36 gpm average for 100 psi
13:21	91	1	3195	5.8	91	285	Gauge is oscillating + or - 3 psi
13:22	92	2	3201	6	90	291	
13:23	93	3	3206.6	5.6	90	296.6	
13:24	94	4	3212.5	5.9	91	302.5	
13:25	95	5	3218.5	6	89	308.5	
13:26	96	6	3224	5.5	90	314	
13:27	97	7	3229.8	5.8	91	319.8	
13:28	98	8	3235.5	5.7	91	325.5	
13:29	99	9	3241.4	5.9	91	331.4	

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
13:30	100	10	3247.5	6.1	90	337.5	5.83 gpm average for 90 psi
13:31	101	1	3252.5	5	80	342.5	psi down to 80
13:32	102	2	3257.8	5.3	80	347.8	
13:33	103	3	3263	5.2	80	353	
13:34	104	4	3268.5	5.5	81	358.5	
13:35	105	5	3273.8	5.3	80	363.8	
13:36	106	6	3279.4	5.6	80	369.4	
13:37	107	7	3284.5	5.1	79	374.5	
13:38	108	8	3290	5.5	79	380	
13:39	109	9	3295.1	5.1	80	385.1	
13:40	110	10	3301	5.9	79	391	5.35 gpm average for 80 psi
13:41	111	1	3305.5	4.5	70	395.5	psi down to 70
13:42	112	2	3310.9	5.4	70	400.9	
13:43	113	3	3315.7	4.8	71	405.7	
13:44	114	4	3321	5.3	70	411	
13:45	115	5	3325.7	4.7	69	415.7	
13:46	116	6	3331	5.3	69	421	
13:47	117	7	3335.7	4.7	70	425.7	
13:48	118	8	3340.9	5.2	70	430.9	
13:49	119	9	3345.7	4.8	70	435.7	
13:50	120	10	3351	5.3	70	441	5.0 gpm average for 70 psi
13:51	121	1	3355.5	4.5	60	445.5	psi down to 60
13:52	122	2	3360.2	4.7	58	450.2	
13:53	123	3	3364.9	4.7	60	454.9	
13:54	124	4	3369.7	4.8	60	459.7	
13:55	125	5	3374.4	4.7	60	464.4	
13:56	126	6	3379.2	4.8	60	469.2	
13:57	127	7	3383.9	4.7	61	473.9	
13:58	128	8	3389	5.1	60	479	
13:59	129	9	3393.5	4.5	60	483.5	
14:00	130	10	3398.2	4.7	60	488.2	4.72 gpm average for 60 psi
14:01	131	1	3402.6	4.4	51 to 52	492.6	psi to 50
14:02	132	2	3407.5	4.9	52 to 50	497.5	
14:03	133	3	missed		52 to 50		
14:04	134	4	3416	4.25	50	506	
14:05	135	5	3420.7	4.7	50	510.7	
14:06	136	6	3425	4.3	50	515	
14:07	137	7	3429.4	4.4	48 to 50	519.4	
14:08	138	8	3433.7	4.3	51	523.7	
14:09	139	9	3438.2	4.5	50	528.2	
14:10	140	10	3442.5	4.3	50	532.5	4.43 gpm average for 50 psi
14:11	141	1	3447	4.5	40	537	psi to 40
14:12	142	2	3451.1	4.1	40	541.1	
14:13	143	3	3454.8	3.7	40	544.8	
14:14	144	4	3459	4.2	40	549	
14:15	145	5	3463	4	40	553	
14:16	146	6	3467.1	4.1	40	557.1	
14:17	147	7	3471.3	4.2	41	561.3	
14:18	148	8	3475.4	4.1	39	565.4	
14:19	149	9	3479.7	4.3	38	569.7	
14:20	150	10	3484	4.3	40	574	4.15 gpm average for 40 psi
14:21	151	1	3487.4	3.4	34	577.4	psi to 30
14:22	152	2	3491.2	3.8	30	581.2	
14:23	153	3	3494.8	3.6	30	584.8	
14:24	154	4	3498.7	3.9	29	588.7	
14:25	155	5	3502.3	3.6	30	592.3	

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
14:26	156	6	3506	3.7	30	596	
14:27	157	7	3509.8	3.8	29	599.8	
14:28	158	8	3513.3	3.5	31	603.3	
14:29	159	9	3517	3.7	31	607	
14:30	160	10	3521	4	32	611	3.7 gpm average for 30 psi
14:31	161	1	3524.2	3.2	20	614.2	psi to 20
14:32	162	2	3527.6	3.4	20	617.6	
14:33	163	3	3531.1	3.5	21	621.1	
14:34	164	4	3534.3	3.2	21	624.3	
14:35	165	5	3538	3.7	20	628	
14:36	166	6	3541.4	3.4	20	631.4	
14:37	167	7	3544.6	3.2	20	634.6	
14:38	168	8	3548	3.4	20	638	
14:39	169	9	3551.4	3.4	20	641.4	
14:40	170	10	3554.5	3.1	21	644.5	3.35 gpm average for 20 psi

Repeated steps summarized

psi increased		psi decreased		psi increased		psi decreased		Notes
Injection rate, gals	Injection pressure, psi	Injection rate, gals	Injection pressure, psi	Injection rate, gals	Injection pressure, psi	Injection rate, gals	Injection pressure, psi	
3.14	20.0	3.14	20.0	3.80	30.0	5.78	90.0	Set pressure. Wait 1 minute
3.71	30.0	3.71	30.0	3.95	40.0	5.63	80.0	average over 2 minutes. Repeat
3.98	40.0	3.98	40.0	4.61	50.0	5.50	70.0	
4.46	50.0	4.46	50.0	4.99	60.0	4.99	60.0	
4.90	60.0	4.90	60.0	5.46	70.0	4.51	50.0	
5.31	70.0	5.31	70.0	5.62	80.0	4.15	40.0	
5.49	80.0	5.49	80.0	5.80	90.0	3.80	30.0	
5.94	90.0	5.94	90.0	6.31	100.0	3.33	20.0	
6.20	100.0	6.20	100.0					

same data as "increase" series

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Date	**8/13/2011**
Client	**New Mexico Copper Corp**
Project	**Copper Flat**
Well Name	**GWQ 11-25 Zone 1**
Hydrologist	**JJK**

Starting Water Level (ft bgl)	**29.0 (not representative of Static)**	**Packer Dia**	**2 inch**
Elevation (ft GL)		**Bore/Casing Dia**	**3-3/4 inch**
Injection Interval (ft bgl)	**100 to 147.7**	**Injection Pipe Dia**	**1 inch**
Bore/Casing Depth (ft bgl)	**147.7**	**Pressure gauge height above GL**	**3 ft**

Time 24 hr.	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
15:00	0		4400		10	0	
15:01	1	1	4400	0.00	10	0	
15:02	2	2	4400	0.00	10	0	
15:03	3	3	4400	0.00	10	0	
15:04	4	4	4400	0.00	10	0	
15:05	5	5	4400	0.00	10	0	
15:06	6	6	4400	0.00	10	0	
15:07	7	7	4400	0.00	10	0	
15:08	8	8	4400	0.00	10	0	
15:09	9	9	4400	0.00	10	0	
15:10	10	10	4400	0.00	10	0	
15:11	11	1	4400	0.00	20	0	
15:12	12	2	4400	0.00	20	0	
15:13	13	3	4400	0.00	20	0	
15:14	14	4	4400	0.00	20	0	
15:15	15	5	4400	0.00	20	0	
15:16	16	6	4400	0.00	20	0	
15:17	17	7	4400	0.00	20	0	
15:18	18			0.00		0	Break out meter to verify operation of same
15:19	19			0.00		0	
15:20	20			0.00		0	Operating to spec
15:21	21	1	4410	0.00	30	0	
15:22	22	2	4410	0.00	30	0	
15:23	23	3	4410	0.00	30	0	
15:24	24	4	4410	0.00	30	0	
15:25	25	5	4410	0.00	30	0	
15:26	26	1	4410	0.00	40	0	
15:27	27	2	4410	0.00	40	0	
15:28	28	3	4410	0.00	40	0	
15:29	29	4	4410	0.00	40	0	
15:30	30	5	4410	0.00	40	0	
15:31	31	1	4410	0	50	0	
15:32	32	2	4410	0	50	0	
15:33	33	3	4410	0	50	0	
15:34	34	4	4410	0	50	0	
15:35	35	5	4410	0	50	0	
15:36	36	1	4410	0	60	0	
15:37	37	2	4410	0	60	0	
15:38	38	3	4410	0	60	0	
15:39	39	4	4410	0	60	0	
15:40	40	5	4410	0	60	0	
15:41	41	1	4410	0	70	0	
15:42	42	2	4410	0	70	0	
15:43	43	3	4410	0	70	0	
15:44	44	4	4410	0	70	0	
15:45	45	5	4410	0	70	0	

Time 24 hr.	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
15:46	46	1	4410	0	80	0	
15:47	47	2	4410	0	80	0	
15:48	48	3	4410	0	80	0	
15:49	49	4	4410	0	80	0	
15:50	50	5	4410	0	80	0	
15:51	51	1	4410	0	90	0	
15:52	52	2	4410	0	90	0	
15:53	53	3	4410	0	90	0	
15:54	54	4	4410	0	90	0	
15:55	55	5	4410	0	90	0	
15:56	56	1	4410	0	100	0	
15:57	57	2	4410	0	100	0	
15:58	58	3	4410	0	100	0	
15:59	59	4	4410	0	100	0	
16:00	60	5	4410	0	100	0	
16:01	61	1	4410	0	110	0	
16:02	62	2	4410	0	110	0	
16:03	63	3	4410	0	110	0	
16:04	64	4	4410	0	110	0	
16:05	65	5	4410	0	110	0	
16:06	66	6	4410	0.00	110	0	
16:07	67	7	4410	0.00	110	0	
16:08	68	8	4410	0.00	110	0	
16:09	69	9	4410	0.00	110	0	
16:10	70	10	4410	0.00	110	0	
16:11	71	1	4410	0	120	0	
16:12	72	2	4410	0	120	0	
16:13	73	3	4410	0	120	0	
16:14	74	4	4410	0	120	0	
16:15	75	5	4410	0	120	0	
16:16	76	6	4410	0	120	0	
16:17	77	7	4410	0	120	0	
16:18	78	8	4410	0	120	0	
16:19	79	9	4410	0	120	0	
16:20	80	10	4410	0	120	0	
16:21	81	1	4410	0	130	0	
16:22	82	2	4410	0	130	0	
16:23	83	3	4410	0	130	0	
16:24	84	4	4410	0	130	0	
16:25	85	5	4410	0	130	0	
16:26	86	6	4410	0	130	0	
16:27	87	7	4410	0	130	0	
16:28	88	8	4410	0	130	0	
16:29	89	9	4410	0	130	0	
16:30	90	10	4410	0	130	0	
16:31	91	1	4410	0	140	0	
16:32	92	2	4410	0	140	0	
16:33	93	3	4410	0	140	0	
16:34	94	4	4410	0	140	0	
16:35	95	5	4410	0	140	0	
16:36	96	6	4410	0	140	0	
16:37	97	7	4410	0	140	0	
16:38	98	8	4410	0	140	0	
16:39	99	9	4410	0	140	0	
16:40	100	10	4410	0	140	0	Lightning on site forces suspension of test
Resume test on 8-14-2011							
6:00	101	1	4420	0	0	0	Slow repeat of previous ramp up
6:01	102	2	4420	0	40	0	

Time 24 hr.	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
6:02	103	3	4420	0	40	0	
6:03	104	4	4420	0	40	0	
6:04	105	5	4420	0	40	0	
6:05	106	1	4420	0	50	0	
6:06	107	2	4420	0	50	0	
6:07	108	3	4420	0	50	0	
6:08	109	4	4420	0	50	0	
6:09	110	5	4420	0	50	0	
6:10	111	1	4420	0	60	0	
6:11	112	2	4420	0	60	0	
6:12	113	3	4420	0	60	0	
6:13	114	4	4420	0	60	0	
6:14	115	5	4420	0	60	0	
6:15	116	1	4420	0	70	0	
6:16	117	2	4420	0	70	0	
6:17	118	3	4420	0	70	0	
6:18	119	4	4420	0	70	0	
6:19	120	5	4420	0	70	0	
6:20	121	1	4420	0	80	0	
6:21	122	2	4420	0	80	0	
6:22	123	3	4420	0	80	0	
6:23	124	4	4420	0	80	0	
6:24	125	5	4420	0	80	0	
6:25	126	1	4420	0	90	0	
6:26	127	2	4420	0	90	0	
6:27	128	3	4420	0	90	0	
6:28	129	4	4420	0	90	0	
6:29	130	5	4420	0	90	0	
6:30	131	1	4420	0	100	0	
6:31	132	2	4420	0	100	0	
6:32	133	3	4420	0	100	0	
6:33	134	4	4420	0	100	0	
6:34	135	5	4420	0	100	0	
6:35	136	1	4420	0	110	0	
6:36	137	2	4420	0	110	0	
6:37	138	3	4420	0	110	0	
6:38	139	4	4420	0	110	0	
6:39	140	5	4420	0	110	0	
6:40	141	1	4420	0	120	0	
6:41	142	2	4420	0	120	0	
6:42	143	3	4420	0	120	0	
6:43	144	4	4420	0	120	0	
6:44	145	5	4420	0	120	0	
6:45	146	1	4420	0	130	0	
6:46	147	2	4420	0	130	0	
6:47	148	3	4420	0	130	0	
6:48	149	4	4420	0	130	0	
6:49	150	5	4420	0	130	0	
6:50	151	1	4420	0	140	0	
6:51	152	2	4420	0	140	0	
6:52	153	3	4420	0	140	0	
6:53	154	4	4420	0	140	0	
6:54	155	5	4420	0	140	0	
6:55	156	1	4420	0	150	0	
6:56	157	2	4420	0	150	0	
6:57	158	3	4420	0	146	0	First injection
6:58	159	4	4422.9	2.9	150	2.9	All 150 psi readings are approximate.
6:59	160	5	4425.9	3	150	5.9	Gauge oscillating from 140 to 158

Time 24 hr.	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
7:00	161	6	4428.7	2.8	150	8.7	
7:01	162	7	4431.5	2.8	150	11.5	
7:02	163	8	4434.5	3	150	14.5	
7:03	164	9	4437.4	2.9	150	17.4	
7:04	165	10	4440.3	2.9	150	20.3	
7:05	166	11	4443.1	2.8	150	23.1	
7:06	167	12	4444	0.9	150	24	
7:07	168	13	4447.2	3.2	150	27.2	
7:08	169	14	4450.1	2.9	150	30.1	
7:09	170	15	4452.8	2.7	150	32.8	2.73 average for 150 psi
7:10	171	0	4457.1	4.3	130	37.1	Attempt to stabilize at 140 psi. abandon
7:11	172	1	4459.3	2.2	130	39.3	All 130 psi readings are approximate.
7:12	173	2	4461.2	1.9	130	41.2	Gauge oscillating from 125 to 137
7:13	174	3	4464.1	2.9	130	44.1	
7:14	175	4	4466.3	2.2	130	46.3	
7:15	176	5	4468.1	1.8	130	48.1	
7:16	177	6	4470.9	2.8	130	50.9	
7:17	178	7	4473.2	2.3	130	53.2	
7:18	179	8	4475.2	2	130	55.2	
7:19	180	9	4477.1	1.9	130	57.1	
7:20	181	10	4478.9	1.8	130	58.9	2.18 average for 130 psi
7:21	182	1	4480.9	2	100	60.9	
7:22	183	2	4482.7	1.8	100	62.7	
7:23	184	3	4484.6	1.9	100	64.6	
7:24	185	4	4486.4	1.8	100	66.4	
7:25	186	5	4488.2	1.8	100	68.2	
7:26	187	6	4490.1	1.9	100	70.1	
7:27	188	7	4491.9	1.8	100	71.9	
7:28	189	8	4493.9	2	100	73.9	
7:29	190	9	4495.7	1.8	100	75.7	
7:30	191	10	4497.6	1.9	100	77.6	1.87 average for 100 psi
7:31	192	1	4499.5	1.9	90	79.5	
7:32	193	2	4500.7	1.2	90	80.7	
7:33	194	3	4502.7	2	90	82.7	
7:34	195	4	4504.7	2	90	84.7	
7:35	196	5	4506.5	1.8	90	86.5	
7:36	197	6	4508.2	1.7	90	88.2	
7:37	198	7	4510	1.8	90	90	
7:38	199	8	4511.6	1.6	90	91.6	
7:39	200	9	4513.5	1.9	90	93.5	
7:40	201	10	4515.2	1.7	90	95.2	1.76 average for 90 psi
7:41	202	1	4516.6	1.4	80	96.6	
7:42	203	2	4518.2	1.6	80	98.2	
7:43	204	3	4519.9	1.7	80	99.9	
7:44	205	4	4521.3	1.4	80	101.3	
7:45	206	5	4523	1.7	80	103	
7:46	207	6	4524.7	1.7	80	104.7	
7:47	208	7	4526.4	1.7	80	106.4	
7:48	209	8	4528.2	1.8	80	108.2	
7:49	210	9	4530.1	1.9	80	110.1	
7:50	211	10	4531.9	1.8	80	111.9	1.67 average for 80 psi
7:51	212	1	4533.5	1.6	70	113.5	
7:52	213	2	4535.2	1.7	70	115.2	
7:53	214	3	4536.7	1.5	70	116.7	
7:54	215	4	4538.5	1.8	70	118.5	
7:55	216	5	4540.2	1.7	70	120.2	
7:56	217	6	4541.1	0.9	70	121.1	
7:57	218	7	4542.4	1.3	70	122.4	

Time 24 hr.	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
7:58	219	8	4544.3	1.9	70	124.3	
7:59	220	9	4545.9	1.6	70	125.9	
8:00	221	10	4547.5	1.6	70	127.5	1.56 average for 70 psi
8:01	222	1	4548.9	1.4	60	128.9	
8:02	223	2	4550.5	1.6	60	130.5	
8:03	224	3	4552.1	1.6	60	132.1	
8:04	225	4	4553.8	1.7	60	133.8	
8:05	226	5	4555.3	1.5	60	135.3	
8:06	227	6	4556.9	1.6	60	136.9	
8:07	228	7	4558.5	1.6	60	138.5	
8:08	229	8	4560	1.5	60	140	
8:09	230	9	4561.6	1.6	60	141.6	
8:10	231	10	4563.3	1.7	60	143.3	1.58 average for 60 psi
8:11	232	1	4564.7	1.4	50	144.7	
8:12	233	2	4566	1.3	50	146	
8:13	234	3	4567.3	1.3	50	147.3	
8:14	235	4	4568.6	1.3	50	148.6	
8:15	236	5	4570	1.4	50	150	
8:16	237	6	4571.4	1.4	50	151.4	
8:17	238	7	4572.8	1.4	50	152.8	
8:18	239	8	4574.2	1.4	50	154.2	
8:19	240	9	4575.3	1.1	50	155.3	
8:20	241	10	4576.5	1.2	50	156.5	1.32 average for 50 psi
8:21	242	1	4577.6	1.1	40	157.6	
8:22	243	2	4578.9	1.3	40	158.9	
8:23	244	3	4580.2	1.3	40	160.2	
8:24	245	4	4581.5	1.3	40	161.5	
8:25	246	5	4582.8	1.3	40	162.8	
8:26	247	6	4584.1	1.3	40	164.1	
8:27	248	7	4585.4	1.3	40	165.4	
8:28	249	8	4586.5	1.1	40	166.5	
8:29	250	9	4587.6	1.1	40	167.6	
8:30	251	10	4588.9	1.3	40	168.9	1.24 average for 40 psi
8:31	252	1	4590	1.1	30	170	
8:32	253	2	4591.2	1.2	30	171.2	
8:33	254	3	4592.3	1.1	30	172.3	
8:34	255	4	4593.2	0.9	30	173.2	
8:35	256	5	4594.6	1.4	30	174.6	
8:36	257	6	4595.7	1.1	30	175.7	
8:37	258	7	4596.8	1.1	30	176.8	
8:38	259	8	4597.9	1.1	30	177.9	
8:39	260	9	4599	1.1	30	179	
8:40	261	10	4600.1	1.1	30	180.1	1.12 average for 30 psi
8:41	262	1	4601.2	1.1	20	181.2	
8:42	263	2	4602.1	0.9	20	182.1	
8:43	264	3	4603.3	1.2	20	183.3	
8:44	265	4	4604.4	1.1	20	184.4	
8:45	266	5	4605.4	1	20	185.4	
8:46	267	6	4606.3	0.9	20	186.3	
8:47	268	7	4607.4	1.1	20	187.4	
8:48	269	8	4608.4	1	20	188.4	
8:49	270	9	4609.4	1	20	189.4	
8:50	271	10	4610.5	1.1	20	190.5	1.04 average for 20 psi
8:51	272	1	4611.4	0.9	10	191.4	
8:52	273	2	4612.4	1	10	192.4	
8:53	274	3	4613.3	0.9	10	193.3	
8:54	275	4	4614.2	0.9	10	194.2	
8:55	276	5	4615.1	0.9	10	195.1	

Time 24 hr.	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks	
8:56	277	6	4616	0.9	10	196		
8:57	278	7	4617	1	10	197		
8:58	279	8	4617.9	0.9	10	197.9		
8:59	280	9	4618.7	0.8	10	198.7		
9:00	281	10	4619.6	0.9	10	199.6	0.91 average for 10 psi	
Repeated steps summarized								
psi increased		psi decreased		psi increased		psi decreased		Notes
Injection rate, gals	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	
0.98	10	2.31	130	1.02	10	2.45	130	Set pressure. Wait 1 minute
1.12	20	2.24	100	1.18	20	2.23	100	average over 2 minutes. Repeat
1.15	30	2.05	90	1.18	30	2.1	90	
1.26	40	1.8	80	1.29	40	1.82	80	
1.55	50	1.81	70	1.56	50	1.8	70	
1.78	60	1.78	60	1.8	60	1.83	60	
1.81	70	1.56	50	1.83	70	1.54	50	
1.81	80	1.31	40	1.82	80	1.33	40	
2.02	90	1.21	30	2.01	90	1.2	30	
2.20	100	1.13	20	2.19	100	1.14	20	
2.21	130	1	10	2.23	130	1.02	10	
2.98	150			3.12	150			
0.00	1	4	6084.5	0	60	1664.5		
0.00	2	5	6084.5	0	60	1664.5		
0.69	303	1	6084.5	0	50	1664.5		
0.69	304	2	6084.5	0	50	1664.5		
0.69	305	3	6084.5	0	50	1664.5		
0.69	306	4	6084.5	0	50	1664.5		
0.69	307	5	6084.5	0	50	1664.5		
0.69	308	1	6084.5	0	40	1664.5		
0.69	309	2	6084.5	0	40	1664.5		
0.69	310	3	6084.5	0	40	1664.5		
0.69	311	4	6084.5	0	40	1664.5		
0.69	312	5	6084.5	0	40	1664.5		
0.69	313	1	6084.5	0	30	1664.5		
0.69	314	2	6084.5	0	30	1664.5		
0.69	315	3	6084.5	0	30	1664.5		
0.70	316	4	6084.5	0	30	1664.5		
0.70	317	5	6084.5	0	30	1664.5		
0.70	318	6	6084.5	0	20	1664.5		
0.70	319	7	6084.5	0	20	1664.5		
0.70	320	8	6084.5	0	20	1664.5		
0.70	321	9	6084.5	0	20	1664.5		
0.70	322	10	6084.5	0	20	1664.5		
Repeated steps summarized								
psi increased		psi decreased		psi increased		psi decreased		Notes
Injection rate, gals	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	
								No duplicat test performed

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Date	8/16/2011
Client	New Mexico Copper Corp
Project	Copper Flat
Well Name	GWQ 11-25 Zone 2
Hydrologist	JJK

Starting Water Level (ft bgl)	60.2
Elevation (ft GL)	
Injection Interval (ft bgl)	150 to 197.7
Bore/Casing Depth (ft bgl)	197.7

Packer Dia	2 inch
Bore/Casing Dia	3-3/4 inch
Injection Pipe Dia	1 inch
Pressure gauge height above GL	3 ft

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
7:25	0		4700		10	0	
7:26	1	1	4704.5	4.50	12	4.5	
7:27	2	2	4707	2.50	10	7	
7:28	3	3	4709	2.00	10	9	
7:29	4	4	4711	2.00	12	11	
7:30	5	5	4712.9	1.90	10	12.9	
7:31	6	6	4714.9	2.00	10	14.9	
7:32	7	7	4717	2.10	11	17	
7:33	8	8	4718.8	1.80	10	18.8	
7:34	9	9	4720.7	1.90	10	20.7	
7:35	10	10	4722.6	1.90	10	22.6	2.26 gpm average for 10 psi
7:36	11	1	4724.8	2.2	20	24.8	
7:37	12	2	4727.1	2.3	20	27.1	
7:38	13	3	4729.2	2.1	21	29.2	
7:39	14	4	4731.4	2.2	20	31.4	
7:40	15	5	4733.6	2.2	19	33.6	
7:41	16	6	4735.8	2.2	20	35.8	
7:42	17	7	4738	2.2	20	38	
7:43	18	8	4740.2	2.2	21	40.2	
7:44	19	9	4742.4	2.2	20	42.4	
7:45	20	10	4744.6	2.2	20	44.6	2.20 gpm average for 20 psi
7:46	21	1	4747.1	2.5	30	47.1	
7:47	22	2	4749.6	2.5	31	49.6	
7:48	23	3	4752.3	2.7	31	52.3	
7:49	24	4	4754.8	2.5	32	54.8	
7:50	25	5	4757.2	2.4	31	57.2	
7:51	26	6	4759.7	2.5	30	59.7	
7:52	27	7	4762.3	2.6	30	62.3	
7:53	28	8	4764.7	2.4	31	64.7	
7:54	29	9	4767.2	2.5	30	67.2	
7:55	30	10	4769.6	2.4	30	69.6	2.50 gpm average for 30 psi
7:56	31	1	4772.4	2.8	38	72.4	
7:57	32	2	4775.3	2.9	40	75.3	
7:58	33	3	4778.2	2.9	41	78.2	
7:59	34	4	4781	2.8	40	81	
8:00	35	5	4783.8	2.8	40	83.8	
8:01	36	6	4786.4	2.6	40	86.4	
8:02	37	7	4789.1	2.7	40	89.1	
8:03	38	8	4791.9	2.8	41	91.9	
8:04	39	9	4794.2	2.3	40	94.2	
8:05	40	10	4797.3	3.1	41	97.3	2.77 gpm average for 40 psi
8:06	41	1	4800.5	3.2	50	100.5	Oscilating = or - 3 to 4 psi
8:07	42	2	4803.6	3.1	50	103.6	
8:08	43	3	4806.6	3	50	106.6	
8:09	44	4	4809.7	3.1	50	109.7	

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
8:10	45	5	4812.8	3.1	50	112.8	
8:11	46	6	4815.8	3	50	115.8	
8:12	47	7	4818.9	3.1	50	118.9	
8:13	48	8	4822	3.1	50	122	
8:14	49	9	4825	3	50	125	
8:15	50	10	4828.1	3.1	50	128.1	3.08 gpm average for 50 psi
8:16	51	1	4831.6	3.5	60	131.6	Oscilating = or - 3 to 4 psi
8:17	52	2	4834.9	3.3	60	134.9	
8:18	53	3	4838	3.1	60	138	
8:19	54	4	4841.8	3.8	60	141.8	
8:20	55	5	4844.9	3.1	60	144.9	
8:21	56	6	4848.3	3.4	60	148.3	
8:22	57	7	4851.9	3.6	60	151.9	
8:23	58	8	4855.5	3.6	60	155.5	
8:24	59	9	4859.1	3.6	60	159.1	
8:25	60	10	4862.8	3.7	60	162.8	3.47 gpm average for 60 psi
8:26	61	1	4866.4	3.6	70	166.4	Oscilating = or - 3 to 4 psi
8:27	62	2	4870.2	3.8	70	170.2	
8:28	63	3	4874	3.8	70	174	
8:29	64	4	4877.5	3.5	70	177.5	
8:30	65	5	4881	3.5	70	181	
8:31	66	6	4884.6	3.6	70	184.6	
8:32	67	7	4888.1	3.5	70	188.1	
8:33	68	8	4891.7	3.6	70	191.7	
8:34	69	9	4895.5	3.8	70	195.5	
8:35	70	10	4898.9	3.4	70	198.9	3.61 gpm average for 70 psi
8:36	71	1	4903	4.1	80	203	Oscilating = or - 3 to 4 psi
8:37	72	2	4906.8	3.8	80	206.8	
8:38	73	3	4910.4	3.6	80	210.4	
8:39	74	4	4914.2	3.8	81	214.2	
8:40	75	5	4918	3.8	80	218	
8:41	76	6	4921.9	3.9	80	221.9	
8:42	77	7	4925.6	3.7	80	225.6	
8:43	78	8	4929.3	3.7	80	229.3	
8:44	79	9	4933.1	3.8	80	233.1	
8:45	80	10	4937	3.9	80	237	3.81 gpm average for 80 psi
8:46	81	1	4941.1	4.1	90	241.1	Oscilating = or - 5 psi
8:47	82	2	4945.4	4.3	90	245.4	
8:48	83	3	4949.6	4.2	90	249.6	
8:49	84	4	4954	4.4	91	254	
8:50	85	5	4958.1	4.1	90	258.1	
8:51	86	6	4962.3	4.2	90	262.3	
8:52	87	7	4966.6	4.3	90	266.6	
8:53	88	8	4971.2	4.6	90	271.2	
8:54	89	9	4975.3	4.1	90	275.3	
8:55	90	10	4979.7	4.4	90	279.7	4.27 gpm average for 90 psi
8:56	91	1	4984.8	5.1	100	284.8	Oscilating = or - 6 psi
8:57	92	2	4989.9	5.1	100	289.9	
8:58	93	3	4995	5.1	100	295	
8:59	94	4	5000	5	100	300	
9:00	95	5	5005.1	5.1	100	305.1	
9:01	96	6	5010	4.9	100	310	
9:02	97	7	5015.1	5.1	100	315.1	
9:03	98	8	5020	4.9	100	320	
9:04	99	9	5025	5	100	325	
9:05	100	10	5029.9	4.9	100	329.9	5.02 gpm average for 100 psi
9:06	101	1	5034	4.1	90	334	Oscilating = or - 5 psi

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
9:07	102	2	5038	4	90	338	
9:08	103	3	5042.1	4.1	90	342.1	
9:09	104	4	5046.5	4.4	90	346.5	
9:10	105	5	5050.7	4.2	90	350.7	
9:11	106	6	5055	4.3	90	355	
9:12	107	7	5059.2	4.2	90	359.2	
9:13	108	8	5063.4	4.2	90	363.4	
9:14	109	9	5067.7	4.3	90	367.7	
9:15	110	10	5072.4	4.7	90	372.4	4.25 gpm average for 90 psi
9:16	111	1	5076.2	3.8	80	376.2	Oscilating = or - 5 psi
9:17	112	2	5079.9	3.7	80	379.9	
9:18	113	3	5083.5	3.6	80	383.5	
9:19	114	4	5087.1	3.6	80	387.1	
9:20	115	5	5090.5	3.4	80	390.5	
9:21	116	6	5094.3	3.8	80	394.3	
9:22	117	7	5098	3.7	80	398	
9:23	118	8	5101.8	3.8	80	401.8	
9:24	119	9	5105.6	3.8	80	405.6	
9:25	120	10	5109.6	4	80	409.6	3.72 gpm average for 80 psi
9:26	121	1	5113	3.4	70	413	Oscilating = or - 3 to 4 psi
9:27	122	2	5116.2	3.2	70	416.2	
9:28	123	3	5119.8	3.6	70	419.8	
9:29	124	4	5123	3.2	70	423	
9:30	125	5	5126.5	3.5	70	426.5	
9:31	126	6	5130.2	3.7	70	430.2	
9:32	127	7	5133.7	3.5	70	433.7	
9:33	128	8	5137.2	3.5	70	437.2	
9:34	129	9	5140.4	3.2	70	440.4	
9:35	130	10	5143.9	3.5	70	443.9	3.43 gpm average for 70 psi
9:36	131	1	5147	3.1	60	447	Oscilating = or - 3 to 4 psi
9:37	132	2	5150.1	3.1	60	450.1	
9:38	133	3	5153.5	3.4	60	453.5	
9:39	134	4	5156.5	3	60	456.5	
9:40	135	5	5159.7	3.2	60	459.7	
9:41	136	6	5163	3.3	60	463	
9:42	137	7	5166.2	3.2	60	466.2	
9:43	138	8	5169.4	3.2	60	469.4	
9:44	139	9	5172.7	3.3	60	472.7	
9:45	140	10	5175.9	3.2	60	475.9	3.20 gpm average for 60 psi
9:46	141	1	5178.7	2.8	50	478.7	Oscilating = or - 3 to 4 psi
9:47	142	2	5181.6	2.9	50	481.6	
9:48	143	3	5184.7	3.1	50	484.7	
9:49	144	4	5187.5	2.8	50	487.5	
9:50	145	5	5190.3	2.8	50	490.3	
9:51	146	6	5193.3	3	50	493.3	
9:52	147	7	5196.1	2.8	50	496.1	
9:53	148	8	5199	2.9	50	499	
9:54	149	9	5202.1	3.1	50	502.1	
9:55	150	10	5205.1	3	50	505.1	2.92 gpm average for 50 psi
9:56	151	1	5207.8	2.7	40	507.8	
9:57	152	2	5210.1	2.3	40	510.1	
9:58	153	3	5212.8	2.7	40	512.8	
9:59	154	4	5215.6	2.8	40	515.6	
10:00	155	5	5218.1	2.5	40	518.1	
10:01	156	6	5221	2.9	40	521	
10:02	157	7	5223.8	2.8	40	523.8	
10:03	158	8	5226.4	2.6	40	526.4	

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
10:04	159	9	5229	2.6	40	529	
10:05	160	10	5231.9	2.9	40	531.9	2.68 gpm average for 40 psi
10:06	161	1	5234.2	2.3	30	534.2	
10:07	162	2	5236.5	2.3	30	536.5	
10:08	163	3	5238.9	2.4	30	538.9	
10:09	164	4	5241.4	2.5	30	541.4	
10:10	165	5	5244	2.6	30	544	
10:11	166	6	5246.3	2.3	30	546.3	
10:12	167	7	5248.7	2.4	30	548.7	
10:13	168	8	5251.2	2.5	30	551.2	
10:14	169	9	5253.7	2.5	30	553.7	
10:15	170	10	5256.3	2.6	30	556.3	2.44 gpm average for 30 psi
10:16	171	1	5258.2	1.9	20	558.2	
10:17	172	2	5260.2	2	20	560.2	
10:18	173	3	5262.6	2.4	20	562.6	
10:19	174	4	5264.8	2.2	20	564.8	
10:20	175	5	5267	2.2	20	567	
10:21	176	6	5269.1	2.1	20	569.1	
10:22	177	7	5271.3	2.2	20	571.3	
10:23	178	8	5273.6	2.3	20	573.6	
10:24	179	9	5275.9	2.3	20	575.9	
10:25	180	10	5278	2.1	20	578	2.17 gpm average for 20 psi
10:26	181	1	5279.7	1.7	10	579.7	
10:27	182	2	5281.6	1.9	10	581.6	
10:28	183	3	5283.5	1.9	10	583.5	
10:29	184	4	5285.4	1.9	10	585.4	
10:30	185	5	5287.2	1.8	10	587.2	
10:31	186	6	5289.1	1.9	10	589.1	
10:32	187	7	5291	1.9	10	591	
10:33	188	8	5293	2	10	593	
10:34	189	9	5295	2	10	595	
10:35	190	10	5296.9	1.9	10	596.9	1.89 gpm average for 10 psi

Repeated steps summarized

psi increased		psi decreased		psi increased		psi decreased		Notes
Injection rate, gals	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	
NA	10.0	(*)	90.0	2.70	20.0	(*)	90.0	Set pressure. Wait 1 minute
2.38	20.0	5.09	80.0	3.69	30.0	(*)	80.0	average over 2 minutes. Repeat
2.49	30.0	4.68	70.0	4.10	40.0	5.10	70.0	
3.00	40.0	4.80	60.0	4.72	50.0	4.70	60.0	
3.18	50.0	4.38	50.0	5.18	60.0	4.60	50.0	
3.62	60.0	3.70	40.0	5.20	70.0	4.00	40.0	
3.70	70.0	3.29	30.0	6.16	80.0	2.60	30.0	
4.31	80.0	2.80	20.0	(*)	90.0	2.51	20.0	
4.70	90.0	2.40	10.0	(*)	100.0	1.92	10.0	
(*)	100.0							
(*) unable to maintain pressure								

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Date	**8/24/2011**
Client	**New Mexico Copper Corp**
Project	**Copper Flat**
Well Name	**GWQ 11-25, Zone 3**
Hydrologist	**JJK**

Starting Water Level (ft bgl)	**60.00**
Elevation (ft GL)	
Injection Interval (ft bgl)	**207 to 251**
Bore/Casing Depth (ft bgl)	**251**

Packer Dia	**2 inch**
Bore/Casing Dia	**3-3/4 inch**
Injection Pipe Dia	**1 inch**
Pressure gauge height above GL	**4 ft**

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
8:10	0		5463		11	0	
8:11	1	1	5465	2.00	10	2	
8:12	2	2	5465.7	0.70	11	2.7	
8:13	3	3	5468.3	2.60	11	5.3	
8:14	4	4	5470	1.70	10	7	
8:15	5	5	5471.4	1.40	10	8.4	
8:16	6	6	5472.8	1.40	10	9.8	
8:17	7	7	5474.4	1.60	10	11.4	
8:18	8	8	5475.9	1.50	10	12.9	
8:19	9	9	5477.4	1.50	10	14.4	
8:20	10	10	5479	1.60	10	16	1.6 gpm average for 10 psi
8:21	11	1	5480.5	1.5	20	17.5	
8:22	12	2	5482.2	1.7	20	19.2	
8:23	13	3	5483.5	1.3	20	20.5	
8:24	14	4	5485.2	1.7	20	22.2	
8:25	15	5	5486.7	1.5	21	23.7	
8:26	16	6	5488.4	1.7	20	25.4	
8:27	17	7	5490	1.6	20	27	
8:28	18	8	5491.6	0	20	28.6	
8:29	19	9	5493.1	1.5	20	30.1	
8:30	20	10	5494.8	1.7	21	31.8	1.58 gpm average for 20 psi
8:31	21	1	5496.5	1.7	30	33.5	
8:32	22	2	5498.1	1.6	29	35.1	
8:33	23	3	5499.9	1.8	30	36.9	
8:34	24	4	5501.5	1.6	30	38.5	
8:35	25	5	5503.1	1.6	30	40.1	
8:36	26	6	5505	1.9	30	42	
8:37	27	7	5506.6	1.6	30	43.6	
8:38	28	8	5508.6	2	30	45.6	
8:39	29	9	5510.4	1.8	29	47.4	
8:40	30	10	5512.4	2	29	49.4	1.76 gpm average for 30 psi
8:41	31	1	5514.3	1.9	40	51.3	
8:42	32	2	5516.2	1.9	40	53.2	
8:43	33	3	5518.3	2.1	40	55.3	
8:44	34	4	5520.4	2.1	40	57.4	
8:45	35	5	5522.3	1.9	40	59.3	
8:46	36	6	5524.3	2	40	61.3	
8:47	37	7	5526.3	2	40	63.3	
8:48	38	8	5528.2	1.9	39	65.2	
8:49	39	9	5530.2	2	39	67.2	
8:50	40	10	5532.2	2	39	69.2	1.98 gpm average for 40 psi
8:51	41	1	5534.4	2.2	50	71.4	All 50 psi readings are approximate
8:52	42	2	5536.6	2.2	50	73.6	pressure gauge is oscillating + - 3 to 4 psi
8:53	43	3	5539.1	2.5	50	76.1	
8:54	44	4	5541.6	2.5	50	78.6	

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
8:55	45	5	5544.1	2.5	50	81.1	
8:56	46	6	5546.6	2.5	50	83.6	
8:57	47	7	5549.2	2.6	50	86.2	
8:58	48	8	5551.7	2.5	50	88.7	
8:59	49	9	5554.3	2.6	50	91.3	
9:00	50	10	5557	2.7	50	94	2.48 gpm average for 50 psi
9:01	51	1	0	-5557	60	-5463	All 60 psi readings are approximate
9:02	52	2	5565.1	5565.1	60	102.1	pressure gauge is oscillating + - 3 to 4 psi
9:03	53	3	5569.7	4.6	60	106.7	
9:04	54	4	5573.9	4.2	60	110.9	
9:05	55	5	5578.5	4.6	60	115.5	
9:06	56	6	5583.4	4.9	60	120.4	
9:07	57	7	5587.4	4	58	124.4	
9:08	58	8	5592.2	4.8	58	129.2	
9:09	59	9	5597.4	5.2	60	134.4	
9:10	60	10	5602.7	5.3	60	139.7	4.57 gpm average for 60 psi
9:11	61	1	5609	6.3	65	146	Valve fully open. Water moving past packer
9:12	62	2	5616.1	7.1	65	153.1	
9:13	63	3	5623.1	7	65	160.1	
9:14	64	4	5630.3	7.2	65	167.3	
9:15	65	5	5637.6	7.3	65	174.6	
9:16	66	6	5645.1	7.5	63	182.1	Water at surface
9:17	67	7	5652.3	7.2	62	189.3	
9:18	68	8	5659.8	7.5	62	196.8	
9:19	69	9	5666.9	7.1	60	203.9	
9:20	70	10	5674	7.1	60	211	7.13 gpm average for 65 psi
9:21	71	1	5681.4	7.4	60	218.4	
9:22	72	2	5688.6	7.2	60	225.6	
9:23	73	3	5696	7.4	59	233	
9:24	74	4	5703.2	7.2	59	240.2	
9:25	75	5	5710.6	7.4	58	247.6	
9:26	76	6	5717.8	7.2	58	254.8	
9:27	77	7	5725	7.2	58	262	
9:28	78	8	5732.3	7.3	58	269.3	
9:29	79	9	5739.5	7.2	59	276.5	
9:30	80	10	5746.9	7.4	59	283.9	7.29 gpm average for 60 psi
9:31	81	1	5752.3	5.4	50	289.3	Water now moving down casing
9:32	82	2	5757	4.7	50	294	
9:33	83	3	5761.3	4.3	50	298.3	
9:34	84	4	5766	4.7	50	303	
9:35	85	5	5770.5	4.5	50	307.5	
9:36	86	6	5775	4.5	50	312	
9:37	87	7	5779.7	4.7	50	316.7	
9:38	88	8	5784.3	4.6	50	321.3	
9:39	89	9	5788.8	4.5	50	325.8	
9:40	90	10	5793.5	4.7	50	330.5	4.66 average for 50 psi
9:41	91	1	5796.5	3	40	333.5	
9:42	92	2	5798	1.5	40	335	
9:43	93	3	5799.9	1.9	40	336.9	
9:44	94	4	5801.2	1.3	39	338.2	
9:45	95	5	5802.8	1.6	40	339.8	
9:46	96	6	5804.4	1.6	39	341.4	
9:47	97	7	5806	1.6	40	343	
9:48	98	8	5807.5	1.5	40	344.5	
9:49	99	9	5809.2	1.7	40	346.2	
9:50	100	10	5810.5	1.3	39	347.5	1.7 average for 40 psi
9:51	101	1	5812.1	1.6	30	0	

Time 24 hr	Elapsed minutes	Injection period	Water meter reading, gals	Injection rate, gals	Injection pressure, psi	total water injected, gals	Remarks
9:52	102	2	5813.4	1.3	30	1.3	
9:53	103	3	5814.8	1.4	30	2.7	
9:54	104	4	5816.3	1.5	30	4.2	
9:55	105	5	5817.6	1.3	30	5.5	
9:56	106	6	5818.9	1.3	30	6.8	
9:57	107	7	5820.3	1.4	30	8.2	
9:58	108	8	5821.8	1.5	30	9.7	
9:59	109	9	5823	1.2	30	10.9	
10:00	110	10	5824.4	1.4	30	12.3	1.39 average for 30 psi
10:01	111	1	5825.7	1.3	20	13.6	
10:02	112	2	5827	1.3	20	14.9	
10:03	113	3	5828.3	1.3	20	16.2	
10:04	114	4	5829.5	1.2	20	17.4	
10:05	115	5	5830.8	1.3	20	18.7	
10:06	116	6	5832.1	1.3	20	20	
10:07	117	7	5833.3	1.2	20	21.2	
10:08	118	8	5834.6	1.3	20	22.5	
10:09	119	9	5835.9	1.3	20	23.8	
10:10	120	10	5837.1	1.2	20	25	1.27 average for 20 psi
10:11	121	1	5838.2	1.1	10	26.1	
10:12	122	2	5839.3	1.1	10	27.2	
10:13	123	3	5840.3	1	10	28.2	
10:14	124	4	5841.8	1.5	10	29.7	
10:15	125	5	5842.7	0.9	10	30.6	
10:16	126	6	5843.8	1.1	10	31.7	
10:17	127	7	5845	1.2	10	32.9	
10:18	128	8	5846.1	1.1	10	34	
10:19	129	9	5847.2	1.1	10	35.1	
10:20	130	10	5848.3	1.1	10	36.2	1.12 average for 10 psi

Repeated steps summarized

psi increased		psi decreased		psi increased		psi decreased		Notes
Injection rate, gals	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	**Injection rate, gals**	**Injection pressure, psi**	
NA	10.0	NA	65.0	1.21	10.0	NA	65.0	Set pressure. Wait 1 minute
1.20	20.0	2.62	60.0	1.39	20.0	2.39	60.0	average over 2 minutes. Repeat
1.45	30.0	1.89	50.0	1.55	30.0	1.98	50.0	
1.61	40.0	1.70	40.0	1.62	40.0	1.80	40.0	
1.90	50.0	1.14	30.0	2.10	50.0	1.57	30.0	
2.40	60.0	1.29	20.0	2.22	60.0	1.41	20.0	
3.90	66.0	1.20	10.0	3.84	66.0	1.33	10.0	

Appendix D.

MODFLOW Code Documentation

DOCUMENTATION FOR MODFLOW CODE VERSION

The following report first presents general details and documentation for the MODFLOW version titled maj10_12mar10. Documentation for LAK2 is presented as an Appendix.

DOCUMENTATION FOR MODFLOW CODE VERSION

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DOCUMENTATION FOR MODFLOW CODE VERSION

INTRODUCTION

This report documents a version of the US Geological Survey modular ground-water flow model, or MODFLOW (McDonald and Harbaugh, 1988). Major non-standard features include:

- Modifications to module BCF2 and other modules involving the treatment of perched aquifers, dry cells and cell rewetting. These modifications preserve continuity of the governing equations of flow and also preserve mass balance accounting.
- Module RIV2 (adapted from Miller, 1988). The original program has been revised to improve the surface water mass balance accounting, to improve I/O options and to accommodate the sub-module DIV1.
- RIV2 sub-module DIV1. This module simulates the diversion of surface water and the optional re-injection of diverted water into the groundwater system.
- Module LAK2. This module is used to simulate lakes, well bores and other open water bodies connected to groundwater systems.
- Module OUT1 manages output control.
- Module ZON1 computes and outputs zone-by-zone budgets

Minor features include:

- Additional options for the formatting of input arrays (from Zheng, 1989, Appendix B)
- The Drain Package, DRN1, has been modified to also perform the functions of the WEL module, in addition to the DRN function. In addition, a second copy of the DRN module has been implemented in the code. These modifications are useful in simulating complex, multi-component and highly variable pumping regimes.
- The Well Package, WEL1, has been modified to optionally transfer pumping to the next layer down when a pumping cell goes dry.
- The Output Control (OC1) sub-module of the Basic Package, BAS has been modified to include the output of hydrographs and to allow the output of volumetric budget terms to a separate file
- Addition of a repeating seasonal input option to the Evapotranspiration (EVT1) and Recharge (RCH1) modules.

GENERAL DOCUMENTATION

Modules

MODFLOW packages are invoked using the IUNIT array (McDonald and Harbaugh, 1988, ch. 4). This particular version contains the following selection of modules:

IUNIT#	PACKAGE	TYPE	
1	BCF2	G	Block-Centered Flow Package BCF2 (McDonald et al., 1991) modified
2	WEL	B	Well Package modified
3	DRN	B	Drain Package modified
4	RIV	B	River Package
5	EVT	B	Evapotranspiration Package, modified
6	RIV2	S	River Package 2 (adapted from Miller, 1988)
7	GHB	B	General Head Boundary Package
8	RCH	B	Recharge Package, modified
9	SIP	M	Strongly Implicit Procedure solver Package
10	PCG	M	Preconditioned Conjugate Gradient solver Package (Hill, 1990)
11	SOR1	M	Slice-successive OverRelaxation solver Package
12	OC	O	Output Control Option, modified
13	LAK2	S	Lake Package
14	DRN	B	Drain Package modified (second entry)
15	NCF1	G	Node-Centered Flow Package (Jones, 1997)
16	SOL1	M	ITPACK2C matrix solvers (Kincaid et al., 1992)
17	CHD1	B	Time-variant Constant HeaD Package (Leake and Prudic, 1988, Appendix C)
18	OUT1	O	Output Control Package
19	HFB	G	Horizontal Flow Barrier Package (Hsieh and Freckleton, 1992)
20	ZON1	O	Zone Budget Package
21	(unused)		
2	LKMT	O	Package creates interface files to MT3D, modified
23	LKMP1	O	Package creates interface files to MODPATH
24	(unused)		

Types
G: Groundwater flow domain / Aquifer properties
B: Boundary conditions to Groundwater domain
S: Surface water flow / Boundary conditions to Groundwater domain
O: Output control
M: Matrix inversion/ solution

Name file

MODFLOW has been modified to run from a single input file (the Name file) containing a list of input and output file names and unit numbers. The file is equivalent to the ".NAM" file of MODFLOW96 and later, though with different format. In addition to providing instructions to the program, the Name file serves to define the simulation and is a useful file for record keeping. File names needed include

the BAS input file (unit 1),
the main output file (unit 2),
all input file units specified in the IUNIT array,
all output units specified in individual input files (including modules OC1, OUT1, ZON1, LAK2, etc.)

When MODFLOW.EXE is run, the program first reads the console for the name of the Name file. The Name file consists of one line for each file to be used during the simulation, in the following format:

Input Records

RECORD1 : read once for each file to be opened during simulation.

variable:	**KUNIT**	**FNAME**	**UNFC**
format:	I5	A20	A1

Explanation of Variables

KUNIT : Unit number of file to be opened.
FNAME : Name of file to be opened.
UNFC : Format flag.
If UNFC = 'U' or 'u', the file is opened as unformatted.
Otherwise the file is opened as formatted.

Array Readers

Input instructions throughout MODFLOW refer to the input formats U2DREL , U1DREL , and U2DINT. These "formats" are utility package array reading subroutines. Options for the format of input arrays have been added to the original MODFLOW routines, following Zheng (1989). One option not in Zheng (1989) has also been added.

Options for the format of input arrays are characterized here by the value of an input variable, LOCAT (see below). The options available with 1988 MODFLOW are

LOCAT<0
LOCAT>0

The options added by (Zheng, 1989) are

LOCAT = 100
LOCAT = 101
LOCAT = 102
LOCAT = 103

one more option has been added:

LOCAT<-100

The file opening aspects of the (Zheng, 1989) subroutines have not been utilized.

Input Records

When called to read a data array from an input file, the array readers first read an array control record. The data array may then be read in various formats from the same file or from a different file, depending on specifications in the array control record

For the real array readers (U2DREL, U1DREL)
Array control record

variable:	**LOCAT**	**CNSTNT**	**FMTIN**	**IPRN**
format:	I10	F10.0	5A4	I10

For the integer array readers (U2DINT)
Array control record

variable:	**LOCAT**	**ICONST**	**FMTIN**	**IPRN**
format:	I10	F10.0	5A4	I10

The data array may or may not follow the input control record, depending on the value of LOCAT.

Explanation of Variables

LOCAT : Data location and format style.

if LOCAT<-100, the array is read from unit (-LOCAT-100) using format FMTIN. The array input unit is then rewound, so that the same array may be used later.

if -100<LOCAT<0, the array is read unformatted from unit -LOCAT.

if LOCAT=0, the array is set to the constant CNSTNT/ICONST.

if LOCAT>0, but LOCAT does not take the values 100, 101, 102 or 103, the array is read from unit LOCAT using format FMTIN.

if LOCAT=100, the array is read from the current unit (the file from which the array control record was read) using format FMTIN.

if LOCAT=101, the array is read from the current unit using a block format (Zheng, 1989).

if LOCAT=102, the array is read from the current unit using a zone format (Zheng, 1989).

if LOCAT=103, the array is read from the current unit using a list-directed or free format (Zheng, 1989).

CNSTNT/ICONST : constant.
if LOCAT=0, each element of the array is set to CNSTNT/ICONST**.**
if LOCAT≠0, each element of the array is multiplied by CNSTNT/ICONST.

FMTIN : Input format, enclosed in parenthesis.

IPRN : Printout flag and format.
If IPRN<0, the array is not printed.
Otherwise, the array is printed in the main output file, using a format determined by the value of IPRN:

IPRN	U1/2DREL	U2DINT
0	10G11.4	10I11
1	11G10.3	60I1
2	9G13.6	40I2
3	15F7.1	30I3
4	15F7.2	25I4
5	15F7.3	20I5
6	15F7.4	
7	20F5.0	
8	20F5.1	
9	20F5.2	
10	20F5.3	
11	20F5.4	
12	10G11.4	

OUTPUT CONTROL MODULES

The modifications and new modules described below perform output control functions and are not directly related to the numerical computations of water levels and flows. They are, however valuable for viewing, evaluating and presenting model results.

Modifications to module BAS1/OC1

The Basic Package has been modified from its original version (McDonald and Harbaugh, 1988). The Output Control Option has been modified to output hydrographs and to output volumetric budget information to a separate file. The modified option is referred to here as OC2. OC2 will not correctly read unmodified OC1 input files. OC2 capabilities are identical to those of OC1, with the following exceptions:

(1) OC2 allows the specification of a number of cells/nodes as observed head locations: For each time step the user may specify a list of cells/nodes whose hydraulic head will be printed to the file number JHEDUN.

(2) OC2 allows output of the volumetric budget to file number IBUD, as well as to the main output file.

To work correctly with the modified model, input files created for OC1 must be modified. To convert an older file, insert input record 1, with a value of zero, at the beginning of the file:

sample OC1 input file

4	4	81	82
0	1	1	0
0	0	1	0

modified input file

0			
4	4	81	82
0	1	1	0
0	0	1	0

Input Records

Record 1 is read by module OC1AL and *is read once for a simulation*.

record 1: Maximum number of individual head values (observed heads) to be printed to unit JHEDUN in any one time step.
variable: MXHEADS
format: I10

Record 2 is read by module BAS1RP and *is read once for a simulation*.

record 2: Print formats for head and drawdown, unit numbers for head, drawdown, observed heads and volumetric budget.

variable:	IHEDFM	IDDNFM	IHEDUN	IDDNUN	JHEDUN	IBUD
format:	I10	I10	I10	I10	I10	I10

Records 3, 4 and 5 are read by module BAS1OC and *are read once for each time step*.

record 3: Flag for layer-by-layer head and drawdown output requests, flags for head/drawdown, volumetric budget and cell-by-cell or node-by-node flow components, number of observed heads for this time step.

variable:	INCODE	IHDDFL	IBUDFL	ICBCFL	NHEADS
format:	I10	I10	I10	I10	I10

record 4: Layer, row and column of observed heads. Read NHEADS times when NHEADS is greater than zero.

variable:	LAYER	ROW	COLUMN
format:	I10	I10	I10

record 5: Layer-by-layer output specifications for head and drawdown. Read zero, one or NLAY times, depending on the value of INCODE.

variable:	HDPR	DDPR	HDSV	DDSV
format:	I10	I10	I10	I10

Explanation of Variables

Record 1

MXHEADS : Maximum number of individual head values, or observed heads, to be written to unit JHEDUN in any one time step.

Record 2

IHEDFM : Format code for printing heads.
IDDNFM : Format code for printing drawdowns.

Format codes have the same meaning for head and drawdown. A positive entry indicates wrap format, a negative entry strip format. The absolute value of IDDNFM specifies the printout format as follows:

0 - 10G11.4	7 - 20F5.0
1 - 11G10.3	8 - 20F5.1
2 - 9G13.6	9 - 20F5.2
3 - 15F7.1	10 - 20F5.3
4 - 15F7.2	11 - 20F5.4
5 - 15F7.3	12 - 10G11.4
6 - 15F7.4	

IHEDUN : Unit number to which heads are written, if they are saved.
IDDNUN : Unit number to which drawdowns are written, if they are saved.
JHEDUN : Unit number to which observed head values are to be written.
IBUD : Unit number to which volumetric budget is to be written when flag IBUDFL is set. A value of zero indicates the budget is written to the main output file.

Record 3

INCODE : Head/drawdown output code. Determines the number of times record 5 is read. If INCODE is:

< 0 : layer-by-layer specifications from last time step are used. Record 5 is not read.
= 0 : all layers are treated the same way. Record 5 is read once.
> 0 : Input record 5 is read for each layer.

IHDDFL : Head/drawdown output flag. If IHDDFL is nonzero, heads and drawdowns will be printed or saved according to the flags for each layer specified in input record 5.
IBUDFL : Budget print flag. If IBUDFL is nonzero, overall volumetric budget is printed. Exception: The budget is always printed at the end of a stress period.
ICBCFL : node-by-node flow-term flag. If ICBCFL is nonzero, node-by-node flow terms are printed or saved according to flags set in the individual packages.
NHEADS : Number of individual head values to be written to unit JHEDUN for current time step. If NHEADS<0, the list of individual heads from the previous time step is reused.

Record 4

LAYER, ROW, COLUMN : Layer, row, and column of individual head to be written to unit JHEDUN. (Read NHEADS times, when NHEADS>0).

Record 5

HDPR : Flag for head printing. Head is printed if HDPR is nonzero.
DDPR : Flag for drawdown printing. Drawdown is printed if DDPR is nonzero.
HDSV : Flag for head saving to disk. Head is saved if HDSV is nonzero.
DDSV : Flag for drawdown saving to disk. Drawdown is saved if DDSV is nonzero.

Changes to BAS1 Code

Changes to the BAS1 code are listed below by BAS1 module subroutine.

OC1AL

OC1AL is a new subroutine added to allocate array space for hydrograph output using the Output Control package.

BAS1RP

Subroutine BAS1RP has been modified to reserve values of IBOUND and to accommodate hydrograph and budget output. The parameters JHEDUN and IBUD, unit numbers for hydrograph and budget output, have been added. Special IBOUND values (currently 30000 and 99) are reserved in bold text following comment **C5a**. The call statement to subroutine SBAS1I is indicated in bold text following comment **C8**.

BAS1ST

BAS1ST has been modified to include the stress period length (variable PERLEN) as a subroutine argument. This makes this variable available for use by other subroutines.

SBAS1I

Subroutine SBAS1I has been modified to read unit numbers for hydrograph output (JHEDUN) and budget output (IBUD). The parameters JHEDUN and IBUD have been added. The unit numbers are read in the bold text following comment **C2**.

BAS1OC

Subroutine BAS1OC has been modified to read output hydrograph data. The parameters MXHEDS and NHEADS and the array XHEDMT have been added. Hydrograph cell locations are read from the output control input file in the bold text following comments **C3** and **C3a**.

BAS1OT

Subroutine BAS1OT has been modified to accommodate hydrograph and budget output. The parameters JHEDUN, IBUD, MXHEDS and NHEADS and the array XHEDMT have been added. The call statement to subroutine SBAS1H has been modified in the bold text following comment **C3**. A call statement to subroutine SBAS1B has been added in the bold text following comment **C4**.

SBAS1H

Subroutine SBAS1H has been modified to output hydrograph data. The parameters JHEDUN, MXHEDS and NHEADS and the array XHEDMT have been added. Hydrograph data are output in the bold text following comment **C0**.

SBAS1B

SBAS1B is a new subroutine added to print the volumetric budget to a separate output file.

DOCUMENTATION FOR OUT1

OUT1 is an output control package for MODFLOW that generates a user-specified set of output. OUT1 is activated in IUNIT(18) of the BAS input file in MODFLOW version **maj6x5**. Output is specified in a format similar to MODAFT. OUT1 performs the functions of MODAFT and STARTHED.

Input Records

Record 1 is read by module OUT1AL and *is read once for a simulation*.
variable: KOUTOP MXOTRC
format: I10 I10

Record 2 is read by module OUT1OT and is read:
once for each time step when KOUTOP=0.
once for each stress period when KOUTOP>0.
variable: ITMP
format: I10

Records 3 and 4 are read by module OUT1OT a <u>combined</u> total of ITMP times when ITMP>0.
record 3 Read up to ITMP times when ITMP>0. Not read when ITMP≤0.
variable: KCOM KSUB KNDX KFRM KFIL
format: I10 I10 I10 I10 I10

record 4 Read KNDX times when KSUB=4. Not read otherwise.
variable: KLAY KROW KCOL
format: I10 I10 I10

Explanation of Variables

1. KOUTOP : Output control option.
If KOUTOP=0, output control specifications are read for each time step.
Output is generated for each time step.
If KOUTOP=1, output control specifications are read for each stress period.
Output is generated for each time step.
If KOUTOP=2, output control specifications are read for each stress period.
Output is generated for the last time step of each stress period.

MOTRC: Maximum number of output control records. Must be greater than or equal to the largest value of ITMP (Record 2) within a simulation.

2. ITMP: Number of output control records.
If ITMP <0, output control specifications from the previous time step or stress period are re-used.
If ITMP>0, ITMP output control records (combined total of records 3 and 4) are read.
If ITMP=0, no output is generated for the current time step or stress period.

3. KCOM: Component of output desired:

If KCOM =0, **hydraulic head** is output.
=1, "**storage**" flow is output.
=2, "**constant head**" flow is output.
=3, "**flow right face**" is output.
=4, "**flow front face**" is output.
=5, "**flow lower face**" is output.
=6, "**wells**" (WEL1) flow is output.
=7, "**drains**" flow (DRN1, copy 1, IUNIT 3) is output.
=8, "**recharge**" (RCH1) flow is output.
=9, "**ET**" (EVT1) flow is output.
=10, "**river leakage**" (RIV1 flow) is output.
=11, "**head dependent bounds**" (GHB) flow is output.
=12, "**river 2 leakage**" (RIV2 flow to groundwater) is output.
=13, "**lake seepage**" (LAK2 flow to groundwater) is output.
=14, "**drains**" flow (DRN1, copy 2, IUNIT 14) is output.
=15, "**river 2 downstream flow**" (RIV2 surface flow) is output.
=16, **hydraulic head** is output (same as KCOM=0).
=17, (inactive, reserved for NCF1 "diagonal flow")
=18, "**river 2 reinjection**" (DIV1 injection of diverted surface flow) is output
=19, (inactive, reserved for "drawdown")

KSUB: Subset of output desired:

If KSUB=0, the entire array is output
=1, a layer of the array is output
=2, a row of the array is output
=3, a column of the array is output
=4, a selection of points from the array is output

KNDX: Index number for KSUB:

If KSUB=0, KNDX is not used.
If KSUB=1, KNDX is the layer number output
If KSUB=2, KNDX is the row number output
If KSUB=3, KNDX is the column number output
If KSUB=4, KNDX is the number of points to be output (read in Record 4)

KFRM: format of output. KFRM is discussed below.

KFIL: Unit number for output file. Output described by KCOM, KSUB, KNDX and KFRM is output to unit KFIL.

4. KLAY KROW KCOL

The layer, row, column indices of specific points to be output.
Read KNDX times when KSUB=4.

Explanation of KFRM

KFRM is the format of output. Its meaning is dependent on the value of KSUB.

If KSUB=0 (entire array output):

If KFRM=0, the array is output as a list of records in the form of *layer, row, column, value*

=1, the array is output in UBUDSV format (3 dimensional unformatted output, used in MODFLOW for unformatted cell-by-cell flow output).

=2, the array is output in ULASAV format (layer by layer unformatted output, used in MODFLOW for unformatted head output). Use this format to generate starting head files.

=3, the array is output as a list of records in the form of *row, column, period, step, time, value*

If KSUB=1 (one layer output):

If KFRM=0, the layer is output as a list of records in the form of la*yer, row, column, value*

=1, the layer is output as a list of records in the form of *row, column, value*

=2, the layer is output in ULASAV format (layer by layer unformatted MODFLOW output).

=3, the layer is output as a list of records in the form of *row, column, period, step, time, value*

>11, the layer is output in wrap/strip format (ULAPRW and ULAPRS, used by mudflow to print heads). The format number used is determined by computing KFRM1=KFRM-24: If KFRM1<0, strip format (ULAPRS) is used, with format number –KFRM1. Otherwise, wrap format (ULAPRW) is used, with format number KFRM1:

KFRM1	U1/2DREL	U2DINT
0	10G11.4	10I11
1	11G10.3	60I1
2	9G13.6	40I2
3	15F7.1	30I3
4	15F7.2	25I4
5	15F7.3	20I5
6	15F7.4	
7	20F5.0	
8	20F5.1	
9	20F5.2	
10	20F5.3	
11	20F5.4	
12	10G11.4	

If KSUB=2 (one row output):

If KFRM=0, the row is output as a list of records in the form of *layer, row, column, value*

=1, the row is output as a list of records in the form of *layer, column, value*

=2, the row is output as a list of records in the form of *layer, column, period, step, value*

=3, the row is output as a list of records in the form of *layer, column, period, step, time, value*

=4, the row is output as a list of records in the form of *layer, column, time, value*

If KSUB=3 (one column output):

If KFRM=0, the column is output as a list of records in the form of *layer, row, column, value*

=1, the column is output as a list of records in the form of *layer, row, value*

=2, the column is output as a list of records in the form of *layer, row, time, value*

=3, the column is output as a list of records in the form of *layer, row, period, step, value*

=4, the column is output as a list of records in the form of *layer, row, period, step, time, value*

If KSUB=4 (list of points output):

If KFRM=0, output is generated in hydrograph format: Each line of the output file contains stress period and time step numbers and a value for each point. The header of the file contains the layer, row and column location of each point.

=1, output is generated in list format: Each line of the output file contains information in the form of *period, step, layer, row, column, value*

DOCUMENTATION FOR ZON1

ZON1 is an output control package for MODFLOW that generates zone budgets. ZON1 is activated in IUNIT(20) of the BAS input file in MODFLOW version **maj6x5**. ZON1 uses the memory allocated by OUT1 (IUNIT(18)), and will not run if OUT1 is not also activated.

Input Records

Record 1 is read by module ZON1AL and *is read once for a simulation*.

variable:	NZONES	KZONOP	KZONOT
format:	I10	I10	I10

Record 2 is read by module ZON1OT and *is read once for each layer*.

variable:	IZON (NCOL,NROW)
format:	(U2DINT)

Record 3 is read by module ZON1OT and *is read* *once for each stress period if KZONOP>0*,
once for each time step if KZONOP=0

variable:	ITMP
format:	(I10)

Record 4 is read by module ZON1OT when ITMP > 0

variable:	ICODES (NZONES)
format:	(50I2)

Explanation of Variables

1. NZONES: The number of zones in the model grid. Set NZONES equal to the highest number in the zone array, IZON.

   KZONOP: Options for zone budget output

If KZONOP=0	Record 3 is read each time step. Output is generated each time step.
=1	Record 3 is read each stress period. Output is generated each time step.
=2	Record 3 is read each stress period. Output is generated on the last time step of each stress period.

   KZONOT: Unit number for zone budget output.

2. IZON: Zone designation for each cell. One array is read for each layer

3. ITMP: Flag for reading output specifications (Record 4)

If ITMP>0	Record 4 is read. Output is generated based on flags set in Record 4.
=0	Record 4 is not read. No output is generated.
<0	Record 4 is not read. Output is generated based on the previous reading of Record 4.

4. ICODES: Output flag for each zone. If ICODES(K) is not zero, output is generated for zone K.

MODIFICATIONS TO LKMT

The LKMT package has been added to enable use of MT3D (Zheng, 1996). The LKMT package saves MODFLOW output in the format used for MT3D input.

Modifications

(a) the LKMT package has been made into a subroutine; (b) the LKMT package is distributed as an included block in the main MODFLOW program; (c) subroutine LKMT contains the code from the included block; (d) subroutines LAK2MT and RIV2MT have been added to the LKMT package to allow MT3D interfaces for the LAK2 and RIV2 packages.

DOCUMENTATION FOR LKMP1

The LKMP1 package has been added to facilitate the use of MODPATH (Pollock, 1994), a particle tracking program. The LKMP1 package saves MODFLOW output in the format used for MODPATH input. LKMP1 generates a MODPATH input file, the Composite Budget File (*.cbf),

LKMP1 is activated by setting IUNIT(23) in the .BAS file to a non-zero unit number, then listing a file (*.cbf) with the same unit number in the master input file (".NAM" file). The CBF file will be saved to the unit number (IUNIT[23]) and filename specified.

PERCHED WATER, DRY CELLS, AND REWETTING

This group of modifications to MODFLOW was inspired by conditions encountered along the Carlin Trend of Northern Nevada. A highly-transmissive carbonate rock aquifer (the carbonate aquifer) has been dewatered for mining. The carbonate aquifer is represented using multiple model layers, with some cells becoming dry during the course of dewatering. These cells are rewet during the simulation of post-mining water level recovery.

The Carlin Formation overlies the carbonate aquifer in parts of the model area. It is composed of Tertiary-aged alluvial deposits with much lower permeability than the carbonate aquifer. Over the course of dewatering the carbonate water level has dropped below the bottom of the Carlin Formation and created a perched Carlin water table overlying a zone of desaturated carbonate rock.

Water drains through the dewatered but highly transmissive carbonate rock. Components of recharge to the carbonate aquifer that pass through the dewatered part of the aquifer include:

a) Recharge from the Carlin formation. Water drains from the Carlin Formation downward, through the dewatered carbonate rock, to the carbonate water table below.

b) Recharge from stream networks. Stream channels including Brush Creek, Rodeo Creek, Boulder Creek, and Bell Creek directly recharge the carbonate in outcrop areas.

c) Areal recharge. Direct infiltration of precipitation occurs over carbonate outcrops.

In order to properly represent the above conditions, the following modifications were made to the MODFLOW code.

Vertical Leakage Transfer

The BCF2 package (McDonald et al., 1991) has been modified to (optionally) transmit vertical leakage from above a dry cell to a lower, active layer. Thus the Carlin formation in Layer 1, initially leaking water to the carbonate aquifer in Layer 2, will leak water to the carbonate in Layer 3 after Layer 2 is dry.

Without modifications, MODFLOW already simulates perched aquifer units: Under non-perched conditions, vertical flow between two layers is calculated based on the difference in head between the two layers. As water level in the lower layer drops below the bottom of the upper layer, MODFLOW switches to calculating a flow based on water head in the upper layer only, assuming gravity drainage through the unsaturated zone to the water table below in the lower layer.

A problem arises as the Layer 2 carbonate aquifer cells become dry. Without modification, MODFLOW stops simulating drainage from the perched Carlin Formation to the carbonate water table below. This discontinuity in the equations used to calculate flow produced unrealistic results in the simulated carbonate aquifer water balance and in the simulated Carlin Formation water level trends and water balance.

With the modification, water continues draining at the same rate it was before the Layer 2 carbonate aquifer cells became dry. This restores continuity to the equations used to simulate groundwater flow.

The transfer of vertical leakage is appropriate to apply to the situation along the Carlin Trend, where a lower permeability unit is perched above a higher permeability unit. In some cases, the use of the unmodified algorithm, in which drainage stops as Layer 2 becomes dry, would be more appropriate. In other cases, the use of an unsaturated flow algorithm to represent Layer 2 may be most appropriate.

Vertical Transfer of Recharge and River Leakage

The RCH1 package (McDonald and Harbaugh, 1988) was already equipped with an option (NRCHOP=3) to add areal recharge to the uppermost active layer; therefore, no modifications were necessary to simulate recharge to a lower layer when the uppermost carbonate layers are dry.

The RIV2 package was similarly equipped with a feature that adds stream infiltration to the uppermost active layer. Thus rivers initially recharging the carbonate aquifer in Layer 1 will recharge the Layer 2 carbonate when Layer 1 is dry (and Layer 3 when Layer 2 is dry).

Vertical Transfer of Pumping

Historical pumping rates are modeled as specified flows using the module WEL1. Without modifications, MODFLOW removes pumping from the model when a pumping cell becomes dry. The WEL1 package has been modified to (optionally) shift pumping to the next layer down when a pumping cell becomes dry. This option preserves specified pumping rates.

The approach can be appropriate for representing dewatering wells that are completed in multiple layers, or wells that are assumed to be replaced when pumping levels become too low, and it eliminates the need to re-partition pumping between layers and re-specify WEL package input every time a cell becomes dry.

Transfer of Residual Storage

In a model time step in which a cell becomes dry, MODFLOW normally ignores the water stored in the cell at the beginning of the time step. This volume of water is lost to the model mass balance accounting. In the carbonate aquifer, however, this volume of water would percolate to the water table below. The BCF2 package has been modified to (optionally) transfer the residual storage volume from a dry cell to a lower, active cell, thus preserving the mass-balance accounting of aquifer storage.

Cell Rewetting

A simplified rewetting method allows dry cells to be rewet with a zero rewetting threshold, resulting in smoother rewetting and better continuity of groundwater flow equations. Dry cells are rewet when head in an underlying or adjacent cell is above the bottom of a dry cell. Cells may be rewet with a zero saturated thickness and cells can remain wet with a small saturated thickness.

MODIFICATIONS TO MODULE BCF2

The BCF2 package (McDonald et al., 1991) has been modified from its original version for the purpose of simulating conditions of drawdown and recovery of a high-permeability formation underlying a low-permeability formation. The modifications allow the simulation of a perched leaky aquifer by allowing the vertical flow of water through inactive high-permeability cells to a water table in the underlying active cells.

Modifications

The modifications to BCF2 provide an option for vertical transfer of flow, including:

The transfer of vertical flow from an active cell, goes through the underlying inactive cells to the uppermost active cell below. The transfer of vertical flow allows the simulation of a perched water table.

The transfer of storage flow from of a cell, in the time step in which it goes dry, to the uppermost active cell below. The vertical transfer of storage improves computation of cumulative mass balance.

The input parameter IWETIT, previously not used for rewetting simulations with vertical transfer, now is a cutoff iteration for rewetting. When IWETIT is greater than zero, cells are not rewet after iteration IWETIT.

The vertical transfer option may be used with or without rewetting. Vertical transfer simulations use a simplified rewetting algorithm appropriate to high-permeability material: A dry cell is rewet at the beginning of any iteration in which the cell below has a head higher than the bottom of the dry cell. The initial head of the rewet cell is set equal to the cell bottom.

Input Records

Input records for the modified BCF2 are unchanged from the original BCF2. Explanations of input parameters are unchanged except for the following:

IWDFLG rewetting/flux transfer flag.
if IWDFLG=0, cell rewetting and transfer of BCF2 flux components are not enabled.
if IWDFLG>0, BCF2 cell rewetting is enabled.
if IWDFLG<0, vertical transfer of BCF2 flux components is enabled.
if IWDFLG=-2, cell rewetting and vertical transfer of BCF2 flux components are enabled.

WETDRY rewetting array.
When IWDFLG=0 or -1, WETDRY is not read.
When IWDFLG>0 WETDRY is the rewetting array as originally used in BCF2.
When IWDFLG<-1 WETDRY is a rewetting flag: A cell may be rewet if WETDRY for the cell is not equal to zero.

Changes to BCF2 Code

BCF2AL
Subroutine BCF2AL has been modified to reflect vertical transfer of flow. The vertical transfer option is identified in bold text following comment **C2a**. The condition for allocation of array WETDRY is changed in the bold text following comment **C7a**.

BCF2RP

Changes to subroutine BCF2RP accommodating the vertical transfer option are indicated in bold text following comment **C2H**.

SBCF2N

Changes to subroutine SBCF2N accommodating the vertical transfer option are indicated in bold text following comments **C4B1** and **C4B4**.

BCF2AD

Subroutine BCF2AD has been modified to initialize HOLD for inactive cells during simulations using vertical transfer. The parameters KPER and KSTP have been added. New code is indicated in bold text following comment **C1**. Modified code is indicated in bold text following comment **C1a**.

BCF2FM

Transfer of Flux Components

BCF2 has been modified to transfer storage from dry cells to lower layers. Storage is transferred in subroutine BCF2FM in the bold text following comments **C4a**, **C4b** and **C5d**. BCF2 has also been modified to transfer vertical leakage from above to a lower layer from cells that desaturate. Vertical leakage is transferred in subroutine BCF2FM in the bold text following comments **C6** and **C6a**.

Secondary Modifications

Transfer of storage and vertical leakage is invoked in subroutine BCF2FM by an IBOUND value of 99, set in SBCF2H. Cells with an IBOUND value of 99 are deactivated in subroutine BCF2FM in the bold text following comment **C8d**.

SBCF2H

Rewetting

In transient simulations, vertical transfer of flux components from dry cells maintains the head in dry cells at the layer bottom. Dry cells may be rewet with a zero saturated thickness by ending transfer of flux components and restoring vertical conductance values. No wetting threshold is required, allowing cells to remain wet with a small saturated thickness. Dry cells are rewet when head in the layer below is above the bottom of the dry cell. The rewetting criteria are therefore equivalent to the bottom wetting option in BCF2 (WETDRY<0) with a rewetting interval of 1 (IWETIT=1) and a zero wetting threshold (WETFCT=0 and WETDRY=0). Cells are rewet in the bold text following comment **C2c**.

Secondary Modifications

Transfer of storage and vertical leakage is invoked in subroutine BCF2FM by an IBOUND value of 99. SBCF2H sets the IBOUND value of dry cells to 99 when the flux transfer option is invoked. Head in dry cells is set at the layer bottom elevation to allow computation of storage in dry cells. Dry cells entering SBCF2H are assigned IBOUND values of 99 in the bold text following comment **C2b**. As in the unmodified BCF2, horizontal and vertical conductance terms are set to zero. Unlike unmodified BCF2, vertical conductance from above is not set to zero (bold text following comment **C2d**), enabling the transfer of vertical leakage to lower layers. IBOUND values and heads are assigned to cells that become dry in the bold text following comment **C6c**.

BCF1BD

Subroutine BCF1BD has been modified to recognize the vertical transfer of storage from dry cells to lower layers. Flag IWDFLG and array CVWD have been added to the subroutine parameters. Modifications are contained in bold text in the subroutine header and in bold text following comments **C6** and **C6aa** and in the call statement to subroutine SBCF1F

SBCF1F

Subroutine SBCF1F has been modified to recognize the transfer of vertical flow through dry cells during computation of constant head flows. Flag IWDFLG and array CVWD have been added to the subroutine parameters. Modifications are contained in bold text following comments **C6E1** and **C6F1**.

Verification of Changes Made to BCF2

The modifications to BCF2 were verified using the example problems described in the BCF2 Package documentation (McDonald, Harbaugh, Orr, and Ackerman, 1991). Following is a brief description of the example problems and a comparison of the model results using both BCF2 and modified BCF2:

<u>Problem 1</u> A steady-state problem, referred to as Problem 1 in the BCF2 Package documentation, was run. First the original problem was duplicated employing the modified BCF2 Package, with IWDFLG>0. The problem was then run with the flux transfer/rewetting option (IWDFLG=-2). Results closely matched the published Problem 1 results, computing the same number and location of active cells and a maximum head difference between simulations of .02 feet.

<u>Problem 2a</u> A steady-state problem, referred to as Problem 2a in the BCF2 Package documentation, was run. First the original problem was run, with IWDFLG>0. Results were confirmed to be identical to the published BCF2 results.

In a second simulation the problem was modified by the specification of absolute values of .0001 for WETDRY and WETFCT. The small wetting values approximate the zero wetting values of the flux transfer/rewetting option (IWDFLG=-2). Results were close to the published 2A results, with 2 more active cells in Layer 2, 3 more active cells in Layer 5 and head differences of up to .1 feet.

In a third simulation the problem was run with the flux-transfer/rewetting option (IWDFLG=-2). Results were identical to those of the second simulation.

<u>Problem 2d</u> A transient problem, 2d, was run. First the original problem was run, with IWDFLG>0. Results were confirmed to be identical to the published BCF2 results.

Second the problem was modified by the specification of absolute values of .0001 for WETDRY and WETFCT. The small wetting values approximate the zero wetting values of the flux transfer/rewetting option (IWDFLG=-2). The results of changing WETDRY and WETFCT for problem 2d resembled the results of changing WETDRY and WETFCT for problem 2a, with several more active nodes and head differences of up to .1 feet.

Third the problem was run with the flux-transfer/rewetting option (IWDFLG=-2). Results were identical to those of the second simulation.

Fourth, the problem was modified to test the transfer of vertical leakage. The recharge package was turned off and replaced with an initially wet Layer 1. The flux transfer option without rewetting (IWDFLG=-1) was enabled. Layer 1 was specified as active, with an initial head of 70 feet and a bottom of 65 feet. The last row and the last column of Layer 1 were de-activated to avoid vertical transfer of flow directly into constant head cells. Layers 2-9 were specified as inactive, unable to be rewet. Layers 10-14 were specified as active, with an initial head of 25 feet. Layer 1 is thus separated from the rest of the grid by inactive layers. The problem was run for 50 1-day time steps. As a perched aquifer, Layer 1 should drain according to the equation

$$Sy\frac{\partial h}{\partial t} = Vc(h-b),$$

where,

h is hydraulic head
Sy=0.2 is specific yield
Vc=0.05/dy is vertical conductance
b=65 ft is layer bottom,

with a solution of $h = 65ft + (5ft)e^{-t/4dy}$

A comparison of numerical and analytical solutions is shown on the figure below:

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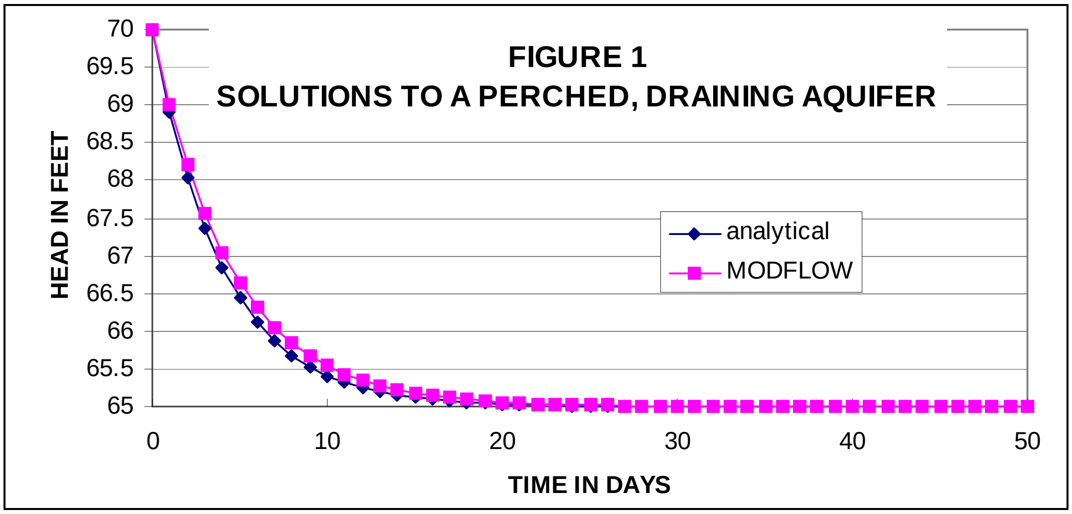

Figure 1 shows that the isolated layer drains as expected, with a reasonable match of the analytical solution. Furthermore, a 1-point implicit finite difference spreadsheet solution exactly matched the MODFLOW solution. Inspection of the mass balance table in the simulation output also shows that the water from Layer 1 enters aquifer storage or exits through constant heads in the active Layers 10-14.

Fifth, the problem was modified to test the transfer of storage. The bottom of Layer 1 is re-specified at 69.1 feet. The simulation is run for a 1 day time step, during which Layer 1 goes dry. Inspection of the mass balance table in the simulation output shows that the correct volume of storage flows from Layer 1:

$$(39 \text{ rows}) \times (39 \text{ columns}) \times (125 \text{ ft})^2 \times (0.9 \text{ ft}) \times (0.2) = 4.2778 \times 10^6 \text{ft}^3$$

The Layer 1 storage entering the model exits the model as storage or constant head flow in the active Layers 10-14.

MODIFICATIONS TO BOUNDARY CONDITION MODULES

The following sections describe mostly minor modifications that are used to specify boundary conditions to a groundwater flow domain, including modules RCH1, EVT1, WEL1 and DRN1.

Modifications to Module WEL1

The original WEL package (McDonald and Harbaugh, 1988) has been modified to shift pumping down to the uppermost active layer when the assigned cell for a well is dry. This vertical flux transfer serves to maintain the total specified pumping flow for a simulated well that is completed in several layers. Prior to modification, MODFLOW removes pumping from the simulation when a cell goes dry; vertical flux transfer therefore eliminates the need to re-partition pumping between layers and re-specify WEL package input every time a cell goes dry. Vertical flux transfer is accomplished by means of an extra variable in the WELL array that serves as a flag indicating whether vertical transfer is to be used for a given well. Modifications to WEL1AL, WEL1RP, WEL1FM and WEL1BD are indicated in bold text.

Modifications

In subroutine WEL1AL the dimensioning of array WELL is 5* MXWEL instead of 4* MXWEL. Modified code is indicated by bold text in the line following comment **C4**. The new dimension of WELL is also indicated by bold text in the DIMENSION statements of WEL1RP, WEL1FM and WEL1BD.

In subroutine WEL1RP the READ statement in the fifth line following comment **C5** has been modified to also read a vertical transfer flag. Modified code is indicated by bold text.

In subroutine WEL1FM, vertical transfer is performed in the bold text following comment **C2aa**.

In subroutine WEL1BD, vertical transfer is performed in the bold text following comment **C5aa**.

Input Records

Record 1 is read by module WEL1AL and *is read once for a simulation*.

record 1 variable: MXWEL IWELCB
format: I10 I10

Records 2 and 3 are read by module WEL1RP and *are read once for each stress period*.

record 2 variable: ITMP
format: I10

record 3 Read ITMP times when ITMP>0. Not read when ITMP≤0.
variable: LAYER ROW COLUMN RATE IVTF
format: I10 I10 I10 F10.0 I10

Explanation of Variables

1. MXWEL : Maximum number of wells in any stress period.
   IWELCB : Flag and unit number for node-by-node WEL output.
   If IWELB>0, well flows are saved unformatted on unit number IWELCB whenever the flag ICBCFL from the OC Package is nonzero.
   If IWELCB<0, well flows are printed to the main output file. In the future they will be printed to unit number -IWELCB.
   If IWELCB=0, well flows are not printed or saved.
2. ITMP : If ITMP≥0, ITMP is the number of wells used in the current stress period.
   If ITMP<0, the well list from the previous stress period is reused.
3. LAYER : Layer of well cell/node.
   ROW : Row of well cell/node.
   COLUMN : Column of well cell/node.
   RATE : Pumping rate of well.
   IVTF : Vertical transfer flag for well.
   If IVTF is not equal to zero, vertical transfer is performed.
   If IVTF is equal to zero, vertical transfer is not used.

Modifications to Module DRN1

The Drain Package has been modified from its original version (McDonald and Harbaugh, 1988). The function of the Well Package has been incorporated into the Drain Package. The modification allows a convenient representation of pumping wells, in which a well may pump a specified rate or a head-dependent rate. Vertical flow transfer may be used with the Well package function of DRN.

Modifications

In subroutine DRN1AL a vertical transfer is read following comment **C2**. The dimension of array DRAI is 6* MXDRN instead of 5* MXDRN. Modified code is indicated by bold text in the line following comment **C4**. The new dimension of DRAI is also indicated by bold text in the DIMENSION statements of DRN1RP, DRN1FM and DRN1BD.

In subroutine DRN1RP the READ statement in the fifth line following comment **C7** has been modified to also read a pumping rate. Modified code is indicated by bold text.

In subroutine DRN1FM the function of the Well Package is performed in the bold text following comment **C3b**. Vertical transfer for the Well package function is performed in the bold text following comment **C3a**.

In subroutine DRN1BD the function of the Well Package is performed in the bold text following comment **C5c** and indicated by bold text in the lines following comments **C5a** and **C9**. Vertical transfer for the Well package function is performed in the bold text following comment **C5b**.

Input Records

Record 1 is read by module DRN1AL and *is read once for a simulation*.

record 1	variable:	MXDRN	IDRNCB	ID1VT
	format:	I10	I10	I10

Records 2 and 3 are read by module DRN1RP and *are read once for each stress period*.

record 2	variable:	ITMP
	format:	I10

record 3 Read ITMP times when ITMP>0. Not read when ITMP≤0.

variable:	LAYER	ROW	COLUMN	HEAD	COND	RATE
format:	I10	I10	I10	(3F10.0)		

Explanation of Variables

1. MXDRN : Maximum number of drains in any stress period.
   IDRNCB : flag and unit number for node-by-node DRN output.
   If IDRNCB>0, drain flows are saved unformatted on unit number IDRNCB whenever the flag ICBCFL from the OC Package is nonzero.
   If IDRNCB<0, drain flows are printed to the main output file. In the future they will be printed to unit number -IDRNCB.
   If IDRNCB=0, drain flows are not printed or saved.
   ID1VT : Vertical transfer flag. If ID1VT is not zero, vertical transfer is used for the well function part
of DRN : Pumping (RATE in record 3) is placed in the uppermost active layer.
2. ITMP : If ITMP≥0, ITMP is the number of drains used in the current stress period.
   If ITMP<0, the drain list from the previous stress period is reused.
3. LAYER : Layer of drain cell/node.
   ROW : Row of drain cell/node.
   COLUMN : Column of drain cell/node.
   HEAD : Elevation of drain.
   COND : Conductance of drain.
   RATE : Pumping rate of well

Modifications to Module RCH1

The areal Recharge Package, version 1, RCH1 (McDonald and Harbaugh, 1988), has been modified to include a seasonal input option. When the seasonal option is invoked, the RCH1 input file is rewound and recharge data from the first stress period are used. The seasonal option may be seen in subroutine RCH1RP in the bold text following comment **C2**. Following are revised input instructions. The seasonal input option is described in Record 2 (INRECH).

Input Records

Record 1 is read by module RCH1AL and *is read once for a simulation.*

record 1.

variable:	NRCHOP	IRCHCB
format:	I10	I10

Records 2-4 are read by module RCH1RP and *are read once for each stress period.*

record 2.

variable:	INRECH	INIRCH
format:	I10	I10

record 3. Read if INRECH is greater than or equal to 0.

variable: RECH(NCOL,NROW)
format: U2DREL

record 4. Read if NRCHOP=2 and INIRCH is greater than or equal to 0.

variable: IRCH(NCOL,NROW)
format: U2DINT

Explanation of Variables

<u>record 1</u>

NRCHOP : RCH option.

If NRCHOP=1, recharge is specified for the top layer.

If NRCHOP=2, the user specifies the recharge layer at each horizontal location using array IRCH.

If NRCHOP=3, recharge is applied to the top-most active layer. If the top-most active layer at a given horizontal location is a constant head cell/node, recharge is not applied to that location.

IRCHCB : flag and unit number for node-by-node RCH output.

When IRCHCB>0, node-by-node terms are recorded on unit IRCHCB.

<u>record 2</u>

INRECH : recharge rate (RECH) read flag.

If INRECH is greater than or equal to 0, RECH is read.

If INRECH=-1, RECH from the previous stress period is used.

If INRECH<-1, the input file is rewound and RCH input for the first stress period is read.

INIRCH : Layer indicator (IRCH) read flag.

If NRCHOP=2 and INIRCH is greater than or equal to 0, IRCH is read. Otherwise (if NRCHOP=2), IRCH from the previous stress period is used.

<u>record 3</u>

RECH : recharge rate (L/t).

<u>record 4</u>

IRCH : Layer indicator array. Used if NRCHOP=2. At each horizontal location, IRCH indicates the layer to which recharge is applied.

Modifications to Module EVT1

The Evapotranspiration Package, version 1, EVT1 (McDonald and Harbaugh, 1988), has been modified to include a seasonal input option. When the seasonal option is invoked, the EVT1 input file is rewound and recharge data from the first stress period are used. The seasonal option may be seen in subroutine EVT1RP in the bold text following comment **C2**. Following are revised input instructions. The seasonal input option is described in Record 2 (INSURF).

Input Records

Record 1 is read by module EVT1AL and *is read once for a simulation.*

record 1.

variable:	NEVTOP	IEVTCB
format:	I10	I10

Records 2-6 are read by module EVT1RP and *are read once for each stress period.*

record 2.

variable:	INSURF	INEVTR	INEXDP	INIEVT
format:	I10	I10	I10	I10

record 3. Read if INSURF greater than or equal to 0.
variable: SURF(NCOL,NROW)
format: U2DREL

record 4. Read if INEVTR greater than or equal to 0.
variable: EVTR(NCOL,NROW)
format: U2DREL

record 5. Read if INEXDP greater than or equal to 0.
variable: EXDP(NCOL,NROW)
format: U2DREL

record 6. Read if NEVTOP=2 and INIEVT greater than or equal to 0.
variable: IEVT(NCOL,NROW)
format: U2DINT

Explanation of Variables:

record 1.

NEVTOP : ET option.
1 - ET is calculated for the top layer.
2 - the user specifies the ET layer at each horizontal location using array IEVT.

IEVTCB : flag and unit number for node-by-node EVT output.
When IEVTCB>0, node-by-node terms are recorded on unit IEVTCB.

record 2.

INSURF : ET surface (SURF) read flag.

If INSURF greater than or equal to 0, SURF is read.

If INSURF=-1, SURF from the previous stress period is used.

If INSURF<-1, the input file is rewound and EVT input for the first stress period is read and used.

INEVTR : Maximum ET rate (EVTR) read flag. If INEVTR is greater than or equal to 0, EVTR is read.

Otherwise, EVTR from the previous stress period is used.

INEXDP : Extinction depth (EXDP) read flag. If INEXDP is greater than or equal to 0, EXDP is read.

Otherwise, EXDP from the previous stress period is used.

INIEVT : Layer indicator (IEVT) read flag. If NEVTOP=2 and INIEVT greater than or equal to 0, IEVT is read. Otherwise (if NEVTOP=2), IEVT from the previous stress period is used.

record 3: SURF : ET surface elevation.

record 4: EVTR : Maximum ET rate.

record 5: EXDP : Extinction depth.

record 6: IEVT : Layer indicator array. Used if NEVTOP=2.

At each horizontal location, IEVT indicates the layer from which ET is taken.

DOCUMENTATION FOR RIV2

The River Package, version 2 (RIV2), developed by the USGS (Miller, 1988) is a FORTRAN package for the U.S. Geological Survey Modular Groundwater Flow Model, MODFLOW (McDonald and Harbaugh, 1988). RIV2 has been modified to allow unformatted output of streamflow, to include a seasonal input option, to allow input of new river reach data while repeating river node data and to allow input of new river node data while repeating river reach data. In addition, river recharge is now placed in the uppermost active layer. The capability to simulate diversion of river flow and optional transfer and re-injection of diverted flow to a new location has also been added. This diversion capability was added through a set of subroutines that all include the characters “DIV1” in their names. Input data for the diversion capability is in a file that is separate from the RIV2 input file.

RIV2 Narrative (from Miller, 1988)

The main features of RIV2 are:

1. The river system is divided into reaches and simulated river discharge is routed from one reach to another in a specified sequence. Within a reach, river discharge is routed from one node to the next.
2. Inflow (river discharge) entering the upstream end of a reach can be specified.
3. More than one river can be represented at one node and rivers can cross, as when representing a siphon.
4. The quantity of leakage to or from the aquifer at a given node is proportional to the hydraulic-head difference between that specified for the river and that calculated for the aquifer. Also, the quantity of leakage to the aquifer at any node can be limited by the user and, within this limit, the maximum leakage to the aquifer is the discharge available in the river. This feature allows for the simulation of intermittent rivers and drains that have no discharge routed to their upstream reaches.
5. An accounting of river discharge is maintained.

Neither stage-discharge relations nor storage in the river or river banks is simulated.

The modeling concepts necessary for the operation of RIV2 differ little from those for RIV1. The differences are largely due to features adapted from the modeling code of Posson et al. (1980) and Hearne (1982). The RIV2 code represents a number of nodes that simulate leakage from or to an overlying river. Certain features of a river that would be essential in a surface-water model, such as storage in the channel or banks, are not represented because RIV2, like RIV1, is considered to be a boundary condition in a ground-water model, not a surface-water model.

The rate of leakage at each node is directly proportional to the difference between the hydraulic head in the aquifer and the stage of the river, but is limited to the lesser of either a user-specified maximum or the intermittent and ephemeral rivers. Leakage from the aquifer to the river is not limited in RIV2.

The user needs to supply the hydraulic-connection coefficient, the limiting maximum rate of leakage to the aquifer, and the river stage for each node. It is possible for the user to re-specify the river characteristics (stage, hydraulic-connection coefficient, and limiting maximum rate of leakage to the aquifer and river stage) for each stress period. They hydraulic-connection coefficient, CRIV, may be defined as the conductance of the reach of the riverbed with units of length squared per unit time:

$$CRIV = K'\,A'/b$$

where K’ = vertical hydraulic conductivity of the riverbed material
A’ = area of the river channel; and
b = thickness of the riverbed material

The river discharge for a node is equal to the river discharge into the node minus the leakage to the aquifer or plus the leakage from the aquifer. The river stage, the wetted perimeter of the river channel, and the conductance of the riverbed material in a river vary with the discharge of the river. The constant values used in RIV2 limit its accuracy, but the error probably is not as great as it would be if the aquifer were allowed to gain more water from the river than the river contained.

The river-discharge-routing procedure in RIV2 uses a higher order structure that is not used in RIV1. A river, as represented in the framework of the model, consists of one or more reaches, and each reach consists of one or more nodes. (This definition of the term “reach” is distinctly different from that of RIV1.) A node may be part of more than one river reach. The river discharge at the upstream end of a reach consists of the river discharge from upstream reaches plus any user-specified tributary inflow. The river discharge from the downstream end of a reach may be routed to any downstream reach. The structure allows representation of tributaries.

RIV2, like RIV1, separates the leakage term into explicit and implicit parts. The explicit part of the leakage term is added to the variable RHS. (RHS is the right side of a finite-difference equation and is an accumulation of the terms that are independent of hydraulic head at the current time step. Terms in RHS are defined by various model packages.) The term added to RHS may have either of two forms. If the hydraulic head computed for the aquifer during the previous iteration was greater that the hydraulic head required to produce the limiting value of leakage to the aquifer, then the following FORTRAN assignment is made:

$$RHS = CRIV * HRIV$$

where, HRIV is the river stage, and other terms are as previously defined. If the hydraulic head computed for the aquifer during the previous iteration was less than or equal to the hydraulic head required to produce the limiting value of leakage to the aquifer, then the assignment is:

$$RHS = RHS - CRIV * (HRIV - HMIN)$$

where, HMIN is the hydraulic head required to produce the limiting value of leakage to the aquifer, and other terms are as previously defined.

The implicit part of the leakage term is added to the variable HCOF. (HCOF) is the coefficient of hydraulic head for the node (J, I, K) in the finite-difference equation.) The implicit term may, like the explicit term, have either of two forms. If the hydraulic head computed for the aquifer during the previous iteration was greater than the hydraulic head required to produce the limiting value of leakage to the aquifer, then the following FORTRAN assignment is made:

$$HCOF = HCOF - CRIV$$

where, all terms are as previously defined. The implicit term is zero when the hydraulic head computed for the aquifer during the previous iteration was less than or equal to the hydraulic head necessary to produce the limiting value of leakage to the aquifer. In this instance, the leakage term included in the solution algorithm is explicit.

Modifications

The following are modifications to the original RIV2 Package:

The River Package, version 2, RIV2, has been modified to allow unformatted output of streamflow. Streamflow for each river node is saved when the flag IDQ (record 1) is set.

RIV2 has been modified to include a seasonal input option. The RIV2 input file is rewound, and river data from the first stress period re-read, when the flag ITMP (record 3) is less than -1.

RIV2 has been modified to allow input of new river reach data while repeating river node data. River reach data will be read, and river node data repeated, when the flag IREAC (record 3) is set.

RIV2 has been modified to allow river leakage to be placed in the uppermost active model layer. The flux transfer option is invoked by the flag IR2VT in record 1 below.

DIV1**,** which is a subpackage to RIV2, has been developed to expand the capabilities of the River Package. DIV1 permits a portion of existing river flow to be diverted and routed to another location in the model. Streamflow is subtracted from a user specified river node. All or part of the flow is added directly to the RHS vector of a user specified model cell.

Input Records

Records 1 and 2 are read by module RIV2AL and are *read once for a simulation*:

record 1

Data:	MXRIVR	IRIVCB	IDQ	IDIV	IR2VT
Format:	I10	I10	I10	I10	I10

record 2

Data:	MXREAC
Format:	I10

Records 3, 4, 5 and 6 are read by module RIV2RP and are *read each stress period*.

record 3

Data:	ITMP	IREAC
Format:	I10	I10

record 4

Data:	NR
Format:	I10

record 5 read NR times.

