CENTRALIA
Public Works

January 25, 2016

Bill Teitzel
Lewis County Environmental Services
2025 N.E. Kresky Avenue
Chehalis, WA 98532

Dear Bill;

Subject: COMPLIANCE MONITORING REPORT FOR THE CENTRALIA LANDFILL

Please find enclosed one copy of the Compliance Monitoring Report from the Centralia Landfill. Sampling for this event occurred in September, 2015. Sampling is done biannually, first in March during the wet season and then again in September during the dry season. Amtest Labs in Redmond, Washington performed laboratory analysis. Mike Gray and I completed the sampling.

Please call me if you have questions or concerns.

Sincerely,

Randy Prevost

Randy Prevost
City of Centralia

cc: Mohsen Kourehdar, WA. State Dept. of Ecology

1100 N. Tower Ave.
Centralia, Washington 98531-5044
Phone (360) 330-7512 • Fax (360) 330-7516

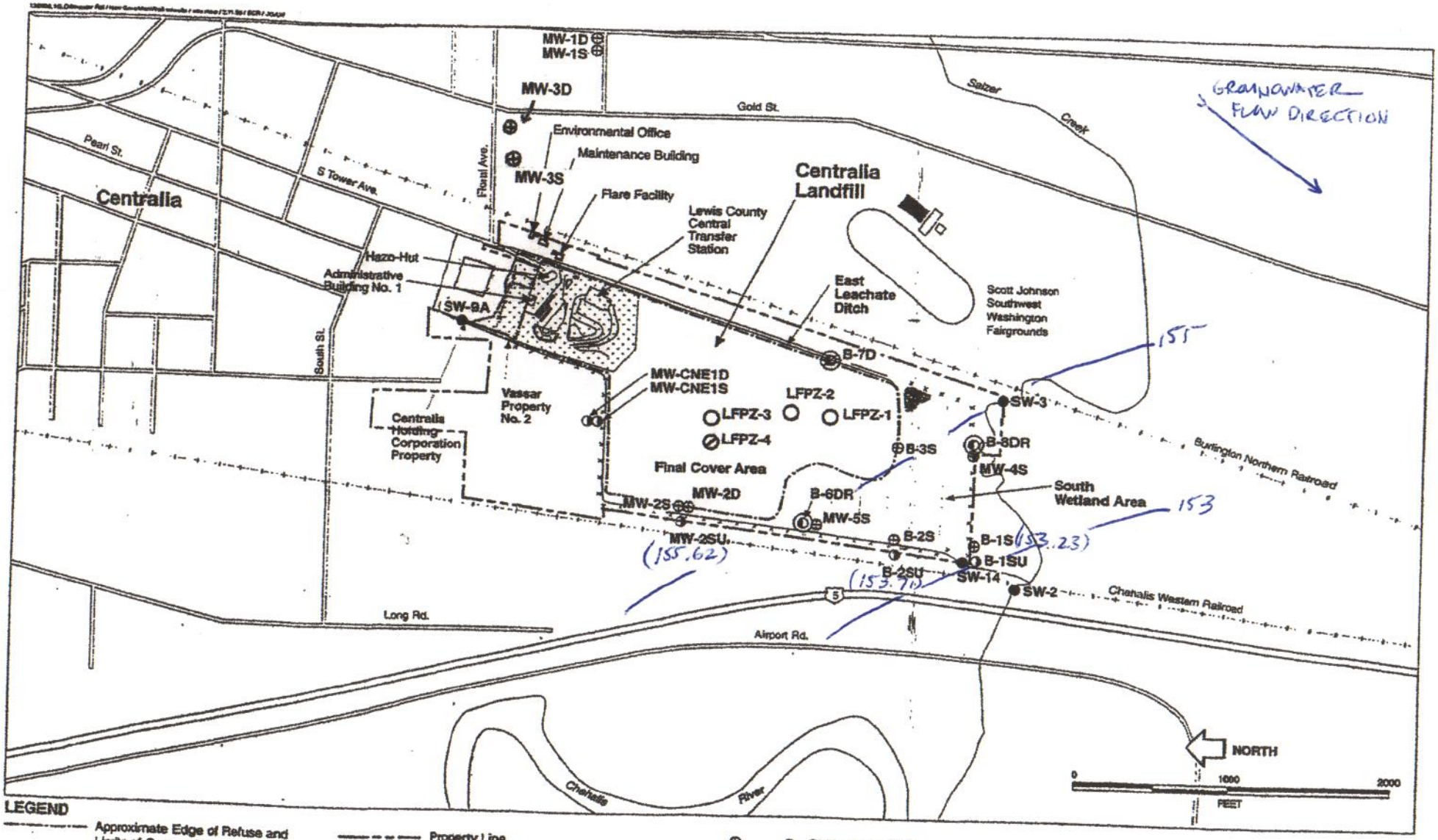
TABLE OF CONTENTS

REPORT NARRATIVE

This biannual Compliance Monitoring Report summarizes the results from the dry season sampling done at the Centralia Landfill in September, 2015. This report was prepared in accordance with the Cleanup Action Plan Consent Decree (signed May, 2001) and the latest Periodic Review from the Department of Ecology Toxics Cleanup Program (September, 2010). This report presents data and graphical analysis of selected parameters in groundwater, surface water and landfill gas. Collection and reporting of groundwater and surface water data occur biannually. Gas sampling occurs quarterly and results are included in this report. 17 groundwater monitoring wells were sampled September 21, 22 and 23, 2015. Data from this sampling event and from quarterly gas probe sampling events are presented in Appendix B and C. Locations of groundwater monitoring wells, surface water stations, and gas probes are shown on the site maps provided. On September 21, 2015 depth to groundwater was measured in all wells.

Weather during the sampling period was mostly sunny. Water was not present at SW 14, in the Weyerhaeuser Ditch (the point of compliance for surface water), and samples were not collected.

Depth to water levels were recorded for all wells on the day sampling commenced. Depth to water was also measured on the day of sampling before the pumps were turned on at each well. The submersible pump was adjusted to the lowest possible purge rate (usually about 2 L/minute). Parameters were taken in a stainless steel pitcher in which purge water passed through. pH, temperature, and conductivity were measured. This was repeated every 3 to 5 minutes. Water level was repeatedly checked to insure minimal drawdown. If drawdown was observed, the flow rate was adjusted if possible. When 3 successive readings were achieved within plus or minus 0.1 for pH and plus or minus 3% for conductivity, sample bottle filling began. Generally, sampling occurred in a progression from upgradient to down gradient wells. Field filtered samples (dissolved metals) were collected last at each well, and disposable inline filters were used.

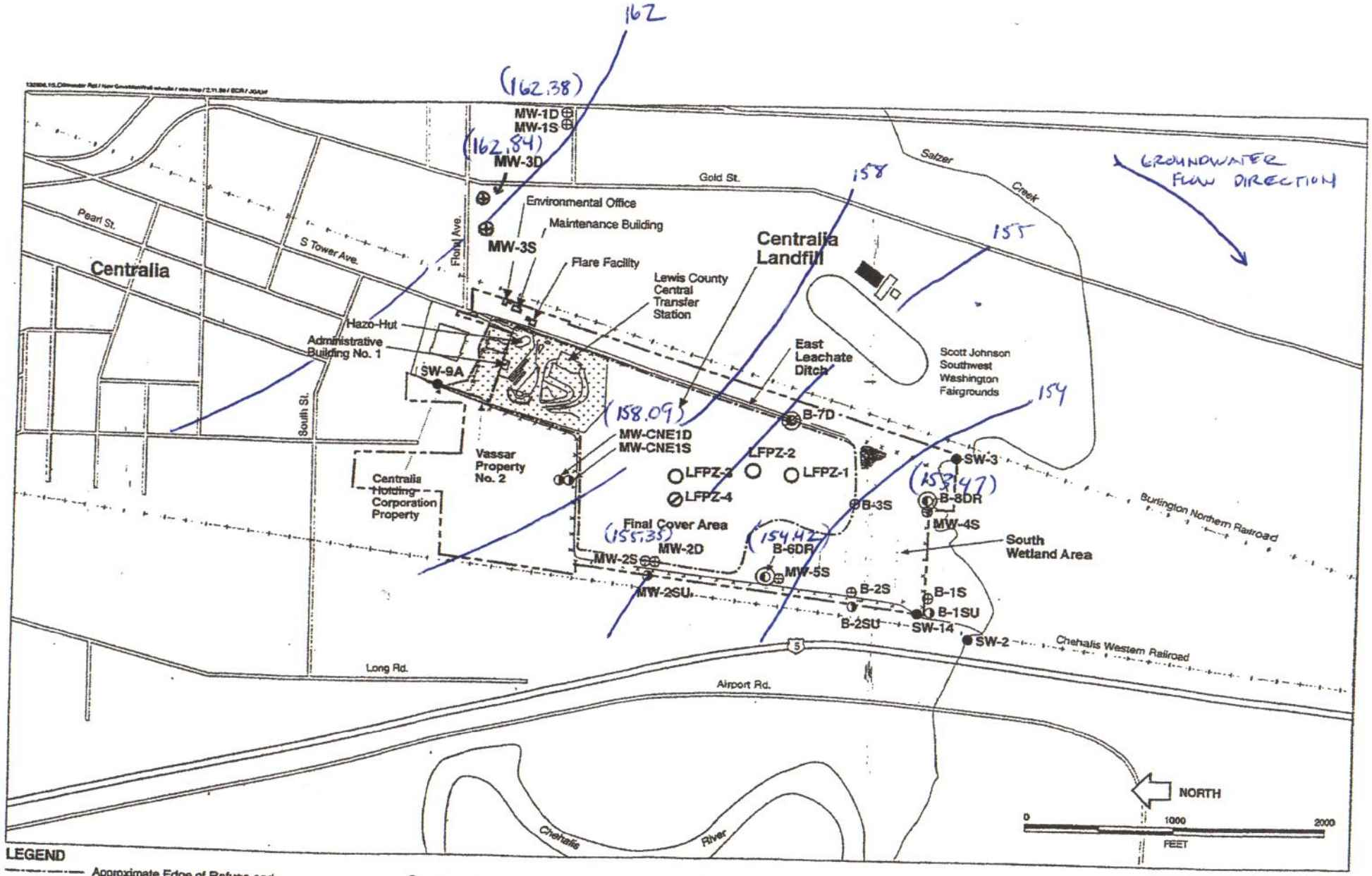


LEGEND

- Approximate Edge of Refuse and Limits of Source Area
- Fence
- Abandoned and New Replacement Monitoring Wells
- Abandoned Monitoring Wells
- Property Line
- Surface Water Monitoring Stations
- Groundwater Flow Direction
- New Monitoring Wells
- Pre-RI Monitoring Wells
- Closed Northend Landfill
- Piezometers
- Abandoned Piezometers