Data:	NREA	NNRE	RQIN	NADD
Format:	I10	I10	F1O.0	I10

(record 5 consists of one record for each river reach active during the current stress period. The reaches need to be specified in downstream order.)

record 6 read ITMP times, when ITMP>0.

Data:	Layer	Row	Column	STAGE	COND	QMAX
Format:	I10	I10	I10	F10.0	F10.0	F10.0

(record 6 consists of one record for each river node active during the current stress period. The nodes need to be specified in downstream order, consistent with the specification of the river reaches.)

Explanation of Variables

record 1

MXRIVR is the maximum number of river nodes active at one time.

IRIVCB is a flag and a unit number.

If IRIVCB > 0, then node-by-node flow terms will be recorded on unit IRIVCB whenever ICBCFL (see Output Control) is set.

If IRIVCB = 0, then node-by-node flow terms will be neither printed nor recorded.

If IRIVCB < 0, then river leakage for each reach will be printed whenever ICBCFL is set.

IDQ is a flag indicating whether downstream flows are to be saved.

If IDQ ≠ 0, then streamflow for each river node will be recorded on unit IRIVCB whenever ICBCFL (see Output Control) is set.

If IDQ = 0, then streamflow will not be recorded.

IDIV is a flag and a unit number activating the DIV1 subpackage for river diversions.

If IDIV > 0 then DIVI is unit number from which DIV1 input is read (see input instructions below).

IR2VT is a flag for vertical transfer of river leakage.

If IR2VT=0, vertical transfer is not used: River leakage is placed in the specified layer, if active.

If IR2VT≠ 0, vertical transfer is used: River leakage is placed in the uppermost active layer.

record 2 MXREAC is the maximum number of river reaches active at one time.

record 3

ITMP is a flag and a counter.

If ITMP <-1, the input file is rewound. River node data and river reach data from the first stress period are used.

If ITMP =-1, then river node data from last stress period will be re-used.

If ITMP ≥ 0, ITMP is the number of river nodes active during the current stress period.

IREAC is a flag for reading river reach data when ITMP=-1.

If IREAC = 0 and ITMP=-1, river reach data and river node data from the previous stress period are re-used. Records 4, 5 and 6 are not read.

If IREAC ≠ 0 and ITMP=-1, river reach data is read, but river node data from the previous stress period are re-used. Records 4 and 5 are read, and record 6 is not read.

record 4 NR if NR<0, river reach data from the previous stress period are re-used.
if NR>0, NR is the number of river reaches active in the current stress period.

record 5 **river reach data**

NREA is the river-reach number.

NNRE is the number of river nodes in the reach.

RQIN is the river discharge added at the upstream end of the reach.

NADD is the number of the downstream reach (zero, if none).

record 6 **river node data**

LAYER is the layer number of the river node.

ROW is the row number of the river node.

COLUMN is the column number of the river node.

STAGE is the hydraulic head in the river.

COND is the riverbed hydraulic conductance.

QMAX is the maximum allowable leakage to the aquifer.

DOCUMENTATION FOR DIV1

DIV1 enables water to be diverted from a river channel and permits the optional transfer of the diverted water to another location within the model. This feature allows the simulation of processes such as the extraction of river water for application to agricultural lands, direct recharge of a reservoir or unspecified municipal/industrial use. Multiple diversions may be made, each being extracted from a single river node and re-injected into a single model cell. Each diversion is specified using the following variables:

NODE = RIV2 node from which water is to be diverted. NODE$\in$(1,MXRIVR)

Qd = maximum rate of water to be diverted. The actual flow diverted by DIV1 is the minimum of Qd and available river flow.

Qa = That portion of Qd assumed to be accounted for elsewhere, not to be re-injected by DIV1. Qa may represent water put into the model by other MODFLOW packages or water removed from the simulation. The amount of water diverted over Qa is re-injected.

ILAY, IROW, ICOL = The layer, row and column indices of the cell into which diverted water is re-injected.

For each RIV2 node (node number) to be diverted from, subroutine DIV1RP sets a flag in MXRIVR(7,NODE) to indicate the diversion. As subroutine RIV2FM is looping through river nodes it checks the flag for diversions. When diversions are found, RIV2FM calls subroutine DIV1FM to perform the diversion.

The amount of water diverted is computed as the minimum of Qd and available river flow:

Qdiverted = min(Qd,Q(NODE))

where, Q(NODE) is the streamflow at the river node.

The amount of water re-injected is the difference between the amount diverted and Qa:

Qreinjected = max (0, Qdiverted-Qa)

Input Records

Records 1 is read by module DIV1AL and is read *once for a simulation*:

record 1

Data:	MXDIV	IDIVOT
Format:	I10	I10

Records 2, and 3 are read by module RIV2RP and are read *each stress period*

record 2

Data:	ITMP
Format:	I10

record 3

Read ITMP times when ITMP $\geq$ 0

Data:	NODE	ILAY	IROW	ICOL	QD	QA
Format:	I10	I10	I10	I10	F10.0	F10.0

Explanation of Variables

record 1

MXDIV is the maximum number of river diversions occurring during the simulation.

IDIVOT is a flag and a unit number.

If IDIVOT > 0, then node-by-node flow terms will be recorded on unit IDIVOT whenever ICBCFL (see Output Control) is set.

If IDIVOT = 0, then node-by-node flow terms will be neither printed nor recorded.

record 2

ITMP is a flag and a counter.

If ITMP <0, information from the previous stress period is repeated. River reach data from the first stress period is used.

If ITMP ≥ 0, ITMP is the number of river nodes active during the current stress period.

record 3

NODE is the river node number as defined in RIV2 (from 1 to MXRIVR) from which water is to be diverted.

ILAY is the layer number of the location for the re-injection of diverted water

IROW is the row number of the location for the re-injection of diverted water

ICOL is the column number of the location for the re-injection of diverted water

QD is the volume of water diverted from the river

QA is the volume of water re-injected into the modeled system

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APPENDIX: DOCUMENTATION FOR MODULE LAK2

DOCUMENTATION OF LAK2: A COMPUTER PROGRAM TO SIMULATE THE PRESENCE OF LAKES AND OTHER OPEN WATER BODIES WITHIN A GROUNDWATER FLOW SYSTEM USING THE MODFLOW GROUNDWATER FLOW MODEL

ABSTRACT

LAK2 is a module for the U.S. Geological Survey Modular Groundwater Flow Model (MODFLOW) that simulates the interconnection between a groundwater system and an adjacent open water body such as a lake, an open pit or a well bore.

The module has been in use since 1998. Although other modules have subsequently been published (lake package, USGS OFR 00-4167 and Multi-Node Well Package, USGS OFR 02-293) that perform some of the same functions, these only provide stable and accurate solutions for a limited range of problems, and break down under strongly transient or nonlinear conditions, when aquifer water level and “lake” water level are each sensitive to the other.

The main difference between LAK2 and other modules is the method used to solve two parallel but interdependent (coupled) sets of equations governing (1) groundwater levels and flows and (2) “lake” water levels and flows. Other modules solve partially decoupled forms of the equations with good results for a limited range of problems, but with slow convergence, instability and mass balance errors for other applications. LAK2 solves the fully coupled system of equations and provides efficient, stable, convergent solutions without mass balance errors.

LAK2 was first reviewed and accepted for use in the state of Nevada for simulation of post-mining water level recovery in an open pit (BLM, 2000). LAK2 has since been applied to pit-filling simulations for sites in Nevada, New Mexico, Canada, Chile, and Tanzania. Other applications have involved modeling borehole hydraulics and wells intersecting multiple model cells. Further applications potentially include the representation of natural lakes, caverns or other open spaces linked to a groundwater system.

This report presents LAK2 documentation and selected applications including:

- Module documentation: Presentation of algorithm, input instructions and simple test case.
- Archimedes pit: Demonstration of the representation of lake (pit) geometry and water balance, projection of future water level and water balance.
- Ortiz pit: Calibration of a groundwater flow model to historical pit water levels, post-audit of water level projections.
- Belen municipal well: Representation of a well pumping from multiple layers, correcting the erratic numerical solution previously obtained.
- Fan Sediments aquifer test: Simulation of borehole water levels for analysis of aquifer test results and projection of future pumping water levels.

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APPENDIX: DOCUMENTATION FOR MODULE LAK2

DOCUMENTATION OF LAK2: A COMPUTER PROGRAM TO SIMULATE THE PRESENCE OF LAKES AND OTHER OPEN WATER BODIES WITHIN A GROUNDWATER FLOW SYSTEM USING THE MODFLOW GROUNDWATER FLOW MODEL

INTRODUCTION

This report describes a module that has been used since 1998 to solve the fully coupled system of equations describing groundwater flow and lake/water body mass balance. The module applies to both larger-scale water bodies such as open pits and smaller-scale bodies such as well bores.

Previous Work

Software for modeling of lakes in conjunction with surrounding groundwater systems, using the U.S. Geological Survey Modular Groundwater Flow Model (MODFLOW), dates back to at least 1993 (Cheng and Anderson, 1993). Other lake modules developed for MODFLOW include those by HSI Geotrans (Council, 1999) and most recently by USGS (Merritt and Konikow, 2000). Another module was developed to represent well bores intersecting multiple model cells (Halford and Hanson, 2002).

All of these modules utilize an algorithm that treats the mass balance equation governing lake stage as if it were decoupled from the equations governing the groundwater system. They have been successfully used to represent natural lakes with little change, or slow change, in water level and they work acceptably well for a range of applications where lake stage does not strongly influence groundwater heads and where simulation time steps are sufficiently small so that the lake stage does not change too much in a single time step.

The decoupling of equations is done as follows: MODFLOW iteratively solves the system of equations governing groundwater head. The equation governing lake stage is then solved, after the iterative process has finished. Because groundwater head and lake stage are mutually dependent variables, errors result in both groundwater and lake solutions.

The decoupled solution algorithms break down for strongly transient problems, such as recovery of water level in an open pit after mining has ceased, or for highly sensitive problems where lake stage strongly influences groundwater levels. Mass balance errors become large and stability or convergence limits require impractically short time step lengths with long model run times.

The module described here solves the fully coupled system of equations describing groundwater flow and lake mass balance. The equations governing lake stage are solved at each iterative step of the groundwater flow solution process, thus simultaneously solving for lake stage and groundwater head. The algorithm produces stable, efficient and convergent solutions without mass balance error.

Structure of Report

This report includes the following chapters:

1. Module documentation: Presentation of algorithm, input instructions and simple test case.
2. Application: Archimedes pit. Representation of lake (pit) geometry and water balance, projection of future water level and water balance.
3. Application: Ortiz pit. Calibration of a groundwater flow model to historical pit water levels, post-audit of water level projections.
4. Application: Belen municipal well. Representation of a well pumping from multiple layers, correcting the erratic numerical solution previously obtained.
5. Application: Fan Sediments aquifer test. Simulation of borehole water levels for analysis of aquifer test results and projection of future pumping water levels.

1.0 DOCUMENTATION

1.1 LAKE WATER BALANCE

Groundwater flow systems can be influenced by stationary surface water features (lakes) including natural lakes, constructed reservoirs, retired mine pits and wetlands. Lakes can function as hydraulic sinks with groundwater inflow, as hydraulic sources of groundwater recharge or as flow-through lakes with both groundwater inflow and groundwater outflow. A lake may serve to connect distinct parts of a groundwater flow system.

Lake water balance components are illustrated on Figure 1.1 and can include:

- direct precipitation and runoff from surface catchment
- evaporation of water from lake surface
- groundwater inflow
- inflow from surface streams
- groundwater outflow
- surface water outflow

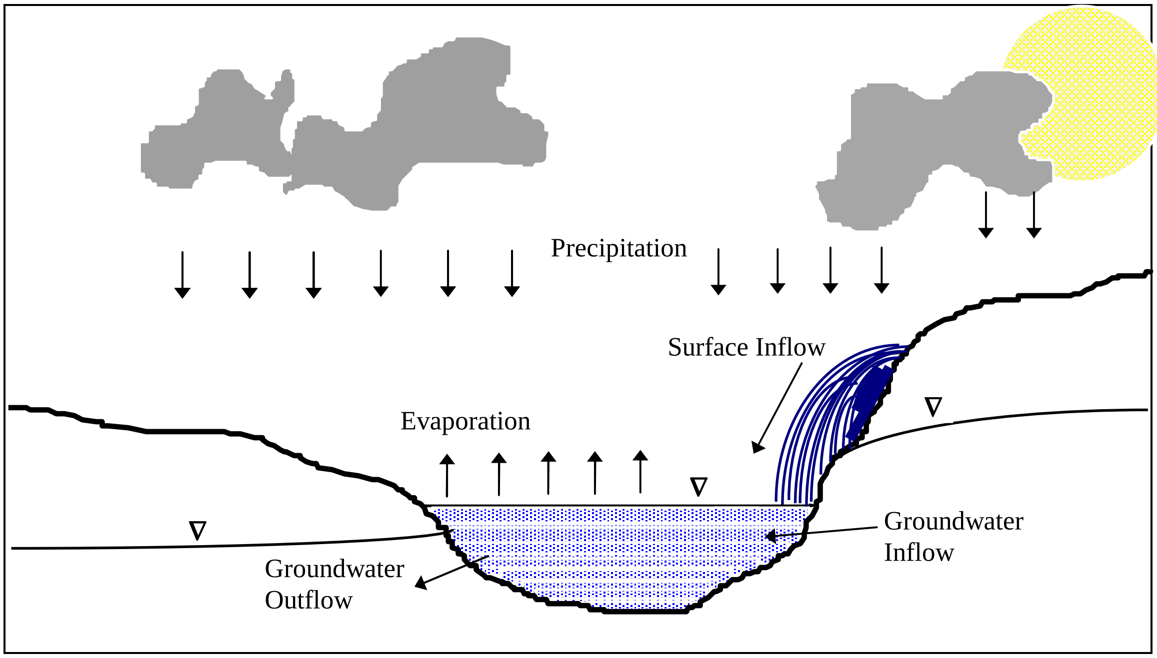

Figure 1.1 Components of lake water balance.

The governing equation for lake stage used by LAK2 is

$$\frac{\partial H_{LAKE}}{\partial t} = \frac{1}{A_{LAKE}}\{Q_{str\ in} - Q_{str\ out} + P - E + Q_{gw} - W\} \qquad (1)$$

where:

H_{LAKE} is the lake water surface elevation (L).
A_{LAKE} is the water surface area of the lake at stage HLAKE (L^2).
Q_{strin} is the rate of streamflow into the lake (L^3/t).
Q_{strout} is the rate of streamflow out of the lake (L^3/t).
P is the rate of precipitation inflow to the lake (L^3/t).
E is the rate of evaporation from the lake (L^3/t).
Q_{gw} is the net rate of groundwater flow to the lake (L^3/t).
W is the rate of pumping or other diversion out of or into the lake (L^3/t).

1.1.1 Geometric Representation of Lake

A lake is defined by a list of cells (lake cells) in the groundwater flow domain that are connected to the lake. A conceptual view is shown on Figure 1.2, indicating lake cells (groundwater cells connected to the lake) and inactive cells (not part of the groundwater domain).

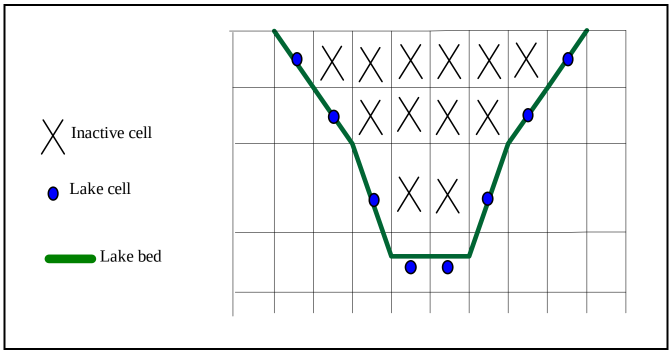

Figure 1.2. Cross-sectional view of a lake in a MODFLOW grid.

Each lake cell is specified with a lakebed minimum elevation, lakebed maximum elevation and maximum water surface area.

Water surface area of the lake is computed by summing the contribution of each cell to the total water surface. The contribution for a cell is equal to zero when lake water level is at or below the lakebed minimum elevation, increasing linearly with lake water level to the maximum water surface area when lake water level is at or above the lakebed maximum elevation.

The bottom of a lake is the lowest lakebed minimum elevation among the lake nodes. Two options exist for representation of the lake bottom:

1. A flat bottom lake is defined when the lakebed minimum elevation is equal to lakebed maximum elevation for the lowermost cell(s) of the lake.
2. A non-flat bottom lake is defined when the lakebed minimum elevation is lower than the lakebed maximum elevation for the lowermost cell(s) of the lake.

The two types of lake bottom have different implications for Equation (1) above when water level is near the lake bottom elevation. For a non-flat bottom, the water surface area A_{LAKE} approaches zero as water level approaches bottom elevation. For a flat bottom, the water surface area A_{LAKE} approaches a nonzero constant as water level approaches bottom elevation. For both types, A_{LAKE} is zero when the lake is dry (water level equal to bottom elevation) and Equation (1) is undefined. Lake bottom type is considered in the computation of the components of Equation (1) and in the handling and rewetting of dry lakes.

1.1.2 Stream Connections

LAK2 is configured to recognize surface water inflows and outflows simulated using the streamflow routing package RIV2 (Miller, 1988, Jones, 2010). RIV2 has been developed to provide the streamflow routing function in an efficient and simple way without surface water mass balance errors. Other streamflow routing modules for Modflow could readily be utilized by LAK2 with minor code changes.

A list of RIV2 reaches may be specified to flow into a LAK2 lake. The simulated streamflow at the bottom node of each inflowing reach is added to Q_{strin} in Equation (1).

A single RIV2 reach may be specified to flow out of a lake at a specified spill elevation. Spill from the lake, Q_{strout} in Equation (1), is computed by setting water level equal to spill elevation and then computing the resulting water surplus. The simulated inflow at the top node of the outflowing reach is set equal to spill from the lake.

Note: Other lake modules including (Merritt and Konikow, 2000) have used a Manning equation to estimate a spill rating curve and thus compute spill as a function of water level above spill elevation. To date, the models to which LAK2 has been applied have not been concerned with the small margin of water level above spill elevation. A Manning equation-based spill computation could be readily implemented into LAK2 with minor code changes.

1.1.3 Precipitation

Total precipitation inflow to a lake consists of direct precipitation on the water surface as well as runoff from the surface catchment above the lake water level. A runoff coefficient for each lake cell is specified to define the portion of precipitation that runs off to the lake from areas above the lake water level.

Total precipitation inflow to the lake is computed as precipitation multiplied by water surface area, plus precipitation multiplied by runoff coefficient multiplied by catchment area above the lake water level, or

$$P=p[\ \alpha\ A_{MAX} + (1-\ \alpha)\ A_{LAKE}] \qquad (2)$$

where

p is precipitation rate over the lake (L/t).
α is runoff coefficient for the lake cell.
A_{MAX} is the maximum water surface area of the lake cell (L^2).
A_{LAKE} is the actual water surface area of the lake cell (L^2).

Note that the right-hand side of equation (2) represents a summation over the individual lake cells defining a lake, each cell having its own α, A_{MAX} and contribution to A_{LAKE}.

1.1.4 Evaporation

Lake evaporation is computed as

$$E = eA_{LAKE} \qquad (3)$$

where

e is evaporation rate over the lake (L/t).

Evaporation/Evapotranspiration from ephemeral, flat-bottom lakes

If groundwater level is close to a flat lake bottom, groundwater evapotranspiration (ET) may occur when the lake is dry. LAK2 recognizes this condition and adds boundary conditions to each lake cell on a dry lake bottom equivalent to those added by the EVT1 module (McDonald and Harbaugh, 1988). An extinction depth is specified for each flat bottom lake to define the reduction of ET with depth. ET is zero if the lake is not dry. ET rate is equal to e when groundwater head is at the lakebed elevation, decreasing linearly to zero when groundwater head drops to extinction depth below the lake bottom. Simulated ET is included as part of the “groundwater inflow” and “evaporation” components of the lake water balance.

Other considerations arise in the computation of evaporation over a discrete time step in which a flat bottom lake is dry or becomes dry. Evaporation in this case is reduced from the maximum rate by limiting evaporation to lake inflow, reflecting the evaporation of all available water in only part of the time step. If, in addition, groundwater levels are close to the lake bottom, maximum ET rate is specified such that the sum of lake evaporation and maximum ET rate is equal to the evaporation rate e, reflecting evaporation for one part of the time step and ET for the other part.

1.1.5 Groundwater Flow

Groundwater flow into and out of the lake is computed based on the difference between lake water level and groundwater head at each lake cell, multiplied by lake cell conductance. The conductance of each lake cell is specified as described in Numerical Implementation below.

Conductance for each lake cell is adjusted based on water levels. Conductance is equal to the specified (maximum) conductance when either lake water level or groundwater level is above the lakebed maximum elevation. Conductance is equal to zero when water level is below the lakebed minimum elevation. Conductance decreases linearly for water levels between the lakebed maximum and lakebed minimum elevations.

Groundwater flow to or from lake cell n is computed as

$$Q_n = -C_n(\max[H_{LAKE}, BOTLK_n] - \max[H_n, BOTLK_n])$$

where

Q_n is the groundwater flux into the lake at lake cell n (L3/t).
C_n is the conductance of lake cell n (L2/t).
H_n is the groundwater head in lake cell n (L).
$BOTLK_n$ is the lakebed minimum elevation in lake cell n (L): If HLAKE > $BOTLK_n$, the lake is wet at lake cell n. If HLAKE < $BOTLK_n$, the lake is dry at lake cell n.

Total groundwater inflow and outflow to the lake are equal to the respective sum of inflows and outflows from each lake cell. Net rate of groundwater flow to the lake is computed as $Q_{gw} = \sum_n Q_n$.

1.2 NUMERICAL IMPLEMENTATION

1.2.1 Discrete Equation

The discrete equation for lake stage used by LAK2 for a MODFLOW time step may be written as

$$\frac{\Delta S}{\Delta t} = P - E + Q_{gw} + Q_{strin} - Q_{strout} \qquad (1)$$

where

$$\Delta S = \int_{t0}^{t0+\Delta t} A_{LAKE} \frac{\partial H_{LAKE}}{\partial t} dt$$ is the change in lake storage during the time step

t_0 is the beginning of the time step
Δt is the length of the time step

1.2.2 Change in Lake Storage

Change in lake storage is computed as

$$\Delta S = \sum_{n=1}^{N} \left[\int_{h1_n}^{h2_n} A_n dh \right]$$

where

$Hnew_{LAKE}$ is lake stage at the end of the time step
$Hold_{LAKE}$ is lake stage at the beginning of the time step

$h1_n = \max[Hold_{LAKE}, BOTLK_n]$

$h2_n = \max[Hnew_{LAKE}, BOTLK_n$

The above equation can be written in the form

(2) $$\Delta S = D_0 + D_1 Hnew_{LAKE} + D_2\ Hold_{LAKE}$$

where

$$D_0 = \sum_{\{n\in[1,N]|Hnew_{LAKE}<BOTLK_n\}} A_n BOTLK_n - \sum_{\{n\in[1,N]|Hold_{LAKE}<BOTLK_n\}} A_n BOTLK_n$$

$$D_1 = \sum_{\{n\in[1,N]|Hnew_{LAKE}>BOTLK_n\}} A_n$$

$$D_2 = -\sum_{\{n\in[1,N]|Hold_{LAKE}>BOTLK_n\}} A_n$$

1.2.3 Precipitation

As above, lake precipitation is computed as

(3) $$P = p\alpha A_{MAX} + p(1-\alpha)A_{LAKE}$$

1.2.4 Evaporation

As above, lake evaporation is computed as

(4) $$E = eA_{LAKE}$$

1.2.5 Groundwater Flow

Groundwater flow to a lake is defined to be the sum of groundwater flow to each lake node:

(i) $$Q_{gw} = \sum_{n=1}^{N} Q_n$$

where

Q_n is the groundwater flux to lake node n (L^3/t).

(ii) $$Q_n = -C_n(\max[H_{LAKE}, BOTLK_n] - \max[H_n, BOTLK_n])$$

where

H_n is the groundwater head in lake node n

C_n is the lake bed conductance at lake node n (L^2/t).

Equation (ii) may be written in the form

(iv) $$Q_n = R_n + \gamma_n H_{LAKE} + \beta_n H_n$$

where

βn	=Cn	if	Hn>BOTLKn		
	=0	if	Hn<BOTLKn		
γn	= -Cn	if	HLAKE>BOTLKn		
	=0	if	HLAKE<BOTLKn		
Rn	=CnBOTLKn	if	Hn<BOTLKn	and	HLAKE>BOTLKn
	= -CnBOTLKn	if	Hn>BOTLKn	and	HLAKE<BOTLKn
	=0	if	Hn,HLAKE<BOTLKn	or	

$H_n, H_{LAKE} > BOTLK_n$

Combining equations (i) and (iv) yields an equation of the form

$$Q_{gw} = \alpha + \beta_0 H_{LAKE} + \sum_{n=1}^{N} \beta_n H_n \qquad (5)$$

where

$$\beta_0 = \sum_{n=1}^{N} \gamma_n$$

$$\alpha = \sum_{n=1}^{N} R_n$$

1.2.6 Lakebed Conductance

Lakebed conductance is specified by the LAK2 user. Conductance may be computed externally to the simulation as

C_n = (lakebed area)x(hydraulic conductivity)/(bed thickness).

Three models of lakebed conductance are shown on Figures 1.3a, b and c.

Lakebed area: If the lakebed is horizontal, then lakebed area is equal to lake cell surface area. Lakebed area may also be computed as lake cell surface area divided by the cosine of the average angle of lakebed inclination.

Hydraulic conductivity: Effective hydraulic conductivity for the zone crossed by the bold line in Figures 1.3a, b or c may be specified to compute conductance. If the lakebed is horizontal, a vertical hydraulic conductivity should be used. If the lakebed is vertical, a horizontal hydraulic conductivity should be used.

Bed thickness: Bed thickness for each of the three conductance models is indicated by the bold line in Figures 1.3a, b and c.

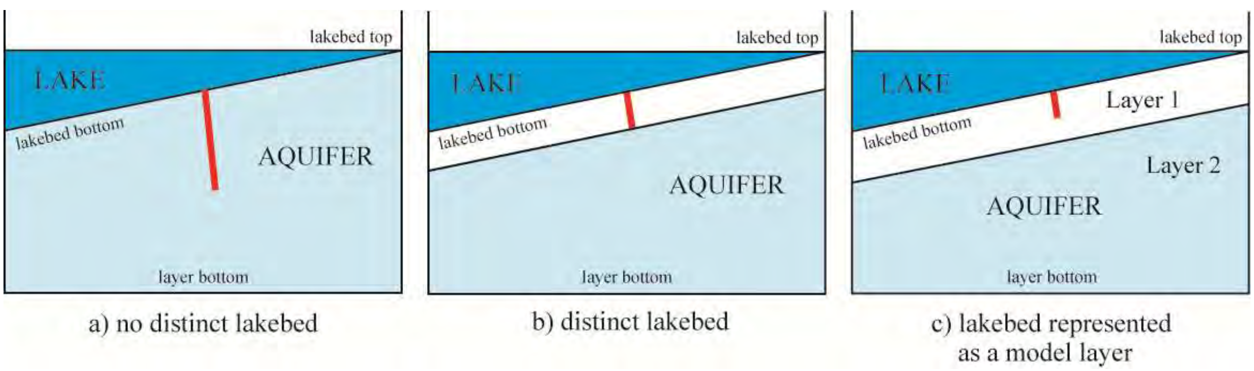

Figure 1.3. Models of lakebed conductance.

LAK2 adjusts conductance for each node to reflect partial saturation:

Let X= max (H_n,H_{LAKE}). Let $TOPLK_n$ = lakebed max elevation in lake cell n

1. If $X \geq TOPLK_n$, C_n is set to the user-specified conductance.
2. If $BOTLK_n < X < TOPLK_n$, C_n is set equal to the user-specified conductance times the factor

$$\left[\frac{X - BOTLK_n}{TOPLK_n - BOTLK_n}\right]$$

3. If $X \leq BOTLK_n$, C_n is set equal to zero

1.2.7 Interpolation of HLAKE

The lake stage used for computing Qgw in equations (3), (4) and (5) is defined by

(6) $$H_{LAKE} = \theta Hnew_{LAKE} + (1-\theta) Hold_{LAKE} ,$$

where

θ is a specified explicit/implicit parameter, with $0 \le \theta \le 1$.

- $\theta=0$ is the explicit formulation of lake stage,
- $\theta=1$ is the implicit formulation of lake stage and
- $0<\theta<1$ is an intermediate formulation of lake stage.

In the explicit formulation, lake stage at the beginning of a time step is used to compute flow between the lake and the aquifer. Lake stage is updated at the end of each time step. The explicit formulation converges most easily, but is unstable for large time steps.

In the implicit formulation, lake stage at the end of a time step is used to compute flow between the lake and the aquifer. Lake stage is updated at the end of each iteration of the groundwater flow equation.

In an intermediate formulation, an intermediate stage is used to compute flow between the lake and the aquifer. Lake stage is updated at the end of each iteration of the groundwater flow equation.

The implicit formulation is used for all of the applications presented here, matching the implicit formulation of groundwater flow equations used by the Modflow module BCF.

1.2.8 Numerical Equation

The LAK2 code substitutes equations (2), (3), (4), (5) and (6) into equation (1) to get an equation for lake stage in the following form:

$$\alpha_0 Hnew_{LAKE} + \sum_{n=1}^{N} \beta_n H_n = RHS_{LAKE} \quad (7)$$

where

$$\alpha_0 = \frac{D_1}{\Delta t} + \theta\beta_0$$

$$RHS_{LAKE} = \frac{D_0}{\Delta t} + \frac{D_2}{\Delta t} Hold_{LAKE} + P - E + Q_{strin} - Q_{strout} + \alpha + (1-\theta)\beta_0 Hold_{LAKE}$$

equation (7) may be solved as

$$Hnew_{LAKE} = \frac{1}{\alpha_0}\{RHS_{LAKE} - \sum_{n=1}^{N} \beta_n H_n\}.$$

Because the equations for lake stage are nonlinear, equation (7) is formulated iteratively. Equation (7) is formulated and solved until computed lake stage in successive iterations changes by less than a specified tolerance, or until the specified maximum number of iterations are performed.

After completing iteration of equation (7), LAK2 modifies the groundwater flow equation for each lake node to reflect flow between aquifer and lake. Inserting equation (6) into equation (iv) above yields a modified form of equation (iv):

$$Q_n = R'_n + \gamma'_n Hnew_{LAKE} + \beta_n H_n \quad \text{(iv')}$$

where

$\gamma'_n = \gamma_n \theta$

$R'_n = R_n + \gamma_n (1-\theta) Hold_{LAKE}$

LAK2 modifies the MODFLOW equation for each lake node according to equation (iv') by adding boundary conditions to the HCOF and RHS arrays of the MODFLOW equation:

β_n is added to the HCOF entry for lake node n.

The term $R'_n + \gamma'_n Hnew_{LAKE}$ is added to the RHS array entry for lake node n.

On the subsequent iteration of the main MODFLOW equation, the iterative formulation and solution of lake stage is repeated and the MODFLOW equation is again modified.

1.3 Input Instructions

Input consists of parameters for the entire simulation, parameters for each lake, parameters for each lake and stress period and parameters for each lake node.

Parameters for the entire simulation include the following:

1. Total number of lake cells.
2. Number of lakes.
3. Unit number for main lake output file.
4. Unit number for cell by cell output.
5. Unit number for lakebed zone budget output.
6. Explicit/implicit parameter THETA.
7. Head change convergence criteria used in lake stage computation.
8. Maximum number of iterations allowed in lake stage computation.
9. Flow change convergence criteria, used when lake stage is at spill elevation.
10. Total number of river reaches flowing into lakes

Parameters for each lake include the following:

1. Number of lake cells
2. Initial water stage
3. Listing of inflowing river reaches, if any
4. Identification of outflowing river reach, if any
5. Spill elevation (lakes with outflowing river reaches only)
6. ET extinction depth (flat bottomed lakes only).

Parameters for each lake and stress period include the following:

1. Precipitation (L),
2. Evaporation (L) and
3. Pumping to/from the lake(L^3/t)

The following are input for each lake cell:

1. Lakebed maximum elevation (L),
2. Lakebed minimum elevation (L),
3. Water surface area (L^2),
4. Conductance (L^2/t)
5. Runoff coefficient ()
6. Zone number, for groundwater zone budgets. Groundwater flow to and from lake nodes may be broken down by zones. This allows, for example, computation of pit lake chemical balances based on groundwater flow from different rock types. Each lake node is assigned a zone number. Flow totals into and out of each zone are computed.

1.3.1 Input Records

For Each Simulation:
Record 1.

variable:	MXLKND	NLAKES	ILKC1	ILKC2	ILKC3	THETA	TOL	MXITER	TOL2	MXRIVIN
format:	I10	I10	I10	I10	I10	F10.0	F10.0	I10	F10.0	I10

For Each Lake:
Record 2. Read NLAKES times.

variable:	NODES	STAGE0	NRVIN	KRVOT	XSPIL	EXDP
format:	I10	F10.0	I10	I10	F10.0	F10.0

Record 3: Read when NRVIN > 0.

variable:	IRI(NRVIN)
format:	*

For Each Lake Node:
Record 4. Read MXLKND times.

variable:	ILAY	IROW	ICOL	COND	BOT	TOP	XAREA	IBZON	RUNCOF
format:	I10	I10	I10	F10.0	F10.0	F10.0	F10.0	I10	

For Each Stress Period:
Record 5.

variable:	ITMP
format:	I10

Record 6. Read NLAKES times.

variable:	XEVAP	XPREC	Q
format:	F10.0	F10.0	F10.0

1.3.2 Explanation of Variables

Record 1. Read once for a simulation/
MXLKND: total number of lake nodes.
NLAKES: number of lakes.
ILKC1: unit number for main lake output file.
ILKC2: flag and unit number for cell by cell output.
ILKC3: flag and unit number for lakebed zone budget output.
THETA: explicit/implicit parameter.
TOL: head change convergence criteria used in lake stage computation.
MXITER: maximum number of iterations allowed in lake stage computation.
TOL2: flow change convergence criteria, used when lake stage equals spill elevation.
MXRIVIN: total number of river reaches flowing into lakes

Record 2. Read NLAKES times.
NODES: number of nodes representing lake.
STAGE0: initial lake stage.
NRVIN: number of RIV2 reaches flowing into lake.
KRVOT: reach number of RIV2 reach flowing out of lake.
XSPIL: spill elevation for lake (L).
EXDP: extinction depth for playa surface.

Record 3. Read when NRVIN > 0.
IRI(NRVIN): reach numbers of RIV2 reaches flowing into lake.

Record 4. Read MXLKND times.
ILAY: layer of lake node.
IROW: row of lake node.
ICOL: column of lake node.
COND: maximum conductance of lake node (L2/t)
BOT: lowest lake bed elevation within lake node.
TOP: highest lake bed elevation within lake node.
XAREA: maximum area of horizontal water surface for node.
IBZON: zone number of lake node, used in computation of lakebed zone budget.
RUNCOF: runoff coefficient for lake node, defined to be the fraction of precipitation falling draining directly to lake ().

Record 5. Read once for each stress period.
ITMP: flag for reading evaporation rate, precipitation rate, and spill elevatiion.
If ITMP>0, record 7 is read.
If ITMP<0, values from the previous stress period are used.

Record 6. Read NLAKES times when ITMP>0.
EVAP: lake evaporation rate for stress period (L/t)
PRECIP: lake precipitation rate for stress period (L/t)
Q: pumping/withdrawal rate from lake (L3/t). A negative value signifies addition of water to the lake.

1.4 CODE VERIFICATION

1.4.1 Example 0: Large-diameter well recovery

The LAK2 stage computation is tested using a pair of MODFLOW simulations. Water level recovery in a large diameter well is simulated in two different ways, with and without LAK2. Results are then compared to confirm the basic functioning of the code.

1.4.2 Example 0a: Without LAK2

A sample grid is constructed with 100 rows, 100 columns and 2 layers. Each column and row has a width of 1000 units. A confined layer type (type 0) is specified. Initial head is specified as 0, except for a group of four layer 1 cells in the center of the grid (Fig. 1.4). The initial head at these cells is specified as -100. Storage coefficient is specified as 1 at the four cells and .001 everywhere else, Transmissivity for each layer is specified everywhere as .001 square units per second. Vertical conductance is specified as 10-9 /second. A 100 year recovery is simulated. By symmetry, head in each of the group of four cells is the same.

1.4.3 Example 0b: With LAK2

The model grid and aquifer parameters from the large diameter well recovery are retained. The four cells are specified as inactive cells. A lake is specified using twelve LAK2 cells as shown in Figure 1.4. An implicit lake stage computation is selected. Initial lake stage is specified as -100. Lake evaporation and precipitation are specified as 0. The four lake cells in the center are placed in layer 2 and are considered to lie underneath a horizontal lake bed. The eight cells on the perimeter are placed in layer 1 and are considered to lie next to a vertical lake bed.

Area of each of the four lake cells in the center is specified as row width times column width, or 10^6 square units. Area of the eight remaining lake cells is specified as zero.

Conductance of each of the four lake cells in the center is specified as vertical conductance times cell area, or 10^{-3} square units per second. Conductance of the eight lake cells on the perimeter is specified as transmissivity times row width divided by column width, also 10^{-3} square units per second. Lakebed minimum and maximum for each lake cell are specified at a level below initial stage, leading to constant conductance for each lake cell throughout the simulation.

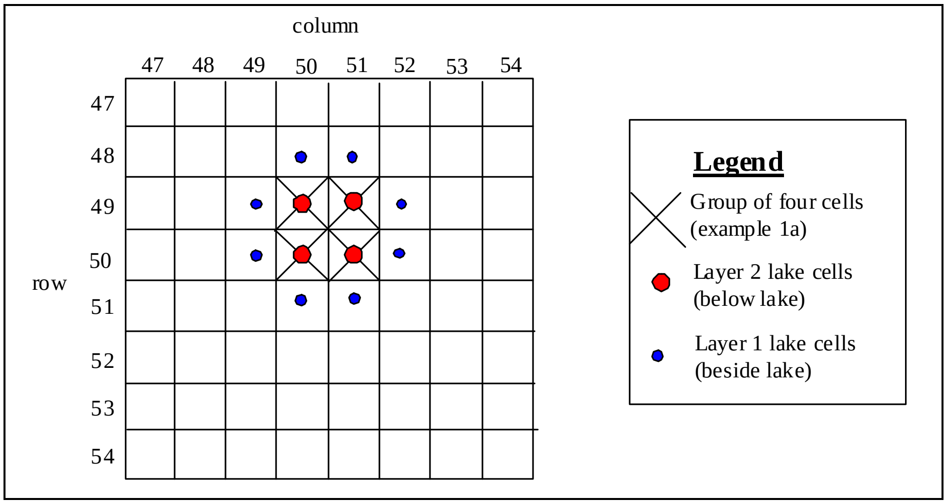

Figure 1.4. Layout of examples 0a and 0b.

1.4.4 Comparison of Results

The results of example 0a and example 0b are expected to be identical because

1. The specified area of the lake cells in example 0b matches the specified area of the group of four cells in example 0a. The storage coefficient of the group of four cells is specified as 1. The storage capacity of the lake is therefore identical to that of the group of four cells.
2. The specified conductances of the lake nodes match the specified horizontal and vertical conductances of Example 0a. In addition the lake node conductances are constant because lakebed elevations are specified below lake stage. Water is therefore transmitted to the lake at the same rate as to the group of four cells.
3. Heads in the group of four cells in example 0a are symmetric. The group of four cells is therefore represented by a single head, analogous to lake stage.
4. An implicit lake stage computation is used in example 0b. Example 0a, like most MODFLOW simulations, uses an implicit computation.

Head in the group of four cells of example 0a and stage in the lake of example 0b, both shown on Figure 1.5, are identical. Further inspection confirms that budget terms for the two simulations are also identical.

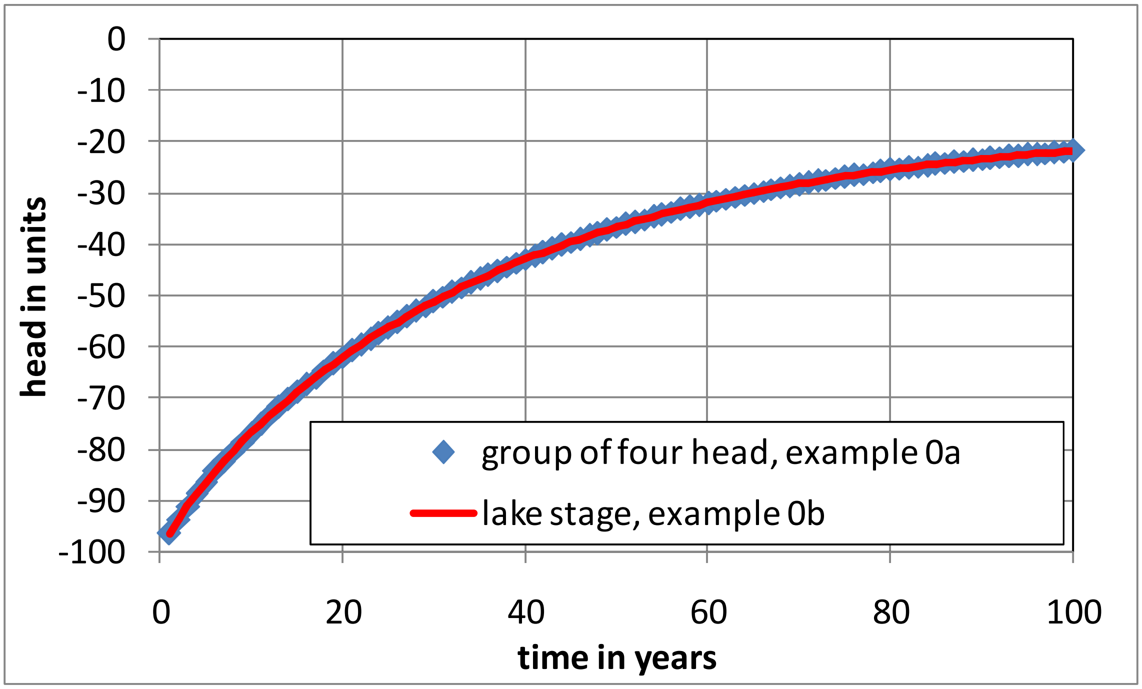

Figure 1.5. Comparison of water levels in examples 1a and 1b.

2.0 APPLICATION: ARCHIMEDES PIT

LAK2 was used to project the post-mining recovery of water level in the Archimedes pit near Eureka, Nevada. The pit bottom topography and pit surface catchment area are shown on Figure 2.1.

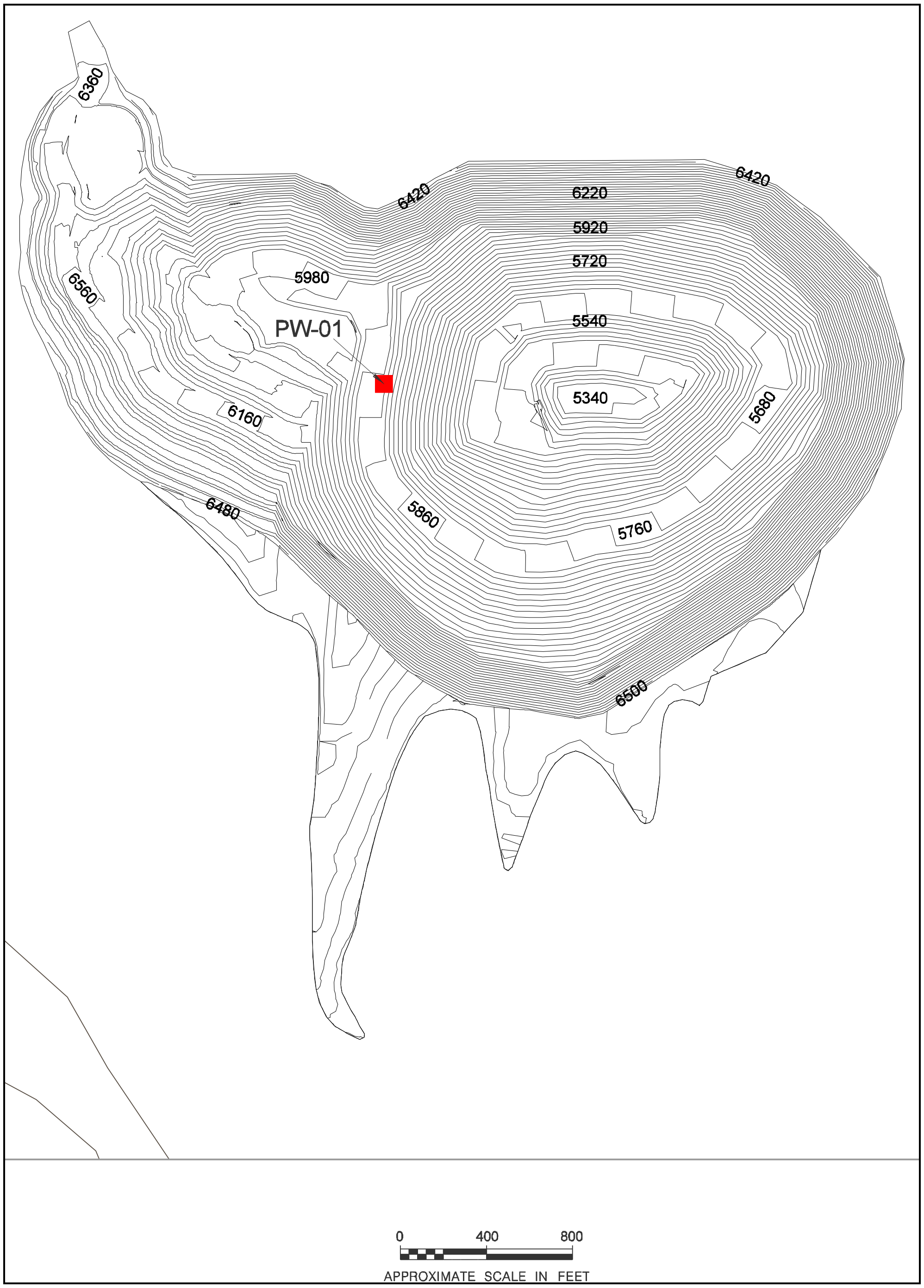

Figure 2.1. Ultimate pit contours.

The pit geometry was represented using LAK2 as described in Section 1 above, as a list of model cell locations. For each cell location, the following geometric parameters are spedified:

- Lowest pit bottom elevation within cell
- Highest pit bottom elevation within cell
- Maximum water surface area of each cell

The contribution of each cell to total open water surface area increases linearly from zero at the lowest pit bottom elevation, to the maximum area at the highest pit bottom elevation. Total water surface is computed as the sum of the area contributed by each cell.

The lowest and highest pit bottom elevations were initially assigned based on the contour map. Maximum open water surface was initially assigned to be the plan area of the MODFLOW finite difference grid cell.

The geometric parameters were then calibrated. The simulated lake bed elevations were adjusted to best reflect the actual increase of area with elevation for the portion of pit bottom within each cell. The measured and modeled pit stage-area-volume relationship is shown on Figure 2.2.

In addition to the pit geometry, the following inputs were required to simulate pit filling:

- Annual precipitation was estimated at 11.72 inches, based on records from the Eureka weather station (Western Regional Climate Center, 2004).
- A runoff coefficient of 0.15 was assumed for the pit catchment of about 210 acres.
- Annual lake evaporation was estimated at 45 inches (NOAA, 2004).

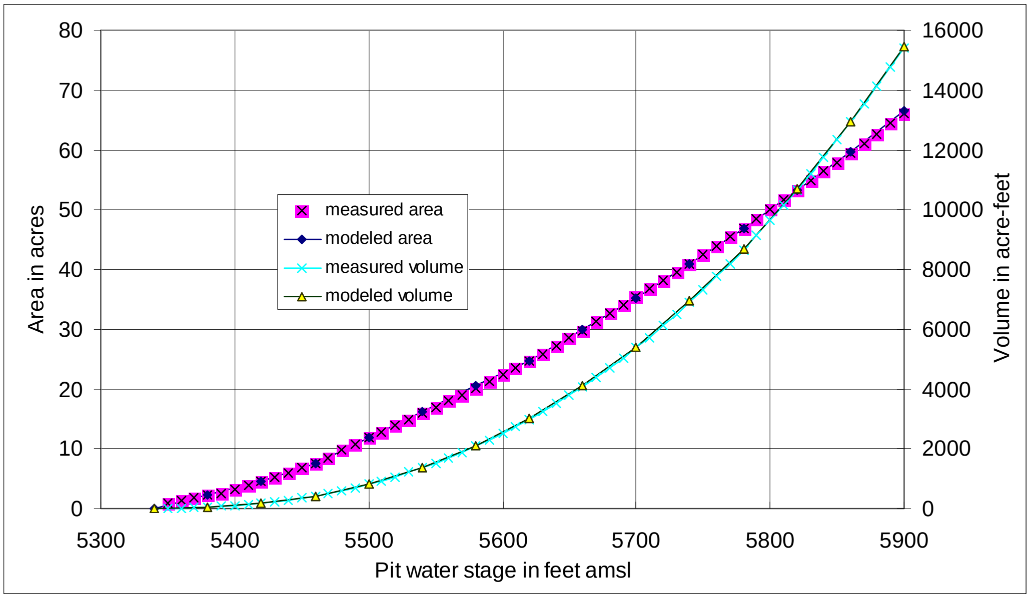

Figure 2.2. Measured and modeled pit stage-area-volume.

2.1 Changes to Original Groundwater Flow Model

Changes were also made to the specifications of aquifer geometry in MODFLOW module BCF, to reflect the presence of the pit: The layer top elevation, at which water level the layer becomes confined, was set equal to the mean of the low and high pit bottom elevations for each LAK2 cell.

2.2 Pit Filling

Recovery of water level after the end of active dewatering was simulated as described above. The projected pit water level is presented on Figure 2.3. The final equilibrium pit elevation is predicted to be 5861 feet amsl. The pit is projected to fill to 95% of recovery (elevation 5835 feet amsl) about 39 years after the end of active dewatering.

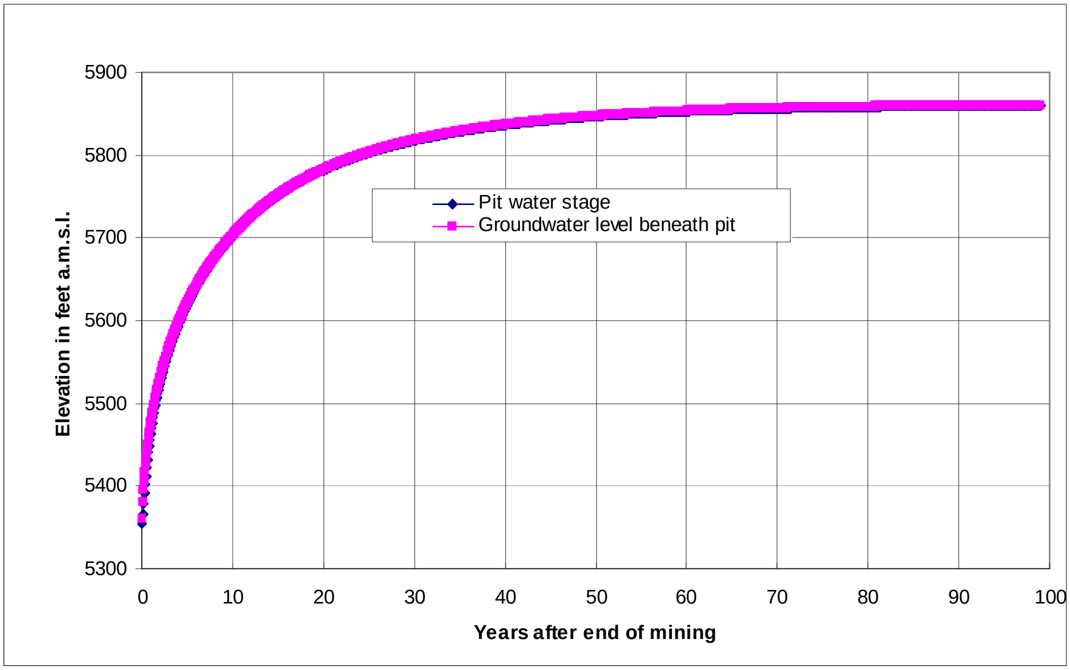

Figure 2.3. Projected pit water stage.

The projected pit water surface area and volume are presented on Figure 2.4. The final pit water surface area is predicted to be 60 acres. The final pit water volume is predicted to be 13,000 acre-feet.

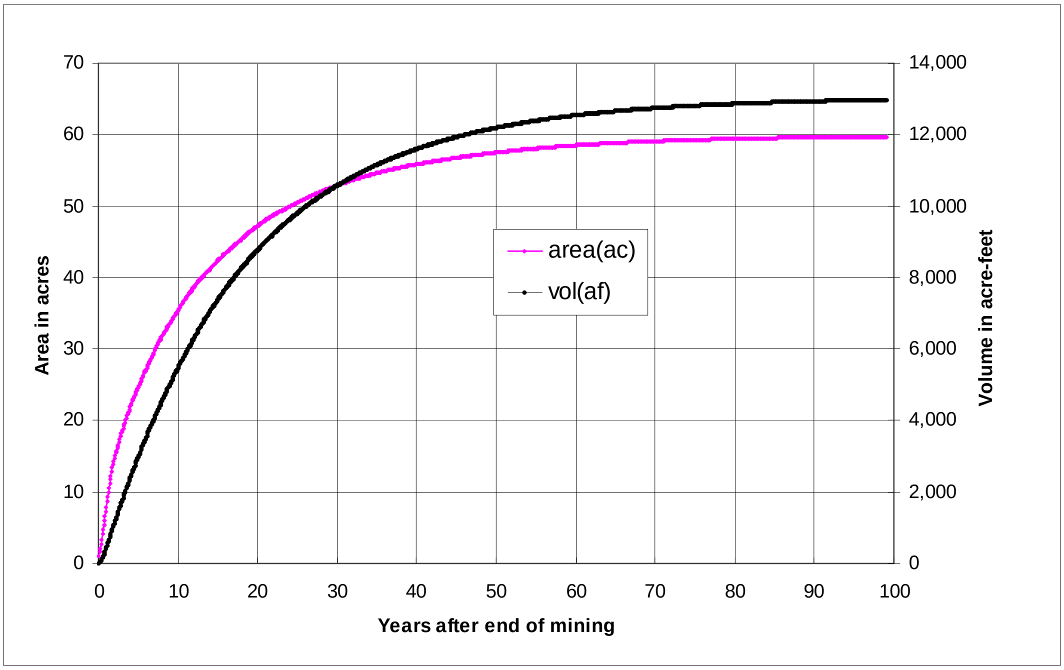

Figure 2.4. Projected pit water surface area and volume.

The projected pit water budget components are presented on Figure 2.5. The final average annual pit evaporation is predicted to be about 140 gpm. Groundwater outflow is predicted to be zero.

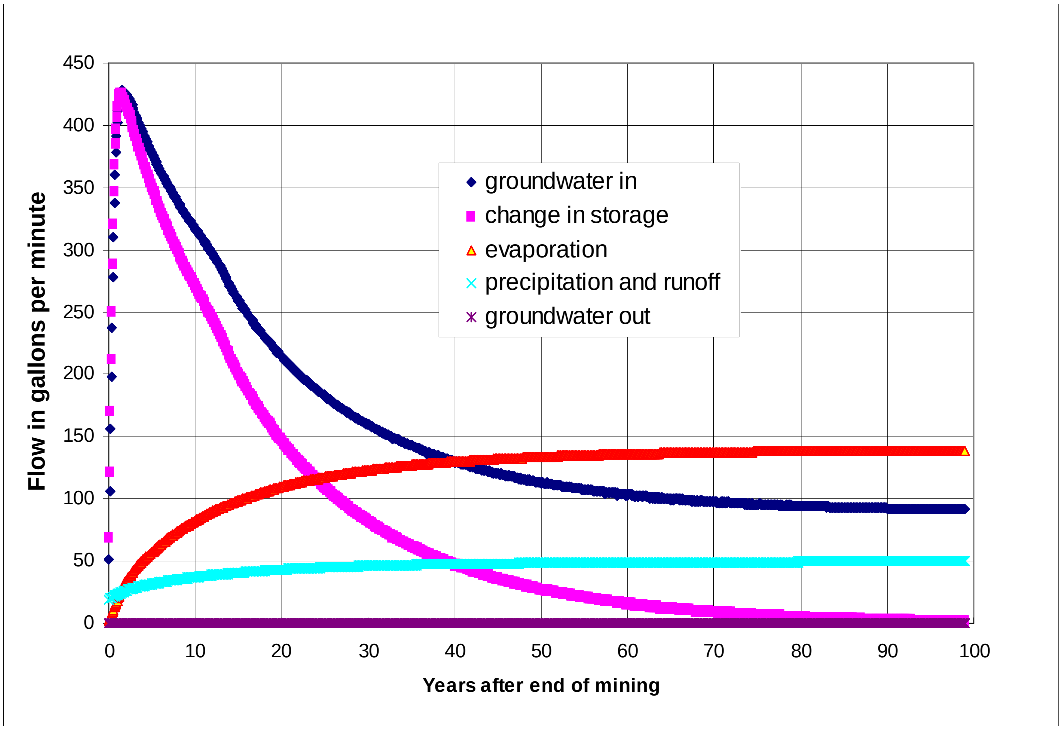

Figure 2.5. Projected pit water budget.

A map of the geochemical types exposed in the pit was provided. The units include:

- Oxide limestone (OgO)
- Oxide intrusive (KgO)
- Sulfide limestone (OgS)
- Sulfide intrusive (KgS)
- Alluvium (Qtal)
- Volcanic Tuff

The map of geochemical types was used to estimate the portions of pit inflow attributable to each unit, for use in projections of pit water chemistry. Groundwater inflow from each geochemical type is shown on Figure 2.6. Inflow from direct precipitation and from runoff over each geochemical type is shown on Figure 2.7.

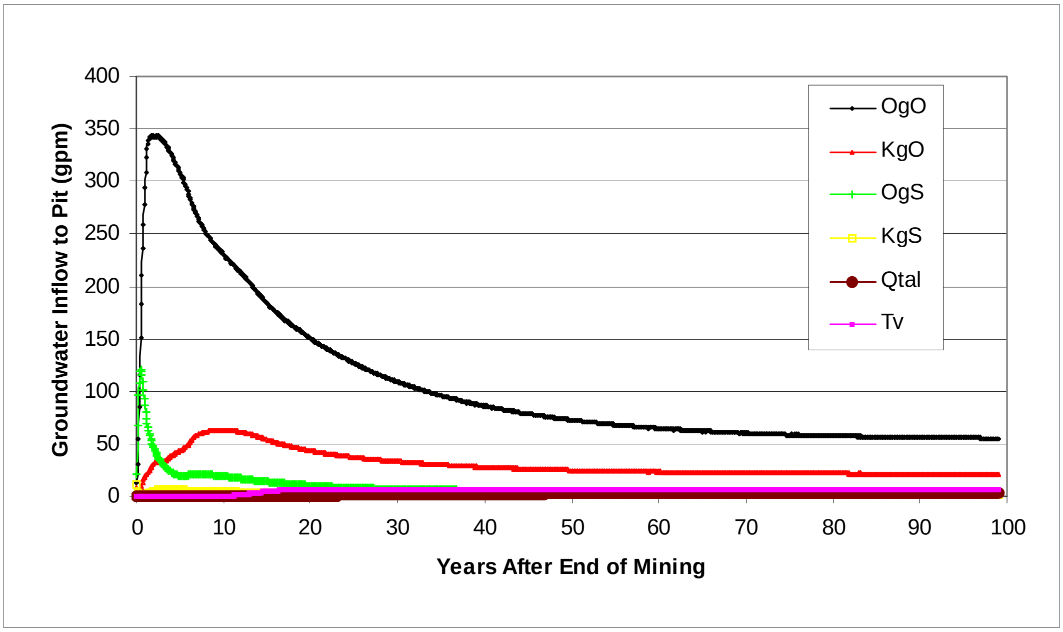

Figure 2.6. Groundwater inflow to pit by geochemical type.

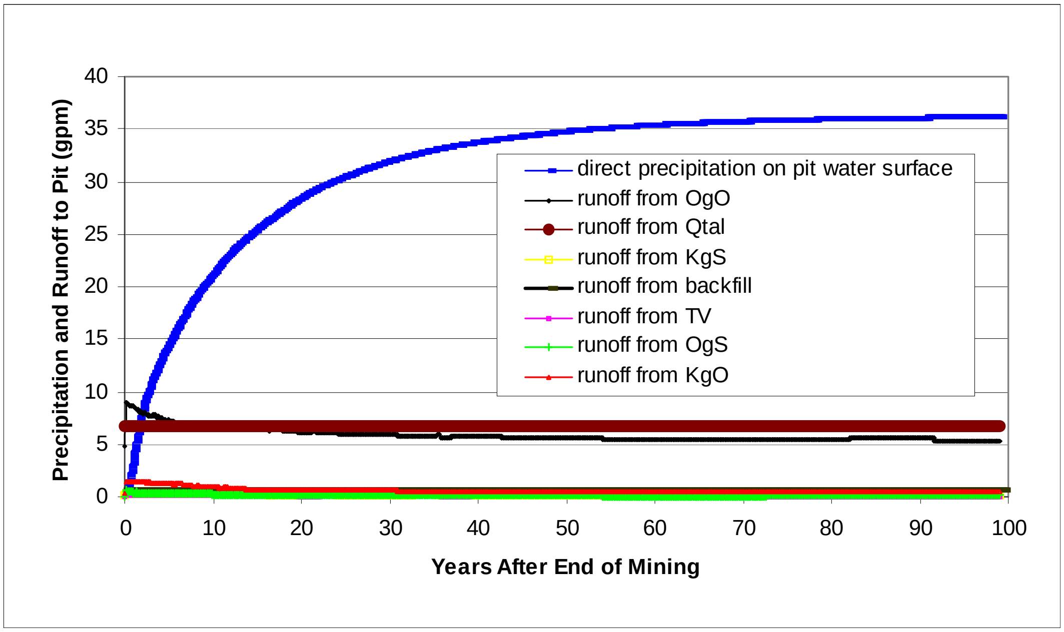

Figure 2.7. Precipitation and runoff to pit by geochemical type.

3.0 APPLICATION: ORTIZ PIT

LAK2 was used to calibrate a groundwater flow model to the measured history of mine dewatering and post-mining water level recovery in the Ortiz pit, near Cerrillos, New Mexico. Measured and simulated groundwater levels during mine dewatering, and measured and simulated post-mining pit water levels, are shown on Figure 3.1.

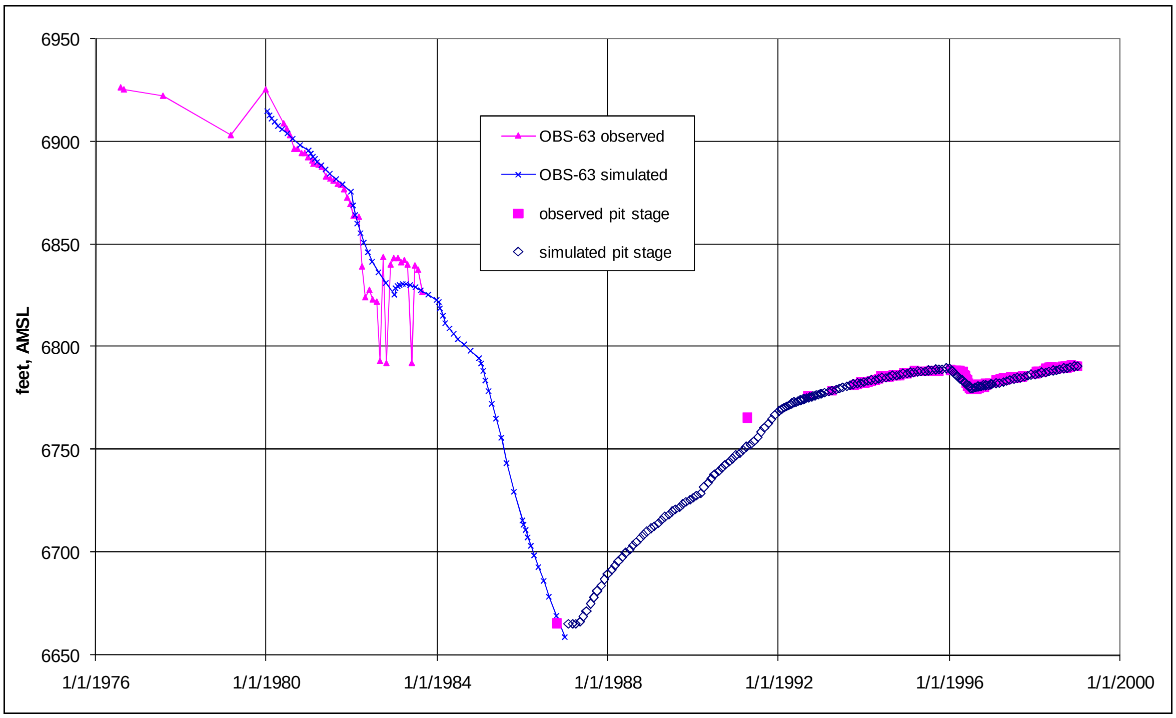

Figure 3.1. Measured and simulated historical water levels (JSAI, 1999).

The model was then used to project long-term water levels and the effect of diverting runoff from the up-gradient watershed into the pit, in order to submerge the acid seeps on the pit wall, which were adversely impacting pit water quality. Runoff from the watershed was estimated using the SCS curve number method. A series of projections of water level was developed, including, "normal", "wet" and "dry" scenarios

4.0 APPLICATION: BELEN MUNICIPAL WELL

This section describes a problem that occurred with an application of the Middle Rio Grande Administrative (MRGA) model (Barroll, 2001), used to administer water rights in the Middle Rio Grande basin of New Mexico. The problem and its cause are analyzed and a solution is presented that utilizes LAK2 to more accurately represent pumping from a well.

4.1 The Problem

The Middle Rio Grande Administrative model (Barroll, 2001) has been employed in an attempt to evaluate the depletion effects of an additional 325 afy of groundwater pumping from the Belen municipal wells.

The results of the exercise are shown on Figure 4.1 which presents the simulated depletion, computed as the sum of the differences in total streamflow gain, streamflow loss and evapotranspiration between the base case model simulation and a simulation including the additional 325 afy of groundwater pumping. Also shown on Figure 4.1 is the portion of the additional pumping supplied by groundwater storage, rather than by depletion.

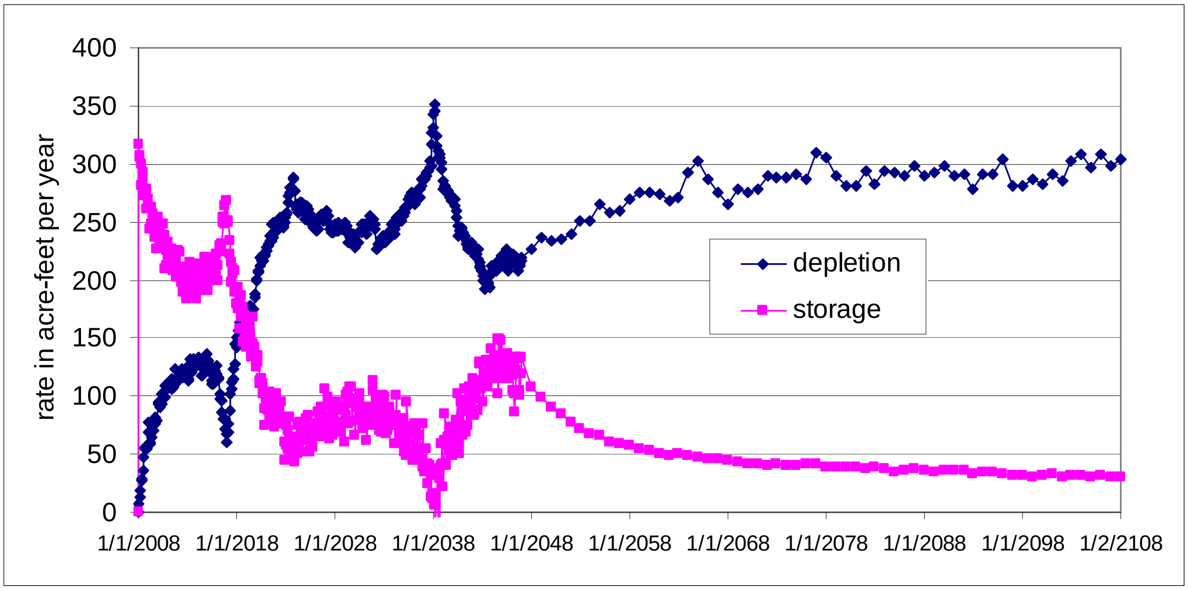

Figure 4.1. Model simulated depletion resulting from 325 afy additional pumping from belen municipal wells.

As can be seen in Figure 4.1, the results are suspicious. Instead of a steady increase in depletion from zero to 325 afy, with a corresponding decrease in the storage component from 325 afy to zero, the graph includes periods of increasing and decreasing depletion, with minima and maxima in between.

4.2 The Cause

The unexpected features of the graph shown on Figure 4.2 are the result of a dry cell in layer 2, row 100, column 37 of the model grid (corresponding to City of Belen Well 1). The cell becomes dry in both the base case simulation, in April 2038, and in the simulation with 325 afy additional pumping, in January 2017.

Simulated water levels for the cell that becomes dry, and for the cells immediately above and below, are presented for the base case ("without") and for the simulation with additional pumping ("with") in Figure 4.2.

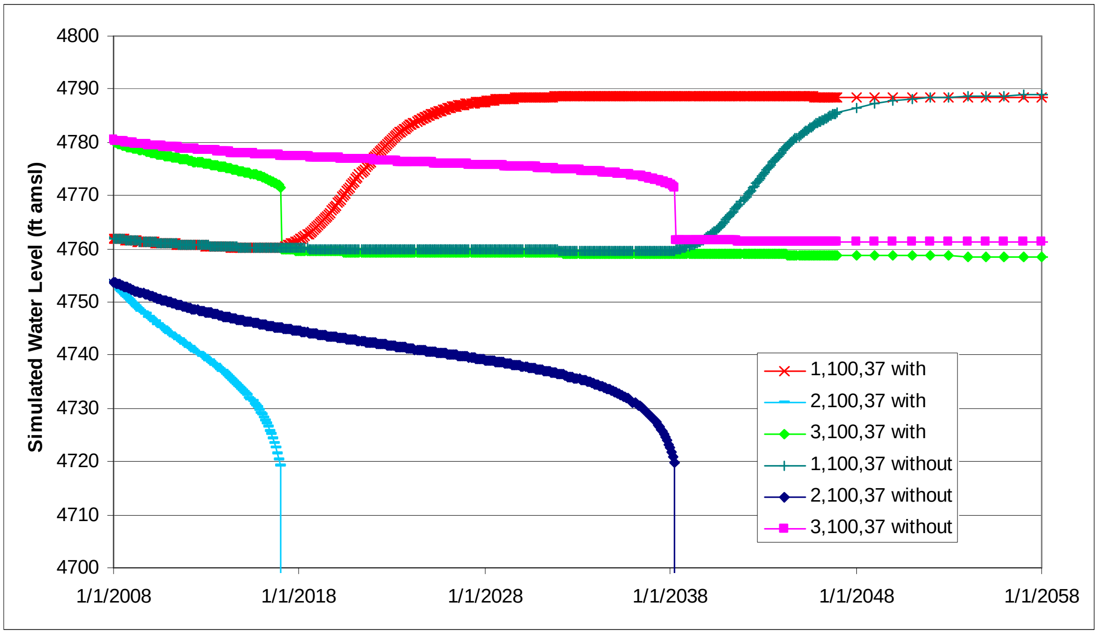

Figure 4.2. Simulated water levels in model cells in row 100, column 37.

In order to preserve simulated pumping rates, the convention adopted with the MRGA model is to shift pumping down a layer whenever a cell becomes dry (Barroll, 2001). Consequently a sharp drop in the layer 3 water level is shown on Figure 2 at the point when layer 2 becomes dry. In addition, the removal of the connection to layer 2 causes water level in layer 1 to begin to rise at the same time.

The correlation between the simulated depletion curve on Figure 4.1 and the simulated water levels on Figure 4.2 is shown graphically on Figure 4.3. Essentially, the dry cell causes discontinuities in the equations used to describe the groundwater flow system. The discontinuities occur at different times in the two simulations, impacting the depletion calculation (the difference between the two simulations) at both times.

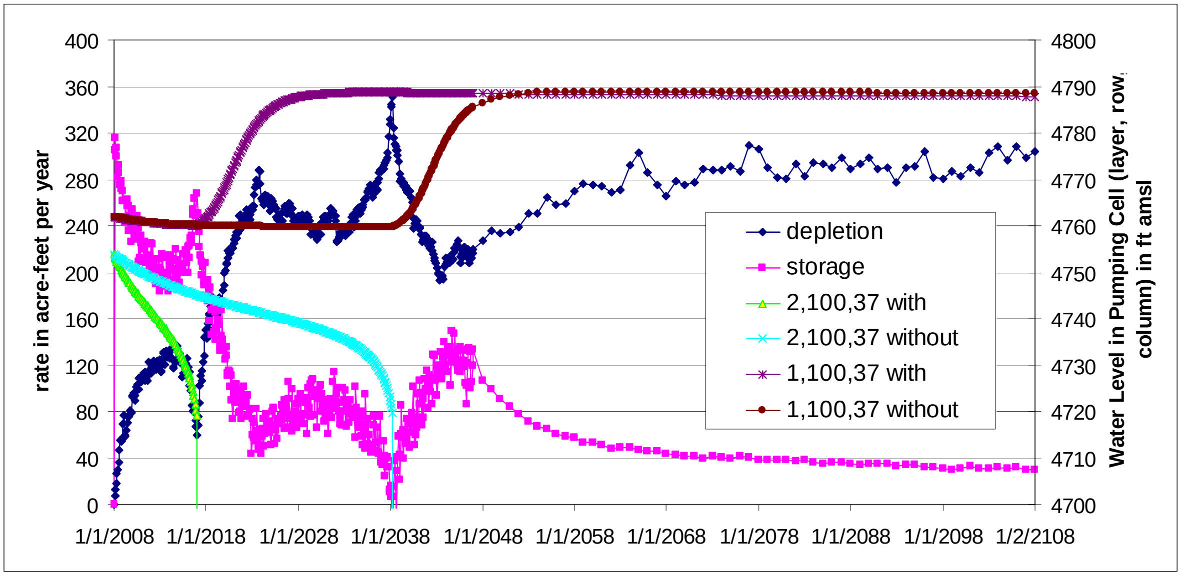

Figure 4.3. Simulated depletion and water levels.

4.3 A Solution

The problem can be addressed by restoring continuity to the equations describing the groundwater flow system. One way to do this is to represent the pumping in both layers 2 and 3. A difficulty with this approach is that results can be sensitive to the division of pumping between the layers. Proper division of pumping should be proportional to the conductivity of each layer, to the saturated screened interval and, if pumping water level is above the bottom of the screened interval, the difference between groundwater level in each cell and water level in the well bore.

The two model simulations were repeated representing the pumping in both layer 2 and layer 3. In order to properly partition the pumping, the well bore was explicitly represented in the model using LAK2 as a generic tool to represent open spaces, including well bores, connecting multiple model cells. Flows between model cells and the well are computed based on conductance terms, groundwater level in the cell, water level in the open space and elevation of the interface between the cell and the open space. The mass balance equation for the well considers the geometry of the space (a function of bore radius) and source/sink terms (pumping rate).

Results are presented in Figure 4.4.

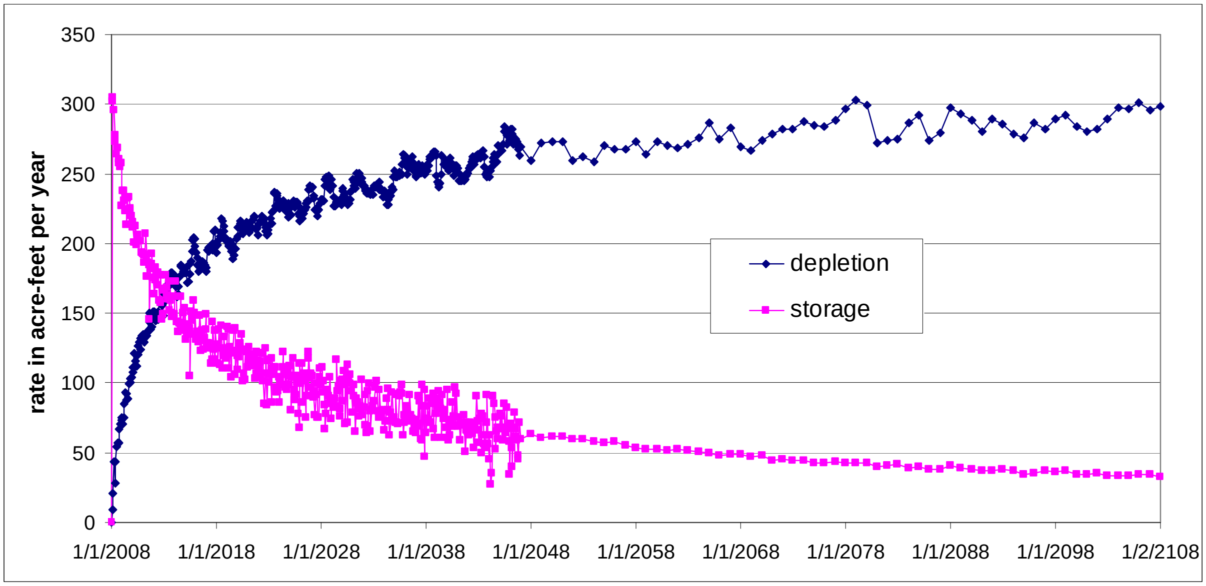

Figure 4.4. Model simulated depletion resulting from 325 afy additional pumping from Belen municipal wells, with pumping from two layers.

The oscillations remaining in the simulated depletion curve are a result of the small mass balance errors in the underlying groundwater flow simulation. These can be reduced through tighter convergence criteria, more iterations and longer run times.

5.0 APPLICATION: FAN SEDIMENTS AQUIFER TEST

LAK2 was used to simulate in-bore water levels in the analysis of aquifer test results. A numerical model was prepared to characterize the “Fan Sediments” colluvial aquifer .

A 21-day aquifer test was conducted. Three production bores, FSWW004-PB, FSWW013-PB, and FSWW020-PB, were pumped simultaneously at an average rate of about 35 liters per second each. Drawdown and recovery were measured in a total of 24 bores including:

- three pumping bores
- an observation bore located near each pumping bore, completed at a similar depth
- an observation bore located near each pumping bore, completed at a shallow depth
- a shallow observation bore located about 1 km from each pumping bore, in the area of the infiltration of pumped water
- regional observation bores, with deeper completions

A numerical model was developed to analyze the aquifer test in detail, considering saturated units above and below the production zone and responses measured in shallow, intermediate, and deep piezometers.

An observation bore is located near each pumping bore, within the same model cell, completed at a similar depth as the pumping bore. The drawdown at each model cell with a pumping bore was calibrated to match drawdown at the nearby observation bore.

In addition, water level in the pumping bore was represented directly using LAK2, in order to characterize the bore efficiency component of drawdown and to characterize the potential range of in-bore head losses that may be encountered in future production bores. The conductivity of each bore skin (the resistance to flow between aquifer and bore hole) was calibrated to match the measured pumping bore drawdown.

The water levels in observation bores FSWW012-MB and FSWW022-MB were also represented with the LAK2 module. Response in both bores to aquifer test pumping was found to be impacted by borehole problems, the first with an apparently blocked annulus and the second with apparent borehole leakage from a deeper formation. The LAK2 results help to confirm the explanation of borehole processes as the cause of each bore’s anomalous response.

Measured and simulated drawdown in pumping bore FSWW004-PB and in nearby monitoring bore FSWW003-MB are shown in Figures 5.1 and 5.2.

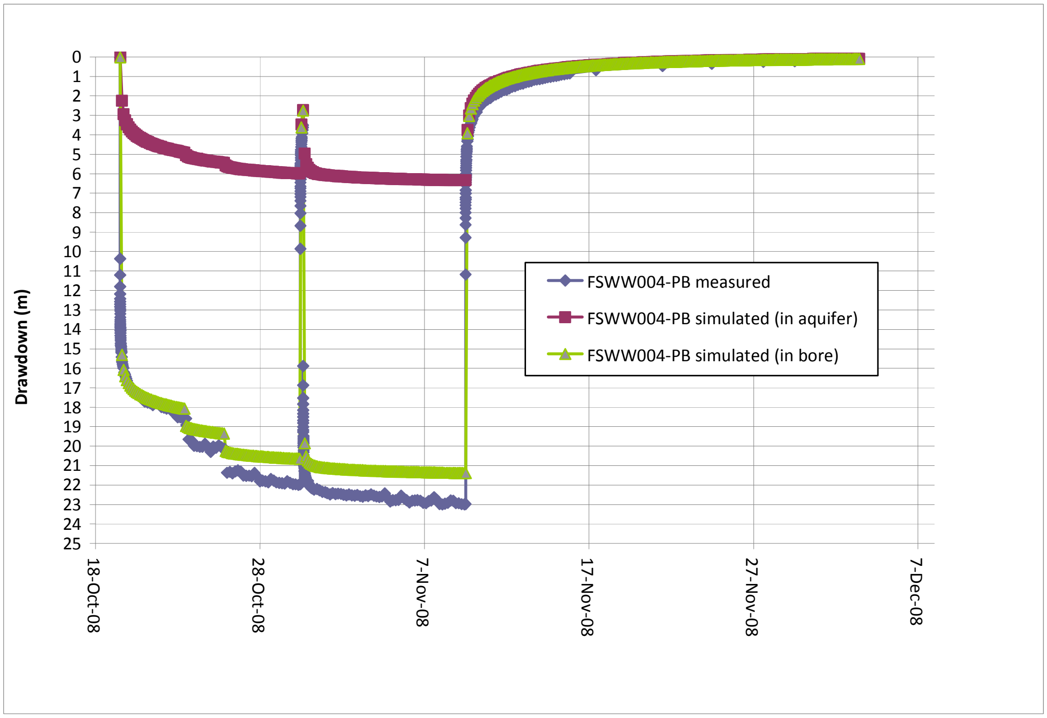

Figure 5.1. Measured and simulated aquifer test drawdown, FSWW004-PB.

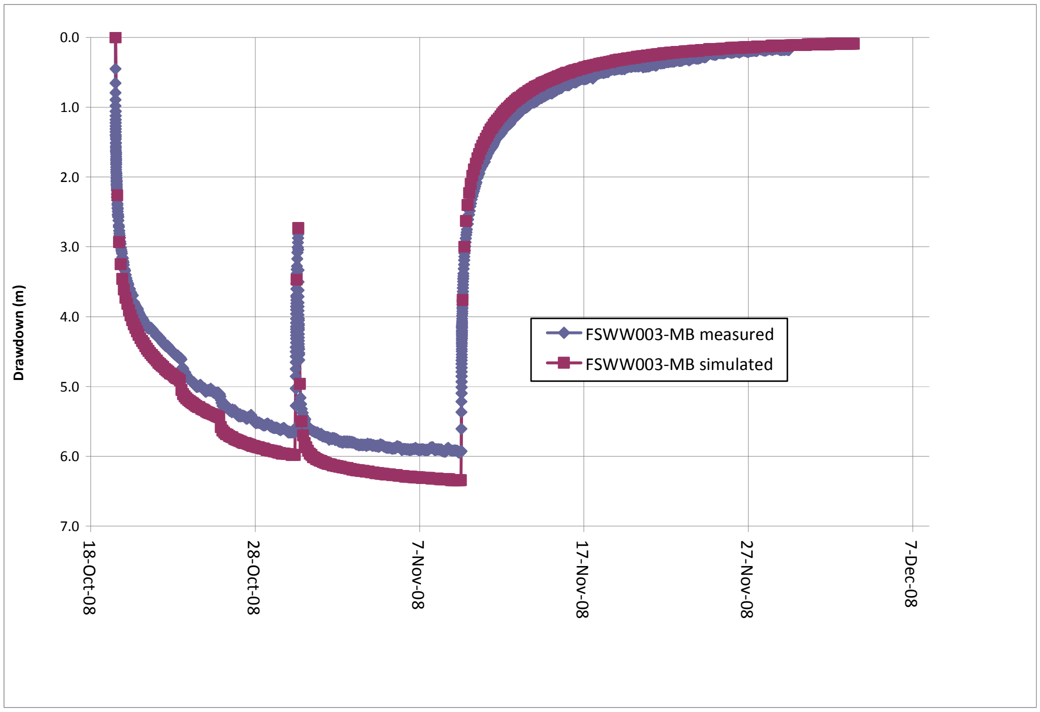

Figure 5.2. Measured and simulated aquifer test drawdown, FSWW003-MB.

Measured and simulated drawdown in pumping bore FSWW013-PB and in nearby monitoring bore FSWW010-MB are shown in Figures 5.3 and 5.4.

Measured and simulated drawdown in shallow observation bore FSWW022-MB is shown in Figure 5.5. The rapid and sharp response is characteristic of borehole leakage rather than water table drawdown. The apparent vertical connection observed in FSWW022-PB is likely a local borehole phenomenon. This was verified using LAK2 to simulate a bore in hydraulic communication with both Layers 1 and 2, resulting in a reasonably close reproduction of measured water levels.

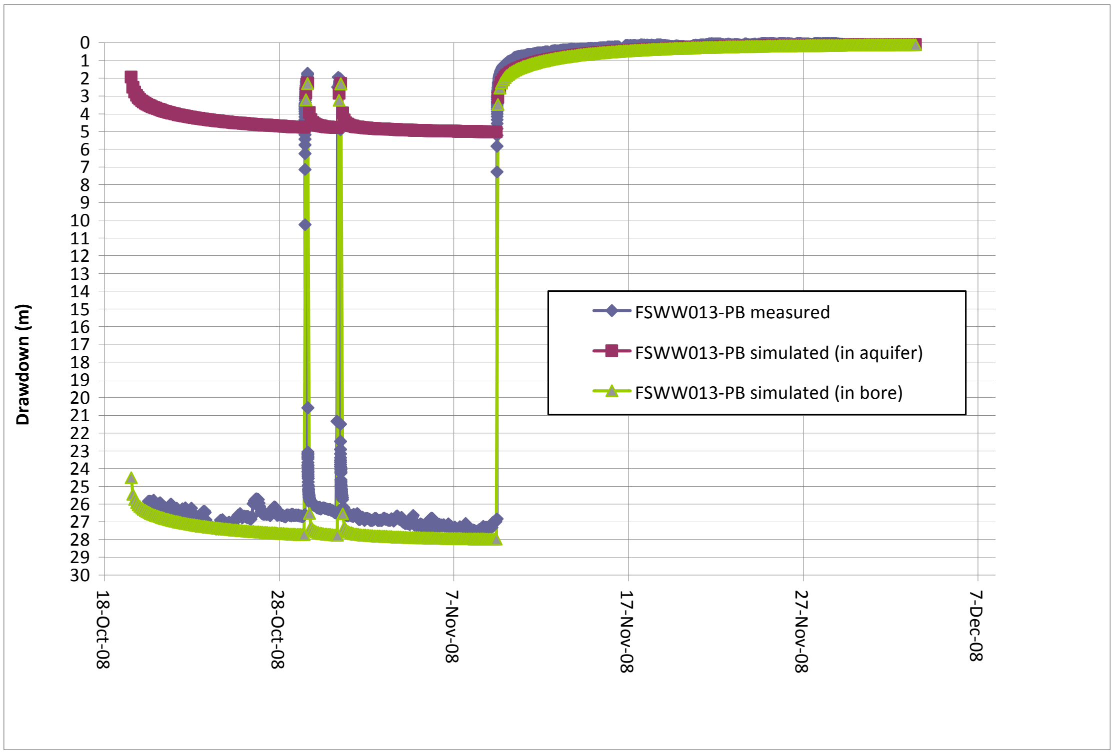

Figure 5.3. Measured and simulated aquifer test drawdown, FSWW013-PB.

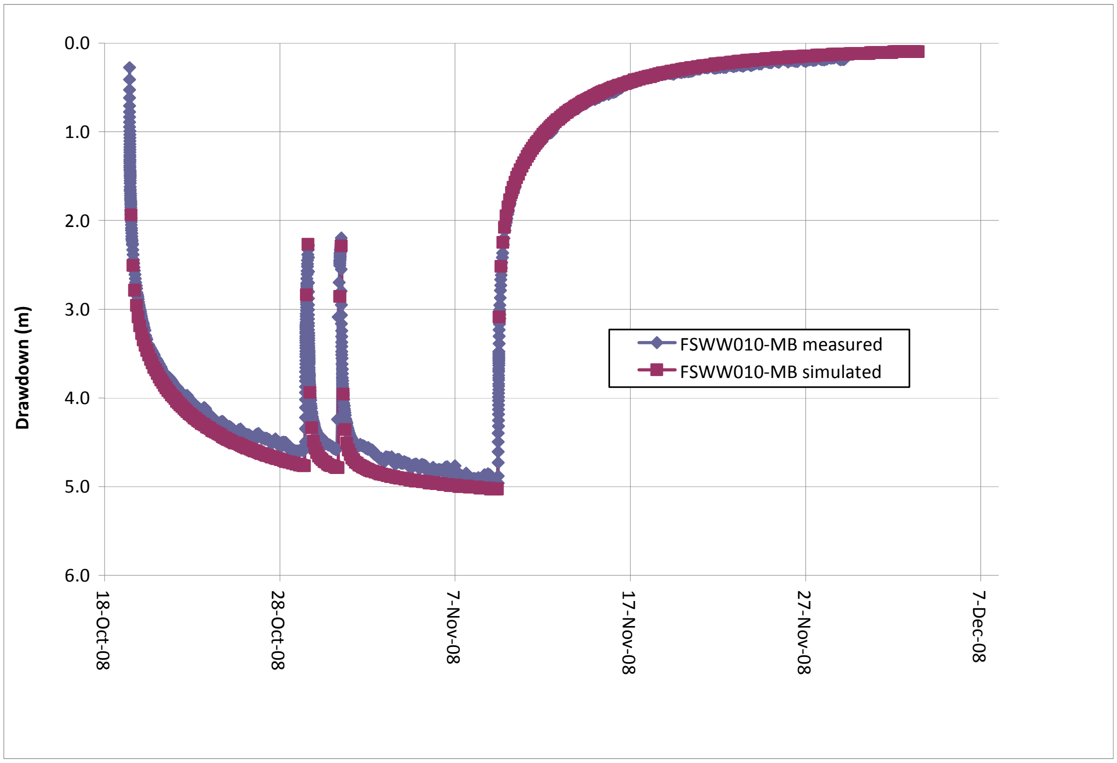

Figure 5.4. Measured and simulated aquifer test drawdown, FSWW010-MB.

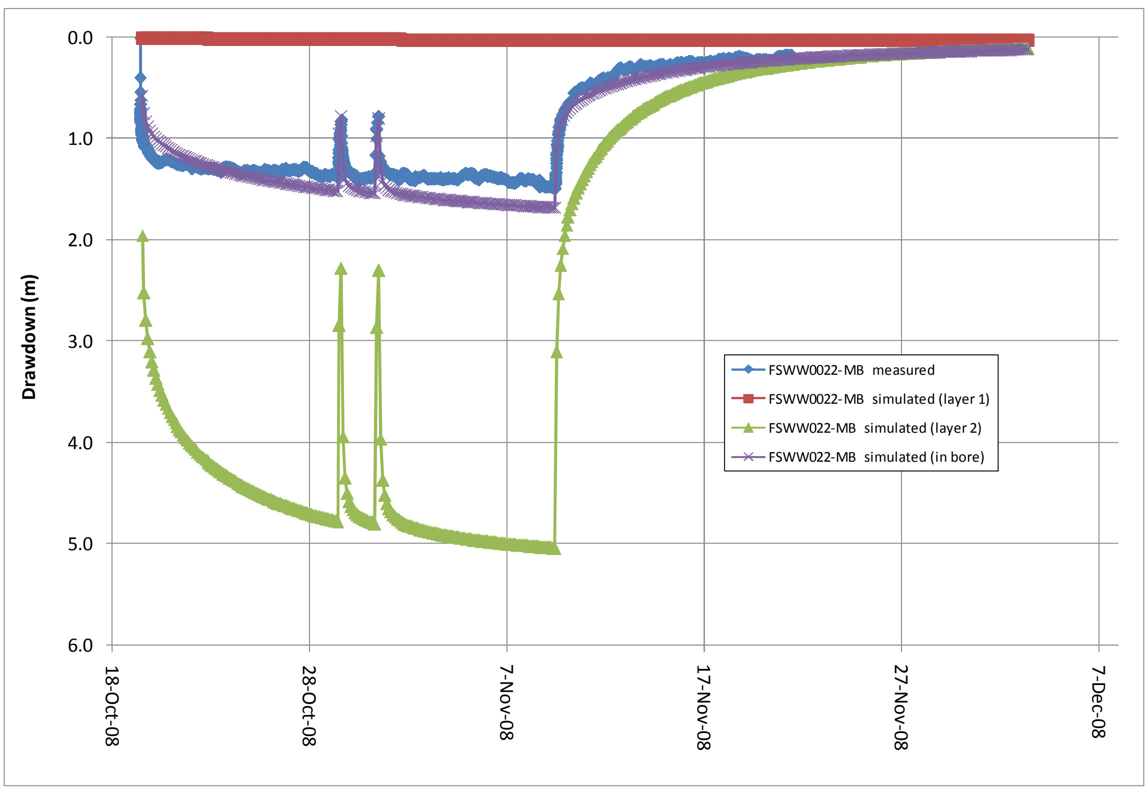

Figure 5.5. Measured and simulated aquifer test drawdown, FSWW022-MB.

Measured and simulated drawdown in pumping bore FSWW020-PB and in nearby monitoring bore FSWW018-MB are shown in Figures 5.6 and 5.7.

Farther away, water level in FSWW012-MB did not respond to pumping, as would be expected from the aquifer parameters indicated by the other observation bore responses. It was concluded, based on drilling results , that FSWW012-MB is isolated from the neighboring aquifer due to difficulties encountered during well construction and development. The lack of response at FSWW012-MB was simulated using the LAK2 module to represent an inefficient bore. Measured and simulated aquifer test drawdown at FSWW012-MB is shown on Figure 5.8.

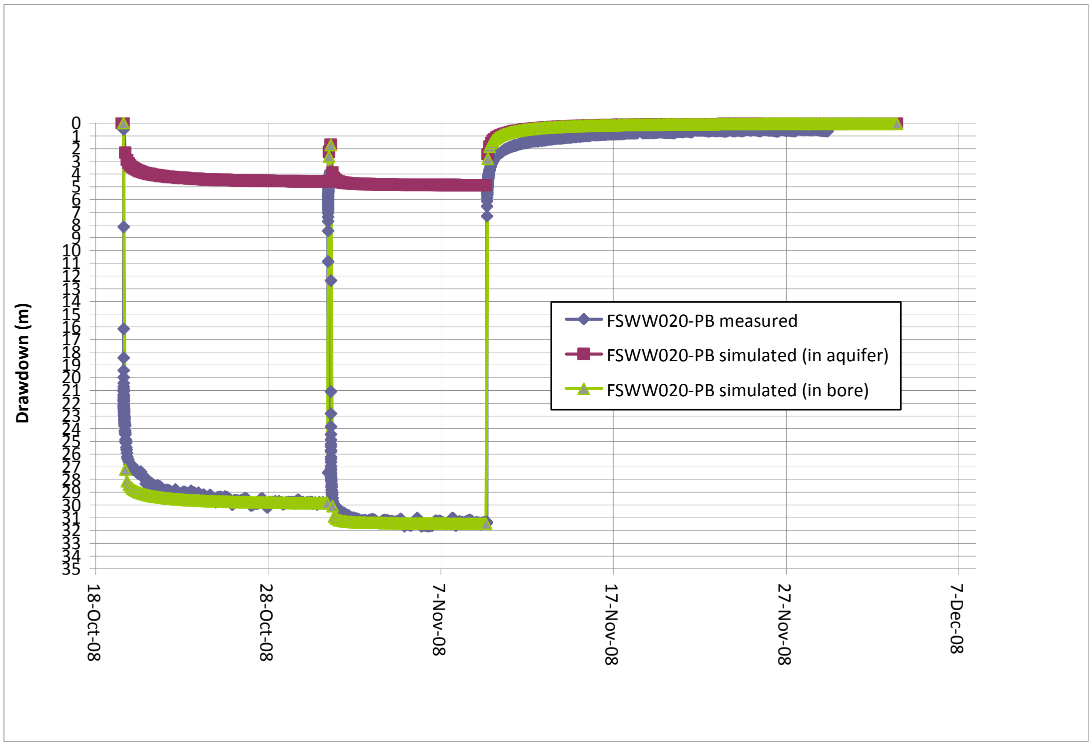

Figure 5.6. Measured and simulated aquifer test drawdown, FSWW020-PB.

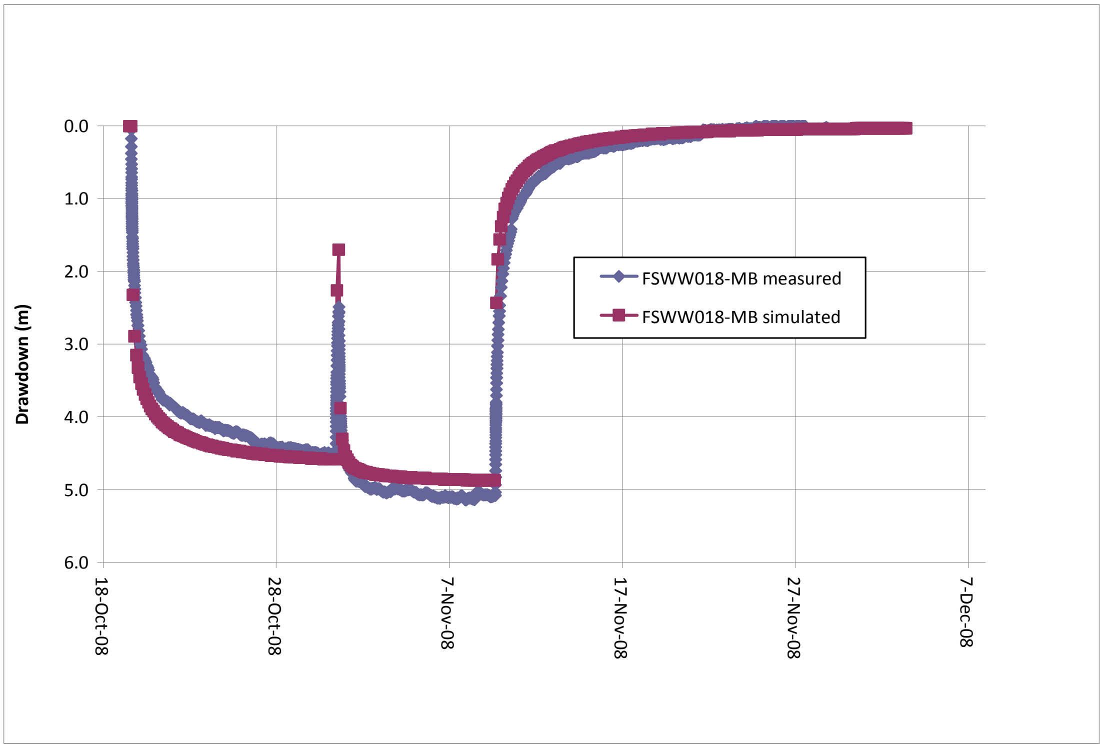

Figure 5.7. Measured and simulated aquifer test drawdown, FSWW018-MB.