Site Map

SHALLOW UPPER AQUIFER
9/21/2015
DRY SEASON, 2015

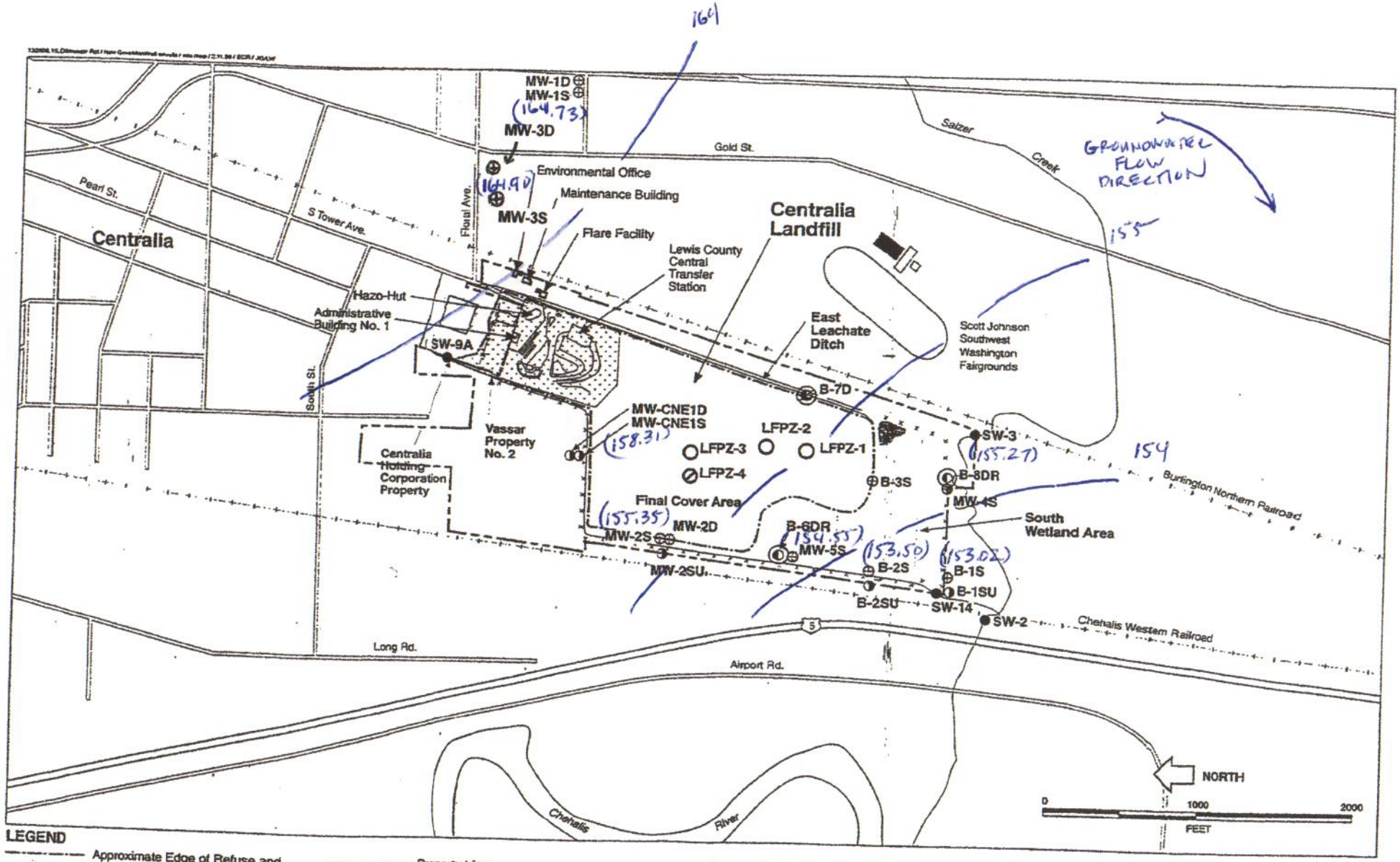


LEGEND

- Approximate Edge of Refuse and Limits of Source Area
- Fence
- Abandoned and New Replacement Monitoring Wells
- Abandoned Monitoring Wells
- Property Line
- Surface Water Monitoring Stations
- Groundwater Flow Direction
- New Monitoring Wells
- Pre-RI Monitoring Wells
- Closed Northend Landfill
- Piezometers
- Abandoned Piezometers

Site Map

LOWER AQUIFER
9/21/2015
DRY SEASON, 2016



Site Map

GROUNDWATER FLOW DIRECTION

164

155

154

UPPER AQUIFER
9/21/2015
DRY SEASON, 2015

Exceedences of Primary and Secondary Standards in Groundwater Wells

	pH	Conductiviy	TDS	Chloride	Sulfate	Nitrate + Nitrite	Arsenic	Iron	Mercury	Manganese	Zinc
Primary Drinking Water Standard						10 mg/l	0.01 mg/l		.002 mg/l		
Secondary Standard	6.5 - 8.5	**CAP** cleanup levels	500 mg/l	250 mg/l	250 mg/l			0.3 mg/l		0.05 mg/l	5 mg/l
Groundwater Standard	6.5 - 8.5	700 umhos/cm	500 mg/l	250 mg/l	250 mg/l		0.0005 mg/l	0.3 mg/l	.002 mg/l	0.05 mg/l	5 mg/l
MW1D	6.56	294	200	6.91	0.29	< 0.02	0.0092	2.36	< 0.00002	0.6227	< 0.002
MW1S	5.43	246	180	2.72	47.2	2.6	0.0001	< 0.009	< 0.00002	< 0.0009	< 0.002
MW3S	5.12	175	160	4.74	22.3	3	0.0001	< 0.009	< 0.00002	< 0.0009	< 0.002
MW3D	6.29	243	200	7.49	0.32	< 0.02	0.0024	4.53	< 0.00002	1.111	0.003
CNE1S	5.86	1030	620	98.1	1.17	< 0.02	0.011	26.7	< 0.00002	2.435	< 0.002
CNE1D	6.91	300	220	7.81	0.31	< 0.02	0.0001	0.404	< 0.00002	0.2291	< 0.002
MW2D	6.66	349	240	11.6	0.31	< 0.02	0.0064	1.94	< 0.00002	0.869	0.005
MW2S	6.24	1410	920	242	1.73	< 0.02	0.028	7.73	< 0.00002	8.682	< 0.002
MW2SU	6.36	1580	1100	251	1.44	< 0.02	0.007	24.5	< 0.00002	9.158	0.002
MW5S	6.08	243	170	8.11	3.76	< 0.02	0.0021	0.889	< 0.00002	0.6934	0.005
B6DR	6.7	290	190	11	0.48	< 0.02	0.0059	1.82	< 0.00002	0.6632	< 0.002
B2SU	6.48	366	200	3.68	5.53	< 0.02	0.0026	0.146	< 0.00002	< .0009	0.003
B2S	5.92	177	260	13.2	1.04	< 0.02	0.013	< 0.009	< 0.00002	1.605	0.002
B1SU	6.25	481	280	14.7	3.08	< 0.02	0.0082	8.73	< 0.00002	2.822	< 0.002
B1S	6.77	237	210	7.72	0.23	< 0.02	0.017	0.717	< 0.00002	0.867	0.002
MW4S	6.36	209	130	2.64	10.5	< 0.02	0.0035	0.895	< 0.00002	0.4648	0.008
B8DR	7.21	455	270	6.2	20.4	< 0.02	0.0003	0.344	< 0.00002	0.2626	< 0.002

Cleanup Levels Established in the Cleanup Action Plan

	Conductiviy	Chloride	Iron	Manganese	Arsenic
Groundwater Cleanup Levels for Shallow Upper/Upper Unit	**700 umhos/cm**	**250 mg/l**	**0.3 mg/l**	**0.05 mg/l**	**0.00027 mg/l cleanup level, 0.0005 mg/l compliance**
MW1S	246	2.72	< 0.009	< 0.0009	< 0.002
MW3S	175	4.74	< 0.009	< 0.0009	0.0001
CNE1S	1030	98.1	26.7	2.435	0.011
MW2S	1410	242	7.73	8.682	0.028
MW2SU	1580	251	24.5	9.158	0.0007
MW5S	243	8.11	0.889	0.6934	0.0021
B2SU	366	3.68	0.146	< 0.0009	0.0026
B2S	177	13.2	< 0.009	1.605	0.013
B1SU	481	14.7	8.73	2.822	0.0082
B1S	237	7.72	0.717	0.867	0.017
MW4S	209	2.64	0.895	0.4648	0.0035
Groundwater Cleanup Level for Lower Unit			**0.3 mg/l**	**0.05 mg/l**	**0.005 mg/l cleanup level**
MW1D			2.36	0.6227	0.0092
MW3D			4.53	1.111	0.0024
CNE1D			0.404	0.2291	0.0001
MW2D			1.94	0.869	0.0064
B6DR			1.82	0.6632	0.0059
B8DR			0.344	0.2626	0.0003
Surface Water Standards					**0.00027 mg/l cleanup level, 0.0005 mg/l compliance**
SW14					No water present at SW14

ANALYTICAL METHODS AND DETECTION LIMITS				
ANALYTE	**UNITS**	**METHOD NUMBER**	**REFERENCE**	**DETECTION LIMIT**
Alkalinity (as $CaC0_3$)	mg/l	2320B	EPA	1.0
Chemical Oxygen Demand	mg/l	410.4	EPA	10.
Total Organic Carbon	mg/l	415.1	EPA	1.0
Chloride	mg/l	325.2	EPA	1.0
Hardness (as $CaC0_3$)	mg/l	130.2	EPA	1.0
Ammonia Nitrogen	mg/l	350.1	EPA	0.005
Nitrate+Nitrite	mg/l	353.2	EPA	0.010
Total Dissolved Solids	mg/l	2540C	EPA	1.0
Sulfate	mg/l	375.4	EPA	1.0
Arsenic	mg/l	200.8	EPA	0.0005
Calcium	mg/l	200.7	EPA	0.10
Iron	mg/l	200.7	EPA	0.01
Mercury	mg/l	245.1	EPA	0.0001
Potassium	mg/l	200.7	EPA	1.0
Magnesium	mg/l	200.7	EPA	0.10
Manganese	mg/l	200.7	EPA	0.002
Sodium	mg/l	200.7	EPA	0.1
Zinc	mg/l	200.7	EPA	0.002

APPENDIX A
DISCUSSION OF GROUNDWATER MONITORING DATA
CENTRALIA LANDFILL

The following discussion summarizes results of the dry season groundwater monitoring for 2015. The analysis consists of a comparison of groundwater monitoring data to Washington State groundwater and drinking water standards, and an evaluation of trends in monitoring parameter values over time (time series plots).

Time series plots were generated for the current monitoring parameters and for each sampling event since June, 1996. These are included in Attachment B of this appendix.

Analysis for each monitoring parameter is discussed below, organized by regulatory criteria. Results for parameters with primary drinking water standards and/or state groundwater standards are presented first (arsenic, mercury, and nitrate), followed by results for parameters with secondary drinking water standards (chloride, iron, manganese, pH, sulfate, TDS and zinc).

Additionally, a discussion of sampling results compared to Cleanup Levels established at the point of compliance for groundwater and surface waters is included.

Parameters with Primary Standards:

Arsenic has two standards: a primary drinking water standard of 0.01 mg/l and a state groundwater quality standard of 0.0005 mg/l. Only B1S, B2S, MW2S and CNE1S exceeded the drinking water standard. Twelve wells exceeded the groundwater standard. Arsenic was detected in all wells.

Mercury has a primary standard of 0.002 mg/l. Mercury was not detected in any wells this quarter.

Nitrate has a primary standard of 10 mg/l. Nitrate was detected in only two wells this round. All wells were below the standard. MW3S had the highest value with 3 mg/l.

Parameters with Secondary Standards:

Chloride has a secondary standard of 250 mg/l. Only MW2SU exceeded the standard with a measurement of 251 mg/l.

Iron has a secondary standard of 0.3 mg/l. Iron was detected in all but three wells this season. Thirteen wells exceeded the standard. CNE1S had the highest value with 26.7 mg/l.

Manganese has a secondary standard of 0.05 mg/l. Manganese was detected in fourteen wells, all of which exceeded the standard.

pH has a regulatory range of 6.5 to 8.5. Eleven of the 17 wells exceeded the standard. All exceedences were values below 6.5.

Sulfate has a secondary standard of 250 mg/l. All wells were far below the standard.

TDS has a secondary standard of 500 mg/l. This value was exceeded in three wells. The highest value was 1100 mg/l in MW2SU.

Zinc has a secondary standard of 5 mg/l. Zinc was detected in eight wells this quarter, all below the standard.

Comparisons of monitoring results to Cleanup Levels established in the Cleanup Action Plan

Ground Water cleanup levels for the shallow upper/upper unit:

Soluble Arsenic has a cleanup level of 0.27 µg/L with a compliance level of 0.50 µg/L. MW1S and MW3S were below both cleanup and compliance levels. All other wells in the unit exceeded both standards.

Conductivity has a cleanup level of 700 umhos/cm. Three of the wells exceeded this value; one of the wells in the shallow upper aquifer (MW2SU), the cross gradient well CNE1S, and the down gradient shallow well MW2S.

Chloride has a cleanup level of 250 mg/l. MW2SU exceeded this level with a value of 251 mg/l.

Soluble Iron has a cleanup level of 0.3 mg/L. Seven wells exceeded the cleanup level this season. CNE1S had the highest value with 26.7 mg/l.

Soluble Manganese has a cleanup level of 50 µg/L. MW1S, MW3S, MW4S, MW5S and B2SU were under this value. All other wells exceeded the cleanup level.

Ground Water Cleanup Levels for the Lower Unit:

The Soluble Arsenic cleanup level is 5 µg/L. Three of the six wells exceeded the cleanup level; B6DR, MW1D, and MW2D.

Soluble Iron has a cleanup level of 300 µg/L. All wells exceeded the cleanup level this season.

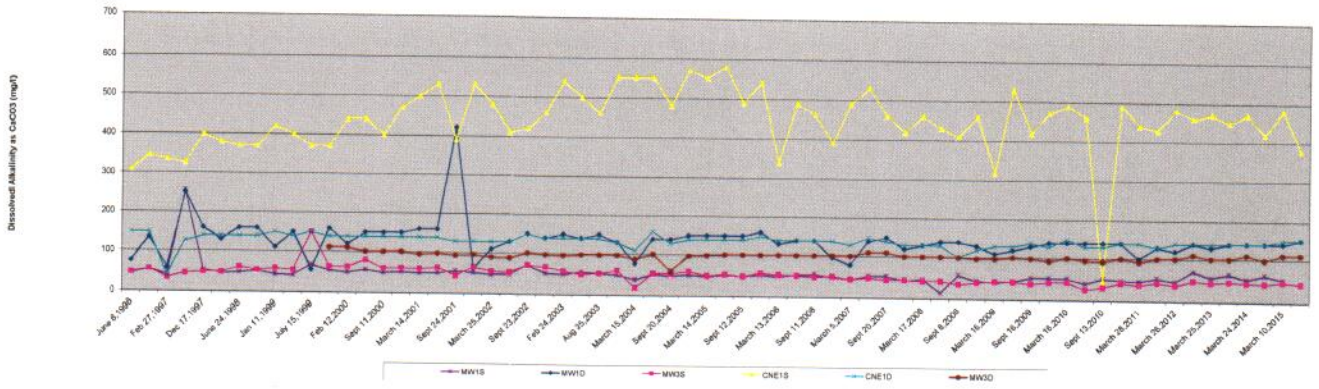
Soluble Manganese has a cleanup level of 50 µg/L. All wells in the lower unit exceeded this value.

Surface Water Standards:

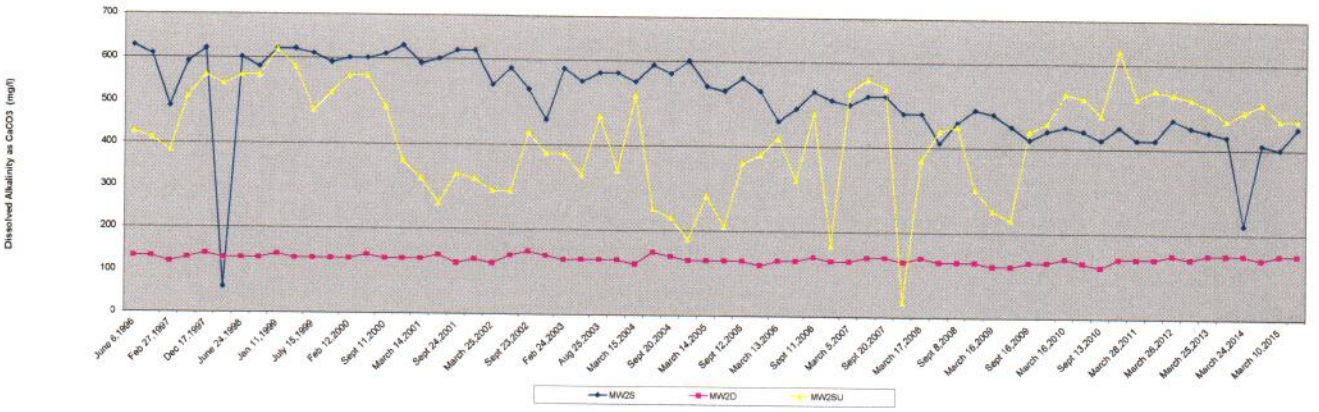
Surface water was not present at SW14, the point of compliance.