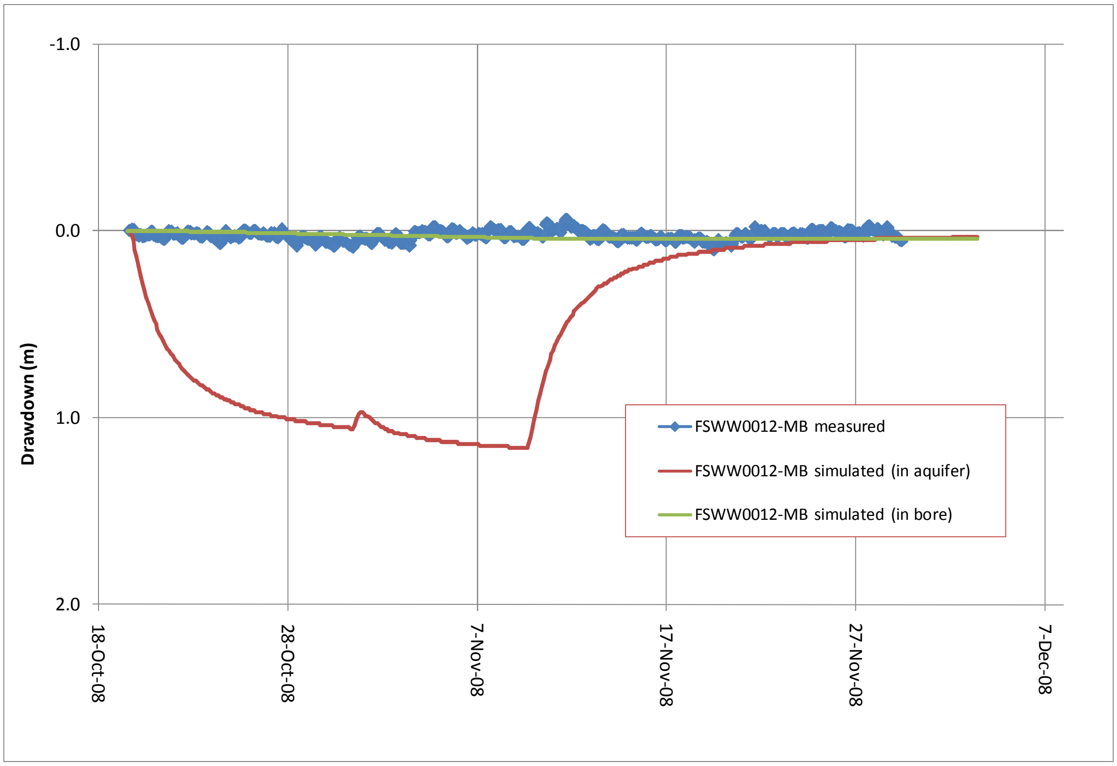

Figure 5.8. Measured and simulated aquifer test drawdown, FSWW012-MB.

6.0 REFERENCES

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APPENDIX G

MODEL SENSITIVITY ANALYSES

APPENDIX G: MODEL SENSITIVITY ANALYSES

TECHNICAL MEMORANDUM

To: New Mexico Copper Corporation

From: Michael Jones, Principal Hydrologist

Date: August 04, 2015

Subject: Alternative Model Projections – Sensitivity of Results of Operating Scenarios Considered for Copper Flat EIS

The model of groundwater flow in the Animas Uplift and the Palomas Basin (JSAI, 15 August, 2014) was used to project the effects of the proposed development of the Copper Flat deposit. Results are presented for three operating scenarios reflecting different mineral processing rates and mining duration, with associated rates and duration of groundwater use.

1. Processing 17,500 tons per day (tpd), for 15.7 years (total 100M t)
2. Processing 25,000 tpd for 10.9 years (total 100M t)
3. Processing 30,000 tpd for 11.3 years (total 125M t)

Model simulations include period-of-mining projections and post-mining projections for each scenario. The period-of-mining projections simulate water-supply pumping from the well field, and pit-area dewatering. The post-mining projections simulate ground-water level recovery around the well field and filling of the open pit.

Simulated conditions at the end of 2014 were used as starting conditions for the period-of-mining projections. Simulated conditions at the end of mining were used as starting conditions for the post-mining projections.

The projections assume water-supply pumping from wells PW-1 through PW-4, shown on Figure 1, to supply the makeup water required by the mill for the tailings stream, and water for other mine uses.

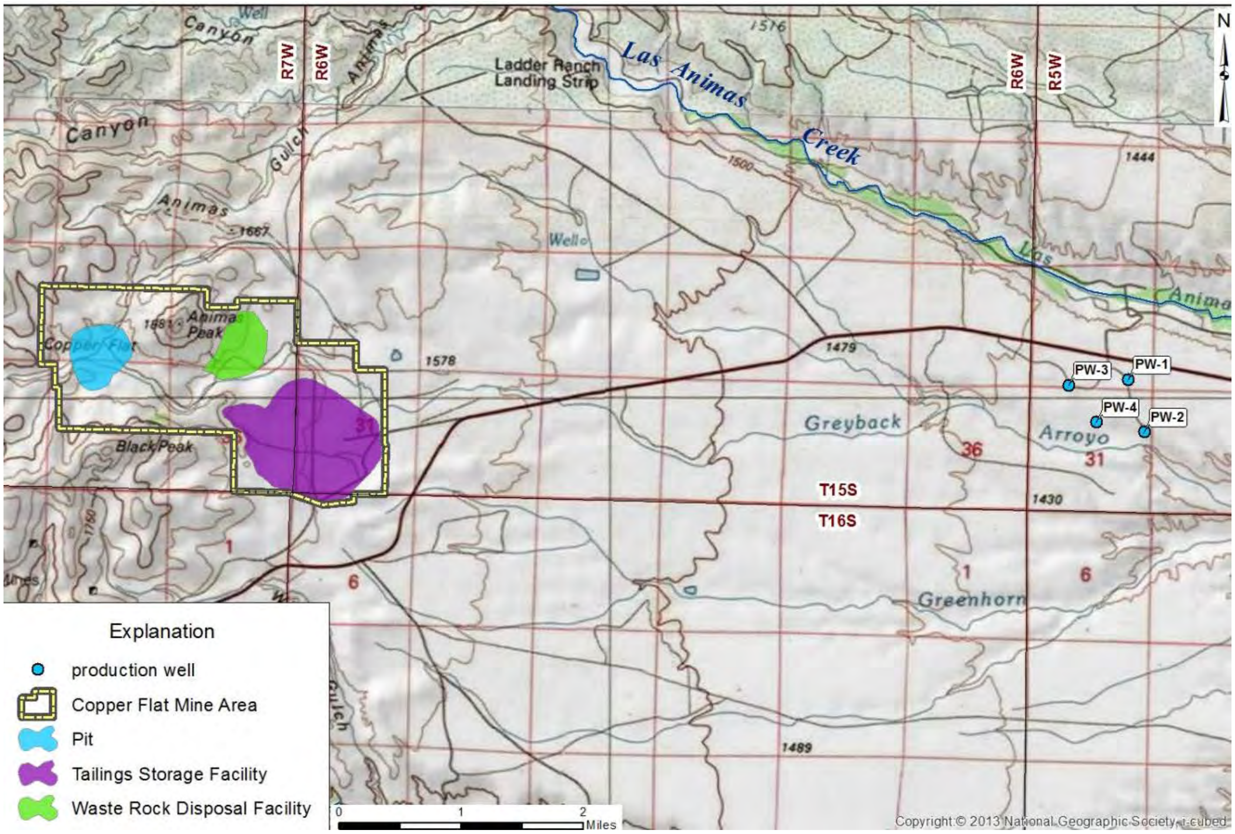

Figure 1. Pumping wells and proposed mine facilities

In order to examine the results of conservative projections, the head-dependent boundary condition at the north end of the model domain was converted to a specified-flow boundary. The effect of this change is to assume that pumping will not induce additional inflow from the north Palomas Graben. The result is more groundwater drawdown and flow depletion than would otherwise be simulated.

The projected groundwater use and resulting water balance changes are presented below for each scenario.

17,500 Tons Per Day, 15.7 Years Scenario EIS Alt0

Projected monthly make up water demand averages to an annual use of about 3,802 ac-ft/yr (from water balance file “Water Balance Model EIS.xlsx”, NMCC personal communication, 9 December 2013), is shown on Figure 2.

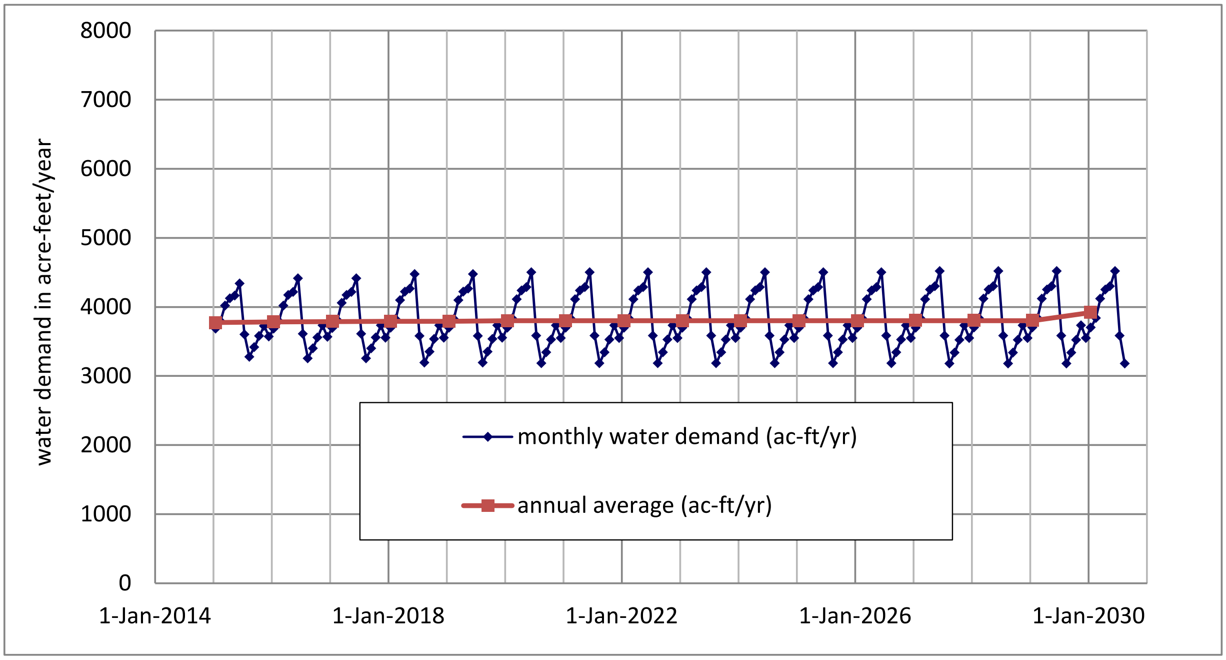

Figure 2. Projected groundwater demand, 17,500 tpd 15.7 y scenario.

Results are summarized on Table 1.

25,000 Tons Per Day, 10.9 Years Scenario EIS Alt1

Projected monthly make up water demand averages to an annual use of about 5,290 ac-ft/yr (from water balance file “Water Balance Model EIS.xlsx”, NMCC personal communication, 9 December 2013), is shown on Figure 3.

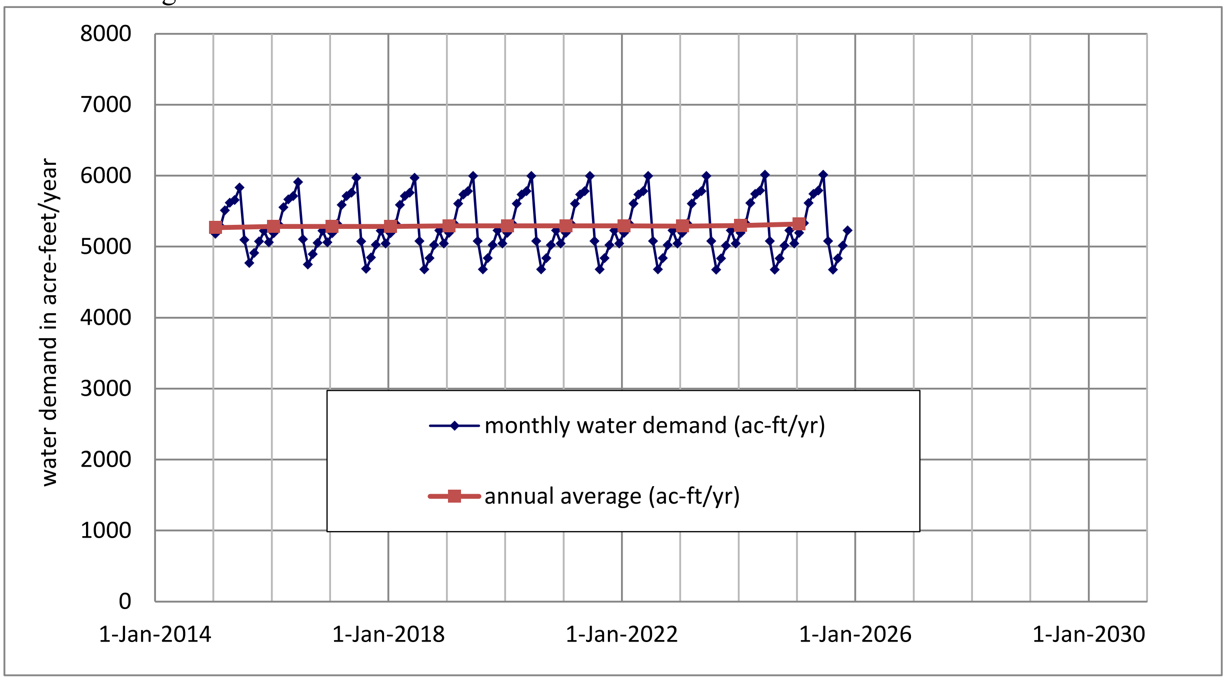

Figure 3. Projected groundwater demand, 25,000 tpd, 10.9 y scenario.

Results are summarized on Table 2.

30,000 Tons Per Day, 11.3 Years Scenario EIS Alt2

Projected monthly make up water demand averages to an annual use of about 6,101 ac-ft/yr (from water balance file “Water Balance Model EIS.xlsx”, NMCC personal communication, 9 December 2013), is shown on Figure 4.

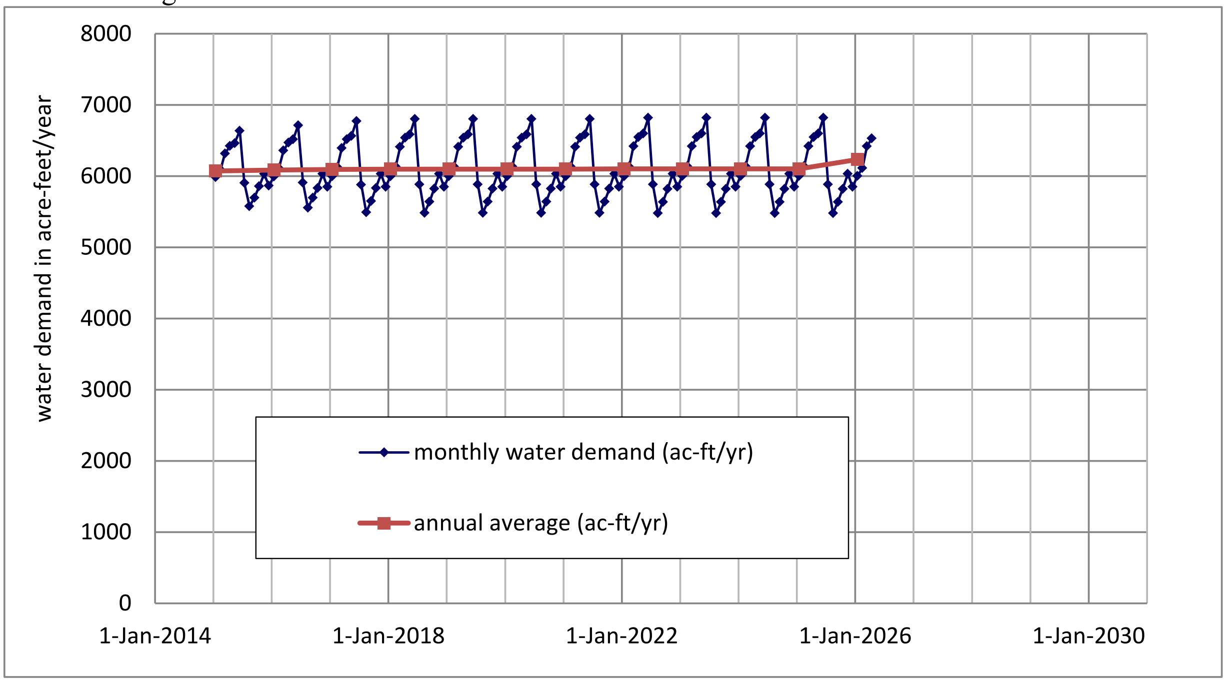

Figure 4. Projected groundwater demand, 30,000 tpd, 11.3 y scenario.

Results are summarized on Table 3.

Summary

The model of groundwater flow in the Animas Uplift and the Palomas Basin (JSAI, 21 August, 2013) was used to project the effects of the proposed development of the Copper Flat deposit, for three mining scenarios:

1. Mining 17,500 tpd, for 15.7 years (total 100M t)
2. Mining 25,000 tpd for 10.9 years (total 100M t)
3. Mining 30,000 tpd for 11.3 years (total 125M t)

Results of each are summarized in Tables 1, 2 and 3.

Table 1. Summary results of Proposed Action (17,500 tpd, for 15.7 years)

Change in Flow, Acre-Feet Per Year			
Parameter	**Rate 3 months after end of mining**	**Rate 100 yrs after mining**	**Flow rate with no mine**
Storage	-2,380	-29	27
Groundwater discharge to Rio Grande above Caballo Dam	869	33	-10,561
Groundwater discharge to Rio Grande below Caballo Dam	682	6	-1,234
Discharge from flowing wells	824	11	-2,030
Animas Ck evapotranspiration and flow reduction	13	1	-4,848
Percha Ck evapotranspiration and flow reduction	19	4	-2,630
Flow to open pit	-21	-28	-7
Inflow from graben north of study area	0	0	2,184

Cumulated Change in Volume, Acre Feet	
Parameter	**Volume change post-mining (ac-ft)**
Storage	3,943
Rio Grande above Caballo Dam	24,557
Rio Grande below Caballo Dam	14,296
Flowing wells	18,754
Animas Ck flow and evapotranspiration	383
Percha Ck flow and evapotranspiration	810
Total	**62,743**

Table 2. Summary results of Alternative 1 (25,000 tpd for 10.9 years)

Change in Flow, Acre-Feet Per Year			
Parameter	**Rate 3 months after end of mining**	**Rate 100 yrs after mining**	**Flow rate with no mine**
Storage	-2,792	-25	27
Groundwater discharge to Rio Grande above Caballo Dam	989	31	-10,561
Groundwater discharge to Rio Grande below Caballo Dam	822	6	-1,234
Discharge from flowing wells	972	10	-2,030
Animas Ck evapotranspiration and flow reduction	15	1	-4,848
Percha Ck evapotranspiration and flow reduction	21	4	-2,630
Flow to open pit	-24	-28	-7
Inflow from graben north of study area	0	0	2,184

Cumulated Change in Volume, Acre Feet	
Parameter	**Volume change post-mining (ac-ft)**
Storage	3,794
Rio Grande above Caballo Dam	24,039
Rio Grande below Caballo Dam	13,909
Flowing wells	18,195
Animas Ck flow and evapotranspiration	385
Percha Ck flow and evapotranspiration	816
Total	**61,138**

Table 3. Summary results of Alternative 2 (30,000 tpd for 11.3 years)

Change in Flow, Acre-Feet Per Year			
Parameter	**Rate 3 months after end of mining**	**Rate 100 yrs after mining**	**Flow rate with no mine**
Storage	-3,214	-27	27
Groundwater discharge to Rio Grande above Caballo Dam	1,155	34	-10,561
Groundwater discharge to Rio Grande below Caballo Dam	955	7	-1,234
Discharge from flowing wells	1,104	12	-2,030
Animas Ck evapotranspiration and flow reduction	18	2	-4,848
Percha Ck evapotranspiration and flow reduction	25	4	-2,630
Flow to open pit	-33	-30	-7
Inflow from graben north of study area	0	0	2,184

Cumulated Change in Volume, Acre Feet	
Parameter	**Volume change post-mining (ac-ft)**
Storage	4,730
Rio Grande above Caballo Dam	28,772
Rio Grande below Caballo Dam	16,831
Flowing wells	21,818
Animas Ck flow and evapotranspiration	443
Percha Ck flow and evapotranspiration	953
Total	**73,547**

REFERENCE

[JSAI] John Shomaker & Associates, Inc., 15 August, 2014, Model of Groundwater Flow in the Animas Uplift and Palomas Basin, Copper Flat Project, Sierra County, New Mexico: Consultant report prepared for NM Copper Corporation.

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DRAFT TECHNICAL MEMORANDUM

To: Katie Emmer, THEMAC Resources kemmer@themacresourcesgroup.com
New Mexico Copper Corporation

From: Michael A. Jones, Principal Hydrologist

Date: 04 August 2014

Subject: Copper Flat model sensitivity to fault conductance.

The JSAI Copper Flat model was run assuming no resistance to flow across the south-bounding fault of the andesite, between Copper Flat and Percha Creek. The change resulted in too-low simulated water levels north of Percha Creek, as much as 200 feet below the measured levels.

Figure 1 shows projected flow changes, due to the Copper Flat project, for EIS Alt 2. Figure 2 shows projected end-of-mining drawdown for EIS Alt 2. Both drawdown and flow changes are about the same as with the calibrated model.

Figure 1. Projected flow changes, EIS Alt 2.

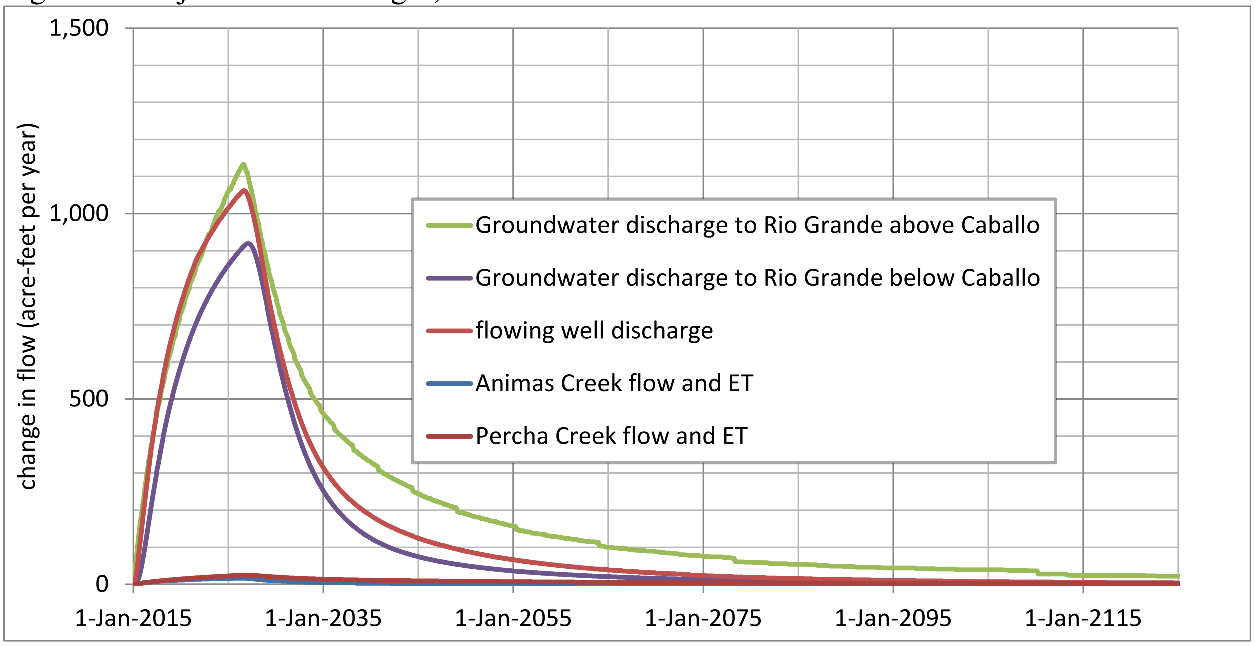
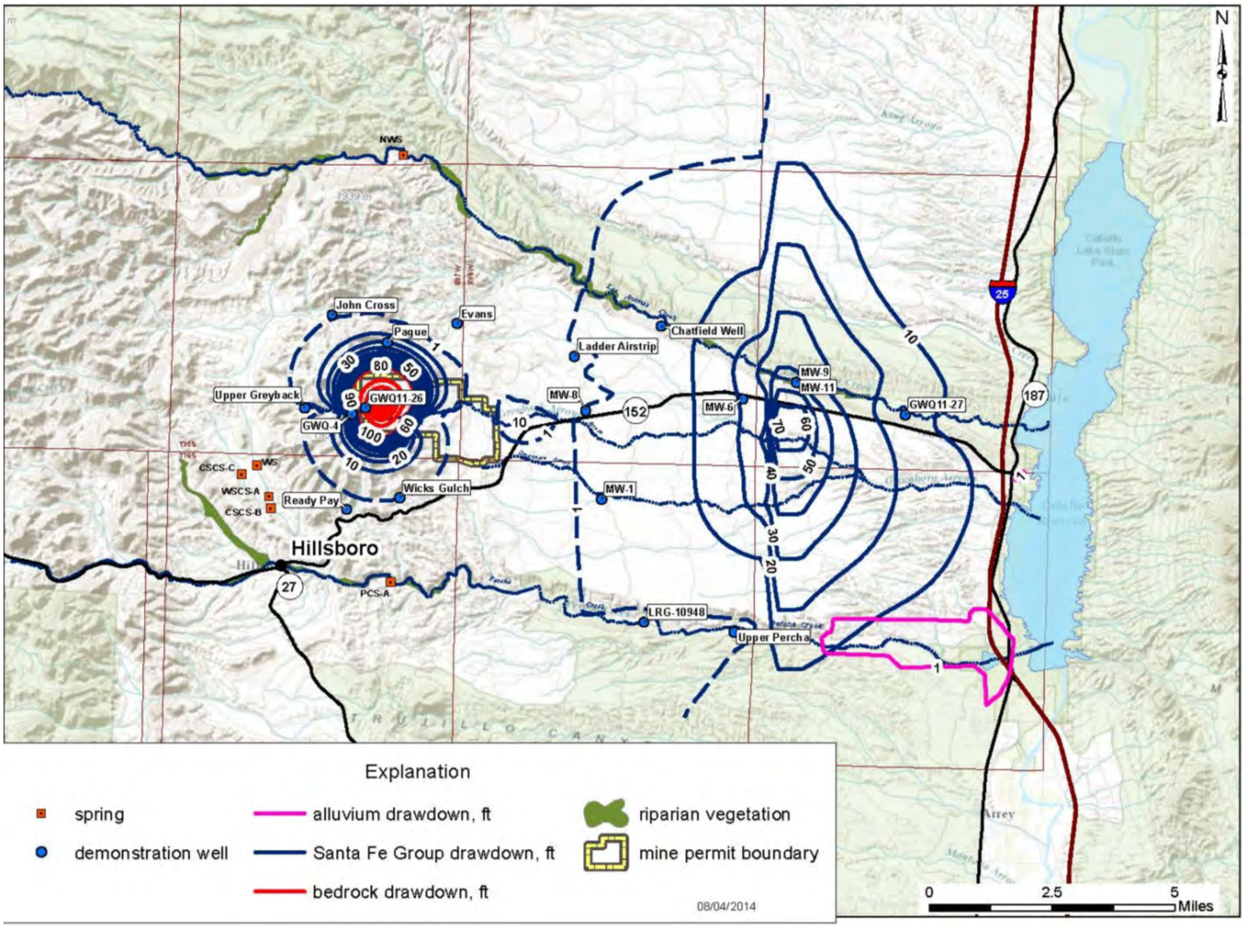


Figure 2. Projected End-of-Mining drawdown, EIS Alt 2.



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DRAFT TECHNICAL MEMORANDUM

To: Katie Emmer, THEMAC Resources kemmer@themacresourcesgroup.com
New Mexico Copper Corporation

From: Michael A. Jones, Principal Hydrologist

Date: 04 August 2014

Subject: Copper Flat model sensitivity to graben anisotropy.

The JSAI Copper Flat model was run assuming a horizontal-to-vertical anisotropy of 100 in the Palomas Graben, to test the sensitivity of model results to graben anisotropy. The calibrated model uses anisotropy of 1, based on previous sensitivity analysis (JSAI, 2014, section 7.1), shown on the Figure 7.1 below.

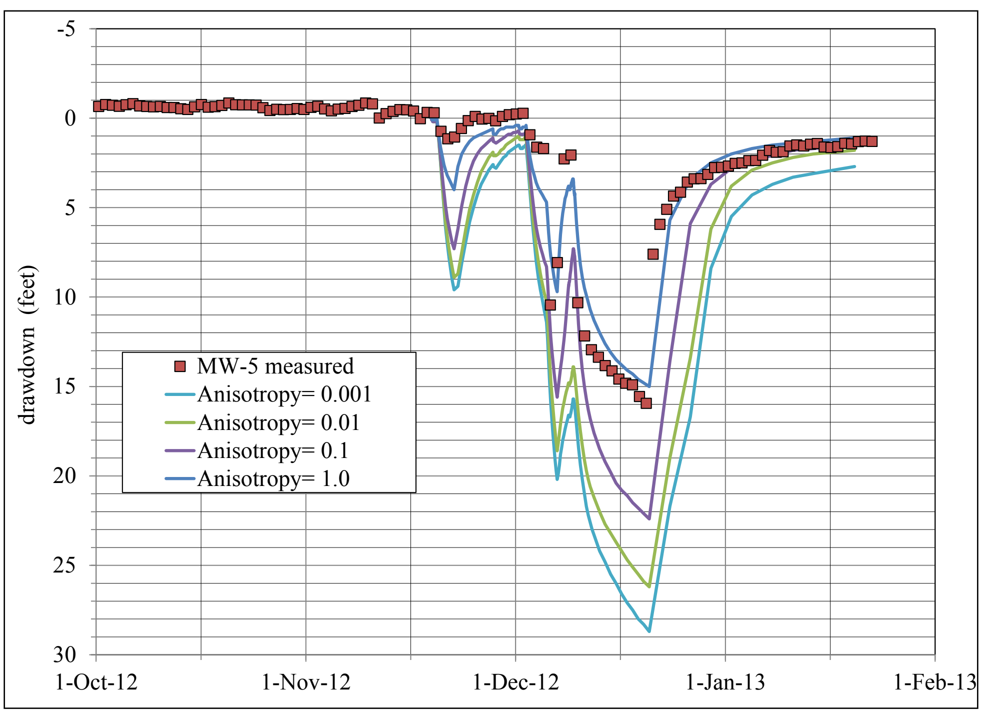


Figure 7.1 (JSAI, 2014). Simulated aquifer-test drawdown in well MW-5 for different vertical anisotropy values.

Figures 1 through 4 show results of the aquifer test calibration. The reproduction of the aquifer test results is not as good as with the calibrated model, suggesting a smaller anisotropy is more likely.

Figure 5 shows projected end-of-mining drawdown for EIS Alt 2. Drawdown in the Santa Fe Group aquifer is larger than with the calibrated model. Figure 6 shows projected flow changes due to the Copper Flat project. Flow changes are about the same as with the calibrated model.

Figure 1. Measures and simulated aquifer test response in PW-2

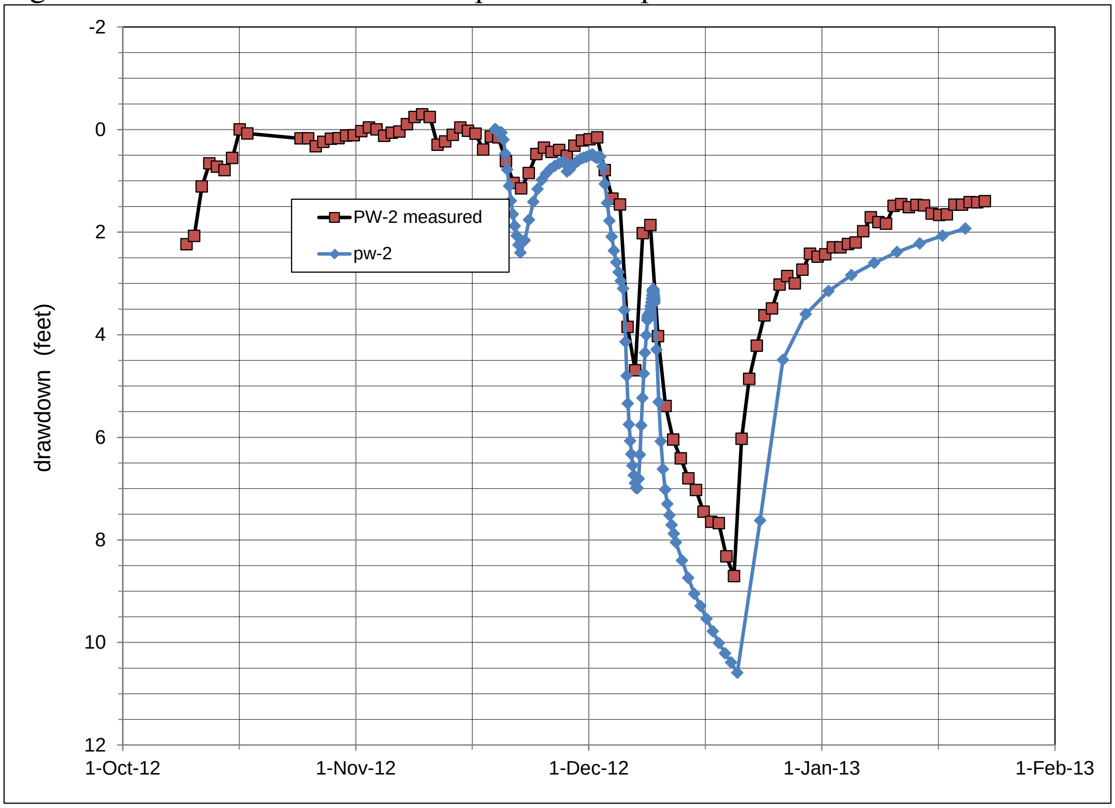


Figure 2. Measures and simulated aquifer test response in PW-4

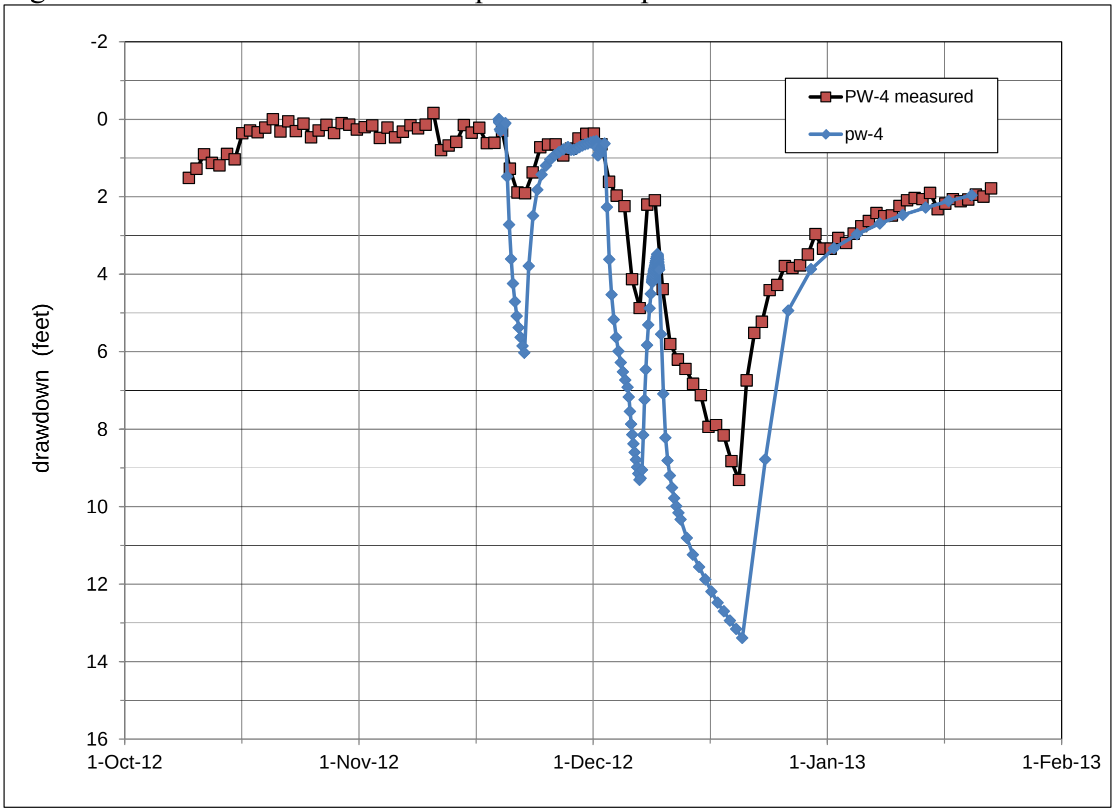


Figure 3. Measures and simulated aquifer test response in MW-5

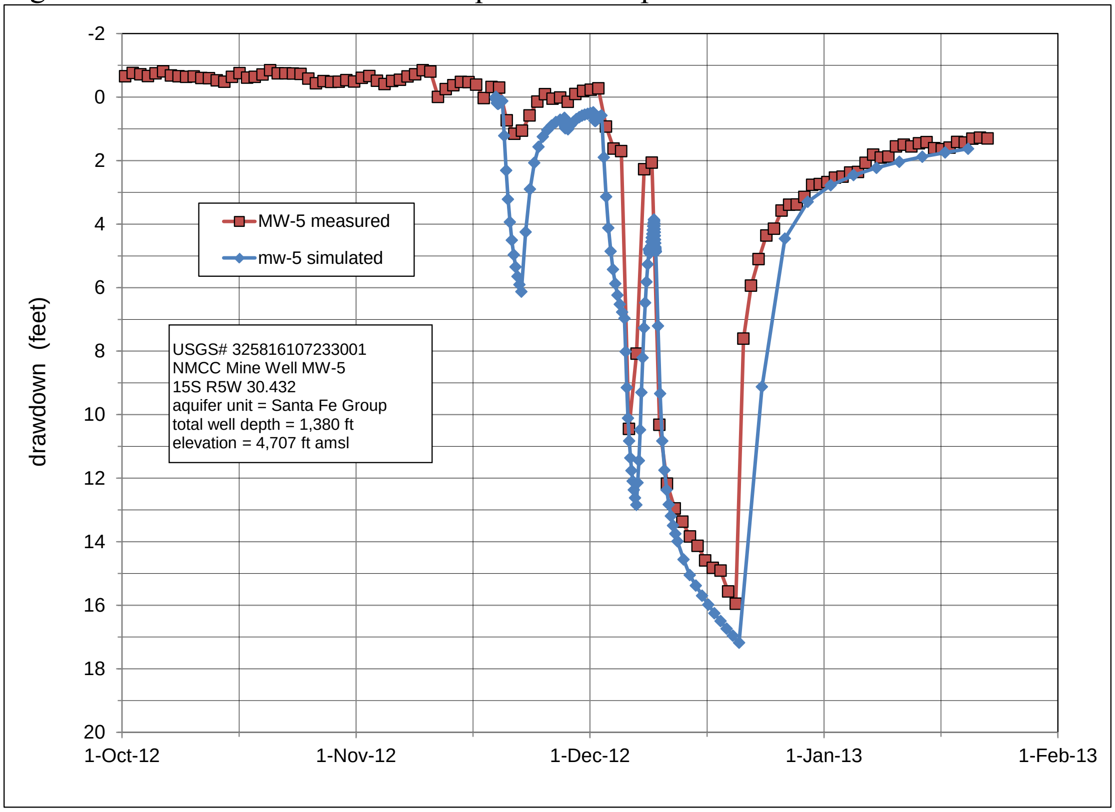


Figure 4. Measures and simulated aquifer test response in MW-9/-10

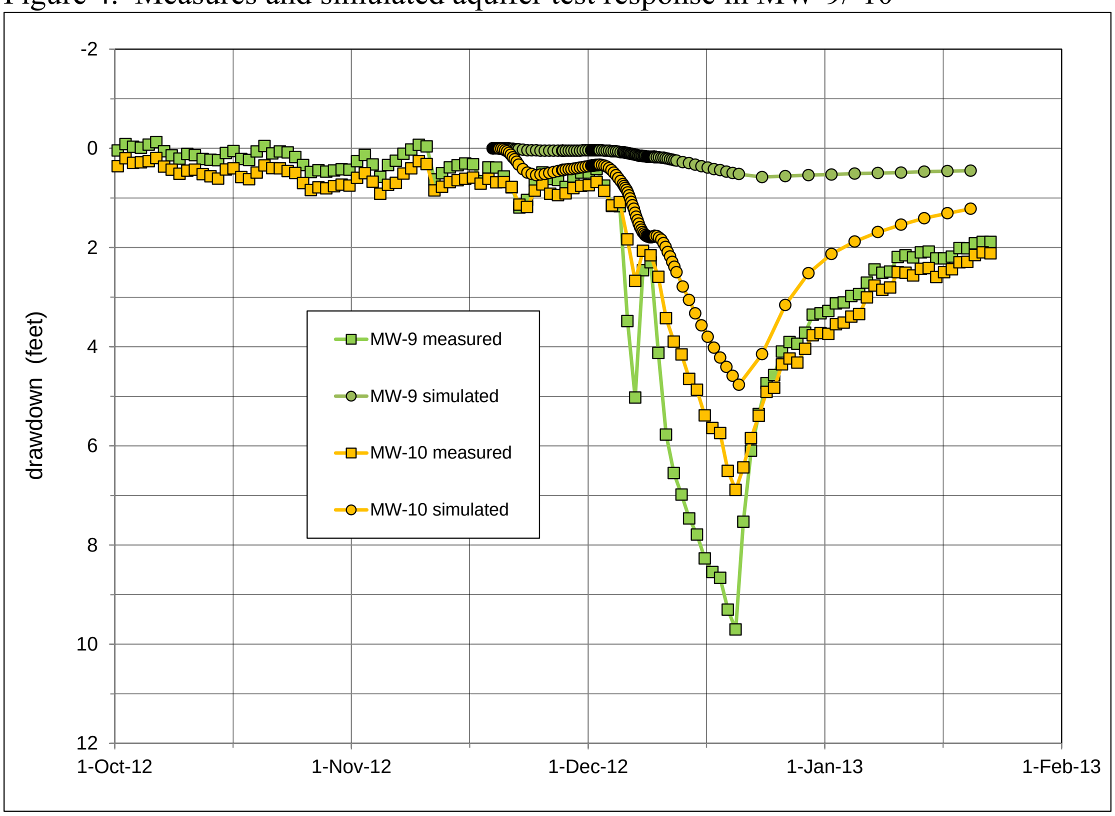


Figure 5. Projected End-of-Mining drawdown, EIS Alt 2.

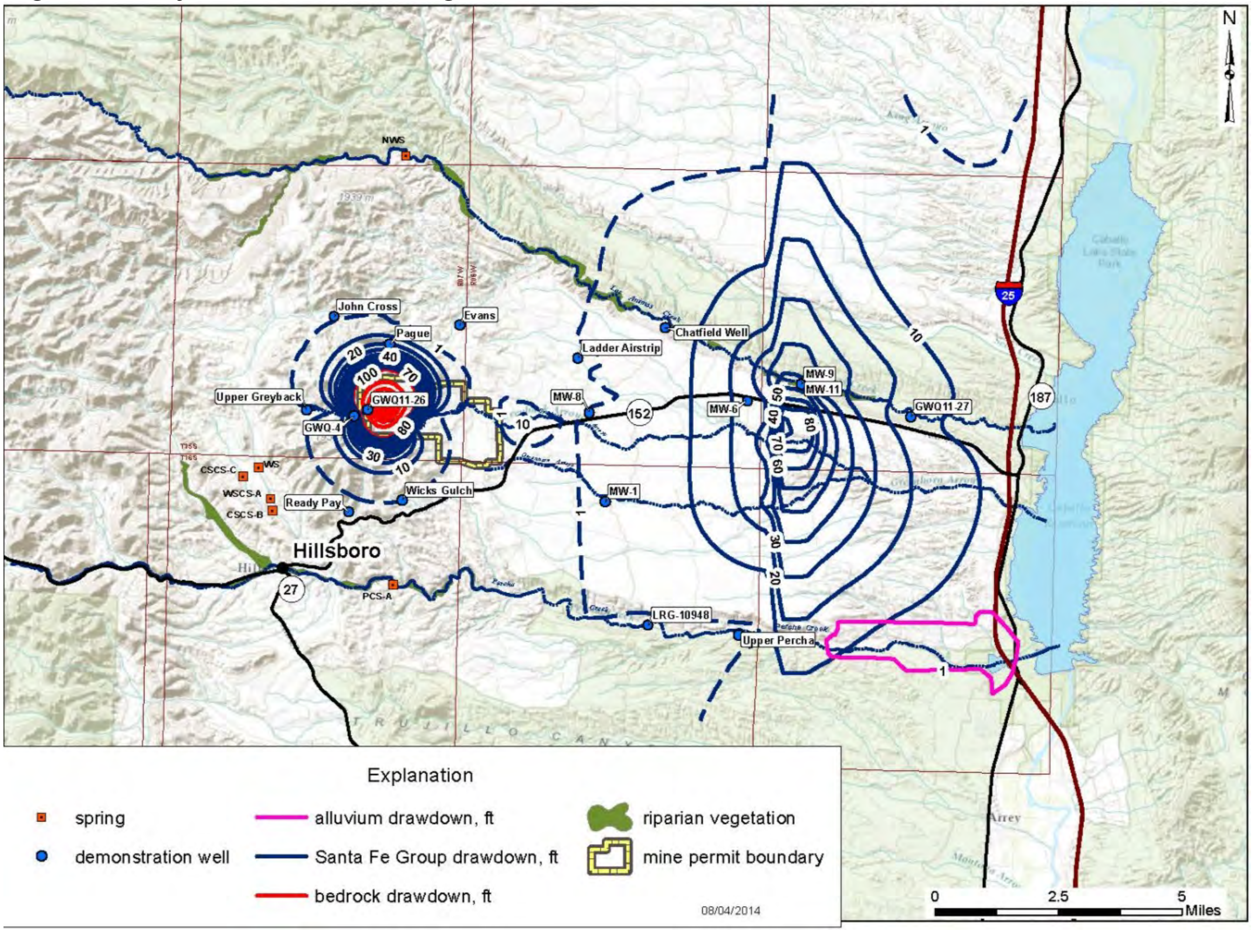
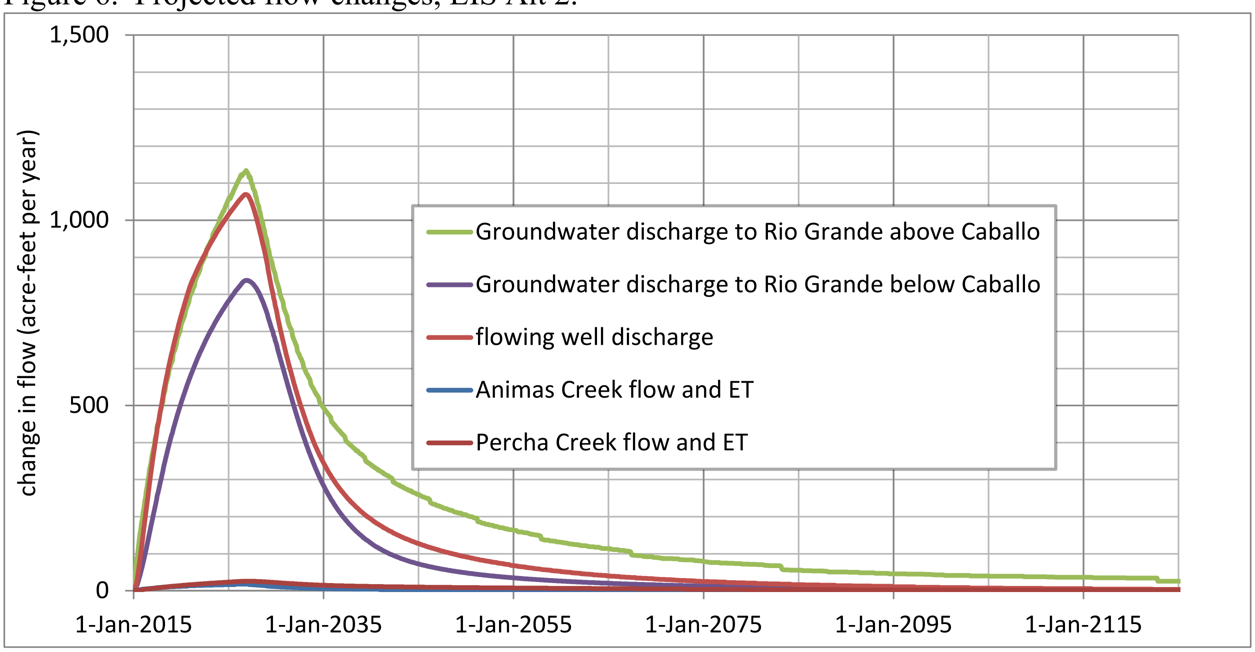


Figure 6. Projected flow changes, EIS Alt 2.



APPENDIX H

PROJECTED GROUNDWATER LEVELS AT SELECTED LOCATIONS

APPENDIX H: PROJECTED GROUNDWATER LEVELS AT SELECTED LOCATIONS

Appendix E: Projected Groundwater Levels at Selected Locations
Prepared by John Shomaker and Associates, September, 2014.

The hydrographs below present in greater detail model (JSAI 2014) results that are discussed in the body of the EIS. Hydrographs are presented for the locations shown on Figure 1. The locations are listed on Table 1. Well diagrams and other information for some locations are presented in JSAI (2014) and Intera (2012).

Figure 1. Selected Hydrograph Locations

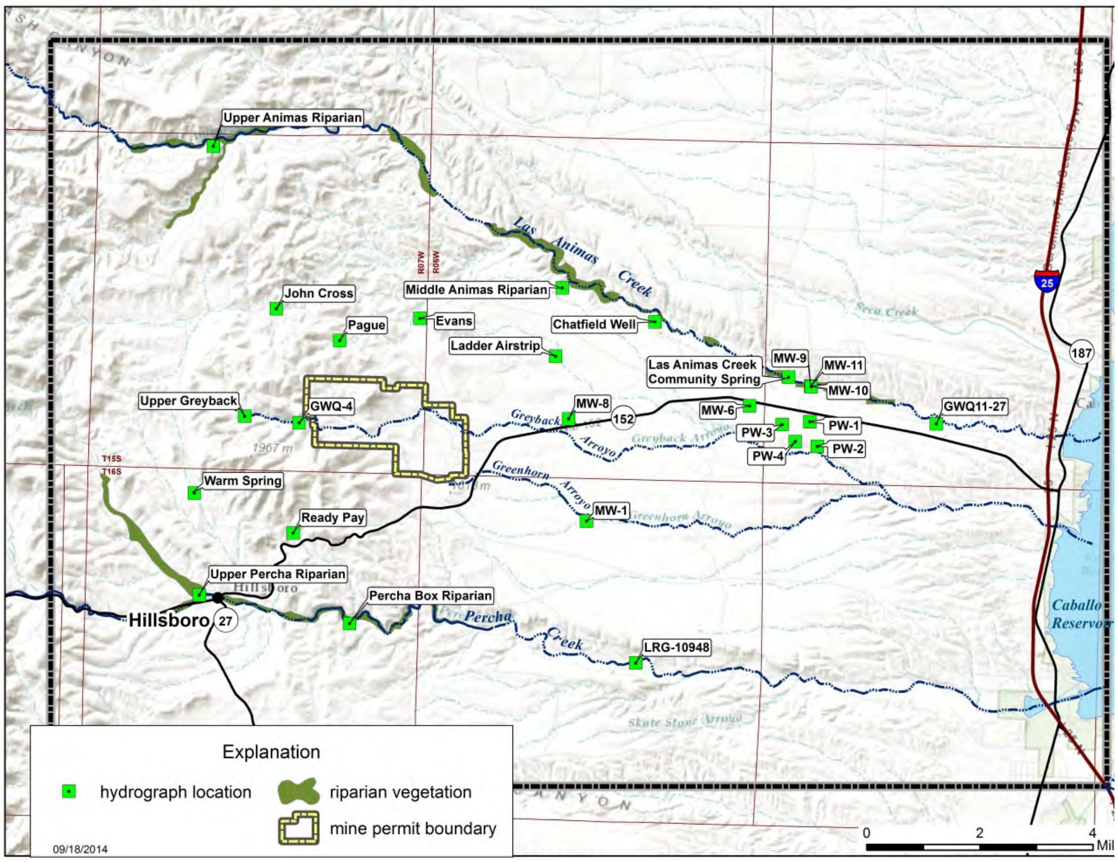


Table 1. Hydrograph Details

Well Name	model row	model column	model layer	Northing (US FT)	Easting (US FT)	Elevation of Measuring Point (ft	Source of Info
GWQ-4 (LRG-4157)	51	23	2	11976381	860456	5566	Schaaf (2013)
Upper Greyback (LRG-4159)	48	14	2	11976990	855379	5720	Schaaf (2013)
Ready Pay (LRG-4158)	70	21	2	11966107	859888	5533	Schaaf (2013)
John Cross	19	18	2	11986996	858327	5496	Schaaf (2013)
Pague	22	41	2	11984044	864250	5551	Schaaf (2013)
Evans	20	61	2	11986102	871745	5174	Schaaf (2013)
PW-1	51	89	2	11976471	908130	4708	Schaaf (2013)
PW-2	61	89	2	11974190	908822	4686	Schaaf (2013)
PW-3	52	87	2	11976220	905548	4731	Schaaf (2013)
PW-4	59	87	2	11974623	906763	4669	Schaaf (2013)
MW-1 (LRG-4652-S-11)	69	73	2	11967214	887292	4932	Schaaf (2013)
MW-6 (LRG-4152-S-15)	43	84	2	11977954	902502	4768	Schaaf (2013)
MW-8 (LRG-4152-S-16)	49	71	2	11976741	885604	5024	Schaaf (2013)
Ladder Airstrip (Labeled by Schaaf as Ladder Airport)	24	71	2	11982576	884397	4998	Schaaf (2013)
Chatfield Well (Mislabled by Schaaf as Animas Station 8)	20	78	2	11985777	893677	4615	Schaaf (2013)
MW-9	34	89	3	11979770	908214	4455	Schaaf (2013)
GWQ11-27	52	97	2	11976284	919945	4333	Schaaf (2013)
MW-10	34	89	2	11979784	908266	4454	Schaaf (2013)
LRG-10948	79	76	2	11954013	891882	4629	Schaaf (2013)
Upper Animas Riparian	8	12	2	12002145	852450	5450	Model cell centers
Middle Animas Riparian	18	71	1	11988945	885030	4917	Model cell centers
MW-11	34	89	1	11979737	908251	4454	Schaaf (2013)
Upper Percha Riparian	74	11	2	11960325	851130	5271	Model cell centers
Percha Box Riparian	76	46	2	11957685	865160	5206	Model cell centers
Warm Spring (NW of Hillsboro)	67	11	2	11969826	850679	5530	Newcomer & Finch (1993)
Las Animas Creek Community Spring	30	87	1	11980635	906150	4457	Murray (1959)

Figure 2. Projected Water Level at GWQ-4

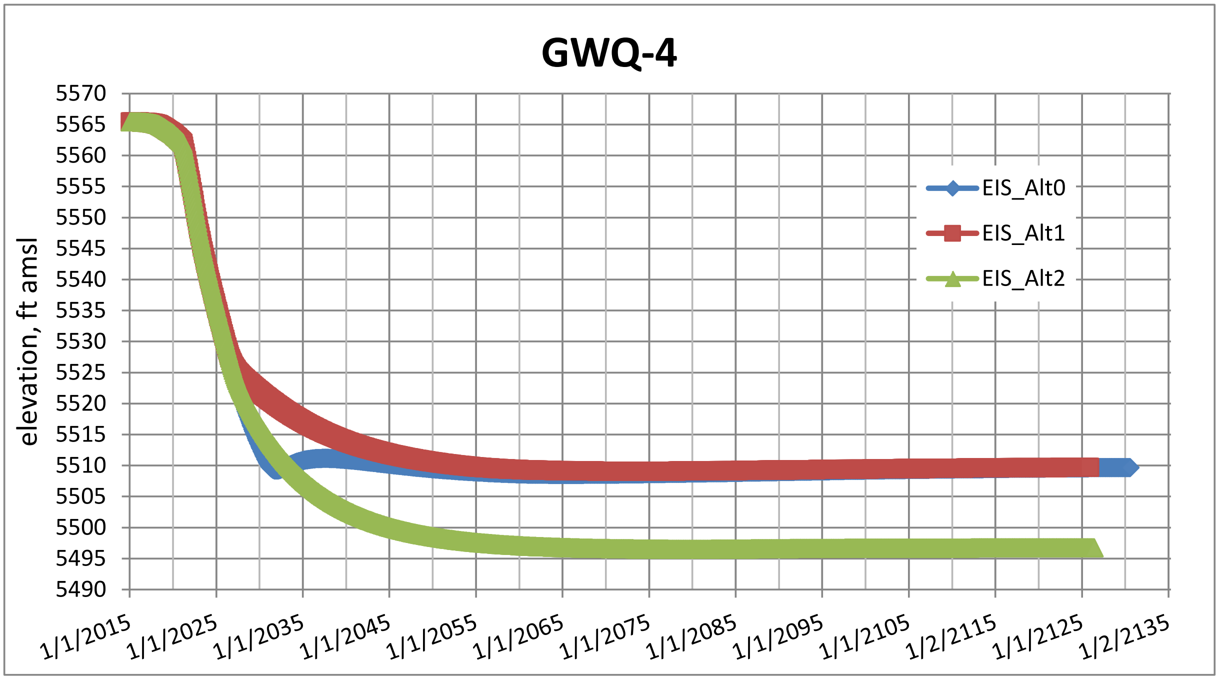


Figure 3. Projected Water Level at Upper Greyback

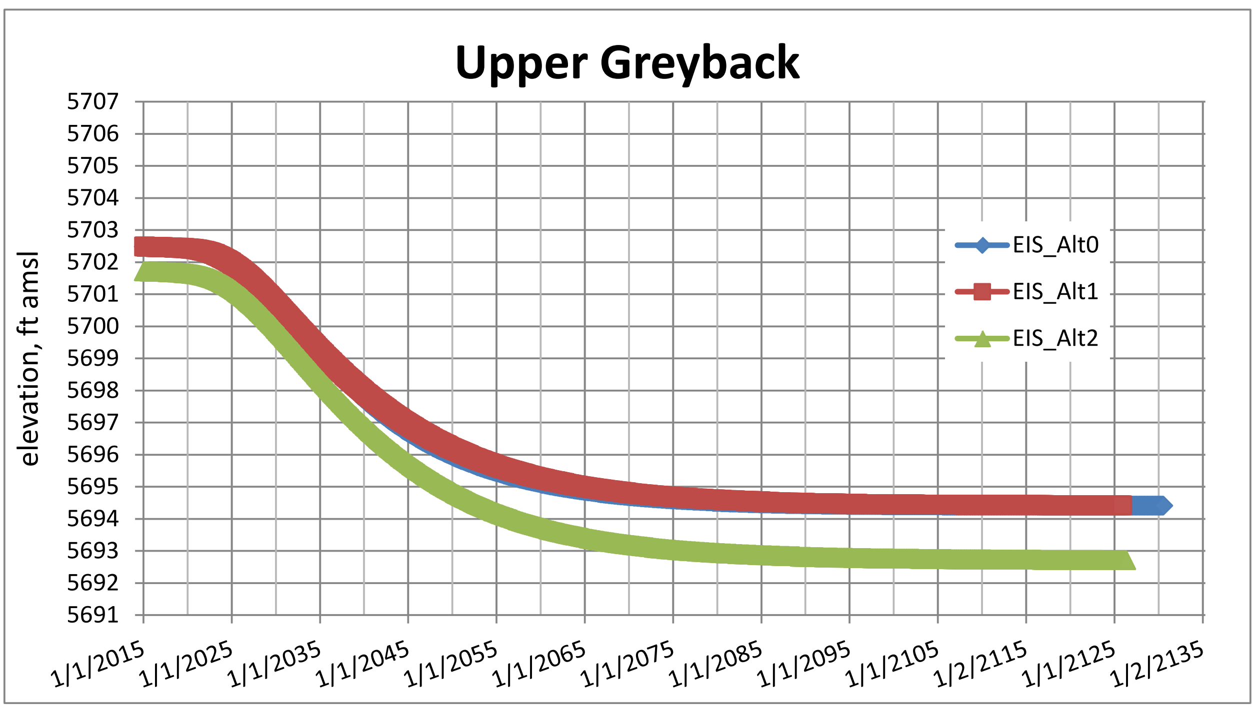


Figure 4. Projected Water Level at Ready Pay

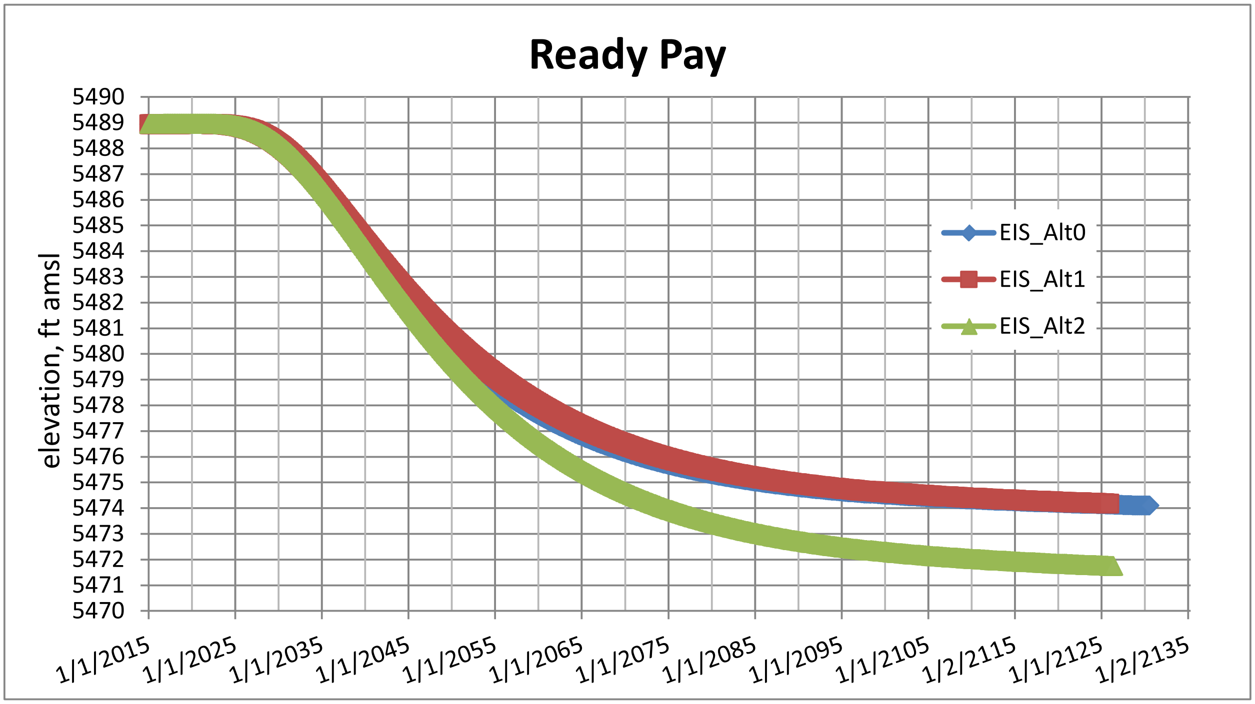


Figure 5. Projected Water Level at John Cross

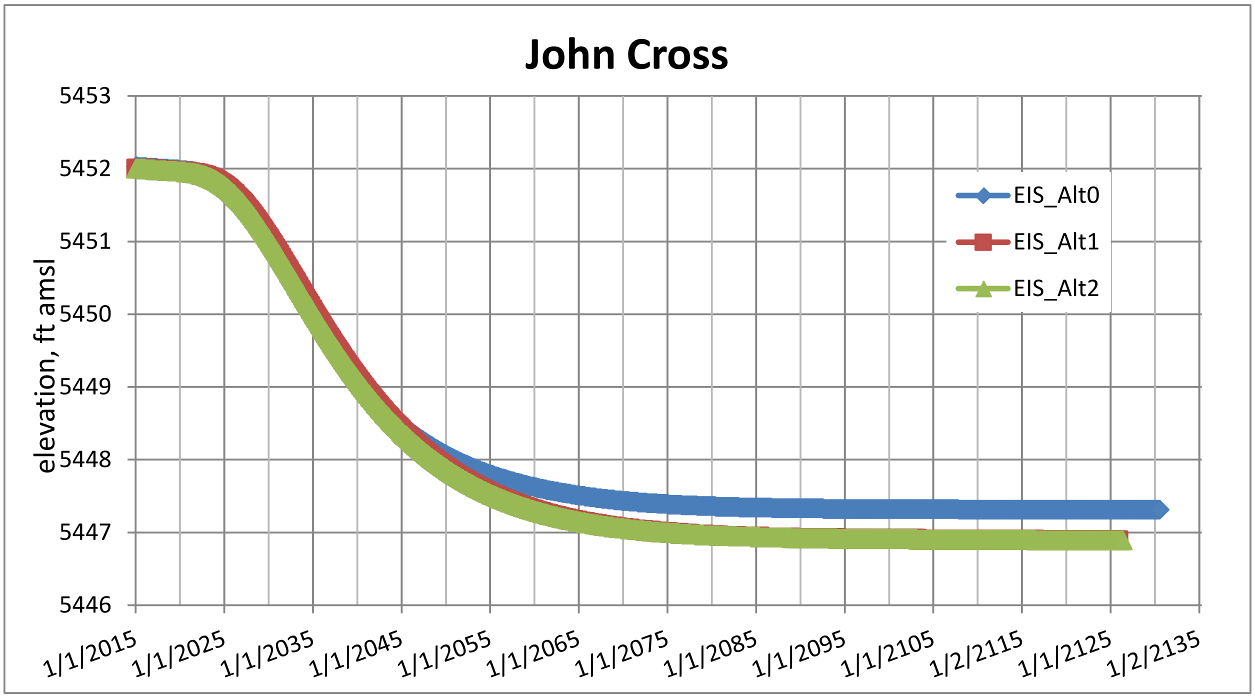


Figure 6. Projected Water Level at Pague

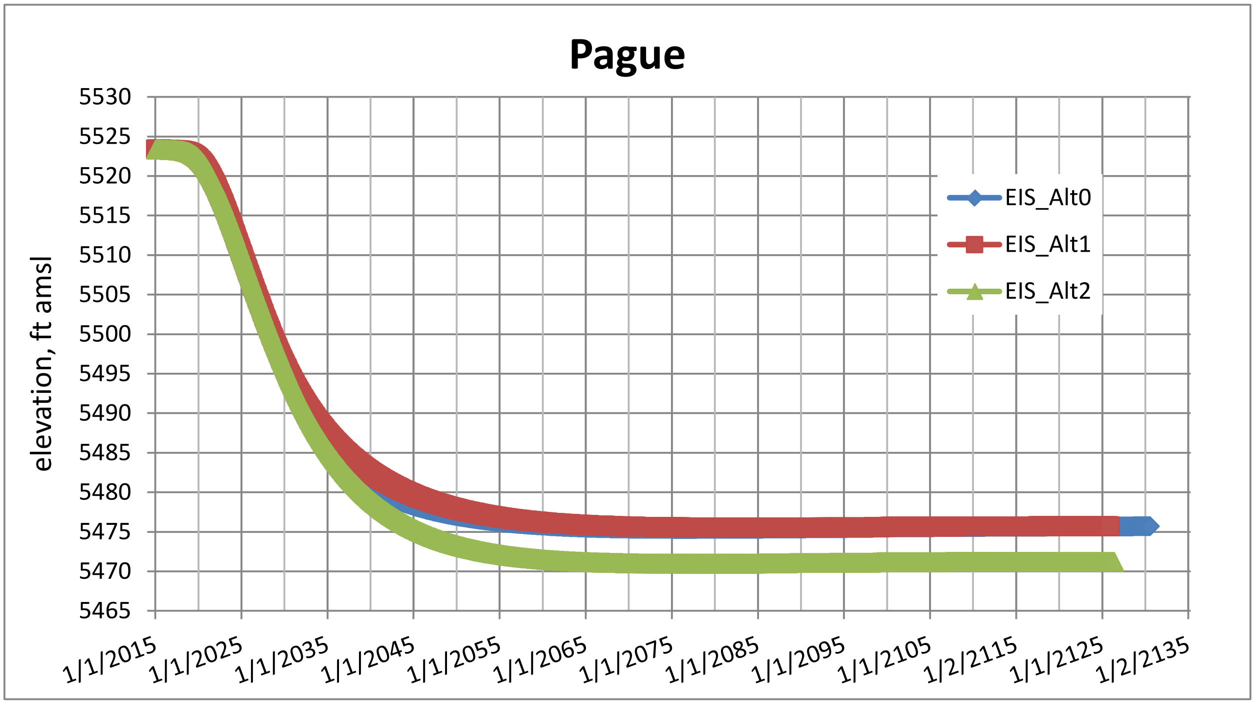


Figure 7. Projected Water Level at Evans

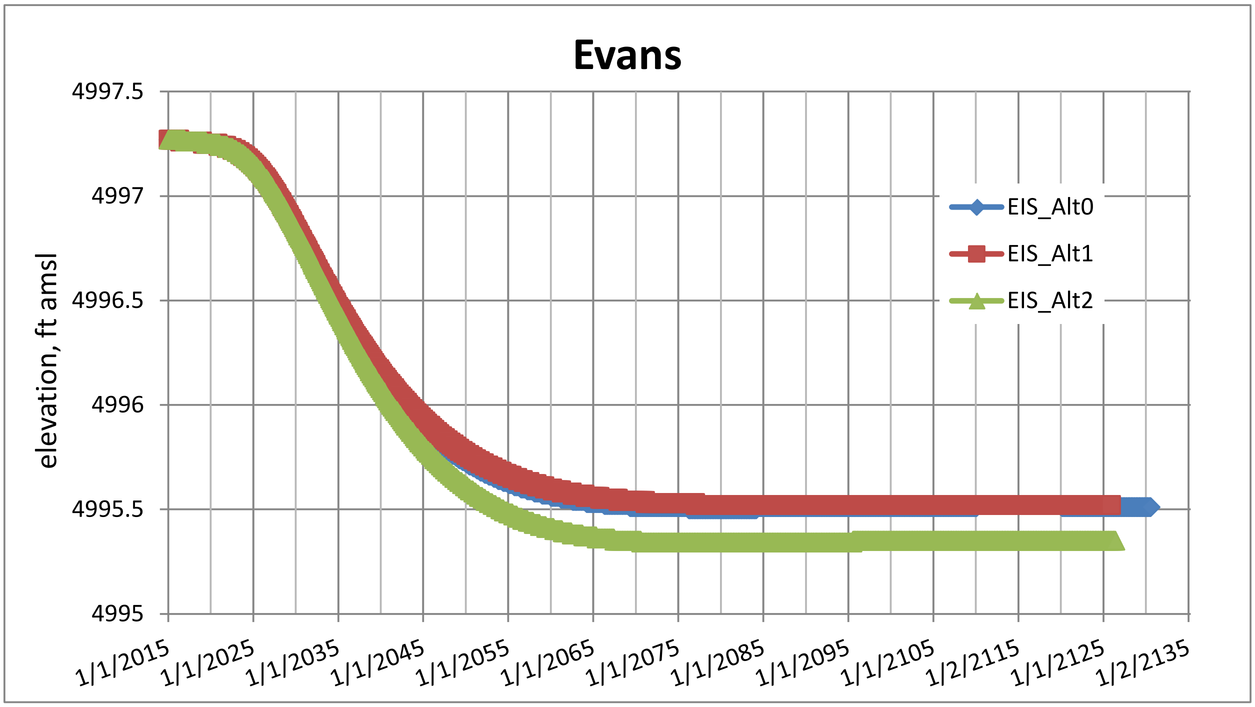


Figure 8. Projected Water Level at PW-1

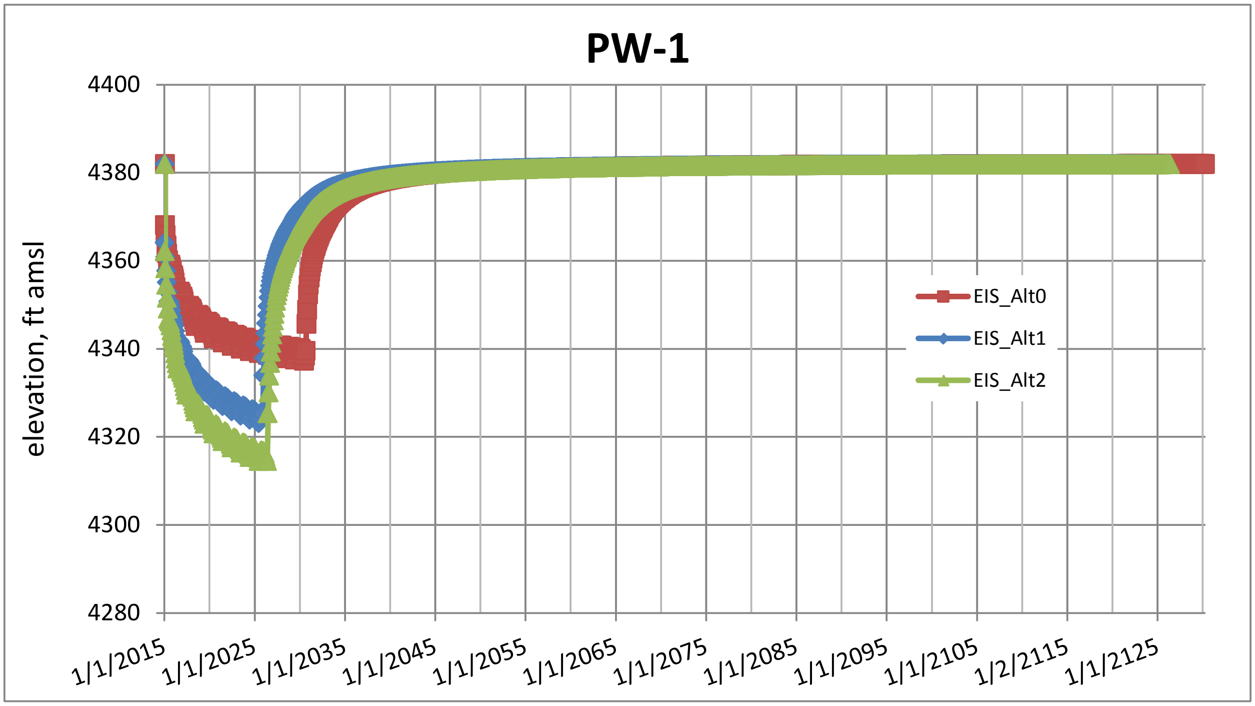


Figure 9. Projected Water Level at PW-2

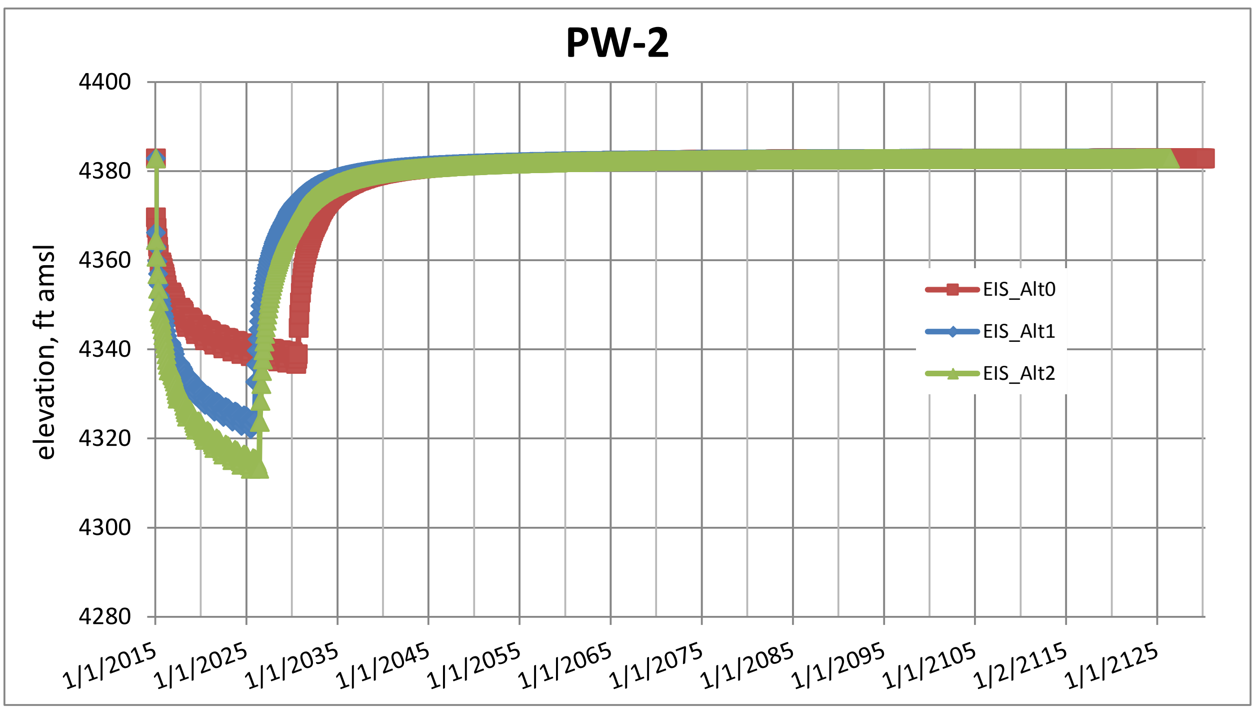


Figure 10. Projected Water Level at PW-3

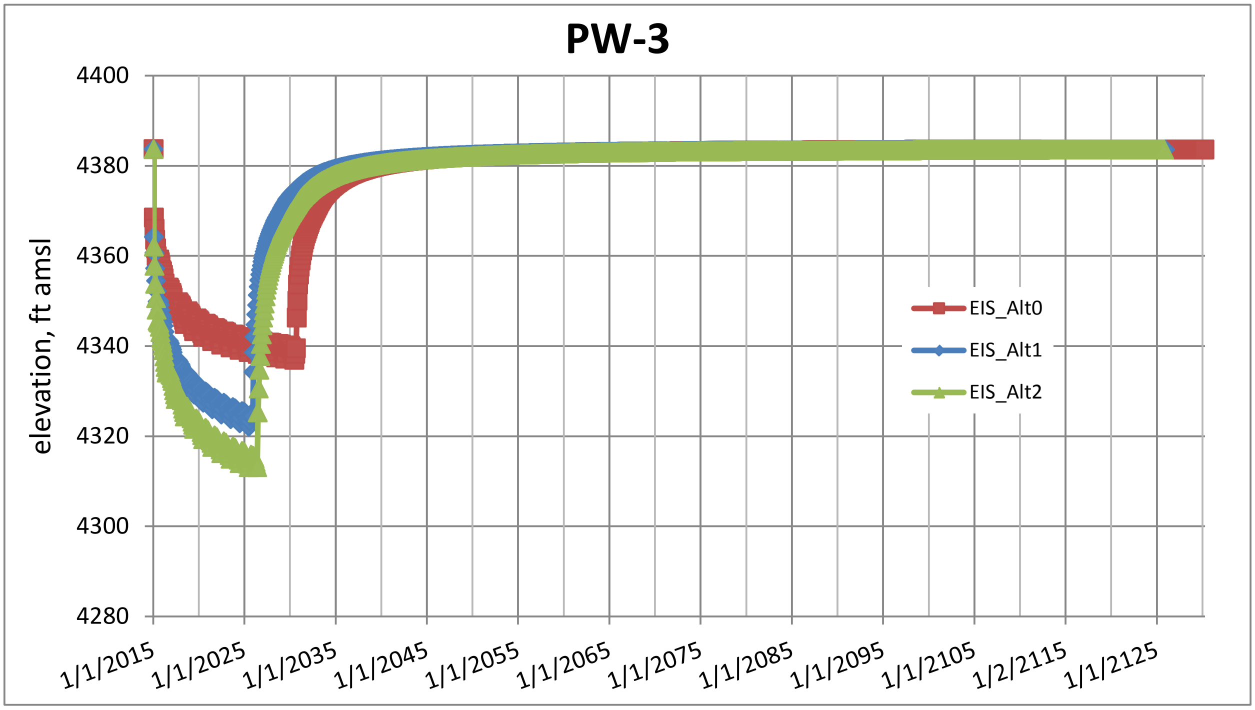


Figure 11. Projected Water Level at PW-4

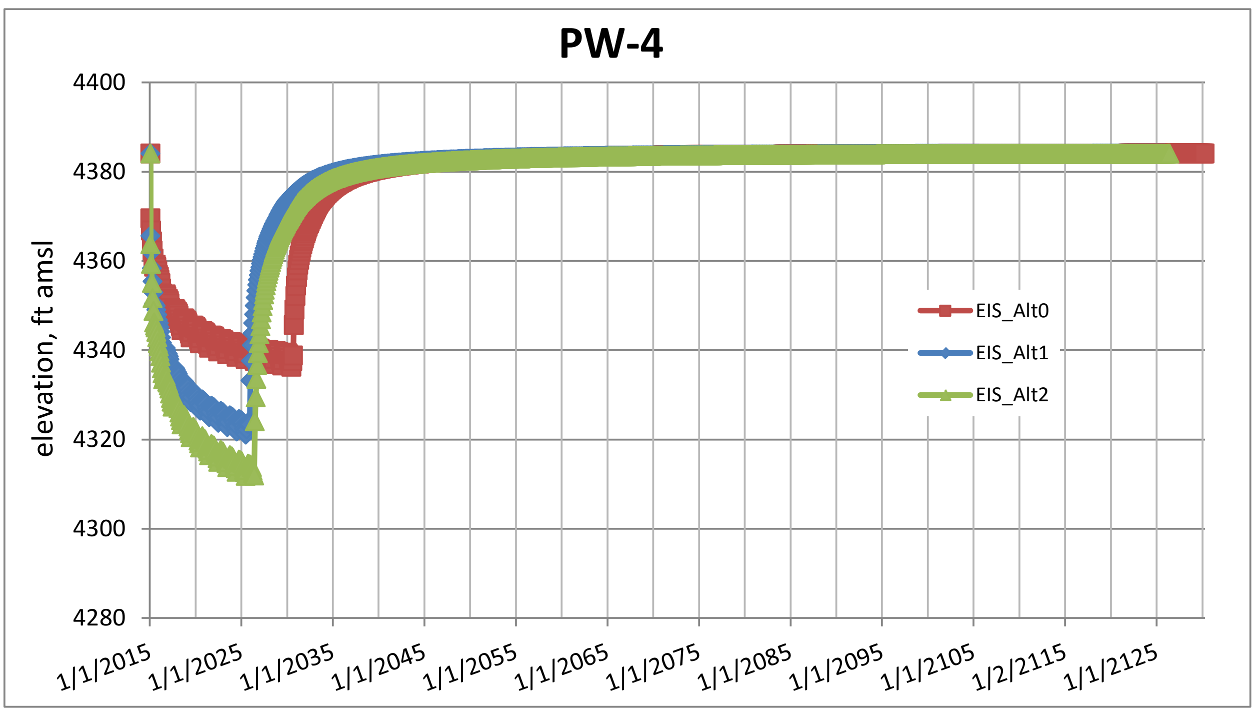


Figure 12. Projected Water Level at MW-1

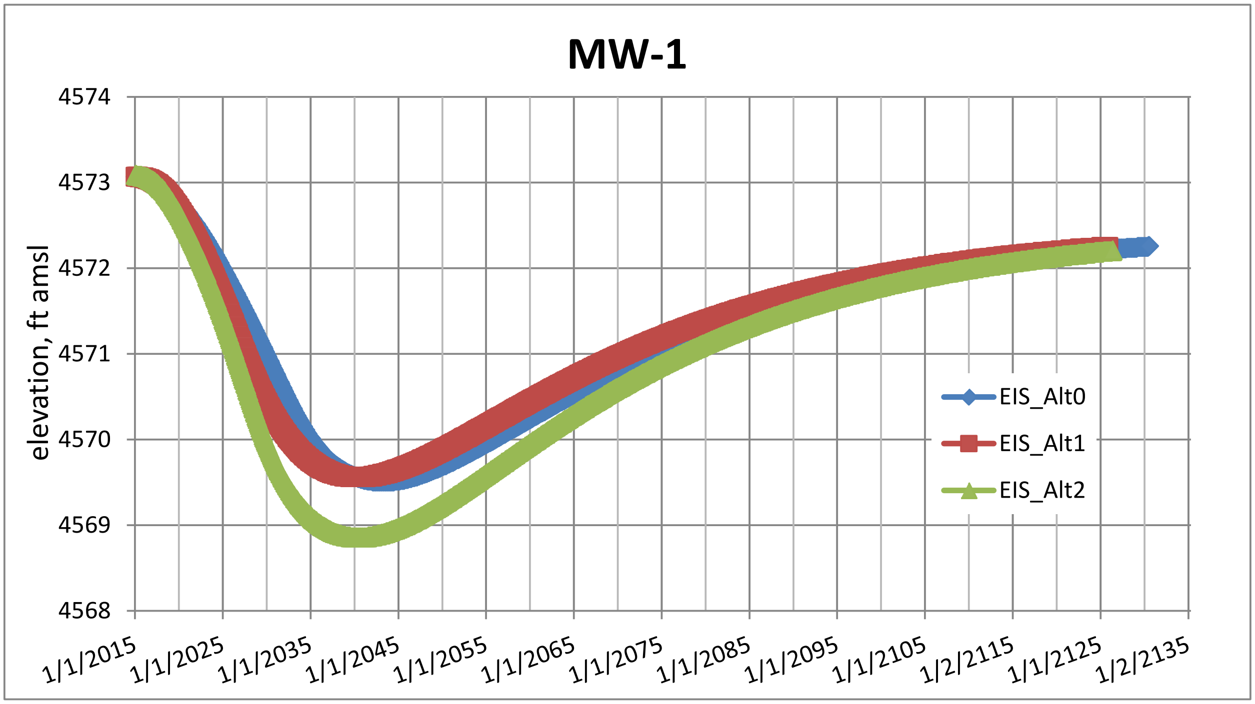


Figure 13. Projected Water Level at MW-6

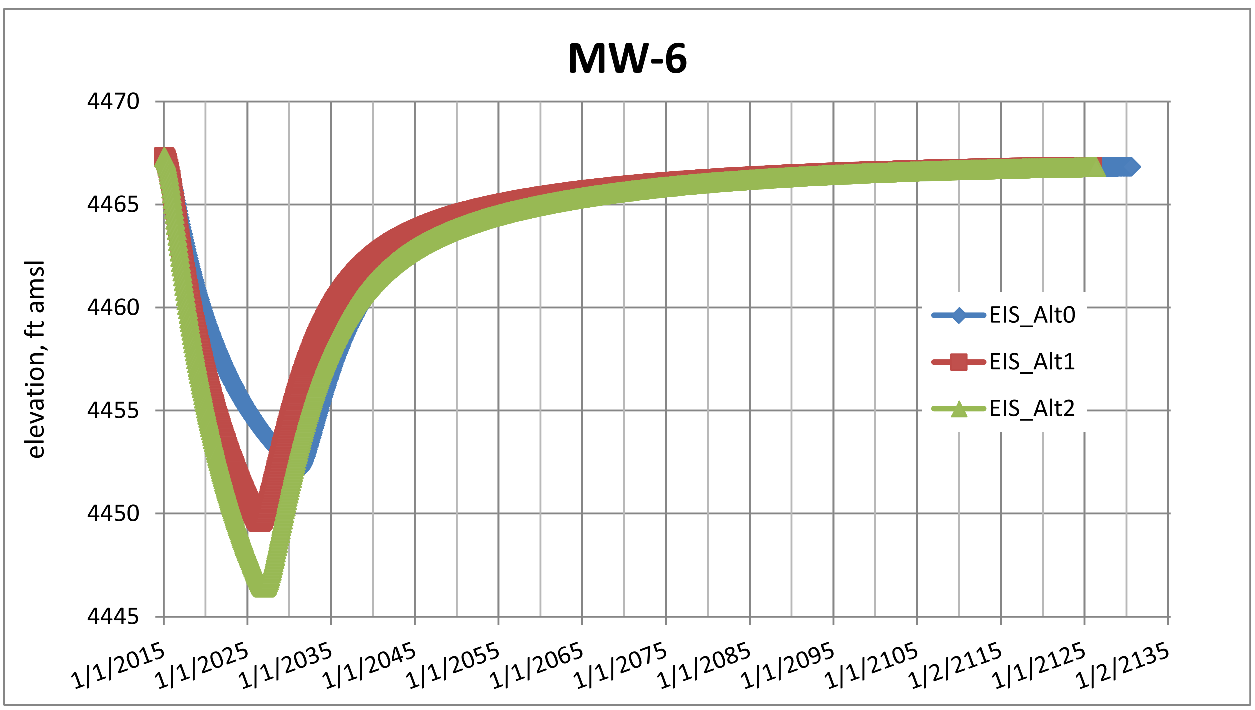


Figure 14. Projected Water Level at MW-8

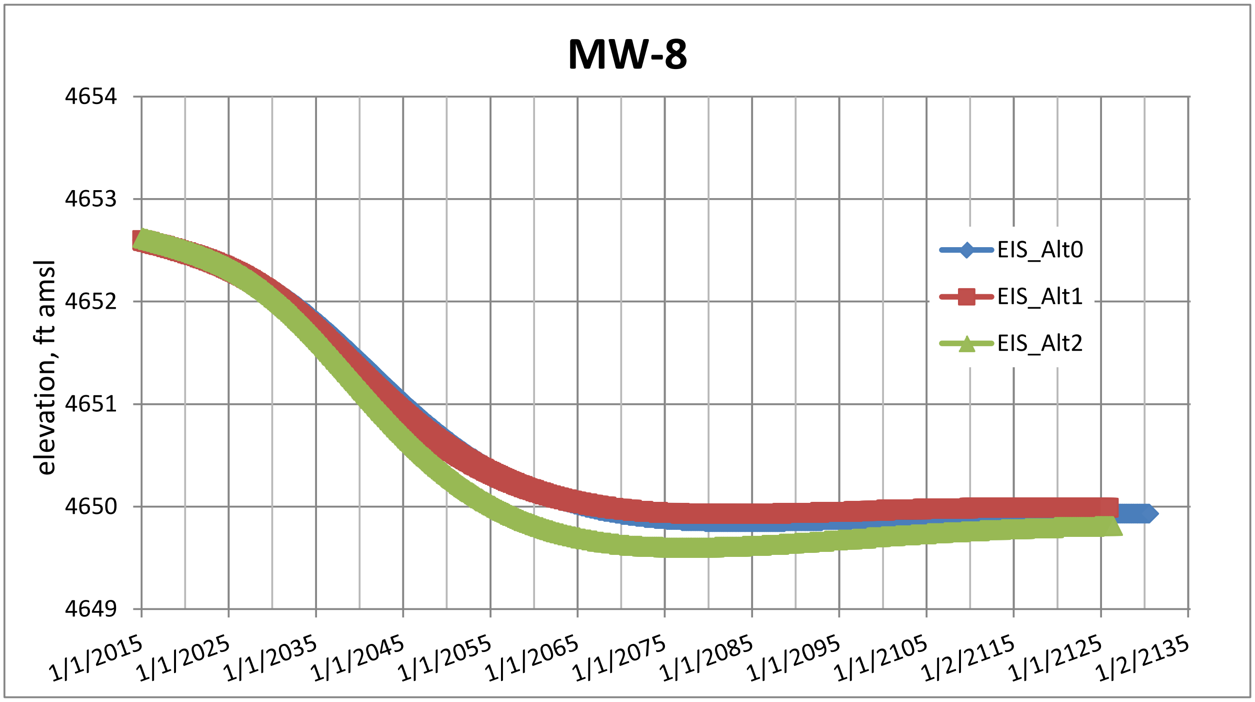


Figure 15. Projected Water Level at Ladder Airstrip

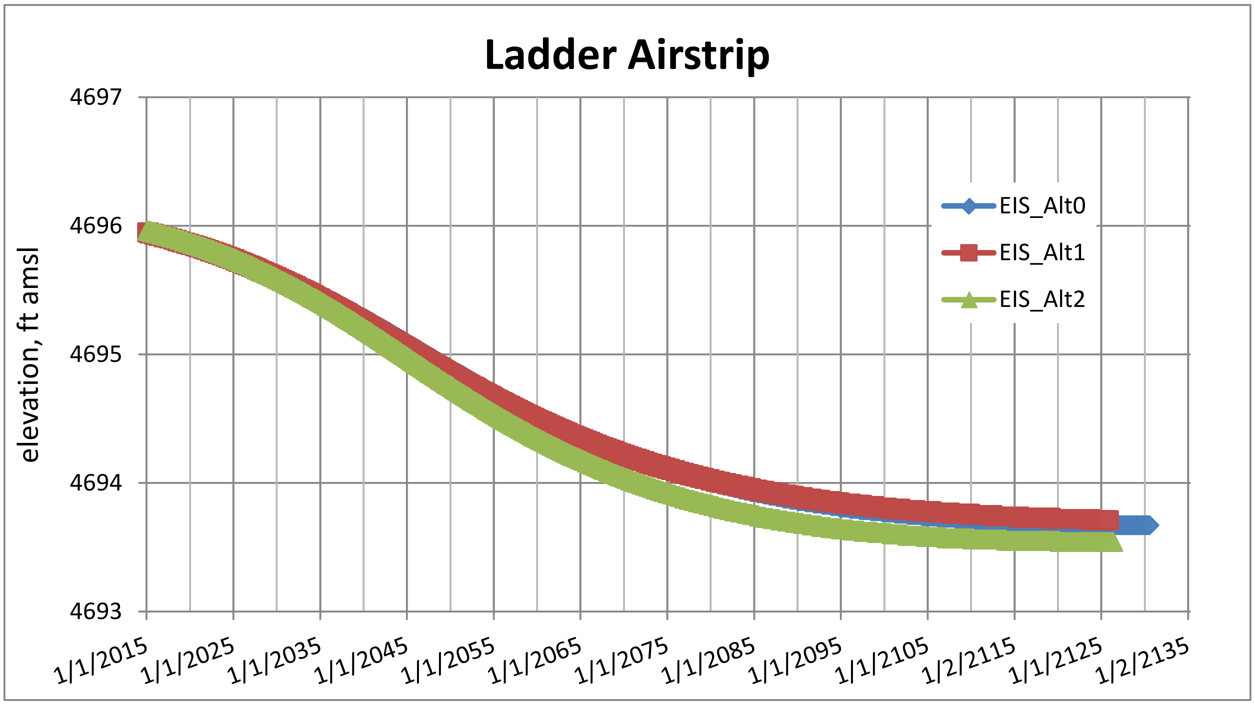


Figure 16. Projected Water Level at Chatfield Well

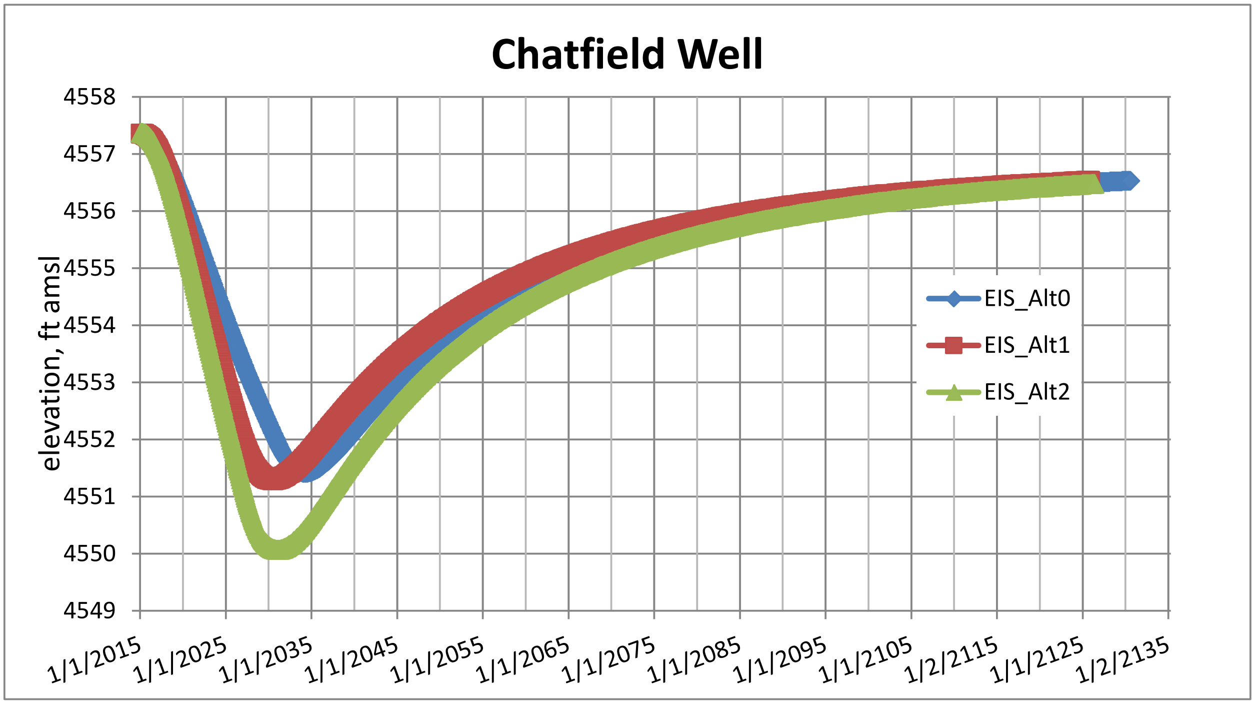


Figure 17. Projected Water Level at MW-9

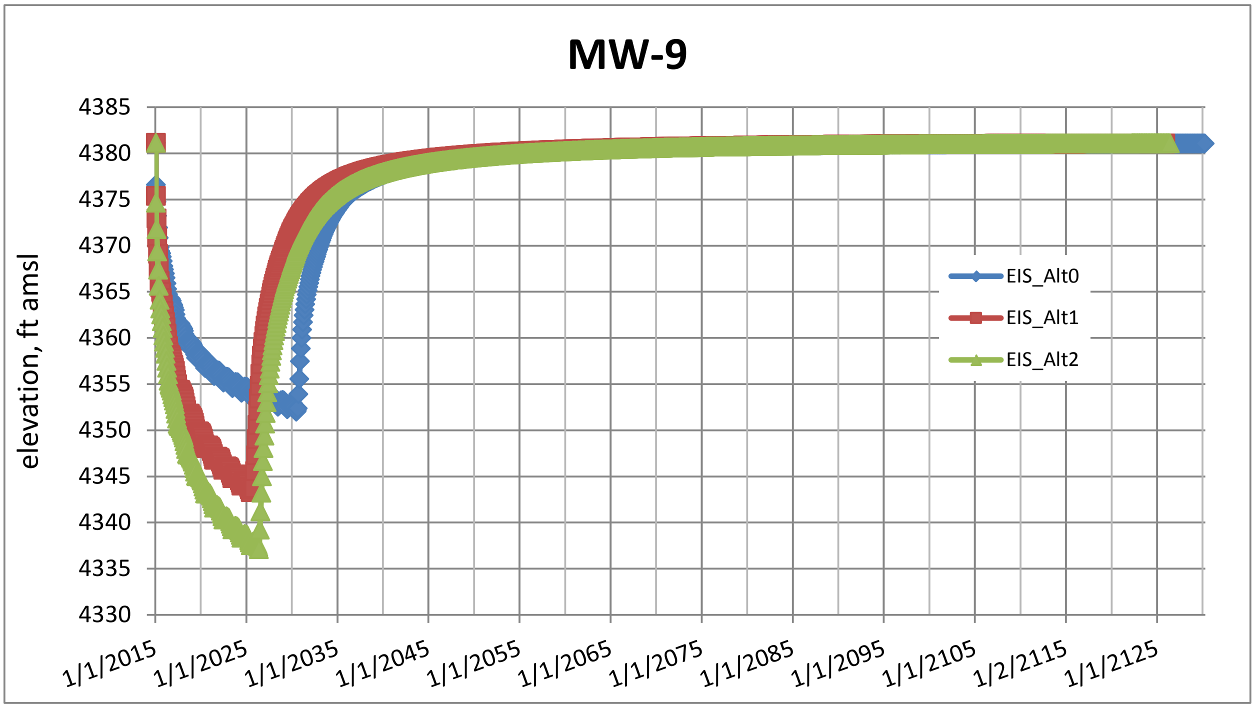


Figure 18. Projected Water Level at GWQ 11-27

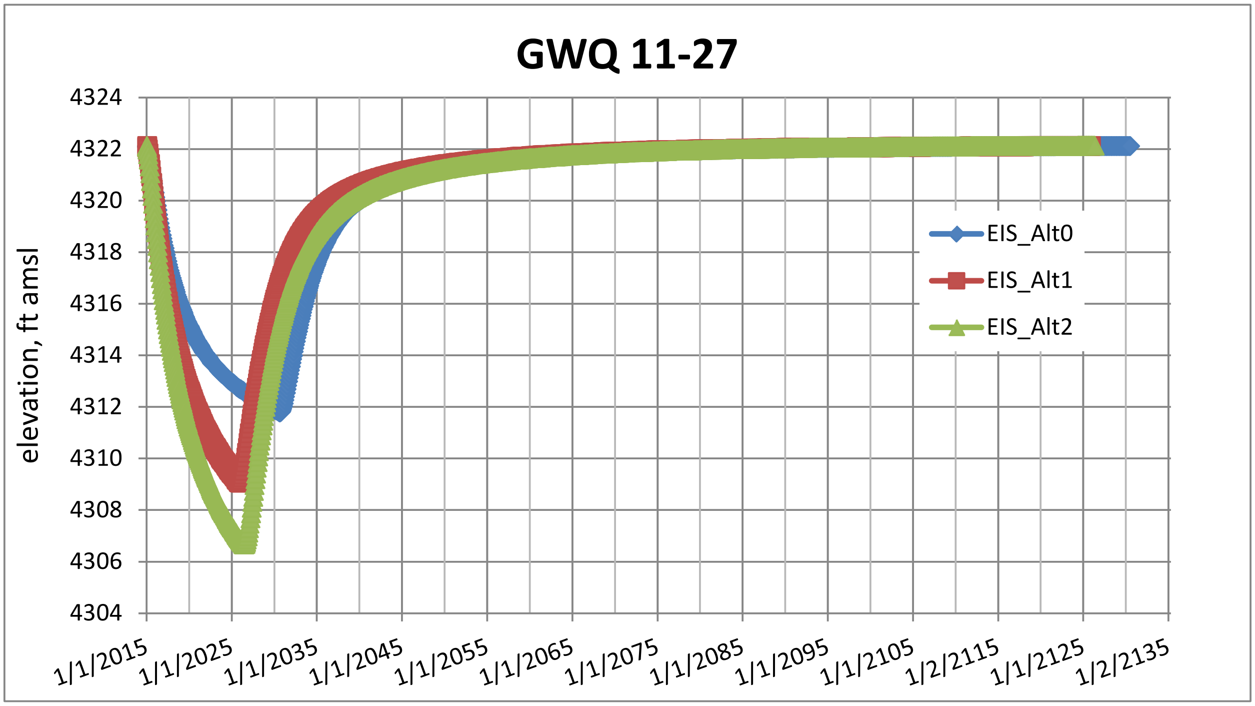


Figure 19. Projected Water Level at MW-10

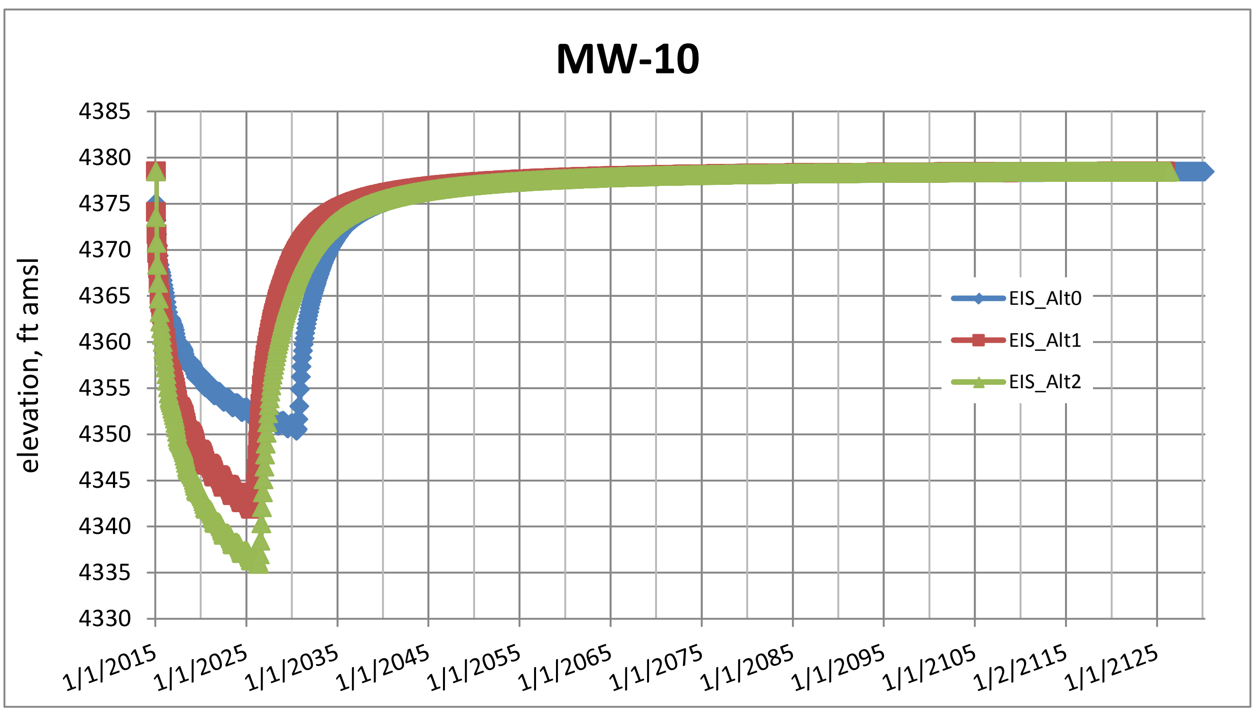


Figure 20. Projected Water Level at LRG10948

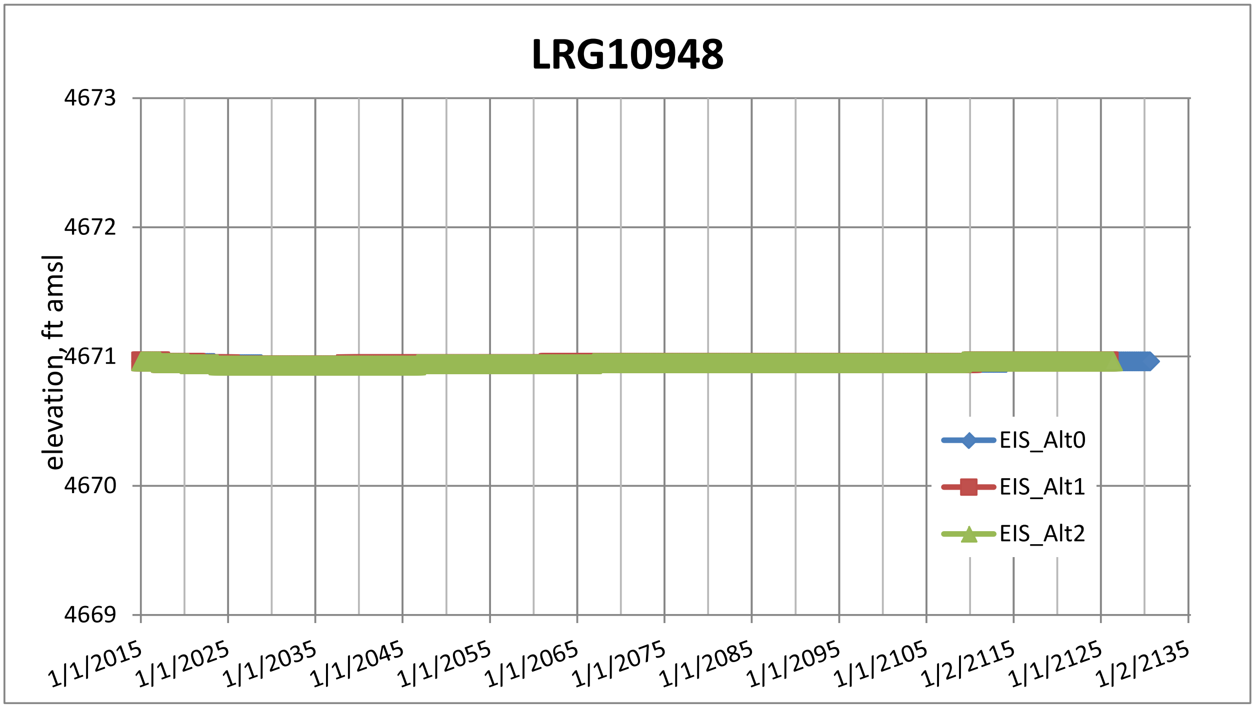


Figure 21. Projected Water Level at Upper Animas Riparian (8, 12)

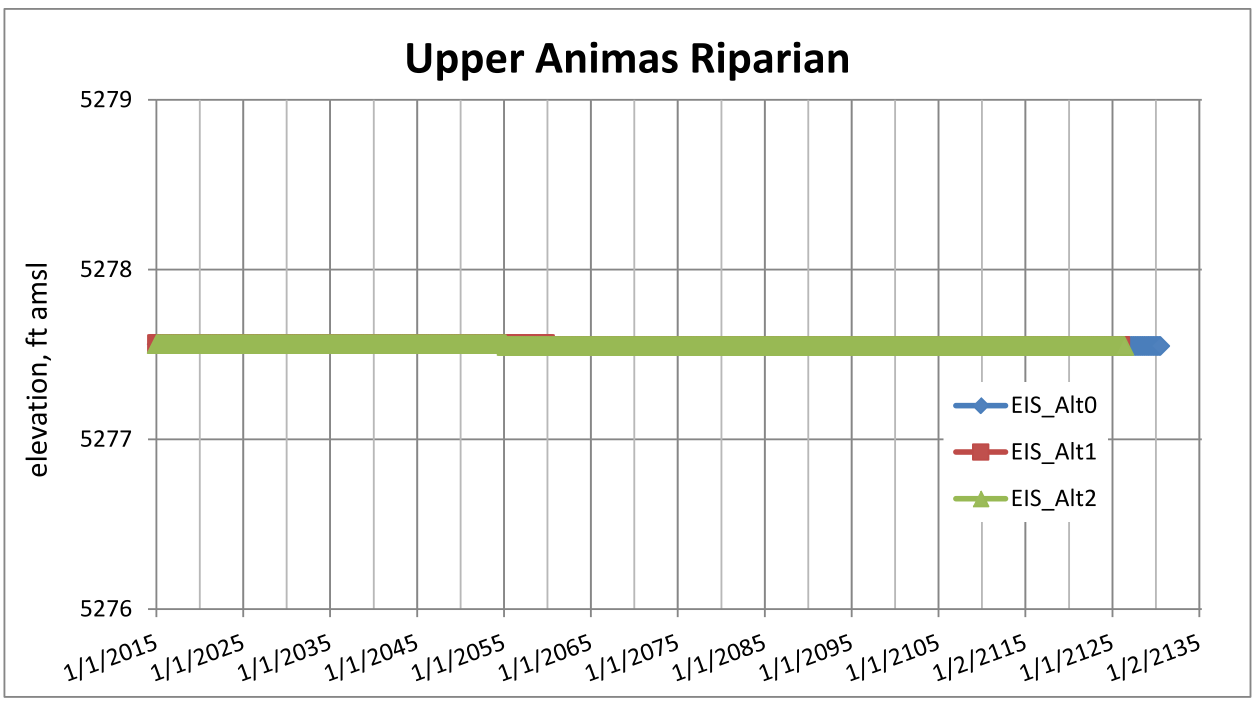


Figure 22. Projected Water Level at Middle Animas Riparian (18, 71)

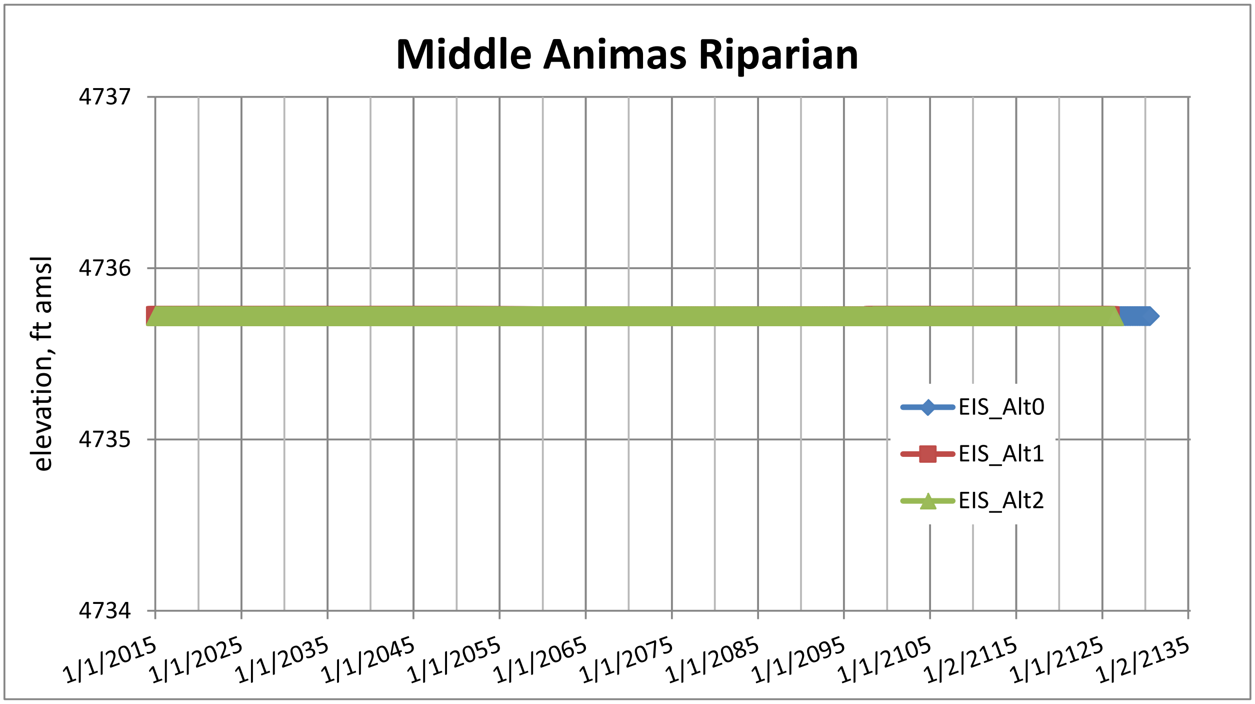


Figure 23. Projected Water Level at MW-11

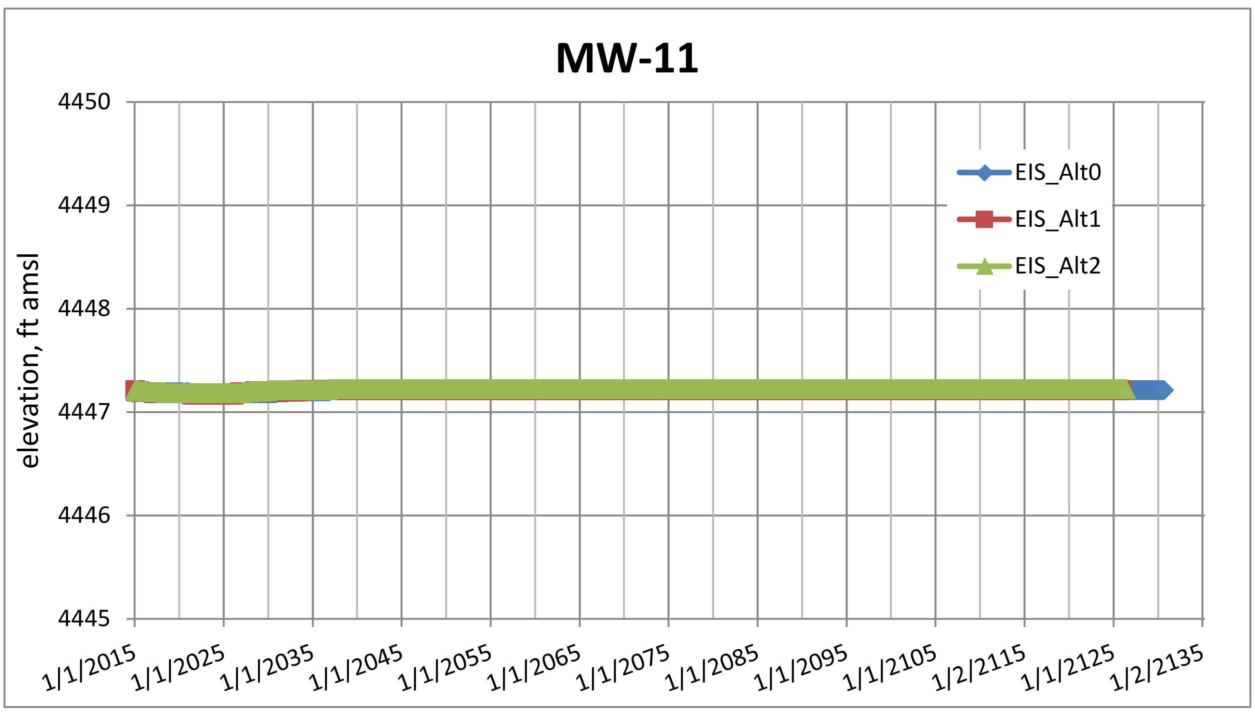


Figure 24. Projected Water Level at Upper Percha Riparian (74, 11)

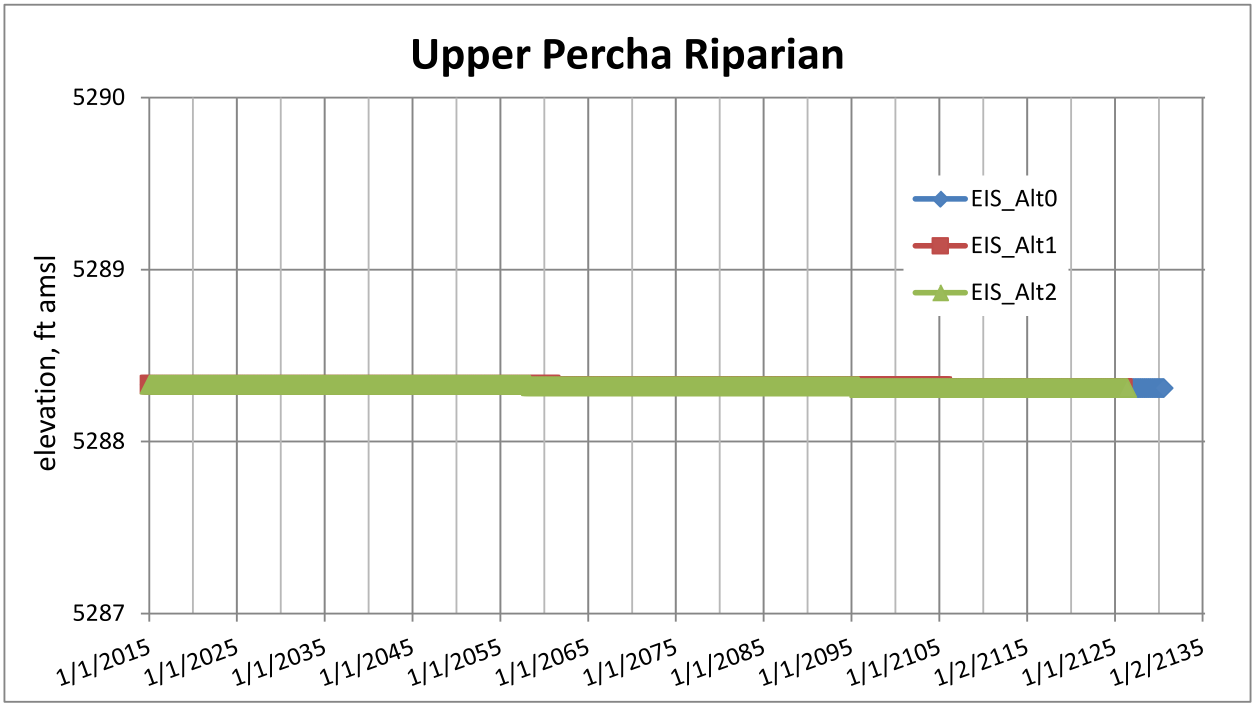


Figure 25. Projected Water Level at Percha Box Riparian (76, 46)

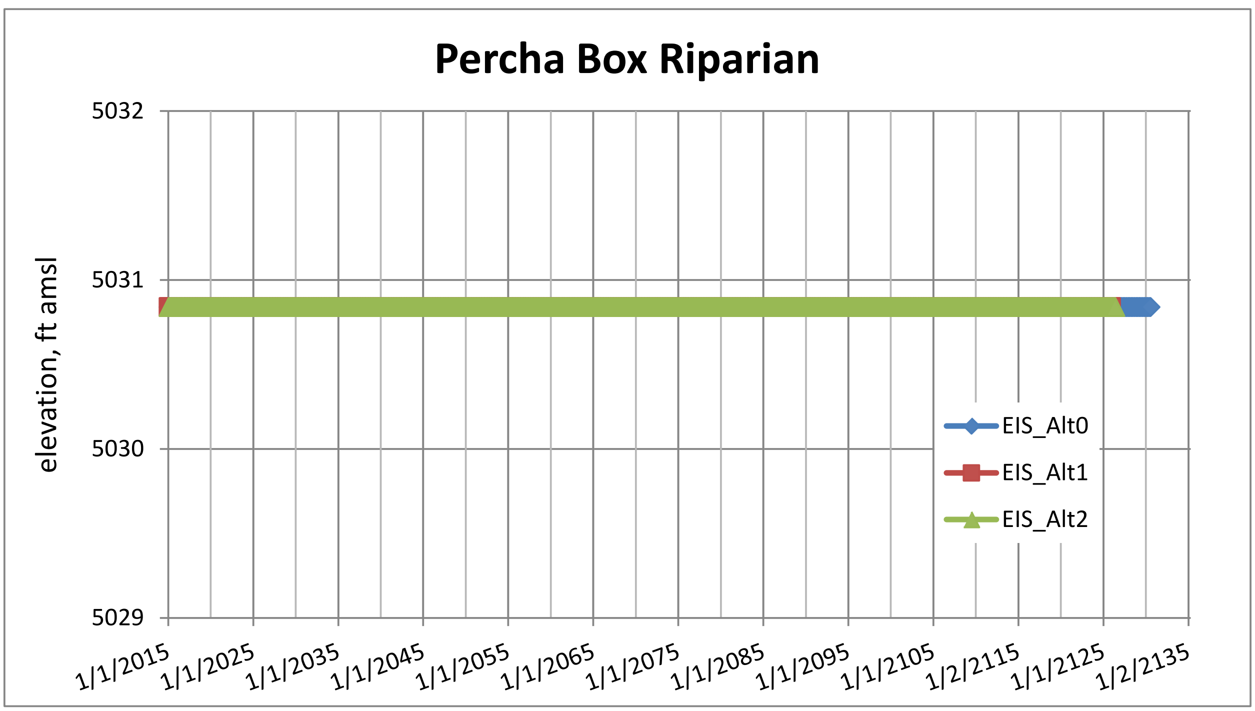


Figure 26. Projected Water Level at Warm Spring

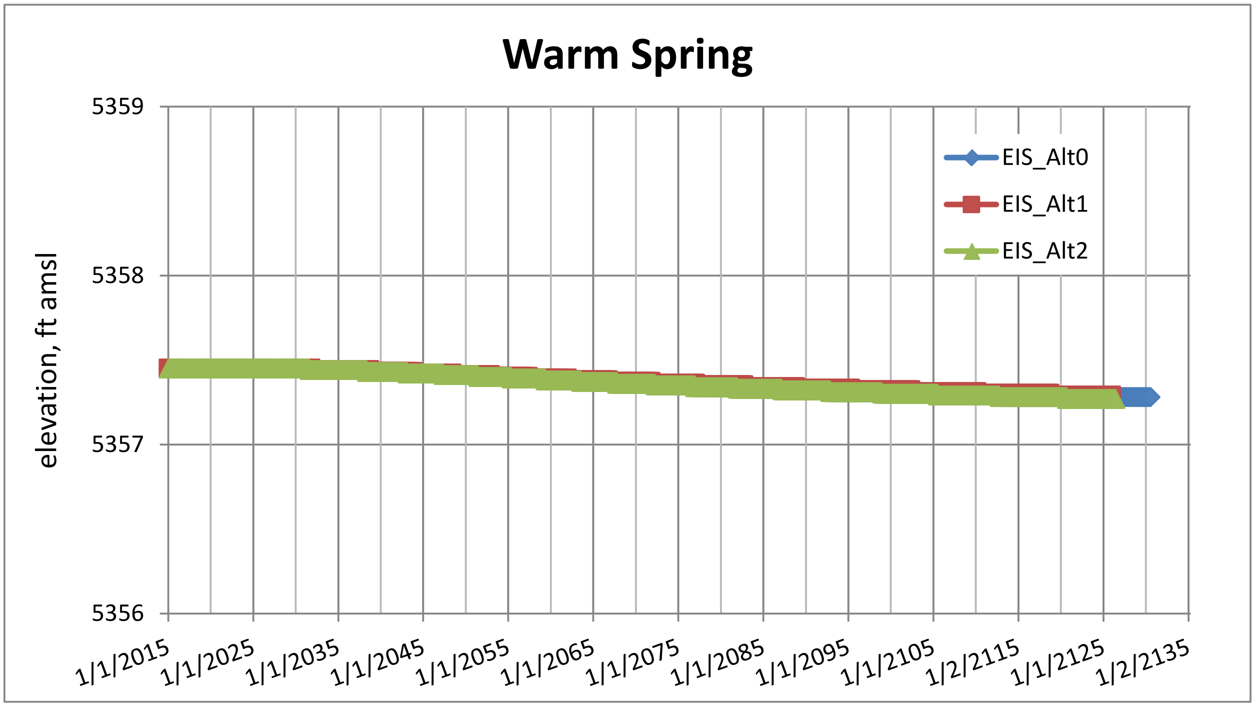
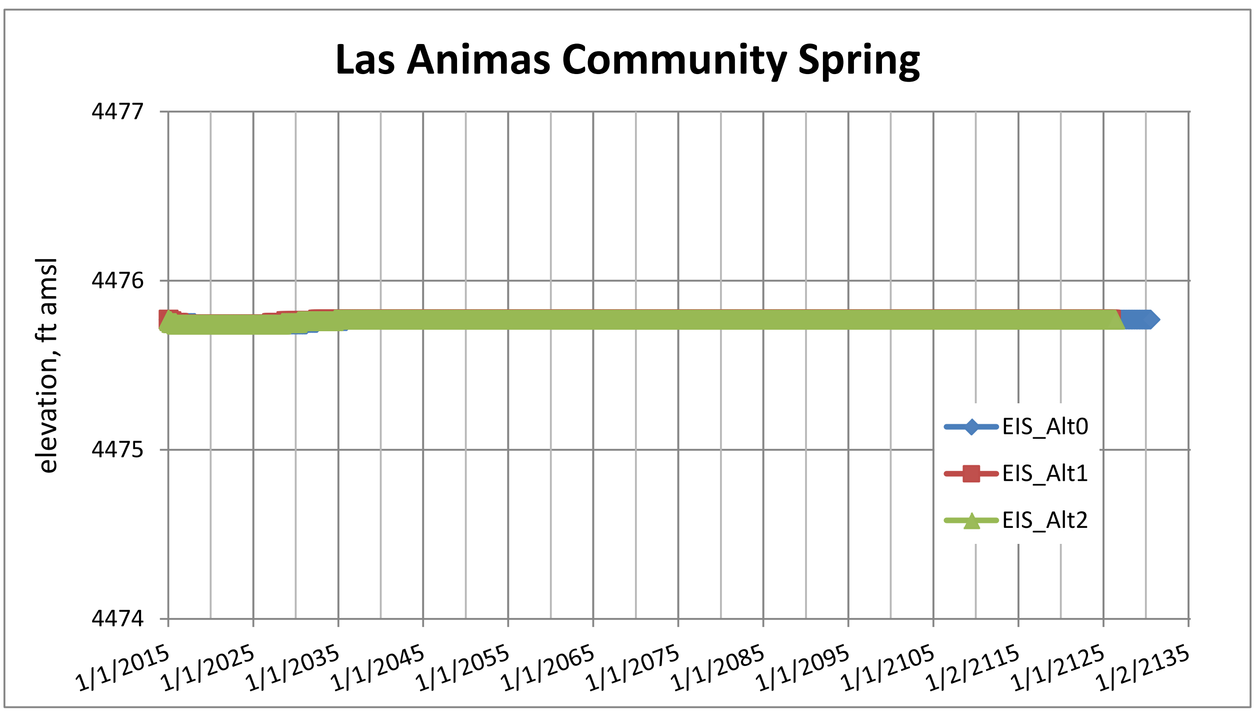


Figure 27. Projected Water Level at Las Animas Community Spring



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APPENDIX I

BIOLOGICAL RESOURCES SURVEY REPORT

APPENDIX I: BIOLOGICAL RESOURCES SURVEY REPORT

Biological Resources Survey Report
Copper Flat Pipeline and Well Sites
Sierra County, New Mexico

Prepared for

Bureau of Land Management
Las Cruces District Office
1800 Marquess St.
Las Cruces, NM 88005-3370

Prepared by

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August 2011 | 563-6671-001

CITATION

Parametrix. 2011. Biological Resources Survey Report, Copper Flat Pipeline and Well Sites, Sierra County, New Mexico. Prepared by Parametrix, Albuquerque, New Mexico.

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A State and Federal Listed Species

KEY TERMS

amsl	above mean sea level
BLM	Bureau of Land Management
CAW	Class A weeds
CBW	Class B weeds
CCW	Class C listed weeds
CWA	Clean Water Act
F	Fahrenheit
MBTA	Migratory Bird Treaty Act
NMCC	New Mexico Copper Corporation
NMDA	New Mexico Department of Agriculture
NMDGF	New Mexico Department of Game and Fish
NMRPTC	New Mexico Rare Plant Technical Council
NWI	National Wetland Inventory
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	United States Department of Agriculture-Forest Service
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey

1. PROJECT DESCRIPTION AND LOCATION

New Mexico Copper Corporation (NMCC) is conducting regional water studies related to the possible development of the Copper Flat mine, located approximately 30 miles southwest of Truth or Consequences, New Mexico. The purpose of the project is to address infrastructure needs in order to conduct the regional water studies required. The proposed action being requested under this amendment to ROW 125293 is to permit the use of additional well sites for testing and monitoring purposes, to clear roads to access six of these wells, to redevelop and repair wells as needed, and to consider additional alternatives to discharge the water from the pipeline/well tests. The need for the project is to address the following infrastructure improvements:

- The wells that are being proposed for aquifer testing purposes include: PW-1, PW-2, PW-3, and PW-4. These four production wells may require redevelopment and repair. The aquifer testing via these four production wells will require the extraction and discharge of up to 159 acre feet of water.
- The proposed action includes the multiple alternative routes to discharge the water from the well test, with multiple route options to the pit lake and one option to the Greyback Arroyo.
- Wells that will be used for water quality and quantity monitoring purposes, but are classified as extraction wells, include: MW-2, MW-5, MW-6, MW-8, GWQ-1, and GWQ-8.
- The proposed action also includes the testing and rehabilitation of the pipeline that connects the mine site to the production well field. This pipeline will be tested on its own, and also used to support the production well aquifer test as part of the water discharge alternatives.
- Road access improvements are required for the following well sites: PW-1, PW-2, PW-3, PW-4, MW-5, MW-8, IW-3, GWQ-10, and NP-4.
- Well rehabilitation, including new well heads, are necessary on the following wells: GWQ-1 and GWQ-8.

Table 1. Proposed Action Summary

Proposed Action	Surveyed Area	Build Alternative	Build Alternative	Build Alternative
Pipeline	60-foot corridor with 50-foot buffer on each side.	Inspection/Maintenance/ Repair.	Sleeve pull through the existing line.	Temporary line connecting the existing line to the pit lake.
Access Roads	50-foot corridor with 50-foot buffer on each side.	Blade and clear.		
Collection Point	200-by-200-foot area.	Placement of a holding tank.		
Well sites	300-by-300-foot area.	Inspect/Maintain/Repair. Installation of pumps for aquifer testing.		
Aquifer Testing/ Discharge of Water	Identified on the figures.	Copper Flat Pit Lake: Pump water from aquifer. Then, carry water through pipeline and discharge to the Copper Flat Pit Lake.	Discharge to Greyback Arroyo following a corridor established from the area of PW-4.	

2. METHODS

In accordance with state and federal laws related to protection of natural resources, a field survey of the project area was conducted to evaluate potential impacts to threatened and endangered species, wetlands/waterways, migratory birds, noxious weeds, and other sensitive biological features. The proposed project area was surveyed and potential impacts to the natural environment were assessed by Parametrix in April 2010, and May, June, and August 2011.

A visual survey of the adjacent environment was also conducted to evaluate the potential for, and presence of, habitat suitable for state- and federally-listed, and sensitive species.

The investigations also included a survey for noxious weeds as designated by the New Mexico Department of Agriculture (NMDA) and U.S. Department of Agriculture (USDA), and an evaluation of potential impacts to nesting birds protected under the Migratory Bird Treaty Act (MBTA) of 1918. In addition, the existing environment along the project corridor was evaluated for the presence of valuable wildlife and bird nesting habitat, sensitive areas, and wildlife corridors.

An assessment of waters of the U.S. that could be impacted by the proposed project was performed using U.S. Geological Survey (USGS) quadrangles, National Wetland Inventory (NWI) maps, aerial photography, and County soil survey maps in-house and then refined during the field visits.

Federal and state lists for protected species in Sierra County were examined for this report. In addition, lists were obtained from the New Mexico Rare Plant Technical Council (NMRPTC) and the Bureau of Land Management (BLM). The habitat requirements of listed species were compared to the habitat at the proposed project location to identify potentially affected species or "target species." Species considered unlikely to occur due to their known distribution in a county, or for which suitable habitat does not exist within the proposed project area, were removed from further consideration.

3. ENVIRONMENTAL SETTING

The project area is located in Sierra County, in the Chihuahuan Desert Grasslands sub-region of the Chihuahuan Deserts Ecoregion. The Chihuahuan Desert Grasslands are characterized by plateaus, high intermountain basins, alluvial fans, and bajadas. Most surface water is in the form of stream segments from an occasional spring source, or else an ephemeral stream that only flows after storm events. Annual precipitation ranges from 10 to 15 inches, and late summer thunderstorms are the source of most of the moisture. Average temperatures range from 24° Fahrenheit (F) to 53° F in the winter and 62° F to 92° F in the summer (Griffith et al. 2006).

The geology of the area consists of Quaternary colluvium with valley-fill alluvium, alluvium and piedmont alluvium, and discontinuous eolian deposits; Permian sandstone, siltstone, gypsum, dolomite, and limestone; Tertiary igneous and volcaniclastic rocks, and some Tertiary sandstones and conglomerates (Griffith et al. 2006).

Soils in the Chihuahuan Desert Grasslands ecoregion include thermic Aridisols, Entisols, and Mollisols with an Aridic or Ustic Aridic moisture regime (Griffith et al. 2006). The specific soil series mapped in the proposed project area is Luzena-Rock outcrop association. This soil type is well drained, has a depth to the water table of more than 80 inches, and is not classified as prime farmland by the Natural Resources Conservation Service Web Soil Survey (NRCS 2010).

The general elevation of the project area is approximately 5,000 feet above mean sea level (amsl). The majority of the project area has been previously disturbed by installation of a water pipeline, wells, and access roads. Vegetation in the project area is typical of Chihuahuan Desert Grasslands, with honey mesquite (*Prosopis glandulosa*), featherplume (*Dalea formosa*), black grama (*Bouteloua eriopoda*), and tobosagrass (*Pleuraphis mutica*) as dominant species.

4. RESULTS

4.1 VEGETATION

During the 2010 and 2011 field surveys, 67 species of plants were observed within the proposed project area (Table 2). The dominant plant species observed within the proposed project area consisted of low woollygrass (*Dasyochloa pulchella*), weeping lovegrass (*Eragrostis curvula*), spreading buckwheat (*Eriogonum effusum*), tarbush (*Flourensia cernua*), broom snakeweed (*Gutierrezia sarothrae*), creosote (*Larrea tridentata*), tobosagrass (*Pleuraphis mutica*), and honey mesquite (*Prosopis glandulosa*). These species were observed fairly uniformly throughout the proposed project area.

Table 2. Plants Observed During the 2010 and 2011 Field Surveys

Common Name	Scientific Name
Dwarf desertpeony	*Acourtia nana*
Powell's amaranth	*Amaranthus powellii*
Flatspine bur ragweed	*Ambrosia acanthicarpa*
Weakleaf bur ragweed	*Ambrosia confertiflora*
Great ragweed	*Ambrosia trifida*
Sand bluestem	*Andropogon hallii*
Sixweeks threeawn	*Aristida adscensionis*
Purple threeawn	*Aristida purpurea*
Spidergrass	*Aristida ternipes*
Groundplum milkvetch	*Astragalus crassicarpus*
Fourwing saltbush	*Atriplex canescens*
Yerba de pasmo	*Baccharis pteronioides*
Desert marigold	*Baileya multiradiata*
Silver beardgrass	*Bothriochloa laguroides*
Sixweeks grama	*Bouteloua barbata*
Side-oats grama	*Bouteloua curtipendula*
Black grama	*Bouteloua eriopoda*
Blue grama	*Bouteloua gracilis*
California brickellbush	*Brickellia californica*
Netleaf hackberry	*Celtis laevigata*
Whitemargin sandmat	*Chamaesyce albomarginata*
New Mexico thistle	*Cirsium neomexicanum*
Yellowspine thistle	*Cirsium ochrocentrum*
American bugseed	*Corispermum americanum*

(Table Continues)

Table 2. Plants Observed During the 2010 and 2011 Field Surveys (Continued)

Common Name	Scientific Name
Dodder	*Cuscuta* sp.
Tree cholla	*Cylindropuntia imbricata*
Christmas cactus	*Cylindropuntia leptocaulis*
Featherplume	*Dalea formosa*
Low woollygrass	*Dasyochloa pulchella*
Sacred thorn-apple	*Datura wrightii*
Fetid marigold	*Dyssodia papposa*
Scarlet hedgehog cactus	*Echinocereus coccineus*
Big jointfir	*Ephedra trifurca*
Weeping lovegrass	*Eragrostis curvula*
Spreading buckwheat	*Eriogonum effusum*
Shaggy dwarf morning-glory	*Evolvulus nuttallianus*
Apache plume	*Fallugia paradoxa*
Tarbush	*Flourensia cernua*
Broom snakeweed	*Gutierrezia sarothrae*
Indian rushpea	*Hoffmannseggia glauca*
Crown of thorns	*Koeberlinia spinosa*
Flatspine stickseed	*Lappula occidentalis*
Creosote	*Larrea tridentata*
Green sprangletop	*Leptochloa dubia*
Pale wolfberry	*Lycium pallidum*
Torrey wolfberry	*Lycium torreyi*
Slender goldenweed	*Machaeranthera gracilis*
Rough menodora	*Menodora scabra*
Bush muhly	*Muhlenbergia porteri*
Cactus apple	*Opuntia engelmannii*
Purple pricklypear	*Opuntia macrocentra*
Vine mesquite	*Panicum obtusum*
Mariola	*Parthenium incanum*
Lemonscent	*Pectis angustifolia*
Tobosagrass	*Pleuraphis mutica*
Honey mesquite	*Prosopis glandulosa*
Littleleaf sumac	*Rhus microphylla*
Burrograss	*Scleropogon brevifolius*
Silverleaf nightshade	*Solanum elaeagnifolium*
Spear globemallow	*Sphaeralcea hastulata*
Brownplume wirelettuce	*Stephanomeria pauciflora*
Greenthread	*Thelesperma megapotamicum*
Spiny dogweed	*Thymophylla acerosa*
Woolly tidestromia	*Tidestromia lanuginosa*
Banana yucca	*Yucca baccata*
Soaptree yucca	*Yucca elata*
Graythorn	*Ziziphus obtusifolia*

4.1.1 Potential Impacts and Mitigation

Under the proposed action, direct and short-term impacts to vegetation resulting from project-related ground disturbance activities would be minimal. Much of the proposed project area consists of existing roads (paved and unpaved), associated rights-of-way, and areas previously cleared around well sites. In addition, heavy cattle-grazing has affected vegetation over large portions of the proposed project corridor. Should water used for pipeline testing be discharged into Greyback Arroyo, a surface pipeline would be temporarily installed from PW-4 to Greyback Arroyo. Vegetation between PW-4 and the arroyo consists predominantly of mesquite (*Prosopis* sp.) and littleleaf sumac (*Rhus microphylla*). The temporary pipeline would minimally affect vegetation along the route.

The overall impact widths for the proposed project will be as follows: 30 feet in roadway corridors for blading/clearing of vegetation; 60 feet in the pipeline corridor for repair of the existing pipeline, sleeve installation, and temporary line installation; and 100 feet by 100 feet around well sites for monitoring activities. New project-related disturbance will be minimal when considered with the extent of previous disturbance on the proposed project site.

Subsequent to project activities, disturbed areas along roadways (esp. State Route 152) will be re-seeded with a local seed mix according to standard BLM post-construction protocols.

4.2 NOXIOUS WE EDS

The State of New Mexico, under the administration of the Department of Agriculture, lists certain weed species as noxious weeds. "Noxious" in this context means plants not native to New Mexico, that are targeted for management and control and that have a negative impact on the economy or environment. Class C listed weeds (CCW) are common, widespread species that are fairly well established within the state. Class B weeds (CBW) are considered fairly common, but not yet widespread within certain regions of the state. Class A weeds (CAW) have limited distributions within the State.

4.2.1 Potential Impacts and Mitigation

No state-listed noxious weeds were observed within the project area during the 2010 and 2011 biological surveys; therefore, the project is not expected to have an impact on the spread of noxious weeds. However, care should be used to prevent introduction of noxious weeds to the project site. Any fill material (soil) brought in from an outside source should be free of weed and invasive species. All heavy equipment should be cleaned to remove mud and dirt prior to entering and exiting public lands to remove potentially-occurring noxious weed seeds.

4.3 WILDLIFE

New Mexico provides extensive habitat for a wide variety of wildlife. Habitat within the proposed project area consists of desert grassland and creosote flat. During the 2010 and 2011 field surveys, 30 wildlife species or their sign were observed within the proposed project area (Table 3).

Table 3. Wildlife Observed During the 2010 and 2011 Field Surveys

Common Name	Scientific Name
Pocket gopher	*Thomomys sp*
White-throated woodrat	*Neotoma albigula*
Pocket mouse	*Perognathus sp*
Merriam's kangaroo rat	*Dipodomys merriami*
Eastern fence lizard	*Sceloporus undulatus*
Whiptail lizard	*Cnemidophorus sp*
American badger	*Taxidea taxus*
Black-tailed jackrabbit	*Lepus californicus*
Red-shouldered hawk	*Buteo lineatus*
Black-throated sparrow	*Amphispiza bilineata*
Barn swallow	*Hirundo rustica*
Red-tailed hawk	*Buteo jamaicensis*
Cactus wren	*Campylorhynchus brunneicapillus*
House finch	*Carpodacus mexicanus*
Canyon wren	*Catherpes mexicanus*
Common raven	*Corvus corax*
Chipping sparrow	*Spizella passerina*
Western kingbird	*Tyrannus verticalis*
White-winged dove	*Zenaida asiatica*
Gambel's quail	*Callipepla gambelii*
Curve-billed thrasher	*Toxostoma curvirostre*
Coyote	*Canis latrans*
Bobcat	*Lynx rufus*
Mule deer	*Odocoileus hemionus*
Desert cottontail	*Silvilagus auduboni*
Rock squirrel	*Spermophilus variegatus*
Turkey vulture	*Cathartes aura*
Funnel-web spider	*Family Agelenidae*
Honey bee	*Family Apidae*
Tarantula hawk wasp	*Pepsis formosa*

In addition to the observation of the above species or their sign, seven cactus wren (*Campylorhynchus brunneicapillus*) bird nests were identified within the project area and an active raptor nest was found in the windmill at well site MW-2. These findings are discussed in more detail in Section 4.4.

4.3.1 Potential Impacts and Mitigation

Potential impacts to wildlife from the proposed project are expected to be minimal because of the pre-existing disturbed nature of the project area. Project activities may cause minor disruption to foraging or localized migratory movement of certain species. Most animals currently utilizing the project area are expected to migrate to undisturbed areas adjacent to the project area, and no direct losses of large mammals or birds are expected as a result of this project.

4.4 MIGRATORY BIRDS

The MBTA protects over 1500 migratory bird species (see 50 CFR 10.133, List of Migratory Birds) in the United States and its territories. This act and Executive Order 13186 provide protection to migratory bird species, which includes protection of their nests and eggs.

Seven cactus wren bird nests were identified within the project area during the 2010 and 2011 biological surveys. During an August 2011 survey, an active raptor nest was observed in the windmill at well-site MW-2, and there are additional structures on the project site that provide habitat for nesting birds.

Migratory habitat for the southwestern willow flycatcher (*Empidonax trailii extimus*) occurs along the Rio Grande, although critical habitat for the species has not been designated as far south as Caballo Reservoir, which is the closest reach of the Rio Grande to the project area.

4.4.1 Potential Impacts and Mitigation

None of the wren nests were located within the area proposed for vegetation clearing on existing access roads. The raptor nest at well-site MW-2 will not be removed or disturbed, and none of the proposed actions are expected to affect the nest.

Due to the presence of bird nests in the proposed project corridor, clearing of vegetation should take place outside of the bird breeding season (roughly March through August). If this is not possible due to scheduling concerns, a pre-construction nest survey conducted by a qualified biologist is recommended. If active bird nests are to be affected by construction, then coordination with the USFWS is required and a permit must be obtained in order to move or disturb active nests.

Designated critical habitat for the southwestern willow flycatcher occurs many miles northeast of the project corridor; the species will not be affected by project activities.

4.5 THREATENED, ENDANGERED AND SENSITIVE SPECIES

Numerous fish, wildlife, and plant species are federally- , state- , and/or locally-listed in New Mexico. Many of these species have specific habitat requirements and, therefore, only occur in specific regions or habitat configurations. Over thirty wildlife species are listed by the New Mexico Department of Game and Fish (NMDGF) and United States Fish and Wildlife Service (USFWS) as threatened, endangered or candidate species (see Table 4). Other federal agencies (e.g., the United States Department of Agriculture-Forest Service [USFS] and the BLM) also list species as sensitive or as species of concern, and the State of New Mexico lists wildlife species as endangered, threatened, or sensitive (BISON-M 2009). Twenty one plant species are identified by the New Mexico Rare Plant Technical Council (NMRPTC) as noted for conservation. Species of concern, sensitive species, and rare plants do not have the rigorous legal protection of listed species, but information about them is included for planning purposes, and the relevant management agencies do have an obligation to consider impacts to these species.

Lists generated by the USFWS, NMDGF and NMRPTC were accessed online on June 10, 2011, and are attached to this document. No listed or special status species were observed within the proposed project area during the 2010 and 2011 biological surveys.

Table 4. Threatened, Endangered, Candidate and Sensitive Species

Scientific Name	Common Name	Status	Species Present	Habitat Present	Rationale for No Effect Determination
Ammodramus bairdii	Baird's sparrow	New Mexico – Threatened BLM - Sensitive	No	Yes	The grassland habitat could potentially support Baird's sparrow, but the species was not observed and is not expected to be impacted by project activities.
Accipiter gentilis atricapillus	Northern goshawk	BLM - Sensitive	No	No	Mature, closed-canopy coniferous forests are not present in or adjacent to the project corridor.
Agosia chrysogaster	Longfin dace	BLM - Sensitive	No	No	The stream habitat required by this species is not present in or adjacent to the project corridor.
Anthus spragueii	Sprague's pipit	USFWS - Candidate	No	Yes	The grassland habitat could potentially support Sprague's pipit, but the species was not observed and is not expected to be impacted by project activities.
Athene cunicularia hypugaea	Burrowing owl	BLM - Sensitive	No	Yes	The grassland habitat could potentially support Burrowing owls, but the species was not observed and is not expected to be impacted by project activities.
Bufo microscaphus microscaphus	Arizona toad	BLM - Sensitive	No	No	There are no streams or rivers in or adjacent to the project corridor.
Buteo regalis	Ferruginous hawk	BLM - Sensitive	No	Yes	The grassland habitat in the project corridor could potentially support the Ferruginous hawk, but the species was not observed and is not expected to be impacted by project activities.
Buteogallus anthracinus anthracinus	Common black-hawk	New Mexico - Threatened	No	No	There is no woodland stream habitat in or adjacent to the project corridor.
Calothorax lucifer	Lucifer hummingbird	New Mexico - Threatened	No	No	The arid montane habitat preferred by this species does not occur in or adjacent to the project corridor.

(Table Continues)

Table 4. Threatened, Endangered, Candidate and Sensitive Species (Continued)

Scientific Name	Common Name	Status	Species Present	Habitat Present	Rationale for No Effect Determination
Calypte costae	Costa's hummingbird	New Mexico – Threatened	No	No	There is no shrubland habitat in or adjacent to the project corridor.
Canis lupus baileyi	Mexican gray wolf	USFWS – Endangered New Mexico – Endangered	No	No	The range of this re-introduced species does not extend to the project corridor.
Charadrius montanus	Mountain plover	USFWS – Threatened	No	No	The shortgrass prairie required by this species does not exist within the project area.
Chlidonias niger surinamensis	Black tern	BLM – Sensitive	No	No	The riparian habitat required by this species does not occur in or adjacent to the project corridor.
Coccyzus americanus occidentalis	Yellow-billed cuckoo	USFWS – Candidate	No	No	The desert grassland habitat in the project area would not support the Yellow-billed cuckoo.
Columbina passerina pallescens	Common ground-dove	New Mexico – Endangered	No	No	There are no agricultural lands or riparian woodlands in the project corridor.
Corynorhinus townsendii pallescens	Pale Townsend's big-eared bat	BLM – Sensitive	Yes	Yes	The species' vocalization was detected at the mine tailings pond.
Cynanthus latirostris magicus	Broad-billed hummingbird	New Mexico – Threatened	No	No	There are no riparian woodlands within or adjacent to the project corridor.
Cynomys gunnisoni gunnisoni	Gunnison's prairie dog (montane)	USFWS – Candidate	No	No	The extensive shortgrass prairie required by this species does not occur within or adjacent to the project corridor.
Cyprinodon tularosa	White Sands pupfish	New Mexico – Threatened	No	No	There are no free-flowing streams or pools in the project corridor.
Empidonax traillii extimus	Southwestern willow flycatcher	USFWS – Critical habitat designated, Endangered New Mexico – Endangered	No	No	There is no suitable riparian habitat within or adjacent to the project corridor.
Falco femoralis septentrionalis	Aplomado falcon	USFWS – Endangered New Mexico – Endangered	No	Yes	The desert grassland habitat in the project area could potentially support the Aplomado falcon, but the species was not observed and is not expected to be impacted by project activities.

(Table Continues)

Table 4. Threatened, Endangered, Candidate and Sensitive Species (Continued)

Scientific Name	Common Name	Status	Species Present	Habitat Present	Rationale for No Effect Determination
Falco peregrinus anatum	Peregrine falcon	New Mexico – Threatened	No	Yes	Peregrine falcons could potentially forage in the project area, but the lack of roosting or nesting habitat makes it unlikely that this species would stay in the area for long periods of time.
Falco peregrinus tundrius	Arctic peregrine falcon	New Mexico – Threatened	No	No	The elevation of the project area is not high enough to support the preferred forest types of this species.
Gila nigra	Headwater chub	USFWS – Candidate New Mexico – Endangered	No	No	There are no streams in or adjacent to the project corridor.
Haliaeetus leucocephalus alascanus	Bald eagle	New Mexico – Threatened	No	No	There are no large bodies of water near the proposed project corridor.
Hedeoma todsenii	Todsen's pennyroyal	USFWS – Critical habitat designated; Endangered	No	No	This species grows in limestone soils on north- or east-facing slopes in pinon-juniper woodland; this habitat configuration is not present in or adjacent to the project site.
Hybognathus amarus	Rio Grande silvery minnow	USFWS – Endangered	No	No	The minnow is extirpated in Sierra County.
Idionycteris phyllotis	Allen's big-eared bat	BLM – Sensitive	No	Yes	The forested areas preferred by this species are not present in or adjacent to the project corridor.
Lanius ludovicianus excubitorides	Loggerhead shrike	New Mexico – Sensitive BLM – Sensitive	No	Yes	The desert grassland habitat in the project area could potentially support the Loggerhead shrike, but the species was not observed and is not expected to be impacted by project activities.
Myotis ciliolabrum melanorhinus	Western small-footed myotis bat	BLM – Sensitive	Yes	Yes	The species' vocalization was detected at the mine tailings pond.
Myotis evotis evotis	Long-eared myotis bat	BLM – Sensitive	Yes	Yes	The species' vocalization was detected at the mine tailings pond.

(Table Continues)

Table 4. Threatened, Endangered, Candidate and Sensitive Species (Continued)

Scientific Name	Common Name	Status	Species Present	Habitat Present	Rationale for No Effect Determination
Myotis lucifugus occultus	Occult little brown myotis bat	BLM – Sensitive	Yes	Yes	The species' vocalization was detected at the mine tailings pond.
Myotis thysanodes thysanodes	Fringed myotis bat	BLM – Sensitive	Yes	Yes	The species' vocalization was detected at the mine tailings pond.
Myotis volans interior	Long-legged myotis bat	BLM – Sensitive	Yes	Yes	The species' vocalization was detected at the mine tailings pond.
Myotis yumanensis yumanensis	Yuma myotis bat	BLM – Sensitive	Yes	Yes	The species' vocalization was detected at the mine tailings pond.
Onchorhynchus clarki virginalis	Rio Grande cutthroat trout	USFWS – Candidate	No	No	There are no streams or rivers in or adjacent to the project corridor.
Onchorhynchus gilae	Gila trout	USFWS – Threatened New Mexico – Threatened	No	No	There are no streams or rivers in or adjacent to the project corridor.
Ondatra zibethicus ripensis	Pecos river muskrat	BLM – Sensitive	No	No	There are no marshes or drainages in or adjacent to the project corridor.
Oreohelix pilsbryi	Mineral creek mountainsnail	New Mexico – Threatened	No	No	The montane habitat with limestone outcroppings required by this species does not occur in the project corridor.
Ovis canadensis mexicana	Desert bighorn sheep	New Mexico – Threatened	No	No	The slopes preferred by this species do not occur within or adjacent to the project corridor.
Passerina versicolor versicolor	Varied bunting	New Mexico – Threatened	No	No	The dense stands of mesquite preferred by this species are not present in or adjacent to the project corridor.
Pelecanus occidentalis carolinensis	Brown pelican	New Mexico – Endangered	No	No	There are no large rivers or lakes within or adjacent to the project corridor.
Phalacrocorax brasilianus	Neotropic cormorant	New Mexico – Threatened	No	No	There are no large bodies of water in or adjacent to the proposed project corridor.
Phrynosoma cornutum	Texas horned lizard	BLM – Sensitive	No	Yes	The project area contains the bunchgrass, cactus, and mesquite habitat preferred by this species.

(Table Continues)

Table 4. Threatened, Endangered, Candidate and Sensitive Species (Continued)

Scientific Name	Common Name	Status	Species Present	Habitat Present	Rationale for No Effect Determination
Plegadis chihi	White-faced ibis	BLM – Sensitive	No	No	There are no riparian woodlands or marshes in or adjacent to the project corridor.
Rana chiricahuensis	Chiricahua leopard frog	USFWS – Threatened	No	No	No streams or suitable wetlands exist in the project area.
Sterna antillarum athalassos	Least tern	USFWS – Endangered New Mexico – Endangered	No	No	The aquatic habitat required by this species does not occur within or adjacent to the project corridor.
Strix occidentalis lucida	Mexican spotted owl	USFWS – Critical habitat designated, Threatened	No	No	There are no old growth, closed-canopy forests within or adjacent to the project corridor.
Trogon elegans canescens	Elegant trogon	New Mexico – Endangered	No	No	The montane canyon woodlands preferred by this species do not occur in or adjacent to the project corridor.
Tyrannus crassirostris	Thick-billed kingbird	New Mexico – Endangered	No	No	There is no riparian habitat that would support this species in the project corridor.
Vireo bellii arizonae	Bell's vireo	New Mexico – Threatened	No	No	The dense shrubland or streamside woodland preferred by this species does not occur in or adjacent to the project area.
Vireo vicinior	Gray vireo	New Mexico – Threatened	No	No	There are no open woodland/shrublands within or adjacent to the project corridor.

The pit lake on the mine site provides foraging habitat for a variety of bat species listed as sensitive by the BLM. Bat vocalizations were recorded and identified by Parametrix biologists in the spring and summer of 2011. If water from pipeline testing were to be discharged into the pit lake, the surface area of the lake would increase and water quality would be improved, thereby providing more habitat for insects and more foraging resources for bats. There would be no negative impacts on bats if water were not discharged into the lake, as the size of the lake would not be reduced.

4.5.1 Potential Impacts and Mitigation

Based on survey results, the lack of suitable habitat, and the pre-existing disturbance at the site, the project is not expected to affect state- or federally-listed, or sensitive plant or wildlife species.

4.6 DESIGNATED CRITICAL HABITAT

The USFWS recognizes the importance of certain habitats for threatened and endangered species and has created designated critical habitat for animals and plants with specific requirements. The proposed project does not cross designated critical habitat for any protected species.

4.6.1 Potential Impacts and Mitigation

Critical habitat for one endangered species, the Rio Grande silvery minnow (*Hybognathus amarus*), has been designated in the project vicinity. Habitat for the silvery minnow has been designated in certain stretches of the Rio Grande, which flows into Caballo Reservoir approximately 5 – 6 miles east of the project area. The designated critical habitat reaches from Cochiti Dam south to San Marcial, New Mexico, but does not extend as far as Caballo Reservoir. The proposed project will have no impact on designated critical habitat for this species.

4.7 WETLANDS AND JURISDICTIONAL WATERS

Waters of the U.S. are defined by 33 CFR Part 328.3 (b) and are protected by Section 404 of the Clean Water Act (CWA) (33 USC 1344), which is administered and enforced by the U.S. Army Corps of Engineers (USACE). The project area was assessed for the presence of waters of the U.S. using U.S. Geological Survey topography maps and county soil survey maps, followed by a site visit to refine and re-evaluate the assessment.

Jurisdictional wetlands, those protected from unauthorized dredge and fill activities under Section 404 of the CWA (33 USC 1344), have three essential characteristics: (1) dominance by hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. To be jurisdictional, a wetland must have a significant connection to a known jurisdictional, navigable waterway. Executive Order 11990 (Protection of Wetlands) requires the avoidance, to the greatest extent possible, of both long and short-term impacts associated with the destruction, modification, or other disturbance of wetland habitats.

One intermittent arroyo, the Greyback Arroyo, is located within the proposed project area. In the project area, the Greyback Arroyo does not have a permanent base flow, is dry for most of the year, and only flows during or immediately after rain events. The Greyback Arroyo joins with the Greenhorn Arroyo before discharging into the Rio Grande at Caballo Reservoir.

A small goodding willow (*Salix gooddingii*) wetland is located at the eastern end of the mine site, and is not jurisdictional. None of the proposed pipeline routes will affect the wetland, as all proposed routes go around it on existing unpaved roads or disturbed areas outside of the wetland area.

Water used in pipeline testing may be discharged into the pit lake located at the western end of the project site. The current size of the lake is considerably smaller than its historic extent due primarily to evaporation. If all the water from pipeline testing is discharged into the lake, it will be returned to its historic extent. Water would re-inundate a patch of cattails occurring west of the pit lake within its historic extent, and wetland habitat could be expanded.

The Preferred Alternative/Proposed Action would not cross any waters that are classified by the USACE as navigable (USACE 2009).

No specific surface water quality issues in the project area have been identified by the BLM.

4.7.1 Potential Impacts and Mitigation

Based on National Wetland Inventory (NWI) data and field verification, wetlands are present within the proposed project area. However, due to the absence of impact, a jurisdictional determination has not been completed. No adverse impacts to wetlands are expected from the proposed project.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

Based on 2010 and 2011 field surveys and a review of the project description, the following conclusions have been made regarding potential impacts to biological resources present within the project area:

- Direct and short-term impacts to vegetation would occur during project activities, as brush would be cleared along existing access roads. Impacts during the proposed action would occur on previously disturbed land.
- No direct losses of mammals, birds, or wildlife in general are expected as a result of the project. Proposed project activities may cause minor disruptions to foraging and, migratory movement, or breeding behavior of some species. There is currently a vast amount of undeveloped land in nearby areas where wildlife can temporarily relocate for cover and foraging.
- Suitable habitat for state- or federally-listed threatened, endangered, or sensitive wildlife or plant species, or species of concern observed during the field surveys was marginal and no species listed as threatened or endangered were observed during the survey. Bats listed as sensitive by the BLM were identified at the pit lake by their vocalizations. If water from pipeline testing were to be discharged into the pit lake, the surface area of the lake would increase and lake water quality would be improved, thereby providing more habitat for insects and more foraging resources for bats. There would be no negative impacts on bats if water were not discharged into the lake, as the size of the lake would not be reduced.
- The proposed project would have no impacts on any wetlands or waterways. The Preferred Alternative/Proposed Action would not cross any waters that are classified by the USACE as navigable (USACE 2009).

5.2 RECOMMENDATIONS

This report makes the following recommendations:

- Care should be used to prevent introduction of noxious weeds to the project site. Any fill material (soil) brought in from an outside source should be free of weed and invasive species. All heavy equipment should be cleaned to remove mud and dirt prior to entering and exiting public lands to remove potentially-occurring noxious weed seeds.
- Subsequent to project activities, disturbed areas along roadways (esp. State Route 152) will be re-seeded with a local seed mix according to standard BLM post-construction protocols.

- Seven cactus wren nests were identified within the project area. None of the wren nests were located within the area proposed for vegetation clearing on existing access roads. An active raptor nest was also found on the windmill at well-site MW-2. The raptor nest will not be removed or disturbed by project activities around the well. If active bird nests are to be affected by project activities in the future, then coordination with the USFWS will be required, and a permit must be obtained in order to move or disturb an active nest.

If the recommendations outlined in this report are followed, the proposed project is not expected to have a significant impact on the natural environment.

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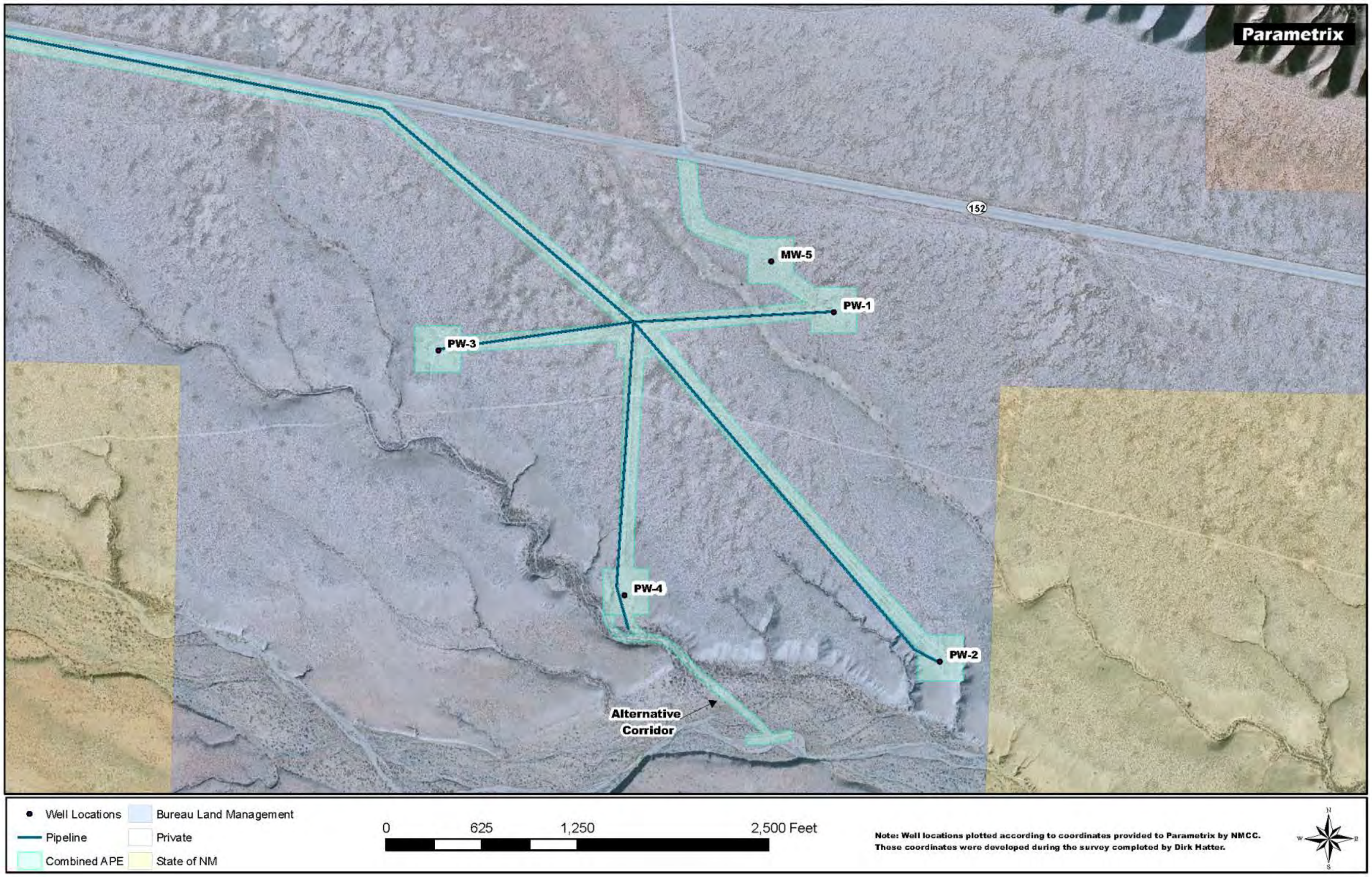
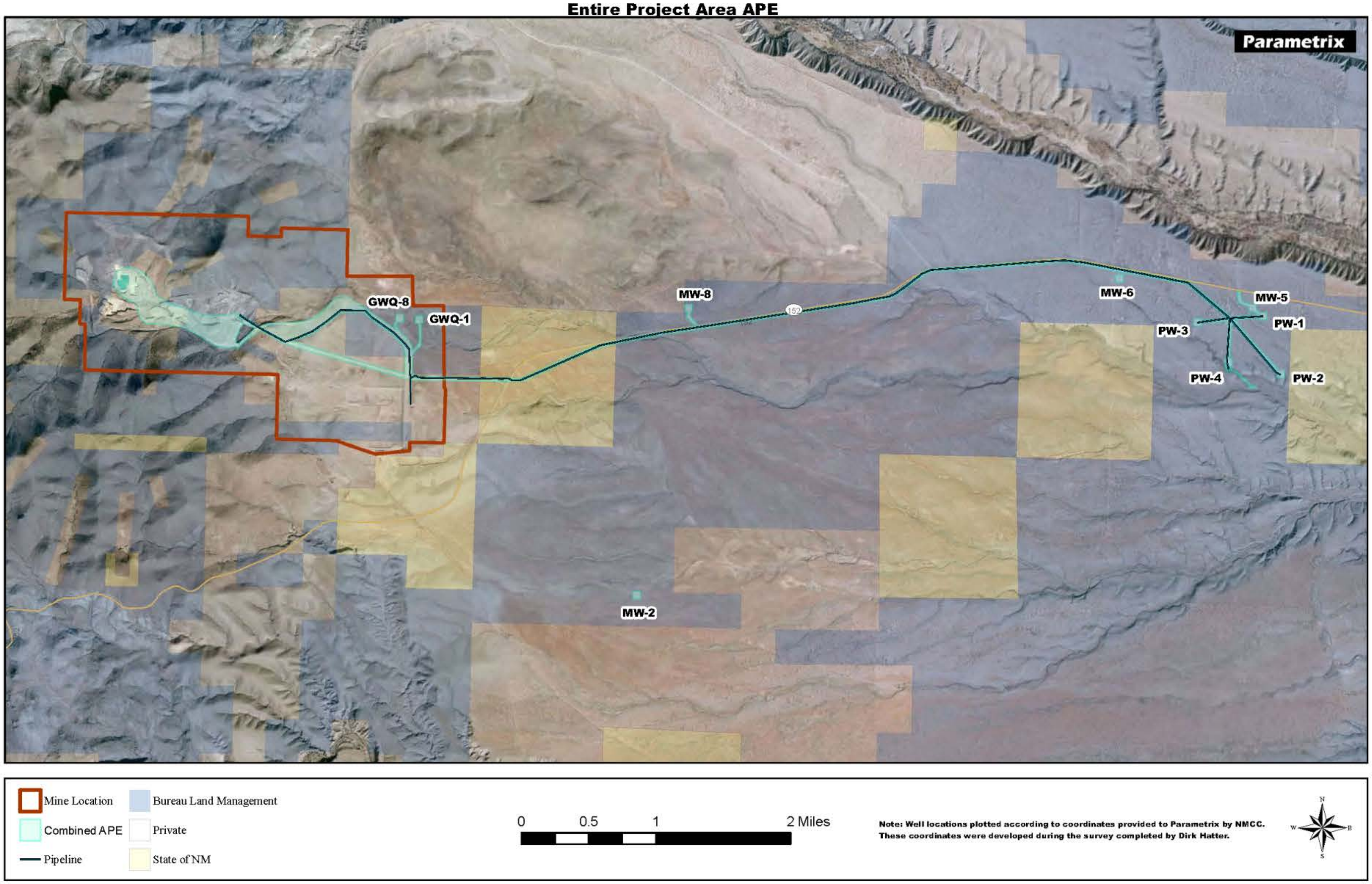
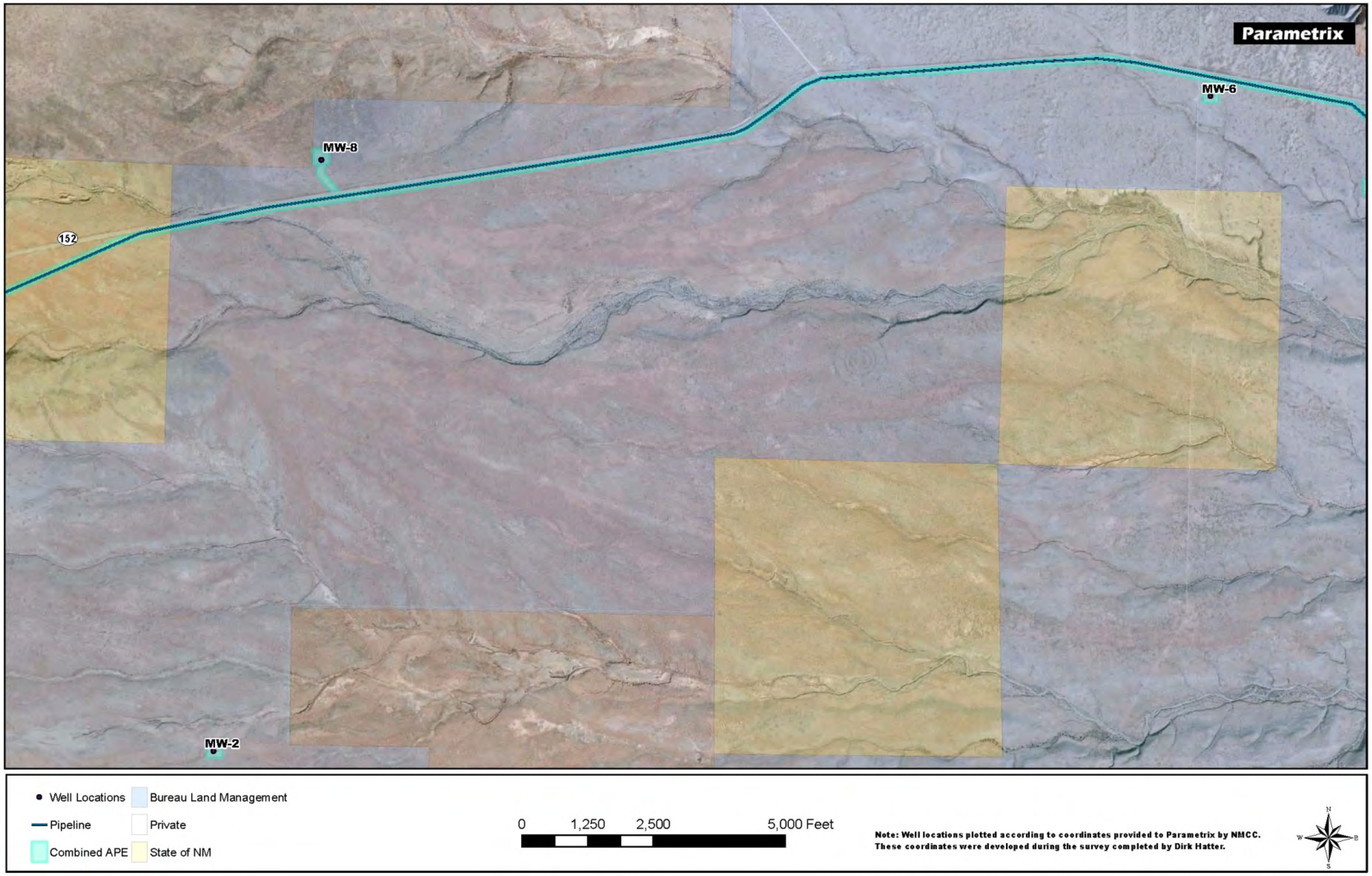
FIGURES

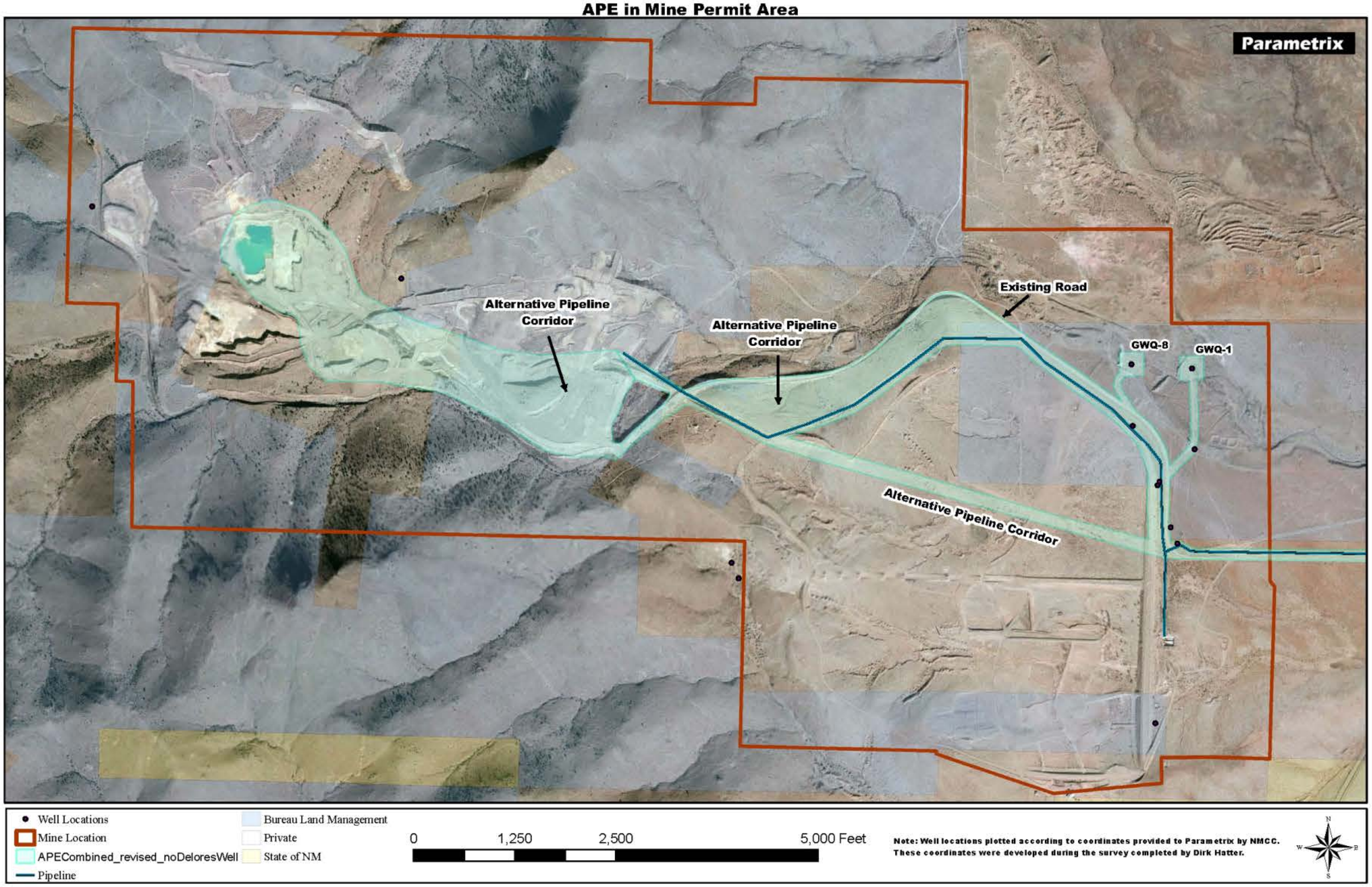

Parametrix
152
MW-5
PW-1
PW-3
PW-4
PW-2
Alternative Corridor
Well Locations
Pipeline
Combined APE
Bureau Land Management
Private
State of NM
0
625
1,250
2,500 Feet
Note: Well locations plotted according to coordinates provided to Parametrix by NMCC. These coordinates were developed during the survey completed by Dirk Hatter.
N
W
E
S

Entire Project Area APE




Parametrix
MW-6
MW-8
152
MW-2
Well Locations
Pipeline
Combined APE
Bureau Land Management
Private
State of NM
0
1,250
2,500
5,000 Feet
Note: Well locations plotted according to coordinates provided to Parametrix by NMCC.
These coordinates were developed during the survey completed by Dirk Hatter.
N
S
W
E

APE in Mine Permit Area



APPENDIX A

State and Federal Listed Species

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Biota Information System Of New Mexico

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Report County TES Table for

Sierra

88 species returned.

Taxonomic Group	# Species	Taxonomic Group	# Species
Fish	7	Mammals	23
Amphibians	4	Molluscs	7
Reptiles	4	Crustaceans	1
Birds	40	Lepidoptera; moths and butterflies	2

Export to Excel

Common Name	Scientific Name	Habitat Map	Species Photo (click photo to enlarge)	FWS-ESA	NM WCA	FS-R3	BLM-NM	NM-Sen	FWS-SOC
Chub, Rio Grande	Gila pandora		no photo	-	-	S	-	S	-
Chub, Headwater	Gila nigra		no photo	C	E	S	-	-	-
Dace, Longfin	Agosia chrysogaster	no map	no photo	-	-	S	S	-	-
Pupfish, White Sands	Cyprinodon tularosa		no photo	-	T	-	-	-	S
Sucker, Rio Grande	Catostomus plebeius		no photo	-	-	S	-	-	-
Trout, Cutthroat, Rio Grande	Oncorhynchus clarki virginalis (NM)	no map		C	-	S	-	S	-
Trout, Gila	Oncorhynchus gilae			T	T	S	-	-	-
Frog, Leopard, Chiricahua	Rana chiricahuensis	no map		T	-	S	-	S	-
Frog, Leopard, Northern	Rana pipiens	no map		-	-	S	-	-	-

http://www.bison-m.org/reports.aspx?rtype=9 7/26/2011

Frog, Leopard, Plains	Rana blairi	no map		-	-	S	-	-	-
Toad, Arizona	Bufo microscaphus microscaphus (NM,AZ)	no map		-	-	S	S	S	-
Lizard, Horned, Texas	Phrynosoma cornutum	no map		-	-	S	S	-	-
Massasauga, Desert	Sistrurus catenatus edwardsii (NM,AZ)	no map		-	-	S	-	-	-
Slider, Big Bend	Trachemys gaigeae	no map		-	-	-	-	S	-
Kingsnake, Desert	Lampropeltis getula splendida (NM,AZ)	no map		-	-	S	-	-	-
Bittern, American	Botaurus lentiginosus	no map		-	-	S	-	-	-
Black-Hawk, Common	Buteogallus anthracinus anthracinus (NM)	no map		-	T	S	-	-	S
Bunting, Varied	Passerina versicolor versicolor (NM);dickeyae (NM)	no map		-	T	S	-	-	-
Cormorant, Neotropic	Phalacrocorax brasilianus	no map		-	T	S	-	-	-
Cuckoo, Yellow-billed	Coccyzus americanus occidentalis (western pop)	no map	no photo	C	-	S	-	S	-
Curlew, Long-billed	Numenius americanus americanus (NM)	no map		-	-	S	-	-	-
Eagle, Bald	Haliaeetus leucocephalus alascanus (NM)	no map		-	T	S	-	-	-

Egret, Great	Ardea alba egretta (NM)	no map		-	-	s	-	-	-
Egret, Snowy	Egretta thula brewsteri (NM)	no map		-	-	s	-	-	-
Falcon, Aplomado	Falco femoralis septentrionalis (NM)	no map		E	E	s	-	-	-
Falcon, Peregrine	Falco peregrinus anatum	no map		-	T	s	-	-	s
Falcon, Peregrine, Arctic	Falco peregrinus tundrius	no map	no photo	-	T	s	-	-	s
Flycatcher, Willow, SW.	Empidonax traillii extimus	no map		E	E	s	-	-	-
Goshawk, Northern	Accipiter gentilis atricapillus (NM,AZ);apache (NM,AZ)	no map	no photo	-	-	s	s	s	s
Ground-dove, Common	Columbina passerina pallescens (NM)	no map		-	E	s	-	-	-
Hawk, Ferruginous	Buteo regalis	no map		-	-	s	s	-	-
Hawk, Swainson's	Buteo swainsoni	no map		-	-	s	-	-	-
Hummingbird, Broad-billed	Cynanthus latirostris magicus (NM)	no map		-	T	s	-	-	-
Hummingbird, Costa's	Calypte costae	no map		-	T	s	-	-	-
Hummingbird, Lucifer	Calothorax lucifer		no photo	-	T	s	-	-	-
Ibis, White-faced	Plegadis chihi	no map		-	-	s	s	-	-

									
Kingbird, Thick-billed	Tyrannus crassirostris	no map		-	E	s	-	-	-
Kingfisher, Belted	Megaceryle alcyon	no map		-	-	s	-	-	-
Kite, Mississippi	Ictinia mississippiensis	no map		-	-	s	-	-	-
Osprey	Pandion haliaetus carolinensis (NM)	no map		-	-	s	-	-	-
Owl, Burrowing	Athene cunicularia hypugaea (NM,AZ)	no map		-	-	s	s	-	s
Owl, Elf	Micrathene whitneyi whitneyi (NM)	no map		-	-	s	-	-	-
Owl, Flammulated	Otus flammeolus	no map		-	-	s	-	-	-
Owl, Spotted, Mexican	Strix occidentalis lucida (NM,AZ)	no map		T	-	s	-	s	-
Pelican, Brown	Pelecanus occidentalis carolinensis (NM)	no map		-	E	s	-	-	-
Pipit, Sprague's	Anthus spragueii	no map	no photo	C	-	s	-	-	-
Plover, Mountain	Charadrius montanus		no photo	T	-	s	-	s	-
Plover, Snowy, Western	Charadrius alexandrinus nivosus (NM,AZ)	no map		-	-	s	-	-	-
Shrike, Loggerhead	Lanius ludovicianus excubitorides (NM);sonoriensis	no map		-	-	s	s	s	-

	(NM);gambeli (NM)								
Sparrow, Baird's	Ammodramus bairdii	no map		-	T	s	s	-	s
Tern, Black	Chlidonias niger surinamensis (NM)	no map		-	-	-	s	-	s
Tern, Least	Sterna antillarum athalassos (NM)	no map		E	E	s	-	-	-
Trogon, Elegant	Trogon elegans canescens (NM)	no map		-	E	s	-	-	-
Vireo, Bell's	Vireo bellii arizonae (NM,AZ);medius (NM)	no map		-	T	s	-	-	s
Vireo, Gray	Vireo vicinior			-	T	s	-	-	-
Bat, Big-eared, Allen's	Idionycteris phyllotis			-	-	s	s	s	s
Bat, Big-eared, Townsend's, Pale	Corynorhinus townsendii pallescens (NM,AZ)	no map	no photo	-	-	s	s	s	s
Bat, Myotis, Brn., Little, Occult	Myotis lucifugus occultus (NM,AZ)	no map	no photo	-	-	s	s	s	-
Bat, Myotis, Fringed	Myotis thysanodes thysanodes (NM,AZ)	no map	no photo	-	-	-	s	s	-
Bat, Myotis, Long-eared	Myotis evotis evotis (NM,AZ)	no map	no photo	-	-	-	s	s	-
Bat, Myotis, Long-legged	Myotis volans interior (NM,AZ)	no map	no photo	-	-	-	s	s	-
Bat, Myotis, Small-footed, W.	Myotis ciliolabrum melanorhinus (NM,AZ)	no map		-	-	-	s	s	-
Bat, Myotis, Yuma	Myotis yumanensis yumanensis (NM,AZ)	no map		-	-	-	s	s	-

									
Prairie Dog, Gunnison's, prairie populations	Cynomys gunnisoni gunnisoni (NM);zuniensis (NM)	no map		-	-	s	-	s	-
Prairie Dog, Gunnison's, montane populations	Cynomys gunnisoni gunnisoni (NM);zuniensis (NM)	no map	no photo	C	-	s	-	s	-
Gopher, Pocket, Botta's	Thomomys bottae albatus (AZ);alexandrae (AZ);alienus (NM);aureus (NM,AZ);catalinae (AZ);cervinus (AZ);cultellus (NM);desertorum (AZ);fulvus (NM,AZ);lachuguilla (NM);modicus (AZ);pectoralis (NM);peramplus (NM,AZ);perv	no map	no photo	-	-	s	-	-	-
Gopher, Pocket, Desert	Geomys arenarius brevirostris (NM)	no map	no photo	-	-	-	-	s	s
Gopher, Pocket, Yellow-faced	Cratogeomys castanops castanops (NM);hirtus (NM);parviceps (NM);perplanus (NM)	no map	no photo	-	-	s	-	-	-
Muskrat, Pecos River	Ondatra zibethicus ripensis (NM)	no map	no photo	-	-	-	s	s	s
Pronghorn, Chihuahuan	Antilocapra americana mexicana (NM,AZ)	no map	no photo	-	-	s	-	-	-
Rat, Wood, White Sands	Neotoma micropus leucophaea	no map	no photo	-	-	-	-	-	s
Ringtail	Bassariscus astutus arizonensis (NM,AZ);flavus (NM);yumanensis (AZ);nevadensis (AZ)	no map		-	-	s	-	s	-
Sheep, Bighorn, Desert	Ovis canadensis mexicana (listed pops)	no map		-	T	s	-	-	-
Shrew, Desert, Crawford's	Notiosorex crawfordi crawfordi (NM,AZ)	no map	no photo	-	-	s	-	-	-
Skunk, Hog-nosed, Common	Conepatus leuconotus mearnsi (NM);venaticus (NM,AZ)	no map	no photo	-	-	-	-	s	-
Skunk, Spotted, Western	Spilogale gracilis	no map	no photo	-	-	-	-	s	-
Vole, Long-	Microtus longicaudus longicaudus (NM);alticola	no	no photo	-	-	s	-	-	-

tailed	(AZ);baileyi (AZ);mordax (AZ)	map							
Wolf, Gray, Mexican	Canis lupus baileyi (NM,AZ)	no map		E	E	s	-	-	-
Mountainsnail, Mineral Creek	Oreohelix pilsbryi	no map	no photo	-	T	s	-	-	s
Mountainsnail, Subalpine	Oreohelix subrudis	no map	no photo	-	-	s	-	-	-
Mountainsnail, Morgan Creek	Oreohelix swopei	no map	no photo	-	-	s	-	-	-
Mountainsnail, Black Range	Oreohelix metcalfei acutidiscus (NM)	no map	no photo	-	-	s	-	-	-
Mountainsnail, Black Range	Oreohelix metcalfei metcalfei (NM)	no map	no photo	-	-	s	-	-	-
Woodlandsnail, Dry Creek	Ashmunella tetrodon animorum (NM)	no map	no photo	-	-	s	-	-	-
Woodlandsnail, Iron Creek	Ashmunella mendax	no map	no photo	-	-	s	-	-	-
Shrimp, Fairy, Moore's	Streptocephalus moorei	no map	no photo	-	-	s	-	s	-
Skipper, Skipperling, Four-potted	Piruna polingii	no map	no photo	-	-	s	-	-	-
Butterfly, Viceroy, Obsolete	Basilarchia archippus obsoleta (NM,AZ)	no map	no photo	-	-	s	-	-	s

Close Window

New Mexico Ecological Services Field Office

Listed and Sensitive Species in Sierra County

Total number of species: 33

Print

Common Name	Scientific Name	Group	Status
Sprague's pipit	*Anthus spragueii*	Bird	Candidate
Yellow-billed cuckoo	*Coccyzus americanus*	Bird	Candidate
Rio Grande cutthroat trout	*Oncorhynchus clarki virginalis*	Fish	Candidate
Northern aplomado falcon	*Falco femoralis septentrionalis*	Bird	Endangered
Southwestern willow flycatcher	*Empidonax traillii extimus*	Bird	Endangered
Rio Grande silvery minnow [3]	*Hybognathus amarus*	Fish	Endangered
Black-footed ferret [2]	*Mustela nigripes*	Mammal	Endangered
Todsen's pennyroyal Designated Critical Habitat	*Hedeoma todsenii*	Plant	Endangered
Whooping Crane	*Grus americana*	Bird	Experimental, Non-essential Population
Gray Wolf (Mexican Gray Wolf)	*Canis lupus baileyi*	Mammal	Experimental, Non-essential Population
Chiricahua leopard frog	*Rana chiricahuensis*	Amphibian	Threatened
Mexican spotted owl Designated Critical Habitat	*Strix occidentalis lucida*	Bird	Threatened
Gila trout	*Oncorhynchus gilae*	Fish	Threatened
White Sands pupfish	*Cyprinodon tularosa*	Fish	Under Review
Mineral Creek mountainsnail	*Oreohelix pilsbryi*	Mollusc - Invertebrate	Under Review

Species of Concern

Species of Concern are included for planning purposes only.

Common Name	Scientific Name	Group	Status
Desert viceroy butterfly	*Limenitis archippus obsoleta*	Arthropod - Invertebrate	Species of Concern

American peregrine falcon	*Falco peregrinus anatum*	Bird	Species of Concern
Arctic peregrine falcon	*Falco peregrinus tundrius*	Bird	Species of Concern
Baird's sparrow	*Ammodramus bairdii*	Bird	Species of Concern
Bell's vireo	*Vireo bellii*	Bird	Species of Concern
Black tern	*Chlidonias niger*	Bird	Species of Concern
Northern goshawk	*Accipiter gentilis*	Bird	Species of Concern
Western burrowing owl	*Athene cunicularia hypugaea*	Bird	Species of Concern
Desert sucker	*Catostomus clarki*	Fish	Species of Concern
Sonora sucker	*Catostomus insignis*	Fish	Species of Concern
Black-tailed prairie dog [1]	*Cynomys ludovicianus*	Mammal	Species of Concern
Organ Mountains Colorado chipmunk	*Eutamias quadrivittatus australis*	Mammal	Species of Concern
Southwestern otter	*Lutra canadensis sonorae*	Mammal	Species of Concern
Townsend's big-eared bat	*Corynorhinus townsendii*	Mammal	Species of Concern
White Sands woodrat	*Neotoma micropus leucophaea*	Mammal	Species of Concern
Duncan's pincushion cactus	*Coryphantha duncanii*	Plant	Species of Concern
Pinos Altos flame flower	*Talinum humile*	Plant	Species of Concern
Sandhill goosefoot	*Chenopodium cycloides*	Plant	Species of Concern

Endangered	Any species which is in danger of extinction throughout all or a significant portion of its range.	**Threatened**	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
Candidate	Candidate Species (taxa for which the Service has sufficient information to propose that they be added to list of endangered and threatened species, but the listing action has been precluded by other higher priority listing activities).	**Proposed**	Any species of fish, wildlife or plant that is proposed in the Federal Register to be listed under section 4 of the Act. This could be either proposed for endangered or threatened status.
Experimental, Non-essential Population	A reintroduced population established outside the species' current range, but within its historical range. For purposes of section 7 consultation, this population is treated as a proposed species, except when it is located within a National Wildlife Refuge and National Park, when the population is considered threatened.		

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County List
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Discussion Group
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Results of County Search

SIERRA	
Scientific name	County-NM
Agastache cana	Doña Ana, Grant, Luna, Sierra
Astragalus castetteri	Doña Ana, Sierra
Cirsium wrightii	Chaves, Eddy, Guadalupe, Otero, Sierra, Socorro
Cuscuta warneri	Roosevelt, Sierra
Desmodium metcalfei	Grant, Sierra
Draba mogollonica	Catron, Grant, Sierra, Socorro
Draba standleyi	Doña Ana, Otero, Sierra, Socorro
Erigeron scopulinus	Catron, Sierra, Socorro
Escobaria duncanii	Sierra
Escobaria sandbergii	Doña Ana, Sierra
Grindelia arizonica var. neomexicana	Grant, Sierra
Hedeoma todsenii	Otero, Sierra
Hexalectris arizonica	Doña Ana, Hidalgo, Otero, Sierra
Hymenoxys vaseyi	Doña Ana, Sierra
Penstemon metcalfei	Sierra
Perityle staurophylla var. homoflora	Sierra, Socorro
Perityle staurophylla var. staurophylla	Doña Ana, Otero, Sierra
Physaria gooddingii	Catron, Sierra
Silene plankii	Bernalillo, Doña Ana, Sandoval, Sierra, Socorro, Torrance
Silene thurberi	Grant, Hidalgo, Sierra
Silene wrightii	Catron, Grant, Luna, Sierra, Socorro

Photo credits in header *Peniocereus greggii var. greggii* © T. Todsen, *Lepidospartum burgessii* © M. Howard, *Argemone pleiacantha ssp. pinnatisecta* © R. Sivinski

APPENDIX J

BIOLOGICAL ASSESSMENT

APPENDIX J: BIOLOGICAL ASSESSMENT

Copper Flat Copper Mine
Final
Biological Assessment

Sierra County, New Mexico

October 2018

BLM

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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COPPER FLAT COPPER MINE PROJECT
BIOLOGICAL ASSESSMENT

LEAD AGENCY: U.S. Department of the Interior, Bureau of Land Management (BLM)

FOR FURTHER INFORMATION, CONTACT:

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Project Manager
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Las Cruces, NM 88005
(575) 525-4498
Email: lkeeven@blm.gov

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1. INTRODUCTION

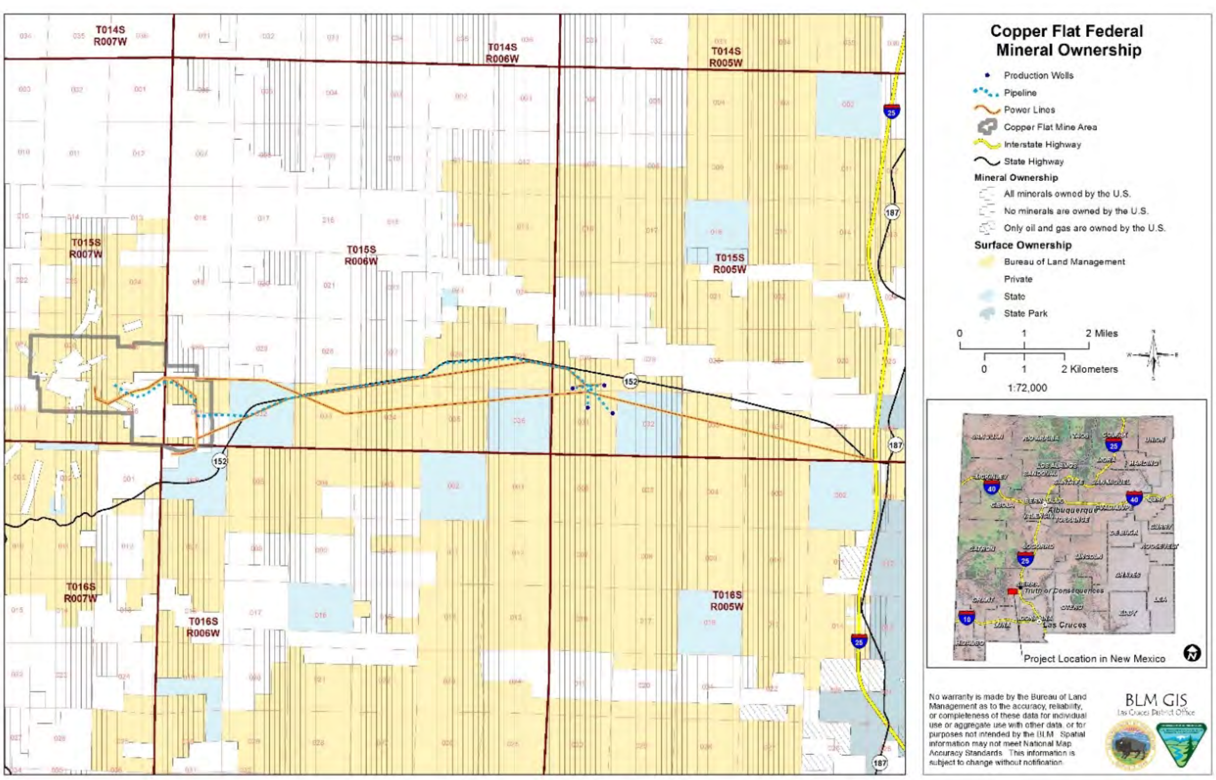
1.1 SYNOPSIS OF PROPOSED ACTION

The Copper Flat project (project) is the proposed reestablishment of a poly-metallic mine and processing facility located near Hillsboro, New Mexico. (See Figure 1-1.) The Proposed Action would consist of an open pit mine, flotation mill, tailings impoundment, waste rock disposal areas, a low-grade ore stockpile, and ancillary facilities. In most respects, the facilities, disturbance, and operations would be similar to the former mining operation at this location. The project is owned and would be operated by the New Mexico Copper Corporation (NMCC), a wholly owned subsidiary of THEMAC Resources Group Limited (THEMAC 2011).

1.2 PURPOSE OF THE BIOLOGICAL ASSESSMENT

A Biological Assessment (BA) is required by law (Endangered Species Act [ESA] of 1973, 16 USC 1531 et seq.) for projects on tribal or Federally managed lands. A BA is the means to review, analyze, and document the direct, indirect, interrelated, interdependent, and cumulative effects on U.S. Fish and Wildlife Service (USFWS) Federally listed endangered, threatened, proposed, or candidate species as well as proposed or designated critical habitats thereof, as a result of actions undertaken on Federally managed land. Solv LLC was contracted by the Bureau of Land Management (BLM) to prepare the Copper Flat project Environmental Impact Statement (EIS) and to conduct this BA. A letter designating Solv as the non-Federal representative for the BLM in preparing the BA was sent to the USFWS Regional Office in Albuquerque, New Mexico on August 18, 2015 (BLM 2015).

Figure 1-1. Copper Flat Mine Location in New Mexico



Source: BLM 2018.

1.3 PROJECT BACKGROUND

Records show copper and gold mining has occurred in and around the Copper Flat location for more than 125 years. Modern exploration efforts at Copper Flat date back to the 1950s. Quintana Mineral Corporation (Quintana Minerals) began development of the Copper Flat mine in the 1970s (NMCC 2014a). An Environmental Assessment Report (EAR) was prepared for the Quintana operation in 1977 by the BLM Las Cruces District Office (LCDO) to analyze potential impacts resulting from granting rights-of-way (ROWs) for utilities and access roads, as well as impacts resulting from the mine development. The ROWs were approved by the BLM in the EAR and air quality, tailings discharge, and water discharge permits (DPs) were issued by the State of New Mexico. In 1982, Quintana Minerals brought the property into production as an open pit mine with a mill and concentrator. The Quintana facility required approximately 2 years to construct. The initial mine excavation required to expose the ore body occurred during the 4- to 6-month period immediately preceding startup of the mineral processing plant. Following startup of mineral processing, the mine was in commercial production for 3.5 months until all operations were halted due to a significant decline in copper prices (NMCC 2014a).

In 1986, all on-site surface facilities were removed and a BLM-approved program of non-destructive reclamation was carried out. Much of the property's infrastructure, including building foundations, power lines, and water pipelines, was preserved for reuse in the event copper prices recovered sufficiently to make reactivating the mine economically viable (THEMAC 2011).

In 1991, a proposed plan of operations was filed with the BLM by Gold Express Corporation to reactivate the Copper Flat mine. The BLM initiated an Environmental Assessment (EA) because Federal land would be "newly" disturbed. New archaeological, biological, threatened and endangered species, air quality, hydrologic, and socioeconomic studies were conducted. However, it was determined in 1993 that an EIS would be required for the mine development due to concerns related to water quality issues, and the EA was never completed (THEMAC 2011).

Alta Gold Company (Alta) acquired the property in early 1994 and proposed to rebuild the Copper Flat mining facility essentially as it existed in 1982. Alta submitted an updated mine plan of operations (MPO) and associated environmental baseline data to the BLM for initiation of the EIS process. The draft EIS — Copper Flat Project was completed by the BLM in 1996. A preliminary final EIS — Copper Flat Project was prepared by the BLM in 1999 following public comment on the draft EIS. However, the EIS and record of decision (ROD) were never finalized because Alta declared bankruptcy in early 1999 (THEMAC 2011).

NMCC acquired the Copper Flat property in 2009 with the intent to re-establish an open pit mine and processing facility similar to the Quintana Minerals operation. Current work to evaluate and potentially re-permit the Copper Flat mine includes the development of a new EIS as well as numerous studies that have been conducted to support the analysis presented herein. Permitting efforts with the State of New Mexico have included initiating the process toward a new mine permit with the New Mexico Mining and Minerals Division (MMD) through submission of a Sampling and Analysis Plan and subsequent baseline data reports. NMCC submitted an application for a new air permit; this was issued by the New Mexico Environment Department (NMED) Air Quality Bureau in July 2013. Efforts to renew the DP associated with the mine area are underway with the NMED Ground Water Quality Bureau. In addition, work to address previous impacts at the site associated with the Quintana facility has included the submission of a Stage I Abatement Plan that was approved by the NMED in February 2012 and four quarterly periods of groundwater and surface water monitoring in 2013 (NMCC 2014a).