Appendix B - Groundwater Time Series Graphs

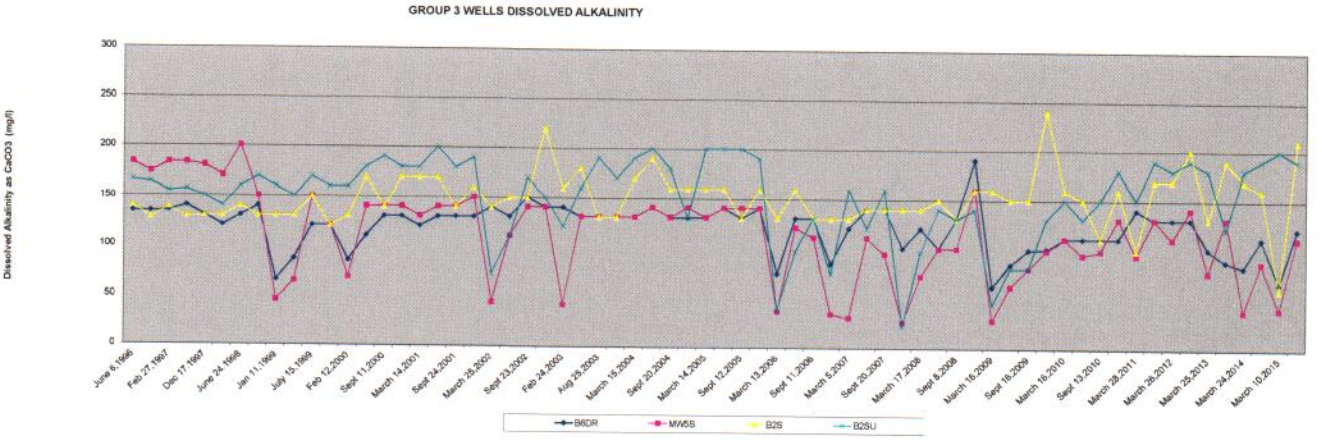
GROUP 1 WELLS DISSOLVED ALKALINITY



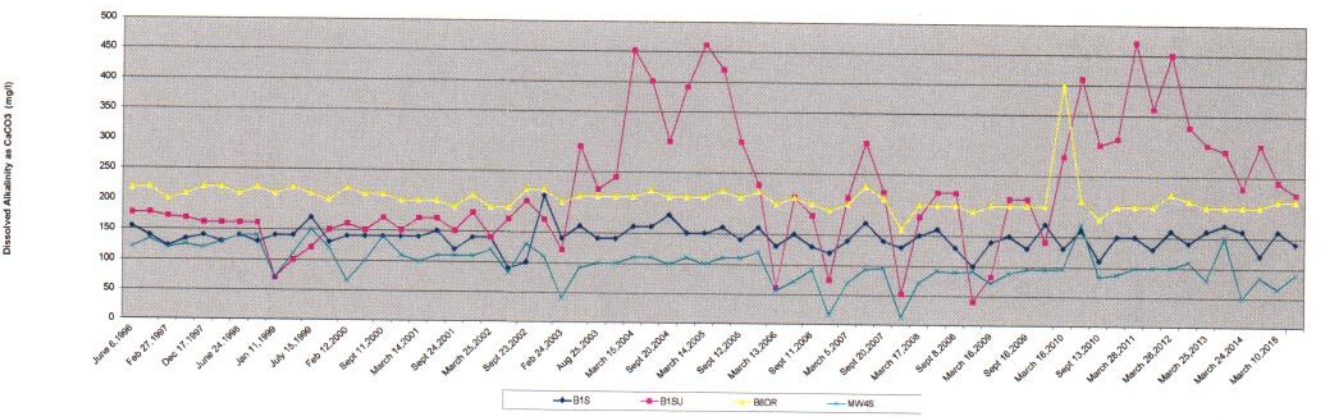
GROUP 2 WELLS DISSOLVED ALKALINITY



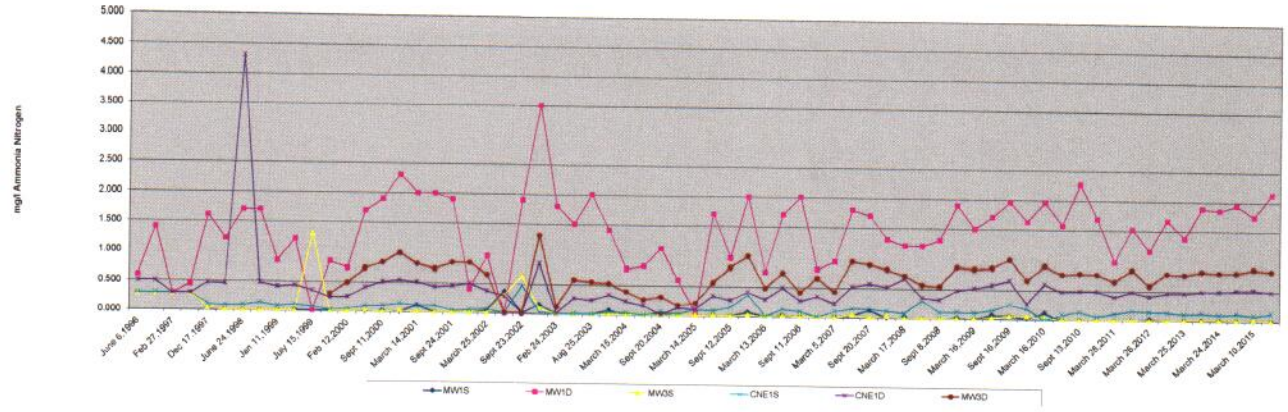
GROUP 3 WELLS DISSOLVED ALKALINITY



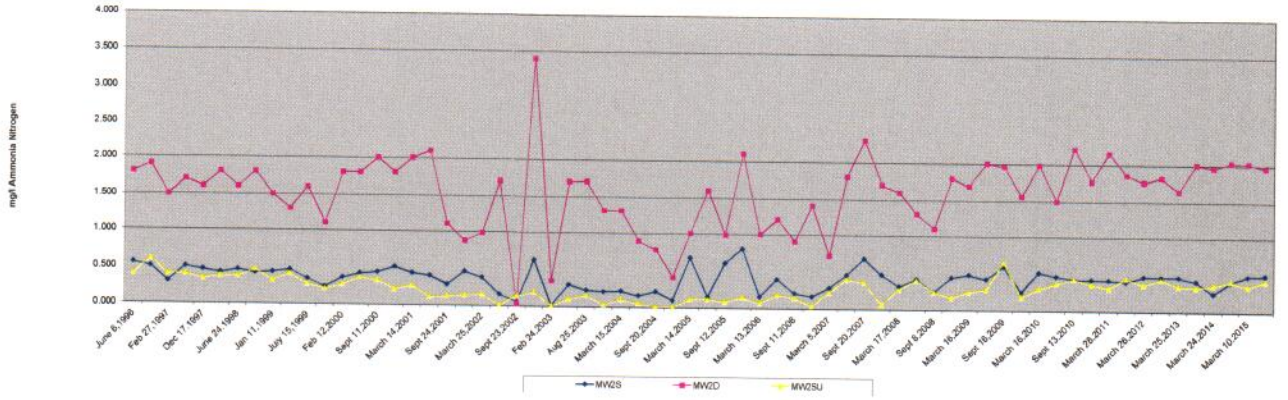
GROUP 4 WELLS DISSOLVED ALKALINITY



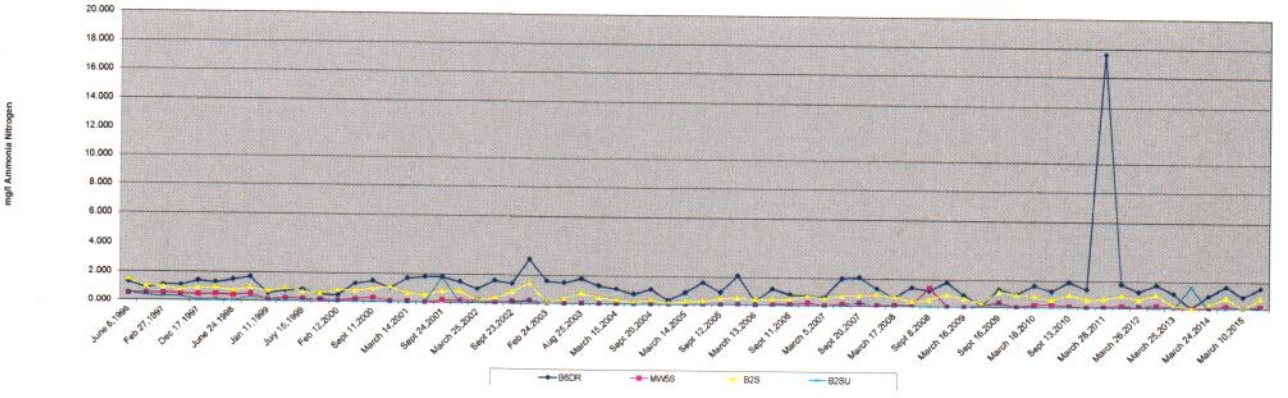
GROUP 1 WELLS AMMONIA



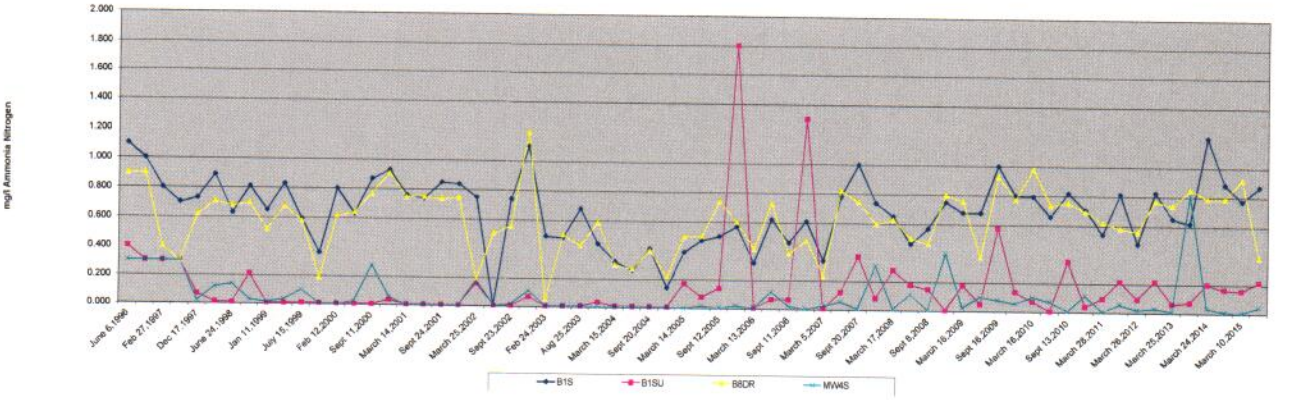
GROUP 2 WELLS AMMONIA



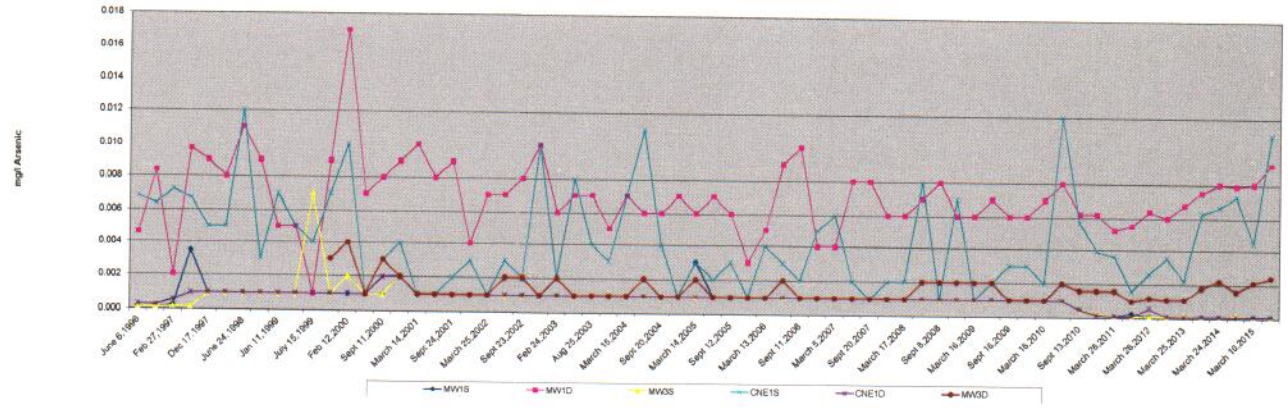
GROUP 3 WELLS AMMONIA



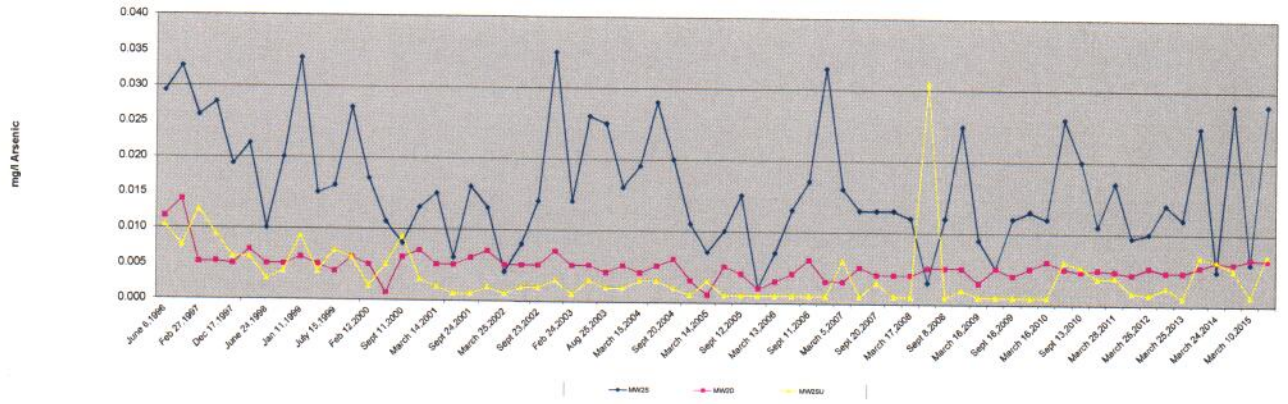
GROUP 4 WELLS AMMONIA



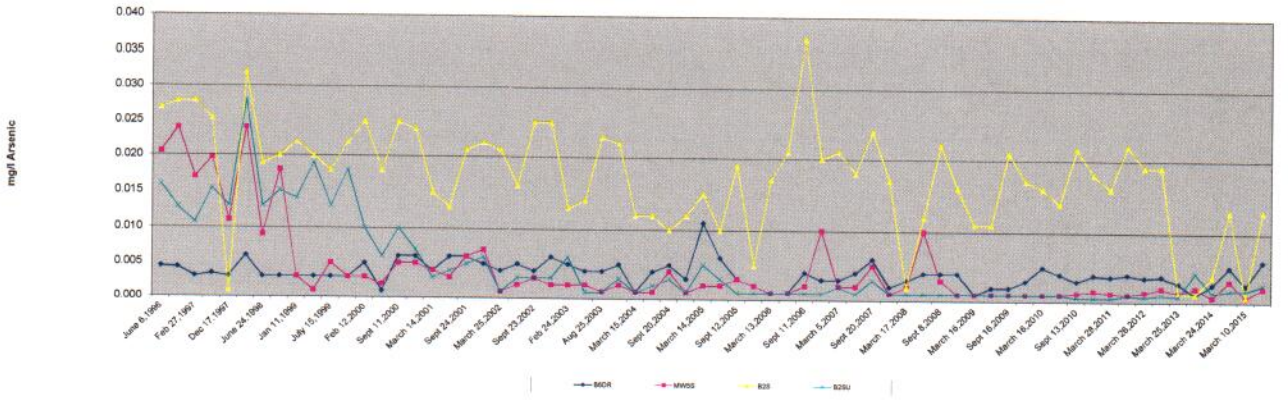
GROUP 1 WELLS DISSOLVED ARSENIC



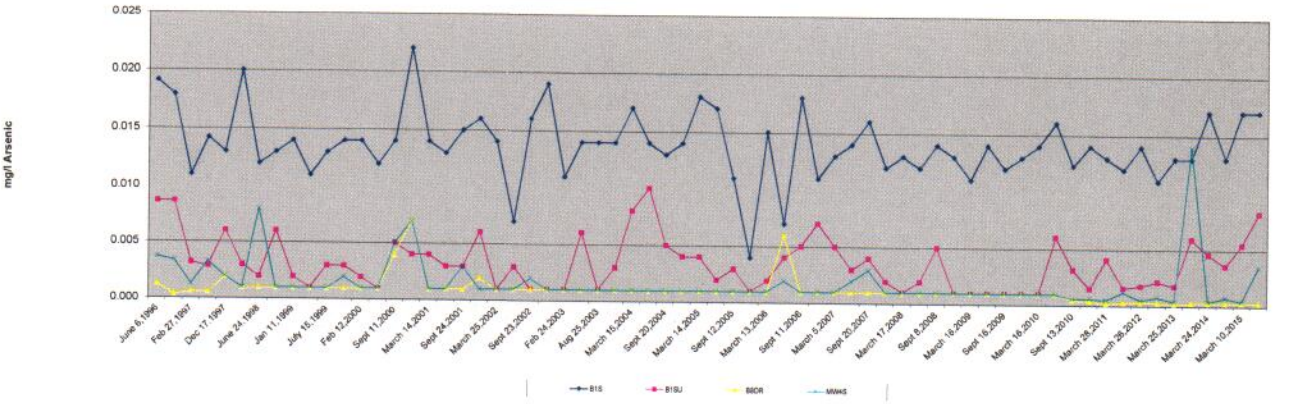
GROUP 2 WELLS DISSOLVED ARSENIC



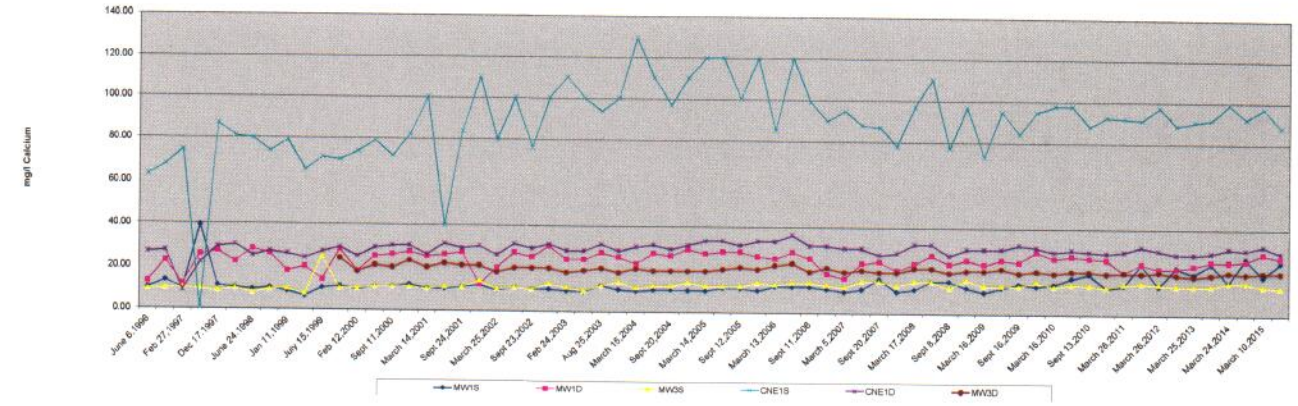
GROUP 3 WELLS DISSOLVED ARSENIC



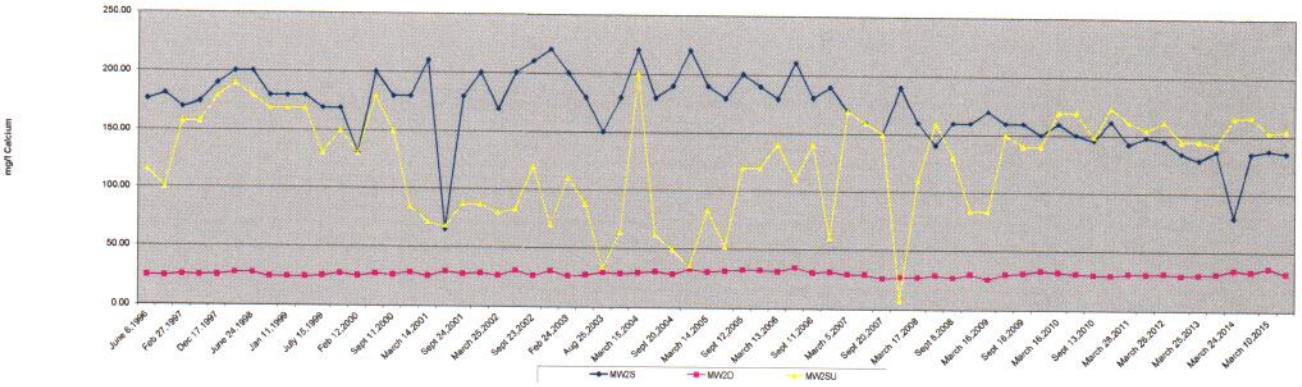
GROUP 4 WELLS DISSOLVED ARSENIC



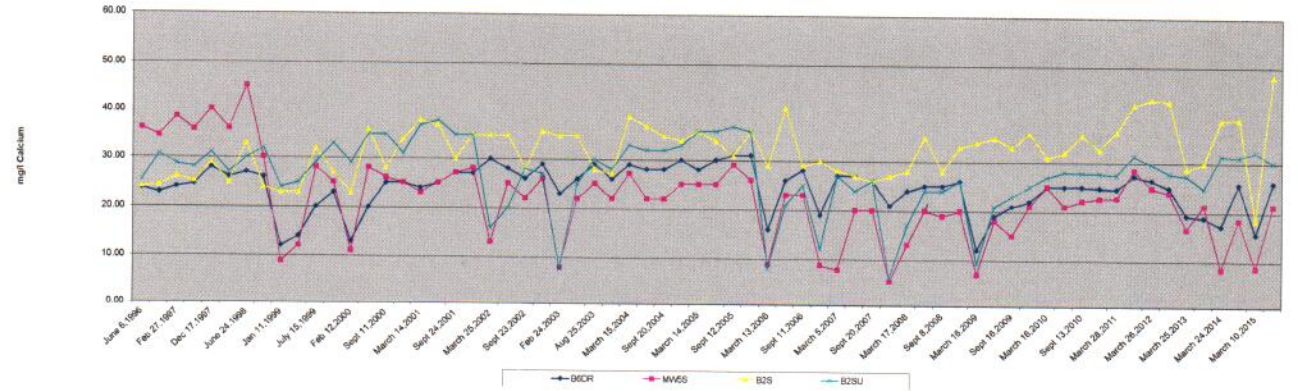