2. PROPOSED PROJECT

The most recent EIS prepared for the Copper Flat Mine Project analyzes three alternatives for the proposed reestablishment of a poly-metallic mine and processing facility located near Hillsboro, New Mexico. The Proposed Action would have a mining throughput of 17,500 tons per day (tpd). Alternative 1, Accelerated Operations, would have a throughput of 25,000 tpd; Alternative 2, the Preferred Alternative, would increase the daily tonnage throughput to 30,000 tpd. The No Action Alternative would not reestablish the mine and processing facility.

This BA evaluates in detail the effects of the highest production alternative only, Alternative 2, which the BLM has designated in the EIS as the Preferred Alternative. Note that the Proposed Action and Alternative 1 are discussed only briefly below; however, these alternatives are not evaluated in detail in the current BA.

2.1 SUMMARY OF THE PROPOSED ACTION AND ALTERNATIVE 1

The Proposed Action was originally submitted to the BLM in June 2011 in the form of an MPO that was based upon the plan of development that Quintana Minerals used for the previous Copper Flat mining activities in 1982, with some upgrades and modifications based on current engineering designs and regulations. The Proposed Action was designed to reuse the existing foundations, production wells, water pipeline, and electrical substation that were employed by the previous Quintana operation. Additionally, the Proposed Action would reuse existing infrastructure on an existing brownfield site.

The Quintana operation ran at a 15,000 ton per day (tpd) rate; the alternative defined as the Proposed Action proposes to increase that throughput to 17,500 tpd to increase efficiency. The Proposed Action varies from some of the original Quintana mine plant elements in ways that would increase efficiency and improve the performance of mine infrastructure. NMCC proposes including a lined tailings storage facility (TSF), which would increase water recycling and meet new regulation standards in New Mexico. The Proposed Action's TSF liner would be a substantial upgrade from the unlined TSF previously employed at the site. The reestablishment of the Copper Flat mine under the Proposed Action would affect nearly 1,586 acres within the mine area, approximately 910 acres of which have been previously disturbed and 676 acres that would be newly disturbed land. An additional 127.2 acres of land outside the mine area would be affected. Overall, the proposed Copper Flat project would disturb approximately 745 acres of unpatented mining claims on public land and 841 acres of private land controlled by NMCC. Approximately 57 percent of the area needed for the proposed MPO has been disturbed by prior operations, and approximately 90 percent of the ore would be mined from private land (THEMAC 2011).

In 2011 and 2012, NMCC followed the standard industry practice of performing a preliminary feasibility study to further develop internal engineering plans for the Copper Flat mine. In addition, an expanded resource exploration program was launched at Copper Flat to better define the ore body. The result of these two efforts was a NMCC-revised plan of development for Copper Flat based on new, more detailed information about the ore body and the engineering studies. NMCC's preliminary feasibility study for Copper Flat maintained the same locations indicated in the Proposed Action for the proposed mine pit, processing area, and TSF, but refined the proposal to reflect better engineering data, increase the mine efficiency, and improve project economics.

Overall, this alternative (Alternative 1 or the Accelerated Operations – 25,000 TPD Alternative) is similar to the Proposed Action and would have the same general scale and scope of operation, with differences largely attributable to higher process rates to improve project viability, and some increases in efficiency wherever possible. Alternative 1 would directly impact 1,402 acres. Of this, 644 acres would be public land and 758 acres would be private land. Disturbance at ancillary facilities would be the same as the Proposed Action.

2.2 SUMMARY OF PREFERRED ALTERNATIVE (ALTERNATIVE 2)

In 2013, NMCC followed the standard industry practice of conducting a definitive feasibility study, which follows and refines the preliminary feasibility study, to further fine-tune the internal plan of development for the Copper Flat mine. This study applied a more detailed approach to evaluating the mine processing circuit and overall initiative. The definitive feasibility study found that the mine would be more efficient with an increase to the TSF capacity and an increase to the annual ore processing rate. Alternative 2, as defined in the EIS and this BA, is based on the definitive feasibility study for Copper Flat and has a TSF that fits in the same footprint as the Proposed Action but has a larger volume for storage. Alternative 2, as defined in the EIS, has a 30,000 tpd processing plan with a 12-year mine life, but remains within the mine area evaluated under the Proposed Action. This alternative has the same general scale and scope as the Proposed Action but would process 25 million tons of ore more than the Proposed Action over the life of the mine. The other main differences are derived from an increase in the process rate to improve project economics and increases in efficiency where possible. Alternative 2 is subsequently referred to as the "Preferred Alternative" in this BA.

The NMCC proposed project operation under the Preferred Alternative includes the following activities:

- Expand the mine area to include additional land controlled by NMCC;
- Provide for exploration over the entire proposed plan area;
- Expand the existing open pit;
- Re-activate existing haul and secondary mine roads;
- Expand, operate, and reclaim existing waste rock disposal facilities (WRDFs);
- Construct, operate, and reclaim low-grade ore stockpiles;
- Construct, operate, and reclaim the mill and associated processing facilities;
- Construct, operate, and reclaim the tailings impoundment facility;
- Construct ancillary buildings (administration offices, laboratory, truck shop, reagent building, substation, gatehouse, etc.);
- Reactivate and maintain an existing water supply network;
- Construct growth media stockpiles for use in future reclamation of the site; and
- Re-activate and maintain surface water diversions.

Using previously disturbed lands and with new disturbance, the proposed project would directly impact 1,444 acres of the total 2,190 acres within the boundary of the mine. (See Table 2-1.) The affected lands within the mine area would consist of 630 acres of BLM land and 814 acres of private land.

Table 2-1. Summary of Disturbance within the Mine Area for the Preferred Alternative

Table 2-1. Summary of Disturbance within the Mine Area for the Preferred Alternative	
Disturbance	**Total (Acres)**
TSF	633
Open pit	161
WRDFs	155
Low-grade ore stockpile	134
Haul roads	34
Plant site area	139
Growth media stockpiles	114
Diversion structures	33
Exploration	40
Total Mine Area Disturbance	**1,444**
Total public land disturbance	630
Total private land disturbance	814

Source: NMCC 2014a.

The project would also impact 127.2 acres outside the boundary of the mine as shown in Table 2-2, with all but 2 acres being public land.

Table 2-2. Summary of Disturbance to Install Ancillary Facilities – Preferred Alternative

Table 2-2. Summary of Disturbance to Install Ancillary Facilities – Preferred Alternative				
Disturbance	**Total (Acres)**	**BLM Land**	**NM State Land**	**Private Land**
Pipeline corridor	44.4	34.6	7.8	2.0
Millsites	45.0	45.0		
Production well roads	7.8	7.8		
Electrical substation	30.0		30.0	
Total Disturbance Outside Mine Area	**127.2**	**87.4**	**37.8**	**2.0**
Public Land	**125.2**			
Private Land	**2.0**			

Source: NMCC 2015.

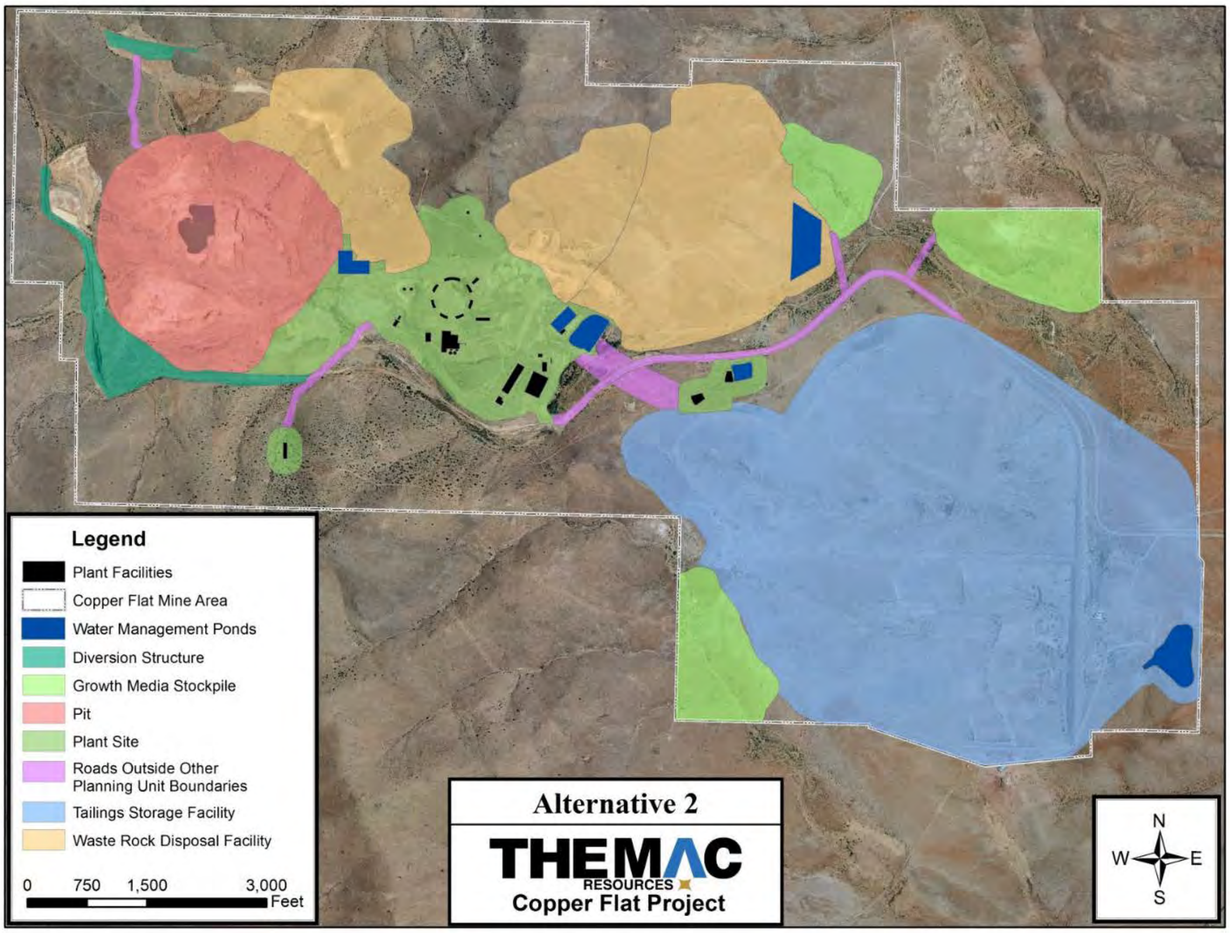
Annually, the mining operation would process an estimated 10.8 million tons of copper ore mill feed. The operations include the phases and activities summarized below. In general these phases are sequential, but there would be some overlap as the activities of an earlier phase continue during the implementation of subsequent phases.

- Pre-construction (permitting) - 2 years;
- Construction (site preparation) – 2 years;
- Operations (mineral beneficiation) - 12 years;
- Closure/reclamation - 3 years; and
- Post-closure monitoring, care, and maintenance - 12 years.

The plant facilities would be constructed at the site of the original Quintana plant site, and to the extent practicable, would use most of the original concrete foundations. The plant site, which would include the crusher, concentrator, assay lab, mine shop, warehouse, security, and administration buildings, would occupy approximately 139 acres and would be located between the open pit and the tailings impoundment area.

Scheduled operating time for the mill would be 24 hours per day, 7 days per week, and 365 days per year. Products produced by the mine would be two mineral concentrates: a copper concentrate, which would contain the recovered copper, gold, and silver; and a separate molybdenum concentrate. The concentrate would be sold to an off-site buyer and transported from the mine by truck to another location for smelting and refining. A general depiction of the proposed mine layout is provided in Figure 2-1, and a description of mine operations is provided below.

Figure 2-1. Mine Layout – Preferred Alternative



Source: NMCC 2015.

2.2.1 Mine Operation – Ore Extraction

The mining of new ore would entail the expansion of the existing open pit and the Copper Flat ore body would be mined by a multiple bench, open pit method. Currently, a portion of the ore body at Copper Flat is exposed at and near the surface and would be mined by conventional truck and shovel open pit methods in a manner similar to the previous operation. Over the life of the project, this alternative would produce approximately 125 million tons of copper ore and 33 million tons of waste rock.

Ore material from the pit would be drilled and blasted, loaded, and hauled to the primary crusher and then conveyed to the process mill where the mineral values would be removed by conventional flotation processes. The operation would process at a nominal throughput of 30,000 tpd of ore through the copper sulfide flotation mill, using standard technology similar to that of the previous Quintana operation. Waste rock would be placed in designated disposal areas. While the operation would focus primarily on copper and molybdenum, other poly-metallic resources such as gold and silver would be extracted from the Copper Flat ore. Low-grade copper ore would likely be processed at the end of the mine life. As such, it would require stockpiling immediately north of the process plant until eventually processed.

The existing pit would eventually be enlarged to a diameter of approximately 2,800 feet with an ultimate depth of approximately 1,000 feet. The land area of the pit would be expanded to 161 acres. The existing diversion of Greyback Arroyo, located south of the pit, would not be altered by the proposed pit expansion.

Bench height would be 25 feet, and the working inter-bench slope of the pit walls would range from 38 to 45 degrees (NMCC 2012). Safety benches would remain as required by regulation. Because the deposit cannot be mined sequentially, there is no plan to backfill the pit although some benign waste rock would be used for pad preparation, plant site development, and in connection with the reclamation of disturbed areas.

Blasting would be limited to daylight hours and performed by trained and certified blasters. Rotary diesel-driven drills or electric-powered or down-the-hole hammer drills would be used for blast hole drilling. Wet drills would be used in conformance with Mine Safety and Health Administration (MSHA) requirements for secondary breakage when necessary. Safe seismic disturbance and air blast limits would be established to prevent damage to buildings.

Blasting agents and explosives would be stored in secured areas in compliance with applicable State and Federal regulations. Ammonium nitrate and diesel fuel would be stored on-site in bins and tanks. Detonators, detonating cord, boosters, caps, and fuses would be stored apart from the batch plant area in secured separate magazines. All locations chosen for storage of blasting agents and explosives would be selected to provide for the safety of personnel and the public and to comply with regulations.

Cuttings samples would be taken from blast holes. Based upon the assay values of these samples, the broken rock in the pit would be classified as "ore" or "waste." The broken rock would be loaded onto end-dump haul trucks for transport to the primary crusher, low-grade stockpile, or waste rock disposal area(s) depending on the assay classification.

Loading of both ore and waste rock would be accomplished by front end loaders (NMCC 2012). Ore and waste rock haulage would be handled by a fleet of end-dump, diesel-powered haulage trucks with a nominal 100-ton capacity (NMCC 2012). Additional units may be added to the fleet over time as the pit is deepened.

Noise from the mine equipment would comply with and be regulated under MSHA. Mining equipment would consist of standard units that are typical of the mining industry and would be fitted with mufflers, spark arresters, and other fire prevention and safety equipment. The major equipment proposed for the mine operation would include:

- Blast hole drill, 45,000 lb.
- Hydraulic shovel,14 cubic yards (y3)
- Haul truck, 100 tons
- Track dozer, 410 horsepower (HP)
- Wheel dozer, 354 HP
- Motor grader, 16’
- Water truck, 10,000 gal.

- Pioneer drill
- Backhoe, 2 yd^3

The proposed plan also includes ongoing exploration drilling to define the copper ore body (infill and step-out drilling in addition to tests for possible deep extensions of the ore body) as well as testing for near-surface coarse gold vein and alluvial gold potential in the area of the mine.

2.2.2 Mine Operation – Pit Lake Water Management

A 5.2-acre lake is currently located in the existing pit. The pit lake contains near-neutral water that is periodically acidic with elevated concentrations of dissolved metals and other contaminants. The floor of the existing pit is currently at 5,400 feet above mean sea level (amsl), which is approximately 100 feet beneath the original pre-mining ground surface. The water level in the pit lake was 5,439 feet amsl in September 2013, indicating that the depth of the pit lake was 39 feet at that time. As a result of seasonal variations in precipitation, the pit lake water level has fluctuated by 1 to 5 feet per year.

Dewatering of the pit lake would be necessary prior to mining, and would be necessary throughout the life of the mine to facilitate mining operations. Groundwater inflow to the pit during previous operations ranged from 50 to 75 gallons per minute (gpm). Initial dewatering of the pit would be accomplished with two or three portable construction trash pumps (pumps designed to move water as well as hard and soft solids such as mud, rocks, twigs, and sludge) operating on a continuous basis. Pumping characteristics would require 6- to 10-inch trash pumps. Water evacuated from the pit would be pumped to a construction pond through fused high-density polyethylene (HDPE) pipe. Dewatering the existing pit would be accomplished in approximately 30 days (NMCC 2015a). The water pumped from the pit would be used for dust suppression on the roads and waste rock dumps. If necessary, pit water would be temporarily stored in a reservoir in the mineral processing area prior to use.

During mining, water inflows to the pit from all sources would be approximately 12 million gallons per year and dewatering would occur on an intermittent basis. As the mine progresses, mine equipment would be used to prepare small, temporary water collection sumps on each mining level as a normal part of the operation. Pumping and piping equipment used for dewatering during mine operation would be similar to the initial pit dewatering effort. The discharge pipe would follow the mine haul road to the edge of the pit and terminate at a small pond or tank at the edge of the pit; water would be drawn from this pond or tank and used for dust control on roads and other surface areas. As the mine progresses and deepens, mine crews would extend the discharge pipe by fusing additional HDPE pipe segments at the bottom of the pipe run. Pumping stations would be added at intermediate points along the mine haul road as needed to lift the water to the pit edge. During mining, the dewatering pumps would operate several times per day for a total of 3 to 5 hours per day in order to keep up with expected inflows (NMCC 2015a).

Water removal from the pit would continue over the operational life of the mine through a sump or series of sumps located within the pit. Water removal would end once mining is completed. After mining and associated dewatering activities end, a pit lake would reform as a result of inflowing groundwater, direct precipitation, and runoff from adjacent slopes. The post-mining pit water body that forms after mining from rapid fill would be about 250 feet in depth and have a steady-state surface area of about 22 acres. Steady-state groundwater inflow is estimated at 36 ac-ft/yr and captured storm-water runoff is estimated at 57 ac-ft/yr. Pit water evaporation is projected to be about 93 ac-ft/yr. Evaporation would maintain the hydraulic sink in perpetuity (JSAI 2017).

2.2.3 Ore Processing

The proposed ore-processing plant would be a sulfide-flotation plant similar to that originally constructed and operated at the site by Quintana Minerals in 1982, and the plant would be typical of plants used at other locations in New Mexico, Arizona, and elsewhere. It would include a molybdenum processing circuit similar to that designed by Quintana Minerals. Additionally, the plant would include a gravity gold recovery circuit. No leaching processes (such as cyanide leaching) would be used. The sulfide flotation plant would be designed to process approximately 10.8 million tons of ore per year at a throughput of 30,000 tpd (assuming 93 percent availability).

Ore from the pit would be hauled via end-dump haulage trucks to the primary crusher area located to the east of the pit. The ore processing operation would commence with the dumping of the ore into the primary crusher for the first stage of crushing. After the first stage of crushing, the ore would be conveyed to downstream mills for further crushing and grinding for the purpose of liberating the copper and other recoverable minerals from the host rock. During the crushing and grinding operations, a portion of this ore stream would be fed through a gravity gold separation process to recover coarse gold in the form of a concentrate.

Once the ore is sized for optimum liberation of the minerals through the crushing and grinding operations, the ore would be introduced into the flotation process. In the flotation process, the ore, which at this time would include the finely ground host rock and liberated minerals, would be mixed with additional process water. Organic reagents would be added to this mixture creating a froth and causing the liberated minerals to adhere to the froth bubbles. The sulfide-mineral-laden froth would be collected and filtered to form a concentrate containing copper, molybdenum, silver, and gold minerals. This concentrate would receive further flotation processing to create a copper concentrate that contained copper, silver, and gold minerals and a separate concentrate containing molybdenum minerals.

2.2.4 Proposed Mine Facilities

For the most part, the mine plant facilities would be constructed at the site of the original Quintana plant site and, where feasible and practical, the plant would use concrete foundations that were constructed for the Quintana operation in the 1980s. The 139-acre plant site would be part of the larger process/shop/ administration site prepared for the Quintana operation located between the open pit and the TSF area. The following major facilities would be constructed at the plant site as part of the proposed project:

Primary crusher
Primary crusher control/ Mechanical building
Coarse ore stockpile tunnel
Concentrator building, Grinding area
Concentrator building, Flotation area
Concentrator building, Maintenance area
Concentrate handling & Storage area
Filter deck
Ball bins
Reagent building
Reagent storage and lime Handling
Lime mill
Flammable material storage building
Mine shop/warehouse
Tire/lube
Small vehicle repair building
Wash pad
Administration building
Change house
Gatehouse
Assay & metallurgical Laboratory
Records & receiving office
Copper Flat electric substation
Fresh water/fire tank (1)
Process water tank (1)
Fresh water pump station tanks (6)
Potable water tank
Reclaim reservoir fresh water surge tank
Reclaim reservoir fresh water storage tank
Off road diesel fuel storage tank (2)
On road diesel storage tank
Gasoline storage tank
Engine oil storage tank

Hydraulic fluid storage tank	Recycle water tank - truck wash	Pax mix tank
ATF fluid storage tank	Used antifreeze storage tank	Pax distribution tank
Gear oil storage tank	Lime silo	Methyl isobutyl carbinol (MIBC) storage tank
Anti-freeze storage tank	Lime slurry tank	No. 2 diesel storage tank
Used oil storage tank		

All mechanical, civil, structural, and architectural designs would be in accordance with applicable standards and codes. Equipment and fabricated items would be furnished with manufacturers' standard finish and retouched after erection. Safety painting would be in accordance with MSHA standards and New Mexico mining codes.

2.2.4.1 Primary Crushing Facilities

The primary crusher would be located within the existing foundation about 2,500 feet east of the pit. Normally, ore hauled from the pit would be dumped directly into the primary crusher; however, some ore may go to a small stockpile near the crusher and be fed to the crusher at a later time. The primary crusher would reduce the mine run rock to a nominal size less than 8 inches in diameter. Crusher discharge would be fed by apron feeder onto a belt conveyor for transport to the coarse ore stockpile located near the mill. Storage capacity of the coarse ore stockpile would be about 75,000 tons. The crusher would be located below ground level to limit noise and contain dust. The crusher would normally operate 12 to 16 hours per day; however, it would occasionally operate longer as needed to maintain production (NMCC 2014).

2.2.4.2 Grinding

Crushed ore would be removed from the coarse ore stockpile by three draw chutes and apron feeders located in an existing ore reclaim tunnel located under the stockpile. The ore would be fed onto a belt conveyor for transport into a large diameter semi-autogenous (SAG) mill for grinding. Reduction in the SAG mill would be the result of impact between the rock entering the mill and 5-inch steel grinding balls fed to the mill along with the rock. Water and various reagents would be added to the SAG mill feed to start the conditioning of the ore pulp for subsequent stages of treatment.

The SAG mill would discharge onto a double-deck vibrating screen for sizing. Rock passing through both screen decks (undersize) would travel to the cyclone feed sump. Rock remaining on top of the upper screen deck (oversize) would be taken by belt conveyor to a cone crusher where it would be crushed to less than 0.75-inch in diameter and returned by belt conveyor to the SAG mill. Rock passing through the upper screen deck but not passing through the bottom screen deck (middling) would be returned directly to the SAG mill by conveyors. Ore from the cyclone feed sump would be pumped to a cluster of hydrocyclones for material sizing. The fine product from the hydrocyclones would be sent to the feed sump for the first stage of flotation, and the coarse product from the hydrocyclones would go to the ball mill for further grinding (NMCC 2014).

2.2.4.3 Flotation and Concentration

Cyclone overflow from the feed sump would be sent to a series of first stage (rougher) flotation cells. Each cell would be equipped with a mechanism to agitate and induce air into the ore pulp as it passed through the tank. Reagents would be added to the pulp to cause the mineral bearing sulfide mineral particles to adhere to bubbles created by the induced air and frothing agents. Reagents such as xanthate, sodium hydroxide, MIBC, sodium hydrosulfide, and diesel fuel would be used in the concentrator for the mineral flotation process. Small amounts of other reagents may be used in the process from time to time as part of an ongoing effort to improve metal recoveries and to cope with changing ore characteristics. The mineral bearing sulfide laden bubbles would rise to the top of the cell to be skimmed off. The copper/molybdenum concentrate floated off of the primary rougher would be routed to the molybdenum plant where the copper would be depressed and the molybdenum would be floated up, graded, filtered, and dried. After separating the molybdenum, the copper concentrate, which would average about 28 percent copper, would be dewatered in a settling facility (thickener) to decant water, then disk filtered to 12 percent moisture and stored for shipment. The copper concentrate would be loaded by a front-end loader into covered trucks for transportation off-site to a smelter. The molybdenum concentrate would be dried and packaged in sacks for shipment. Filtrate from both the copper flotation circuit and the molybdenum flotation circuit would be returned to concentrate thickeners. Thickener overflow would be returned to the plant reclaim water system. No smelting or refining would be conducted at the mine area.

The plant site surface drainage system was originally designed to contain or control a 24-hour precipitation event of 2.6 inches with a maximum 1-hour intensity of 2.0 inches. These calculations would be verified during the engineering design phase of the project in accordance with current regulatory requirements and design criteria. Surface runoff from the area around the administration/mine office, concentrator, assay building, reagent storage, and tailings thickener would be controlled by surface grading and directed to a containment pond. Water from the containment pond would be used for mineral processing make-up water or dust control at the site (NMCC 2014).

2.2.4.4 Tailings Storage Facility

An existing TSF at Copper Flat was constructed by Quintana Minerals to serve their 1982 mining operation. The TSF received 1.2 million tons of material and was essentially reclaimed in 1986. The TSF remains in place and is located southeast of the former plant site. NMCC proposes to construct a new TSF to overlay the Quintana TSF area. The new TSF would occupy the site of the old facility as well as extend approximately 1,000 feet to the east of the existing Quintana starter dam. The Quintana TSF was an unlined facility. The new TSF would be underlain by a geomembrane liner and tailings drainage collection system.

Approximately 125 million tons of tailings are expected to be stored over the life of the project for the Preferred Alternative. Tailings deposition would be approximately 30,000 tpd. During progressive settlement, water would be pumped from the TSF and returned to the process circuit. The total expected water recovery by reclaim systems would be a nominal 70 percent. Water reporting to the TSF would be recovered from the pool of water that would form in the storage facility and be returned to the mill process water system for reuse. Precipitation would also contribute to the volume of water in the storage facility. The height of the embankment would be designed to contain the normal operating volume of water completely within the storage facility, plus the amount of stormwater runoff from 100 percent of the probable maximum precipitation as required by the OSE.

TSF design: The proposed method of construction for the new TSF is by centerline raises with cycloned tailings sand. Initial construction would include a toe berm to buttress the tailings embankment and a starter dam. Coarse sand (cyclone underflow) would be placed on the embankment while the tailings slimes (thickened cyclone overflow) would be discharged to the impoundment interior. A geomembrane liner would be placed beneath the starter dam and anchored on the crest of the toe berm. An underdrain system would be used beneath the tailings embankment and would be continuous beneath the total impoundment. It would consist of (from bottom to top) prepared foundation, 12-inch liner bedding fill, 80-mil HDPE geomembrane, overliner drainage collection layer with internal drainage pipe network and a filter fabric.

The TSF would be constructed in a phased manner. During initial construction phases, diversion ditches would be constructed to divert stormwater from upstream catchment areas within the area contributory to the impoundment. The contributory area is approximately equivalent to the ultimate TSF footprint, as only minor peripheral areas drain into the TSF. At final build out, minimal potential exists for surface water run-on from external areas. Throughout most of the life of the facility, stormwater management requirements would be limited to direct precipitation.

The new TSF design would comply with the design and dam safety guidelines and regulations of the New Mexico Office of the State Engineer (OSE) Dam Safety Bureau. The NMED Ground Water Quality Bureau is the permitting authority for the State of New Mexico DP program. NMED has provided guidance on anticipated design requirements for the impoundment liner system, which have been incorporated into the design.

TSF process: Tailings would be transported from a sump located at the flotation plant and delivered via slurry pipeline to the cyclone plant to be located at the northwest perimeter of the TSF. At the cyclone plant, the tailings would be cycloned.

The cyclone underflow (coarse sands) would be delivered to the TSF and used for dam construction. Two cyclone underflow pipelines would be used to deliver sand to the dam. One leg of the pipeline would run around the north side of the TSF, and the other leg would be routed around the south side of the TSF. Each leg is sized to transport 100 percent of the cyclone underflow. This allows for continuous availability of sand delivery to the dam. Cyclone underflow sand would be discharged through spigots placed every 300 to 400 feet. Each spigot would include a valve to allow manual placement of the sands on the dam as required for dam construction. The underflow pipelines would also have isolation valves strategically placed to allow for isolation and relocation of the pipe as the dam rises.

The cyclone overflow would be routed to the interior of the TSF for permanent storage. When the cyclone plant is not in operation, whole tailings would be routed directly to the tailings impoundment. Water would be reclaimed from the TSF via barge-mounted pumps placed in the supernatant pool inside the TSF as well as from the TSF underdrain collection and return system. This water would be recycled to the process water reservoir for reuse in the milling operation.

The size and location of the impoundment pool would vary during the life of the project. The size of the pool would be affected by pre-deposition grading in the impoundment, the amount of tailings deposited, and precipitation, evaporation rates, and flow rates into and through the underdrain system. The location of the pool would migrate within the impoundment area as tailings beaches form. Tailings deposition would be managed to force the pool away from the embankment toward the upstream reaches of the TSF. The TSF area would be fenced to restrict access.

TSF monitoring: The TSF impoundment would be regulated by the OSE Dam Safety Bureau for safety of operations. The design and operation of the tailings impoundment dam is subject to approval of the OSE, including the closure inspection. The OSE requires monthly reports of the tonnages deposited into the impoundment along with readings of the piezometers, settlement devices, and settlement monuments that monitor movement.

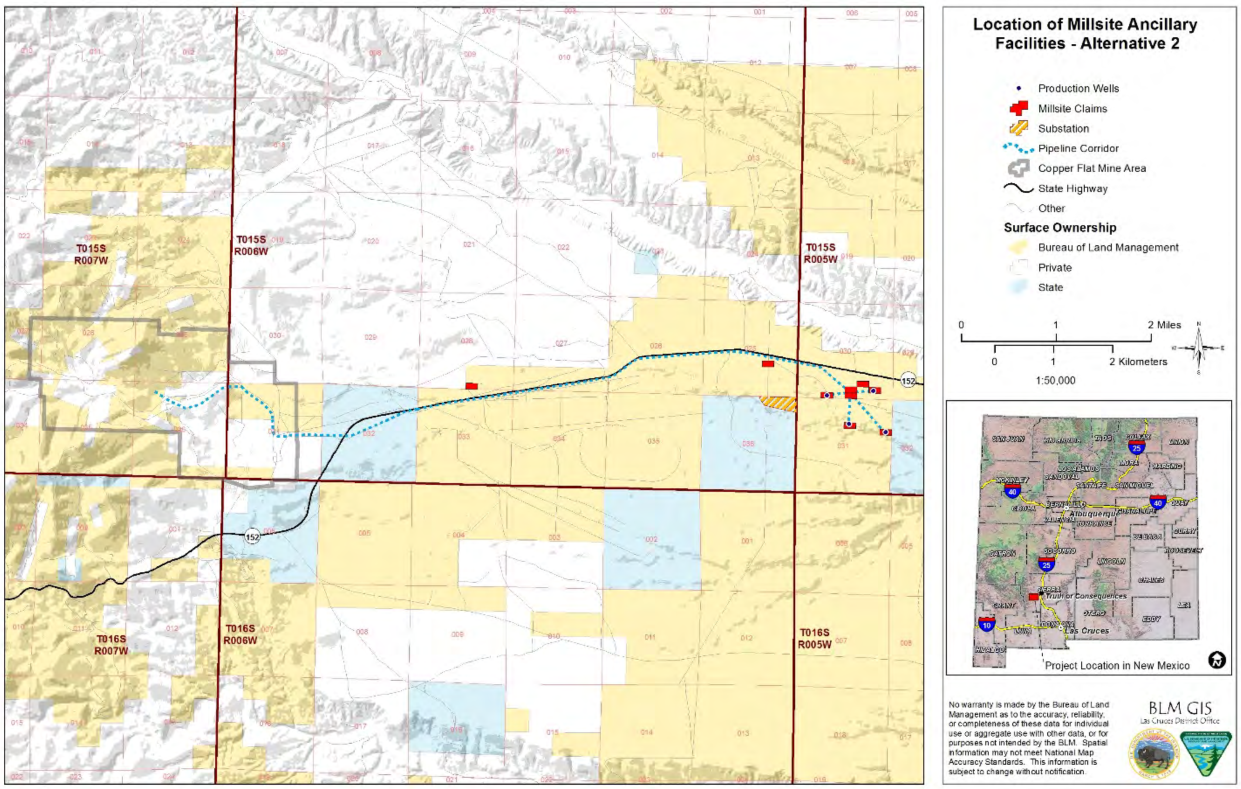
The Ground Water Quality Bureau of NMED requires a monthly report of tonnages of tails discharged along with analyses of the tailings to identify possible contaminants. Samples of water from new monitoring wells proposed for downstream of the tailings dam would be analyzed quarterly, or per specific conditions of an NMED groundwater DP, and the results sent to the NMED Ground Water Quality Bureau. These samples would be used to identify any leakage from the new, lined TSF. Abatement plans would be implemented should leakage and contamination be detected.

2.2.4.5 Ancillary Facilities

The process plant complex would include buildings such as a mine administration building, an assay lab, a mobile equipment shop, a truck scale, and the security gatehouse (NMCC 2014). The administration building would be approximately 60 feet by 120 feet with a 14-foot eave height. The building would have central heating and air conditioning and would accommodate the plant administration, engineering, accounting, secretarial, and clerical personnel. Appropriate sanitary facilities would be provided for men and women.
The assay and laboratory offices would be 40 feet by 180 feet. Appropriate sanitary facilities would be provided. A small air compressor would be mounted on an exterior concrete pad for furnishing service air to the building. The security gatehouse building would be approximately 8 feet by 12 feet. A parking area for employee vehicles would be located adjacent to the main plant entry gate. The shop and warehouse building would be an equipment servicing facility. The reagent building would be a 60-foot by 50-foot building. The buildings would all be prefabricated, standard, rigid-framed structures. All mechanical, civil, structural, and architectural designs would be in accordance with applicable standards and codes. Equipment and fabricated items would be furnished with manufacturers' standard finish and retouched after erection. Safety painting would be in accordance with MSHA standards and New Mexico mining codes. Buildings and facilities would be painted in colors consistent with guidance provided in the BLM Handbook 8400, Visual Resource Management.

Outside the mine area for the mine there are nine millsite claims that were previously established by Quintana. (See Figure 2-2.) The individual 5-acre parcels (45 acres total) would be used for staging, equipment, well pads, water tanks, pumping systems, truck access, and structures to maintain the water supply pumping stations. A 30-acre electrical substation site on New Mexico State lands is proposed to replace an existing electrical substation. (See Figure 2-2.) The proposed substation is described in further detail in Section 2.2.6, Electrical Power.

Figure 2-2. Millsite Claims to be Used for Ancillary Facilities



Source: BLM 2018.

An existing 20-inch water supply line, as described in Section 2.2.7, Water Supply, would provide fresh water needed for the mining operations. Four production wells would provide the water to the pump station. The BLM granted a ROW (ROW NMNM 125293) to allow NMCC to test the pipeline strictly for the purpose of the feasibility studies. The same ROW originally allowed access to a water facility and access roads. With amendments, the ROW added access to the pipeline, and for testing only, access to the four production wells and another six monitoring wells. This ROW could be renewed and retired if the project is approved. The pipeline would be located within a 60-foot-wide corridor, occupying the following BLM-owned, privately owned, and State-owned areas outside the mine area:

- Total BLM land area: 87.4 acres;
- Total private land area: 2.0 acres; and
- Total State land area: 37.8 acres.

2.2.4.6 Sanitary Wastewater Treatment

A packaged water treatment plant would be installed at the mine to accommodate liquid sanitary wastes generated from the mine office, shower, and restroom facilities. The location of the plant would be on a pre-existing concrete slab in the mine plant area (NMCC 2014).

2.2.5 Waste Rock Disposal Facility

The WRDF would be located adjacent to the open pit in an area used for waste rock disposal by the previous operator on the east side of Animas Peak. The disposal area would be expanded to cover approximately 155 acres and at the end of the mine life, the height of the disposal area would be at 5,725 feet amsl. Total material contained in the WRDF at the end of the expected life of the project would be approximately 33 million tons. The low-grade stockpile would cover an area of approximately 134 acres and include about 12 million tons of rock assaying less than 0.20 percent copper. The WRDF would be regraded and reclaimed to blend into the surrounding topography to the extent practicable.

2.2.5.1 WRDF Location and Design

The primary WRDF for the proposed Copper Flat project is located east-northeast of the process area on the east side of Animas Peak. Two smaller WRDFs would be located adjacent to the pit. The waste rock disposal areas would be regraded and reclaimed to blend into the surrounding topography to the extent practicable. Horizontal surfaces would be regraded and contoured to reduce infiltration of water and provide positive drainage to sediment collection points.

Water erosion controls, such as berms and diversion ditches, would be installed to divert runoff away from the WRDFs. These diversion ditches and berms would also be used to control water inflow onto waste rock disposal piles containing partially oxidized and unoxidized material. Runoff from the WRDFs and the low-grade ore stockpile would be controlled by diverting the runoff water into collection ditches and then recycling it into the process water system. No discharge is expected to occur from the WRDFs' stormwater collection system. The final grading plan for the WRDFs would be designed to eliminate surface water run-on, improve runoff, reduce infiltration, reduce visual impacts, and facilitate revegetation through back-grading or crowned grading. Catch benches would be left in place to interrupt surface sheet flow, and regrading would approximate the adjacent and nearby geomorphic land shapes. The WRDFs are designed to facilitate regrading during reclamation.

During operations, the WRDFs would be constructed in up to 200-foot lifts to facilitate regrading during reclamation so the overall slope faces would not exceed 3.0H: 1.0V. Benches would be established at the existing lift elevations and at intermediate intervals to reduce erosion. Surface runoff from Animas Peak would be diverted around the disposal area to prevent surface run-on and infiltration into the waste rock. As the WRDFs progress, concurrent reclamation would be performed on areas that are no longer needed for future mine operations or for access (NMCC 2014). Concurrent reclamation is reclamation activity that is performed while mine operations are ongoing.

For reclamation, the WRDFs and any remaining stockpiles would be regraded and surface runoff velocity dissipaters would be constructed to reduce velocities and limit erosion and soil loss. Exact design parameters, which are specific to the site climatology and soil conditions, would be reviewed and approved as part of the mine operations and reclamation plan.

To limit oxidation potential post-closure, the reclaimed waste rock and any remaining stockpiles would be covered with a reclamation cover and vegetated to limit infiltration of water and oxygen.

2.2.5.1 Reclamation Material

The quantity of reclamation material would be determined by the specifics of the mine and reclamation plans. Suitable reclamation materials would be identified in the field by qualified personnel. A sufficient quantity of reclamation materials has been identified as available for salvage. (See Table 2-3.)

Table 2-3. Available Reclamation Material (yd^3)

Table 2-3. Available Reclamation Material (yd^3)	
Location	**Quantity**
Open pit	316,000
Plant site	205,000

Table 2-3. Available Reclamation Material (yd³)	
Location	**Quantity**
TSF	14,800,000
Waste rock & low-grade stockpile facilities	1,016,000
Total	**16,337,000**

After field identification and marking, reclamation materials would be recovered and the stockpiles constructed using standard earthmoving equipment such as scrapers, excavators, loaders, trucks, and track dozers.

Three separate reclamation stockpiles are planned and a general location for each has been identified on the site plans. Specifics regarding the location and footprint of each stockpile would be finalized to address conflicts with requirements identified by other studies (cultural resources, facility access and location plans, etc.). Studies of existing soils and growth media at Copper Flat show that material characteristics are fairly consistent to depths and across areas considered for salvage. Segregating materials by soil type or horizon is not planned. The combined storage volume of the three reclamation stockpiles is sufficient to meet future needs for cover and growth media. (See Table 2-4.)

Table 2-4. Reclamation Stockpile Storage Capacity (yd^3)

Table 2-4. Reclamation Stockpile Storage Capacity (yd³)	
Stockpile ID	**Stockpile Capacity**
GM-01	510,000
GM-02	2,100, 000
GM-03	1,900,000
Total	**4,510,000**

If additional storage capacity becomes necessary, other areas suitable for storing reclamation materials are available within proposed facility footprints and inside the mine area.

During construction, the stockpiles would be built, shaped, and maintained in a manner that limits material loss due to wind erosion and equipment impacts. After shaping, the surface of the stockpiles would be seeded with an agency-approved seed mix to provide a plant cover to protect material loss from wind erosion and provide a source of organic material.

During construction, vehicle access onto the stockpiles would be limited to only vehicles and equipment needed for placement, shaping, and seeding. After the stockpiles are established, vehicle and equipment access onto the stockpiles would be prohibited except for stockpile maintenance or emergency purposes. Signs to identify the nature of the stockpile and provide notice of no access would be located around the perimeter of each stockpile. The stockpiles would be inspected for indications of vehicle access, water or wind damage, or damaged/fallen signs and prompt action would be taken to address any issues identified.

2.2.6 Project Workforce and Schedule

The estimated operational life required to recover the proven minerals (copper, molybdenum, gold, and silver) is 12 years. Labor requirements for the mine are displayed in Table 2-5.

Table 2-5. Mine Personnel Requirements - Year One – Alternative 2

Work Type	Number of Employees
Mine salary	12
Mine operators	83
Mobile maintenance	43
Mine tech services	8
Process salary	12
Process operators	38
Process maintenance, electricians, etc.	35
Process tech services	11
Administration	28
Total Mine Workforce	**270**

Source: NMCC 2014.

2.2.6 Electrical Power

Power for the project would be furnished by Tri-State Generation & Transmission (Tri-State) through its member system, Sierra Electric Cooperative. Tri-State proposes to furnish power to the Copper Flat mine area via the construction of a new 345/115-kV substation that would interconnect to the existing El Paso Electric 345-kV transmission line between Springerville and Macho Springs substations, and the existing Tri-State 115-kV transmission line between Caballo substation and the mine. The existing Tri-State 115-kV transmission line previously served the mine area until the 1980s and is not in service at this time.

The new substation is planned as a 345-kV, three-breaker ring bus substation, expandable to a future breaker-and-a-half configuration, with a 345/115-kV, 100 megavolt amp transformer bank and single breaker on the 115-kV low-side. This new primary substation would be located on a 30-acre site on State land south of Highway 152 and east of the production wells. Utilizing this new substation at the intersection of the 345-kV line and the 115-kV line, Tri-State would deliver power to the mine area via their existing 115-kV transmission line. Initial assessment indicates some pole replacement and structure modifications would be required in order for the transmission line to carry the Copper Flat mine's expected 40 megawatts (MW) of load. Tri-State would also require that a new 115-kV switch be installed at the Copper Flat mine. The plant electrical load requirement for the 30,000 tpd processing rate (10.8 million tons per year (tpy) is tabulated in Table 2-6.

Table 2-6. Summary of Average Project Electrical Demand – Preferred Alternative

Activity	Power Demand (kWh/ton)	Power Demand (GWh*/Year)
Crushing	0.38	4.10
Grinding	15.71	169.67
Flotation	2.50	27.00
Molybdenum plant	0.14	1.51
Concentrate filtering	0.16	1.73
Tailings system	0.50	5.40
Reagent system	0.24	2.59
Water system	2.69	29.05
Ancillary facilities	0.04	0.43
Total	**22.36**	**241.49**

Source: NMCC 2014.

Note: * = gigawatt hours.

In addition to the new secondary substation for mine operation, an emergency generator would be installed on-site for backup power in the event of power loss to maintain critical systems and to aid in a controlled shut down. On-site power distribution would include one 25-kV distribution line. Because of the configuration and size of these distribution lines, standard raptor-proof protective designs would be incorporated into the line design and line upgrade, as presented in the Rural Electrification Administration guidelines. This design would be used for the entire length of the distribution line within the mine area.

2.2.7 Water Supply

Water is essential to mining. It is used for ore processing, dust control, and other important activities. Water is a limited resource in New Mexico and the Copper Flat mine would implement best management practices (BMPs) to conserve this valuable resource. These BMPs would include monitoring water use, providing for water conservation, and water recycling.

The water supply for the Copper Flat mine would be comprised of two distinct types of water classifications:

- Process water: Process water is water that would be collected on-site as part of ongoing operations and that would be reused within the operation. This includes water recycled from the TSF, stormwater catchment ponds, and pit dewatering operations and water contained within the copper ore rock as moisture. Seventy-two percent of the water supply for the Copper Flat mine would be process water.
- Fresh water: Fresh water is water that would be pumped to the site from off-site groundwater wells. Fresh water would be necessary to supplement process water in order to meet total water use requirements. NMCC would employ water conservation measures during the design and through the entire life of the mine. These measures would come from a combination of water recycling or reuse activities as well as activities that would decrease the need or use of water in order to minimize the amount of fresh water pumped to the site. Twenty-eight percent of the water supply for the Copper Flat mine would be fresh water.

2.2.7.1 Water Use

Total water use under the Preferred Alternative for the Copper Flat mine, including 15,504 AF of recycled water, would be approximately 22,210 AF on a yearly average basis. Total water use is presented in Table 2-7.

Table 2-7. Total Water Use in Acre-Feet – Preferred Alternative

Table 2-7. Total Water Use in Acre-Feet – Preferred Alternative	
	Preferred Alternative
Average annual water use (AF)	22,210
Average water used to process 1 ton of material (gallons)	632
Total water use* – life of mine (AF)	257,000

Note: * Includes recycled water.

Ninety-six percent of this water would be used for processing copper ore. The other four percent of water use would be for dust control, maintenance, laboratory, and sanitary use. Average annual water use by process is presented in Table 2-8.

Table 2-8. Water Use by Process – Preferred Alternative

Table 2-8. Water Use by Process – Preferred Alternative				
	Acre-Feet per Year			**Percent of Total**
Water Use	**Recycled**	**Non-recycled**	**Total**	
Ore Processing:				
Reclaimable TSF water	15,504	0	15,504	70%
Water retained in tailings	0	4,973	4,973	22%
Evaporation	0	752	752	3%
Concentrates	0	13	13	<1%
Subtotal	**15,504**	**5,738**	**21,242**	**96%**
Dust control	0	726	726	3%
Other	0	242	242	1%
Total Use	**15,504**	**6,706**	**22,210**	**100%**

Note: Columns may not sum exactly due to rounding.

Reclaimable TSF water: A portion of the water contained in the tailings that are deposited in the TSF would be reclaimed. This portion of water, referred to as reclaimable TSF water, would be reclaimed at the TSF through a designed water collection system for reuse. Other portions of the water contained in the tailings would not be reclaimable due to being entrained within the tailings or lost due to evaporation. As shown in Table 2-8, reclaimable TSF water would be the single largest use of water at the operation.

Water retained in tailings: A percentage of the water deposited in the TSF with the tailings would be retained within the tailings. Entrainment of this water within the tailings would prevent it from being reclaimed by the TSF collection systems in a timely manner.

- **Evaporation**: Some water used within the ore processing circuit would be lost due to evaporation. The majority of evaporation would occur at the supernatant pond located within the TSF, but additional evaporation losses would occur throughout the process.

- **Concentrates**: Copper concentrate produced at the site would be dewatered through a filtering process prior to shipment. However, some moisture would be retained and shipped off-site with the concentrates.
- **Dust control**: Water would be used for dust control within the mine on roads and other traffic areas.
- **Other**: The "other" category is the summation of small amounts of water that would be used throughout the site (mine operations and maintenance activities, laboratory use, sanitary use, and contingency).

The washing facility for mobile equipment would be equipped with a water/oil separator system. Gray water from the equipment wash facility would be reused for washing equipment or recycled for use in the ore processing stream. Sediment from the equipment wash facility would be taken to the TSF for disposal.

2.2.7.2 Water Sources

Table 2-9 summarizes the water sources and amounts that would be used at the proposed mine under the Preferred Alternative.

Table 2-9. Water Sources – Preferred Alternative

Table 2-9. Water Sources – Preferred Alternative				
	Acre-Feet per Year			Percent of Total
Water Source	**Recycled**	**Non-recycled**	**Total**	
Process Water:				
Water reclaimed from TSF	15,504	0	15,504	70%
Stormwater	304	0	304	1%
Moisture in the ore	258	0	258	1%
Pit dewatering	39	0	39	>1%
Subtotal	**16,105**	**0**	**16,105**	**72%**
Fresh water for mine operation (groundwater wells)	0	6,105	6,105	28%
Total Use	**16,105**	**6,105**	**22,210**	**100%**

Note: Columns may not sum exactly due to rounding.

Process water sources: The majority of the 22,210 AFY of water that would be used at Copper Flat would be process water sourced on-site. These process water sources would provide for 16,105 AF per year (72 percent) of the total water use by the Copper Flat operation. Process water sources would include:

- Water reclaimed from the TSF and recycled; and
- Water collected from stormwater catchment ponds and reused within the operation.

Stormwater that would come in contact with disturbed mine and plant site areas would be collected in catchment ponds and recycled into the process water system. The use and ongoing maintenance of diversion ditches, dams, and berms would limit the amount of stormwater that would come in contact with disturbed areas and collected in catchment ponds.

The use of pit water would be for dust control only, would require a groundwater DP from the NMED, and would be subject to the applicable New Mexico groundwater standards in 20.6.2.3103 NMAC. Pit dewatering activities would be managed according to a mine operation and water management plan approved by the NMED. The mine operation and water management plan is a component of the NMED Groundwater Discharge Permit Application (NMCC 2014).

Fresh water source: The BLM may authorize this mine project; any operations are premised on the acquisition of necessary water rights under the authority of the OSE for the life of the mine plan. Four groundwater production wells would be sourced for fresh water. They are located approximately 8 miles east of the proposed mine site and south of NM-152 on BLM land. These wells (PW-1, PW-2, PW-3, and PW-4) were drilled by Quintana. Production wells 1, 2, and 3 were drilled in 1975-1976 and PW-4 was drilled in 1980. All four wells have 16-inch-diameter steel casing and vary in depth from 957 to 1,005 feet below ground surface. The wells were tested after completion to establish individual well capacities and were the main source of water for the Quintana operation in 1982. All four production wells have remained intact and locked shut since the end of the Quintana operation and there have been no subsequent events that would compromise the quality of the water in these wells. In 2012, NMCC conducted well maintenance on PW-1 and PW-3, installed pumps in those wells to test their capacity, and conducted a localized aquifer test. The water quality in the production wells meets groundwater standards in the State of New Mexico.

Water pumped from the production wells would be conveyed through a 10-inch steel pipe to a pump station located on millsite claims between PW-1 and PW-3. From this pump station, water would be conveyed in the existing 20-inch underground pipeline to a second pump station located within the mine and plant site area. The existing 20-inch welded steel pipeline is associated with ROW Grant #NMNM 125293 and the pipeline is buried a minimum of 2 feet deep from the well field to the point of entry to the permit area. From the second pump station, water would be conveyed via pipeline for use.

Fresh water would provide for 6,105 AFY (28 percent) of the total water use for this alternative.

2.2.7.3 Water Conservation

NMCC would employ water conservation measures during the design phase and through the entire life of the mine. Efforts to conserve water would come from a combination of water recycling or reuse activities as well as activities that would decrease the need for or use of water. Conservation measures involving water recycling or water reuse are discussed further in Section 2.2.7.4, Water Recycling. Water conservation measures that would be taken to decrease the need or use of water are discussed in Section 2.2.7.5, Decreasing Water Demand.

2.2.7.4 Water Recycling

Water available for recycling would consist of water collected on-site as part of ongoing operations and reused within the operation. Approximately 72 percent of the water supply for the proposed mine operation would be recycled water. The largest source of water for recycling is process water reclaimed from the TSF. Recycling water from the TSF is the largest single water conservation activity that would be employed at the proposed mine. The majority of the water use at the mine would be for ore processing, and the majority of the ore processing water would be recycled. Process water would be recovered from the TSF and returned to the ore processing circuits to offset fresh water needs. Processing ore at the mine would require approximately 633 gallons of water per ton of ore processed, an amount that is typical of copper flotation circuits. Of this amount, approximately 415 gallons would be supplied through recycling water from the TSF. Other sources of recycled water at the mine would include stormwater harvesting; pit dewatering; returning gray water to the process stream; and concentrate dewatering.

2.2.7.5 Decreasing Water Demand

When a mining operations process either limits water loss or decreases the amount of water required to complete the process, the overall water required for the mine to operate decreases. Methods that would be employed on an adaptive management basis to reduce water loss or decrease water demand at Copper Flat include:

- Managing the TSF to limit the size of the supernatant pond;
- Limiting driving surfaces;
- Limiting surface disturbance;
- Interim reclamation;
- Minimizing open launders and ditches;
- Improving control of water truck sprays;
- Covering solutions storage tanks;
- Installing water efficient fixtures; and
- Preventing spills and leaks.

Additional discussion and information regarding the primary water conservation actions that would be implemented at the mine is provided below.

- **Manage TSF supernatant pond:** The size of the supernatant pond at the TSF would be managed and controlled to reduce evaporative water losses.
- **Stormwater recycling:** The mine area and TSF would be graded to limit stormwater run-on from reaching impacted areas. Impacted areas would be graded to capture the stormwater that came in contact with impacted areas, and this water would be contained in catchment ponds and recycled for use. Site plans have been prepared and evaluated using regional precipitation and runoff calculations; stormwater recycling would provide approximately 304 AFY of process water.
- **Pit dewatering:** The existing pit lake contains approximately 20 to 28 million gallons (61 to 86 AF) of water (NMCC 2014). During operation, NMCC estimates that groundwater would continue to seep into the pit at an annual average rate of 24 gpm (39 AFY). Pumping of the pit lake would be necessary prior to mining and continuously throughout the life of the mine. Minor drilling work in 1976 indicated that groundwater in the pit area is localized in the larger fractures. As a result of seasonal precipitation, the pit water level has fluctuated by 1 to 5 feet per year. The water inflow into the pit would be used for dust suppression on the roads and waste rock dumps. If necessary, pit water could be temporarily stored in a tank or reservoir in the area of the pit. Water removal from the pit would continue over the operational life of the mine through a sump or series of sumps located within the pit. Water removal would end once mining is completed.
- **Concentrate dewatering:** After production, the final concentrate product would be dewatered by filtering prior to shipment and the reclaim water would be returned to the process circuit for reuse. In the proposed mine design, the concentrate filters would recover approximately 83 percent of the water content of concentrates entering the concentrate filter plant.
- **Gray water reuse:** Gray water from the equipment wash facility would be reused for washing equipment or recycled for use in the ore processing stream.
- **Surface treatment of roads:** Permanent haul roads and secondary access roads would be conditioned with an approved soil stabilizer product to bind fines and reduce water requirements for dust control. Field experience shows that water requirements for dust control can be significantly reduced through proper application and management.

- **Minimizing disturbed areas:** Construction of new haul roads, secondary access roads, and other graded areas would be limited and, where feasible, existing roads and graded areas would be closed off to traffic to reduce water required for dust control.
- **Interim reclamation:** Growth media stockpiles and disturbed areas no longer required for the operation would be graded and revegetated to reduce water requirements for dust control.
- **Minimizing open launders and ditches:** Open launders and ditches would be limited to reduce water loss to evaporation.
- **Covering solution tanks:** Fresh water tanks and, where possible, process solution tanks would be covered to reduce water loss to evaporation.
- **Water efficient fixtures:** The operation would specify water efficient fixtures in facilities to reduce water demand.
- **Water management system:** Water meters, flow control devices, and tracking logs would be employed on fresh and process water circuits. Logs would be monitored and analyzed on a regular basis to identify potential water losses and prompt action would be taken to address issues when identified. In the event of water losses (i.e., a leak in the system), the response would be to find and repair the leak and clean up spills as necessary.
- **Water truck auto spray control:** Mine water trucks would incorporate digital spray control to limit overspray and overwatering conditions. Though digital spray control systems are a new application for the industry, empirical data indicates a potential 25 percent improvement over non-controlled systems.

2.2.8 Plant Growth Media

Available growth media would be salvaged and stored in stockpiles for reclamation. Growth media would consist of soils stripped prior to surface disturbance activities and containing some organic matter. Growth media remaining in a stockpile for one or more planting seasons would be shaped for erosion control and seeded with an interim seed mix to stabilize the material, reduce establishment of undesirable weeds, and assist with control of blowing dust.

2.2.9 Borrow Areas

Borrow sources would be required for prepared sub-grade materials, drainage materials, pipe bedding materials, road surfacing materials, retarding layer materials, reclamation materials, growth materials, and riprap. Construction-related borrow areas would be located within facility footprints.

Borrow area locations would depend on construction requirements and material conditions as well as locations of cultural resources sites that must be avoided. NMCC would obtain borrow materials from the TSF area. Other areas within the areas disturbed by construction and mining activities would be used as needed, including the pit area and the waste rock and low-grade ore stockpile areas. Borrow areas would be kept free of steep walls and would be sloped and stabilized to allow for safe wildlife entry and exit and to prevent erosion (NMCC 2015a).

With regard to reclamation cover, no areas unaffected by construction and mining activities are currently proposed to be disturbed in order to obtain these cover materials. Several borrow areas within the limits of the tailings impoundment would be the main source of the reclamation cover. Mine haul trucks and front- end loaders would be used to excavate the required materials during the construction period and stockpile it in designated locations. These locations were chosen to reduce haul distances and to limit erosion. The stockpiles would be constructed with 3H.0:1V slopes.

2.2.10 Inter-Facility Disturbance

As with most mining facilities, general ground disturbance occurs around and between structures and facilities as a result of construction, operation, and maintenance. This inter-facility disturbance is in addition to the formal footprint created by design. NMCC has included disturbance buffer zones surrounding specific facilities (i.e., tailings impoundment, waste rock disposal areas, open pit area, etc.) for the purpose of calculating the surface area for disturbance in order to ensure that the full extent of disturbance associated with these facilities is accounted for and that appropriate reclamation and bonding of these areas can be facilitated.

2.2.11 Fencing and Exclusionary Devices

NMCC would construct BLM-approved barbed wire fencing to prevent livestock from entering the WRDFs and TSF. Wildlife exclusion fences would be constructed around the pit and other water and solution ponds to keep out wildlife such as deer, antelope, and smaller animals. This fencing would meet New Mexico Department of Game and Fish (NMDGF) standards for wildlife exclusion fencing that require an 8-foot-high fence, chain link or welded wire material. The bottom portion of the eight-foot chain link fence should be finer meshed and wrapped in a durable and corrosion-resistant material that would exclude small mammals and other terrestrial species. This portion of fencing should extend from ground level to a height of at least three feet. Additionally, the bottom of the fence should be buried to prevent animals from digging underneath.

NMCC would monitor the fences on a regular basis and repairs would be made by NMCC as needed. In the event that livestock manage to enter the proposed mine area via a gate or opening in a fence, the grazing permittee would be contacted immediately. NMCC would assist as requested in moving these animals out of the proposed mine area.

The use of avian exclusion devices would be employed as needed to prevent deleterious exposure of birds to toxic chemicals or conditions used or created by mining and mineral processing operations.

2.2.12 Haul Roads and On-Site Service Roads

Haul roads would be constructed and utilized to haul material to the crusher, stockpiles, and waste rock disposal areas and to access the truck shop area and equipment parking areas. Some minor realignment of these roads may be necessary and road widths would vary. The on-site roads would be constructed and utilized for easy access and traffic movement within the mine area.

During operation of the proposed mine, water trucks would be used as needed to control emissions of fugitive dust from the haul roads as well as other roads within the mine area. Wetting agents and binding agents, such as magnesium chloride, would also be used to control dust as a water conservation measure.

2.2.13 Transportation

Access from the site is by 3 miles of all-weather gravel road and 10 miles of paved highway (State Highway 152) east to I-25, near Caballo Reservoir. The 10 miles on State Highway 152 to I-25 is mainly a straight and relatively flat road that does not include any sharp turns or significantly adverse grades. I-25 is a primary north-south highway. Traffic associated with reestablishment of the Copper Flat project would be broadly grouped as follows:

- **Concentrate shipments:** After production, shipment of concentrate and other products would be trucked off-site. Copper concentrate would be hauled by 25-ton capacity highway trucks towing 10-ton trailers to I-25 and then to a nearby railhead in southern New Mexico. It would then be transported by rail to a smelter in North America or to port facilities for shipping to Asia or Europe. A concentrate storage shed is planned at the railhead. NMCC would lease land and construct a concentrate storage shed to receive and store concentrates at the rail siding located at Rincon, New Mexico, which is 45 road miles from the project site. The shed would be fully enclosed for security and to control dust emissions from stored concentrate. Rail cars would be loaded by conveyor. Plans for the concentrate storage facility include a wheel loader, loadout hopper and conveyor, and a winch system for positioning rail cars under the loading conveyor. Concentrate would be shipped by rail to the seaport at Guaymas, Mexico. Rail line to the port is existing and active. Facilities at the port would be owned and operated by a third party. Molybdenum concentrate and any other mineral would be filtered, dried, and packaged on-site and then transported to an off-site refinery by truck.

- Copper concentrate shipment schedule (hauling weekdays only) would be:

  Years 1–6+ ship: 14 to 19 truckloads per day, 5 days per week.

- Molybdenum concentrate shipment schedule (hauling weekdays only) would be:

  Life of mine: ship three truckloads per month (NMCC 2014).

- **Incoming supplies:** Vendors, equipment, and service suppliers are anticipated to make an average of 10 to 15 trips per day by truck, in total, to the mine. Except for emergencies, deliveries to the mine would be scheduled to occur during the day shift on Monday to Friday. Title 49 Code of Federal Regulations (CFR) regulates the transportation of hazardous materials in commerce. Anyone who transports, packages, loads, unloads, or in any way assumes responsibility for marking, labeling, or handling of any regulated hazardous materials must comply with 49 CFR. In addition, carriers must comply with the Federal Motor Carrier Safety Regulations of the Department of Transportation (DOT) (parts 383, 390, 397, and 399). Hazardous materials required for operation of the Copper Flat project include gasoline, diesel fuel, propane, other petroleum products, explosives, solvents for degreasing of machinery and equipment, and laboratory chemicals. These materials would be purchased from various vendors and brought to the site by truck. NMCC would ensure that the Hillsboro volunteer fire department and the Sierra County fire district are aware of the nature of the materials routinely being transported to the site, and that they have appropriate response training in the event of a spill or other accident involving hazardous materials.
- **Employees and visitors:** The majority of employees are expected to commute from the local area. It is anticipated that the majority of employees would carpool in groups ranging from two to five individuals per vehicle trip. Applying an average of 3 employees per carpool, and accounting for the planned rotation schedules, the operation would expect 40 to 45 vehicle trips for employees on day shifts Monday to Friday; 25 to 30 vehicle trips on weekend days/nights; and night shift seven days per week for a total of 65 to 75 employee vehicle trips per day. An additional 15 to 20 trips per day would be expected by visitors and sales representatives. NMCC would encourage employee car and van pools. At present, there are no plans for a company-operated employee transportation system. There are no plans for rail or air access to mine facilities or operations.

2.2.14 Exploration Activities

NMCC conducted exploration activities in 2010, 2011, and 2012 to identify new reserves and expand existing reserves within the plan area. All NMCC exploration activities were completed under appropriate approvals from Federal and State agencies. Exploration and mineral evaluations were focused within and on previously disturbed Federally-administered land and privately-owned patented lands. Exploration disturbance generally included the construction of access roads, drill pads, sumps, trenches, surface sampling, bulk sampling, and staging areas. Exploration methods included both reverse circulation and core drilling, with minor trenching also conducted.

Additional future exploration activities are planned; however, exact locations of the exploration disturbance have not been determined. Future exploration activities would be composed of approximately 15,000 linear feet of drill road (average width of 20 feet), approximately 100 drill pads (average dimensions of 100 feet by 100 feet), and approximately 150 drill holes (average diameter of 5 inches; average depth of 1,200 feet below ground surface). The BLM would require future exploration activities to be handled on a case-by-case basis.

In addition to exploration activities and once mining activities commence at Copper Flat, ongoing development drilling would be required to support the operation. Development drilling would be necessary to supply data and access in the support of mine planning, reserve estimation, ore control, and pit-slope monitoring functions. Development drilling could also become necessary for pit-slope dewatering if it becomes necessary to dewater the pit slopes for stability purposes as the pit deepens. Development drilling would be conducted within the pit as well as areas adjacent to the pit perimeter. Disturbance created by development drilling activities would be within the life-of-mine pit disturbance area.

2.2.15 Reclamation and Closure

The Copper Flat mine area would be reclaimed to achieve a self-sustaining ecosystem appropriate for the climate, environment, and land uses of the area. The objective of the reclamation plan is, at a minimum, to return the mine area to conditions similar to those present before reestablishment of the mine. The project is designed to meet, without perpetual care, all applicable Federal and State environmental requirements following closure.

2.2.15.1 Statutory and Regulatory Requirements

Reclamation of disturbed areas caused by the project would comply with Federal and State regulations. Under the Federal Land Policy and Management Act, the BLM is responsible for preventing undue or unnecessary degradation of Federally administered public land, which may result from operations authorized by the mining laws (43 CFR 3809). The New Mexico Mining Act requires the preparation of a reclamation plan for submittal and approval by MMD and the NMED. In addition, closure of the tailings embankment must also comply with requirements of the OSE. Reclamation activities would be carried out concurrent with mine operations wherever possible, and final closure and reclamation measures would be implemented at the time of mine closure.

2.2.15.2 Pit Lake Reclamation

Major land uses occurring in the vicinity of the mine area are mining, grazing, wildlife habitat, watershed, and recreation. Following closure, the mine area would continue to support mineral development, grazing, wildlife habitat, watershed, and recreation. Following closure, the pit would partially fill with water from subsurface groundwater flow and surface water runoff resulting in a permanent impoundment. It is expected that the overall pit lake management plan would be optimized through several processes considered at pit closure including:

- Reducing, to the extent practicable, post-mining inflows of contaminated water caused by oxidation of sulfide minerals in pit highwalls;
- Filling of the pit lake with water to rapidly submerge sulfide minerals that would be exposed on the pit floor and lower highwalls;
- Selective excavation of acid generating rocks that would be exposed in the pit highwalls above the pit lake water level and submergence of these materials within the pit lake; and

- Conservation measures of potential inflows of contaminated water from exposed rock surfaces and mine waste rock dumps within and near the pit through placement of vegetated soil covers during reclamation.

Assuming that the recommended conservation measures are implemented and effective, the expected value of the water quality measurement indicator for the pit lake would be zero and the pit lake would continue to meet applicable water quality standards set by the New Mexico Energy, Minerals, and Natural Resources Department (NMEMNRD). This value of the pit lake water quality measurement indicator is the same as that for the existing condition.

2.2.15.3 Summary of Disturbance

Reconstruction would involve utilization of existing foundations and previously disturbed land where feasible. For the Preferred Alternative, approximately 57 percent of the proposed disturbance would take place on areas disturbed during the previous operations. New disturbance of previously undisturbed land would be kept to a minimum. Approximately 43 percent of the new disturbance would be related to the tailings and waste rock facilities.

Areas to be disturbed are divided into the following major mine components: TSF, open pit area, WRDFs, stockpiles, process facilities, stormwater diversions, structures, roads, and exploration. The utility corridor, access road, and surface water diversions were developed during the previous operations, and no further disturbance associated with these facilities is anticipated. The majority of the haul roads were also developed during previous operations and only minor additional disturbance would be related to haul road construction.

2.2.15.4 Reclamation Objectives

The objective of mine reclamation is to restore disturbed areas to a self-sustaining ecosystem consistent with applicable regulations, post-mining land use, and mine reclamation standards. Specific objectives of the Copper Flat reclamation plan are to:

- Meet or exceed applicable State and Federal reclamation requirements through application of most appropriate technologies and BMPs.
- Prevent erosion and limit contribution of suspended solids to streams and other bodies of water through employment of BMPs and contemporaneous reclamation. Contemporaneous reclamation would be conducted on disturbed areas not to be re-disturbed by future mining operations.
- Protect human health and safety, the environment, wildlife and domestic animals, cultural resources, hydrologic balance, and extant riparian and wetland areas, including reclamation of any streams that may be impacted by the mining operations.
- Protect the quality of surface and groundwater resources by minimizing pollutant formation and on-site containment of any unavoidable toxicity.
- Preserve suitable topsoil and other approved topdressing material for use in reclamation by employing appropriate technologies and BMPs for sampling, testing, replacement, and stabilization.
- Establish surface soil conditions most conducive to regeneration of a stable plant community through stockpiling, and reapplication of alluvial or soil material where feasible.
- Revegetate disturbed areas with a diverse mixture of appropriate plant species in order to achieve a self-sustaining ecosystem.
- Maintain public safety and site stability through appropriate recontouring and revegetation of disturbed areas within the mine area.

After completion of mining and processing, surface facilities, equipment, and buildings related to the mining project would be removed, foundations broken and removed from public land, and the plant site returned to conditions similar to those present before reestablishment of the mine. The topography, slopes, and aspects of the disturbed and reclaimed areas would conform to the existing physiographic forms of the Copper Flat area.

2.2.15.5 Implementation

Contemporaneous reclamation would be conducted on disturbed areas not to be re-disturbed by future mining operations. Both public and private land would be reclaimed. Upon completion of mining activities, the site would be restored in accordance with the restoration and reclamation plan. The reclamation and restoration must be demonstrated to be sustainable without perpetual care. Closure of the site would be accomplished by the following activities:

- **Pre-construction and permitting:** In this stage, baseline data is collected to characterize the existing environment.
- **Construction:** Where feasible, the existing soils and suitable alluvial material would be removed first from major disturbance areas (tailings impoundment, waste rock disposal areas, etc.), then stockpiled, protected, and used in the reclamation and restoration process. The revegetation test program would be initiated during this phase of the operation.
- **Operations:** Reclamation and restoration efforts would be implemented at the earliest feasible time in areas where activities are discontinued. This includes recontouring; scarifying; placement of soil, alluvial material, and other approved topdressing material; and revegetation. The revegetation test program and concurrent reclamation would be monitored during this phase to provide data that would be utilized to determine final closure methods to be implemented to achieve reclamation and restoration goals and pre-determined plans, subject to regulatory approval.
- **Closure:** Upon closure of the mining operations, facilities would be reclaimed according to the reclamation plan.
- **Post-closure monitoring:** Following the completion of reclamation and closure activities, revegetation would be monitored for at least two growing seasons and would meet Part 6 requirements under the New Mexico Mining Act. Groundwater would be monitored according to conditions set forth in the groundwater DP, which was prepared by NMCC for submission to the NMED and is currently undergoing technical review.

2.2.15.6 Environmental Considerations for Reclamation

This subsection summarizes the environmental considerations that factored into the proposed mine reclamation procedures.

Signs, markers, and safeguarding: Measures such as signs, markers, fences, and barricades would be used to protect the public, wildlife, and domestic animals from potentially dangerous areas associated with the project.

Wildlife and domestic animal protection: Reclamation of the Copper Flat project would be conducted to achieve a stable configuration, and access to the site would be restricted for protection of the public and animals. The project would result in the reclamation of over 910 acres of land disturbed by previous mining activities. NMCC would construct BLM-approved barbed wire fencing to prevent livestock from entering the WRDFs and TSF. Wildlife exclusion fences would be constructed around the pit and other water and solution ponds to keep out wildlife such as deer, antelope, and smaller animals. This fencing would meet NMDGF standards for wildlife exclusion fencing that require an 8-foot-high fence, chain link or welded wire material, with finer mesh at the bottom to exclude smaller animals.

Cultural resources: Cultural resources requiring protection and any cemeteries or burial grounds would be protected or avoided during reclamation activities. This includes any resources identified before or during project activities.

Hydrologic balance: This subsection describes measures used to maintain the hydrologic balance of the mine permit area to account for the inflow to, outflow from, and storage in the hydrologic unit of evaporation, precipitation, runoff, and the change in water storage. Several provisions are in place including recycling, runoff diversion, and control of infiltration that would optimize the use and quality of water resources in the mine area. Additional details on these provisions are described below:

- **Acid rock drainage (ARD):** Partially oxidized transitional waste rock would be managed and reclaimed to alleviate potential ARD. The transitional waste rock may be segregated and placed in the west and north waste rock disposal areas. The exact method of disposal and possible segregation would be determined though the current geochemical testing program and the development of a material handling plan. To minimize oxidation post-closure, waste rock would be placed in an engineered WRDF (NMCC 2014). The WRDFs would be contoured to enhance runoff; covered to reduce infiltration; and reclaimed by regrading. This would be done with a dozer that would compact the surface and cover this surface with up to 36 inches of growth media or topsoil (or as may be allowable under State statutes). The WRDFs containing transitional material would be located adjacent to the pit.
- **Suspended solids:** Sediment control would be achieved by the use of BMPs including regrading, seeding and mulching, silt fences, straw bale dams, diversion ditches with energy dissipaters, and rock check dams at appropriate locations during construction and operation. Diversion structures, including existing structures, would divert run-on away from disturbed areas. All sediment control structures would be monitored and maintained on a regular basis. During operations, all runoff from the plant site would be directed into a sediment pond located on the east side of the site adjacent to the make-up water pond. Following reclamation, all ponds would be regraded to prevent holding water, surfaces covered with growth media, and vegetated.
- **Diversions and overland flow:** The surface drainage of the mine area was designed to contain or control the 100-year/24-hour storm event. During reclamation, most areas would be regraded and, where possible, the original drainages restored. The diversion of surface water runoff around the waste rock disposal areas would remain in place. Ditches would be lined with riprap as needed to protect the channels from erosion.
- **Stream diversions:** The watershed area to the west of the pit is drained by Greyback Arroyo, an ephemeral stream that is dry over most of its length except during the rainy season. Greyback Arroyo used to pass through the pit area. This drainage has been intercepted, diverted around the southern periphery of the pit, and returned to the original channel east of the pit area. This was accomplished by cutting a channel through the ridges and placing diversion dams in the tributary arroyos. Following closure of the previous operation, the diversion was left in place. The diversion would be left in place following closure of the proposed operation.
- **Impoundments:** The tailings impoundment would be designed, constructed, and maintained to prevent adverse impacts to the hydrologic balance and adjoining property, and to assure the safety of the public and wildlife.

Prevention of mass movement: All slopes, impoundment embankments, and WRDFs would be designed, constructed, and maintained to prevent mass movement during operations and following closure.

Riparian areas: The riparian areas south and east of the proposed plant area are in the existing Greyback Arroyo channel. The Preferred Alternative does not change the flow of water through the diversion channel and Greyback Arroyo.

Roads: Access to the site is via an existing county road (Gold Dust Road/County Road 27), which would remain following closure. Prior to final closure, the State of New Mexico and the BLM would determine which other roads would be left intact around the site in order to conduct post-closure monitoring or provide adjacent landowner access. All other NMCC mine-related roads would be reclaimed.

Surface facilities or roads not subject to reclamation: A number of pre-1981 primitive roads exist within the proposed mine area. Some of these roads would not be utilized during the currently proposed operation and therefore are not subject to reclamation by NMCC.

Drill hole plugging and water well abandonment: Mineral exploration and development drill holes, monitoring, and production wells subject to State regulations would be abandoned in accordance with applicable rules and regulations (NMAC 19.27.4 et seq.). Borings or wells that penetrate a water-bearing stratum would be plugged under the terms of an NMAC 19.27.4 OSE-approved Well Plugging Plan of Operations, which typically calls for the placement of a column of sealant from maximum depth to ground surface to prevent cross contamination between aquifers and to prevent contamination by surface access. Monitoring wells around the tailings impoundment would be maintained until NMCC is released from this requirement by the NMED, MMD, and the BLM. These wells would then be plugged and abandoned according to applicable requirements.

2.2.15.7 Post-Closure Monitoring

Monitoring would be ongoing throughout the life of the operation, during closure, and for a post-closure period. The post-closure monitoring period includes final abandonment of monitoring wells (ROW Grant #NMNM 125870) and reclamation of access roads needed for monitoring (NMCC 2014). The BLM and State agencies would set post-closure monitoring requirements at mine closure. Sampling of the water in the pit after mine closure would continue for a period that is established by consultation with the NMED to determine any changes in pit water quality. The tailings dam/pond would be regulated by the OSE for safety of operations. A DP that requires monitoring for seepage into the groundwater would be required from the NMED Ground Water Quality Bureau. Following closure, water samples from monitoring wells located downstream of the tailings dam and in the plant and pit area would be taken and analyzed on a regular basis and the results sent to the Ground Water Quality Bureau in accordance with monitoring requirements set forth in the DP. These samples would identify any seepage from the tailings pond or other mine units at the facility that have the potential to impact groundwater quality. The DP would contain contingency requirements that would address groundwater exceedances resulting from leakage from the tailings dam and, if necessary, require an abatement plan to address groundwater exceedances.

2.2.15.8 Site Stabilization and Configuration

The mine area would be stabilized, to the extent practicable, to prevent future impact to the environment and protect air and water resources. All facilities, slopes, embankments, and roads would be designed, constructed, maintained, and reclaimed to achieve stable configurations. The topography, slopes, and aspects of the disturbed areas would be developed to blend in with the surrounding topography as much as practicable. All drainage channels, ditches, and earthen water control structures would be revegetated to the extent practicable. Additionally, riprap, sediment traps, or other types of BMPs would be utilized as needed to prevent erosion. Alluvial materials suitable for surface treatment would be salvaged from disturbed areas where safe and feasible operation of earthmoving equipment is possible and would be stockpiled and protected for use in reclamation.

2.2.15.9 Plant Growth Media and Cover Materials

This subsection describes the how the mine site would be restored.

Removal and storage: Suitable soil material available for reclamation from the previously mined and disturbed areas at the mine area is very limited. Where salvageable soil exists either on undisturbed or reclaimed areas, NMCC would salvage as much material as can be safely and practically recovered. The lack of reclamation cover material available from previously disturbed areas and the poor development of topsoil (top dressing) at the site would require the evaluation of alternative sources and types of materials for use as reclamation cover. The estimated volumes of salvageable cover material available in areas to be newly disturbed or re-disturbed by the project are shown in Table 2-3, above.

NMCC plans to salvage the near-surface alluvial materials from within the limits of the tailings impoundment to cover the identified soil deficit to meet reclamation cover requirements.

Diversion ditches would be constructed and maintained around the reclamation material stockpiles to prevent run-on erosion. They would be seeded with an interim, weed-free seed mix. Seeding is typically done once, right before the monsoon season. Efforts would be made to salvage the existing vegetation on the areas that would be newly disturbed by the project. Prior to and during soil salvage, woody plants and vegetation would be removed. The vegetation would be stored with the growth media to increase the organic matter content of the growth media.

Placement: The goal is to salvage sufficient growth media and alluvial material to provide required cover on areas to be revegetated. Table 2-10 shows the required cover volumes by specific disturbed areas. The final details of the placement and use of these materials in reclamation would be approved by the State and the BLM following analysis of the results of a test-plot program that would be conducted during the mining operation. To ensure good contact with the subsoils, the surface would be roughened by ripping or disking prior to placement of the cover material. The cover material would be spread and graded with care taken to prevent a reduction in bulk density by limiting the number of passes. Following placement, the area would be graded with a dozer to lightly compact the soil.

Amendments: Soils and alluvial materials to be salvaged for reclamation cover are deficient in nitrogen, phosphorus, and potassium and would require 4,000 to 8,000 pounds per acre of amendments to create fertile growth media. Aerobically digested sanitized sewer sludge, cotton husks, and feedlot cattle waste are possible natural materials that might be used, if available, to amend the growth media prior to placement on reclaimed areas. Composting of materials, if required, would be performed on-site to better control the rate and amount of composting. Any natural soil amendments used would be certified free of invasive and noxious weeds. Repeated applications may be required based upon additional testing and vegetation monitoring.

Revegetation: The revegetation plan is designed to create a stable, self-sustaining plant community and would be in conformance with the planned post-mining land uses of wildlife and grazing. The dominant biotic community of the Copper Flat area is Chihuahuan desert scrub (often dominated by creosote bush).

To achieve the post-mining land use of wildlife and grazing, revegetation of the site would consist mainly of the establishment of grass and shrub species characteristic of the desert grassland community. Appropriate native riparian and hydrophilic plant species (willows, cottonwood, cattails, sedges, etc.) shall be planted in shallow areas near the shoreline of the pit lake after mining is complete.

Table 2-10. Estimated Reclamation Cover Requirements

Table 2-10. Estimated Reclamation Cover Requirements						
				Cover Source		
Facility	Regraded Surface Area[1] (acres)	Cover Thickness (ft)	Cover Requirement (reclamation cy)	Direct Haul (cy)	Windrow / Berm Next to Facility (cy)	Growth Media Stockpiles (cy)
EWRSP-1[2]	17.5	3	84,700	84,700	0	0
EWRSP-2A[2,3]	8.3	0	0	0	0	0
EWRSP-2B[2,3]	5.1	3	24,684	24,684	0	0
EWRSP-3	19.5	3	94,574	0	0	94,574
EWRSP-4[2]	22.6	3	109,481	27,370	0	82,111
WRSP-1	41.9	3	202,796	0	0	202,796
WRSP-2 and WRSP-3	171.8	3	831,512	0	0	831,512
TSF	564.4	3	2,731,696	150,000	0	2,581,696
Plant area (excluding EWRSP-3)	78.9	0.5	63,646	0	0	63,646
Surface impoundments[4]	31.3	0.5	25,249	0	0	25.249
Open Pit[5]	165.3	0	0	0	0	0
GMSP-1	29.3	0	0	0	0	0
GMSP-2	31.6	0	0	0	0	0
GMSP-3	14.1	0.5	11,374	0	0	11,374
Ancillary facility Areas[6]	19.7	0.5	15,891	0	0	15,891
West pit buildup	6.9	15.0	166,980	166,980	0	0
Plant area perimeter cover	19.9	3.0	96,316	0	0	96,316
TSF pipeline cut fill	0.7	30.0	33,880	0	0	33,880
Misc. horizontal construction fill & cover[7]	100	0.5	80,667	0	20,000	60,667
Surface impoundment backfill[8]	44.2	NA	427,000	0	320,000	107,000
Foundation backfill[9]	NA	NA	80,000	0	0	80,000
Total	**1,393.0**	**-**	**5,080,446**	**453,734**	**340,000**	**4,286,711**

Source: NMCC 2017a.

Notes:

[1] Regraded areas based on reclamation and closure designs presented in Attachment E1.

[2] Existing waste rock stockpile (EWRSP) -1, EWRSP-2B, a portion of EWRSP-2A, and the outslope of EWRSP-4 would be reclaimed during the pre-production phase of mine operations. The top surface of EWRSP-4 would be reclaimed following cessation of mining.

[3] The portion of the EWRSP-2A that lies within the footprint of proposed waster rock stockpile (WRSP) -1 and would be incorporated into this new stockpile. The portion of EWRSP-2A located outside of the OPSDA boundary would be relocated to the top of EWRSP-2B and the disturbed areas will be ripped and seeded. EWRSP-2B includes 5.1 acres of waste rock stockpile that would get covered and 7.6 acres of disturbed area that would get ripped and seeded.

Table 2-10. Estimated Reclamation Cover Requirements

[4] Impacted Stormwater Impoundment A and the Process Water Reservoir cover requirements are included within the Plant Area and are excluded in the cover volume calculation. The TSF underdrain collection pond would be incorporated into the TSF evaporation pond and is included in the 22.3 acre total TSF evaporation pond area.

[5] Open pit area and associated disturbed area around the pit perimeter that would get ripped and seeded.

[6] Includes ancillary facilities and structures not already included in one of the specific facilities listed. Includes haul and access roads, electrical power distribution system; storm water and sediment control structures; equipment storage areas; pipeline corridors; pump stations; tanks; explosives magazine and associated access road; and fencing.

[7] NMCC calculation for WRSP storm water ditches & miscellaneous roads, pipelines, power lines, ditches. Fill and cover. 20,000 cy stored in windrows adjacent to alignments.

[8] NMCC calculation based on water volume + 2 foot additional feet to account for freeboard volume.

[9] Foundation backfill by NMCC.

cy - cubic yards

lcy - loose cubic yards (reclamation cover)

NA - not applicable

Table 2-11 provides the proposed interim seed mix for disturbed areas planned for contemporaneous reclamation (primarily associated with the seeding of the stockpiled growth media). It also shows the final seed mixtures proposed for the grazing and wildlife Post Mining Land Uses (PMLUs). The seed mixtures include native warm and cool season grasses, perennial shrubs, and forbs (NMCC 2017).

Seeding would take place prior to the traditional monsoon season. Compacted soils would be ripped or scarified to a depth of 6 to 12 inches prior to seeding. The types of seeding employed, drill or broadcast, would be determined by consideration of seed type, soil type, moisture content, and other factors.

Revegetation success would be determined by monitoring the vegetation parameters of ground cover, productivity, woody plant density, and plant species diversity.

Reclamation research: As part of the reclamation plan, NMCC would conduct a revegetation test program to determine the most effective methods to meet revegetation standards as defined in their reclamation plan.

Concurrent reclamation: As part of the Preferred Alternative, NMCC would periodically review areas disturbed by the operation and complete concurrent reclamation, including grading and revegetation, of areas no longer necessary for operation or areas expected to remain inactive for a significant period of time to limit blowing dust and potential erosion (NMCC 2014).

Table 2-11. Interim and Final Reclamation Seed Mixes

Table 2-11. Interim and Final Reclamation Seed Mixes			
Scientific Name	Common Name	PLS/ac[1] Interim	PLS/ac[1] Final
Grasses - Warm Season			
Bothriochloa barbinodis	Cane bluestem	0.15	0.20
Bouteloua curtipendula	Sideoats grama	1.00	1.10
Bouteloua gracilis	Blue grama	0.20	0.25
Pleuraphis jamesii	Galleta	0.75	1.10
Leptochloa dubia	Green sprangletop	0.15	0.20
Seteria vulpiseta	Plains bristlegrass	0.20	0.30
Sporobolus cryptandrus	Sand dropseed	0.03	0.04
Grasses - Cool, Intermediate Season			
Achnatherum hymenoides	Indian ricegrass	0.60	1.30
Eragrostis intermedia	Plains lovegrass	0.05	0.04
Hesperostipa newmexicana	NM feathergrass	0.70	0.50
Shrubs			
Atriplex canescens	Four-wing saltbush	0.30	1.75
Ericamerica nauseosus	Rubber rabbitbrush	0.10	0.35
Fallugia paradoxa	Apache plume	--	0.10
Krascheninnikovia lanata	Winterfat	0.15	0.70
Forbs			
Dalea candida	White prairie clover	0.10	0.40
Linum lewisii	Blue fax	0.15	0.35
Ratibida colomnifera	Prairie coneflower	--	0.10
Sphaeralcea ambigua	Desert globemallow	0.10	0.40
Total		**4.73**	**9.18**

Source: NMCC 2017.

Notes: [1] Rate is in pounds of pure live seed (PLS) per acre; substitutions may change seeding rates.

Interim reclamation: There is a possibility that continuous, full-scale production might be interrupted for short periods in response to economic considerations or unforeseen circumstances. In this event, interim reclamation would be initiated as outlined below:

- **ROWs:** Power lines and the water pipeline would be inspected regularly and maintained as necessary. None of the facilities would be altered or removed. The main access road would receive regular maintenance. The internal roads would receive minimal maintenance.
- **Pit:** The pit area would be protected by fencing with a locked access gate. Monitoring of pit water would be ongoing.
- **Tailings facility:** The tailings impoundment would be retained for potential future development. Limited care and maintenance of the reclaimed embankment face would be performed as necessary to continue stabilization of the area.

- **Diversion ditches:** Diversion ditches would be inspected and maintained as necessary. Surface water runoff would be managed in accordance with the site's DP requirements.
- **Buildings:** The process buildings, equipment, and support facilities would be guarded by an on-site resident security guard and maintained as necessary. None of the buildings would be destroyed or modified.

2.2.15.10 Interim Management Plan

In accordance with 43 CFR 3809.401(b)(5), NMCC has prepared the following interim management plan to manage the mine area during periods of temporary closure (including periods of seasonal closure, if necessary) to prevent unnecessary or undue degradation. This plan includes:

- Measures to stabilize excavations and workings;
- Measures to isolate and control toxic or deleterious materials;
- Provisions for the storage or removal of equipment, supplies, and structures;
- Measures to maintain the mine area in a safe and clean condition; and
- Plans for monitoring site conditions during periods of non-operation. A schedule of anticipated periods of temporary closure during which the interim management plan would be implemented, including provisions for notifying the BLM of unplanned or extended temporary closures.
- NMCC's DP requirements include stormwater management controls, for periods of mining operations as well as temporary closure, to divert clean water away from mine facilities and to divert water that has contacted mine facilities (i.e., direct precipitation) to lined impoundments. In addition, Grayback Arroyo intermittent water would be sampled per the Monitoring Plan and the draft DP. The NMED will also require an Interim Emergency Water Management Plan. NMAC 20.6.7.30(K) states that this plan "shall be submitted… no less than 60 days prior to discharge at a new copper mine facility." NMCC would conform to this requirement and submit an Interim Emergency Water Management Plan no less than 60 days prior to discharge at Copper Flat.

2.2.15.11 Schedule of Operations

The standard operating schedule at the proposed mine would be 24 hours a day, 365 days a year for the mining activities and processing circuits. No temporary or interim closures of the facility are currently planned. It is possible that, due to various mechanical, technical, economic, legal, or other unforeseen events, mining and processing facilities would have to be temporarily closed. In the event of an unplanned temporary closure, the following plan would be implemented:

- The BLM, MMD, and the NMED would be notified within 30 days of the temporary closure of the flotation mill or the concentrate circuit.
- NMCC would supply the BLM, MMD, and the NMED with a list of supervisory personnel who would oversee the mine facility during the temporary closure period.
- If the interim closure period exceeds 180 days, NMCC would either apply for standby status or would begin to evaluate procedures required to carry out a permanent closure of the process components.

2.2.15.12 Measures to Stabilize Excavations and Workings

No additional measures would be necessary to stabilize excavations and workings during an unplanned temporary closure. Pit dewatering activities may cease during the temporary closure period, in which case all dewatering pumps, pipelines, and water storage tanks would be drained. Interim reclamation procedures would be implemented as necessary to stabilize disturbed sites during the temporary closure period. These procedures would be coordinated with the BLM, MMD, and the NMED. Adequate storage capacity would be maintained in the process components to accommodate runoff resulting from the design-level storm event.

2.2.15.13 Measures to Isolate or Control Toxic or Deleterious Materials

NMCC would follow the waste rock management procedures described in the MPO to isolate waste rock as necessary during an unplanned temporary closure.

2.2.15.14 Storage or Removal of Equipment, Supplies, and Structures

In the event of a temporary closure, it is anticipated that equipment, supplies, and structures would not be removed or placed into storage. In addition, the following steps would be taken:

- Additional reagents would not be introduced into any process component during the temporary unplanned closure period. Process piping and pumps would be drained if the process circuits are shut down. Stored equipment would be clearly identified as having contained process solutions.
- Any mine equipment remaining in operation during the temporary closure, including haul trucks, shovels, loaders, drills, and personnel vehicles would continue to be maintained according to standard company procedure.
- Following any temporary closure period, the integrity of the entire fluid management system would be evaluated before startup is initiated. Solution tanks, pumps, and piping would be visually inspected and repaired as necessary. The mineral processing circuit would be charged with process solution and visually inspected for evidence of leaks. Mine equipment would be inspected for compliance with appropriate Federal and State mining regulations before mining activities recommence. Upon reopening, it is unlikely that mining activities would be affected by a temporary closure. The mine dewatering system would be visually inspected and repaired as necessary. Pit dewatering would resume as soon as possible.

2.2.15.15 Monitoring During Periods of Non-Operation

All provisions of this plan and all other regulatory and permitting requirements would continue to be met during the temporary closure period.

2.2.15.16 Facility-Specific Reclamation

This subsection describes the reclamation procedures proposed for the mine pit and its watershed, the waste rock disposal areas, the TSF, and the ancillary facilities associated with the mine.

Mine pit: NMCC does not propose to backfill the pit. Groundwater inflow formed a lake in the former pit. The current water level is at about 5,439 feet; therefore, pit dewatering would be necessary during operations. Following cessation of dewatering activities, a lake would again form in the pit. The post-closure pit water elevation is estimated to be approximately 4,900 feet. The depth of the lake would fluctuate a few feet depending on precipitation and the evaporation rate. If natural refilling were to be selected, this would proceed over a number of years. Rapid filling, proposed as a conservation measure, would occur much more quickly. This would occur under conditions of water right approval to quickly submerge mineralized wallrock and limit mineral oxidation and formation of soluble mineral residue. Reclamation of the pit during operations would be limited to erosion control and maintaining slope stability.

At closure, stable pit walls would be left in place, and unstable pit walls would be stabilized by blasting or other safe methods. In those areas where pit benches could be safely accessed with the appropriate equipment, alluvial material would be placed on the benches above the projected water level and the benches would be graded and seeded to limit erosion. Roads would be ripped and water barred to control surface water runoff. Disturbed areas around and adjacent to the pit would be covered with alluvial material and revegetated. The ramp would be graded or ramps placed at different locations to allow escape routes for wildlife. The pit area and high walls would be properly barricaded with physical barriers or fences and posted according to MSHA and New Mexico State Mine Inspectors Office regulations. Access would be limited by a locked gate and the access road blocked with a physical barricade.

NMCC must design a pit reclamation plan that would meet BLM requirements in CFR 3809.420, including a post-mining land use consistent with applicable BLM land use plans, operations that comply with all pertinent Federal and State laws, and reasonable measures to control on-site and off-site damage of Federal land. NMCC pit reclamation must adhere to MMD requirements in NMAC 19.10.6, including the achievement of a self-sustaining ecosystem appropriate for the life zone of the surrounding area. MMD pit reclamation requirements also include stabilization, to the extent practicable, to minimize future impact to the environment and to protect air and water resources. Because the mine pit is privately owned, and the resulting water body has been demonstrated through hydrologic modeling to be a hydraulic sink, water in the pit after mine closure would be neither a water of the State (pending a final determination by the State via permit issuance) nor a water of the U.S.and would not be required to meet State surface water quality standards found in NMAC 20.6.4. The pit lake water quality would instead meet a permit condition imposed by MMD that the water quality remain similar to what exists prior to the start of mining operations.

The proposed post-mining land use for the pit is wildlife habitat. After mine operation, the benches and walls of the pit would be stabilized, the overall pit slope would be maintained, and the pit would be about 900 feet deep. The pit walls and benches would become Chihuahuan Desert wildlife habitat, providing abundant rock outcroppings, which are regularly utilized by bats for day or night-roosting, or for cliff-dwelling bird species such as raptors for nesting. There is no current applicable State water quality standard for the pit lake. Any ability for the future pit lake to provide aquatic habitat or support shoreline riparian habitat is unknown. Pit lake reclamation may follow one or more of the following strategies:

- "Rapid fill" of the pit would bring the pit water to a steady-state water level elevation in less than a year through the addition of groundwater from the mine production wells, rather than the many years it would take for the pit water elevation to rise to this level if it were to refill naturally. Additional details for the rapid fill scenario include the following:
- Rapid fill would occur by pumping the mine production wells at approximately 3,000 gpm for about 7 months. Water would be pumped into the bottom of the pit via a temporary HDPE pipe laid along the haul road. The total pumped volume would be about 2,200 AF.
- Rapid fill from groundwater would introduce good quality water, dilute solutes derived from water-rock interaction, submerge walls and benches to limit the exposure of sulfide minerals to oxygen to inhibit oxidation, stabilize pit water quality, and create a steady-state condition for a hydraulic sink in the near term rather than waiting for natural refilling of the pit. Initial pit water chemistry would be comprised of 98 percent supply well water and 2 percent stormwater runoff from the pit shell.
- The rapid fill scenario pumping would be close to the pumping rate employed during mine operation; therefore, there would be no change to the predicted final drawdown. Recovery of water levels would be delayed for 6 months to a year.

NMCC would plan the rapid fill pumping rate to not exceed its allowed water rights.

Mine pit watershed: Reclamation of disturbed areas in the watershed surrounding the open pit would be accomplished to minimize infiltration and promote vegetative growth. This proposed reclamation measure would create a store and release cover, minimize infiltration of storm water around the pit perimeter, and limit water–rock interaction in the upper pit walls.

An existing waste rock stockpile west of the pit would be reclaimed such that the western portion of the pit perimeter would be graded to drain away from the pit into a proposed toe channel that would drain to the Greyback Arroyo diversion. NMCC's Revised Mine Operations and Reclamation Plan (MORP) (NMCC 2017a) provides details about how the Existing Waste Rock Stockpile-1 (EWRSP-1) on the western portion of the pit will be reclaimed according to MMD and NMED requirements that will protect surface water and groundwater, including a 36-inch cover and revegetation. As noted in Section 2.1.2 of the MORP Appendix E, waste rock adjacent to the Grayback Diversion would be pulled back from EWRSP-1 or moved to provide clear separation between the final toe of the reclaimed stockpile and the bank of the Grayback Diversion channel. The plan includes covering of the top surfaces and slopes of the EWSPs with 36 inches of growth media, as well as ripping and seeding of covered and disturbed areas to reestablish vegetation using a seed mix approved by the BLM and MMD.

A controlled pathway would be provided for the pit watershed area to direct excess runoff to the pit bottom to protect water quality and prevent erosion. Additional water collected in the pit through storm events would provide dilution of naturally occurring constituents. Additional details for the controlled pathway scenario include the following:

- Reclamation of the 90-foot-wide haul road within the open pit would occur through the installation of a stormwater conveyance system along the haul road. Other reclamation measures that would be employed would include erosion control features, potentially a compacted base on exposed haul road area, and seeding for natural revegetation where appropriate. Haul road reclamation would be performed in stages prior to and after rapid filling:
  - The first stage would likely include removal of loose material, installation of storm water controls, and lining a stormwater conveyance system.
  - After rapid filling, the second stage of haul road reclamation would include localized placement of substrate (if needed) and revegetation. Access would be prohibited except for maintenance, monitoring, or emergency purposes.
  - During the initial stage of the rapid fill scenario, vehicle access to the pit would be limited to only vehicles and equipment needed for reclamation work and monitoring. In the second stage, vehicular access would be further restricted, through the placement of berms, to only that which is necessary for monitoring or emergencies. Signs to provide notice of no access would be located around the perimeter of the pit. Wildlife would have access to and from the pit via the haul road. Surface features would be designed such that wildlife could not become trapped in the pit.

Waste rock disposal areas and low-grade stockpile: The primary WRDF for the Preferred Alternative is located east-northeast of the millsite on the east side of Animas Peak. Two smaller WRDFs would be located adjacent to the pit. The waste rock disposal areas would be regraded and reclaimed to blend into the surrounding topography to the extent practicable. Horizontal surfaces would be regraded and contoured to reduce infiltration of water and provide positive drainage to sediment collection points. Partially oxidized waste rock represents some of the material in the existing west and north WRDFs. All the WRDFs would be reclaimed in a manner that has been determined to reduce infiltration and to alleviate the long-term risk of acid generation and metals leaching. Following regrading, the surface of the disposal areas would be consolidated with earthmoving equipment and covered with a layer of alluvial material and revegetated. Waste rock disposal areas would be covered with suitable reclamation materials and revegetated contemporaneously as practicable with the operations. The disposal area would cover approximately 155 acres and at the end of the mine life, the height of the disposal area would be at 5,725 feet amsl. Total material contained in the WRDF at the end of the expected life of the project would be approximately 33 million tons. The low-grade stockpile would cover an area of approximately 134 acres and include about 12 million tons of rock assaying less than 0.20 percent copper. The WRDF would be regraded and reclaimed to blend into the surrounding topography to the extent practicable.

Diversion structures would be revegetated to the extent practicable. Additionally, riprap would be used as needed to reduce erosion and left in place following closure. The low-grade ore stockpile is located immediately north of the process plant area and would include about 19 million tons of rock assaying lower than 0.20 percent copper. If the low-grade ore stockpile is milled by the end of mine life, the pad area would be ripped, contoured for drainage control, covered with growth media, and revegetated. If the low-grade stockpile remains following closure, the stockpile would be reclaimed in the same manner as the WRDFs; it would be regraded to overall slopes of 3.0H:1.0V and shaped to enhance runoff, prevent infiltration, and ponding. The surface would be consolidated with earthmoving equipment, covered with a layer of alluvial material, and revegetated.