GROUP 1 WELLS DISSOLVED CALCIUM



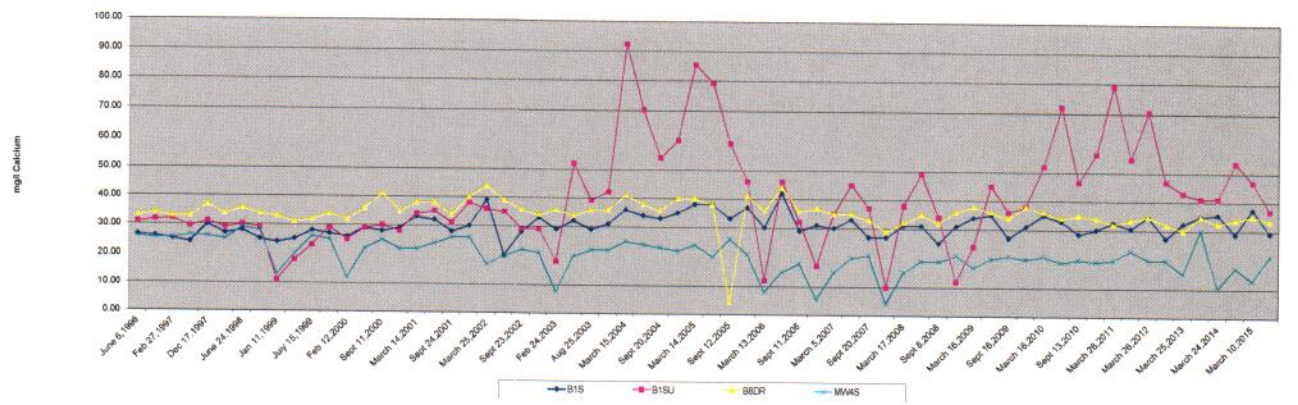
GROUP 2 WELLS DISSOLVED CALCIUM



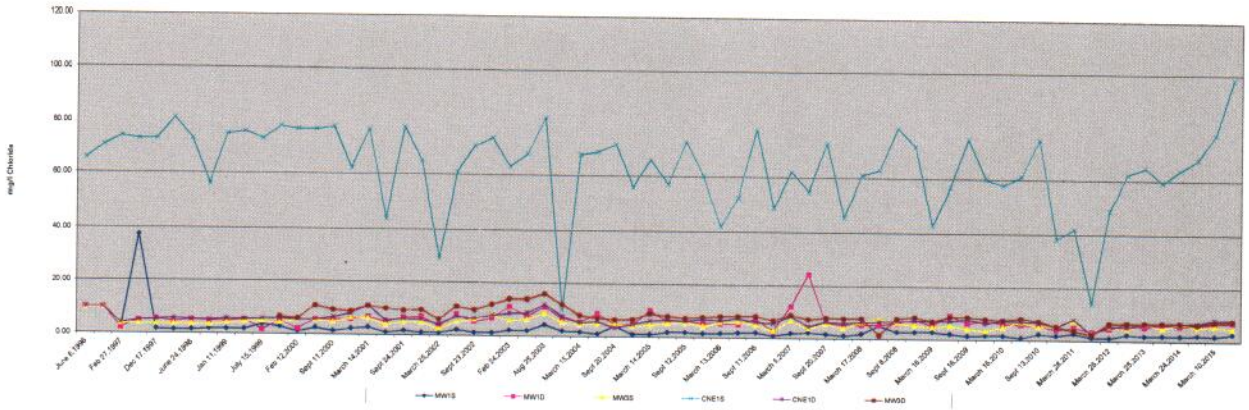
GROUP 3 WELLS DISSOLVED CALCIUM



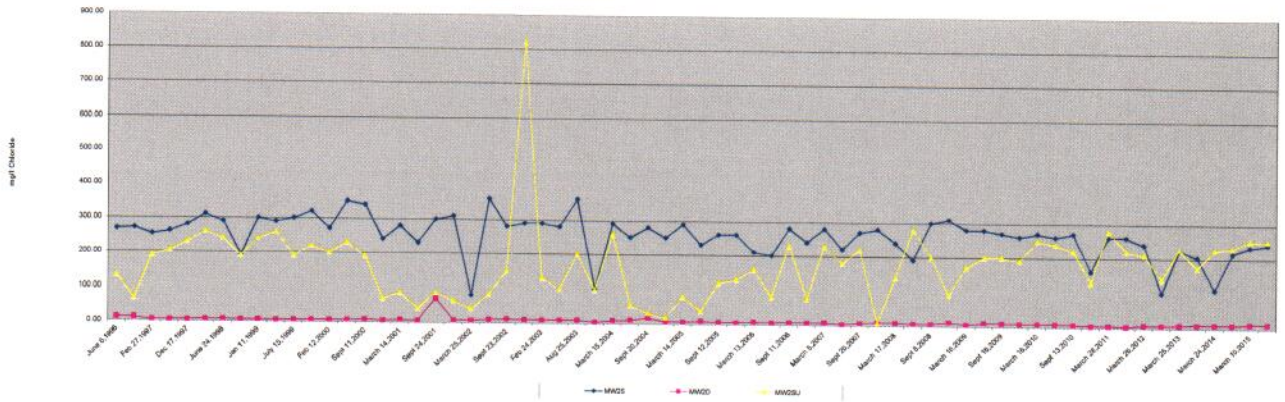
GROUP 4 WELLS DISSOLVED CALCIUM



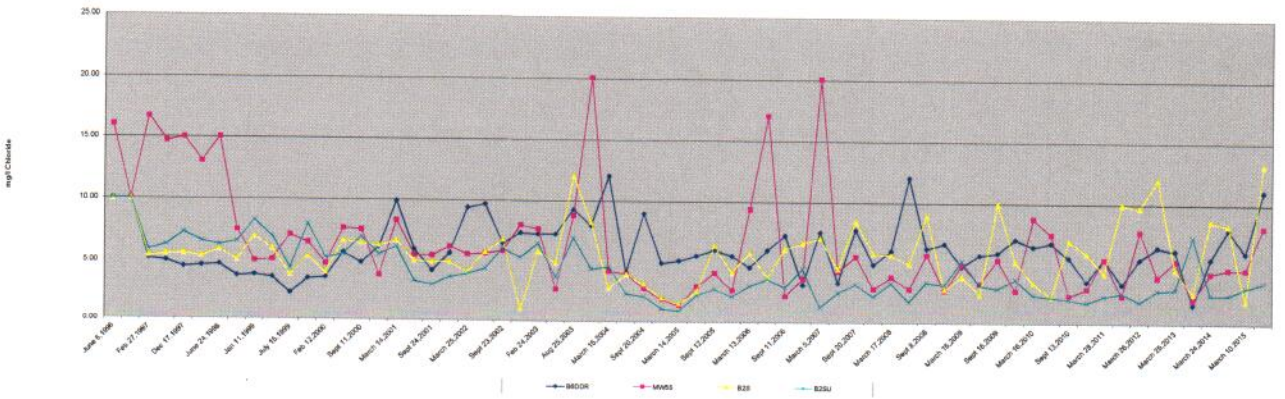
GROUP 1 WELLS DISSOLVED CHLORIDE



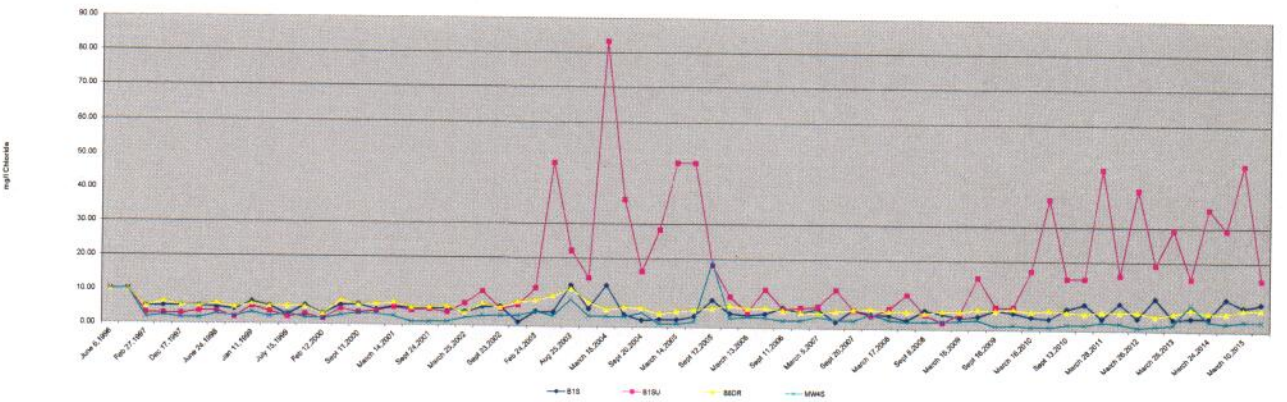
GROUP 2 WELLS DISSOLVED CHLORIDE



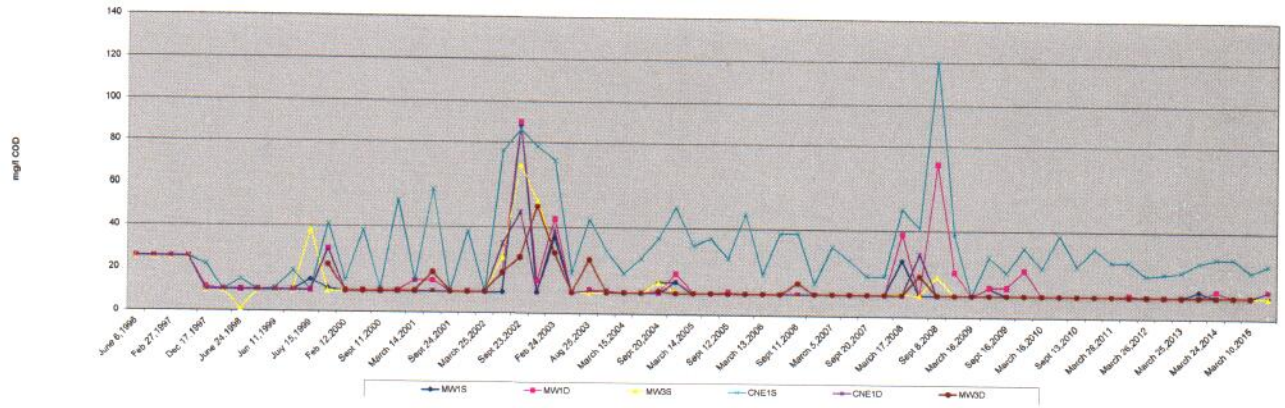
GROUP 3 WELLS DISSOLVED CHLORIDE