Plant site: At closure, all surface facilities, equipment, and buildings would be removed from the area. For buildings located on public land administered by the BLM, the concrete foundations would be broken, excavated, and disposed of in a suitable location on adjacent private land. The concrete building slabs, footings, and foundations for facilities located on private land controlled by NMCC would be broken, covered with waste rock material and available growth media, regraded, and revegetated. All fuel tanks and reagent storage facilities would be removed from the site according to applicable Federal and State laws. The general surface area would be shaped and contoured for surface drainage control and covered with a minimum of 6 inches of stockpiled alluvium/growth media to conform to the surrounding topography to the extent practicable. The tailings reclaim pond would be backfilled and regraded to eliminate ponding prior to placement of alluvial material/growth media and revegetation. After closure, the stormwater pond located east of the plant site would be removed, regraded, revegetated, and opened to drain to Greyback Arroyo (NMCC 2014).

TSF: A TSF located southeast of the plant site was designed to hold a total of 95 million tons of tailings (including tailings from 11 million tons of low-grade ore). Closure of the TSF would include:

- Final grading of embankment outslopes to establish erosion controls and control surface water drainage (BMPs);
- Placement of a soil or rock cover and revegetation of the embankment outslope;
- Placement of riprap and erosion controls on the embankments of surface water drainage structures;
- Regrading or depositional modification of the impoundment surface to promote drainage to a permanent engineered spillway;
- Placement and vegetation of a soil cover over the tailings surface;
- Armoring of surface drainage channels and implementation of BMPs for erosion control; and
- Management of underdrainage.

During ore processing, solution reporting to and flowing from the TSF underdrain collection pond is projected at 1,200 gpm. When processing and tailings deposition ends, the free water pond remaining at the top of the TSF would be evaporated to eliminate the largest source of draindown solution, and solution flow through the TSF underdrain system would reduce to approximately 800 gpm approximately 9 months after processing shutdown. After that time, draindown from the TSF would continue to decline at a steady rate. Draindown solution would be collected in the TSF underdrain collection pond, from which it would be pumped to the top of the TSF to be evaporated or used as reclamation cover irrigation if the water is of suitable quality. If the draindown solution is not suitable for reclamation cover, a portion of the TSF would be left un-reclaimed and uncovered for evaporation operations. When the draindown flow rate reached a very low level, estimated to require 3 to 5 years following process shutdown, and with the approval of the appropriate New Mexico regulatory agencies, a passive evapotranspiration (ET) system would be installed at the bottom of the TSF to eliminate final draindown flows. At this point, the seepage collection pond would be decommissioned and reclamation of the TSF completed.

Final grading of the TSF surface would be accomplished with earthmoving equipment or through modification of tailings disposal patterns during the final years of operation. Tailings discharge from selected locations would be used to relocate the supernatant pool to a location adjacent to the post-closure spillway. This would reduce grading requirements and limit earthmoving operations in areas where working conditions are expected to be difficult due to the presence of soft and saturated tailings. At the location of the spillway, a bedrock foundation is anticipated. If the spillway channel is erodible, grouted riprap or other erosion controls would be applied.

Ancillary project facilities: All surface pipelines, poles, and commercial signage would be removed. Buried pipelines and electrical conduits would also be removed.

Solution flow from underdrainage during ore processing would be 1,800 gpm, and the draindown rate at 6 months following process shutdown would be 1,200 gpm.

Fences: The tailings and mine area would be fenced to discourage access by people, wildlife, and livestock for safety purposes. Fences used to restrict access to potentially hazardous areas would remain in place. The BLM would determine which fences would remain intact on public land. All fencing on public land would be constructed to meet BLM requirements.

Water tanks: The fresh water and process water tanks would be removed, their foundations buried in place, and the side-hill cuts recontoured to approximate the original topography. Following recontouring, the areas would receive alluvial material if the replaced fill material would not support vegetation. The areas would then be revegetated.

Roads: A portion of the access road has been deeded to Sierra County and provides access through the mine area to private and public property adjacent to the west boundary of the project. From the point where the mine access road leaves the county road north of the tailings impoundment, it would be narrowed to a standard two-lane road. One culvert, located where the road crosses Greyback Arroyo, would be left in place. Prior to final closure, the State and the BLM would determine which auxiliary roads and haul roads would be left intact. Roads to be reclaimed would be recontoured to approximate the original topography if constructed on sidehills or contoured and ripped if constructed in flat areas. Water bars would be constructed to reduce erosion. Recontoured areas would be covered with alluvial material if replacement fill material would not support vegetation. These recontoured areas would also be revegetated.

Electrical power: Power for the project would be furnished by means of existing overhead power lines. The overhead lines would be removed from the millsite and disconnected from the 115-kV line owned by Sierra Electrical Cooperative by removing the wires of the last span of the line. Pumping stations and electrical substations on the site would be removed if no other post-closure land use is identified and approved. The disturbance associated with removal would be reclaimed by regrading and seeding. If renewable energy facilities are deployed at specific buildings, these would be removed and associated disturbances would be regraded and reseeded. The existing 25-kV line that provides power to the production wells, pumping stations on the fresh water pipeline, and reclaim water pump stations at the tailings dam would remain in place.

Water supply: Water would be supplied to the mine from four production wells located about 8 miles east of the plant site. A 20-inch welded steel pipeline transports the water to the mine and is buried at a minimum depth of 2 feet from the well field to the point of entry to the mine area. The buried pipeline is owned by the BLM. The BLM would determine upon closure whether the buried pipeline would remain in place. All roads and power lines for the production wells are in place. The BLM would determine whether the well area would remain as it currently exists after closure of the mine.

Sanitary solid waste disposal: At closure, the system used to treat domestic waste would be dismantled and removed, and the area would be regraded and vegetated in accordance with site closure plans (NMCC 2014). If a private landfill is permitted for on-site disposal of solid waste, the landfill would be closed according to NMED requirements.

2.3 ENVIRONMENTAL PROTECTION MEASURES

In addition to mine operations and reclamation actions described previously, NMCC would commit to the following practices to prevent unnecessary environmental degradation during the life of the project. These practices, described briefly below, are to be considered part of the Preferred Alternative and the operating plan and procedures. More detailed information would be developed as the project is advanced to more detailed design stages.

2.3.1 Design Features

Air quality: The Copper Flat project would be designed to control both gaseous and particulate emissions and to meet all regulatory standards. Appropriate air quality permits would be obtained from the NMED Air Quality Bureau for the proposed project facilities and land disturbance. As per NMED regulations, the project air quality operating permit must be authorized by the NMED prior to project commissioning. The NMED Air Quality Bureau issued a New Source Review Permit to NMCC dated June 25, 2013.

Committed air quality practices would include dust control for mine unit operations. In general, the fugitive dust control program would provide for water application on haul roads and other disturbed areas; chemical dust suppressant application (such as magnesium chloride) where appropriate; and other dust control measures as per industry practice. Also, disturbed areas would be seeded with an interim seed mix to limit fugitive dust emissions from unvegetated surfaces where appropriate. Drilling operations would be done wet or with other efficient dust control measures as set by MSHA, New Mexico State Mine Inspector’s Office, and New Mexico mining and exploration permit requirements (NMCC 2014).

Fugitive emissions in the process area would be controlled at the crusher and conveyor drop points through the use of water sprays and dry cartridge filter-type dust collectors where necessary. Other process areas requiring dust or emission controls include the concentrate drying and packaging circuit, various process plants, and laboratory. Appropriate emission control equipment would be installed and operated in accordance with the construction and operating air permits. The lime storage would be fitted with a baghouse for capture of fugitive dust during loading of the lime bin. The sample preparation lab would be equipped with fans and filters.

Deposition of tailings would be by dispersion spigots or cyclone discharge. Using this procedure, the surface would be wet, thereby eliminating or reducing fugitive dust. As necessary, control of fugitive dust in the vicinity of the tailings pond would be attained by watering, sprinkling, and vegetation. No gaseous contaminants above allowable standards are expected to be emitted to the atmosphere from the proposed operations.

Combustion emissions would result from the mobile mining machinery and support vehicles. All combustion equipment emits nitrogen dioxide and carbon monoxide. The mobile mining equipment is diesel-fueled and would also emit particulate matter. Combustion emissions would be controlled by original equipment manufacturer pollution control devices. Fugitive emissions from ore and the flotation equipment are expected to be small due to the low volatility of the sulfur compounds present in the concentrate.

Water resources: Process components would be designed, constructed, and operated in accordance with NMED regulations. The proposed process facilities would be zero discharge, and the TSF facilities would have engineered liner systems. Waste rock with the potential to generate acid or mobilize deleterious constituents would be determined through the current geochemical testing program and the development and execution of a NMED-approved waste management plan.

Erosion and sediment control: BMPs would be used to limit erosion and reduce sediment in precipitation runoff from proposed project facilities and disturbed areas during construction, operations, and initial stages of reclamation. BMPs that would be used during construction and operation to limit erosion and control sediment runoff would include:

- Surface stabilization measures — dust control, mulching, riprap, temporary and permanent revegetation/reclamation and restoration, and placing growth media;
- Runoff control and conveyance measures — hardened channels, runoff diversions; and
- Sediment traps and barriers check dams, grade stabilization structures, sediment detention, and sediment/silt fence and straw bale barriers.

Revegetation of disturbed areas would reduce the potential for wind and water erosion. Following construction activities, areas such as cut and fill embankments and growth media/cover stockpiles would be seeded as soon as it is practicable. Contemporaneous reclamation would be conducted on disturbed areas not to be re-disturbed by future mining operations. All sediment and erosion control measures would be inspected periodically and repairs performed as needed.

Wildlife: Land clearing and surface disturbance would be timed to prevent destruction of active bird nests or birds' young during the avian breeding season (March 1 to August 31) to comply with the Migratory Bird Treaty Act (MBTA). If surface disturbing activities are unavoidable during the avian breeding and nesting season, NMCC would have a qualified biologist survey the areas proposed for disturbance for the presence of active nests immediately prior to the disturbance. If active nests are located, or if other evidence of nesting is observed (mating pairs, territorial defense, carrying nesting material, transporting of food), NMCC would work with the biologist and the BLM to develop a work plan to allow construction activities to continue without impacting the identified nesting area during the nesting and breeding season.

Operators would be trained to monitor the mining and process areas for the presence of larger wildlife such as deer and antelope. Mortality information would be collected. NMCC would establish wildlife protection policies that would prohibit feeding or harassing wildlife.

Fire protection: As specified by MSHA, NMCC would institute a fire protection training program and have a rehearsed fire suppression plan. A fire protection system would be installed that would incorporate Sierra County and State code requirements in the administration and warehouse complexes, truck shop, crushing plant, and process plant. Hydrants would be located near all buildings. A 100,000-

gallon fire water reserve would be stored in a water storage tank located sufficiently above and near the mill and crushing area to provide adequate water pressure. A fuel break would be constructed around the facilities. Mine water trucks and equipment would be available in the event of a fire. An ambulance would be located on-site in the event emergency transportation is required. NMCC would promptly comply with any emergency directives and requirements of Sierra County and the BLM pertaining to industrial operations during the fire season.

Invasive, non-native species: NMCC recognizes the economic and environmental impact that can result from the establishment of noxious weeds and invasive species and has committed to a proactive approach to their control. Objectives would include:

- Determination of noxious and invasive species currently present;
- Prevention of spread; and
- Prevention of further introduction.

A noxious weed survey would be completed prior to any earthmoving disturbance. Areas of concern for noxious weeds would be flagged by a weed scientist or qualified biologist/botanist to alert all personnel to avoid those areas pending any remediation of the area. Information and training regarding noxious weed management and identification would be provided to all personnel affiliated with the implementation and maintenance of the project.

A noxious weed monitoring and control plan would be implemented during construction and continued through operations. The plan would contain a risk assessment, management strategies, provisions for annual monitoring and treatment evaluation, and provisions for treatment. The results from annual monitoring would be the basis for updating the plan and developing annual treatment programs.

Policies and training would be developed so that personal vehicles and mine equipment that entered an identified noxious week area would be inspected and cleaned. Vehicle cleaning would eliminate the transport of vehicle-borne weed seed, roots, or rhizomes. To eliminate the transport of soil-borne noxious weed seeds, roots, or rhizomes, infested soils or material would be handled in a manner that limits the transport of soil-borne noxious weed seeds, roots, and rhizomes. Appropriate measures would be taken to avoid wind or water erosion of the affected stockpile. All interim and final seed mixes, hay, straw, and hay/straw products would be certified weed-free for New Mexico and BLM-identified noxious weeds.

Weed monitoring would be conducted for the life of the operation or until the site is released and the reclamation financial surety is released. If the spread of noxious weed(s) is noted, weed control procedures would be determined in consultation with BLM personnel and would be in compliance with State of New Mexico and BLM handbooks and applicable laws and regulations. Mixing of herbicides and rinsing of herbicide containers and spray equipment would be conducted only in areas that are a safe distance from environmentally sensitive areas and points of entry to bodies of water (storm drains, irrigation ditches, streams, lakes, or wells).

Materials and waste management: Operations at the Copper Flat project would result in the generation of nonhazardous and hazardous waste materials. The majority of waste would be mill tailings and waste rock that are currently excluded from regulation under the Resource Conservation and Recovery Act (RCRA). NMCC anticipates that the mine would fall in the "small generator" category (NMCC 2014). The management of regulated solid and hazardous waste is discussed in the following sections.

Sanitary and solid waste disposal: Nonhazardous solid wastes that would be generated at the site include waste paper, wood, scrap metal, and other domestic trash. A recycling program would be implemented in preference to landfilling nonhazardous solid wastes. NMCC anticipates the recycling program to include clean plastics, paper, cardboard, aluminum, wood, and scrap metal. The amount of recycling would be subject to the availability of off-site programs to receive recycled material. Nonhazardous solid wastes that cannot be recycled would be disposed of in a permitted on-site Class III sanitary landfill on private land, which would be approved by the State of New Mexico or by other methods approved by the State and Sierra County (NMCC 2014).

Sanitary liquid wastes would be handled by a package wastewater treatment plant to process domestic wastewater generated from the mine office, shower, and restroom facilities. Following treatment, plant effluent would be reused as process make-up water or for dust control as allowed by regulation in order to reduce fresh water needs. Assuming 200 personnel and visitors are typically on-site on a daily basis and assuming a usage rate of 25 gallons of water per day per person, gray water reuse would supply approximately 5,000 gallons of water per day (about 5.6 AFY).

The washing facility for the mobile equipment would be equipped with an oil/water separator system. Waste oil and lubricants would be collected and transported off-site by a buyer/contractor for recycling on an as needed basis. Reagent drums would be recycled by the reagent supplier. Scrap metal would be sold to a dealer and transported off-site (NMCC 2014).

Chemical wastes from the laboratory that exhibit a hazardous waste characteristic, including off-specification commercial chemicals and assay wastes, would be managed as hazardous waste.

Employee training would include appropriate landfill disposal practices such as the allowable wastes that can be placed in the landfill, management of used filters, oily rags, fluorescent light bulbs, aerosol cans, and other regulated substances. Used solvent, liquids drained from aerosol cans, accumulations of mercury fluorescent lights, and used antifreeze may be regulated pursuant to RCRA. Signs would be installed at the landfill sites reminding employees of appropriate disposal practices.

Reagent management: Reagents used as part of the copper/molybdenum concentrating process would include frothers, flotation promoters, flotation collectors, flocculants, flotation reagents, pH regulators, and filter and dewatering aids. These reagents would be delivered by truck from commercial sources to the mine area where facilities would be provided for offloading, storing, mixing, handling, and feeding. Reagents that are received dry would be mixed in agitation tanks and pumped to either outdoor storage tanks or liquid storage tanks inside the mill building where they would be metered into the concentrating process. Residual reagent concentrations in the tailings and reclaim water streams are expected to be present at very low levels since they would be added to water in amounts resulting in concentrations of approximately 3 parts per million (ppm). Also, normally 95 percent of the reagents would be adsorbed onto the copper or molybdenum mineral surface and floated off in the mineral froth. The reagent would then be subsequently consumed in the off-site smelting process. Assuming 95 percent of the reagents are absorbed, the residual reagent reporting to the tailings stream drops to less than 0.15 ppm.

All reagent storage tanks and mixing areas would be located inside secondary containment to protect soils and groundwater. A collection sump and pump system would be provided at each containment to return spilled material back to a storage tank or into the milling process as necessary. Material Safety Data Sheets for the reagents to be used would be readily available in accordance with MSHA's *Hazard Communication for the Mining Industry* (30 CFR Part 47).

In reagent management, there would not be any use of AERODRI 100 (ethanol, sodium dioctyl sulfosuccinate, and 2-ethylhenanol).

Hazardous materials management: In 49 CFR 172.101 the Hazardous Materials Table designates the materials listed as "hazardous materials for the purpose of transportation of those materials". Hazardous substances are designated as such in 40 CFR 302.4 and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) Title III. Hazardous materials would be transported to the Copper Flat mine by DOT-regulated transporters and stored on-site in DOT-approved containers. Spill containment structures would be provided for storage containers. Hazardous materials would be managed in accordance with regulations identified in 40 CFR 262 Standards Applicable to Generators of Hazardous Waste.

Hazardous materials and substances that may be transported, stored, and used at the Copper Flat mine in quantities less than the threshold planning quantity designated by SARA Title III for emergency planning would include blasting components, petroleum products, and small quantities of solvents for laboratory use. Small quantities of hazardous materials not included in the above list may also be managed at the Copper Flat project; such materials are contained in commercially produced paints, office products, and automotive maintenance products.

Blasting components, including ammonium nitrate and diesel fuel, would be stored on-site in bins and tanks. NMCC currently anticipates utilizing two explosives magazines (one for boosters and one for blasting caps), each no larger than 8 feet by 8 feet, with 1,000-pound capacities. In addition, NMCC would utilize one 75-ton capacity silo for storage of ammonium nitrate. All explosive materials would be stored away from the plant site in compliance with MSHA, New Mexico State Mine Inspector's Office regulations, and U.S. Department of Homeland Security requirements. Management of hazardous materials at the Copper Flat project would comply with all applicable Federal, State, and local requirements, including the inventory and reporting requirements of Title III of CERCLA, also known as the Emergency Planning and Community Right to Know Act. All petroleum products, kerosene, and reagents used in the mill would be stored in aboveground tanks within a secondary containment area capable of holding 110 percent of the volume of the largest vessel in the area.

The spill contingency plan (SCP) would be reviewed and updated at a minimum of every 3 years and whenever major changes are made in the management of these materials. Inspection and maintenance schedules and procedures for the tanks, as well as all piping connecting the facility with the tailings pond, would be set forth in the sections of the SCP that address hazardous materials and petroleum products. Fuel and oil for diesel- and gas-powered equipment would be stored in aboveground, sealed tanks located near the processing facilities area. The tanks would have secondary containment capable of holding 110 percent of the volume of the largest vessel. Designated fuel dispensing areas would be lined pads consisting of gravel underlain by a plastic liner. Surface piping would lead from each tank to the fuel dispensing area. The refueling hoses would be equipped with overflow prevention devices and emergency shutoff valves. Storage of refueling hoses would be within secondary containment. Other refueling would occur in the field utilizing fuel/lube service trucks with either secondary containment built into the truck or the vehicle would be parked within an area having secondary containment when not in use.

Hazardous wastes, other than those from the laboratory, would also be managed in the short-term storage facility prior to their shipment to an off-site licensed disposal facility. These materials may include waste paints and thinners. Spent solvents and used oils would be returned to recycling facilities. Waste oil and lubricants would be collected and hauled off-site by a buyer/contractor for recycling. Solvents would be collected by a subcontractor and recycled off-site.

An ongoing inventory of all materials used at the mine area and mill would be provided on a monthly basis to the appropriate Federal, State, and local regulatory agencies. The local fire department would be kept informed about materials stored on-site and appropriate emergency response.

Spill contingency plan: NMCC would develop a preliminary SCP to prevent and limit the impacts of a reagent or fuel spill. This plan describes the reporting and response that would take place in the event of a spill, release, or other upset condition, as well as procedures for cleanup and disposal. The plan would be posted and distributed to key site personnel and would be used as a guide in the training of employees. Also, the plan would address conservation measures of potential spills associated with project facilities as well as activities of on-site contractors. The use, transportation, and storage of reagents and fuels would be covered in the plan. The emergency reporting procedures would be posted in key locations throughout the mine area. Containment structures designed to prevent the migration of a spill are included in the design of the facilities.

NMCC would be responsible for spill events at the mine area, while contract haulers (i.e., trucking companies) would be responsible for accidents and spills along the transportation routes. Fuel and oil for the diesel- and gasoline-powered equipment would be stored in aboveground, sealed tanks near the processing facilities area. The tanks would have secondary containment capable of holding 110 percent of the volume of the largest vessel.

Reporting spills or releases of certain materials to the environment may be divided into four categories:

- Those requiring internal notification only;
- Those also requiring notification to the State of New Mexico;
- Those also requiring notification to the National Response Center and the local emergency planning committee pursuant to CERCLA or Superfund; and
- Those subject to Clean Water Act requirements only.

Determining which of the above categories is appropriate for any particular spill or release depends on the material spilled or released, the amount spilled or released, and the circumstances of the spill or release.

Monitoring: Baseline monitoring of current environmental conditions was conducted in 2010, 2011, 2012, and 2013 in accordance with the Sampling and Analysis Plan for Copper Flat mine. This plan, known as the Copper Flat Monitoring Plan, was developed to collect local and regional baseline information and provides the basis for the monitoring of regional impacts that may result from the operation of the mine. This plan would be updated as detailed engineering for the proposed mine facilities is completed, and the monitoring requirements become more defined.

Technical updates: During the course of operations, NMCC would periodically review and update the geochemical and hydrogeological predictions, mine waste characterization studies, and pit lake studies to incorporate new information accumulated during operations. NMCC would review the data every 5 years and make updates as necessary. These updates would provide quantitative predictions of water quality during the operational and post-closure period. Conservation measures would be developed as necessary.

Sustainability: NMCC recognizes the social and economic impacts from "boom and bust cycles" that sometimes occur in connection with the mining industry. In addition, removal of facilities that may have post-mining uses is not in accordance with the overall environmental practice of conservation. NMCC would work with the local and regional communities to identify post-mining uses of the land and facilities to enhance opportunities to sustain the economy and culture in the post-mining phase of this project.

Environmental baseline: For the purpose of establishing baseline conditions for environmental resources at the Copper Flat mine area prior to beginning mining operations, NMCC has gathered resource data and conducted surveys for potentially disturbed land within the mine area for the project.

These baseline conditions are documented in baseline data reports used in this EIS as a tool to identify and evaluate changes from baseline environmental conditions.

Land has also been identified that would be disturbed outside the mine area. There are nine millsite claims that were previously established by Quintana. The 5-acre millsite claims would be used for staging, equipment, well pads, water tanks, pumping systems, truck access, and structures to maintain the water supply pumping stations. A 30-acre electrical substation site on New Mexico State lands is proposed to replace an existing electrical substation. Because these lands would be disturbed, NMCC has performed cultural resource, wildlife, vegetation, and paleontology surveys to establish baseline conditions for these ancillary facilities as a basis for further evaluation.

2.3.2 Best Management Practices

BMPs involve either industry standard practices accepted as indicators of good quality performance or are adopted by NMCC as standard operating procedures to be implemented regardless of potential effects to resources that may result from mining activities. The BMPs to be implemented are summarized below, grouped by the resource most relevant to them. For clarity, the BMPs are again described in Chapter 3 within the resource section for which they primarily apply.

Air quality BMPs:

- Water would be applied on haul roads and other disturbed areas and other dust control measures would be used as per accepted and reasonable industry practice.
- Disturbed areas and stockpiles would be seeded with an interim seed mix to limit fugitive dust emissions from unvegetated surfaces where appropriate.
- Crusher and conveyor drop points would utilize NMED and MSHA-approved Sonic Misting System, which are considered to be the Best Available Control Technology (BACT).
- Deposition of tailings would utilize spigotting or cyclone discharge. Using this procedure the surface would be wet, thereby eliminating or reducing fugitive dust.
- The lime storage – a 200-ton-capacity silo – would be fitted with a baghouse for capture of fugitive dust during loading of the lime bin. The sample preparation lab would be equipped with fans and filters.
- As necessary, control of fugitive dust in the vicinity of the tailings pond would be attained by watering, sprinkling, and vegetation.
- Drilling operations would be done wet or with other efficient dust control measures as set by the MSHA/New Mexico Mine Inspection, and New Mexico mining and exploration permit requirements.
- Combustion emissions from mobile mining machinery and support vehicles would be controlled by manufacturer pollution control devices.

Water quality:

- Methods would be used to limit erosion and reduce sediment in runoff during construction, operations, and initial stages of reclamation and would include:
    - Surface stabilization measures — dust control, mulching, riprap, temporary and permanent revegetation/reclamation and restoration, and placing growth media;
    - Runoff control and conveyance measures — hardened channels, runoff diversions; and

  - Barrier check dams, grade stabilization structures, sediment detention, sediment/silt fence and straw bale barriers, and sediment traps.

- Stormwater pollution would be managed using seeding and mulching of disturbed areas, silt fences, straw bale check dams, diversion ditches with energy dissipaters, and rock check dams.
- Surface runoff from the area around the administration/mine office, concentrator, assay building, reagent storage, and tailings thickener would be controlled by surface grading and directed to a containment pond to be used for mineral processing make-up water or dust control at the site.
- Water erosion controls, such as berms and diversion ditches, would divert runoff away from the WRDFs and control water inflow onto waste rock disposal piles.
- Runoff from the WRDFs and the low-grade ore stockpile would be controlled by diverting the runoff water into collection ditches and then recycling it into the process water system. No discharge is expected to occur from the WRDFs.
- The final grading plan for the WRDFs would be designed to eliminate surface water run-on, improve runoff, reduce infiltration, minimize visual impacts, and facilitate revegetation through back-grading or crowned grading. Surface runoff velocity dissipaters would be constructed to reduce velocities and minimize undue erosion and soil loss.
- The bottom of the TSF is lined and an underdrain seepage return system is used to prevent seepage of tailings liquids into underlying groundwater.
- Chemicals used in the mining process would be stored out of the elements and with containment provisions, as required, to prevent release of harmful chemicals to the environment.
- A spill prevention, control, and countermeasures (SPCC) plan would be developed to manage spills and prevent releases to the environment.

Stormwater management:

- NMCC would use diversions, berms, and other BMPs to prevent stormwater from areas outside the mine from running on to mine areas and facilities.
- Surface stabilization measures would be employed, including dust control, mulching, riprap, temporary and permanent revegetation/reclamation, and placing growth media.
- Runoff control and conveyance measures – hardened channels, runoff diversions.
- Sediment traps and barriers – check dams, grade stabilization structures, sediment detention, sediment/silt fence and straw bale barriers, and sediment traps.
- Revegetation of disturbed areas would reduce the potential for wind and water erosion. Following construction activities, areas such as cut and fill embankments and growth media/cover stockpiles would be seeded as soon as it is practicable and safe. Contemporaneous reclamation would be used to the extent practicable to accelerate revegetation of disturbed areas.
- All sediment and erosion control measures would be inspected periodically and repairs performed as needed.

Land uses on adjacent lands:

- Consideration would be given to neighbors regarding their land use requirements including cattle grazing, alternate energy generation such as wind and solar, and reestablishment and enhancement of original botanical and zoological species inhabitants.

Wildlife and migratory birds:

- During the course of operations, NMCC would periodically review and update the geochemical and hydrogeological predictions, mine waste characterization studies, and pit lake studies to incorporate new information accumulated during operations to minimize impacts to wildlife.
- Wildlife exclusion fences would be constructed around the pit and other water and solution ponds to keep out wildlife such as deer, antelope, and smaller animals. This fencing would meet NMDGF standards for wildlife exclusion fencing that require an 8-foot-high fence, chain link or welded wire material, with finer mesh at the bottom to exclude smaller animals.
- To the extent practicable, NMCC would investigate and utilize other conservation measures, such as exclusionary devices. These devices could include but are not necessarily limited to bird balls and netting to prevent deleterious exposure of birds to toxic chemicals or conditions used or created by mining and mineral processing operations.

Vegetation and non-native invasive species:

- All equipment would be pressure washed before being moved on-site to eliminate the possibility of introduction of noxious weeds.
- On-site biological monitoring in areas of noxious weed concern or presence would be conducted before, during, and after project activities. NMCC would be responsible for providing the monitoring.
- Vehicle and equipment parking would be limited to within construction limits or approved staging areas.
- Heavy equipment would be cleaned and weed-free before entering the mine area.
- Monitoring and follow-up treatment of exotic vegetation would occur after project activities are completed.
- All gravel and fill material imported on-site must be source-identified to ensure that the originating site is noxious weed free.
- During the reclamation phase of the project, all areas disturbed by construction would be reseeded with a BLM-approved seed mix.

Threatened and endangered species and special status species:

- Ground clearing and other mine development activities would be avoided during breeding and nesting season (generally March 1 through August 31) until the area is surveyed by a qualified biologist to confirm the absence of nests (on the ground and in burrows and vegetation) and nesting activity to avoid impacting migratory birds.
- Active nests (containing eggs or young) would be avoided until they are no longer active or the young birds have fledged. The area to be avoided around the nest would be appropriate to the species, and the size of the avoided area would be confirmed by a BLM biologist.

Range and livestock:

- The proposed mine area would be fenced to prevent injury or loss of livestock from mining operations. The location of the boundary fence would maintain connectivity for livestock movement throughout the Copper Flat Ranch allotment.

- Health and safety training of mine workers would include the provision of information on livestock open range and operation of vehicles to reduce the risk of collisions with livestock.
- NMCC would construct BLM-approved barbed wire fencing to prevent livestock from entering the WRDFs and TSF.
- Pending monitoring information, either gates or cattle guards or both would be installed along roadways within the proposed mine area as appropriate.

3. DESCRIPTION OF THE ACTION AREA

The action area addressed in this BA is defined in 50 CFR 402.02 (USFWS 2017a) as "all areas that may be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. It encompasses the geographic extent of environmental changes (i.e., the physical, chemical, and biotic effects) that will result directly and indirectly from the action. Action area is typically larger than the area directly affected by the action."

3.1 ACTION AREA EXTENT

For the Copper Flat mine project, the project action area (the terms "project area" and "action area" are used interchangeably here) includes the extent of any resource base that could potentially be affected by the different types of impacts that mine construction and operation would cause. The geographic extent of the Copper Flat project action area, including all potential direct and indirect impacts, is shown in Figures 3-1 and 3-2. Figure 3-1 shows the extent of direct ground disturbance in addition to the potential dust, truck, and equipment noise impacts that would occur from construction of new mining facilities within the mine site and at ancillary facilities nearby. Figure 3-1 includes the immediately adjacent roads, pipelines, power lines and associated ROWs, millsites, substation site, and adjacent potentially affected areas outside the mine boundary.

Figure 3-1 shows the extent of the 1-foot or more groundwater drawdown in the bedrock surrounding the mine pit and in the deep Santa Fe aquifer that may affect Las Animas Creek and Percha Creek by groundwater pumping for mine operations. Figure 3-1 also shows the 1-foot drawdown perimeter in the artesian aquifer that feeds the irrigation ponds in the lower Las Animas Creek floodplain. It also shows the 1-foot drawdown perimeter in the deep Santa Fe aquifer that was evaluated for its potential to affect surface waters in Percha Creek and Caballo Reservoir and in perennial reaches of Las Animas Creek. The scope of the groundwater and surface water effects encompasses approximately 14 square miles in the mine bedrock drawdown area, 113 square miles in the overlapping zones with the Santa Fe deep aquifer, and the 8.3 square miles of Caballo Reservoir, totaling approximately 135 square miles.

The known Chiricahua leopard frog locations are highlighted on Figure 3-1 to show their relationship to locations where surface and artesian water effects may occur, but they are not part of the action area. The wolf pens are shown because they are part of the noise impacts analysis; however, they are not affected by mine pumping either.

Figure 3-2 shows the pattern of potential noise impacts from blasting during mine operations. Blasting may affect the Mexican gray wolf in their holding facility at Ladder Ranch. It may also affect Mexican spotted owls using either riparian areas along Las Animas or Percha Creek or critical habitat and Protected Areas (PACs) to the west of the mine site and within the Gila National Forest. Figure 3-2 shows the straight-line noise level in decibels (dB) within parentheses for each doubling of distance from the blast site. This is based upon acoustic studies that predict a 6dB reduction for each doubling of distance from the noise source. The first number shown at each distance is the expected noise level that includes a 15dB noise attenuation due to the high intervening terrain. The terrain has the similar function of a sound wall used to attenuate the effects of highway traffic noise on nearby residential properties. The circular area outside of which blast noise is estimated to be reduced to less than 64dB is approximately 30 square miles.

Figure 3-1. Copper Flat Project Action Area (excluding Noise Impacts)

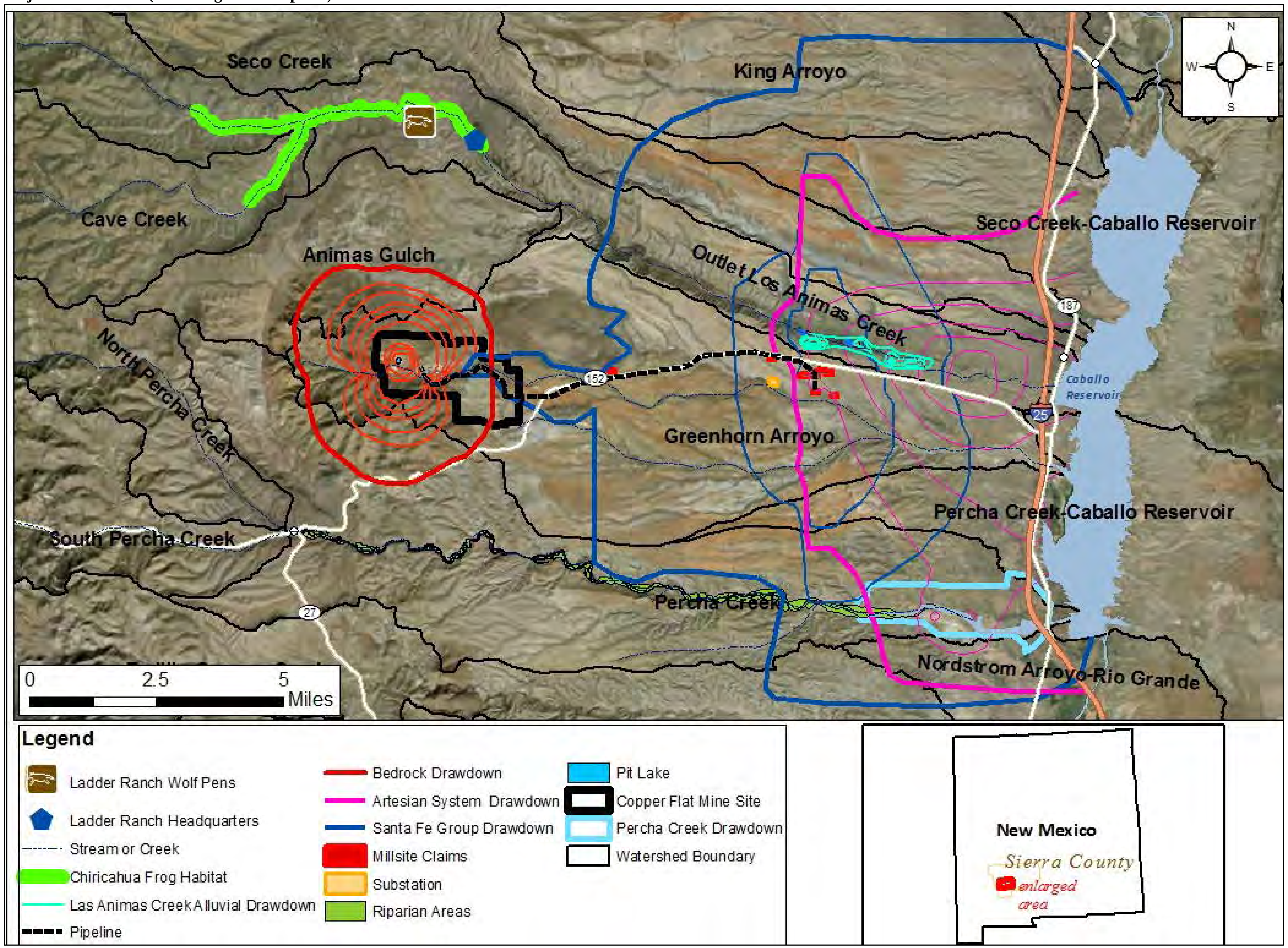
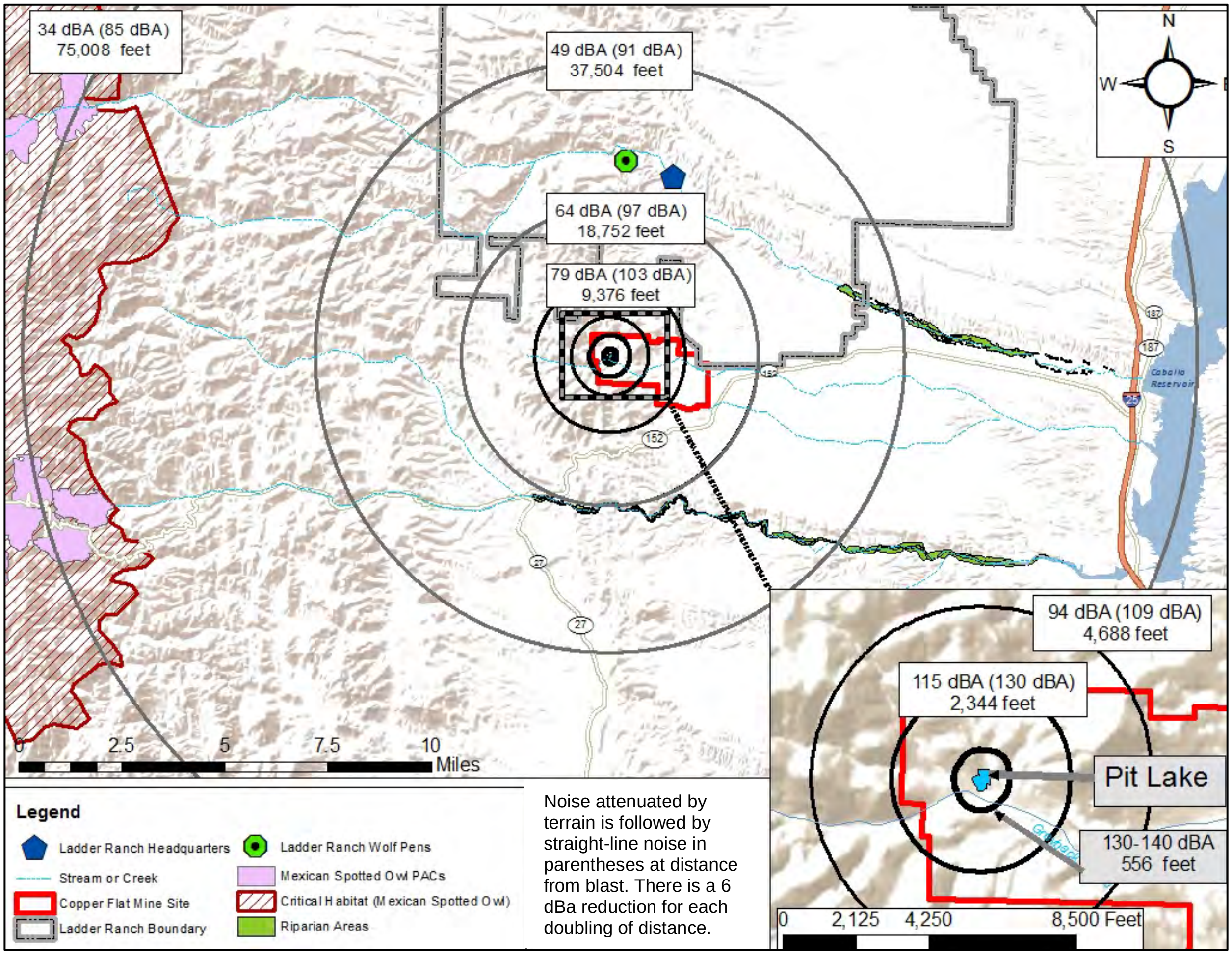


Figure 3-2. Copper Flat Project Action Area for Evaluation of Noise Impacts



3.2 LANDS DIRECTLY DISTURBED BY CONSTRUCTION OPERATIONS

The Copper Flat project area is composed of a mixture of public and private land that includes patented and unpatented mining claims (lode, placer, and millsite). The proposed mine area is 2,190 acres. Activity at the Copper Flat mine in 1982 disturbed approximately 361 acres of BLM-administered public land and 549 acres of private land (THEMAC 2011).

As noted in Section 2.2, using previously disturbed lands and with new disturbance, the proposed project would directly impact 1,444 acres of the total 2,190 acres within the boundary of the mine. (See Table 2-1.) The affected lands within the mine area would consist of 630 acres of BLM land and 814 acres of private land. The project would also impact 127.2 acres outside the boundary of the mine as shown in Table 2-2, all but 2 acres being public land.

Portions of the waste rock disposal areas, as well as the crushing facility and the mill facility, would be located on public land subject to unpatented mining claims controlled by NMCC. Approximately 28 percent of the tailings impoundment and 10 percent of the open pit would be located on public land subject to mining claims controlled by NMCC (THEMAC 2011).

3.3 SURFACE HYDROLOGY

The Copper Flat mine area is within the Creosote Rolling Upland and Grass Mountain region of southern New Mexico, a warm arid region where annual evaporation greatly exceeds annual precipitation. Precipitation generally comes in the form of local, high-intensity summer (July through September) rain showers. These storms are typically of short duration. Annual precipitation in the area of Copper Flat ranges from 5 to 20 inches per year, averaging approximately 13 inches per year (JSAI 2013). Daily precipitation of 1 inch or more occurs twice per year on average, with daily storm events of greater than 2 inches expected about every 5 years (JSAI 2013). The 100-year 24-hour storm event is about 3.6 inches (NOAA 2014).

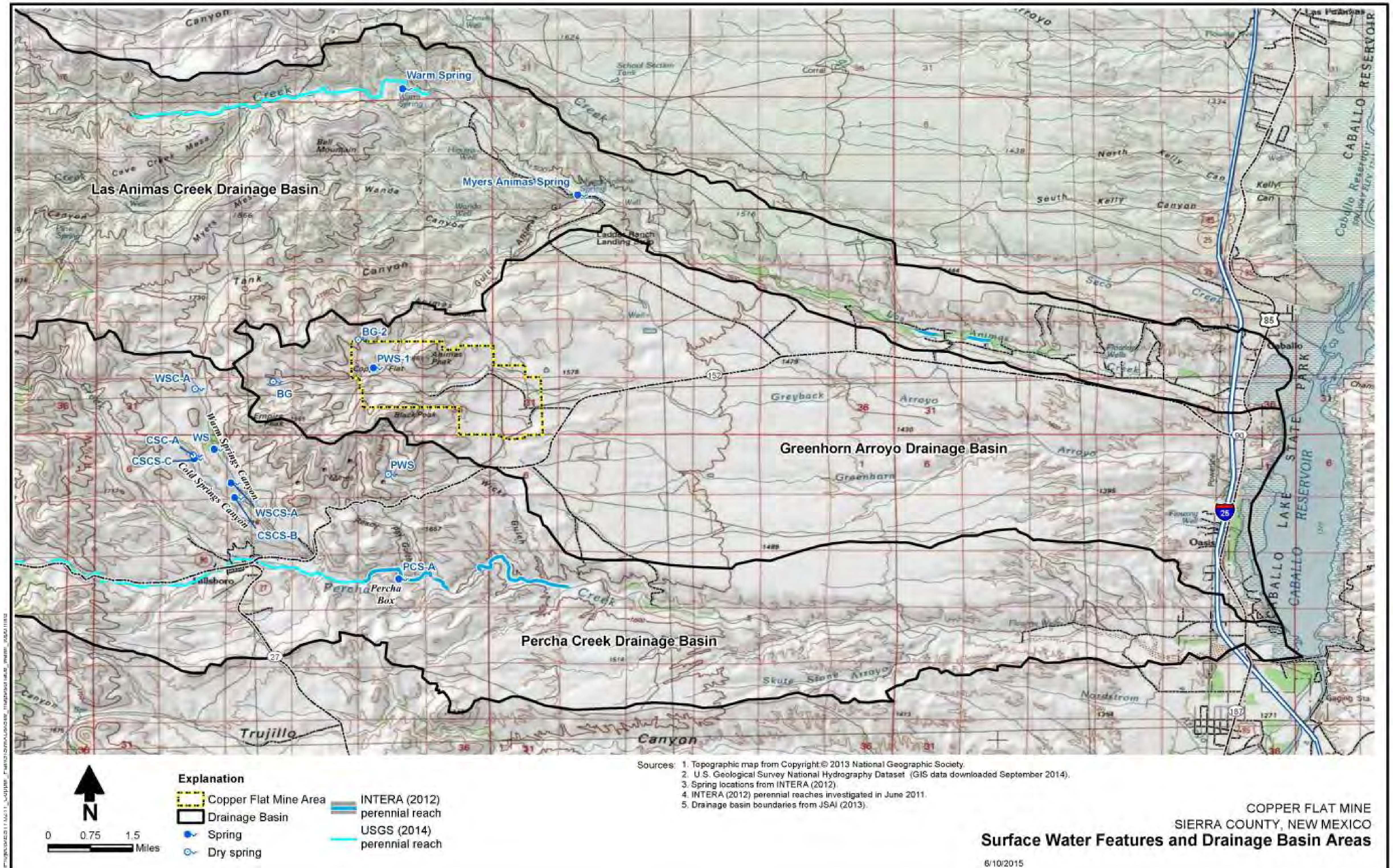
Within the project area, estimated annual potential ET, which includes evaporation and plant transpiration, ranges from 60 to 65 inches per year (JSAI 2013). Actual ET is less and depends on water availability and climatic conditions such as temperature, sun, and wind exposure. Evaporation from the Copper Flat pit lake is approximately 65 inches per year (JSAI 2013).

The Copper Flat project area lies within the Lower Rio Grande watershed of south-central New Mexico. This approximately 5,000-square-mile watershed, located east of the Continental Divide, extends from the Elephant Butte reservoir to the junction of the Mexico, New Mexico, and Texas international boundary (USGS 2014). The watershed is dominated by the Rio Grande and the Elephant Butte and Caballo Reservoirs, which lie along the river. Caballo Reservoir, located at the eastern margin of the proposed project area, is an earthen dam reservoir constructed in the late 1930s. The conservation capacity of the reservoir is 279.6 million cubic meters (MCM) (IBWC 2018). The approximate volume of water stored in the reservoir on June 1, 2018 was 50 MCM (IBWC 2018), approximately 18 percent of the conservation capacity.

Headwaters to the Rio Grande are fed by the Rocky Mountains in Colorado. Numerous tributary drainages within the Lower Rio Grande watershed also contribute water to the Rio Grande. However, none of these drainages provide perennial flow; they contribute flow primarily during storm events.
The mine area is located within the Greenhorn Arroyo drainage basin, a topographic basin within the Lower Rio Grande watershed. This basin contains small, ephemeral washes (arroyos) that drain generally from west to east toward Caballo Reservoir; major washes include the Greyback and Greenhorn arroyos.

Surface water runoff at Copper Flat is generated predominantly by precipitation at higher elevations (Davie and Spiegel 1967). The Percha Creek and Las Animas Creek topographic drainage basins are located immediately south and north, respectively, of the Greenhorn Arroyo drainage basin. Both Percha Creek and Las Animas Creek flow from west to east toward Caballo Reservoir and have ephemeral, intermittent, and perennial reaches. Three drainage basins and their associated surface water features are located in the area of the Copper Flat mine. (See Figure 3-3.)

Figure 3-3. Surface Water Features and Drainage Basin Areas



Source: NGS 2013; USGS 2014; INTERA 2012; JSAI 2013.

The following subsections provide a description of each of the three drainage basins based on information documented in existing reports. These reports include recent baseline characterization and groundwater supply and modeling studies (Intera 2012; JSAI 2012 and 2013), a previous EIS (BLM 1999), and other historical documents (Davie and Spiegel 1967; Newcomer 1993).

3.3.1 Greenhorn Arroyo Drainage Basin

The Copper Flat mine area lies within the Greenhorn Arroyo drainage basin. The area of this drainage basin is approximately 35,000 acres, including a 230-acre watershed that drains to the existing open pit (JSAI 2013). Current surface water uses within this basin are primarily livestock watering.

Major washes within the Greenhorn Arroyo drainage basin include the Greenhorn and Greyback Arroyos. (See Figure 3-1.) Several smaller arroyos are tributaries to these two larger arroyos, which drain to the east and converge approximately 8 miles east of the Copper Flat mine. The Greyback Arroyo is the predominant surface water drainage feature in the area of the mine. It originates west of the mine and was rerouted around the southern perimeter of the mine area during the earlier mining activities in the 1980s. Before mining in the 1980s, the Greyback Arroyo ran directly through the current mine area. An arroyo that is tributary to the Greyback Arroyo is located just north of the existing waste rock disposal facilities that are situated north of the pit lake. The arroyo runs along the north side of Animas Peak, and its confluence with the Greyback Arroyo is located east of the mine site. The Greenhorn Arroyo is located south of the Greyback Arroyo.

From August 2010 through April 2011, stormwater flows were monitored at three locations along Greyback Arroyo within the proposed mine area as part of the baseline characterization study (Intera 2012). Stormwater flows during this period were minimal, with dry conditions often observed. In March 1993, Newcomer et al. (1993) (as cited in Intera 2012) recorded a surface water flow rate of 0.028 cubic feet per second (cfs) (20 AFY) in the Greyback Arroyo east of the former plant area.

Springs and seeps have been identified within the Greenhorn Arroyo drainage basin (Newcomer 1993; BLM 1999; Intera 2012). The baseline characterization study monitored springs located north and west of the open pit and identified several seeps emanating from the fractured bedrock of the open pit highwalls shortly after precipitation events. (See Figure 3-1.) Flow rates at these features were minimal; the springs were dry, and pit wall seepage was too low to accurately measure flow during routine monitoring events (Intera 2012). Previously reported seeps and springs (BLM 1999; Newcomer et al. 1993) were dry during the baseline characterization study. Below average precipitation during the period of the baseline characterization study was likely a factor in the low flow rates and dry conditions observed at the springs and seeps. Precipitation recorded at the mine between October 2010 and September 2011 was 4.82 inches.

The existing open pit has filled with water to form a small pit lake. The pit lake covers approximately 5.2 acres and holds approximately 60 AF of water (Intera 2012). The water level at the pit lake is influenced by several factors, including the following:

- Stormwater runoff to the open pit;
- Groundwater inflow from the adjacent saturated bedrock; and
- Evaporation from the lake surface.

3.3.2 Las Animas Creek Drainage Basin

The Las Animas Creek drainage basin is adjacent to and north of the Greenhorn Arroyo drainage basin. The basin is approximately 84,000 acres (JSAI 2013) and is drained by Las Animas Creek. (See Figure

3-1.) This creek originates in the Black Range Mountains west of the project area and flows to the east to Caballo Reservoir – a distance of approximately 32 miles. Like other drainages in the region, Las Animas Creek is deeply incised into an east-sloping alluvial plain. Springs have been identified within Las Animas Creek basin (Davie and Spiegel 1967). Several are present along Las Animas Creek, including Warm Spring and Myers Animas Spring.

Surface water flow characteristics in Las Animas Creek vary; the creek has ephemeral, intermittent, and perennial reaches but does not contribute perennial surface water flow to the Rio Grande. Surface water flow rates were measured in August 2010, November 2010, January 2011, and April 2011 along Las Animas Creek and ranged from 0.04 to 7.09 cfs (30 to 5,140 AFY) (Intera 2012). The greatest flow rates were generally recorded just downstream of Warm Spring in August, when precipitation was higher. During the period of the baseline characterization study, two short perennial reaches located 4 to 6 miles west of Caballo Reservoir were monitored, and Las Animas Creek was predominantly a losing stream where water infiltrates into the ground recharging the local groundwater, because the water table is below the bottom of the stream channel (Intera 2012). (See Figure 3-1.) Historical surface water flow rates of Las Animas Creek range from less than 1 to 60.3 cfs (700 to 43,700 AFY) (Davie and Spiegel 1967; ABC 1996). The higher flow rates are most likely associated with snowmelt and late summer precipitation. From 2010 and 2011, the flow rate at Warm Spring was nearly constant, ranging from approximately 0.73 to 1.1 cfs (530 to 800 AFY) (Intera 2012). Historical flow rate measurements vary from 0.007 cfs (5 AFY) (Newcomer 1993) to 0.81 cfs (590 AFY) (Davie and Spiegel 1967). A second, unnamed spring was identified during the 2010-2011 baseline characterization study (Intera 2012). This spring is located 3 miles downstream of Warm Spring and is designated as Myers Animas Spring on U.S. Geological Survey (USGS) topographic maps.

The Ladder Ranch uses water from the upper portion of Las Animas Creek basin for irrigation and to fill stock ponds (Intera 2012). This includes both surface water from Las Animas Creek and groundwater pumped from the shallow alluvium. Local residents use water resources in the lower portion of Las Animas Creek basin for agricultural and domestic purposes. A number of diversion ditches and return flow ditches exist along the lower portion of Las Animas Creek. In addition, many residents have shallow wells (NMOSE 2014), some of which are artesian. The use of diversion ditches and shallow wells along Las Animas Creek causes local and seasonal changes in alluvial groundwater levels and surface water flows (Davie and Spiegel 1967; Intera 2012).

3.3.3 Percha Creek Drainage Basin

The Percha Creek drainage basin encompasses approximately 77,000 acres (JSAI 2013), and is located immediately south of the Greenhorn Arroyo basin. The basin is drained by Percha Creek, which originates in the Black Range Mountains and flows to the east toward Caballo Reservoir. (See Figure 3-1.) Surface water flow characteristics in Percha Creek vary, but are considered intermittent in many reaches (BLM 1999). Percha Creek is intermittent in the area of Hillsboro and perennial east of Hillsboro in an area known as the Percha Box, a steep-walled reach of the creek that is incised into Paleozoic carbonate rocks (BLM 1999). (See Figure 3-1.) The creek is perennial through the box due to its geological structure. Downstream of the Percha Box, the creek is ephemeral, as the surface geology changes from carbonate rocks to alluvial sands and gravels. At the east end of the creek, artesian groundwater conditions create local springs and flowing wells near Caballo Reservoir (BLM 1999). Percha Creek does not contribute perennial flow to the Rio Grande.

Between 2010 and 2011, surface water flow rates along perennial reaches of Percha Creek ranged from 0.002 to 7.45 cfs (1 to 5,400 AFY) (Intera 2012). The highest surface water flow rates were recorded in August, when precipitation was higher. Three separate perennial reaches were observed in the area of and immediately downgradient of the Percha Box. (See Figure 3-1.) The reaches range from approximately

0.2 mile to 2 miles in length (Intera 2012). During the period of the baseline characterization study, the creek exhibited both losing and gaining reaches, with surface water flow decreasing significantly downstream of the Percha Box, eventually disappearing as the creek enters the Tertiary Palomas Basin alluvial gravels and sands. Earlier surface water investigations report perennial flow characteristics in the area of the Percha Box, with measurable flow rates ranging from approximately 0.3 to 1 cfs (200 to 700 AFY) (SRK 1995; ABC 1996).

Several springs have been identified in the Percha Creek drainage basin (Intera 2012). Springs exist in Warm Springs and Cold Springs canyons and the Percha Box. (See Figure 3-1.) Warm Springs and Cold Springs canyons are tributary drainages to Percha Creek and are located northwest of the Percha Box. Between 2010 and 2011, surface water flow rates at springs in these canyons ranged from 0 cfs (0 AFY) (i.e., stagnant water or dry conditions) to 0.75 cfs (540 AFY), with the highest flow rates recorded in August (Intera 2012). The flow rate at a spring monitored within the Percha Box was nearly constant, ranging from 0.41 to 0.64 cfs (300 to 460 AFY) (Intera 2012), and exhibited little seasonal variability. Springs are also present at the eastern terminus of Percha Creek.

Water resources within the Percha Creek drainage basin are used for domestic purposes, livestock, and irrigation (Intera 2012). Many of the residents of Hillsboro and the surrounding area have shallow alluvial wells (NMOSE 2014). Some residents also divert surface water for irrigation. Ranches east of Hillsboro obtain stock water from shallow alluvial wells or diversion ditches when surface water is available. The shallow wells are generally located in the alluvium along Percha Creek.

3.4 GROUNDWATER HYDROLOGY

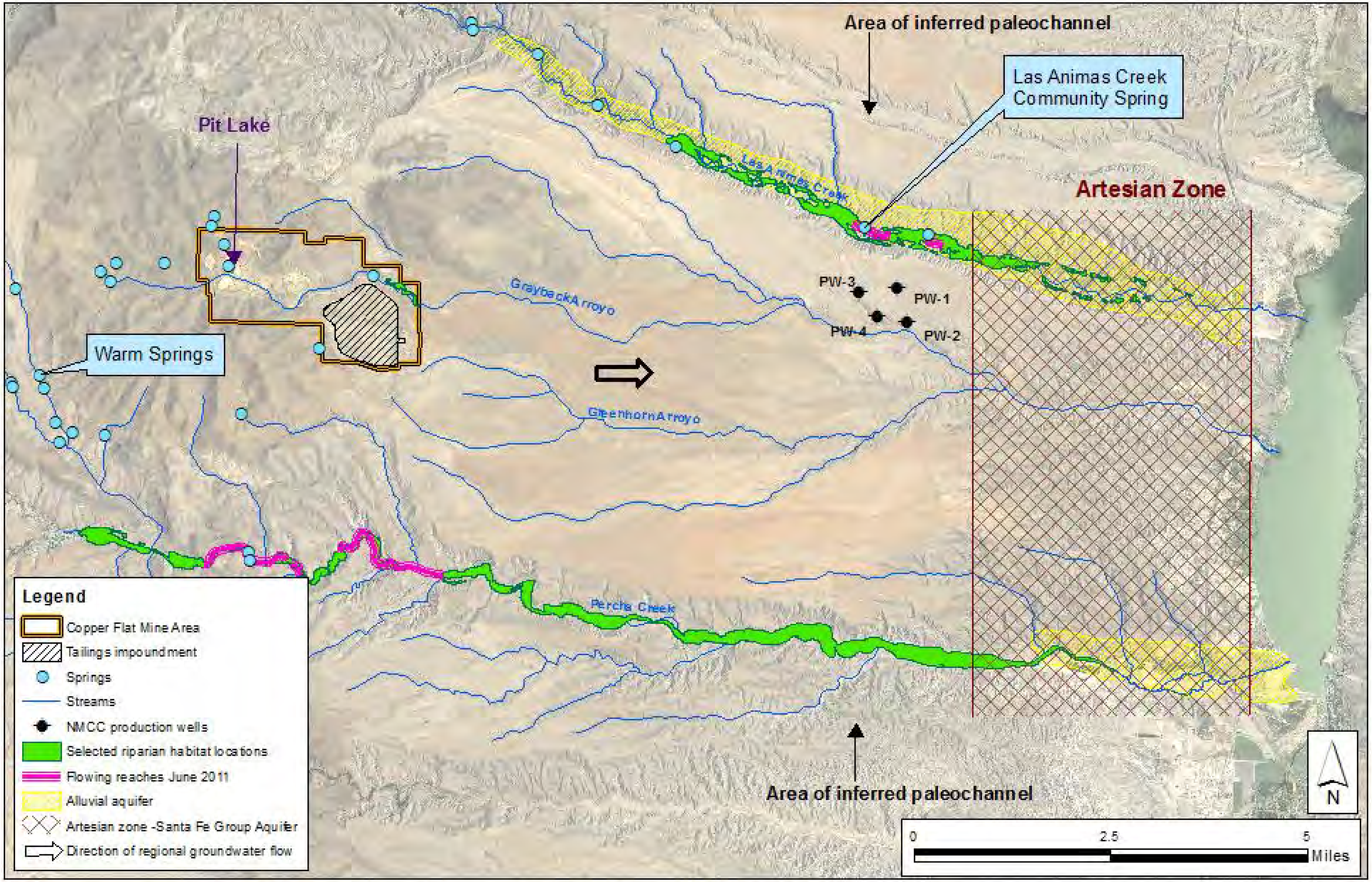
Groundwater resources within the affected environment include those near the Copper Flat mine area and those near the water supply wells, as shown below. (See Figure 3-4.) Related geologic information is discussed in Section 3.7 of the EIS, Mineral and Geologic Resources. References used in compiling information on area groundwater include (Davie and Spiegel 1967); (Wilson et al. 1981); (BLM 1999); (JSAI 2011); (Intera 2012); (Jones et al. 2012); and (Jones et al. 2013).

3.4.1 Regional Hydrogeology

The principal water-bearing materials of the project area include the coarser sediments in the Santa Fe Group of the Palomas Basin and Warm Springs Valley, and saturated alluvium in the principal drainages. As documented in (Jones et al. 2012), groundwater recharge occurs primarily in the uplands, where periodic rainfall and snowmelt are greater than elsewhere, and along the arroyos and losing stream reaches where ephemeral and intermittent surface flows can seep downward. Regional-scale groundwater flow is west to east, from about 5,800 feet amsl at the western edge of the Warm Springs graben to less than 4,200 feet amsl at Caballo Reservoir.

Except near the mine, data on water levels are sparse, making it difficult to accurately map the water table. The water level information that is available (Wilson et al. 1981, Plate 5) indicates that contours are closely spaced in the Animas Uplift and westernmost Palomas Basin, which indicates a relatively steep water level gradient and is evidence of lower transmissivity of the aquifer in those locations.

Figure 3-4. Hydrologic Features in Project Area



Source: Intera 2012; Jones et al. 2013.

Contour spacing is much wider around the NMCC well field, which indicates the water table gradient is flatter and the aquifer has a higher transmissivity and better potential to supply wells. The gradient steepens again east of the well field, indicating more restricted water movement toward Caballo Reservoir, as a result of substantial clays in the Santa Fe Group east of the well field.

Groundwater discharge is primarily to the Rio Grande valley, including river alluvium and Caballo Reservoir. Some discharge occurs locally to springs, to tributary streamflow, and to riparian vegetation along tributaries (primarily Las Animas and Percha creeks). Discharge also occurs to area wells, most of which withdraw small amounts of water in comparison to the large production expected from the NMCC wells.

3.4.2 Hydrogeology of the Mine Pit Area

John Shomaker and Associates, Inc. (JSAI 2011) estimate hydraulic conductivity of the saturated crystalized bedrock in the mine area to be in the range of 0.05 to 0.1 feet per day, with the higher values in the fractured monzonite. These values are consistent with the findings of (DBSA 1998). This equates to a transmissivity of no more than 10 square feet per day for each 100 feet of thickness, which is low. Because the rocks in the uplift are poorly transmissive, most groundwater from the highly transmissive Santa Fe Group sediments in the Warm Springs Valley flows around the uplift northeast toward Las Animas Creek or southeast toward Percha Creek. Disturbed areas at the mine area, such as areas of waste rock, are likely more permeable than the natural material. These areas may be locations of minor recharge to the local groundwater system.

The existing pit was excavated to below the local water table, and thus required dewatering for mining to occur. The pit lake elevation is currently as much as 100 feet below the regional groundwater table. Reflecting the low transmissivity of the bedrock, inflows to the lake are small despite the high gradient. Thus pumping rates for dewatering were no more than 50 gpm for the Quintana pit (Jones et al. 2013). In the absence of pumping for dewatering, the level of water in the pit lake reflects an approximate balance in which evaporation is the only depletion. Evaporation is offset by the inflows from precipitation, local runoff, and groundwater. Net outflow to groundwater does not occur at the pit.

3.4.3 Hydrogeology of the TSF

A portion of the existing TSF overlies Santa Fe Group materials. Local hydrologic conditions in this area have been extensively studied as part of a program to abate elevated levels of dissolved solids in groundwater caused by seepage from the existing tailings. Information below is taken from (Intera 2011), which was submitted by NMCC to the NMED.

Seepage from the western part of the TSF flows directly into gravels of the Santa Fe Group. In the eastern part of the TSF, the Santa Fe is overlain by a shallow clay layer which in turn is beneath surficial stream terrace gravels. These gravels include old placer workings. Seepage from the eastern part of the TSF flows eastward through the gravels that overlie the clay, creating a water level mound that is higher than the regional water table. Tests on both the shallow and deeper gravels indicate a hydraulic conductivity of 1 to 5 feet per day.

A fault lies east of the TSF. The fault may act as a barrier to groundwater flow from the mound that occurs beneath the tailings. It may limit the extent of a sulfate plume that extends east of the TSF in the shallow gravels. For additional information on the existing plume, see Section 3.4.2 of the EIS, Water Quality, Environmental Effects.

3.4.4 Hydrogeology of the Palomas Basin in the Vicinity of the Supply Well Field

The existing water supply wells are located within the Palomas Basin on a mesa between Animas Creek (north) and Greyback Arroyo (south), about 8 miles east of the mine and within 6 miles of Caballo Reservoir to the east. Dunn (1982) documents that the production wells were located following an exploration program that determined this to be the nearest location to the mine with sediments that have both sufficient thickness and permeability to support large capacity supply wells. The location coincides with a graben and paleo-channel. (See Figure 3-5.)

Figure 3-3 is a cross-section along Lower Las Animas Creek near the supply wells. In addition to showing the graben in which the supply wells are located, the figure shows a shallow clay layer that serves as a perching horizon that would isolate flows in Las Animas Creek from direct effects of pumping of the mine supply wells. The presence of a clay layer is demonstrated in well logs and in aquifer test results. The cross-section also shows a substantial amount of clay east of the well field that is responsible for the artesian conditions found in many wells between the supply well field and the Rio Grande.

Groundwater flow in the area depicted by the cross-section is consistent with the overall flow in the Palomas Basin, which is west to east toward the Rio Grande valley. In the well field area the slope of the water table is less than 20 feet per mile, compared to 150 feet per mile near the mine (Wilson et. al. 1981). As previously noted, this difference in gradient is due to the differences in transmissivity in different parts of the aquifer.

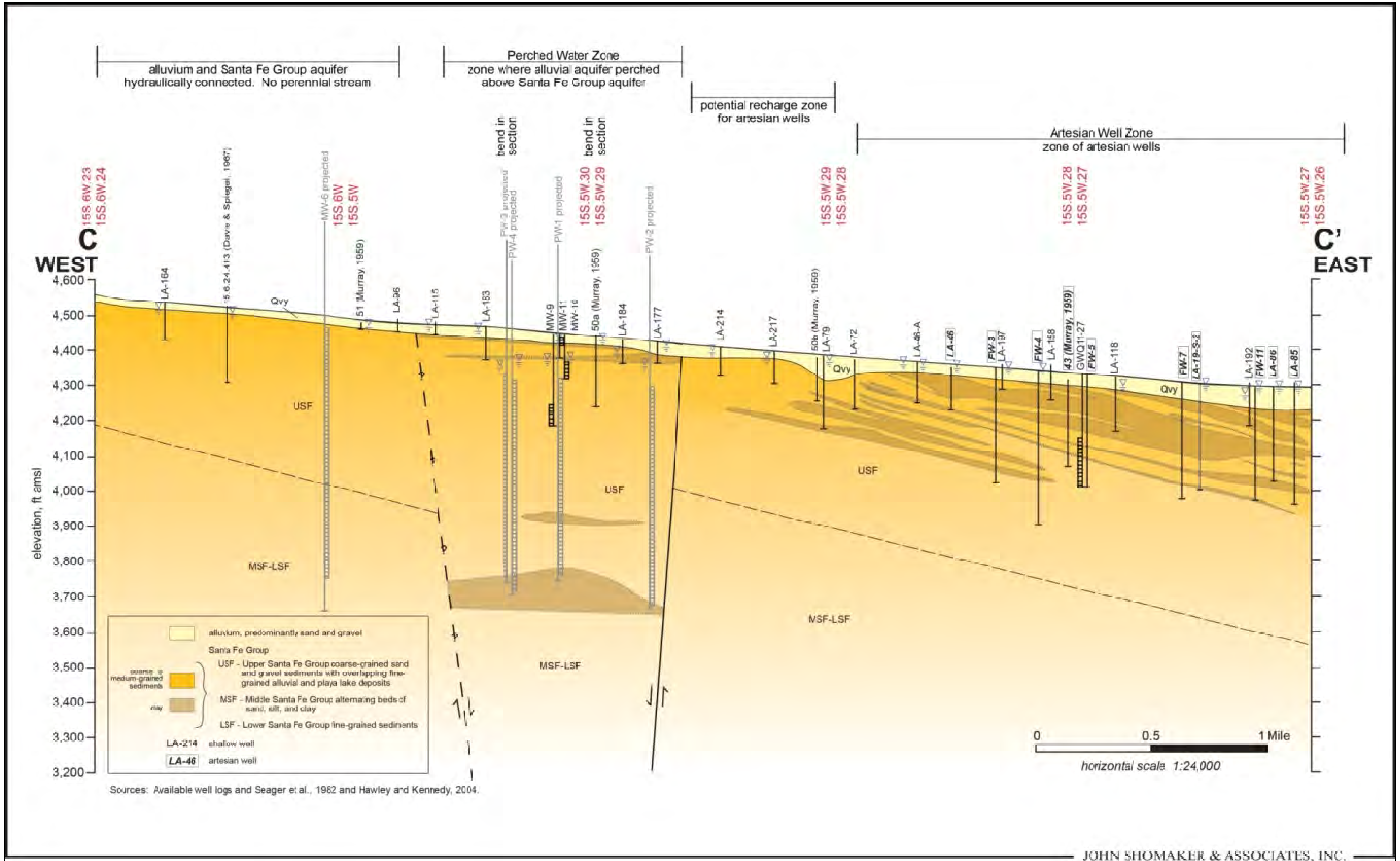
The four large-diameter (16-inch) production wells were originally tested to have individual well yields on the order of 1,000-2,000 gpm (Dunn 1982). (Wilson et al. 1981) indicates that the wells penetrate a thickness of 950 to 1,000 feet of sand and gravel before encountering any thick clay beds. According to data in (Intera 2012), the wells are typically screened over the bottom 600 feet. Depths to water exceed 300 feet, and the average static water level in the wells is at 4,380 feet amsl.

Aquifer tests of the supply wells conducted by NMCC in 2012 resulted in a generalized estimate of the transmissivity of the upper 1,000 feet of the Santa Fe Group to be 20,000 square feet per day (i.e., hydraulic conductivity was estimated at 20 feet per day; see (JSAI 2014). This is higher than the 11,000 square feet per day reported in (BLM 1999), but that reference did not specify aquifer thickness and thus cannot be directly compared to the recent test result. DBSA (1998) also indicated a possible value of 11,000 square feet per day.

3.4.5 Hydrogeology of Alluvial Valleys in the Vicinity of the Mine and Well Field

The alluvial valleys potentially affected by the Copper Flat mine and well field are those streams and arroyos that drain the area near the mine and supply wells: Las Animas Creek, Percha Creek, Greyback and Greenhorn arroyos, and the Rio Grande including Caballo Reservoir.

Figure 3-5. Cross-Section North of Supply Well Field



Source: NMCC 2018a.

Las Animas Creek: The only published report specific to the hydrology of Las Animas Creek is (Davie and Spiegel 1967). This reference provides information on area groundwater, for both pre-development and the historic conditions resulting from the development of surface irrigation systems and drilling of artesian wells, and was an important source of information used to construct the groundwater model used in this analysis. In the area near the project well field, the valley of Las Animas Creek is locally underlain by alluvial materials in the range of 20 to 60 feet thick. The materials contain shallow groundwater that is generally close enough to the land surface to be within the riparian root zone. Intera (Intera 2012) provides the results of a seepage study along Las Animas Creek. In most areas the creek is a losing stream (water losses exceed water gains when there is runoff) and a source of recharge to the water moving in the underlying alluvium. Reaches with perennial flow occur near the water supply well field; the stream dries up below these reaches, as shown above. (See Figures 3-2 and 3-3.)

Wilson et al. (Wilson et al. 1981) observed that the static water levels in the area of what is now the project well field were 25 to 50 feet lower than the water table in the Las Animas alluvium. That relationship is also shown in Intera 2012, is consistent with (BLM 1999), and is illustrated by several triangular symbols on Figure 3-3 above that indicate a shallow water table in the area labeled 'Perched Water Zone'. The data indicate that perched alluvial groundwater occurs in Las Animas Creek in the reach near the supply wells. This perched water has quite limited hydraulic connection to the main aquifer that will be directly impacted by the supply wells. Hydrology within the perched layer reflects localized conditions such as seepage from irrigation canals and irrigated fields, and pumping of domestic and other small capacity wells. The amount of downward seepage from the perched groundwater to the Santa Fe Group sediments is considered small (BLM 1999) and is independent of water levels in the Santa Fe Group.

The clays in the Santa Fe Group east of the well field created artesian conditions, in which water levels were above the land surface before the aquifer was developed (Intera 2012). In that area there are large capacity irrigation wells that penetrate several hundred feet or more into the permeable materials of the Santa Fe Group. Artesian flows of up to a few hundred gpm have been reported in these wells at various points in time. Pressures have declined over time, and some wells no longer flow (Jones et al. 2013). However, such wells can still produce several hundred gpm if pumped. According to (Jones et al. 2012), the decline in artesian pressure may be due in part to poor well construction that resulted in leakage upward from the artesian zone by means of flow in and around the well casings.

Percha Creek: Near the supply wells, the valley of Percha Creek is underlain by alluvial materials up to 50 feet thick that contain groundwater (Wilson et al. 1981). The primary area where groundwater supports riparian vegetation or surface flow is in and just downstream of the Percha Box, where Paleozoic bedrock is at the surface and groundwater flows to the surface. Elsewhere the stream is typically dry and flow that does occur (e.g., from storm runoff) provides recharge to groundwater.

Many wells are found near Percha Creek near Hillsboro, New Mexico. These wells typically draw from shallow alluvium or from silts and clays in the Santa Fe Group (Seager et al. 1984) and yields are generally low. Data are not available on the water table elevation in the Percha Creek alluvium in the area of the supply wells, and the extent of perched conditions (if any) is not defined. Some artesian wells do occur near the downstream end of the creek, where the hydrogeology is similar to that in lower Las Animas Creek.

Arroyos: Alluvium is found along Greyback and Greenhorn Arroyos and consists primarily of sand and gravel; thickness varies between 5 and 50 feet (Intera 2012). Alluvium in Greyback Arroyo may be locally and seasonally saturated in the vicinity of the mine. Hydrologic conditions in arroyos near the supply wells have not been defined. No wells are known to obtain their supply from arroyo alluvium.

Rio Grande: Wilson et al. (Wilson et al. 1981) provides information on hydrogeology along the Rincon Valley. Alluvium deposited by the Rio Grande underlies the valley, including Caballo Reservoir. The material is up to 100 feet thick and overlies clays in the Santa Fe Group. Water levels are generally within 15 feet of the ground surface, with a flow direction south at the same slope as the ground surface (about 5 feet per mile). Specific capacities of wells in the Rincon Valley average 50 gpm per foot, a value which indicates a high hydraulic conductivity. Flow from the Palomas Basin to the discharge zone along the Rio Grande Valley is presumably affected by the elevation of water in Caballo Reservoir, but details on this relationship are not established.

Springs: Numerous springs are known to occur in the vicinity of the proposed mine and supply well field, as shown above. (See Figure 3-2.) In this area, spring flows can originate in several ways.

Most springs occur along the main creeks upstream of the well field where groundwater discharges from perched horizons, or from the emergence of shallow groundwater that overlies low permeability materials (e.g., Percha Box).

Several small seeps and springs are located in the area of the mine pit (Intera 2012). These are higher in elevation than the regional water table and are interpreted as discharge from local perched water.

Springs in Warm Springs Valley (including Warm Springs itself) are understood as an emergence of water due to the barrier effect of the Animas Uplift. Consequently, the generally eastward flow of groundwater in the valley is diverted around the low permeability rocks in the uplift, south to toward Percha Creek and north toward Las Animas Creek. Upflow of deep geothermal water along faults is an additional source of spring flow (Kelley et al. 2013).

Many of the springs have been observed to be dry at times; flow is thus often intermittent or ephemeral. However, limited data on "NWS" spring on Las Animas Creek indicate a measured flow of 0.7 to 1.1 cfs (Intera 2012). Water from NWS spring is warmer than in other local springs and is believed to have a deep source. None of the published reports identify any springs that discharge from groundwater that is in direct hydrologic communication with the NMCC supply wells, pit lake, or TSF.

3.4.6 Existing Uses of Groundwater

The New Mexico OSE maintains records on wells and water use. There is no compilation of data specific to the Palomas Basin. The New Mexico Water Rights Reporting System (NMWRRS) is the designation of OSE's database which contains scanned copies of the State's water rights files. Kevin Myers, staff hydrologist at OSE, provided the results of a search of the NMWRRS database for the area. The search identified nearly 700 separate points of diversion or well locations, mostly located along the valleys and in the area where artesian wells are found. Mr. Myers indicated that the OSE files identify a large number of claimed or permitted water rights that total in excess of 6,000 AFY, most of which are for irrigation use; in addition, many domestic and stock wells are listed.

The NMWRRS database includes information as reported by drillers and well owners, which commonly does not reflect any process of independent quality control to ensure the files are complete or the content not originating with the agency is accurate. In this instance, documents relating to the Quintana Mine water rights were not found in the database and location coordinates for some irrigation wells do not appear to correspond to areas where irrigated land is observed on air photos. Moreover, there are no data that indicate the amount of groundwater pumping that actually occurs within the area.

For some files, the database can provide unverified information on actual water use. The Hillsboro Mutual Domestic Water Consumers Association has the largest water right not associated with mining or irrigation. This right is 217.75 AFY. Actual use was about 30 AFY in 2001, the most recent year when data from all three community wells were found in the OSE files.

3.5 BIOLOGICAL CHARACTERISTICS OF THE ACTION AREA

The Copper Flat mine area is located within the foothills of the Black Range, which is a major north-south mountain chain in south-central New Mexico. To the west, the Black Range rises sharply above the Rio Grande Valley and Caballo Reservoir, which lie east of the Copper Flat mine. The vegetation of the Copper Flat mine area is typical Chihuahuan Desert shrubland in the lower elevations with an increasing grass component evident as elevations and slope increase. Much of the approximately 2,200-acre area has been disturbed during previous mining ventures. Mining activities and infrastructure, combined with previous mining-related activities, have contributed to the disturbance of approximately 690 acres within the Copper Flat mine area (THEMAC 2011). Calculations based on digitized high-resolution 2009 aerial photography indicate that the total existing disturbed area is close to 956 acres, or 43.6 percent of the total proposed mine area (THEMAC 2011). Although much of the proposed mine area has been disturbed by past mining activities, some of it has been reclaimed. There are no definitive records of the reclamation efforts after the Quintana operation, although from correspondence it appears some reclamation was conducted in either 1987 or 1988 (Emmer 2014), and active revegetation was inconsistent, patchy, and yielded variable results. Reseeding efforts were to be limited to 46 acres in the north tailings pond and 8 acres to the east side of the plant site yard. The majority of disturbed land at the proposed mine site is currently sparsely covered by vegetation.

Vegetation data within the proposed mine boundary, pipeline boundary, Percha Creek, and Las Animas Creek were collected and described by Parametrix, Inc. within the 2010 and 2011 growing seasons. Both a noxious weed survey and a wetland survey were also conducted. However, because the 2010 growing season was wetter than average, the vegetation cover and production results could be inflated (THEMAC 2011). Information gathered during these surveys provides the baseline data for the proposed mine area, Las Animas Creek, and Percha Creek. Outside the mine area, but essential to mining operations, are nine individual 5-acre millsite parcels (45 acres total) that would be used for staging, equipment, well pads, booster tanks, pumping systems, truck access, and structures to maintain the water supply pumping stations, and a 30-acre area where an electrical substation would be built to supply the increased power needed for accelerated processing under Alternative 2. Descriptions in the following section are supplemented with vegetation data from a 2015 survey performed for the nine 5-acre millsites and the 30-acre electrical substation area (NMCC 2015b).

3.5.1 Land Cover within the Mine Area Boundary

Within the proposed mine area boundary, there are highly disturbed areas as a result of previous mining activity with little to no vegetation in places where topsoil is gone. Some areas remain completely denuded of vegetation, even after many years of mine inactivity. Areas where the rehabilitation (seeding) took place, as well as areas on the periphery of the mining activity that were disturbed to a lesser degree, retain topsoil and support healthy stands of vegetation. Outside the mine area boundary, relatively intact vegetation communities are present.

The history of repeated disturbance in the mine area has dramatically affected vegetation communities. Current vegetation community distribution in the previously mined areas is perhaps more strongly correlated with previous land use than with the biotic or abiotic factors that typically render the distribution of vegetation types or vegetation potential. The “baseline” vegetation condition for portions of the mine area include: a tailing dam, barren areas, various roads, a diversion channel, pit and pit lake, waste rock piles, prospector mining disturbance, grazing, and other disturbed areas. However, relatively intact vegetation communities are also still present within the mine area.

The vegetation of the mine area has been classified variously as semi-desert grassland and steppe (USGS 2004), Chihuahuan Desert shrubland (Dick-Peddie 1993), and Hills Ecological Site (NRCS 2014). Using the data in Appendix G of the Draft EIS for the purposes of this analysis, the area has been determined by the BLM to be best characterized as a grassy hills area, a shrubland area, and an arroyo/riparian area. There is a significant difference in shrub density, grass cover, and species diversity among the tailings dam, waste rock pile, grassy hills, shrubland, and arroyo/riparian land cover types (THEMAC 2011). Vegetation communities and vegetation found within each land cover type are discussed below. The type of vegetation and land cover, the acreage and percentage of each vegetation and land cover type, and the total aerial cover of each vegetation land cover type are listed below. (See Table 3-1.) The distribution of these major vegetation and land cover types are also listed below. (See Figure 3-6.) The table and figure are followed by a description of the vegetation found within the proposed mine area boundary. The presence of wetlands within the proposed mine area boundary is also discussed.

Grassy hills: The Grassy hills type covers 932.9 acres (or 42.6 percent) of the proposed mine area, making it the most abundant vegetative community, albeit highly disturbed. It is dominated by warm season grasses and typical northern Chihuahuan Desert shrubs. Two grass species, black grama (*Bouteloua eriopoda*) and side oats grama (*B. curtipendula*), are the most abundant. Other perennial grass species found in this area include tobosa grass (*Pleuraphis mutica*), Harvard's three-awn grass (*Aristida harvardii*), cane bluestem (*Bothriochloa barbinodis*), blue grama (*Bouteloua gracilis*), hairy grama (*B. hirsute*), and fluff grass (*Dasyochloa pulchella*). The most abundant annual species found in this community is threadstem chinchweed (*Pectis filipes*). Shrubs include broom snakeweed (*Gutierrezia sarothrae*), cat-claw mimosa (*Mimosa aculeaticarpa*), honey mesquite (*Prosopis glandulosa*), spiny dogweed (*Thymophylla acerosa*), and creosote bush (*Larrea tridentata*). In areas devoid of vegetation, litter (partly decomposed leaves, twigs, or other plant parts) and cobble-sized rock are evenly distributed across the ground. Small oak or netleaf hackberry (*Celtis laevigata*) woodlands are present in isolated drainages on the northern and western portions of the proposed mine area. One-seed juniper (*Juniperus monosperma*) is most common on hill slopes with a north-facing aspect on the western half of the site (THEMAC 2011).

Table 3-1. Vegetation Cover Types Within the Proposed Mine Area

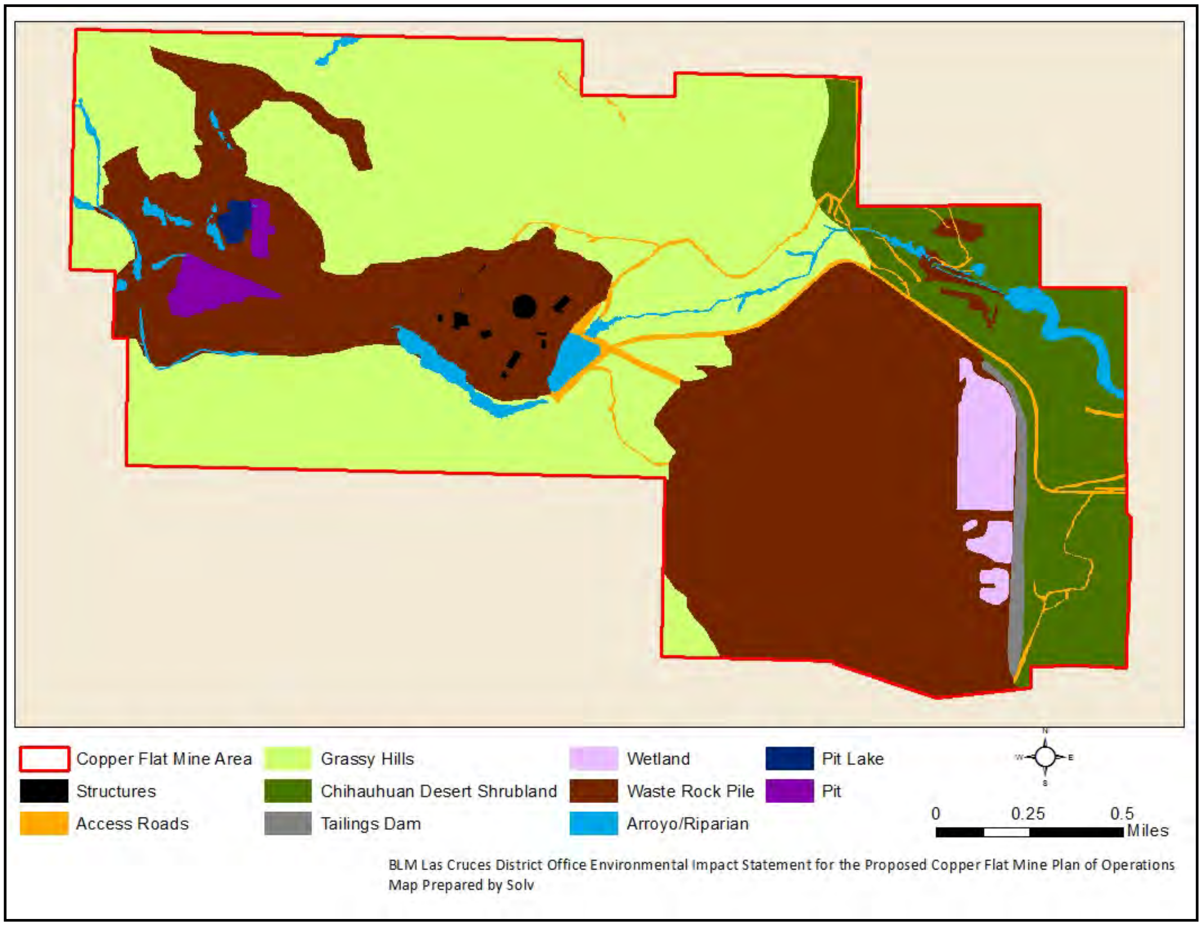
Table 3-1. Vegetation Cover Types Within the Proposed Mine Area		
Land Cover	**Acreage (Percent)**	**Total Vegetation Cover (Percent)**
Grassy hills	932.9 (42.6)	64
Chihuahuan Desert shrubland	260.9 (11.9)	42
Arroyo riparian	50.5 (2.3)	25
Access road*	36.5 (1.7)	--
Pit	21.4 (1)	4
Pit lake*	5 (0.23)	--
Tailing dam	16.6 (0.76)	34
Disturbed areas/waste rock piles	865.7 (39.5)	39

Source: THEMAC 2011.

Note: *Land cover types devoid of vegetation.

Chihuahuan Desert shrubland: Shrubland covers 260.9 acres (or 11.9 percent) of the proposed mine area and is composed primarily of shrub species characteristic of the Chihuahuan Desert. This area has experienced limited disturbance, except from grazing and isolated pockets of prospector mining. The most prominent shrub species found within this vegetative community are honey mesquite, tarbush (*Flourensia cernua*), and creosote bush. Grass species composition is relatively even and includes black grama grass, side oats grama, fluff grass, bushy muhly grass (*Muhlenbergia porteri*), and tobosa grass. The most common perennial forb is small whitemargin sandmat (*Chamaesyce albomarginata*). Annual plant species include six weeks grama (*Bouteloua barbata*) and woolly honeysweet (*Tidestromia lanuginosa*) (THEMAC 2011).

Figure 3-6. Land Cover Map of the Proposed Mine Area



Source: THEMAC 2011.

Arroyo/riparian: Arroyo areas within the proposed mine boundary occur along Greyback Arroyo, the diversion channel, and pit lake. The arroyo vegetative cover has the highest woody plant density within the proposed mine area. The majority of vegetation within this land cover consists of shrubs, with Emory's baccharis (*Baccharis emoryi*) being the most abundant. Burro bush (*Hymenoclea monogyra*) is also frequent in Greyback Arroyo. Grasses make up 24 percent of the relative vegetation cover, with vine mesquite (*Panicum obtusum*) being the most abundant. Other vegetation found in Greyback Arroyo includes desert willow (*Chilopsis linearis*), Goodding's willow (*Salix gooddingii*), cottonwood, fourwing saltbush (*Atriplex canescens*), and the noxious weed saltcedar (*Tamarix* spp.).

Wetlands: During the mine area surveys (NMCC 2012), two locations within the proposed mine area boundary appeared to meet wetland conditions as defined by the Clean Water Act (i.e., dominance by hydrophytic vegetation, hydric soils, and wetland hydrology); however, formal wetland delineations were not conducted. A small cattail community was found along the fringe of the pit lake, and although no open water was present in this community during mine area surveys, it had relatively high soil moisture. Cottonwood (*Populus fremontii*), Goodding's willow, netleaf hackberry, Emory's oak (*Quercus emoryi*), honey mesquite, saltcedar, Apache plume (*Fallugia paradoxa*), rubber rabbitbrush (*Ericameria nauseousus*), velvet ash (*Fraxinus velutina*), single soapberry (*Sapindus saponaria*), and little walnut (*Juglans microcarpa*) were also encountered in this area (THEMAC 2011). A second wetland area, a patch dominated by Goodding's willow and estimated to be 1.5 acres, is located near the main mine entrance where the boundary intersects with the turnoff from SH 152. Seep willow (*Baccharis salicifolia*) also occurs here.

Pit: The pit makes up 21 acres (or 1 percent) of the proposed mine area. The most common ground surface in this location is crushed, cobble-sized rock. During mine area surveys (THEMAC 2011), plant cover was very low, with no annual plants encountered due to past disturbance from mine activity and subsequent loss of soil. A portion of this area is covered with perennial grasses; the three most common grasses encountered during mine area surveys were Harvard's three-awn, silver bluestem (*Bothriochloa laguroides*), and side oats grama. Other vegetation found in this area includes forbs and shrubs. The most common shrub found was California brickelbush (*Brickellia californica*) (THEMAC 2011).

Tailings dam: The tailing dam area accounts for 16.6 acres (or 0.76 percent) of the proposed mine area. Based on current vegetation distribution and diversity, it is likely that this area was seeded during previous reclamation efforts (though gravel is the most prominent ground cover). During mine area surveys, perennial plants were the most abundant type of vegetation found in the tailing dam area. Of these, silver bluestem was the most abundant. Honey mesquite, broom snakeweed, and feather dalea (*Dalea formosa*) were the most abundant shrubs encountered (THEMAC 2011).

Disturbed areas/waste rock piles: Disturbed areas/waste rock piles account for 865.7 acres (or 39.5 percent) of the proposed mine area. The vegetation community found within the disturbed areas/waste rock piles is the most variable due to previous mining activities and associated reclamation efforts. Scraped areas, mining waste dumps, waste rock piles, and placer mining overburden are scattered throughout this land cover. Grasses, particularly graminoids, are the most common vegetation type found in the disturbed areas/waste rock piles. The most dominant species are side oats grama, cane bluestem, black grama, and fluff grass. Shrubs found in this area include honey mesquite, broom snakeweed, and feather dalea. The most dominant perennial forb in this area is spreading buckwheat. Annual plant species include six weeks grama, threadstem chinchweed, and tansy aster (*Machaeranthera tanacetifolia*). Besides vegetation, the groundcover in this area consists of bare soil, litter and gravel, and rock and bedrock (THEMAC 2011).

3.5.2 Land Cover of Linear Corridors and Ancillary Facility Sites

Much of the area proposed for the pipeline corridor and NM 152 consists of existing roads, associated ROWs, a power utility corridor, and well sites. Within this corridor, 67 plant species were observed during surveys. The dominant species observed were creosote bush, woollygrass (*Dasyochloa pulchella*), weeping lovegrass (*Eragrostis curvula*), spreading buckwheat, tarbush, broom snakeweed, tobosa grass, and honey mesquite (THEMAC 2011).

Millsite and substation locations are shown in Section 2. (See Figure 2-2.) A spring 2015 biological survey (NMCC 2015b) in the millsite and substation area yielded 123 plant species, most of which were native. No special status plant species, wetlands, springs/seeps, noxious weeds, adits/shafts, or other biological features critically unique to the region were observed. The majority of the proposed millsites are located in areas with existing developments such as production wells or monitoring wells and each of the sites is bisected by a road. Five typical vegetation types were described for the broad millsite and substation survey area: creosotebush shrubland, draw vegetation, arroyo vegetation, grassland flat, and tobosa grass swale.

- **Creosotebush shrubland:** Most of the sites are dominated by creosotebush flats. In addition to creosote, other shrubs regularly observed included tarbush, mariola (*Parthenium incanum*), Christmas cactus (*Cylindropuntia leptocaulis*), purple prickly pear (*Opuntia macrocentra*), honey mesquite, and longleaf jointfir (*Ephedra trifurca*). This type was the most dominant community through all of the millsites and in Substation A. The southern portion of Substation B is composed of creosote hills that transition into a creosote flat on the southernmost edge of the site.
- **Arroyo vegetation:** The bottom of Greyback Arroyo is dominated by honey mesquite, singlewhorl burrobrush (*Ambrosia monogyra*), and Apache plume. This type only intersects two small corners of Substation A. The arroyo vegetation type is entirely avoided in the Substation B site and the millsites.
- **Draws:** Side slopes of the draws that feed into Greyback Arroyo are dominated by honey mesquite and tobosa grass. The draw vegetation type intersects portions of Substation A, Substation B, and millsites 7 and 8.
- **Grassland flat:** The northern half of Substation B contains a large area dominated by annual grasses, tobosa grass, halfmoon milkvetch (*Astragalus allochrous*), and honey mesquite. Annual grasses, primarily six weeks grama, compose most of the plant cover in this type.
- **Tabosa grass swale:** A tobosa grass swale has developed in a narrow zone where finer textured soils have accumulated over the gravelly loams that are more characteristic of the mine area. This vegetation type crosses through millsite 5 and the small depression eventually drains into a draw vegetation type. Honey mesquite is the most common woody plant in this type.

The affected habitats are primarily Chihuahuan desert scrubland with a plant community that has deviated from its ecological potential. However, perhaps unintentionally, small portions of the millsite boundaries include draws and/or arroyo habitats that contain relatively unique microhabitats for the area. As indicated by the 2015 survey, the arroyo habitats and draws contain a higher biological diversity and abundance than the surrounding creosote flats. Avoiding disturbance in draws or in the arroyo during future developments in this area would be mitigative.

3.5.3 Land Cover of Nearby Creek Drainages

Las Animas Creek: Las Animas Creek, located in the Caballo Lake watershed approximately 4 miles north of the proposed mine boundary, contains variable stream flow, including ephemeral, intermittent, and perennial reaches along approximately 40 total river miles much of it through the Ladder Ranch property. The Las Animas Creek vegetation study area for the Copper Flat Mine Expansion EIS was conducted entirely on private land. Ladder Ranch did not grant access permission for this study; as a result, the study area for Las Animas Creek includes the riparian habitats along approximately 7 river miles of the creek from the eastern Ladder Ranch boundary to I-25.

Riparian habitat along Las Animas Creek is extensive alongside the upper and middle reaches of the Creek. Here the surficial geology consists of bedrock with inter-bedded clays that retard downward flow of surface waters, thereby sustaining a perched surface aquifer in the Creek alluvium. This perched water table supports substantial riparian tree growth including an ecologically important stand of Arizona sycamores (*Plantanus wrightii*) with cottonwoods, netleaf hackberry, velvet ash, Goodding's willow, and coyote willow (*Salix exigua*). Understory vegetation along the creek consists of burro bush and baccharis communities (THEMAC 2011). The Arizona sycamore is an important bird tree in this area, providing habitat for many species including woodpeckers and owls (Firefly Forest 2015). This tree can only be found along riparian corridors (NPS 2012) and is the most abundant co-dominant species along Las

Animas Creek. Although habitat for the Arizona sycamore has been disturbed in this area, the population appears to be in good condition (THEMAC 2011). In the lower reach of Las Animas Creek, where the surficial geology does not have the shallow inter-bedded clays that would support a perched aquifer and the artesian well system does not contribute directly to creek flows, there is no riparian vegetation growth of any note. There are some minor patches of wetland emergent vegetation in the artesian well-fed ponds.

Percha Creek: Percha Creek lies approximately 2 miles south of the proposed mining boundary. Like Las Animas Creek, it has ephemeral, intermittent, and perennial sections. Percha Creek lies in the Caballo Lake watershed and enters Caballo Lake on the south end of the reservoir. The reach surveyed for the vegetation study also includes Percha Box, a steep-walled canyon with perennial flows. The Percha Creek study area includes the riparian habitats along approximately 15 river miles from Hillsboro, New Mexico to just above Interstate Highway 25. Most of the study area was on private land with the exception of the Percha Box reach and a small section of State Trust land. Percha Box is carved through a portion of BLM property.

Riparian and arroyo riparian vegetation communities along Percha Creek included burro bush, Apache plume, baccharis, cottonwood, Goodding's willow, coyote willow, netleaf hackberry, little walnut, velvet ash, desert willow (*Chilopsis linearis*), honey mesquite, cat-claw acacia (*Acacia greggii*), whitethorn acacia, and cat-claw mimosa. Streamside patches of cattail were also observed along the Percha Box (NMCC 2012).

3.5.4 Invasive Species and Site Restoration

Invasive species: During the 2010 and 2011 mine area surveys of the proposed mine area, saltcedar (*Tamarix chinensis*) was the State-listed noxious weed encountered with some frequency within the proposed mine boundary (THEMAC 2011). The total area of saltcedar patches mapped in the mine area was approximately 30 acres. This species out-competes native species as it is more drought-tolerant and less palatable to grazing animals than native species. Saltcedar is usually associated with changes in geomorphology, hydrology, soil salinity, fire regimes, plant community composition, and native wildlife density and diversity (Zouhar 2003). Tree of heaven (*Ailanthus altissima*) and Siberian elm (*Ulmus pumila*) were both observed as single individuals growing at the base of the tailing dam. Both of these infestations were isolated and minimal, only one pole-sized Siberian elm tree was observed, as was a small patch of tree of heaven, likely composed of one individual connected with rhizomes belowground. No State-listed noxious weeds were observed within the pipeline corridor or at Las Animas Creek. Two State-listed noxious weed species were classified as co-dominants in the Percha Creek study area (THEMAC 2011). Tree of heaven and Siberian elm were each encountered.

Restoration: In 2005, the BLM in New Mexico launched the Restore New Mexico initiative with the goal of restoring grasslands, woodlands, and riparian areas to a healthy and productive condition. To date, it has applied restoration treatments on over 3 million acres, including public, State and private lands. What began as a concept has become a widely successful restoration and reclamation program involving numerous agencies, organizations, ranchers, and industry groups. Landscape restoration in New Mexico has focused on controlling invasive brush species, improving riparian habitat, reducing woodland encroachment, and reclaiming abandoned oil and gas well pads (BLM 2014).

As part of Restore New Mexico, the Copper Flat Allotment No. 16079 had a grassland restoration treatment of approximately 5,546 acres, targeting creosote bush (*Larrea tridentata*), completed in November 2014 (Gentry 2014). Although this treatment is entirely outside of the proposed mine area, it gives a vested interest in the allotment from a vegetation/watershed restoration standpoint. The treatment will reduce existing invasive species with the objective of increasing more desirable herbaceous vegetation. This, in turn, will benefit the watershed by stabilizing soil and ultimately increase forb, grass, and favorable shrub production, resulting in increased and improved habitat for a variety of wildlife.

3.6 NOISE AND VIBRATION ENVIRONMENT

This section presents an overview of noise and how it is measured and the existing acoustic environment in and around the proposed mine location.

3.6.1 Noise Overview

Sound is a physical phenomenon consisting of vibrations that travel through a medium, such as air, and are sensed by the human ear. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. Human response to noise varies depending on the type and characteristics of the noise distance between the noise source and the receptor, receptor sensitivity, and time of day. Noise is often generated by activities essential to a community's quality of life, such as heavy equipment or vehicular traffic.

Sound varies by both intensity and frequency. Sound pressure level, described in decibels (dB), is used to quantify sound intensity. The dB is a logarithmic unit that expresses the ratio of a sound pressure level to a standard reference level. Hertz are used to quantify sound frequency. The human ear responds differently to different frequencies. "A-weighing", measured in A-weighted decibels (dBA), approximates a frequency response expressing the perception of sound by humans. Sounds encountered in daily life and their dBA levels are shown below. (See Table 3-2.)

The dBA noise metric describes steady noise levels, although very few noises are, in fact, constant. Therefore, A-weighted Day-night Sound Level (DNL) has been developed. DNL is defined as the average sound energy in a 24-hour period with a 10-dB penalty added to the nighttime levels (10 p.m. to 7 a.m.). DNL is a useful descriptor for noise because: 1) it averages ongoing yet intermittent noise, and 2) it measures total sound energy over a 24-hour period. In addition, Equivalent Sound Level (Leq) is often used to describe the overall noise environment. Leq is the average sound level in dB.

Table 3-2. Common Sounds and Their Levels

Table 3-2. Common Sounds and Their Levels		
Outdoor	**Sound level (dBA)**	**Indoor**
Motorcycle	100	Subway train
Tractor	90	Garbage disposal
Noisy restaurant	85	Blender
Downtown (large city)	80	Ringing telephone
Freeway traffic	70	TV audio
Normal conversation	60	Sewing machine
Rainfall	50	Refrigerator
Quiet residential area	40	Library

Source: Harris 1998.

The Noise Control Act of 1972 (PL 92-574) directs Federal agencies to comply with applicable Federal, State, and local noise control regulations. In 1974, the U.S. Environmental Protection Agency (EPA) provided information suggesting continuous and long-term noise levels in excess of DNL 65 dBA are normally unacceptable for noise-sensitive land uses such as residences, schools, churches, and hospitals. Neither the State of New Mexico nor Sierra County has a noise ordinance.

3.6.2 Existing Noise and Vibration Levels

Existing sources of noise near the proposed Copper Flat project include light traffic, high-altitude aircraft overflights, and natural noises such as wind gusts and animal and bird vocalizations. The areas surrounding the site can be categorized as rural or remote. There are no nearby noise-sensitive receptors (churches, schools, hospitals, or residences) in the immediate vicinity of the proposed Copper Flat project. Existing noise levels (DNL and Leq) were estimated for the areas associated with the proposed Copper Flat project using the techniques specified in the *American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound Part 3: Short-term Measurements with an Observer Present* (ANSI 2013). (See Table 3-3.)

Table 3-3. Closest Noise-Sensitive Areas

Table 3-3. Closest Noise-Sensitive Areas						
			Estimated Existing Sound Levels (dBA)			
Description	**Approximate Distance from Project**	**Type**	**Land Use Category**	**DNL**	**Leq (daytime)**	**Leq (nighttime)**
Hillsboro	3.5 miles	Residential	Very Quiet Suburban and Rural Residential	42	40	34
Residence	0.5 miles					

Source: ANSI 2013

Groundborne vibrations were evaluated using peak particle velocity (PPV) and the Office of Surface Mining (OSM) vibration criteria. PPV is the maximum instantaneous (peak) level of a vibration wave and is normally measured in inches per second. OSM thresholds vary according to the repetition pattern of vibration events, human response versus cosmetic building damage potential, and type of building for the onset of structural damage. Several historic structures exist in or near the proposed mine area. Because of the remote location and lack of existing activity, there is no perceptible vibration at the site. Existing levels of vibration at the site are expected to be less than 0.04 inches per second, and appreciably below levels with the proposed project (Bureau of Mines 1980; Caltrans 2004).

3.6.3 Noise and Vibration Effects from Mining

Groundborne vibrations associated with heavy equipment and blasting activities were evaluated with respect to the potential to affect humans and fragile structures using OSM vibration criteria. PPV and critical distances at which the construction vibration would exceed human response and the threshold for structural damage were estimated. (See Table 3-4.) Groundborne vibration associated with general heavy equipment (i.e., non-impact) would be perceptible to humans and begin to cause cosmetic damage to historic structures at a distance substantially less than those of blasting. Notably, decay factors for groundborne vibrations can vary greatly based on site-specific features such as soil and rock types, and topography. The numbers provided below are estimates based on the best currently available information and were carried forward to characterize the types and overall level of effects under the National Environmental Protection Act (NEPA). If additional refinements were required, on-site monitoring during operations would be necessary to verify estimates contained herein.

Table 3-4. Critical Distance for Human Response and Structural Damage from Vibration

Table 3-4. Critical Distance for Human Response and Structural Damage from Vibration				
Human Response Thresholds				
		Critical Distance (feet)		
Human Response	**Peak Particle Velocity (inches/second)**	**General Heavy Equipment**	**Drilling**	**Blasting**
Barely perceptible	0.04	113	315	1,573
Distinctly perceptible	0.25	21	60	500
Strongly perceptible; may be annoying to some people in buildings	0.9	7	19	225
Severe; unpleasant for people in buildings; unacceptable to pedestrians on bridges	2	3	9	136
Structural Damage Thresholds				
		Critical Distance (feet)		
Structure and Condition	**Peak Particle Velocity (inches/second)**	**General Heavy Equipment**	**Drilling**	**Blasting**
Extremely fragile historic buildings, ruins, and ancient monuments	0.12	42	116	792
Fragile buildings	0.2	26	73	575
Historic and some old buildings	0.5	11	32	324
Older residential structures	0.5	11	32	324
Newer residential structures	1	6	17	210
Modern commercial/industrial buildings	2	3	9	136

Source: Siskind 1989; USDI 1989; Caltrans 2004.

Groundborne vibration associated with blasting would be distinctly perceptible at a distance of 500 feet and barely perceptible at 1,573 feet. There are several historic structures in or near the proposed mine area. Blasting activities within 792 feet, drilling activities within 116 feet, and general heavy equipment activities within 42 feet could cause minor cosmetic damage to extremely fragile historic buildings. Blasting activities within 324 feet, drilling activities within 32 feet, and general heavy equipment activities within 11 feet could cause minor cosmetic damage to older structures and historic buildings.

4. EVALUATION OF IMPACTS TO LISTED SPECIES

4.1 INITIAL LIST OF SPECIES AND CRITICAL HABITATS

Listed species considered for evaluation: According to the USFWS (USFWS-NMESFO 2016), there are ten Federally listed species in Sierra County, New Mexico with some potential to occur in the project area and that may be affected by the project. These include four endangered species, five threatened species, and one species represented by a non-essential experimental population. (See Table 4-1).

Table 4-1. Potentially Affected Federally Listed Species and their Critical Habitat Status

Table 4-1. Potentially Affected Federally Listed Species and their Critical Habitat Status		
Species and Status	**Status**	**Critical Habitat Status Throughout Range**
Chiricahua Leopard Frog *Lithobates chiricahuensis*	Threatened	There is final critical habitat designated for this species.
Narrow-headed Garter Snake *Thamnophis rufipunctatus*	Threatened	Critical habitat has been proposed for this species.
Mexican Spotted Owl *Strix occidentalis lucida*	Threatened	There is final critical habitat designated for this species.
Northern Aplomado Falcon *Falco femoralis septentrionalis*	Non-Essential Experimental Population	No critical habitat has been designated for this species.
Yellow-billed Cuckoo *Coccyzus americanus*	Threatened	Critical habitat has been proposed for this species.
Southwestern Willow Flycatcher *Empidonax traillii extimus*	Endangered	There is final critical habitat designated for this species.
Mexican Gray Wolf *Canis lupus baileyi*	Endangered	No critical habitat has been designated for this species.
Gila Trout *Oncorhynchus gilae*	Threatened	No critical habitat has been designated for this species.
Rio Grande Silvery Minnow *Hybognathus amarus*	Endangered	There is final critical habitat designated for this species.
Todsen's Pennyroyal *Hedeoma todsenii*	Endangered	There is final critical habitat designated for this species.

Source: https://ecos.fws.gov/ecp/report/table/critical-habitat.html.

Sprague's pipit (*Anthus spragueii*) was identified in an earlier draft of this BA as a candidate for USFWS listing that might be found in the project action area, but the species has since been judged by the USFWS to not warrant candidate status and has been removed from this BA analysis (USFWS 2016a). The gray wolf (*Canis lupus*) was identified in an earlier version of this BA as an endangered species, but has since been de-listed (USFWS 2017b). In a separate action, the Mexican subspecies of the gray wolf was listed in Mexico and parts of Arizona and New Mexico as endangered and undergoing restoration to parts of its historic range.

Critical habitats considered: The status of critical habitat for the ten species is shown in Table 4-1. According to the USFWS, the potential effects to critical habitats within Sierra County must be considered for evaluation in this biological assessment along with potential effects to the listed species themselves (USFWS-NMESFO 2016).

4.2 SITE SURVEYS AND LITERATURE REVIEWS

NMCC's biological resources contractor completed a biological study of the project site, including the proposed mine site and the pipeline/NM-152 corridor, in 2011. This study identified the presence of special status species (both wildlife and plants) and evaluated the potential for and presence of habitat for special status species, including Federally listed threatened and endangered species. The study consisted of searches of online databases, published books, and reports; communications with local experts to determine the potential occurrence and habitat needs of special status species in Sierra County; and field surveys for the species and suitable habitat. A follow-up survey was done in 2015 of nine millsites and two potential substation siting areas located outside and to the east of the mine permit area.

Las Animas and Percha creeks provide important habitat and, despite being a relatively small area in the region, have a much higher proportion of listed and sensitive species. This is largely, if not exclusively, due to the presence of perennial surface water fed by a shallow aquifer that supports a diverse and unique riparian area. There is a gallery forest of Arizona sycamore (*Platanus wrightii*) along Las Animas Creek, one of only a very few sites east of the continental divide with this assemblage. Percha Creek also supports sycamores with perennial surface water for approximately 4 miles and portions of the creek that support a diverse riparian community. Percha Creek sycamore growth would likely be only suckers or saplings at this point due to the floods and ash flows after the 2012 Silver Fire and would not be considered suitable habitat for yellow-billed cuckoo or southwestern willow flycatcher (Frey 2018).

Bird surveys of Las Animas and Percha creeks were not conducted, apart from making incidental observations during one brief visit in October 2011. However, considerable work has been conducted by birders at these locations. Using several sources (Audubon Society 2011; Cornell 2011; West 2011; Cleary 2011; and Griffin 2011), a preliminary list of seasonal bird presence for Las Animas and Percha creeks has been developed. In addition to listed species such as the Mexican spotted owl (*Strix occidentalis lucida*) and threatened status species such as the yellow-billed cuckoo (*Coccyzus americanus*), the area contains many sensitive, rare, and endemic species that are found in a very limited range in the State. These endemic species include common black hawk (*Buteogallus anthracinus*), gray hawk (*Buteo nitidus*), zone-tailed hawk (*Buteo albonotatus*), bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), elf owl (*Micrathene whitneyi*), summer tanager (*Piranga rubra*), brown-crested flycatcher (*Myiarchus tyrannulus*), Hammond's flycatcher (*Empidonax hammondii*), vermilion flycatcher (*Pyrocephalus mexicanus*), bell's vireo (*Vireo bellii*), Brewer's sparrow (*Spizella breweri*), red-naped sapsucker (*Sphyrapicus nuchalis*), bridled titmouse(*Baeolophus wollweberi*), and hooded oriole (*Icterus cucullatus*). The area has been listed as an "Important Bird Area" by the Audubon Society.

Table 4-2 identifies the Federally listed species that were either observed in the project action area or for which suitable habitat was found to be present in the project action area.

Table 4-2. Federally Listed Species Observed or with Habitat in the Project Action Area

Common Name	Scientific Name	Federal Status[1]	Species Observed[2]	Potential Habitat[2]
Chiricahua Leopard Frog[4]	*Lithobates chiricahuensis*	T	R[4]	R
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	E		R
Yellow-billed Cuckoo[3]	*Coccyzus americanus*	T	R	R
Northern Aplomado Falcon	*Falco femoralis septent.*	NEP		M, P, R
Mexican Spotted Owl	*Strix occidentalis lucida*	T	R	

Source: NMCC 2012; BLM 2013; BLM 2011; USFWS 2014b.

Notes: [1] T = threatened E = endangered C = candidate S = sensitive NEP = nonessential experimental population.

[2] M = mine site P = pipeline corridor R = Las Animas/Percha creeks riparian areas .

[3] Western distinct population segment (DPS).

[4] = Las Animas Creek observations of the Chiricahua leopard frog are based on surveys done on the upper portions of the creek and its tributary, Cave Creek, in which the frog was found, rather than on direct observations in the NMCC surveys.

4.3 SPECIES ELIMINATED FROM DETAILED EVALUATION

Five of the ten Federally listed species whose range includes Sierra County, New Mexico were eliminated from detailed evaluation in this BA due to the lack of direct observation of the species in field surveys as well as the lack of suitable habitat within the action area, as determined through searches of online databases, published books, and reports, and communications with local experts to determine the potential occurrence and habitat needs of the species in Sierra County.

4.3.1 Narrow-headed Garter Snake

The narrow-headed garter snake is strongly associated with clear, rocky streams using predominantly pool and riffle habitat that includes cobbles and boulders. The species range in New Mexico is the Gila River to the Arizona border. The species habitat is not present in the project action area. Therefore the species was not evaluated for effects from the project.

4.3.2 Mexican Gray Wolf

On June 13, 2013, the USFWS concurrently proposed a rule in the *Federal Register* to remove the gray wolf (*Canis lupus*) from the Federal List of Threatened and Endangered Species and list the Mexican wolf (*Canis lupus baileyi*) subspecies as endangered and expand recovery efforts in the Southwest. On January 16, 2015, the USFWS finalized a rule listing Mexican wolves as a separate entity under the ESA and revised the regulations for the nonessential experimental population of the Mexican wolf under Section 10(j) of the ESA to make it more effective in recovering this endangered subspecies; the ruling became effective on February 17, 2015 (USFWS 2018).

The Mexican wolf is the rarest subspecies of gray wolf in North America. Once common throughout portions of the southwestern United States, the Mexican wolf was all but eliminated from the wild by the 1970s. In 1977, the USFWS initiated efforts to conserve the species. (USFWS-SWR 2017). In the United States, Mexican wolves were reintroduced to the wild in 1998 in Arizona and New Mexico as a nonessential experimental population pursuant to section 10(j) of the ESA. Captive-bred Mexican wolves can be released into a portion of the Blue Range Wolf Recovery Area (BRWRA), which is part of a larger Mexican Wolf Experimental Population Area (MWEPA). The BRWRA consists of all of the Apache and

Gila National Forests. The MWEPA is a larger area surrounding the BRWRA that extends from Interstate Highway 10 to Interstate Highway 40 across Arizona and New Mexico and includes a small portion of Texas north of U.S. Highway 62/180 (63 FR 1752, January 12, 1998). Under current regulations, Mexican wolves can occupy any portion of the BRWRA but are not allowed to establish in the MWEPA. Mexican wolves are found in a variety of southwestern habitats; however, they are not low desert dwellers as once commonly believed. They prefer mountain woodlands, probably because of the favorable combination of cover, water, and available prey.

The project area does not contain the preferred habitat of the species, and the species was not observed in the wild during surveys of the project area. Therefore, the species population in the wild was not evaluated for effects of the project. A small captive population of the Mexican gray wolf is located in a holding facility at the Ladder Ranch, where it is being housed for acclimation and reintroduction to the wild. Potential effects to wolves in that holding facility are evaluated in this BA in Section 4.6, Ladder Ranch Species.

4.3.3 Gila Trout

Gila trout habitat is restricted to a few isolated streams in the upper Gila River and San Francisco River drainages, which are outside project area. Therefore, the species was not evaluated for effects from the project.

4.3.4 Rio Grande Silvery Minnow

The Rio Grande silvery minnow is known to occur only in the reach of Rio Grande from Cochiti Dam to the headwaters of Elephant Butte Reservoir; which is outside the project action area. Therefore, the species was not evaluated for effects from the project.

4.3.5 Todsen's Pennyroyal

Todsen's pennyroyal grows in a habitat not present in the project area: gypseous-limestone soils on north-facing slopes in piñon-juniper woodland. Therefore, because the species is not expected to be found growing in the project action area, the species was not evaluated for effects from the project.

4.4 SPECIES EVALUATED IN DETAIL

Based on the habitat types within the action area, there is suitable habitat and either known presence or the potential for presence of six Federally listed or candidate species—the Chiricahua leopard frog, southwestern willow flycatcher, yellow-billed cuckoo, northern Aplomado falcon, and Mexican spotted owl.

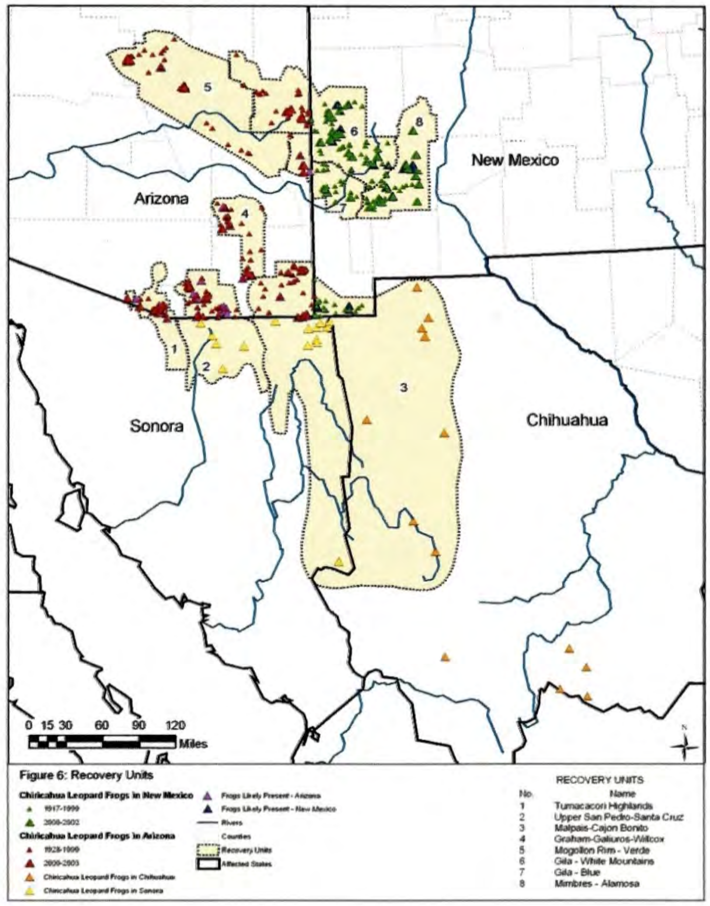
4.4.1 Chiricahua Leopard Frog

4.4.1.1 Distribution and Habitat

Distribution: The Chiricahua leopard frog is Federally listed as threatened. The species' recovery priority number is 2C, which indicates a high degree of threat, a high potential for recovery, and a taxonomic classification as a species. The Chiricahua leopard frog occurs at elevations of 3,281 to 8,890 feet in central and southeastern Arizona, west-central and southwestern New Mexico, and the sky islands and Sierra Madre Occidental of northeastern Sonora and western Chihuahua, Mexico. The range of the species is split into two disjunct parts (Figure 4-1), northern populations along the Mogollon Rim in Arizona east into the mountains of west-central New Mexico, and southern populations in southeastern

Arizona, southwestern New Mexico, and Mexico. Genetic analysis suggests the northern populations may be an undescribed, distinct species.

Figure 4-1. Range of Chiricahua Leopard Frog



Source: USFWS, 2008.

Habitat: The Chiricahua leopard frog is an inhabitant of montane and river valley cienegas, springs, pools, cattle tanks, lakes, reservoirs, streams, and rivers. It is a habitat generalist that historically was found in a variety of aquatic habitat types but is now limited to the comparatively few aquatic systems that support few or no non-native predators (e.g. American bullfrogs, fishes, and crayfishes). The species also requires permanent or semi-permanent pools for breeding, water characterized by low levels of contaminants and moderate pH, and may be excluded or exhibit periodic die-offs where a pathogenic chytridiomycete fungus (see text box on next page) is present.

The Chiricahua leopard frog requires various habitats at each stage in the species' life history to maintain a reproducing population. These habitats include permanent or nearly permanent water that is free or relatively free from non-native predators and not overly polluted by livestock excrement or chemical pollutants; shallow water with emergent and perimeter vegetation that provide egg deposition sites, tadpole and adult thermoregulation sites, and foraging sites; deeper water, root masses, and undercut banks that provide refuge from predators and potential hibernacula during the winter; substrate that includes some mud that allows for the growth of alga and diatoms (food for tadpoles) and to allow for hibernacula; and a diversity or complex of nearby aquatic sites including a variety of lotic (flowing water) and lentic (standing water) aquatic habitats to provide habitat for breeding, post-breeding, and dispersing individuals (USFWS 2008).

Threats to this species include predation by non-native organisms, especially American bullfrogs, fish, and crayfish; the fungal disease chytridiomycosis; drought; floods; degradation and loss of habitat as a result of water diversions and groundwater pumping, livestock management that degrades frog habitats, catastrophic wildfire (fire-prone upland habitats) resulting from a long history of fire suppression, mining, development, and other human activities; disruption of metapopulation dynamics; increased chance of extirpation or extinction resulting from small numbers of populations and individuals existing in dynamic environments; and environmental contamination such as runoff from mining operations and airborne contaminants from copper smelters (USFWS 2007). Loss of Chiricahua leopard frog populations fits a pattern of global amphibian decline, suggesting that other regional or global causes of decline may be important as well, such as elevated ultraviolet radiation, pesticides or other contaminants, and climate change (USFWS 2007).

The Copper Flat project site is within Recovery Unit 8 (USFWS 2007), which contains extant populations of the frog.

Four Management Areas (MA) are designated in RU 8 (Figure 4-2):

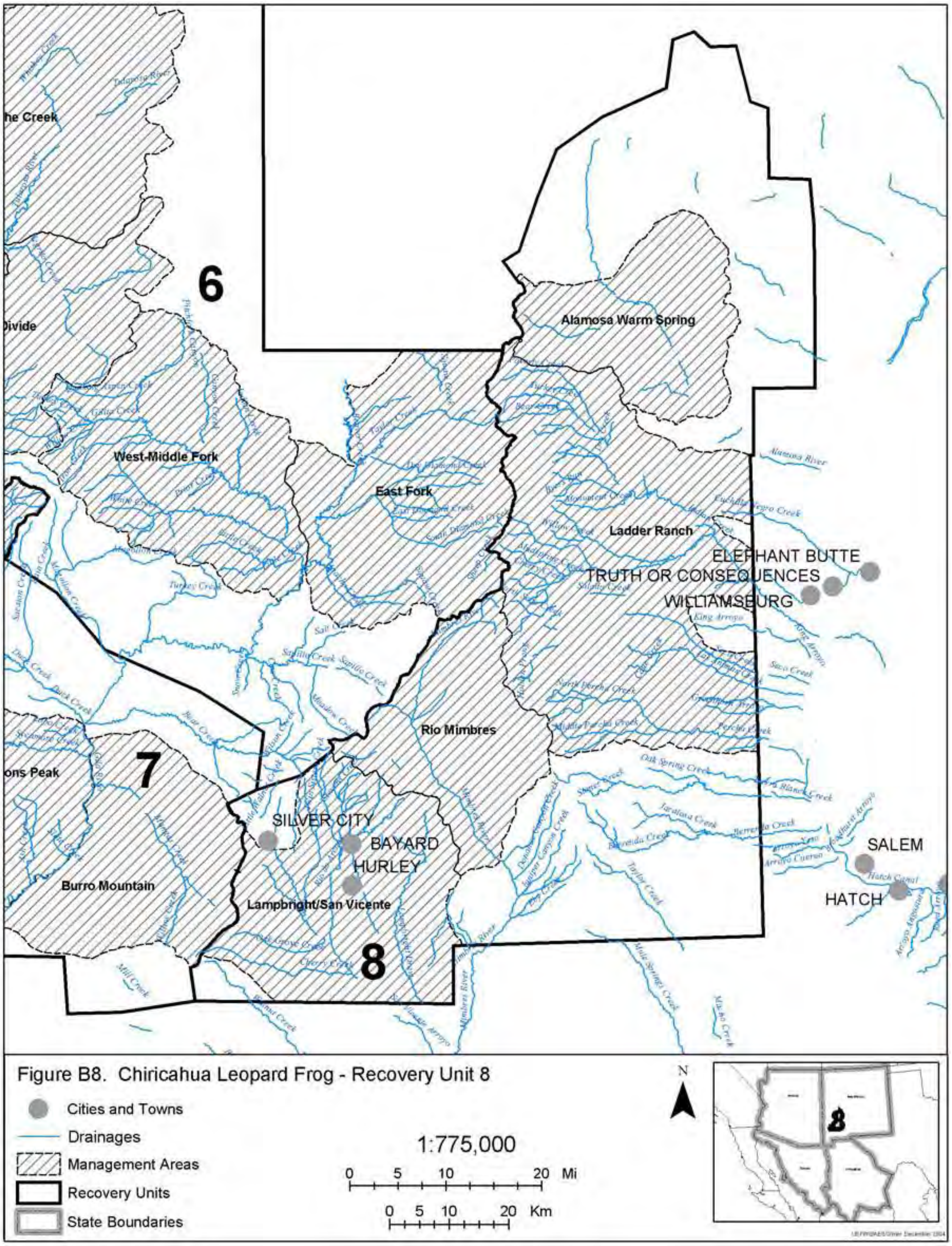
- **Rio Mimbres MA** (potential for metapopulation and buffer). Includes the Upper Mimbres Hydrologic Unit.
- **Lambright/San Vicente MA** (potential for metapopulation and buffer). Includes the San Vicente and Lampbright Hydrologic Units.
- **Ladder Ranch MA** (potential for metapopulation and buffer). Includes the Cuchillo Negro, Palomas, Seco, Las Animas, and Percha Hydrologic Units.
- **Alamosa Warm Spring MA** (potential for large isolated population and buffer). Includes the Kinsley Hydrologic Unit.

Chytridiomycosis is an infectious disease of amphibians caused by an aquatic fungal pathogen, *Batrachochytrium dendrobatidis (Bd)*. *Bd* appears to be specific to amphibians and has been documented in numerous frog species and some salamander specials. *Bd* may be responsible for the greatest disease-caused loss of biodiversity in recorded history. Over just the past 30 years, *Bd* has caused the catastrophic decline or extinction (in many cases within a single year) of at least 200 species of frogs, even in pristine, remote habitats. Recently *Bd* has been implicated in the unexplained disappearances of Central American salamanders as well. While diseases have previously been associated with population declines and extinctions, chytridiomycosis is the first emerging disease shown to cause the decline or extinction of hundreds of species not otherwise threatened. Currently over 350 amphibian species are known to have bene infected by *Bd* (Amphibiaweb 2010).

A total of 1,320 acres (534 hectares) of critical habitat for the Chiricahua leopard frog was established in Recovery Unit 8 in the following critical habitat units: Seco Creek 66 acres (27 hectares), Alamosa Warm Springs 79(32), Cuchillo-Negro-Warm Springs-Creek 6(2), Ash and Bolton Springs 49(20), Mimbres River 1,097(444), South Fork Palomas Creek 23(9) Note that neither Las Animas Creek nor Percha Creek which are located in the Ladder Ranch MA contain Chiricahua leopard frog critical habitat.

Note that neither Las Animas Creek nor Percha Creek which are located in the Ladder Ranch MA contain Chiricahua leopard frog critical habitat.

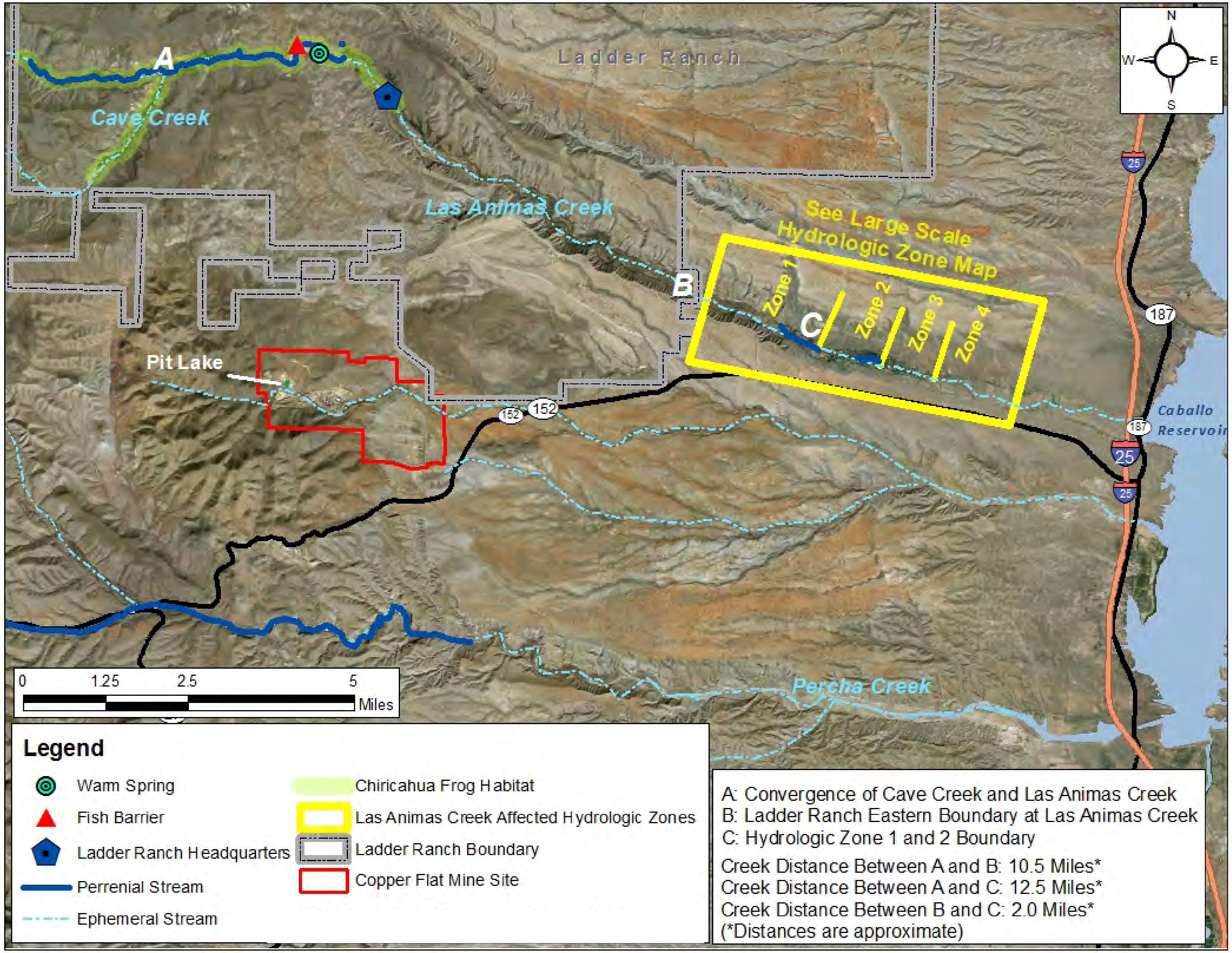
Figure 4-2. Chiricahua Leopard Frog Recovery Units



4.4.1.2 Status of the Chiricahua Leopard Frog in the Action Area

The action area of the project in terms of surface hydrology and related groundwater resources encompasses the lower reach of the Las Animas Creek, the lower reach of Percha Creek, and the Greyback and Greenhorn Arroyo drainages. (See Figure 4-3.) The Chiricahua leopard frog is not known to occur in Percha Creek or any of its tributaries. The arroyos are ephemeral so provide no suitable frog habitat and are not known to contain the frog. Cave Creek and the mainstem of Las Animas Creek on Ladder Ranch have been used as frog restoration sites by the Turner Endangered Species Fund (TESF) Chiricahua leopard frog project for a number of years. However, Cave Creek and the portion of Las Animas Creek transecting the Ladder Ranch would not be affected by groundwater pumping near the lower reaches of the Las Animas Creek. Therefore, the analysis of frog effects focuses on the lower portion of the Las Animas Creek downgradient of Ladder Ranch.

Figure 4-3. Surface Hydrologic Features of Project Action Area Evaluated for Chiricahua Leopard Frog Effects



The lower portions of Las Animas Creek and its floodplain include small sections of permanent surface waters comprising two segments of less than 2,000 feet and the adjacent riparian areas along Las Animas Creek. These surface water and riparian habitat features are sustained by a perched aquifer which overlies a portion of the deep groundwater zone that would be pumped during mine operations. East of and downgradient from these segments, the creek is dry except for post-storm events and so provides no suitable frog habitat. The floodplain of the lower Las Animas Creek contains man-made and maintained irrigation ponds that may provide frog habitat for portions of the year, depending on size and frequency of drainage for field irrigation.

The project action area also encompasses the reasonable dispersal capability of the Chiricahua leopard frog. Reasonable dispersal could be within 1 mile overland or 3 miles along an ephemeral or intermittent drainage from a known occupied habitat to the project site. Frogs are known to disperse up to 5 miles along perennial streams and drainages. The upper portions of Las Animas Creek would be within that dispersal distance from known Cave Creek and Ladder Ranch populations. However, the lower portion of the creek, where pumping for mine operations may affect the hydrology and where only short sections of the creek are perennial (the rest being dry creek bed for most of the year), would not likely support that dispersal distance (USFWS 2008).

Frog populations are known to occur in Cuchillo Creek and in at least three other drainages (and in dirt tanks in the vicinity of these drainages) in Sierra County (BLM 2013), which would not be within a reasonable dispersal distance. However, tanks built for Chiricahua leopard frog recovery on the Ladder Ranch upstream on Las Animas Creek could be located within a reasonable dispersal distance. The action area would, therefore, be limited to the Las Animas Creek riparian area and floodplain.

The Chiricahua leopard frog was not observed in the riparian areas of Las Animas Creek and Percha Creek during the project biological surveys (NMCC 2012 and 2015), and there are no recent reports of the frog being present on the reaches of Las Animas Creek that would be considered potentially affected by the project or in Percha Creek. It must be noted that the project biological surveys did not employ standard protocols for identifying or inventorying the Chiricahua leopard frog and that the surveys were not conducted on private lands in the lower portions of the Las Animas Creek drainage. This means that the analysis was conducted without the benefit of accurate frog population estimates.

Surveys of portions of Las Animas Creek above the action area, i.e. upgradient from the portions of lower Las Animas that might be affected by pumping for mine operations, have been conducted by agencies and entities not affiliated with the Copper Flat project. Surveys of the Las Animas drainage during the summer of 2001 using species-specific protocols documented four frogs in Cave Creek but none in Las Animas Creek (Christman et al. 2003). More recent surveys have shown no frogs on Las Animas or Cave Creek. TESF began a captive rearing program to provide stock for reintroductions, and in November of 2014, released 420 tadpoles and 52 metamorph/adults into Las Animas Creek (McCaffrey and Phillips 2015).

In 2014, the NMDGF, USFWS, Southwest Region, U.S. Forest Service, Gila National Forest, and Turner Ranch Properties, LP prepared an EA for Restoration of Rio Grande Cutthroat Trout to the Las Animas Creek Watershed. The EA preparers noted that the Chiricahua leopard frog occurs in the project area on the Ladder Ranch in Las Animas Creek from Warm Springs (located below the fish barrier) upstream to approximately 2 miles above the confluence of Cave Creek and in lower Cave Creek (Kruse 2013a).

The American bullfrog (*Lithobates catesbeiana*), an introduced species, and canyon treefrog (*Hyla arenicolor*), a native species, occur in Las Animas Creek in the project area (Kruse and Christman 2007). Crayfish are known to occur below the fish barrier and may also occur above the fish barrier in Las Animas Creek (Kruse 2013b).

In the lower reach of Las Animas Creek, where the surficial geology does not have the shallow inter-bedded clays that would support a perched aquifer, and the artesian well system does not contribute directly to creek flows, there is no riparian vegetation growth of any note. There are some minor patches of wetland emergent vegetation in the artesian well-fed ponds. The project did not conduct surveys on private land where artesian-fed ponds are being used for crop irrigation and livestock water. However, these locations are deemed likely to provide only suboptimal habitat for Chiricahua leopard frogs because of likely presence of bullfrogs and other predators and disease (Barnitz 2015).

4.4.1.3 Potential Effects

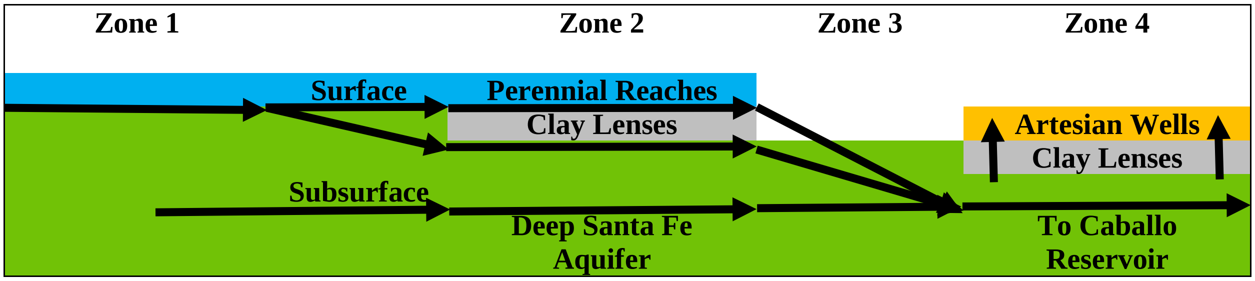
Potential adverse effects from the Copper Mine project that are considered in this evaluation include direct effects such as the possibility of contamination of the flowing surface water in Las Animas Creek and reduction in the volume of water in the creek, and indirect effects such as removal or deterioration of riparian vegetation that protects the creek's aquatic environment. Also considered are effects on artesian well-fed ponds near the intermittent lower reach of Las Animas Creek, one or more of which may provide suitable habitat for adult frog survival although likely suboptimal for frog reproduction.

Potential effects from contamination: It is extremely unlikely that contamination of Las Animas Creek surface water would occur because, even in the event of an accidental spill or major runoff event directly from the mine site or on the roadway approaches to the mine site, contaminants would not flow to Las Animas Creek because of the creek's location in a separate watershed. Greyback Arroyo would channel any such contaminated runoff east, towards Caballo Reservoir, and the watershed of Las Animas Creek is separated from the arroyo watershed by the local topography.

Potential effects in Las Animas Creek and in artesian-well supplied ponds: Depending on the hydrology of the underlying deep aquifer, the surficial aquifer and surface waters in Las Animas Creek, groundwater drawdown from pumping the deep Santa Fe aquifer which lies directly beneath Las Animas Creek could affect the riparian root zone as well as perennial flow reaches. These dynamics could adversely affect riparian plant growth and aquatic habitats that may support Chiricahua leopard frogs in the creek. In a much different environment along the Las Animas Creek, potential frog habitat and any frogs that may inhabit the man-made ponds in the floodplain of the creek could be affected if the artesian wells that supply the ponds are affected by pumping the deep aquifer. Types of effects that could occur are listed in the subsections that follow.

In-creek and irrigation pond effects: There have been no protocol surveys of the lower Las Animas Creek for Chiricahua leopard frogs so it is unknown if frogs occupy habitats there. However, the frogs are known to be adapted to a wide range of habitats at different life stages. Therefore, the BA analysis evaluated the potential effects of the project on Chiricahua leopard frogs that may inhabit the lower Las Animas Creek in two different locations where habitat for the frogs may exist: 1) in short perennial sections in Zone 2 of the creek where surface creek flows are sustained by the underlying impervious substrate, and 2) in man-made irrigation ponds built in the Las Animas Creek floodplain in Zone 4 where landowners use artesian well water to fill their ponds before using them to irrigate their fields.

Figure 4-4. Simplified Diagram of Las Animas Creek Hydrogeology



Creek flow effects: Figure 3-5, "Cross-Section North of Supply Well Field" in Section 3.3.5 illustrates the two separate affected zones where frog effects were evaluated. The four production wells for the mine project would be screened in the deep aquifer below the perennial reaches of Las Animas Creek. These perennial reaches are separated from direct pumping effects by the impermeable geologic layer in the perched water zone, so would not be directly affected by project pumping. Figure 4-4 is a simplified diagram illustrating this. The perennial reaches would be minimally affected by small reductions in upstream inflows because pumping would draw down a portion of Zone 1 flows to the deep aquifer. As noted, because of the large distance involved from the pumping source, the flows to the perennial surface reaches would be reduced by a minimal amount.

Floodplain pond effects: The artesian water zone where the groundwater would be directly affected by pumping is located a considerable distance downgradient from the perched water zone.

Potential surface-flow sustained Chiricahua leopard frog habitat: Short segments of surface flow on Las Animas Creek are unaffected by pumping for mine operations the deep aquifer because the deep aquifer is disconnected from the perched surface alluvial flows to the extent any change would not be measurable (in Zone 2).

The artesian system that provides flows to the wells located in the creek floodplain downgradient (in Zone 4) from the perched reach is not protected from pumping effects and it is expected that the artesian well-fed ponds would be impacted by pumping for mine operations.

Modeling analysis of in-creek effects: The hydrologic effects of the Copper Flat mining project were evaluated using the NMCC hydrogeologic model (JSAI 2014). Groundwater levels in the Quaternary alluvial aquifer along Las Animas Creek are projected to respond slightly to water-supply pumping from the underlying Santa Fe Group aquifer.

The projected effect reaches a maximum near the end of mining, when groundwater discharge to the perennial/riparian zones along Las Animas Creek is projected to decrease by 18 acre-feet per year, out of a pre-mining discharge of 4,848 AFY. After mining, discharge levels will gradually recover to pre-mining rates.

The gaining and losing perennial reaches of Las Animas Creek are shown on Figure 4-5 (Intera, 2012). In gaining reaches, water discharges from the alluvial aquifer overlying less transmissive geologic substrate to the surface to sustain perennial flow. In losing reaches, surface flow seeps into the creek bed rapidly over more transmissive geologic substrate and no longer constitutes surface flow, in this instance moving into the artesian strata underlying the creek. These reaches fall into four generally distinct zones from west to east from the mountain front as shown in the figure. The named grabens are neighboring geologic rift zones east of the mountain front containing sediments of the Santa Fe deep aquifer.

- **Zone 1:** area west of the Animas Graben and east of the mountain front. The shallow alluvium is hydraulically connected to the Santa Fe Group; however, the Santa Fe Group west of the graben is not significantly transmissive and is isolated by clay beds from the shallow alluvium. No direct hydraulic effects in the alluvium would occur.
- **Zone 2:** the alluvial water table is perched above the Santa Fe Group aquifer and separated from it by clay beds that limit downward percolation of streamflow. Alluvial groundwater discharges to Las Animas Creek at the base of the graben. Due to the hydraulic disconnection, no direct hydraulic effects from pumping the wellfield can or would occur.
- **Zone 3:** comprises potential artesian zone recharge. The alluvial water table is isolated from the Santa Fe Group aquifer. Streamflow can percolate downward, but direct hydraulic effects from pumping the wellfield cannot and would not occur.
- **Zone 4:** is the artesian zone without perennial streamflow where the creek bed is dry except after a substantial rainfall event. Groundwater pumping is projected to reduce artesian pressure, resulting in reduced flow to artesian wells and to the shallow aquifer. Drawdown in the alluvial aquifer is projected to be less than 1 foot.

Groundwater discharges to the surface just upstream of the faults bounding the main Santa Fe Group aquifer (the Palomas Graben, or Zone 2). (See Figure 4-3.) Monitoring well MW-11 is representative of the hydrology of Zone 2.

There is a gaining stretch in Zone 1 just above the Palomas Graben (Zone 2), and in the lower part of Zone 2 just above the fault bounding the eastern edge of the Palomas Graben.

Downstream of the gaining stretches, across the faults, are losing perennial stretches. Downstream of these, surface flow occurs after snowmelt or after major precipitation events.

Also shown on Figure 4-5 are contours of projected end-of-mining Quaternary alluvial groundwater level drawdown, reaching a maximum of about 3 inches. The groundwater model is conservative, and the contouring overstates the drawdown at MW-11, which is only about 0.5 inches, as shown on Figure 4-6.

Figure 4-5. Projected Shallow Groundwater Drawdown along Las Animas Creek, with Perennial Flow Denoted as Gaining Sections

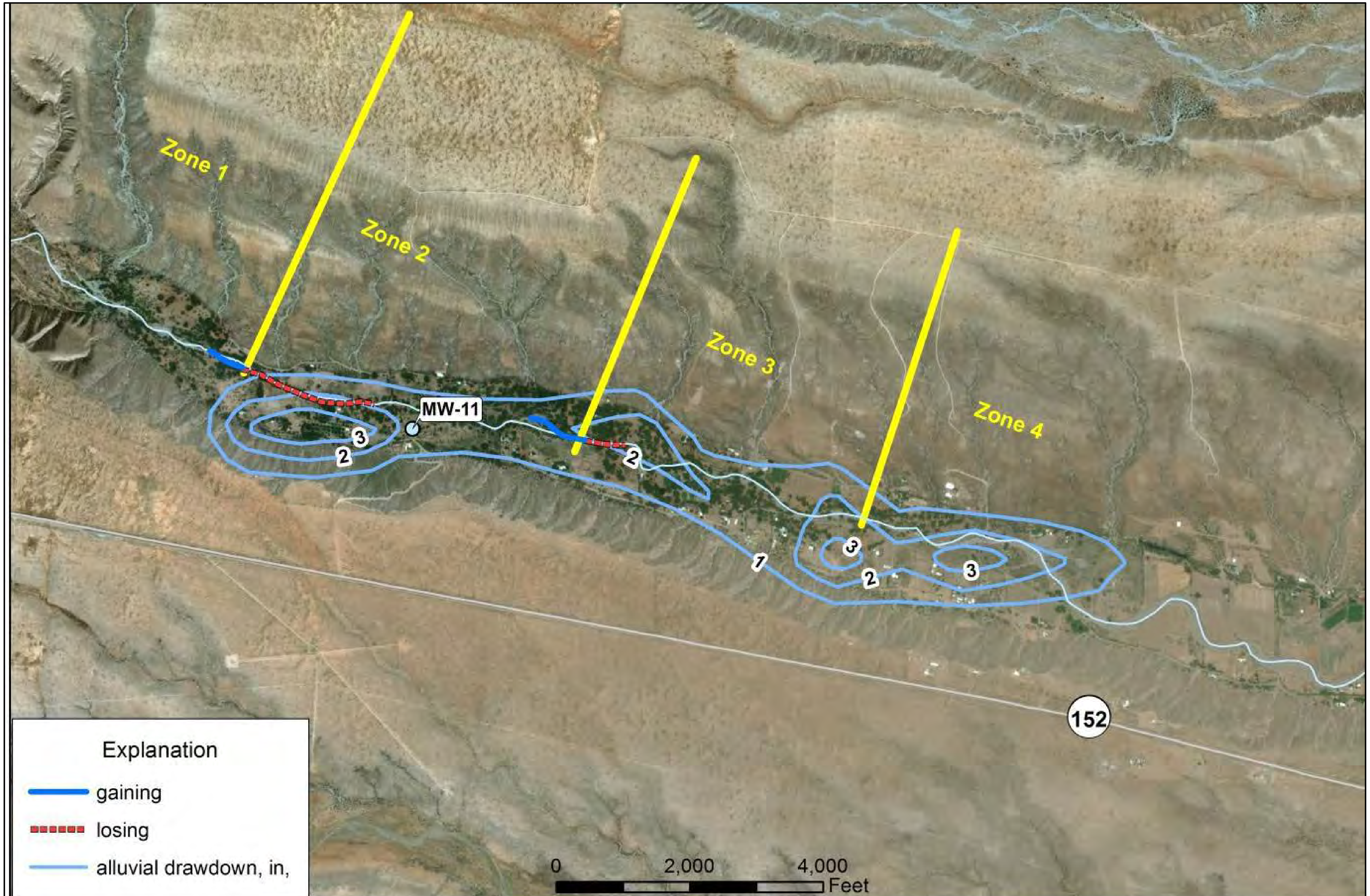
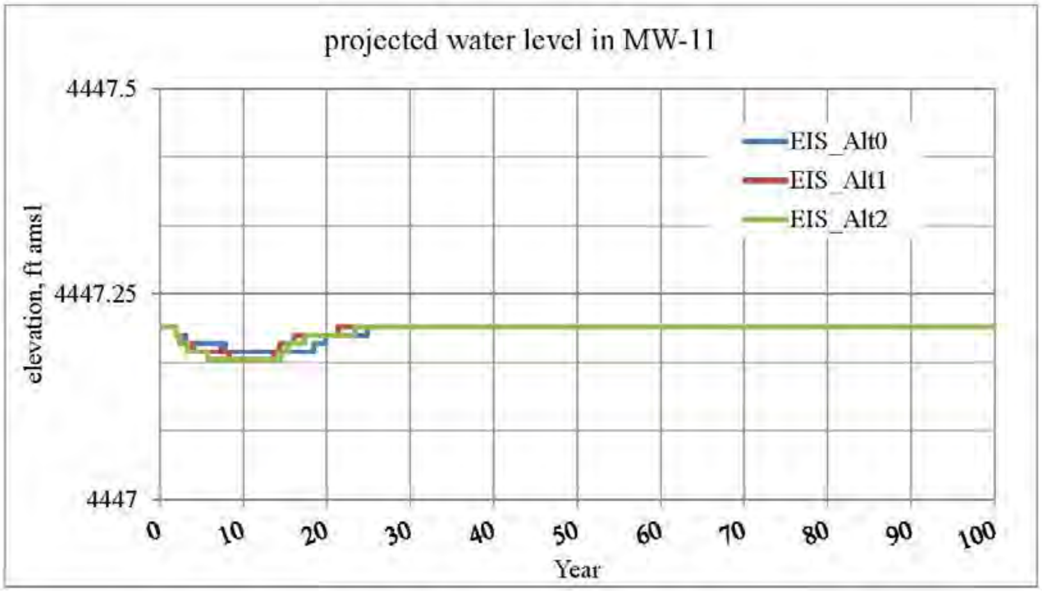
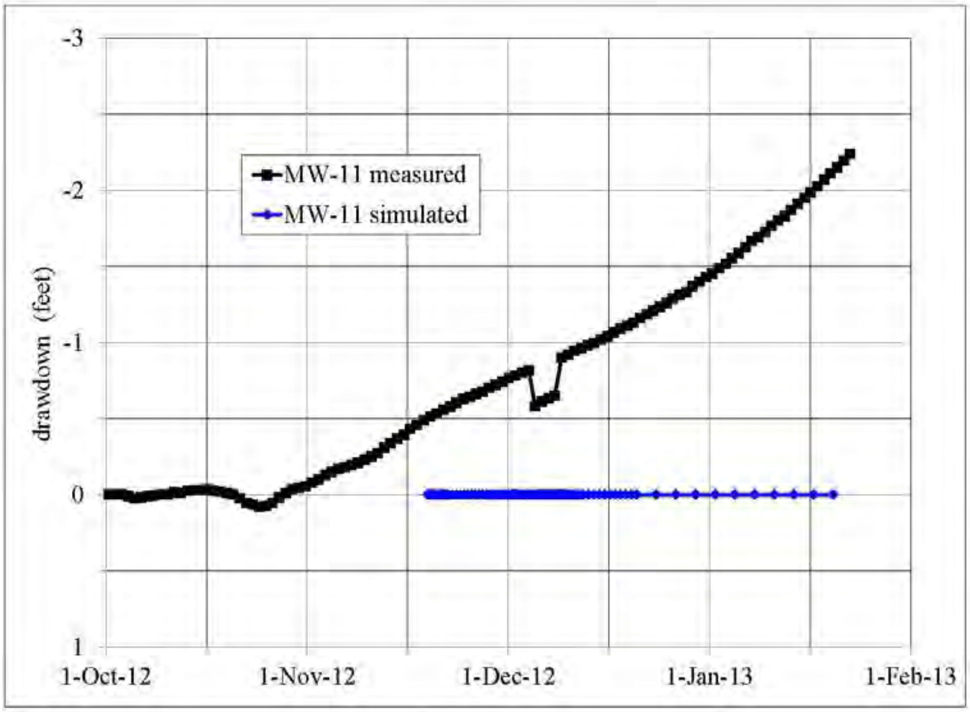


Figure 4-6. Projected Drawdown at MW-11



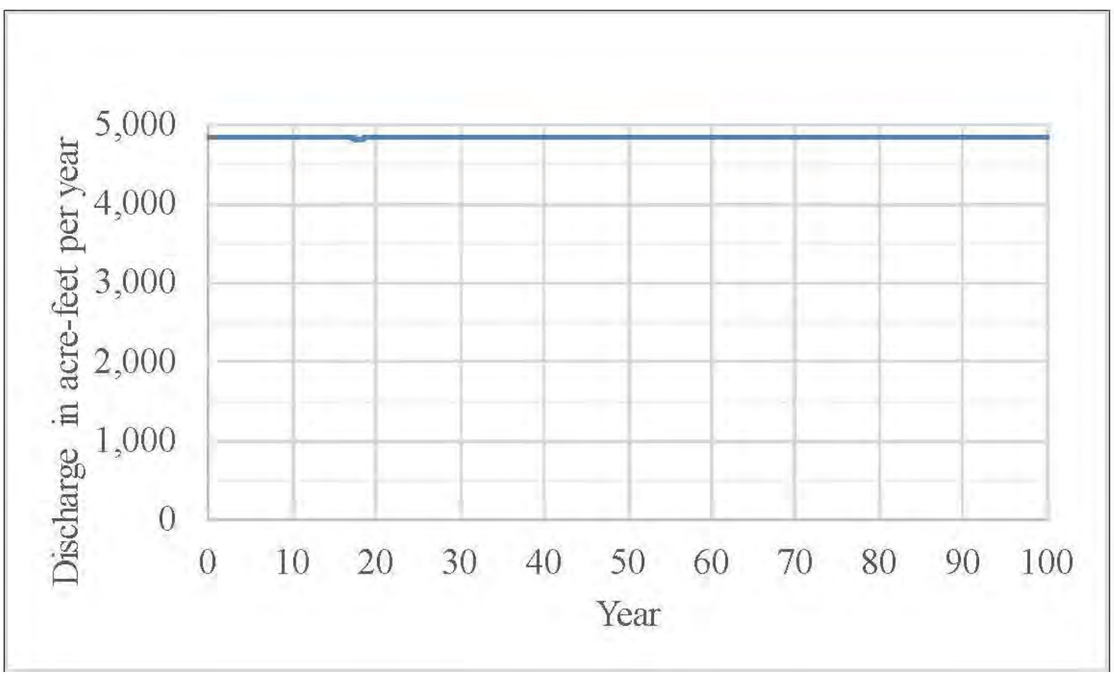
This water level response would not be measurable, as shown in the hydrograph of measured water level at MW-11 during the December 2012 aquifer test. (See Figure 4-7.) No response to the pumping test was detected. However, there was a natural background fluctuation not due to the pumping that included a water level rise of over 2.0 feet before and during the aquifer test (a human measurement error during the test resulted in an apparent fluctuation of about 0.25 feet). Such comparatively large natural background fluctuations make the projected drawdown of less than 1 inch unmeasurable.

Figure 4-7. Measured and Simulated Water Level in MW-11, 2012-2013



Model-projected groundwater discharge to the Animas riparian zone is shown on Figure 4-8. Without an exaggerated vertical scale, the change is barely visible to the naked eye. The theoretically projected effect does not amount to a real effect in terms of streamflow or riparian habitat.

Figure 4-8. Projected Discharge to the Las Animas Creek Riparian/Perennial Zone



The projected theoretical effect would not be detectable by a monitoring network. However, if the effect were measurable (that is, much greater than projected) the proposed monitoring network (Figure 4-9) would detect it.

Figure 4-9. Proposed Monitoring Network near Las Animas Creek Riparian/Perennial Zone

Potential effects to irrigation ponds: In the lower reach of Las Animas (Figure 4-3, Zone 3) ancillary calculations and site inspection have indicated that water from the artesian wells does not create surface creek flows in the lower reach but is consumed in pond and irrigation ET and subsurface alluvial recharge, which eventually flows into Caballo Reservoir. This is because the artesian wells have been employed for crop irrigation purposes by landowners along the lower reach, where the well water is retained in a number of irrigation ponds or otherwise seeps back into the subsurface alluvial flows to Caballo Reservoir. Because artesian water is captured to such a great extent in this system, surface creek flows occur only immediately after substantive rainfall events.

The zone of highest potential impact to the Chiricahua leopard frog is Zone 4 where 12 irrigation ponds may provide Chiricahua leopard frog habitat. The pond habitats are likely to be marginal at best to support Chiricahua leopard frog because:

- pond water levels would fluctuate from artesian well inflow and subsequent irrigation outflows, thereby making a substantial portion of the ponds' peripheral aquatic environments subject to drying and inundation at varying intervals during the growing season;
- pond water temperatures are likely to vary widely based on ambient temperatures and the amount and water and frequency of artesian inflows;
- invasive species such as the bullfrog are likely to inhabit lower creek sections where human disturbance and the proximity of Caballo Reservoir favor that species.

Figure 4-10a is a base location map covering the lower artesian zone (Zone 4) of Las Animas Creek. The twelve ponds are located within the framed areas on the base map. Although the zone extends farther east, farming operations end east of Pond 10. Figures 4-10b, c, and d show the ponds with outlines used to estimate their size. The estimates were obtained from measurements of Google Earth imagery. Accompanying Table 4-3 lists the pond size in terms of perimeter (edge habitat) and acreage for the 12 ponds.

Figure 4-10a. Artesian Zone (Zone 4) of Las Animas Creek, NM

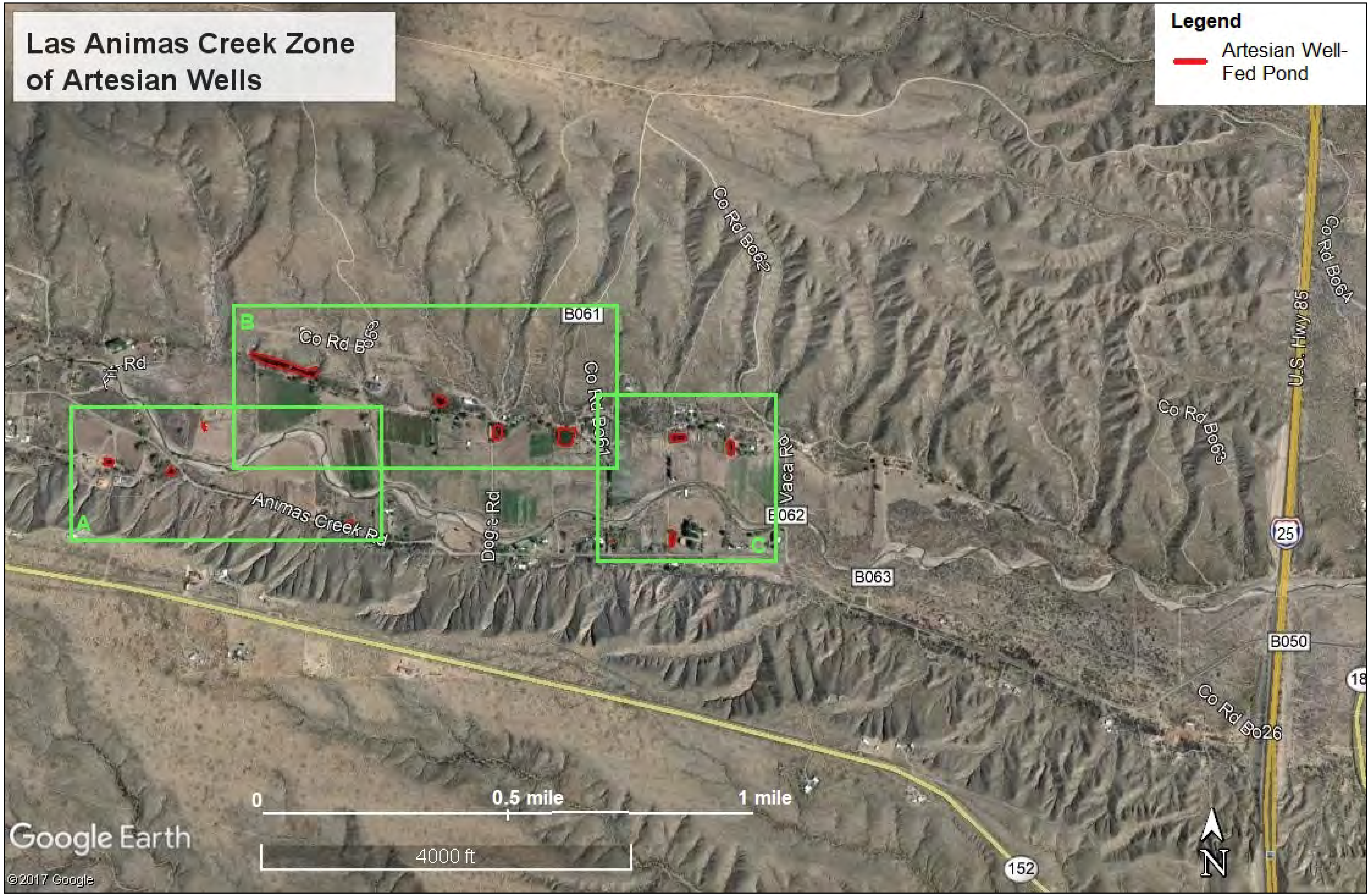


Figure 4-10b. Irrigation Ponds 1 to 4 in the Artesian Zone of Las Animas Creek, NM

Figure 4-10c. Irrigation Ponds 5 to 8 in the Artesian Zone of Las Animas Creek, NM

Figure 4-10d. Irrigation Ponds 9 to 12 in the Artesian Zone of Las Animas Creek, NM

Table 4-3. Size of Las Animas Artesian-Fed Ponds

Table 4-3. Size of Las Animas Artesian-Fed Ponds		
Pond ID Number	**Perimeter (ft)**	**Surface Area (ac)**
1	273	0.04
2	318	0.15
3	407	0.12
4	222	0.07
5	1,623	1.28
6	400	0.27
7	480	0.35
8	698	0.71
9	446	0.26
10	451	0.24
11	59	0.01
12	387	0.17
Total	5,764	3.67

4.4.1.4 Cumulative Effects

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area. Future Federal actions that are unrelated to the mining proposal are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA. Cumulative effects are analyzed for listed species that may be adversely affected by the proposed project. Cumulative actions considered include:

- Increased use of water, including groundwater from the Las Animas Creek drainage for agricultural and private uses. Further use of artesian well water from the deep aquifer can reduce irrigation pond water levels and thereby decrease available habitat for the frog.
- Contamination of Las Animas Creek or pond surface waters (i.e., runoff from pasture and feed lots and from residential and any future commercial development). A decrease in water quality could adversely affect the frog.
- Intentional and unintentional destruction and fragmentation of riparian habitat, such as by increases in private development and urbanization in the historic floodplain, human-caused wildfires, trash dumping, and cutting and removal of native riparian vegetation. Riparian vegetation provides shade, shelter, and food for the frog and contributes to proper functioning of the Las Animas Creek that will benefit frog habitat.
- Future local actions, including additional farming and grazing, recreation, and residential development in the Las Animas Creek floodplain. Livestock grazing can adversely impact the frog by negatively impacting *native vegetation and injuring or killing frogs, tadpoles or eggs. The other human activities listed may adversely impact the frog by decreasing the amount and suitability of habitat.*

The BLM anticipates that these types of activities may continue to threaten the survival and recovery of the frog by reducing the quantity and quality of habitat and by possibly causing injury or death to frogs, tadpoles, or eggs.

4.4.1.5 Effects Determination

There would be no effect to Chiricahua leopard frog critical habitat in the project action area because no critical habitat has been designated in the area.

Protocol surveys for Chiricahua leopard frog have not been completed in the project action area. The species was not observed within the action area in either the 2011 or 2015 biological surveys of the project area, in particular during the plant cover type surveys of the permanent surface flow area of Las Animas Creek in Zone 2. No corresponding plant survey was conducted on the private lands encompassing the artesian well-fed irrigation ponds of the lower reach. Therefore, conclusions as to presence or absence of the Chiricahua leopard frog in the project action area cannot be made with certainty. This analysis assumed that, wherever surface waters and aquatic or riparian habitats that could support Chiricahua leopard frogs are present in the action area, and those habitat elements could be affected by mine operations in some substantive way, Chiricahua leopard frogs could be adversely affected.

The BA determination for the Chiricahua leopard frog is that the Copper Flat mine operations may effect but would not adversely affect Chiricahua leopard frogs that may be living in the perennial sections of Las Animas Creek or in adjacent riparian areas but that the project may affect and would likely adversely affect any Chiricahua leopard frogs that may inhabit the artesian-well-fed irrigation ponds in the Las Animas Creek floodplain. Because a voluntary conservation measure would be undertaken to compensate for any potential take of Chiricahua leopard frogs in the managed floodplain ponds, BLM concluded that the project may affect, but would not likely adversely affect the restoration of Chiricahua leopard frogs overall in Recovery Unit 8.

This determination is based on the following two points:

1. In Zones 1 and 2 where surface flows are permanent and riparian and aquatic vegetation that could support the frog is present, the proposed project would cause some incremental effect on streamflow, but the effect would not be measureable and therefore would be discountable. In this zone, there is no direct hydrologic connection between the shallow underlying perched aquifer that sustains the surface flow and the deep aquifer that would be pumped for mine operations.
2. In the lower reach (Zone 4), flows to the artesian well-fed irrigation ponds would be measurably affected by mine pumping operations. These ponds have not been surveyed for presence of frogs or habitat suitability so it must be assumed that one or more of the ponds may contain Chiricahua leopard frogs. It is expected that landowners would attempt to maintain pond levels, and thus irrigation flows, by pumping the wells if diminished artesian flows affect maintenance of the irrigation water supply. However, in cases where a landowner does not find it feasible or cost effective to do so, any suitable frog habitat that may be present could be adversely affected which in turn may kill or cause the frogs to disperse.

4.4.1.5 Chiricahua Leopard Frog Conservation Measures

Incidental take: Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Harass is defined in the same regulation by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take of a listed animal species that is incidental to, and not the purpose of, the carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of sections 7(b)(4) and 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Estimated incidental take: Because no surveys were done of the irrigation ponds, the BLM does not have information that supports assumptions and estimates regarding the density and number of adult frogs to estimate frogs taken. Therefore, the BLM has restricted the estimates to the number and acreage of ponds that will likely be affected and are reasonably likely to be occupied by Chiricahua leopard frogs.

The following assumptions are provided for the purposes of discussion of reasonable estimates of take, since take cannot be based on direct survey estimates of Chiricahua leopard frog numbers in the irrigation ponds:

- Edge habitat supporting riparian plant growth is the most important aspect of the ponds for frog survival.
- All of the irrigation ponds provide habitat for Chiricahua leopard frogs.
- Take of frogs would be directly proportional to the amount of edge habitat affected by project pumping.
- Because the pond characteristics are unknown beyond acreage and perimeter measures, no pond could be ruled out as not subject to loss of or damage to frog habitat.

- An upper limit on an estimate of take in terms of frog habitat loss would be the total distance in linear feet of pond perimeter.

  NOTE: The BLM based its conclusion of Not Likely to Adversely Affect for potential in-creek effects on Chiricahua leopard frogs on Las Animas Creek on the results of hydrology modeling that indicated that the effects to streamflow would be so minimal as to not be measurable. To verify that this modeling prediction was correct, the BLM will require project-duration monitoring of streamflow.

The BLM proposes that conservation measures would involve construction or rehabilitation of a number of ponds or stock tank equivalent in frog-edge habitat to a minimum of one-half the perimeter of the 12 affected irrigation ponds. Alternatively, conservation measures could be provided where Chiricahua leopard frog habitat could be accessed and potentially restored, either through the creation of new off-channel pools or restoration and improvement of stream habitat on Las Animas Creek or other similar creek. Conservation measures would be applied preferably in Recovery Unit 8 (RU8) locally, but locations would be determined in coordination with USFWS.

The BLM understands these may be locations that have been affected by wildfire or other factors such as livestock grazing that have impacted the quantity and/or quality of Chiricahua leopard frog habitat. In areas where restoration of perennial stream habitat has greater potential to positively affect the Chiricahua leopard frog than the creation of new ponds, these areas will be pursued as candidates for conservation measures because stream habitat provides a higher quality of habitat for the Chiricahua leopard frog, and would likely have fewer associated maintenance costs.

The BLM proposes the following reasonable and prudent conservation measures to mitigate for potential incidental take in the lower Las Animas Creek irrigation ponds:

- Refurbishing or constructing a number of ponds, either in the lower Las Animas creek drainage or in a comparable environment elsewhere in Recovery Unit 8 that would be beneficial to Chiricahua leopard frog recovery. These ponds should be equivalent in combined edge habitat to half (six) of the twelve existing irrigation ponds. Pond parameters are as follows:
  - Mean perimeter habitat is 480 feet times 6 ponds = total edge created would be 2,880 feet.
  - Alternatively, rehabilitating approximately 1/2 mile (2,640 feet) of stream habitat.
- Inclusion of a mechanism to support maintenance of the ponds or stream segment(s) with edge habitat and as free from non-native invasive species, other predators and diseases, including chytrid, as is feasible for the duration of mining plus ten years.
- As part of the Mine Reclamation Plan, establishing a cooperative agreement between the BLM and the Chiricahua leopard frog recovery team (comprised of the USFWS, NMDGF, and TESF) for maintenance assistance and takeover by the Recovery Team or a local conservation group of Chiricahua leopard frog pond maintenance prior to the cessation of mining.

4.4.2 Southwestern Willow Flycatcher

4.4.2.1 Distribution and Habitat

New Mexico Aviation Conservation Partners (NMACP) (2015c) profiles the southwestern willow flycatcher as follows:

> The southwestern subspecies of the Willow Flycatcher has been Federally listed as endangered since 1995, with critical habitat being designated in 2005. It is one of four recognized subspecies of the Willow

> Flycatcher and breeds only in dense riparian habitats in the southwestern United States. In New Mexico, the species is found primarily along the Gila River and Rio Grande drainages. It is vulnerable to the loss, fragmentation, and modification of riparian breeding habitat, including the removal of exotic vegetation along the Rio Grande, where nesting in salt cedar is a regular occurrence (Moore and Ahlers 2006).
>
> All four recognized Willow Flycatcher subspecies occur in New Mexico during migration and are indistinguishable except in the hand. However, all breeding Willow Flycatchers in the state can be assumed to be the southwestern subspecies (Sogge et al. 2003). Southwestern Willow Flycatcher is known to breed only in Arizona, New Mexico, southern California, southwestern Colorado, and the extreme southern portions of Nevada and Utah (Sogge et al. 1997). Probable historical breeding records exist from extreme northern Sonora and Baja California, Mexico (Unitt 1987, Wilbur 1987) and far western Texas, but there are no recent data from these areas (Sogge et al. 2003).
>
> In New Mexico, Southwestern Willow Flycatcher breeds almost exclusively along the Gila River and Rio Grande. In 2007, all confirmed breeding activity in New Mexico occurred in the Gila and Rio Grande drainages, with the exception of a single breeding site on the San Francisco River (D. Hill, USFWS, pers. comm.). [Note: references in preceding excerpt are as cited in NMACP 2015c.]

4.4.2.2 Status in the Action Area

The southwestern willow flycatcher was not definitively detected during the 2011 or 2015 surveys of the project area, although a willow flycatcher was identified in a spring survey of Las Animas and Percha creeks. The bird may have been the southwestern subspecies; however, weighing against that possibility is the fact the species was not detected in the summer on the creeks and the habitat of the creeks is marginal for the southwestern subspecies. Further, available data for Las Animas and Percha creeks riparian areas do not indicate historic or current presence of the species. The dense riparian habitat required for its nesting is not present in the project area on the creeks but is present along the Rio Grande. As noted previously, because the 2011 and 2015 surveys were not conducted according to a standard protocol that would be employed to locate a protected species, no conclusion about the presence or absence of the southwestern willow flycatcher in the project action area can yet be made.

The species is present in habitats on the Rio Grande River, including along Caballo Reservoir. The flycatcher is documented throughout the Rio Grande Canalization Project area, but most birds are concentrated between Percha Dam and Leasburg Dam, which is the 40-mile river reach just south of Caballo Reservoir.

4.4.2.3 Potential Effects

The breeding success of the southwestern willow flycatcher appears to be directly related to flow volumes in nearby water bodies, with reductions in flow correlated with reduced nest success. Therefore, the BA analysis examined the question of whether there may be a reduction in flow volumes to the Caballo Reservoir due to pumping for Copper Flat mine operations that may adversely affect flycatchers nesting in the vicinity. According to NMACP (2015c), throughout the southwest:

> Southwestern willow flycatchers nest near lentic water, such as slow moving streams, river backwaters, oxbows, or marshy areas (Sogge and Marshall 2000), and apparently choose nesting territories based in part on the presence of water. In particularly dry years, flycatchers at traditional nesting sites along the Middle Rio Grande nested in reduced numbers relative to wetter years (Smith and Johnson 2004, 2005) or failed to nest altogether (Johnson et al. 1999). In one New Mexico study, distance of nests from the main river channel was correlated with flow volumes (Brodhead and Finch 2005). In a study from Camp Pendleton, California, 12 of 13 transient male territories were detected within 50 m of the water, but only about half (9 of 17) of breeders were within 50 m. The rest were more than 150 m away (Kus 2000), which suggests that the birds preferred territories not directly adjacent to flowing water. In New Mexico, stream flows (which indicate current and long-term climatic conditions) have been reported to correlate with nest success during

> two narrow time windows, late June to early July, and late July (Brodhead and Finch 2005). In another recent study on the Middle Rio Grande, 16 of 22 nests (73%) were constructed over standing water or wet soil, and timing of standing water was associated with nesting success (Smith and Johnson 2007). [Note: references in preceding excerpt are as cited in NMACP 2015c.]

4.4.2.4 Effects Determination

Designated critical habitat for the southwestern willow flycatcher occurs many miles northeast of the project's action area in a separate watershed, so the species critical habitat would not be affected by project activities. Because the subspecies nests along the Rio Grande and is known to occur in the area of Percha Dam, it is possible that reductions in groundwater flow volumes to Caballo Reservoir from pumping groundwater for mine operations might, if not mitigated, affect nesting pairs near the reservoir.

In the Rio Grande watershed, reservoirs capture and store native Rio Grande water and water piped from northwestern New Mexico via the San Juan-Chama Project. This water is designated for particular users and managed under the legal control of the Rio Grande Compact. Elephant Butte and Caballo reservoirs, for example, hold Rio Grande Compact water for users in southern New Mexico and Texas. Heron, El Vado, and Abiquiu reservoirs on the Chama River store water for cities like Albuquerque and Santa Fe, farmers, and the six Middle Rio Grande pueblos.

Elephant Butte Reservoir is managed to maintain required water levels in Caballo Reservoir under the terms of the Compact so any loss of water to Caballo Reservoir from project pumping would be offset from Elephant Butte Reservoir as part of their routine operations. Thus, the Caballo losses would shift to become Elephant Butte losses. So, to compensate for the Elephant Butte losses, NMCC has agreed to purchase water rights in the Rio Grande basin above the Caballo Reservoir to offset the total of all water losses due to project pumping. The Jicarilla Tribe has affirmed that the water they have agreed to lease to NMCC, if it were not leased to NMCC, would still be released in the Rio Grande and so would not be diverted from some other place because of the NMCC lease. It would go into the Rio Grande via the San Juan Chama Project at Heron for use by some other lessee. The environmental impacts of the San Juan Charma Project were evaluated in an EIS in 2016 (BOR 2016).

Therefore, because the water level in Caballo Reservoir would remain constant, the Copper Flat project may affect, but would not adversely affect the southwestern willow flycatcher.

4.4.3 Yellow-billed Cuckoo

4.4.3.1 Distribution and Habitat

From NMACP (NMACP 2015d):

> The Yellow-billed Cuckoo breeds from southern Canada to south Texas and Florida across almost all of the eastern United States, and in scattered locations throughout the west from California to the Rocky Mountain States. The Yellow-billed Cuckoo occupies a wide array of vegetation types across its large geographic range, but generally prefers open woodland with clearings and low, dense, scrubby vegetation. In the southwestern United States, it is most associated with riparian woodlands dominated by Fremont cottonwood or dense mesquite (Hamilton and Hamilton 1965, Howe 1986). Cuckoos prefer mature or late-successional cottonwood/willow associations with a dense understory. In parts of the west, they also breed in orchards adjacent to river bottoms. Habitat in New Mexico may be primarily native, mixed native and exotic, or primarily exotic plant species, the latter including riparian salt cedar, orchards, and ornamental/shade plantings (Williams and Travis 2005).
>
> Nesting activity in New Mexico begins in May, and generally occurs in large groves of broad-leafed deciduous trees. In the Pecos River valley, Yellow-billed Cuckoos commonly nest in areas dominated by salt

cedar and reach highest densities in areas of taller trees (Howe 1986, pers. comm.). Elsewhere, nests are often placed in willow, Fremont cottonwood, or mesquite; also hackberry, soapberry, or other deciduous vegetation. In native riparian habitat along the Gila River, breeding is confined to areas of tallest trees and densest understory vegetation (Stoleson and Finch 1998). Here, nests are placed at a range of heights (2.7-18.8m) in deciduous trees often overgrown with vines and well concealed by surrounding or overhanging foliage (S. Stoleson, pers. comm.). In the Gila River area, habitat patches as small as 3 ha may be used, though more generally the species is considered sensitive to fragmentation and prefers larger patches of 40 ha or more (Stoleson and Finch 1998).

Partners in Flight (PIF) estimates a species population of 9.2 million, and that New Mexico holds far less than 1% of the species population. Hughes (1999) cites an estimate of 100-200 pairs remaining in New Mexico. Population estimates derived from systematic surveys in the early 1980s suggested a minimum of at least 1,000 pairs statewide, with largest populations in the lower Pecos, Middle Rio Grande, and Gila valleys. Surveys since 2002 suggest that numbers in the Rio Grande study area have since declined (Williams and Travis 2005). [Note: references in preceding excerpt are as cited in NMACP 2015d.]

4.4.3.2 Status in the Action Area

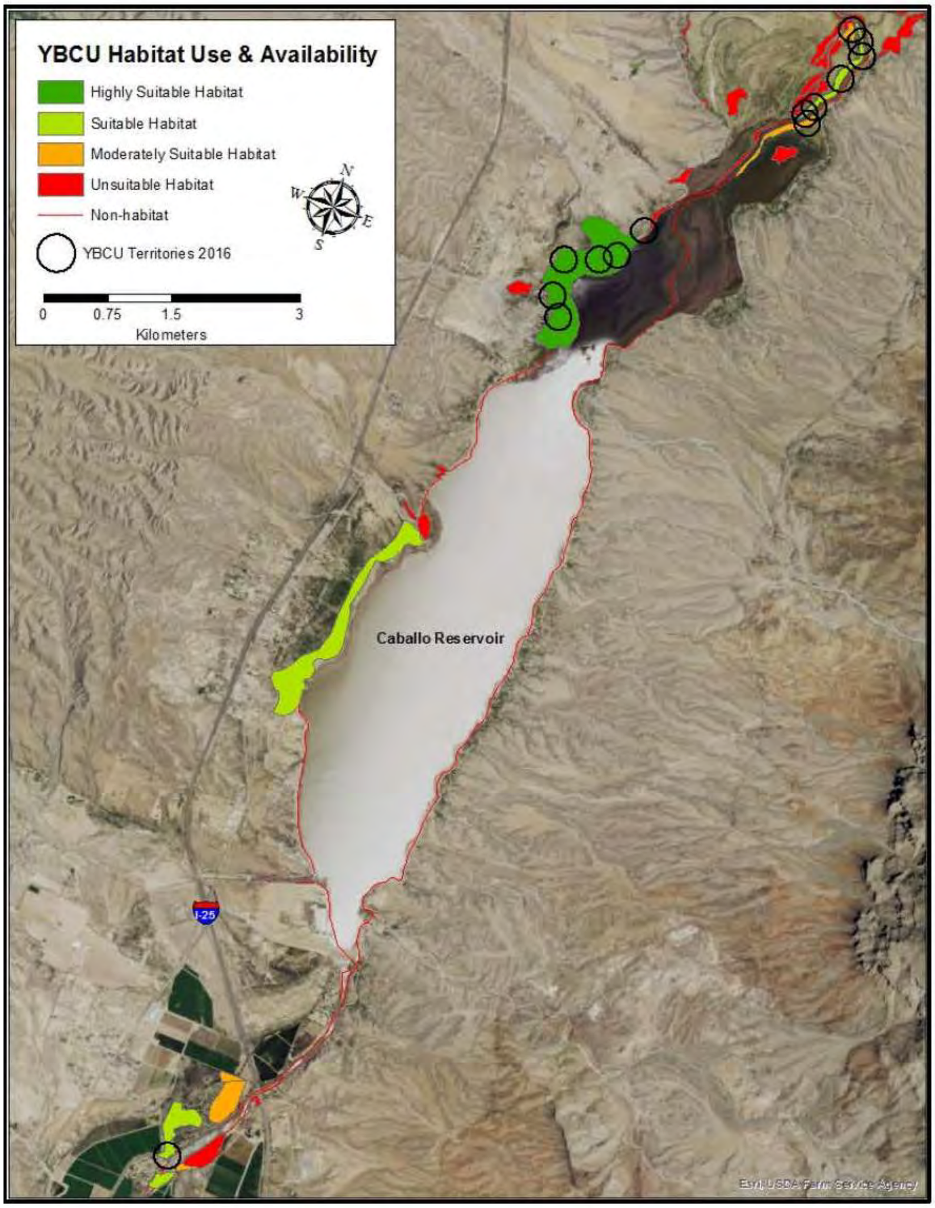
Critical habitat has been proposed for the yellow-billed cuckoo along the Rio Grande River in Sierra County, New Mexico. Proposed critical habitat unit NM–8 is 61,959 acres (ac) (25,074 hectares [ha]) in extent and is an approximate 170 miles (273 kilometers)-long continuous segment of the lower Rio Grande from Elephant Butte Reservoir in Sierra County upstream through Socorro, Valencia, and Bernalillo Counties to below Cochiti Dam in Cochiti Pueblo in Sandoval County, New Mexico. This unit is consistently occupied by a large number of breeding western yellow-billed cuckoos and currently is the largest breeding group of the species north of Mexico. The area also provides a movement corridor for western yellow-billed cuckoos moving farther north. Tamarisk, a nonnative species that reduces the habitat's value, is a major component of habitat in this unit. Las Animas Creek and Percha Creek flow into the Caballo Reservoir on the Rio Grande just south of this unit but the creeks are not part of the critical habitat designation.

The NMDGF reports the yellow-billed cuckoo as a summer resident of the riparian sycamore portions of Las Animas Creek. The NMDGF Southwest New Mexico Birding Trail Brochure for Site 33, Las Animas Creek describes the creek as follows: "Las Animas Creek… bed hosts a beautiful stand of Arizona sycamores, creating an ideal environment for such southwestern riparian species as elf owl, brown-crested flycatcher, acorn woodpecker, and bridled titmouse. The first few miles [of] desert scrub harbors verdin, cactus wren, curve billed and Crissal thrashers, rufous-crowned and black-throated sparrows. Farther west, sycamore groves host acorn woodpecker and bridled titmouse. Summer residents include white-winged dove, yellow-billed cuckoo, elf owl, lesser night hawk, brown-crested and ash-throated flycatchers, Cassin's kingbird, Lucy's warbler, yellow breasted chat, and summer tanager…"

During the summer of 2016, the Bureau of Reclamation (BOR 2017) conducted surveys for the Federally threatened western yellow-billed cuckoo within the Lower Rio Grande Basin, New Mexico. Surveys were done in all potentially suitable habitat of the Rio Grande riparian corridor between Elephant Butte Dam, New Mexico and El Paso, Texas. Surveys were conducted using established protocols to determine the distribution and abundance of yellow-billed cuckoo throughout this stretch of the Lower Rio Grande.

A total of 87 yellow-billed cuckoo detections were recorded during the 2016 breeding season; 24 territories were delineated from these detections. Of these, 12 were considered possible breeders and 12 were considered probable breeders, as defined in Halterman et al. (2016). The Caballo Reach contained the largest breeding population with 62 detections comprising 15 territories. Figure 4-11 shows that highly suitable habitat for the cuckoo with active territories is located along the northernmost portion of the reservoir along the western shore above the delta formed at the Las Animas Creek outflow. Suitable habitat is located along the western shore below the outflow from Greenhorn Arroyo. No suitable habitat is associated with the outflow from Percha Creek.

Figure 4-11. Yellow-billed Cuckoo Habitat Use on the Periphery of Caballo Reservoir



4.4.3.3 Potential Effects

The potential adverse effects from the proposed Copper Mine project that are considered in this evaluation are the potential loss or deterioration of riparian vegetation that provides nesting and foraging habitat for the species along portions of Las Animas and reduction of subsurface flows to the Rio Grande that may affect floodplain habitats supporting the yellow-billed cuckoo.

Disruption of natural stream processes which help the development and regeneration of riparian vegetation has been identified as a threat to the western yellow-billed cuckoo (USFWS 2014a). Lack of an adequate food supply is another threat for the cuckoo, which forages almost entirely in native riparian habitat. The cuckoo is primarily dependent on large caterpillars, which depend on cottonwoods and willows.

A segment of Las Animas Creek, which is upstream of the area that could be impacted by groundwater drawdown, supports a diverse area of pole-sized sycamore, cottonwood, Gooding's willow, and coyote willow and could be a food source for the cuckoo. Breeding habitat of the western yellow-billed cuckoo consists of expansive blocks of riparian vegetation, especially cottonwood-willow woodlands, containing trees of various ages including larger, more mature trees used for nesting and foraging (USFWS 2014a). For these areas to remain as viable western yellow-billed cuckoo habitat, the dynamic transitional process of vegetation recruitment and maturity must be maintained, and without such a process of ongoing recruitment, habitat becomes degraded and is eventually lost (USFWS 2014a).

The Preferred Alternative would not result in measureable changes in stream flow in Las Animas Creek because the water sources sustaining the surface creek flows and riparian vegetation are not directly connected to the deep aquifer. This is the aquifer that would be pumped for use as the mining water supply although there would be a small, discountable effect from indirect loss of surface flow from upstream due to a minimal increased diversion to subsurface alluvial flows. Therefore, no indirect effects from the potential alteration of riparian habitats or stream channel morphology would occur on Las Animas or Percha creeks. The area of Las Animas Creek that could be impacted by groundwater drawdown from mining operations has been altered by past and ongoing channelization of the creek and vegetation removal for agriculture and development, which has limited recruitment and growth of the riparian plants that are the basis of the cuckoo's habitat. As stated above, this area is predominately older growth sycamore, hackberry, and cottonwood which would not likely be affected by a gradual drawdown of the water table of less than 1 inch. The recruitment of younger cottonwood and willow trees needed for breeding habitat is occurring outside the affected drawdown area; recruitment is limited to sycamore trees only in the upper reach of the affected area. The cuckoo has been observed in the project action area, but would not likely be affected by any gradual change to the composition of the riparian plant community. The location and size of the preferred habitat type necessary for breeding (cottonwood-willow) and for a food source would not likely be affected by groundwater drawdown of the shallow alluvium.

Pumping of water from the deep aquifer to supply the Copper Flat mine project would substantively reduce groundwater discharge to Caballo Reservoir and the Rio Grande, decreasing surface water quantities in those water bodies.

4.4.3.4 Effects Determination

There would be no effect to yellow-billed cuckoo proposed critical habitat because the species' critical habitat is located upstream of Caballo Reservoir along the Rio Grande and not in the project action area.

The Preferred Alternative mining project may affect, but would likely not adversely affect the yellow-billed cuckoo near the Caballo Reservoir. The Preferred Alternative would not result in changes in streamflow on Las Animas or Percha creeks; therefore, no indirect effects from the potential alteration of surface flow volumes, stream characteristics, or riparian habitats would be expected.

Reduced groundwater discharge to Caballo Reservoir could adversely affect lakeside vegetation used for nesting and foraging by the cuckoo. However, NMCC would fully offset the loss of water flow to Caballo Reservoir by purchase of water rights on the Rio Grande above Caballo Reservoir so, as described previously for the southwestern willow flycatcher, there would be no net loss of flow or change in water levels due to the mining project.

4.4.4 Northern Aplomado Falcon

4.4.4.1 Distribution and Habitat

Once considered common in its range within the U.S., populations declined rapidly after the 1930s. By the late 1950s, the northern Aplomado falcon was considered extirpated in the U.S. and was designated an endangered species in 1986.

Aplomado falcons (*Falco femoralis*) inhabit desert grasslands and savannas of Latin America, and formerly inhabited desert grasslands and coastal prairies of Texas, New Mexico, and southeastern Arizona. The falcon ranges through most of South America, from Tierra del Fuego to Ecuador and Venezuela, and from near sea level to above 13,000 feet in the Andes, and is also found throughout Central America.

Falcon habitat consists of open terrain with scattered trees or shrubs. In Mexico, they inhabit palm and oak savannas, open tropical deciduous woodlands, seasonally flooded coastal savannas and marshlands, desert grasslands, and upland pine parklands. In the U.S., they occur along yucca-covered sand ridges in coastal prairies, riparian woodlands in open grasslands, and in desert grasslands with scattered mesquite and yucca.

NMACP (NMACP 2015a) describes the northern Aplomado falcon:

> The northern Aplomado falcon is designated as endangered in Arizona, New Mexico, Texas, Mexico, and Guatemala. On July 26, 2006, a final rule on the establishment of a nonessential experimental population (NEP) in Arizona and New Mexico under section 10(j) of the Endangered Species Act was published in the Federal Register. This designation authorizes unintentional or incidental take of the falcon pursuant to otherwise legal actions, but still prohibits intentional take. The objective of the 1990 Aplomado Falcon Recovery Plan is to ensure that the falcon is no longer threatened by habitat loss, pesticide contamination, or human persecution. Criterion to reclassify the falcon from endangered to threatened status was tentatively identified as a minimum self-sustaining population of 60 pairs in the U.S. Currently, long-term drought, shrub encroachment in areas of Chihuahuan Desert grasslands, and the increased presence of the great horned owl, which preys upon the falcon, may be limiting recovery of this subspecies. Substantial recolonization of U.S. habitats by naturally occurring falcons in Chihuahua, Mexico, would likely take decades, if it occurred at all, because the reproductive rate of falcons in Chihuahua has typically been low. However, falcons appear to be relatively tolerant of human presence and are frequently found nesting in association with well-managed livestock grazing operations in Mexico and Texas. It appears that falcons would be able to coexist with current land-use practices in New Mexico on a broad scale.
>
> The Recovery Plan recommends that an attempt should be made to establish populations in the U.S. The intense overgrazing that resulted in shrub encroachment in Chihuahuan Desert grasslands in New Mexico and Arizona has moderated, and there has been widespread implementation of improved range management techniques. In addition, the use of DDT was banned in Mexico in 2000. [Note: references in preceding excerpt are as cited in NMACP 2015a.]

4.4.4.2 Status in the Action Area

The northern Aplomado falcon that could occur in Sierra County is a nonessential experimental population, which is defined as a species proposed for Federal listing under Section 10(j) of the ESA. Some suitable habitat for the falcon, which includes desert grasslands with scattered mesquite and yucca, and riparian woodlands in open grassland does exist at the project action area. However, the Chihuahuan Desert grassland and shrubland habitats that exist in the project action area have been affected by grazing practices and lack some of the yucca/grassland habitat preferred by the falcon. Falcon releases have occurred in Sierra County, but these releases have not resulted in known Aplomado falcon nests in the county (BLM 2013).

Beginning in 1997, TESF at the Armendaris Ranch in New Mexico had collaborated with The Peregrine Fund and the USFWS on efforts to reintroduce falcons to restore a viable population to the Chihuahuan grasslands of the Armendaris Ranch and environs, which would count toward Federal recovery of the species per the ESA. By 2013, it was apparent that ecological circumstances precluded restoration of such a population. Therefore, that year TESF terminated field efforts on behalf of the species.

Aplomado falcon has not been detected near the mine site, but it has been recorded in Sierra County in habitat similar to that which occurs in the mine site (West 2011). The 2011 survey showed falcon habitat is present at the mine site, in the pipeline corridor, and in the Las Animas and Percha creek riparian areas.

4.4.4.3 Potential Effects

Mine construction or operation actions that would remove native desert grasses permanently or remove grasses but tend to favor establishment of shrubs as revegetation species would adversely affect the potential for the area to support the Aplomado falcon. Mine development activities that would affect vegetation include clearing and grading activities associated with construction, operation, and maintenance. Both woody and herbaceous (non-woody) vegetation would be cleared and grubbed in constructing haul and secondary mine roads as well as mining facilities, essentially eliminating that vegetation-for the approximately 16-year duration of the Copper Flat project. Approximately 1,586 acres of vegetation on both public and private lands would be directly affected. While 910 acres of the proposed mine area boundary have previously been disturbed from past mining activities, the proposed mining activities would also impact 676 acres of undisturbed land within this boundary. Outside the mine area boundary, up to 45 acres would be permanently cleared of vegetation for millsite construction activities at the millsite locations. In eastern Mexico, home ranges were 2.6-9.0 square kilometers (642 to 2,224 acres), or 11-39 pairs/100 square kilometers (11-39 pairs/24,710 acres) (Hector 1988). In northern Chihuahua, 10 home ranges occupied approximately 400 square kilometers (10 home ranges occupied 98,842 acres), and individual home-range sizes based on radiotelemetry were 3.3- 21.4 square kilometers (815 to 5,288 acres) (Montoya et al. 1997). Therefore, it is possible that the proposed 676 acres of clearing might affect an area large enough to comprise the home range of an aplomado falcon or portions of two or more falcons if at some future date the aplomado falcon established a population in New Mexico.

4.4.4.4 Effects Determination

Although mine development would remove some substantial acreage of grassland and shrubland vegetation, that vegetation is widespread and common throughout the area in Sierra County. The minimal potential habitat losses in the project area that would occur may affect, but would not adversely affect, the northern aplomado falcon or its preferred habitat.

4.4.5 Mexican Spotted Owl

4.4.5.1 Distribution and Habitat

NMACP (2015b) describes the Mexican spotted owl as follows:

> Mexican spotted owls occupy primarily mixed conifer forests dominated by Douglas-fir, true fir and pine, or pine with an oak or other broad-leafed understory component. Favored habitat is often steep forested canyons with cliffs, perennial water, and riparian vegetation (Gutierrez et al. 1995, U.S. Fish and Wildlife Service 1995, Willey 1993). It may also occur in rocky canyons, particularly in the northern portion of its

range. The species prefers old growth where available and generally occupies uneven-aged forests with complex vertical structure (Ganey and Balda 1989a).

In mixed conifer, breeding owls select sites with more mature Douglas-fir and pine, canopy closure of 75% or more, and the presence of an oak understory (Seamans and Gutierrez 1995, Peery et al. 1999). In pine-oak habitat, territories may be located on more moderate slopes with 60% or greater canopy cover and are less concentrated in canyon bottoms (Ganey et al. 2000). In the Sacramento Mountains, 75% of nests were located in Douglas-fir, of which 61% were in dwarf mistletoe clumps. Nest trees averaged over 150 years in age (Seamans and Gutierrez 1995). In steep-walled canyons, owls may also nest in cliff crevices (Gutierrez et al. 1995).

Territory sizes in Arizona and New Mexico range from 7-11 square kilometers (Kroel 1991). Owls may forage and roost in a wider range of habitats than are used for nesting, but generally prefer sites with high canopy closure, live-tree basal area, and snag density, and the presence of fallen logs (Ganey and Balda 1989b). Fledglings may depend on oak thickets for roosting and to avoid predator detection (Gutierrez et al. 1995). In winter, lower-elevation pinyon-juniper habitat may be used. The prey base of the species in New Mexico is strongly affected by climatic variation. A recent study shows annual survival and reproduction of Mexican spotted owls is positively correlated with previous year's precipitation (Seamans et al. 2002).

Adult Mexican spotted owls are highly faithful to breeding sites, and the majority of dispersing birds are juveniles (Arsenault et al. 1997). Dispersal habitat is more variable than breeding habitat. Nearly all isolated patches of mixed conifer or ponderosa pine in New Mexico and the southwest could be reached by dispersing owls (U.S. Fish and Wildlife Service 1995). Dispersers have also established home ranges in pinyon-juniper habitat (Ganey et al. 1998). [Note: references in preceding excerpt are as cited in NMACP 2015b.]

4.4.5.2 Status in the Action Area

Historically, the Mexican spotted owl occupied low-elevation riparian forests, but it now typically breeds and forages in dense, old-growth, mixed-conifer forests along steep slopes and ravines. The owl has been recorded in all montane regions in New Mexico and may occur in piñon-juniper and cliff habitats in Sierra County.

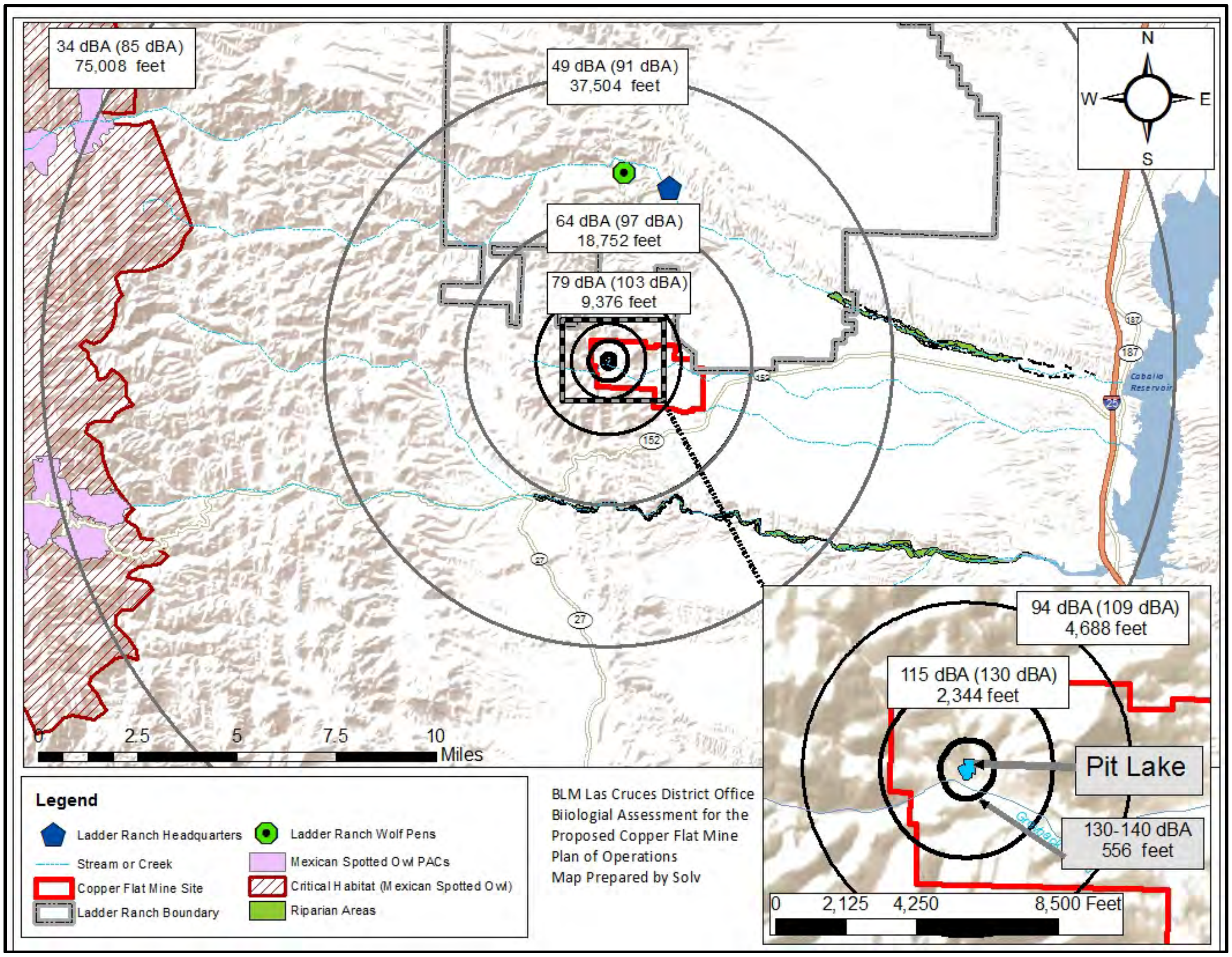
According to the Rio Grande Cutthroat Trout (RGCT) Restoration EA (NMDGF et al., 2014) which covered portions of Las Animas Creek to the west, upstream of the Copper Flat action area, including Ladder Ranch, two Mexican Spotted Owl Protected Activity Centers (PAC) are located in the RGCT project area: the East Curtis PAC and the Gooseberry PAC. Roosting/nesting sites for both of these PACs are located in tributary drainages of Las Animas Creek. No nesting/roosting habitat is found along Las Animas Creek or Cave Creek on the Ladder Ranch, but these riparian areas may provide wintering habitat for owls. Proposed RGCT restoration stream segments that begin at the Aldo Leopold Wilderness boundary of the Gila National Forest upstream are within designated critical habitat for Mexican spotted owl.

The 2011 NMCC survey lists the Mexican spotted owl as having been observed in the riparian areas of Las Animas and Percha creeks in the spring. Figure 4-12 shows the PACs within Mexican spotted owl critical habitat on the Gila National Forest as well as riparian habitats along Percha and Las Animas creeks the owls may use in the winter and spring.

4.4.5.3 Potential Effects

It appears evident that the Mexican spotted owl is using the portion of the action area that provides dense tree cover, i.e. the riparian areas, probably for lower elevation winter survival. Any Copper Flat mine project activities that would reduce the riparian cover would adversely affect the habitat value of these areas for owl survival. If supply well pumping affected the root zone of riparian trees causing leaf loss or killing trees, then there would be a concomitant loss of cover density and the habitat would lose value for the owl.