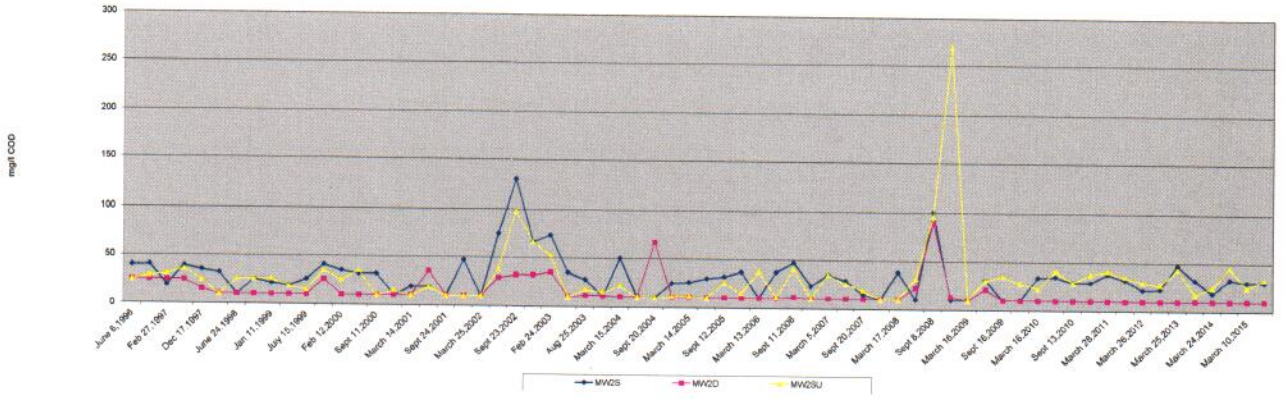
GROUP 4 WELLS DISSOLVED CHLORIDE



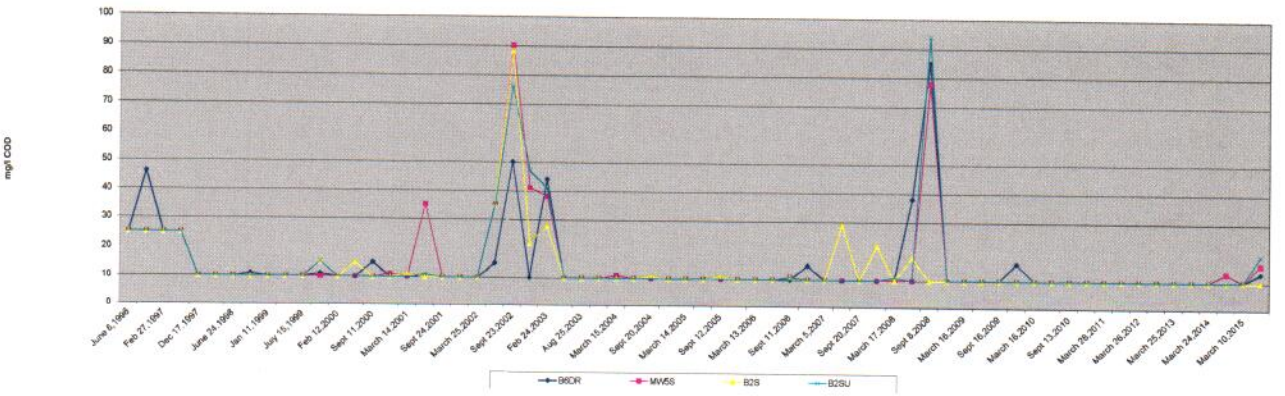
GROUP 1 WELLS CHEMICAL OXYGEN DEMAND



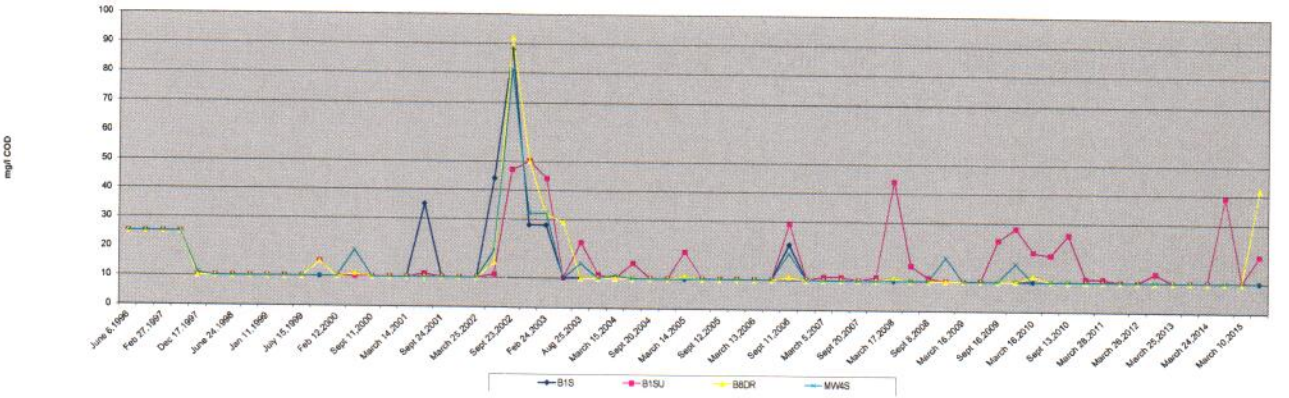
GROUP 2 WELLS CHEMICAL OXYGEN DEMAND



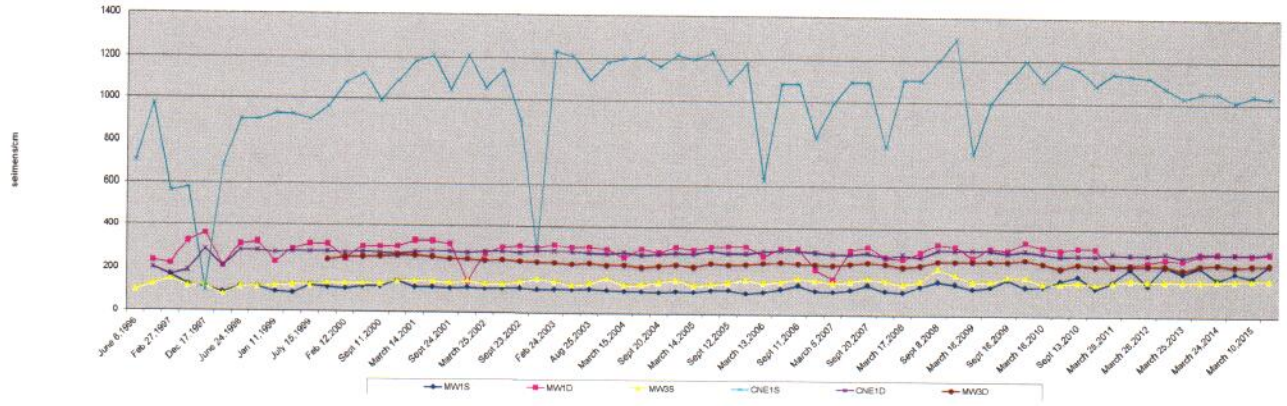
GROUP 3 WELLS CHEMICAL OXYGEN DEMAND



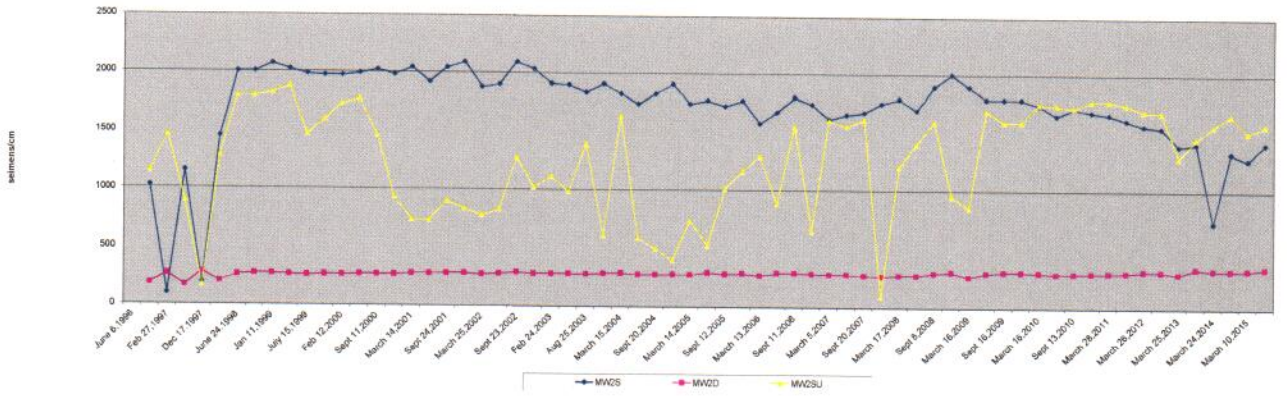
GROUP 4 WELLS CHEMICAL OXYGEN DEMAND



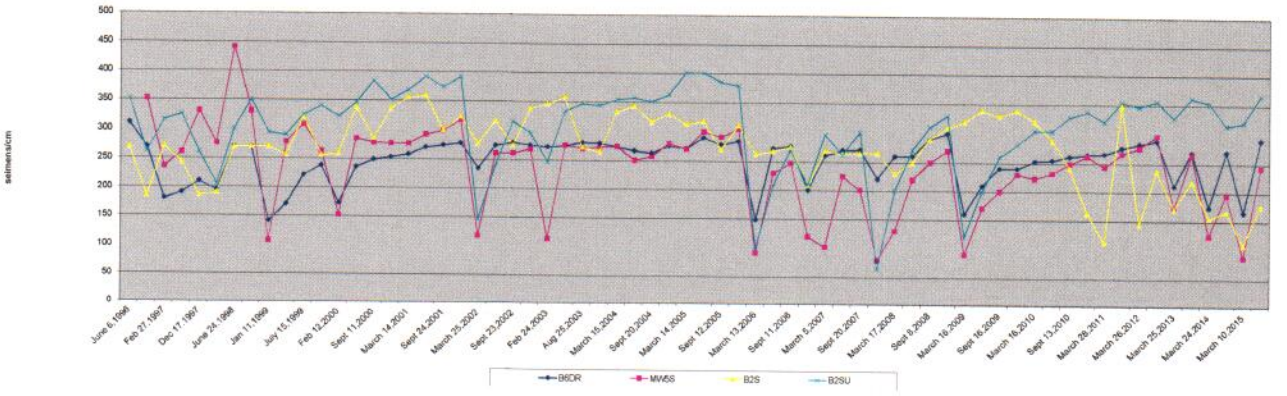
GROUP 1 WELLS CONDUCTIVITY