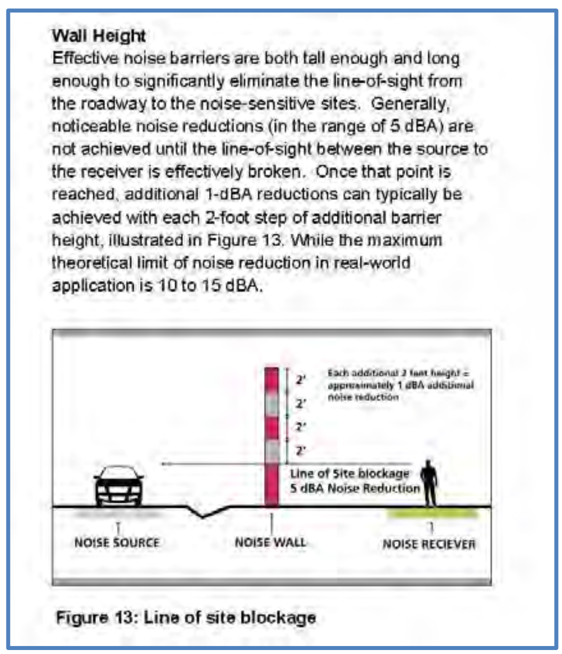
Figure 4-12. Riparian Habitats and Mexican Spotted Owl PAC Locations in Critical Habitat for Evaluation of Blast Noise Impacts



Blast noise from mine operations may also adversely affect the owl. Adverse effects may occur during the winter or spring in any riparian habitats the owl may be using on Las Animas or Percha creeks, and potentially in their PACs depending on the level of noise possibly reaching those locations. (See Figure 4-12.)

4.4.5.4 Effects Determination

Blasting noise may affect owls using riparian habitats along Percha or Las Animas creeks in the winter or spring, however, the distance from the mine blast locations to riparian habitats along either of the creeks is greater than 3 miles. (See Figure 4-12.) The bowl-shape of the mine site and pit, the rugged intervening terrain (which would act as a series of effective sound barriers similar to the sound walls used to shield homes from highway noise [see text box, Source: VDOT 2018]), and the fact that the riparian habitats are located


Wall Height

Effective noise barriers are both tall enough and long enough to significantly eliminate the line-of-sight from the roadway to the noise-sensitive sites. Generally, noticeable noise reductions (in the range of 5 dBA) are not achieved until the line-of-sight between the source to the receiver is effectively broken. Once that point is reached, additional 1-dBA reductions can typically be achieved with each 2-foot step of additional barrier height, illustrated in Figure 13. While the maximum theoretical limit of noise reduction in real-world application is 10 to 15 dBA.

Figure 13: Line of site blockage

in the deep-incised creek bottoms with steep hillsides surrounding all would combine to diminish blast sound levels to minimally above background noise. Noise levels in the riparian areas along Percha and Las Animas creeks are expected to be less than 64 dB, and in most of the habitat noise levels would be less than 49 dB which is approximately background level. By the time the sound reaches the PACs in the critical habitat, it would be below normal background level. Further, the dense riparian areas used by the owls are not located close enough to mining operations to be subject to light disturbance that might cause the owls to disperse, which would reduce their survival ability.

Although the owl has been observed near the project site, the project would not likely cause any adverse change to the density or composition of the riparian plant community the owl is using for cover and foraging. Supply well pumping for mining operations would affect the deep Santa Fe aquifer, but the surface waters in Las Animas creek would not be measurably affected by the deep aquifer pumping as discussed previously in Section 4.4.1.2. Similarly, there would be no measurable effects to portions of Percha Creek where dense riparian growth currently exists. Pumping drawdown would affect the short reach of Percha Creek just west of Interstate Highway 25, but as is the case with the lower reach of Las Animas Creek, that reach does not support any more than sparse creekside growth.

Pumping for mine operations would not adversely alter the riparian habitats the owl may use. Blast noise would not affect owls in the PACs or other locations on the Gila National Forest because those locations are too distant from the mine site and blast noise would have dissipated before reaching them.

In conclusion, the project May Affect, but Would Not Likely Adversely Affect, the Mexican spotted owl.

4.5 CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this BA. Future Federal actions that are unrelated to the Preferred Alternative are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Cumulative effects involve only future non-Federal actions: past and present impacts of non-Federal actions are part of the environmental baseline. Indicators of actions "reasonably certain to occur" may include, but are not limited to: approval of the action by State, tribal, or local agencies or governments (e.g., permits, grants); indications by State, tribal or local agencies or governments that granting authority for the action is imminent; project sponsors' assurance that the action will proceed; obligation of venture capital; or initiation of contracts. The more State, tribal, or local administrative discretion remaining to be exercised before a proposed non-Federal action can proceed, the less there is a reasonable certainty the project would be authorized.

4.5.1 Reasonably Foreseeable Future Actions

The actions described in this section were identified by information taken from personal communications with the BLM and other Federal agency staff and personal communications with commercial and local representatives of the Chambers of Commerce and local economic development entities in the area. There are some actions that could be considered speculative, such as stating that more development would occur in an area because existing recreational facilities would entice additional facilities to accommodate expansion, but those actions would not meet the criteria which potential future actions must meet to be considered reasonably foreseeable, such as: 1) legislation drafted to implement the action; 2) the existence of a completed approved plan; 3) an awarded contract for work on action; or 4) any work on an action that is currently being prepared.

The timeframe for the analysis includes activities or actions that are reasonably foreseeable for the duration of the project comprising construction, mine operations, closure, and reclamation. For the purposes of this discussion, the mine operation is 16 years. Construction activities would start at the beginning of this timeframe.

Projected population growth: The populations of the project county Sierra County and of nearby Otero, and Doña Ana counties are anticipated to increase through the duration of the project. Below are population projections (Table 4-4) for the *TriCounty Resource Management Plan (RMP)/EIS Planning Area*.

Table 4-4. Projected Population Growth of Sierra, Otero, and Doña Ana Counties, New Mexico

Table 4-4. Projected Population Growth of Sierra, Otero, and Doña Ana Counties, New Mexico			
County	**Population Projections by Year**		
	2020	**2030**	**2040**
Sierra	12,048	12,218	12,737
Otero	66,367	67,047	66,841
Doña Ana	243,164	273,513	299,088

Source: Bureau of Business and Economic Research, University of New Mexico 2002 (revised 2004).

Highway development—Tri-County RMP decisions for the Lake Country Backcountry Byway: This proposed Byway is nestled between the Mimbres and Caballo Mountains and the Cooke's Range in southwestern New Mexico over NM-152 and 27, between Las Cruces and Truth or Consequences. It is situated near a string of lakes and reservoirs. Specific resource management decisions are not yet determined for the three counties affected by the Byway.

Rail development—Union Pacific Intermodal Transfer Station: A $400 million Union Pacific rail facility is proposed in Santa Teresa, New Mexico. The locomotive fueling station and intermodal freight yard are expected to create 3,000 jobs during 4 years of construction and to bring 600 permanent jobs once the facility is operating at full capacity in 2025. The facility, to occupy 2,200 acres, will include fueling facilities, crew change buildings, and an intermodal yard and ramp to load and unload up to 250,000 containers annually that are designed for seamless transfer among ships, trucks, and trains.

Natural resource extraction—Mine Plan of Operations Amendment for Freeport McMoran at Cobre Mine: Future mining operations are proposed at Cobre's Continental Pit and Hanover Mountain Mine, which involve hauling copper ore to Chino's existing facility. Cobre is proposing to construct the connecting haul road to transport the Cobre ore to the Chino operations facility for processing. The total mine production rate for the Continental Pit and Hanover Mountain Mine at Cobre will range from about 20,000 to 125,000 tpd. The mining-related activities will commence immediately upon BLM approval and occur over a 10-year period.

Urban development—SunZia Transmission Line: SunZia Transmission, LLC plans to construct and operate two 500-kV transmission lines originating at a new substation in Lincoln County in the vicinity of Corona, New Mexico, and terminating at the Pinal Central Substation in Pinal County near Coolidge, Arizona. The proposed transmission line would cross just to the east of the mine.

Rural development—continued grazing permit authorization: Ongoing permits for grazing would continue on BLM-administered land in New Mexico.

Commercial development—Spaceport America: Spaceport America is the first purpose-built commercial spaceport in the world. It is located a short distance from Truth or Consequences in southern Sierra County. Virgin Galactic is the spaceport's anchor tenant. Spaceport America has been providing commercial launch services since 2006. Phase One construction is now complete. Phase Two of the construction and pre-operations activities has begun and includes improvements to the vertical launch complex, the paving of the southern road to the spaceport, and the development of a world-class visitor center for students, tourists, and space launch customers.

4.5.4.2 Cumulative Effects of Future Non-Federal Actions on Listed Species

Mining development and operation activities would add a minor increment to an array of other factors that would slightly increase overall adverse cumulative effects to listed species. Conservation measures and proper reclamation would reduce or offset and may improve overall cumulative effects, particularly after mining ceases.

Agriculture, grazing, development, groundwater use, and channelization of creeks for agriculture and development contribute to the loss and fragmentation of habitat available for listed species. Surface water management of the perennial rivers and reservoirs by Federal and State agencies also contribute to the loss and creation of riparian habitat suitable for the Mexican spotted owl, yellow-billed cuckoo, southwestern willow flycatcher, and Chiricahua leopard frog. Climate change could lead to increased drought and floods, further removing depleting native upland vegetation and riparian communities, as both drought and flooding could result in plant mortality and an increase in non-native species.

As noted previously, the proposed project would reduce groundwater discharge to Caballo Reservoir and the Rio Grande, but those impacts would be fully mitigated by the purchase of water rights in the Rio Grande Basin upriver from Caballo.

Beneficial effects of foreseeable future actions also would exist. The Non-native Phreatophyte/ Watershed Management Plan (NMDA 2005) focuses on the management and implementation of future control practices and rehabilitation efforts in New Mexico's watersheds and riparian areas that provide habitat for protected species. Such restoration improvements along the Rio Grande, including reducing the consumptive water use of floodplain vegetation by improving riparian habitat (i.e., removing salt cedar and planting native vegetation) would enhance native riparian communities, require less water, and improve habitat suitable for special status species.

4.6 LADDER RANCH SPECIES

In a letter commenting on the Copper Flat Mine Project Draft EIS, the Environmental Law Center (ELC), on behalf of TESF programs on the Ladder Ranch, described concerns about the potential for the Copper Flat mine project to cause adverse impacts to Federally listed endangered and threatened species and other protected species that are part of TESF programs on the Ladder Ranch. The ranch is located in the Las Animas Creek drainage up-gradient of the rural populated area in the lower Animas where the deep aquifer would be pumped during mining operations. The ELC letter states the concern that the Chiricahua leopard frog might be affected by chemical contamination in runoff of water used in dust abatement at the mine site, that blasting at the mine might adversely affect the behavior of the captive Mexican gray wolves being held at Ladder Ranch prior to their release in the wild, and that blasting might also damage the burrows of the Bolson tortoise. The letter notes concern about mine pumping that might affect surface water in Las Animas Creek and potentially harm the streamside habitat of two Federally listed birds occurring on the creek, the southwestern willow flycatcher and the yellow-billed cuckoo. Also found on Ladder Ranch, according to the letter, are the black-tailed prairie dog, which has recently been proposed for ESA listing, and the major avian group of migratory birds, which are protected by the USFWS under the MBTA.

This section evaluates the potential for the Copper Flat mine project to jeopardize the Chiricahua leopard frog, Mexican gray wolf, and Bolson tortoise where they currently occur on Ladder Ranch. The southwestern willow flycatcher and the yellow-billed cuckoo were previously evaluated in Sections 4.4-2 and 4.4-3; those effects are summarized here. Black-tailed prairie dogs as well as migratory birds, including the potential for impacts to those species at the Ladder Ranch, are evaluated here as well.

4.6.1 Chiricahua Leopard Frog

The species distribution and protection status of the Chiricahua leopard frog were presented previously in this document in Section 4.4.1. In brief, the frog occurs at middle elevations in Arizona and New Mexico and in adjoining portions of Mexico. The species' recovery priority number is 2C, which indicates a high degree of threat and a high potential for recovery.

4.6.1.1 Species Status on Ladder Ranch

TESF has worked in partnership with the USFWS and the NMDGF to conserve Chiricahua leopard frogs on the Ladder Ranch since 2001. TESF works to maintain and expand wild Chiricahua leopard frog populations on the Ladder Ranch and to maintain captive refugia and captive breeding facilities for on- and off- ranch frog populations. Ladder Ranch is home to the last, large Chiricahua leopard frog population in New Mexico and plays a crucial role in the survival of this species. Numerous factors have been implicated in the range-wide decline of Chiricahua leopard frogs, including disease, nonnative species invasions, habitat degradation, and an increase in the severity and duration of drought events. Perhaps in response to reduced natural habitat availability and drying climatic conditions, these frogs have been found to naturally colonize man-made livestock water tanks. This behavior prompted TESF to incorporate the Ranch's extensive stock-water infrastructure into a comprehensive Chiricahua leopard frog conservation program on the Ladder Ranch, which includes wild and captive population management, as well as captive breeding efforts.

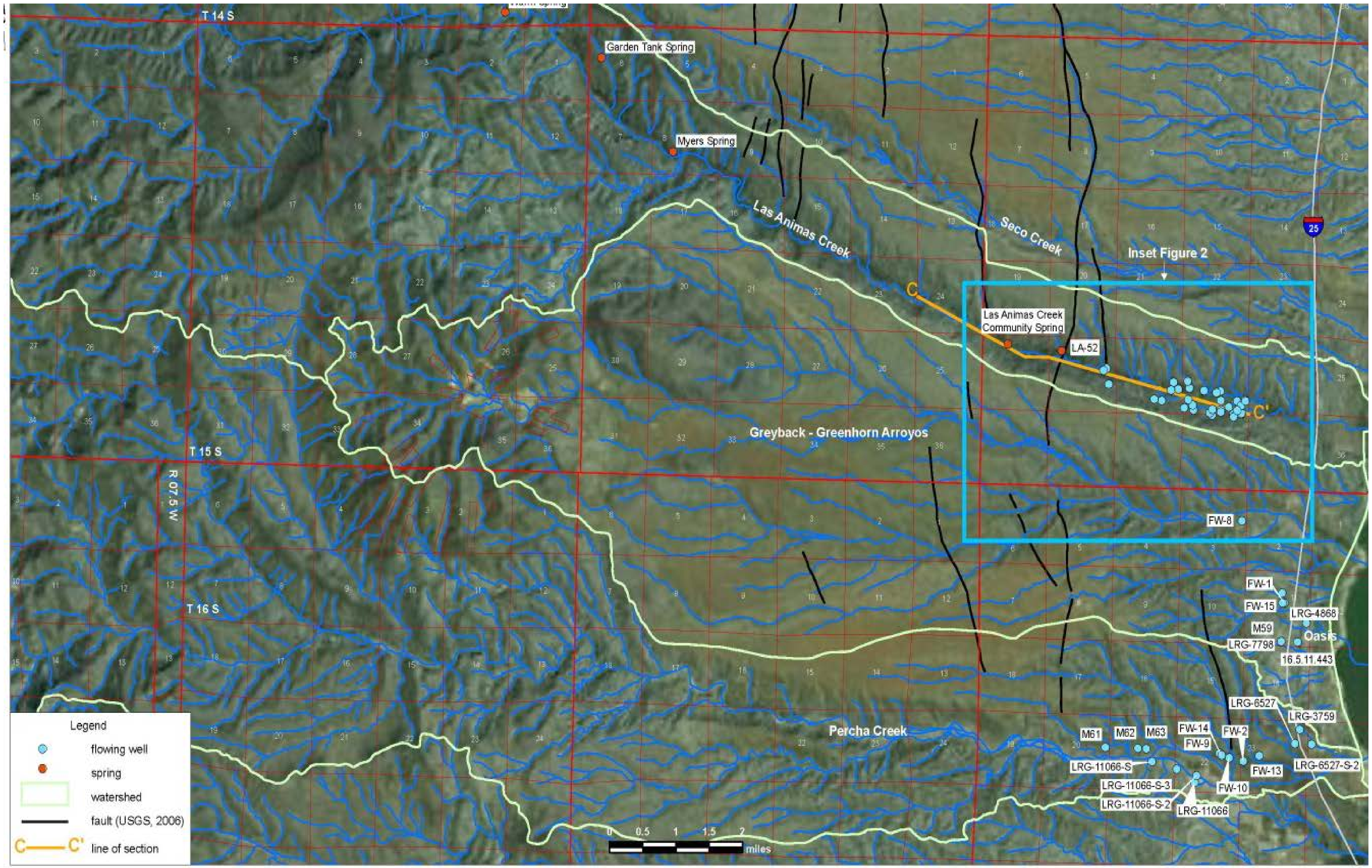
4.6.1.2 Potential Effects

Ladder Ranch expressed concern that the Chiricahua leopard frog might be adversely affected by chemicals in mine waters that are sprayed on project site roads for dust abatement because the water could run off into stream systems containing the frogs. That contamination of stream systems could only occur if the sprayed roads were within the local watershed where the runoff would flow during rain events. The project site roads are in the Greenhorn Arroyo drainage which, with the Greyback Arroyo, drains a watershed entirely separate from the Las Animas, Seco, Las Palomas, and Cuchillo creeks. (See Figure 4-13.) Therefore, there would be no risk that water used for dust abatement would reach Chiricahua leopard frog habitat or populations.

4.6.1.3 Effects Determination

Pumping of groundwater for mine operations that would be conducted in the lower reach of the Las Animas Creek would have no effect on the surface waters of the Las Animas Creek upstream on the Ladder Ranch nor would it affect the waters or riparian vegetation on any of the creek's tributaries which are also located upstream of the lower Las Animas reach where the pumping would be conducted; thus, there would be no impacts from loss of surface waters. Therefore, the finding for the Chiricahua leopard frog populations on the Ladder Ranch is that the Copper Flat project would cause No Effect.

Figure 4-13. Local Watershed Boundaries of Surface Drainage Areas at the Mine Site with Las Animas and Percha Creeks on Stream Flow Base Map



Note: inset shows artesian well area.

4.6.2 Mexican Gray Wolf

4.6.2.1 Species Distribution and Habitat

The Mexican gray wolf (*Canis lupus baileyi*) is the smallest, southern-most occurring, rarest, and most genetically distinct subspecies of gray wolf in North America. Mexican gray wolves are found in a variety of southwestern habitats; however, they are not low desert dwellers as once commonly believed. They prefer mountain woodlands, likely because of the favorable combination of cover, water, and available prey (USFWS-SWR 2017). Once common throughout portions of the southwestern U.S., the Mexican gray wolf was all but eliminated from the wild by the 1970s. In 1977, the USFWS initiated efforts to conserve the species. In 1998, Mexican gray wolves were released into the wild for the first time in the Blue Range Wolf Recovery Area (Figure 4-11) within the Mexican Wolf Experimental Population Area (USFWS-SWR 2017). The Mexican Wolf Interagency Field Team (IFT) completed the annual year-end population survey, documenting a minimum of 113 Mexican gray wolves in the wild in Arizona and New Mexico at the end of 2016 (USFWS-SWR-IFT 2017).

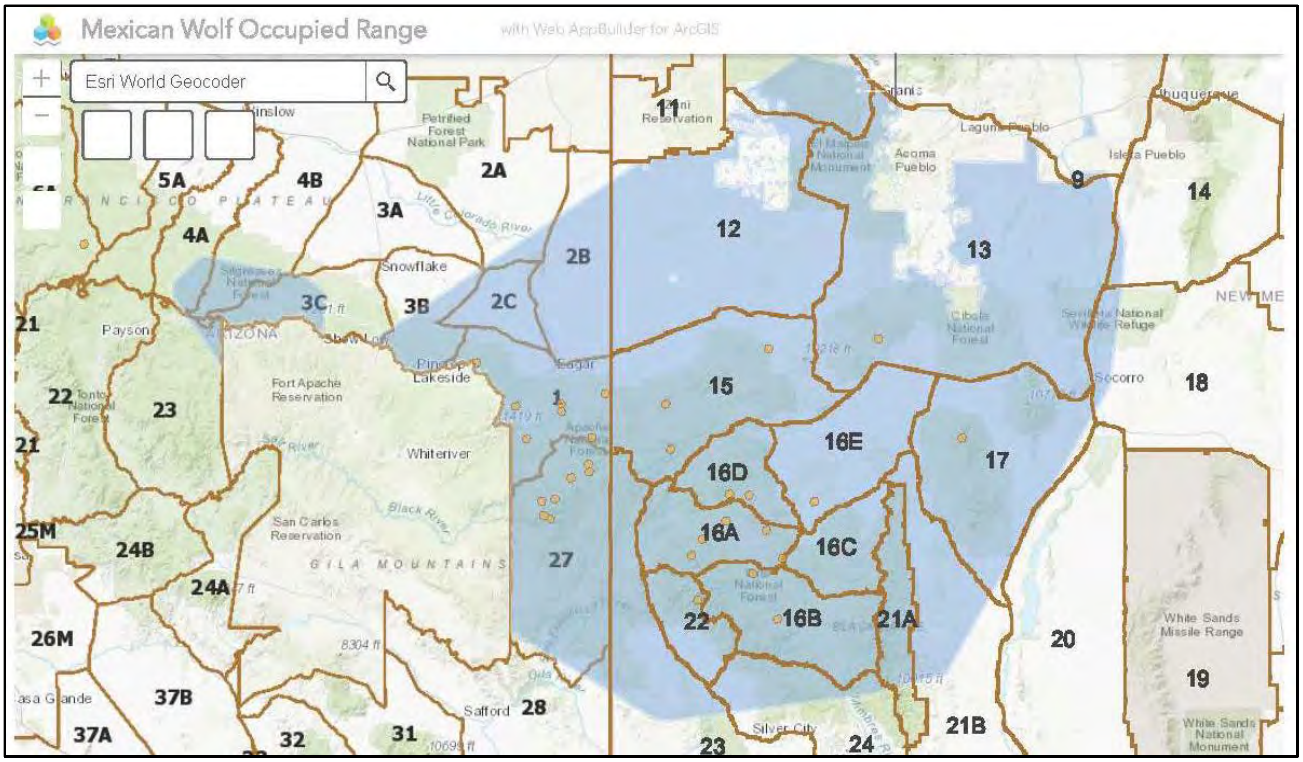
Status of captive population: Wolves released to the wild are bred and prepared for release from a captive population which is managed under the Association of Zoos and Aquariums (AZA) through the Mexican Wolf Species Survival Plan (SSP). The Mexican Wolf SSP was initiated in 1977 to 1980 with the capture of the last remaining Mexican gray wolves in the wild in Mexico. The purpose of the SSP is to re-establish the Mexican gray wolf in the wild in the U.S. and Mexico through captive breeding, public education, and research. This captive population is the sole source of Mexican gray wolves available to re-establish the species in the wild and is critical to the success of the Blue Range Mexican wolf reintroduction project and any additional potential reintroduction areas that may be identified in the future. The SSP currently houses approximately 300 Mexican wolves in 49 facilities in the United States and Mexico. The SSP maintains the goal of housing a minimum of 240 wolves in captivity at all times to ensure the security of the species in captivity, while still being able to produce surplus animals for reintroduction (USFWS-SWR 2017).

Mexican wolves from captive SSP facilities that are subsequently identified for potential release are first sent to one of three pre-release facilities (one in Washington State and two in New Mexico, including the Ladder Ranch facility) to be evaluated for release suitability and to undergo an acclimation process. All wolves selected for release are genetically redundant to the captive population, meaning their genes are already well represented. This minimizes any adverse effects on the genetic integrity of the remaining captive population, in the event wolves released to the wild do not survive. Limited pen space in the captive breeding program restricts the size and reproductive output of the captive population. Given the rarity of free-ranging Mexican wolves, for the foreseeable future the captive population will provide much needed security to the recovery effort.

4.6.2.2 Species Status on Ladder Ranch

The Ladder Ranch is located in Mexican Gray Wolf Recovery Area 21B (Figure 4-14) and has been involved in Mexican gray wolf recovery since 1997 when the Ladder Ranch Wolf Management Facility (LRWMF) was constructed. This pre-release facility is managed by TESF and the USFWS. Since this facility began operation in 1998, it has held over 100 wolves. The LRWMF comprises five enclosures, ranging in size from 0.3 acre to approximately 0.70 acre. Caretaking of wolves at the facility is carried out by the TESF, though the facility is managed and supported financially by the USFWS. During 2016, 16 individual wolves were housed at the Ladder Ranch which consisted of ten wolves that were transferred to the Ladder Ranch and six births at the facility. Of the 16, twelve wolves were transferred out so that at year's end, the Ladder Ranch housed four Mexican gray wolves (USFWS 2016b).

Figure 4-14. Mexican Gray Wolf Currently Occupied Range in NM and AZ



4.6.2.3 Potential Effects

TESF at Ladder Ranch reinforces the wolves' natural avoidance behavior to humans by providing as much privacy and as little disturbance as possible. The concern for the Mexican gray wolf on Ladder Ranch is that noise and ground vibrations from blasting at the Copper Flat mine site could potentially adversely affect the wolf in its holding facility, impairing its ability to acclimate to the wild. Another concern is that the wolves' water supply, which comes from the Las Animas Creek, could be contaminated or reduced by mine construction or operations.

Potential effects to wolf water supply: Mine construction activities take place more than 4 miles from the wolf holding pens and in a different watershed (the Greenhorn Arroyo rather than the Las Animas Creek drainage); therefore, direct contamination by wind or dust in storm runoff would not occur to the wolves' water supply.

Pumping the deep aquifer under lying the lower reaches of the Las Animas Creek would have no effect on the water supply located in the stream miles upgradient of the lower reaches.

Components of blast effects: Blasting from mining may impact nearby sensitive receptors including humans, wildlife and structures through airblast (air overpressure) and ground vibration. Whenever blasting is carried out, energy is transmitted through the air from the blast site in the form of airborne pressure waves. These pressure waves comprise energy over a wide range of frequencies. Some are higher than 20 Hz and perceptible as sound, but the majority are below 20 Hz and hence inaudible but can be sensed as concussion. The combination of sound and concussion is known as airblast. Energy is also transmitted through the ground as vibration. The effect of vibration on people is highly subjective, as one person may tolerate high levels that would be unacceptable to someone else. It is therefore difficult to offer advice on suitable levels of ground vibration because of the uncertainties in response. Appropriate limits need to take account of local conditions and the nature of the works (Simandou 2012).

Noise from Copper Flat mine blasting: Blasting noise would be intermittent and greatest during initial phases; noise would decrease as mining activities progress. Although operations would take place 24 hours per day, blasting would be limited to daylight hours. Drill patterns would range from 60 to 120 blast holes, and a typical hole would contain approximately 175 pounds of ammonium nitrate/fuel oil (ANFO) (140 pounds of TNT equivalent). Typically, there would be 10 to 20 milliseconds of delay between each blast hole, and each blasting event would last between 1 to 2 seconds.

Peak noise levels provide the absolute maximum sound level for an individual acoustical event, not an average over several events or over a period of time like the DNL. Although not a good descriptor of the overall noise environment like the DNL, peak noise levels relate well to the level of concern and possibility of complaints among people living nearby after an individual blast event. Level of concern guidelines that use peak noise levels exist for impulsive noise and the distances these effects would take place after a blasting event. (See Table 4-5.)

Blast noise spectrum and wolf hearing: Blast overpressure produces sound waves in the very low frequency of 2 Hz while human hearing is in the 20 Hz to 20 KHz which is why buildings may experience structural effects from "noise" humans can't hear. Wolves' hearing is the same as humans at the low end of the range but more acute at the higher end. Wolves can hear well up to a frequency of 25 kHz with some researchers believing the maximum frequency detected by wolves is much higher, perhaps up to 80 kHz (Wolf Country 2017). Therefore, the low frequency airborne noise from the blasting at 2 Hz is not likely to register with the higher frequency-attuned wolves.

The Final EIS on Mexican gray wolf reintroduction in the Southwest (USFWS 1996) evaluated blast effects from known human activities in the species Arizona and New Mexico recovery zone. Parts of the primary recovery zone are overlaid by the Yonder Air Force training impact area, but it is unlikely that the high altitude training that occurs there will impact wolves, or vice versa (Bednarz 1989).
Gray wolves are able to tolerate noise and blast effects associated with heavy mining in Minnesota, which may be comparable to testing activities on White Sands Missile Range (Mech 1993). Further, red wolves exist in North Carolina in and adjacent to an Air Force and Navy training area without negative impacts (Phillips 1993).

Blast effects attenuation with distance and terrain: Noise at the mine blast site (Table 4-5) would reach 130 to 140 dBP (peak pressure of impact noises like blasting), The 130-dBP peak noise levels would extend 556 feet from the point of detonation but diminish to 115 dBP within 2,344 ft. The unimpeded straight-line dBP would be diminished by 6 dBP for each doubling of distance, and by the time the sound reached the wolves (over 4.6 miles (24,658 feet) away at the closest wolf pen), it would be more than 20 dBP less, or less than 95 dBP which is the noise level of a passing motorcycle. (See Table 4-6.)

Table 4-5. Noise Risk: Risk of Noise Concern from Blasting

Table 4-5. Noise Risk: Risk of Noise Concern from Blasting		
Risk of Noise Concern	**Peak Noise Levels**	**Critical Distance (feet)**
Low	< 115 dBP	> 2,344 feet
Medium	115–130 dBP	556 - 2,344 feet
High	130 - 140dBP	< 556 feet

Source: Siskind 1989; U.S. Army 2007; Caltrans 2004.

Table 4-6. Distances from Pit Lake to Wolf Facility Pens

Table 4-6. Distances from Pit Lake to Wolf Facility Pens		
Wolf Pen Number	**Distance (Miles)**	**Distance (feet)**
1	4.84	25,555
2	4.90	25,872
3	4.89	25,819
4	4.67	24,658
5	4.72	24,922

However, these estimates are based on a straight-line calculation. In fact, the mine blasts would primarily be contained within the mine pit itself, which is in a topographic bowl surrounded by ridges, so the straight-line calculated sound levels would apply only to points directly above the mine pit. Blasting would occur within the excavated mine pit with charges placed in the pit walls well below the ground surface level of the larger mine site area. This would ensure that the sound would project primarily horizontally into the center of the mine pit and vertically above the pit, thus containing and diminishing the loudest sound levels. The blast sound that would reach the wolf holding facility would be greatly attenuated by the intervening terrain. (See Figure 4-15.) Blasting sound may reach the wolf holding facility at a perceptible level above ambient background noise, but at the 4.6-mile distance (Figure 4-12) would likely not be louder than trucks and equipment used on-site at Ladder Ranch, which would be in the range of 49 to 64 dB.

Figure 4-15. Intervening Topographic Terrain between the Copper Flat Mine Pit and the Wolf Holding Facility That Would Attenuate Blast Noise

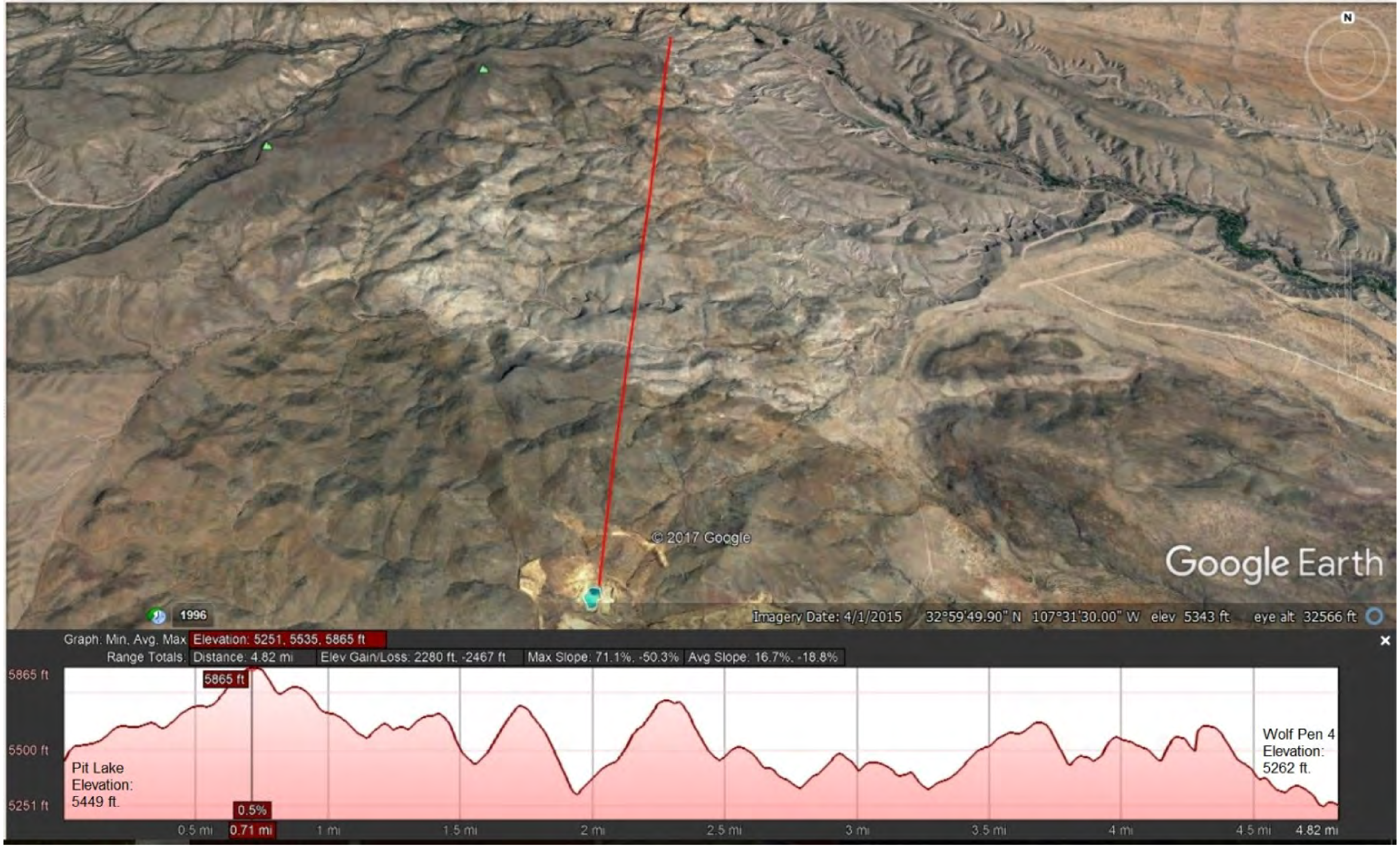
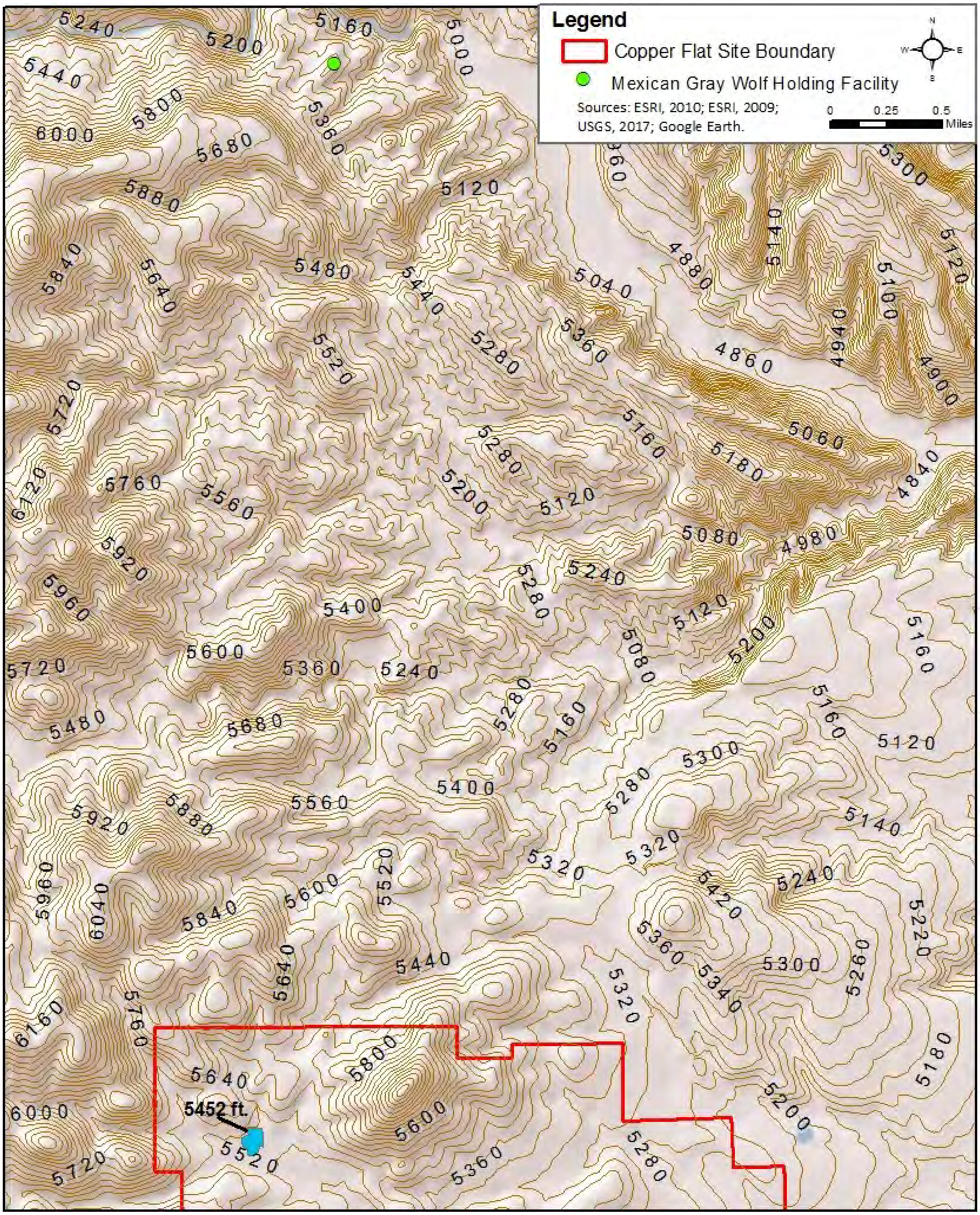


Figure 4-16. Topographic Elevations between the Copper Flat Mine Pit and Wolf Holding Facility



The mine site is located within a relatively flat topographic bowl (Figure 4-16) surrounded by higher elevation ridges, including Animas Peak, that would further intercept and diminish sound waves similar to the effect of roadside sound barriers on traffic noise.

Because the blasting would occur during daylight hours only, this timing constraint and the perception that the noise is coming from a long distance away may in combination allow the wolves to habituate to the noise after a few days. However, it may be argued that habituation to blast noise would be contrary to the objective of acclimating the wolves to an environment with humans absent.

Potential vibration effects: Ground shaking vibrations, if they are strong enough by the time they reach the holding facility to frighten them, might also adversely affect the Mexican gray wolves on Ladder Ranch. As noted in Section 3.5, groundborne vibration associated with blasting would be distinctly perceptible to humans at a distance of 500 feet but barely perceptible at 1,573 feet. Blasting activities within 792 feet, drilling activities within 116 feet, and general heavy equipment activities within 42 feet could cause minor cosmetic damage to extremely fragile historic buildings. Therefore, groundborne vibration effects from blasting would diminish within a distance of less than 2,000 feet from the blast site to a level that would be barely perceptible by humans. At 18 times that distance, the blast vibrations would likely not be perceptible to either humans or wolves.

4.6.2.4 Effects Determination

The Copper Flat project may affect, but would not likely adversely affect the Mexican gray wolf at the Ladder Ranch wolf holding facility. This conclusion is based on the following points:

1. Wolves are not known to be highly sensitive to loud sounds. Their hearing is similar to humans at lower frequencies but attuned to a greater range of higher frequency sounds rather than the much lower frequency sounds of the airborne concussive noise of blasting.
2. The wolf holding facilities are a significant distance away, more than 4.5 miles, from the mine pit where blasting would occur.
3. There is a great deal of intervening mountainous terrain which would act as an attenuating series of sound barriers, similar to the sound walls used to shield human communities from traffic and other loud noises.

Conservation measures for potential effects to the Mexican gray wolf: Possible Monitoring and Conservation Measures Plan elements include:

- Employ an independent third-party expert consultant to measure the noise and vibration environment and the wolf responses to operational blasts at the wolf holding facilities.
  - Standard equipment for monitoring environmental sounds would be used to record airborne sound levels as well as separate monitoring of ground vibrations at the location of the wolf holding facility.
  - Remote cameras would be set up to record the reaction, if any, of one or more wolves held in a pre-release cage to ensure clear and adequate recordation of the wolf response
- Wolves' reactions to other noise sources, for example trucks or equipment used for facility maintenance, should also be monitored and recorded for comparison with blast reactions as a control.
- "Take" would result if one or more of the wolves flinches or otherwise shows through body or ear movement that the blast noise has registered with the animal and then exhibits stress behavior after test blasts.
- Conservation measures might include:

- Working with TESF on the Ladder Ranch to relocate the wolf holding facilities to a point distant enough that the blast noise no longer registers on the monitoring equipment;
- Working with the Mexican Wolf Recovery Program elsewhere to set up and maintain wolf facilities elsewhere in the recovery area to aide in the recovery effort;
- contributions to Mexican Wolf Program; and/or
- inclusion of the wolf program in public outreach on the Copper Flat mine project.

4.6.3 Bolson Tortoise

4.6.3.1 Species Distribution and Habitat

The largest and rarest of the five North American tortoise species, the bolson tortoise, is thought to have once lived throughout most of the Chihuahuan desert, but its current range is restricted to a small area in north central Mexico where the States of Durango, Chihuahua, and Coahuila meet. With their powerful front legs, tortoises dig burrows in which they spend over 85 percent of their time. The burrows are an important part of a healthy desert ecosystem, as they provide shelter for a myriad other species, including mammals, birds, reptiles, and insects.

The following profile material covering habitat and threats is from van Dijk & Flores-Villela (2007):

> Bolson tortoises prefer low grade slopes (0.5% to 2%) of fine textured soil (averaging 48% sand, 32% silt, 10% clay, 10% gravel), vegetated by mixed sclerophyll shrub and desert bunch grass. These areas generally fringe basin floodplains. The area of occurrence is between 1,000 and 1,400 m altitude. (Morafka 1982, Morafka *et al.* 1989).
>
> Bolson tortoises dig burrows up to 8 m long and 2 m deep as refuge from predators and extremes of climatic and weather conditions, and surface activity is correlated with rainfall and temperature. Aguirre *et al.* (1989) calculated that adult Bolson Tortoises spend less than 1% of their entire lives on the surface, either basking or feeding along well-established trails near the burrow. Burrows are constructed in social aggregations, and clusters show social structuring of individuals. (Morafka 1982, Morafka *et al.* 1989). Radiotracked juveniles preferred to excavate (or opportunistically use) burrows under *Opuntia* cacti (Tom 1994).
>
> Bolson tortoises are exclusively herbivorous, feeding on a variety of grasses, shrubs and herbs (Morafka 1982, Morafka *et al.* 1989).
>
> This is the largest North American tortoise species, approaching 40 cm CL (fossils indicate past size more than double this). Both sexes reach similar size. Sexual maturity probably occurs at CL over 25 cm and 15 to 20 years of age. Females outnumber males, at male/female ratios of 0.43 to 0.83 in different populations. Wild females produce 1 or 2 clutches (average 1.3) averaging 5.2 eggs; infertility rate averages 35%. Thus, an average female will produce only 3.4 offspring in an 8-year period of her reproductive period. With perhaps a survivorship of less than 5% to maturity, replacement time is over half a century.

Due to a suite of political, social, economic, and personal safety issues, the current status of the bolson tortoise in the wild is largely unknown. The last population survey estimated fewer than 10,000 animals alive in the early 1980s. However, continued habitat degradation and loss since then make it likely that this number has since decreased significantly. In an effort to prevent the extinction of the bolson tortoise, TESF is working towards establishing free-ranging bolson tortoise populations on the Ladder Ranch, which lies at the northern tip of the tortoise's prehistoric range.

4.6.3.2 Species Status on Ladder Ranch

The TESF goal at Ladder Ranch is to establish free-living, minimally managed Bolson tortoise populations in the northern portion of the Chihuahuan Desert, which constitutes their prehistoric range. To this end, Ladder Ranch aims to:

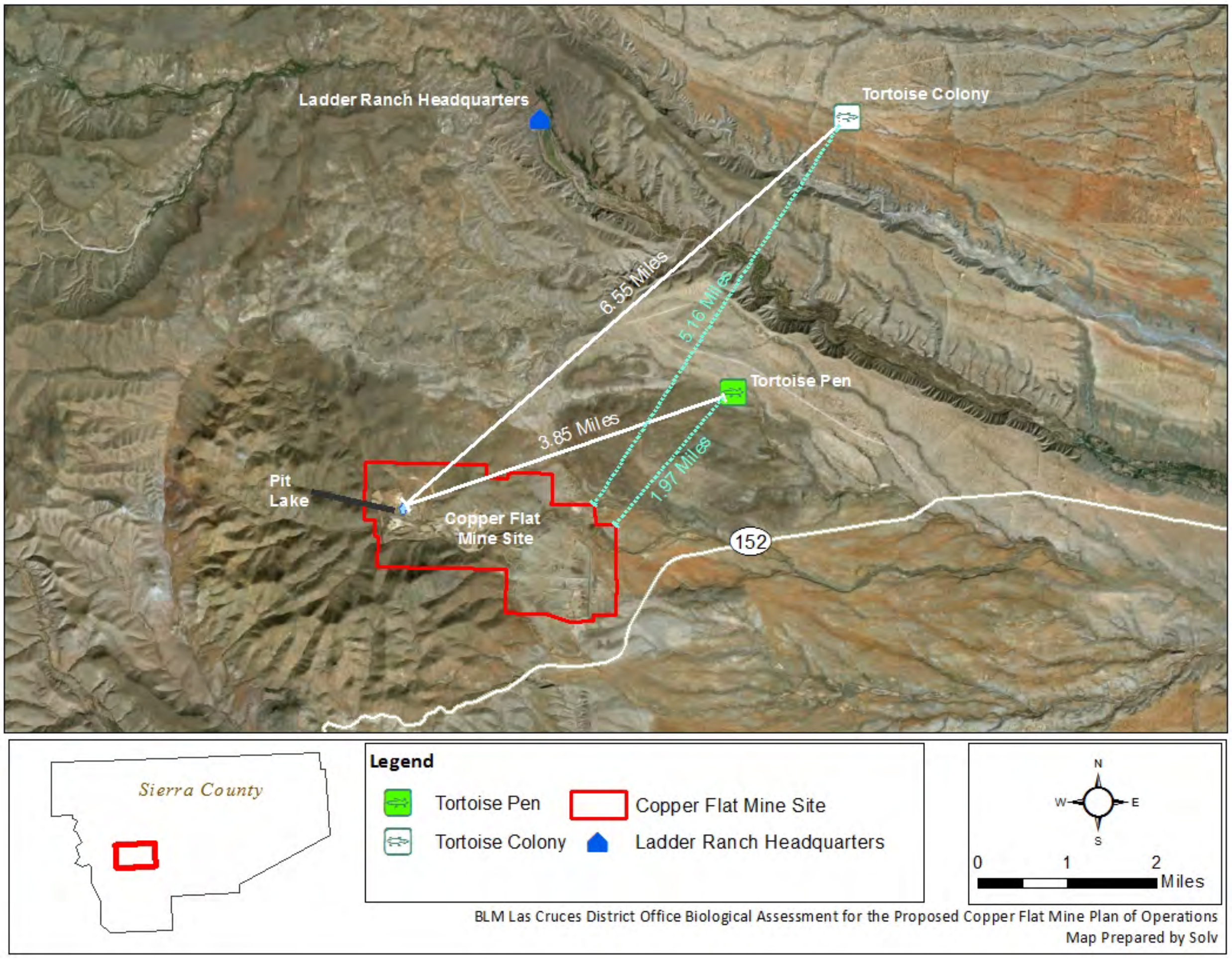
- Increase Bolson tortoise population size through robust captive breeding and head-start programs that protect juveniles until they reach a predator-resistant size; and
- Release juvenile Bolson tortoises on the Ladder and Armendaris ranches to establish wild populations.

Successful breeding programs elsewhere in New Mexico have hatched over 400 juvenile tortoises since 2006. Hatchlings and juveniles are fed native forage in outdoor, predator-proof enclosures until they are large enough to be released (about the size of the native box turtle, or approximately 110 mm shell length). Tortoise growth rates depend both on the weather and on forage availability. It typically takes between 3 and 7 years or more for a hatchling bolson tortoise to reach 110 mm.

4.6.3.3 Potential Effects

TESF is concerned that blasting at the Copper Flat mine might damage or cause the collapse of the burrows of the Bolson tortoise. According to Ladder Ranch, the Bolson tortoise burrows are located 2.5 miles (13,200 feet) from the mine site. Figure 4-17 shows the location of the Bolson tortoise pens and colony on the Ladder Ranch with respect to the Copper Flat mine site.

Figure 4-17. Bolson Tortoise Pen and Colony on the Ladder Ranch



Blast vibrations: A recent study of the potential effects of blasting and traffic vibrations on tortoises (Barneich et al. 2004) found that an impact of 0.4 inches per second PPV is a conservative estimate of the vibration level that could affect a tortoise burrow. A safe explosion distance would be 300 feet from the burrow to protect it from damage. Ground vibration effects from the Copper Flat mine blasts would radiate outward from the blast hole but would diminish to a level of 0.12 PPV at a distance of 792 feet away from the hole, and to a level ten times lower than the conservative impact level (0.04 PPV) at a distance of 1,573 feet. Because the Bolson tortoise burrows are located more than 8 times that distant from the mine than the distance at which the vibrations would be 10 times *lower* than the conservative impact level, the Bolson tortoise burrows at Ladder Ranch would not be impacted.

Airborne noise: There is little known about noise impacts to reptiles, though "dune-buggy" noise had an adverse effect on hearing of the fringe-toed lizard (*Uma scoparia*) at durations of 500 seconds or longer (95 dBA). Blast events at the mine would be 1 to 2 seconds in duration. Therefore, airborne sounds from very short-duration blasting at 2.5 miles (13,200 feet) away with intervening terrain, as discussed in the preceding section on the Mexican gray wolf, would be substantially lower than 95 dBA and may be perceptible to the tortoises. However, it would not likely cause adverse impacts because of the short noise duration, substantial distance, and intervening terrain which would reduce airborne sound impacts to well below 100 dB.

4.6.3.4 Effects Determination

The finding of the analysis of potential impacts to Bolson tortoises and their burrows concludes that the Copper Flat project may affect, but would not likely adversely affect either the tortoise or the tortoise's burrows on the Ladder Ranch for the following reasons:

Vibration effects:

- Ground vibrations from blasting would be attenuated at much shorter distances from the blast location than airborne noise levels.
- Bolson tortoise burrows are located more than 8 times distant from the mine (13,200 feet) than the distance (1573 feet) at which the vibrations would be ten times *lower* than the conservative impact level.

Noise effects:

- Blast noise would be much shorter in duration than the loud traffic noise that affected the hearing of a studied reptile.
- Intervening terrain would greatly attenuate blasting noise.
- Bolson tortoises spend only one percent of their time on the surface so are unlikely to hear the noise from blasting at ground level.

4.6.4 Southwestern Willow Flycatcher and Yellow-Billed Cuckoo

General species distribution and habitat information for the southwestern willow flycatcher and yellow-billed cuckoo were presented in Sections 4.4.2 and 4.4.3.

4.6.4.1 Species Status on Ladder Ranch

NMDGF et al. (2014) conducted an EA on the potential effects of cutthroat trout restoration to Las Animas Creek on the reaches of the creek west of the Ladder Ranch fish ladder. In evaluating potential effects to listed species in that EA, they indicated that neither the southwestern willow flycatcher nor the yellow-billed cuckoo was present on the Ladder Ranch. Available data for Las Animas and Percha creeks riparian areas do not indicate historic or current presence of the southwestern willow flycatcher. The dense riparian habitat required for its nesting is not present in the project area along the creeks although it is present along the Rio Grande. The NMDGF reports the yellow-billed cuckoo as a summer resident of the riparian sycamore portions of Las Animas Creek. The NMDGF Southwest New Mexico Birding Trail Brochure for Site 33, Las Animas Creek describes the creek as hosting Arizona sycamores, creating an ideal environment for southwestern riparian species such as yellow-billed cuckoo.

4.6.4.2 Potential Effects

Ladder Ranch is concerned about how wildlife restoration projects and ecotourism programs on the ranch would be impacted by the potential for Copper Flat mine pumping of groundwater for mine operations to reduce stream flows in Las Animas Creek and Cave Creek. They estimate that roughly 80 percent of all the wildlife on Ladder Ranch depends on these creeks for survival; they also function as important migration corridors for birds and potential nesting areas for willow flycatchers and yellow-billed cuckoos on Las Animas Creek.

The hydrologic analysis of the effects of pumping groundwater for mining operations conducted for the Copper Flat EIS indicated that the surface waters of Las Animas Creek supporting the Arizona sycamores and other streamside vegetation would not be affected by any loss or reduction in the flow of surface waters that sustain creek-side vegetation. The permanent surface flows on the Las Animas Creek in the lower reach of the creek are not hydrologically connected with the deep groundwater that would be pumped for mining operations. Therefore, the riparian habitat that supports the yellow-billed cuckoo and other birds along Las Animas Creek would not be affected.

The two species could be affected outside of Ladder Ranch by groundwater drawdown beneath the lower reaches of Las Animas Creek from Copper Flat mine project pumping that would reduce subsurface alluvial flows and thereby reduce the volume of water reaching and the water level in Caballo Reservoir. However, that reduced level would be offset by inflow of waters provided through the project's purchase of water rights in the watershed of the Rio Grande north of Caballo Reservoir.

4.6.4.4 Effects Determination

The evaluation of potential effects concluded that there would be No Effect on the two bird species on Ladder Ranch and that pumping drawdown of the deep aquifer in the lower reach of Las Animas Creek May Affect, but Would Not Likely Adversely Affect the two species on the periphery of Caballo Reservoir.

The following is the basis for those conclusions:

- The hydrologic analysis of the effects of pumping groundwater for mining operations conducted for the EIS indicated that the surface waters of Las Animas Creek supporting the Arizona sycamores and other streamside vegetation would not be affected by any loss or reduction in the flow of surface waters that sustain creek-side vegetation.
- The permanent surface flows on Las Animas Creek in the lower reach of the creek are not hydrologically connected with the deep groundwater that would be pumped for mining operations. Therefore, the riparian habitat that supports the yellow-billed cuckoo and other birds along Las Animas Creek would not be affected.
- The two species could be affected by groundwater drawdown from mine project pumping that would reduce subsurface flows and therefore reservoir water levels in the Caballo Reservoir. However, that reduced level would be offset by inflow of waters provided through the project's purchase of water rights in the watershed of the Rio Grande north of Caballo Reservoir.

4.6.5 Other Ladder Ranch Species of Concern

4.6.5.1 Black-Tailed Prairie Dogs

Ladder Ranch has been restoring black-tailed prairie dog colonies within two miles (10,560 feet) of the mine. Ladder Ranch is concerned that blasting and other mining operations could cause the collapse of burrows and alter behavior patterns. Similar to the discussion above for the Bolson tortoise, with burrows at a distance of two miles, blasting vibration effects would have diminished prior to reaching the colonies so as to be barely perceptible; thus, no impacts to black-tailed prairie dog burrows or behavior from such distant blast vibrations are expected to occur to prairie dogs on Ladder Ranch.

4.6.5.2 Migratory Birds

Similar to the discussion of impacts to the Southwestern flycatcher and yellow-billed cuckoo, the Copper Flat mine project would have no effects on migratory bird species on the Ladder Ranch. Impacts to migratory songbirds, water birds, and eagles at the mine site, including those using the pit lake, at the mine ancillary facilities, in Las Animas and Percha creeks, and at Caballo Reservoir are evaluated in Section 4.8.

4.7 NATIVE FISH SPECIES OF CONCERN

The USFWS completed 90-day findings on the Rio Grande chub (*Gila pandora*) and Rio Grande sucker (*Catostomus plebeius*) in 2016 (USFWS 2016) and is presently conducting a 12-month finding that may lead to these species being listed. These species are found in small streams, such as Las Animas and Percha creeks. In addition, Las Animas Creek supports the only population of Rio Grande cutthroat trout (*Oncorhynchus clarkii virginalis*) in the Caballo geographic management unit (GMU). The Rio Grande cutthroat trout was not listed because, after a 12-month review of the best available scientific and commercial information, the USFWS found that listing the Rio Grande cutthroat trout was not warranted at this time. Therefore, it was removed from the candidate list. However, USFWS asked the public to submit any new information that becomes available concerning the status of the Rio Grande cutthroat trout at any time. Further loss of Rio Grande cutthroat trout populations would likely trigger additional listing review. Therefore this section provides descriptions and an assessment of the potential effects of project activities on these three species.

4.7.1 Rio Grande Chub

The Rio Grande chub (occurring in New Mexico, Colorado, and Texas) is a 5- to 10-inch stream-dweller from the Rio Grande and Pecos River drainages and headwaters of the Canadian River. The USFWS received a petition to list this species as threatened/endangered. The petition claims that dams and irrigation diversions have led to altered stream flows, habitat fragmentation, and poor habitat quality and quantity, impairing the chub's ability to reproduce and overall affecting its abundance. In addition, the petition states that channelization increases (which remove vegetation with associated increased sedimentation) reduces prey availability and decreases water quality. The petition presents substantial information and a full status assessment will be conducted to determine if listing is warranted.

Rio Grande chub is a considered a species of concern by the NMDGF. The historic distribution of Rio Grande chub included cool-water reaches of the Rio Grande and Pecos River (and their tributaries) in New Mexico. Single populations of the species are found in Colorado and Texas (Sublette et al. 1990). Rio Grande chub occupies perennial river and stream habitats. In main-stem Rio Grande and Pecos River habitats, the range of the species has contracted in the past 50 years, and the species has declined in abundance in the upper Rio Grande drainage in Colorado. However, populations appear to be stable in tributaries of the upper Rio Grande drainage in northern New Mexico (Calamusso and Rinne 1999). Rio Grande chub occurs in impoundments and pools of small to moderate streams and is frequently associated with aquatic vegetation. Spawning occurs in spring to early summer, and in a northern New Mexico stream, a bimodal spawning pattern was postulated with peaks occurring in March to June and again in September to October (Rinne 1995). Spawning is associated with the descending limb of flow peaks (Rinne 1995), such as occur with spring snow melt. Spawning aggregations have been observed in tailwaters of pools (J.S. Pittenger, pers. obs.). The species is typically associated with pool habitat, particularly with cover such as large woody debris, undercut banks, or overhanging vegetation (J.S. Pittenger, pers. obs.) although riffle habitat is also important to spawning (Frey, pers comm., 2018). Principal food items of Rio Grande chub include zooplankton, aquatic insects, juvenile fish, detritus (Sublette et al. 1990), mollusks, and filamentous algae (J.S. Pittenger, pers. obs.). Rio Grande chub occurs in Las Animas Creek from the fish barrier upstream to the vicinity of the confluence of Water Canyon. It also occurs in perennial sections of Cave Creek on the Ladder Ranch. The Rio Grande chub population in Las Animas Creek likely was reduced by the Silver Fire and resulting ash and sediment flows.

4.7.2 Rio Grande Sucker

The Rio Grande sucker (occurring in Colorado, New Mexico, and Mexico) is a small- to medium-sized sucker native to the Rio Grande and its tributaries in southern Colorado, New Mexico, and Mexico. Breeding males are identified by a bright red lateral stripe. The USFWS received a petition to list the fish, which claims that habitat fragmentation, changes in stream morphology, stream erosion, sedimentation, and dewatering of streams from dams and diversion are threats to the sucker by causing poor water quality conditions, increased stress due to crowding, increased vulnerability to terrestrial predators, or higher water temperatures. In addition, the petition states that overgrazing and other land use practices have negatively affected sucker abundance and condition by limiting the availability of food. The petition for the Rio Grande sucker does present substantial information indicating that listing may be warranted. A full status assessment will be conducted (USFWS-SWR 2016). Like the Rio Grande chub, the Rio Grande sucker occurs in the Las Animas Creek project action area from the Ladder Ranch fish barrier upstream to near the confluence of Water Canyon (*ca.* 19 stream miles).

4.7.3 Rio Grande Cutthroat Trout

The Rio Grande Cutthroat Trout Conservation Team completed a range-wide status assessment (Alves et al. 2008) concerning the Rio Grande cutthroat trout. This status assessment summarized information provided by 15 fisheries professionals from Colorado and New Mexico with specific knowledge of Rio Grande cutthroat trout. Additionally, all of the data on Rio Grande cutthroat trout collected yearly by these professionals are entered into a comprehensive database. According to these analyses, there are currently approximately 127 Rio Grande cutthroat trout conservation populations distributed in high elevation streams of New Mexico and Colorado (2012 database). Of these current conservation populations, 53 are considered secure populations. The Lower Rio Grande GMU has the most conservation populations of the five GMUs. The Caballo GMU currently has none; the only known historical location for the species is currently unoccupied but is expected to undergo restoration in the next several years.

4.7.4 Copper Flat Project Impacts to the Fish Species of Concern

None of the fish species of concern would be affected by implementation of the Copper Flat mine project. Pumping of the deep aquifer during mine operations would cause a non-measurable, discountable effect on flowing waters in Las Animas or Percha creek because water levels in the creeks do not depend on the deep aquifer. Rather, water levels in these creeks vary depending on rainfall runoff and snowmelt from the contributing watersheds and on pumping of shallow wells screened in the surface alluvium underlying the creeks. The three fish species would not be affected by minimal changes in water levels in Caballo Reservoir caused by drawdown of subsurface flows to the reservoir because those would be offset by water purchased by NMCC.

4.8 MIGRATORY BIRDS

In general, all native, non-game bird species, regardless of migratory status, are protected under the MBTA. The MBTA and the international migratory bird treaties implemented through the Act impose substantive obligations on Federal agencies to conserve migratory birds and their habitats (16 USC 703-711).

Bird surveys of the habitats of the mine site and ancillary facilities and of Las Animas and Percha creeks were conducted (Parametrix 2011; THEMAC 2015) for the Copper Flat mine project EIS analysis (Table 4-8 at the end of this section). Forty-six species of birds were identified during the breeding season, and 8 additional species were encountered during other work and a winter bird survey. The number of bird species recorded in the Parametrix study was 39 in arroyo habitat, 15 in the creosote rolling uplands, 38 in the grass mountain, 4 in the pit lake habitat, and 21 in the disturbed areas/waste rock pile habitat (Parametrix 2011). Thirty-four species were recorded during the millsite surveys (THEMAC 2015).

Seven cactus wren bird nests were identified within the mine area during the 2010 and 2011 biological surveys. During an August 2011 survey, an active raptor nest was observed in the windmill at well site MW-2, and there are additional structures on the project site that provide habitat for nesting birds.

4.8.1 Upland and Riparian Species

The Preferred Alternative would likely result in impacts to migratory birds. Both direct and indirect impacts to migratory species are expected to result from minerals development, construction activities, and from traffic changes on the coal haul transportation route, all of which could affect individuals, populations, or habitat conditions. For migratory bird species, loss of habitat would reduce forage, cover, perches, and nesting areas. Most surface disturbance by project activities would occur in or adjacent to previously disturbed areas. Because these areas have experienced disturbance and the poor quality soils are slow to recover, it is unlikely these areas contain high quality foraging or nesting habitats for migratory birds.

Proposed project activities may cause minor disruptions to foraging, migratory movement, or breeding behavior of some migratory bird species. A few birds may be killed during these activities because they are driven out of their foraging territories and are made more susceptible to predation, but these losses would not be expected to impact the species populations in the project area as a whole.

None of the known wren nests is located within the area proposed for vegetation clearing on existing access roads (Parametrix 2011). A raptor nest located at supply well site MW-2 would not be removed or disturbed, and none of the proposed mining activities would be expected to affect the nest.

Due to the presence of bird nests in the proposed project corridor, clearing of vegetation should take place outside of the bird breeding season (roughly March through August) (Parametrix 2011). If this is not possible due to scheduling concerns, a pre-construction nest survey conducted by a qualified biologist is recommended. If active bird nests would be affected by construction, then coordination with the USFWS is required, and a permit must be obtained in order to move or disturb active nests.

A species of concern in New Mexico, the common ground dove (*Columbina passerina*), is a widespread species which occurs at varying densities across the southern tier of states from California to South Carolina. Among these, it is least common and widespread in New Mexico with a limited distribution in southern New Mexico. State populations are considered vulnerable due to their reliance on limited areas of riparian habitat. In New Mexico, this species prefers shrubby riparian habitat or edges of riparian woodlands; it also occurs in desert shrub dominated by mesquite or *Opuntia* spp., and in abandoned agricultural fields with tall weeds. The common ground-dove is considered highly vulnerable in New Mexico due to lack of preferred available breeding habitat.

4.8.2 Waterfowl, Shorebirds, and Wading Birds

Aquatic habitats potentially affected by the Copper Flat mine project that may in turn affect waterfowl, shorebirds and wading birds include the pit lake at the mine site, Las Animas and Percha creeks, and Caballo Reservoir.

Waterfowl using the pit lake as a resting area would likely move to Caballo Lake when the pit is dewatered for mining. They would likely return to using the pit lake after mining is completed and the lake is refilled. A camera wildlife survey was conducted (NMCC 2015b) to characterize use of the pit lake. Overall, waterfowl visitation listed in Table 4-7 as either canvasback, mallard, or unidentified/mixed waterfowl triggered the game cameras most frequently. Waterfowl caused the cameras to trigger more than 100 times through the capture period. The higher frequency of waterfowl captures versus other types of wildlife can be partially attributed to the fact that camera 3 was placed in a location with a clear view of the water's surface and intended to only capture waterfowl. A waterfowl photo was first captured on 3 September 2012, and visitation was photographed fairly regularly (2-6 times per month) through April 2013.

Table 4-7. Summary of Game Camera Observations of Birds at the Pit Lake

Table 4-7. Summary of Game Camera Observations of Birds at the Pit Lake		
Species	**Sum of Individuals within a Photo**	**Total Number of Camera Triggers**
Canvasback	5	2
Chipping Sparrow	1	1
Dove	3	2
Great Blue Heron	11	11
Horned Lark	1	1
Mallard	39	13
Rock Wren	4	4
Say's Phoebe	2	2
Spotted Sandpiper	1	1
Unidentified avian	14	14
White-winged Dove	3	3
Unidentified/mixed waterfowl	434	103

When the pit lake has once again filled with water, the water quality would be similar to the water quality of the existing pit lake. The baseline data report for the project identified four species of migratory birds using the pit lake habitat. It also identified riparian vegetation in the fringes of the pit lake consisting of a small cattail marsh (<0.1 acre) and intermittent saltcedar, an invasive species. A 2014 survey of the pit lake concluded that there are no fish, zooplankton, or macroinvertebrates in the pit lake which birds can feed on.

In the absence of EPA water quality criteria for selenium applicable to aquatic dependent wildlife and the scarcity of quality food sources (fish, aquatic vegetation, zooplankton, and macroinvertebrates) that would biomagnify higher levels of selenium, the BLM observes that the potential for bioaccumulation of selenium and selenium poisoning, selenosis, is very low. The presence of insect-eating birds at the existing pit lake at a point in time 35 years after the lake began refilling and establishing the water quality baseline for the lake suggests that existing water quality levels in the pit lake are not poor enough to exclude these species. The pit lake is likely a resting or transitory area for the four migratory bird species rather than a feeding or breeding area.

None of the creek habitats where waders may occur near the Copper Flat mine site would be significantly affected by mining facility construction or excavation or by pumping of groundwater to supply the mine operation.

The waters of Caballo Reservoir are a significant concentration point for waterfowl, shorebirds, and waders.The bosque and marsh habitats at Percha State Park, Palomas Marsh, and scattered locations along the reservoir edge represent very rare habitats in southern New Mexico, and thus attract concentrations of many migrants and priority breeding species. Over 300 species of birds have been seen in the Caballo/Percha/Palomas area. Percha Dam State Park is a relatively manicured, open bosque of cottonwoods with picnic tables and campsites. Flanking the east side of the park along the river is a thick growth of willow and cottonwood. Caballo Lake is 18 miles long with a surface area of over 11,000 acres. The lake is the winter home of many species of waterfowl and a migratory stop for wading and shore birds. The Palomas Marsh is located at the northernmost point of Caballo Lake. As with all sites along the Rio Grande, battles over water rights, seasonal flows, and flood control could impact riparian wetland habitats in the area.

4.8.3 Bald and Golden Eagles

There were no bald or golden eagles counted in surveys at the mine site itself although a golden eagle was observed during the winter bird survey in 2016 at the millsite claims. The golden eagle also was counted in the spring survey of Las Animas and Percha creeks and the bald eagle in the summer and winter surveys.

Nicholopoulos (1996) studied bald eagles in winter and nests near Caballo Reservoir to determine if fluctuating reservoir pool levels affected the number of wintering bald eagles. Additionally, the effects the fluctuating reservoir pool may have on the fish prey base and on the physical components of the reservoir, specifically the availability of suitable perches, was investigated. A nesting pair of bald eagles was monitored to determine if the reservoir pool affected production. Over a 3-year period with varying reservoir pool levels (1993-1995), data indicated that reservoir pool fluctuations had contradicting effects on the numbers of wintering eagles during the two extreme reservoir pool levels. Fish availability and foraging success were high when the reservoir pool was low. Bald eagle activity areas were concentrated in locations with suitable perches. Existing suitable perches were increasingly damaged and destroyed during extreme reservoir pool fluctuations. Artificial perch structures were utilized on a very limited basis. Foraging experiments indicated that bald eagles wintering on Caballo Reservoir preferred Gizzard shad (*Dorosoma cepedianum*) over other fish species. The largest gizzard shad was selected over other size classes in most experimental trials. The nesting pair of bald eagles were monitored over the same 3-year period (1993-1995); five eaglets fledged from the nest. Gizzard shad were the most frequently delivered prey item. Food caching was common during all three nesting seasons. Data indicated that reservoir pool fluctuations may not have influenced the number of wintering bald eagles; however, the impacts on perches were evident. The prey base did not appear to be negatively impacted by reduction in reservoir pool. In fact, fish availability was highest during the lowest reservoir pool and lowest during the highest reservoir pool. Foraging success followed the same trend. There was no indication that reservoir pool levels affected bald eagle nest productivity.

The Copper Flat mine project would not significantly affect the pool level in the Caballo Reservoir because NMCC has agreed to purchase water rights on the Rio Grande above Caballo Reservoir to compensate for any pumping losses. Therefore, no adverse effects to bald or golden eagles are expected.

Table 4-8. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek

Table 4-8. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek								
Species	Copper Flat Mine Area				Las Animas/Percha Creeks			
	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win
A=Abundant, C=Common, U=Uncommon, R=Rare; ○ = Not recorded but likely occurs in proper habitat; • = observed, observation method along creeks did not yield relative commonality.								
Canada Goose	○		○	○				•
Gadwall	○		○	○				•
Mallard	○		○	○	○	○	○	•
Northern Shoveler	U		○	○				•
Northern Pintail	○		○	○				•
Cinnamon Teal	R		○	○				
Blue-winged Teal	R		○	○				
Canvasback	U		○	○				
American Widgeon	R		○	○				
Green-winged Teal	○		○	○				•
Redhead	○		○	○	•			•
Ring-necked Duck	○		○	○				•
Common Merganser	○		○	○		•		•
Scaled Quail	○	○	○	R	○	○	○	•
Gambel's Quail		A			•	•	•	•
Montezuma Quail	○	○	○	○	•	○	○	•
Ring-necked Pheasant								•
Wild Turkey					•	•	○	○
Pied-billed Grebe								•
Bl.-crowned Night Heron		R				○		
Cattle Egret						○		
Snowy Egret					•		•	
Great Blue Heron	U	○	○	○	•	○	○	•
Green Heron					•			
White-faced Ibis						•		
Turkey Vulture		U				•	•	
Bald Eagle						•		•
Golden Eagle				R				
Northern Harrier		○		R	•			•
Sharp-shinned Hawk	○	○	○	○	•	○	○	•
Cooper's Hawk	○	○	○	○	•	○	○	•
Swainson's Hawk		R					•	
Red-tailed Hawk	○	U	○	U	•	•	○	•

Table 4-8. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek

	Copper Flat Mine Area				Las Animas/Percha Creeks			
Species	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win
Ferruginous Hawk	○		○	○	○	•	○	•
Gray Hawk						•		
Zone-tailed Hawk					•	•		
Common Black Hawk					•	•		
Golden Eagle	○	○	○	R	•			
American Kestrel	○	R	○	R	•	○	•	•
Merlin	○		○	○	○		○	•
Peregrine Falcon					•	•		
Prairie Falcon	○	○	○	○				•
Sora					•			
American Coot						○		
Sandhill Crane							○	•
Killdeer	U	○	○	○	•	•	•	
Black-necked Stilt						○		
American Avocet						○		
Spotted Sandpiper	○	○	○	○		○		
Common Snipe						○		○
Ring-billed Gull								•
Rock Dove	○	○	○	○	○	○	○	•
Eurasian Collared-Dove	○	○	○	○	•	○	•	•
White-winged Dove	U	U	○	○	•	•	•	•
Mourning Dove	C	C	C	C	•	•	•	•
Common Ground Dove						○		
Yellow-billed Cuckoo						•		
Greater Roadrunner	○	R	○	○	•	○	○	•
Western Screech-Owl	○	○	○	○	•	○	○	•
Great Horned Owl	○	R	○	○	•	•	○	•
Barn Owl	○	○	○	○	○	○	○	•
Burrowing Owl	○					•		
Northern Pygmy Owl	○	○	○	○	○	○	○	•
Mexican Spotted Owl					•			
Elf Owl					•	•		
Lesser Nighthawk		○				•		
Common Poorwill		○			•	•		
White-throated Swift		R			•	•		
Black-chinned Hummingbird		R			•	•	•	

Table 4-8. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek

Species	Copper Flat Mine Area				Las Animas/Percha Creeks			
	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win
Broad-tailed Hummingbird		R					•	
Belted Kingfisher					•	•	•	•
Lewis's Woodpecker								•
Red-headed Woodpecker					•			•
Red-naped Sapsucker								•
Acorn Woodpecker					•	•	•	•
Red-naped Sapsucker					•		•	•
Yellow-bellied Sapsucker								•
Ladder-backed Woodpecker				R	•	•		•
Downy Woodpecker	○	○	○	○	•	○	○	•
Hairy Woodpecker	○	○	○	○	•	○	○	○
Northern Flicker	○	R	○	○	•	○	•	•
Western Wood-Pewee		C				•	•	
Hammond's Flycatcher					•			•
Willow Flycatcher					•			
Brown-crested Flycatcher						•		•
Eastern Phoebe								•
Black Phoebe		R			•	•		•
Say's Phoebe	○	C	○	U	•	•	•	•
Vermilion Flycatcher		○			•	•		•
Ash-throated Flycatcher		C				•		
Brown-crested Flycatcher						•	•	
Dusky Flycatcher					•			
Dusky-capped Flycatcher						•		
Cassin's Kingbird						•	•	
Western Kingbird		C				•	•	
Loggerhead Shrike	○	R	○	○	•	•	○	•
Bell's Vireo						•		
Plumbeous Vireo						•		
Warbling Vireo							•	
Hutton's Vireo		○		○			•	•
Steller's Jay								•
Western Scrub-Jay	○	○	○	○	○	○	•	•
American Crow	○	○	○	○	○	○		•
Chihuahua Raven				U	•	○	•	•
Common Raven	○	C	○	C	•	○	•	•

Table 4-8. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek

Species	Copper Flat Mine Area				Las Animas/Percha Creeks			
	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win
Horned Lark	○	R	○	○	•	○	○	•
N. Rough-winged Swallow		○			•	•		
Violet-green Swallow	○	C	○		•	•	○	
Barn Swallow	○	R	○		•	•	•	
Cliff Swallow		○				•		
Mountain Chickadee				○				•
Bridled Titmouse	○	○	○	○	•	•	○	•
Juniper Titmouse	○	R	○	○				•
Verdin	R			R	•		•	•
Bushtit	○	○	○	U	○	○	○	○
Red-breasted Nuthatch								•
White-breasted Nuthatch					•	•	•	•
Brown Creeper	○	○	○	○	○	○	○	•
Cactus Wren	○	U	○	○	•	○	•	•
Rock Wren	C	C	C	C	•			•
Canyon Wren	U	C	○	○		•		
Bewick's Wren	○	○	○	U	•	•	•	•
House Wren	○							•
Winter Wren								•
Bl.-tailed Gnatcatcher	○					•		
Blue-Gray Gnatcatcher		○					•	
Golden-crowned Kinglet								•
Ruby-crowned Kinglet	○	○	○	U	•	○	○	•
Eastern Bluebird								•
Western Bluebird	○	○	○	○	•	○	○	•
Mountain Bluebird	○	○	○	C			•	
Townsend's Solitaire				R	•			•
Hermit Thrush					•			•
Rufous-backed Robin					•			•
American Robin	○	U	○	R	•	•	○	•
Northern Mockingbird	○	C	○	○	•	•	○	•
American Dipper						•		
Curve-billed Thrasher	○	U	○	○	•		•	•
Crissal Thrasher	○	U	○	○	•			•
Bendire's Thrasher	○	○	○		○	○	○	
Brown Thrasher		R						•

Table 4-8. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek								
	Copper Flat Mine Area				Las Animas/Percha Creeks			
Species	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win
Sage Thrasher				R				
European Starling	○	○	○	○	•	•	•	•
American Pipit								•
Sprague's Pipit			○					
Cedar Waxwing					•			•
Phainopepla	○	○	○	○	•	○	•	•
Orange-crowned Warbler	○	○	○				•	•
Bl.-throated Gray Warbler	○				○			
Lucy's Warbler		○			•	•		
Virginia's Warbler		○			•		•	
Grace's Warbler						•		
MacGillivray's Warbler							•	
Northern Parula					•			
Yellow-rumped Warbler	○	R	○	○	•	○	•	•
Red-faced Warbler						•		
Wilson's Warbler	○	○	○				•	
Pine Warbler								•
Tennessee Warbler					•		•	
Yellow-breasted Chat		○				•		
Ch.-collared Longspur				R				•
Green-tailed Towhee		R		R				•
Spotted Towhee		R		R	•	○	○	•
Rufous-crowned Sparrow		A		C	•			•
Canyon Towhee		C		A	•	•	•	•
Chipping Sparrow	○	○	○	A	•	○	○	•
Brewer's Sparrow	○		○	C	•		•	•
Vesper Sparrow	○	○	○	○				•
Lark Sparrow		○					•	
Black-throated Sparrow	○	A	○	C	•		•	•
Black-chinned Sparrow	○					•		
Sage Sparrow	○		○	A				•
Baird's Sparrow	○							•
Grasshopper Sparrow				R				•
Clay-colored Sparrow								•
Lark Bunting	○		○	○	•			
Indigo Bunting						•		

Table 4-8. Bird Species Recorded or Likely Present at Copper Flat Mine Area, Las Animas Creek, and Percha Creek

Species	Copper Flat Mine Area				Las Animas/Percha Creeks			
	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win
Lazuli Bunting					•			
Varied Bunting						•		
Song Sparrow				R	•		•	•
Lincoln's Sparrow	○		○	○	•		•	•
White-crowned Sparrow	○		○	A	•		•	•
White-throated Sparrow								•
Swamp Sparrow								•
American Tree Sparrow								•
Dark-eyed Junco	○	○	○	C	•		•	•
Summer Tanager					•	•	•	•
Hepatic Tanager					•			
Western Tanager					•			
Northern Cardinal						○		
Pyrrhuloxia				○	•	•		•
Blue Grosbeak		C			•	•	•	
Red-winged Blackbird	○	○	○	○	•	○	•	•
Western Meadowlark	○	U	○	R	•	○	○	•
Yellow-headed Blackbird	○	○		○				•
Brewer's Blackbird	○	○	○	○				•
Rusty Blackbird								•
Common Grackle					•			
Great-tailed Grackle	○	○	○	○	•	○	○	•
Brown-headed Cowbird		U				•		•
Hooded Oriole	○				•	•		
Bullock's Oriole	○						•	
Scott's Oriole	○					•		
Purple Finch								•
Cassin's Finch		R	○	R				•
House Finch	○	C	○	○	•	•	•	•
Red Crossbill								•
Pine Siskin	○	○	○	○				•
Lesser Goldfinch		U		C	•	•	•	•
Lawrence's Goldfinch								•
American Goldfinch			○		•			•
Evening Grosbeak								•
House Sparrow		U			•	•	•	•

4.9 SUMMARY OF DETERMINATION OF EFFECTS ON FEDERALLY LISTED SPECIES

Table 4-9 provides a summary of determinations of effect of the proposed project on Federally listed, threatened, or endangered species.

Table 4-9. Summary of the Analysis of Effects on Federally Listed Species

Table 4-9. Summary of the Analysis of Effects on Federally Listed Species		
Species	**Listing Status**	**Determination of Effects**
Chiricahua leopard frog *Lithobates chiricahuensis*	Threatened	*In-stream Effects in Las Animas Creek*: May Affect, Not Likely to Adversely Affect *Effects in Artesian well-fed Irrigation Ponds* May Affect, Likely to Adversely Affect
Narrow-headed garter snake *Thamnophis rufipunctatus*	Threatened	No Effect
Mexican spotted owl *Strix occidentalis lucida*	Threatened	May Affect, Not Likely to Adversely Affect
Northern Aplomado falcon *Falco femoralis septentrionalis*	Non-Essential Experimental Population	May Affect, Not Likely to Adversely Affect
Yellow-billed cuckoo *Coccyzus americanus*	Threatened	May Affect, Not Likely to Adversely Affect
Southwestern willow flycatcher *Empidonax traillii extimus*	Endangered	May Affect, Not Likely to Adversely Affect
Mexican gray wolf *Canis lupus baileyi*	Endangered	No Effect
Gila trout *Oncorhynchus gilae*	Threatened	No Effect
Rio Grande silvery minnow *Hybognathus amarus*	Endangered	No Effect
Todsen's Pennyroyal *Hedeoma todsenii*	Endangered	No Effect
Ladder Ranch Species		
Chiricahua leopard frog *Lithobateschiricahuensis*	Threatened	No Effect
Mexican gray wolf (*Canis lupus baileyi*) in holding facility	Endangered	May Affect, Not Likely to Adversely Affect
Bolson tortoise (Gopherus flavomarginatus) and their burrows	Endangered	May Affect, Not Likely to Adversely Affect
Southwestern willow flycatcher *Empidonax traillii extimus*	Endangered	No Effect
Yellow-billed cuckoo *Coccyzus americanus*	Threatened	No Effect

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ACRONYMS

AF	acre-feet
AFY	acre-feet per year
amsl	above mean sea level
ANFO	ammonium nitrate/fuel oil
ARD	acid rock drainage
BA	Biological Assessment
BACT	Best Available Control Technology
Bd	Batrachochytrium dendrobatidis
BLM	Bureau of Land Management
BMP	best management practice
BOR	Bureau of Reclamation
BRWRA	Blue Range Wolf Recovery Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
dB	decibel
dBA	A-weighted decibel
DNL	Day-night sound level
DOT	Department of Transportation
DP	discharge permit
DPS	distinct population segment
EA	Environmental Assessment
EAR	Environmental Assessment Report
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act
ELC	Environmental Law Center
EO	Executive Order
ESA	Endangered Species Act
ET	evapotranspiration
EWRSP	existing waste rock stockpile
FR	Federal Register
GMU	Game Management Unit
gpm	gallons per minute
HDPE	high-density polyethylene
HP	horsepower
IFT	Interagency Field Team
JSAI	John Shoemaker and Associates Inc
kV	kilovolt

kW	kilowatt
kWh	kilowatt hours
LCDO	BLM Las Cruces District Office
Leq	equivalent sound level
LRWMF	Ladder Ranch Wolf Management Facility
MBTA	Migratory Bird Treaty Act
mg/l	milligram per liter
mg/m^3	milligrams per cubic meter
MIBC	methyl isobutyl carbinol
MMD	Mining and Minerals Division
MPO	Mine Plan of Operations
MSHA	Mine Safety and Health Administration
MSL	mean sea level
MW	megawatt
MWEPA	Mexican Wolf Experimental Population Area
NEP	non-essential population
NEPA	National Environmental Policy Act
NMCC	New Mexico Copper Corporation
NMDA	New Mexico Department of Agriculture
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMWRRS	New Mexico Water Rights Reporting System
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resource Conservation Service
OSE	Office of the State Engineer
OSM	Office of Surface Mining
PAC	Protected Activity Center
PLS	pure live seed
PMLU	post mining land use
ppm	parts per million
PPV	peak particle velocity
RCRA	Resource Conservation and Recovery Act
RD	Ranger Districts
RGCT	Rio Grande Cutthroat Trout
RMP	Resource Management Plan
ROD	Record of Decision
ROI	Region of Influence
ROW	right of way
SAG	semi-autogenous grinding
SARA	Superfund Amendments and Reauthorization Act
SCP	spill contingency plan

SPCC	Spill Prevention Control and Countermeasures Plan
SSP	species survival plan
TESF	Turner Endangered Species Fund
THEMAC	THEMAC Resources Group, Ltd.
tpd	tons per day
tpy	tons per year
TSF	tailings storage facility
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WRDF	waste rock disposal facility
WRSP	waste rock stockpile
yd^3	cubic yard

GLOSSARY

Action: All activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas. Examples include, but are not limited to: (a) actions intended to conserve listed species or their habitat; (b) the promulgation of regulations;(c) the granting of licenses, contracts, leases, easements, rights-of-way, permits, or grants-in-aid; or (d) actions directly or indirectly causing modifications to the land, water, or air. [50 CFR §402.02]

Action area: All areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. [50 CFR §402.02]

Affect/effect: To affect (a verb) is to bring about a change ("The proposed action is likely to adversely affect piping plovers nesting on the shoreline"). The effect (usually a noun) is the result ("The proposed highway is likely to have the following effects on the Florida scrub jay"). **"Affect"** appears throughout section 7 regulations and documents in the phrases "may affect" and "likely to adversely affect." **"Effect"** appears throughout section 7 regulations and documents in the phrases "adverse effects," "beneficial effects," "effects of the action," and "no effect." [Proper grammatical usage]

Allotment (range): A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under management of an authorized agency. An allotment generally consists of Federal rangeland, but may include intermingled parcels of private, State, or Federal land. BLM stipulates the number of livestock and season of use for each allotment.

Alluvial valley: Valley filled with stream deposit.

Ambient: The natural surroundings of a location.

Applicant: Any person (an individual, corporation, partnership, trust, association, or any other private entity; or any officer, employee, agent, department, or instrumentality of the Federal Government, of any State, municipality, or political subdivision of a State, or of any foreign government; any State, municipality, or political subdivision of a State; or any other entity subject to the jurisdiction of the United States) [ESA §3(12)] who requires formal approval or authorization from a Federal agency as a prerequisite to conducting the action. [50 CFR §402.02]

Best available scientific and commercial data: To assure the quality of the biological, ecological, and other information used in the implementation of the Endangered Species Act, it is the policy of the Services to: (1) evaluate all scientific and other information used to ensure that it is reliable, credible, and represents the best scientific and commercial data available; (2) gather and impartially evaluate biological, ecological, and other information disputing official positions, decisions, and actions proposed or taken by the Services; (3) document their evaluation of comprehensive, technical information regarding the status and habitat requirements for a species throughout its range, whether it supports or does not support a position being proposed as an official agency position; (4) use primary and original sources of information as the basis for recommendations; (5) retain these sources referenced in the official document as part of the administrative record supporting an action; (6) collect, evaluate, and complete all reviews of biological, ecological, and other relevant information within the schedules established by the Act, appropriate regulations, and applicable policies; and (7) require management-level review of documents developed and drafted by Service biologists to verify and assure the quality of the science used to establish official positions, decisions, and actions taken by the Services during their implementation of the Act. [59 FR 34271 (July 1, 1994)]

Best Management Practice (BMP): Method that has been determined to be the most effective, practical means of preventing or reducing pollution from non-point sources, including construction sites. They also help prevent or mitigate other safety and environmental issues.

Biological assessment: Information prepared by, or under the direction of, a Federal agency to determine whether a proposed action is likely to: (1) adversely affect listed species or designated critical habitat; (2) jeopardize the continued existence of species that are proposed for listing; or (3) adversely modify proposed critical habitat. Biological assessments must be prepared for "major construction activities." See 50 CFR §402.02. The outcome of this biological assessment determines whether formal consultation or a conference is necessary. [50 CFR §402.02, 50 CFR §402.12]

Biological opinion: Document which includes: (1) the opinion of the Fish and Wildlife Service or the National Marine Fisheries Service as to whether or not a Federal action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of designated critical habitat; (2) a summary of the information on which the opinion is based; and (3) a detailed discussion of the effects of the action on listed species or designated critical habitat. [50 CFR §402.02, 50 CFR §402.14(h)]

Candidate species: Plant and animal taxa considered for possible addition to the List of Endangered and Threatened Species. These are taxa for which the Fish and Wildlife Service has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposal to list, but issuance of a proposed rule is currently precluded by higher priority listing actions. [61 FR 7596-7613 (February 28, 1996)]

Conservation: The terms "conserve," "conserving" and "conservation" mean to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to [the] Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking. [ESA §3(3)]

Conservation measures: Are actions to benefit or promote the recovery of listed species that are included by the Federal agency as an integral part of the proposed action. These actions will be taken by the Federal agency or applicant, and serve to minimize project effects on the species under review. These may include actions taken prior to the initiation of consultation, or actions which the Federal agency or applicant have committed to complete in a biological assessment or similar document.

Contamination: The introduction into water, air, and soil of microorganisms, chemicals, toxic substances, wastes, or wastewater in a concentration that makes the medium unfit for its next intended use.

Critical habitat: For listed species consists of: (1) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of the Act, on which are found those physical or biological features (constituent elements) (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Act, upon a determination by the Secretary that such areas are essential for the conservation of the species. [ESA §3 (5)(A)] Designated critical habitats are described in 50CFR §17 and 226.

Cumulative effects: Are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation. [50 CFR §402.02] This definition applies only to section 7 analyses and should not be confused with the broader use of this term in the National Environmental Policy Act or other environmental laws.

Designated non-Federal representative: The person, agency, or organization designated by the Federal agency as its representative to conduct informal consultation or prepare a biological assessment. The non-Federal representative must be designated by giving written notice to the Director. If a permit or license applicant is involved and is not the designated non-Federal representative, then the applicant and the Federal agency must agree on the choice of the designated non-Federal representative. [50 CFR §402.02, 50 CFR §402.08]

Destruction or adverse modification of critical habitat: A direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical. [50 CFR §402.02]

Distinct Population Segment: "Population," or "distinct population segment," are terms with specific meaning when used for listing, delisting, and reclassification purposes to describe a discrete vertebrate stock that may be added or deleted from the list of endangered and threatened species. The use of the term "distinct population segment" will be consistent with the Services' population policy. [61 FR 4722-4725 (February 7, 1996)]

Effects of the action: The direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action. These effects are considered along with the environmental baseline and the predicted cumulative effects to determine the overall effects to the species for purposes of preparing a biological opinion on the proposed action. [50 CFR §402.02] The environmental baseline covers past and present impacts of all Federal actions within the action area. This includes the effects of existing Federal projects that have not yet come in for their section 7 consultation.

Endangered species: Any species which is in danger of extinction throughout all or a significant portion of its range. [ESA §3(6)]

Environmental baseline: The past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process. [50 CFR §402.02]

ESA: The Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Federal agency: Any department, agency, or instrumentality of the United States. [ESA §3(7)]

Fish or wildlife: Any member of the animal kingdom, including without limitation any mammal, fish, bird (including any migratory, nonmigratory, or endangered bird for which protection is also afforded by treaty or other international agreement), amphibian, reptile, mollusk, crustacean, arthropod or other invertebrate, and includes any part, product, egg, or offspring thereof, or the dead body or parts thereof. [ESA §3(8)]

Forb: An herbaceous flowering plant other than grasses.

Formal consultation: A process between the Services and a Federal agency or applicant that: (1) determines whether a proposed Federal action is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat; (2) begins with a Federal agency's written request and submittal of a complete initiation package; and (3) concludes with the issuance of a biological opinion and incidental take statement by either of the Services. If a proposed Federal action may affect a listed species or designated critical habitat, formal consultation is required (except when the Services concur, in writing, that a proposed action "is not likely to adversely affect" listed species or designated critical habitat). [50 CFR §402.02, 50 CFR §402.14]

Graben: A depressed block of land bordered by parallel faults.

Grama: Pasture grass.

Graminoids: Grasses, herbaceous plants with narrow leaves growing from the base.

Grazing: Consumption of native forage on rangeland or pastures by livestock or wildlife.

Grazing allotment: An area where one or more livestock operators graze their livestock. An allotment generally consists of Federal land but may include parcels of private or State-owned land.

Grazing permit: An authorization that allows grazing on public land. Permits specify class of livestock on a designated area during specified seasons each year. Permits are of two types: preference (ten years) and temporary nonrenewable (one year).

Incidental take: Take of listed fish or wildlife species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by a Federal agency or applicant. [50CFR §402.02]

Indirect effects: Those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur. [50 CFR §402.02]

Informal consultation: An optional process that includes all discussions and correspondence between the Services and a Federal agency or designated non-Federal representative, prior to formal consultation, to determine whether a proposed Federal action may affect listed species or critical habitat. This process allows the Federal agency to utilize the Services' expertise to evaluate the agency's assessment of potential effects or to suggest possible modifications to the proposed action which could avoid potentially adverse effects. If a proposed Federal action may affect a listed species or designated critical habitat, formal consultation is required (except when the Services concur, in writing, that a proposed action "is not likely to adversely affect" listed species or designated critical habitat). [50 CFR §402.02, 50 CFR §402.13]

Invasive species: Non-native species that tend to spread prolifically and undesirably or harmfully.

Is likely to adversely affect: The appropriate finding in a biological assessment (or conclusion during informal consultation) if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial (see definition of "is not likely to adversely affect"). In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action "is likely to adversely affect" the listed species. If incidental take is anticipated to occur as a result of the proposed action, an "is likely to adversely affect" determination should be made. An "is likely to adversely affect" determination requires the initiation of formal section 7 consultation. [Clarification of usage]

Is likely to jeopardize proposed species/adversely modify proposed critical habitat: The appropriate conclusion when the action agency or the Services identify situations where the proposed action is likely to jeopardize the proposed species or adversely modify the proposed critical habitat. If this conclusion is reached, conference is required. [Clarification of usage]

Is not likely to adversely affect: The appropriate conclusion when effects on listed species are expected to be discountable, insignificant, or completely beneficial. **Beneficial effects** are contemporaneous positive effects without any adverse effects to the species. **Insignificant**

effects relate to the size of the impact and should never reach the scale where take occurs. **Discountable effects** are those extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur. [Clarification of usage]

Jeopardize the continued existence of: To engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. [50 CFR §402.02]

Listed species: Any species of fish, wildlife or plant which has been determined to be endangered or threatened under section 4 of the Act. [50 CFR §402.02]

Major construction activity: A construction project (or other undertaking having similar physical effects) which is a major Federal action significantly affecting the quality of the human environment as referred to in the National Environmental Policy Act (NEPA, 42U.S.C. 4332(2)(C)). [50 CFR §402.02]

Make-up water: Water supplied to compensate for loss by evaporation and leakage.

Material Safety Data Sheet (MSDS): Sheets that contain safety information about a chemical or material including necessary protective equipment and safety precautions, such as reactivity.

May affect: The appropriate conclusion when a proposed action may pose **any** effects on listed species or designated critical habitat. When the Federal agency proposing the action determines that a "may affect" situation exists, then they must either initiate formal consultation or seek written concurrence from the Services that the action "is not likely to adversely affect" [see definition above] listed species. [Clarification of usage]

Mesa: An isolated flat-topped hill with steep sides, found in landscapes with horizontal strata.

No effect: The appropriate conclusion when the action agency determines its proposed action will not affect a listed species or designated critical habitat. [Clarification of usage]

Noxious weed: Invasive plant species that has been designated by county, State, or Federal government.

Occupied critical habitat: Critical habitat that contains individuals of the species at the time of the project analysis. A species does not have to occupy critical habitat throughout the year for the habitat to be considered occupied (e.g. migratory birds). Subsequent events affecting the species may result in this habitat becoming unoccupied. [Clarification of usage]

Plant: Any member of the plant kingdom, including seeds, roots, and other parts thereof. [ESA §3(14)]

Perennial plants: A plant that that lives for more than two years.

Population: "Population," or "distinct population segment," are terms with specific meaning when used for listing, delisting, and reclassification purposes to describe a discrete vertebrate stock that may be added or deleted from the list of endangered and threatened species. The term "population" will be confined to those distinct population segments officially listed, or eligible for listing, consistent with section 4(a) of the Act and the Services' population policy. [61 FR 4722-4725 (February 7, 1996)]

Programmatic Agreement: A Programmatic Agreement is a document developed to memorialize the measures that would be implemented to avoid, minimize, or mitigate adverse effects that would occur to historic properties as the result of an undertaking. Such measures are normally developed by the lead Federal agency in consultation with the SHPO, ACHP, the project proponent, interested Tribes, and the interested public.

Proposed critical habitat: Habitat proposed in the Federal Register to be designated as critical habitat, or habitat proposed to be added to an existing critical habitat designation, under section 4 of the Act for any listed or proposed species. [50 CFR §402.02]

Proposed species: Any species of fish, wildlife or plant that is proposed in the Federal Register to be listed under section 4 of the Act. [50 CFR §402.02]

Raised fault: Very large blocks of rock, sometimes hundreds of kilometers in extent, created by tectonic and localized stresses in the Earth's crust.

Reasonable and prudent alternatives: Recommended alternative actions identified during formal consultation that can be implemented in a manner consistent with the intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the Director believes would avoid the likelihood of jeopardizing the continued existence of listed species or the destruction or adverse modification of designated critical habitat. [50 CFR§402.02]

Reasonable and prudent measures: Actions the Director believes necessary or appropriate to minimize the impacts, i.e., amount or extent, of incidental take. [50 CFR §402.02]

Recovery: Improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Act. [50 CFR §402.02]

Recovery unit: Management subsets of the listed species that are created to establish recovery goals or carrying out management actions. To lessen confusion in the context of section 7 and other Endangered Species Act activities, a subset of an animal or plant species that needs to be identified for recovery management purposes will be called a "recovery unit" instead of a "population." [Clarification of usage]

Right-of-Way: The legal right, established by usage or grant, to pass along a specific route through grounds or property belonging to another.

Runoff: The non-infiltrating water entering a stream or other conveyance channel shortly after a rainfall.

Section 7: The section of the Endangered Species Act of 1973, as amended, outlining procedures for interagency cooperation to conserve Federally listed species and designated critical habitats. Section 7(a)(1) requires Federal agencies to use their authorities to further the conservation of listed species. Section 7(a)(2) requires Federal agencies to consult with the Services to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat. Other paragraphs of this section establish the requirement to conduct conferences on proposed species; allow applicants to initiate early consultation; require FWS and NMFS to prepare biological opinions and issue incidental take statements. Section 7 also establishes procedures for seeking exemptions from the requirements of section 7(a)(2) from the Endangered Species Committee. [ESA §7]

Section 7 consultation: The various section 7 processes, including both consultation and conference if proposed species are involved. [50 CFR §402]

Sediment: Particles derived from rock or biological sources that have been transported by water.

Service(s): The U.S. Fish and Wildlife Service.

Species: Includes any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature. [ESA§3(16)]

Survival: For determination of jeopardy/adverse modification: the species' persistence as listed or as a recovery unit, beyond the conditions leading to its endangerment, with sufficient resilience to allow for the potential recovery from endangerment. Said another way, survival is the condition in which a species continues to exist into the future while retaining the potential for recovery. This condition is characterized by a species with a sufficient population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter. [Clarification of usage]

Take: To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. [ESA §3(19)]. **Harm** is further defined by FWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. **Harass** is defined by FWS as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. [50 CFR §17.3]

Threatened species: Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. [ESA §3(20)]

Unoccupied critical habitat: Critical habitat not occupied (i.e., not permanently or seasonally occupied) by the listed species at the time of the project analysis. The habitat may be suitable, but the species has been extirpated from this portion of its range. Conversely, critical habitat may have been designated in areas unsuitable for the species, but restorable to suitability with proper management, if the area is necessary to either stabilize the population or assure eventual recovery of a listed species. As recovery proceeds, this formerly unoccupied habitat may become occupied. Some designated, unoccupied habitat may never be occupied by the species, but was designated since it is essential for conserving the species because it maintains factors constituting the species' habitat. For example, critical habitat may be designated for an upstream area maintaining the hydrology of the species' habitat downstream. [Clarification of usage]

Warm season grasses: Grasses that go dormant in the winter in mild climate areas. They normally will not grow in cold winter areas.

Wildlife: See "fish or wildlife".