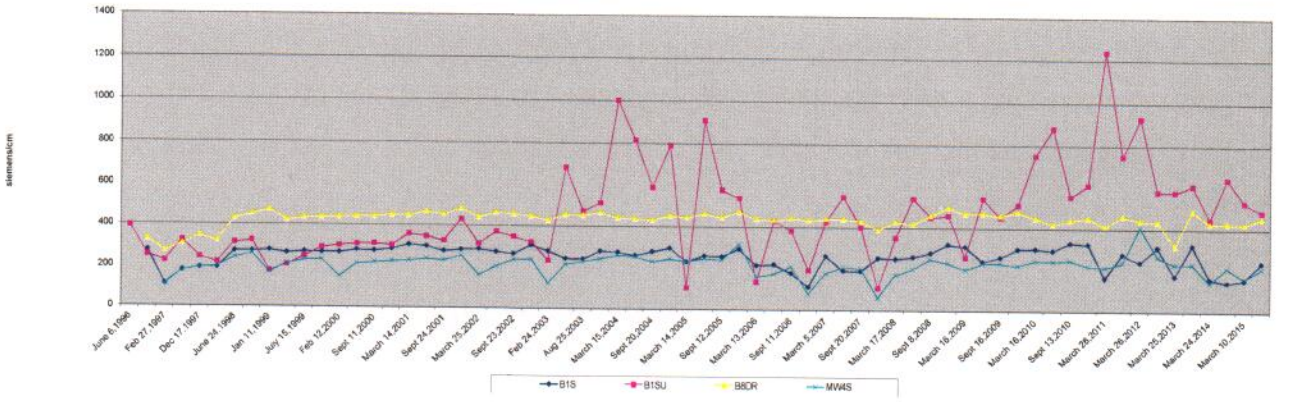
GROUP 2 WELLS CONDUCTIVITY



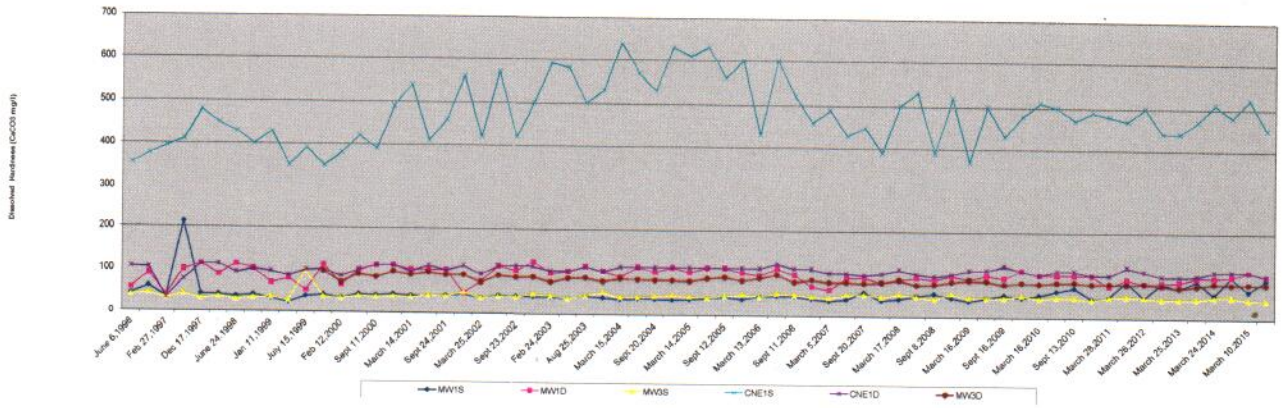
GROUP 3 WELLS CONDUCTIVITY



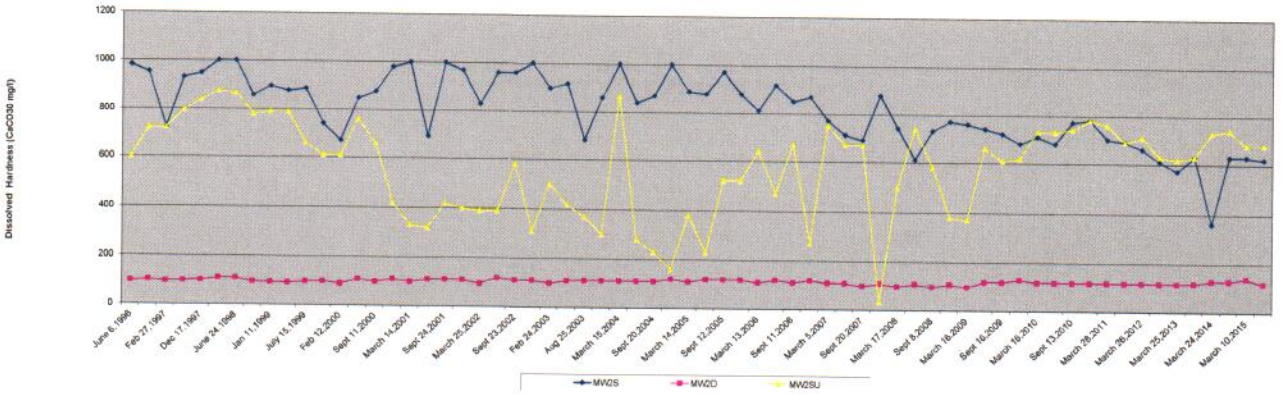
GROUP 4 WELLS CONDUCTIVITY



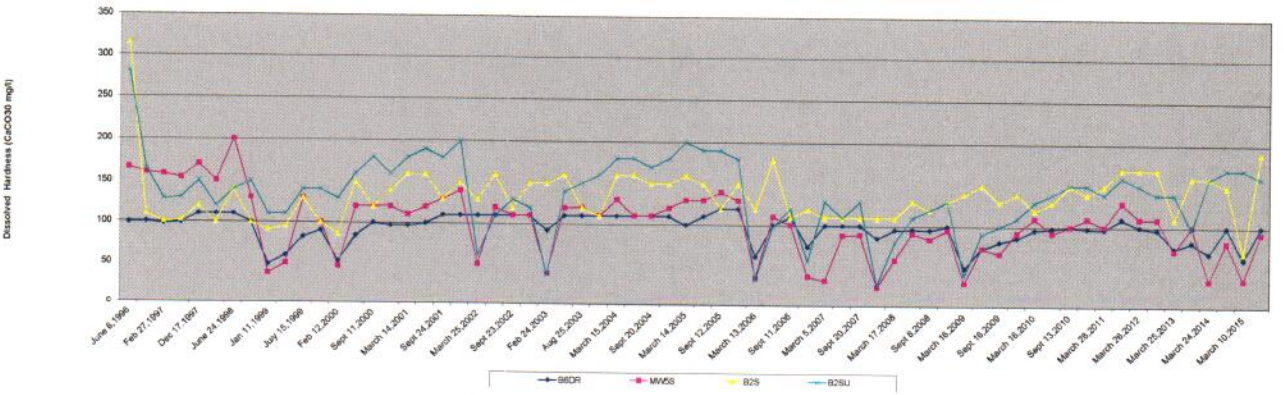
GROUP 1 WELLS DISSOLVED HARDNESS



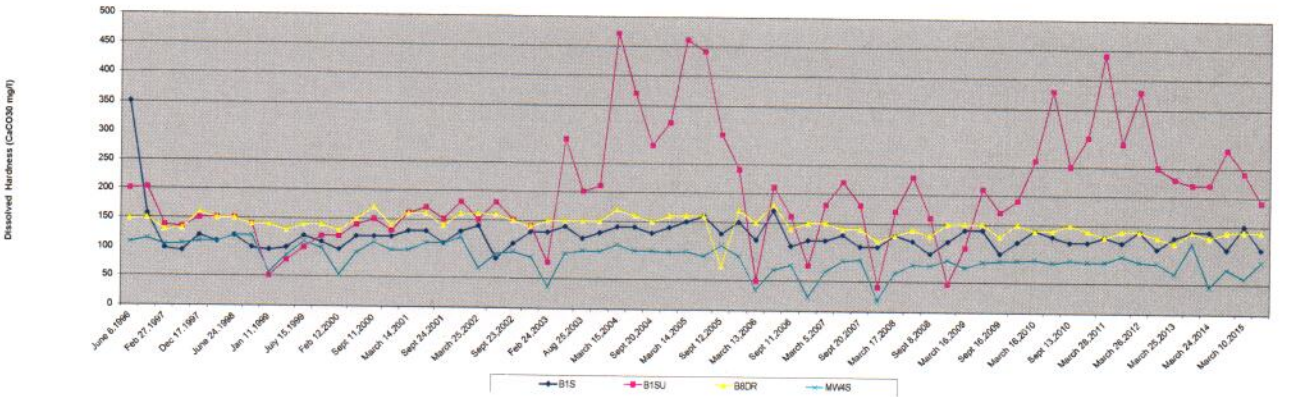
GROUP 2 WELLS HARDNESS



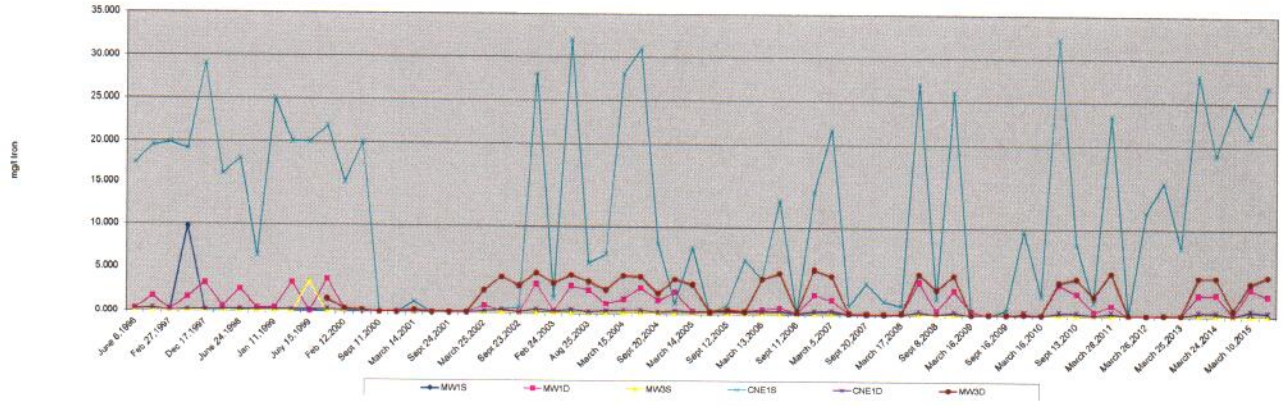
GROUP 3 WELLS HARDNESS



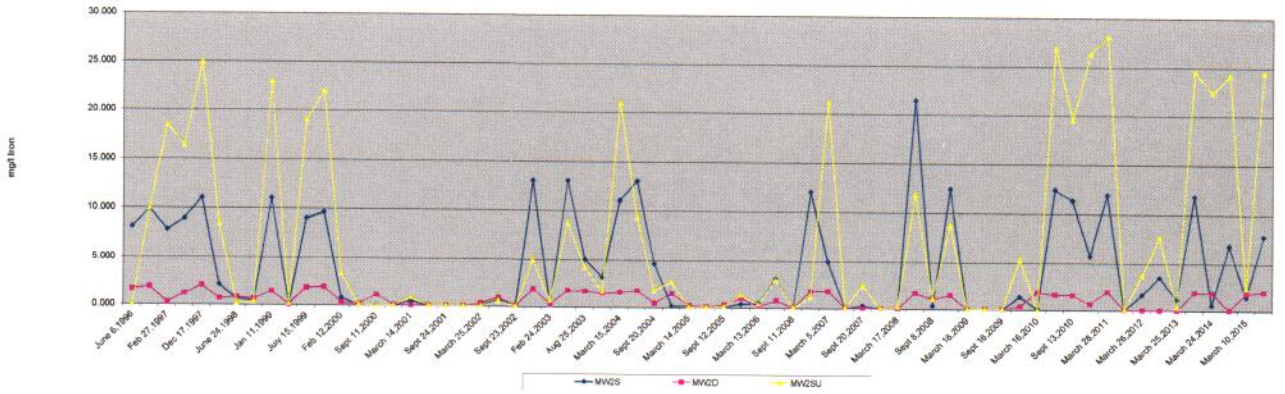
GROUP 4 WELLS HARDNESS



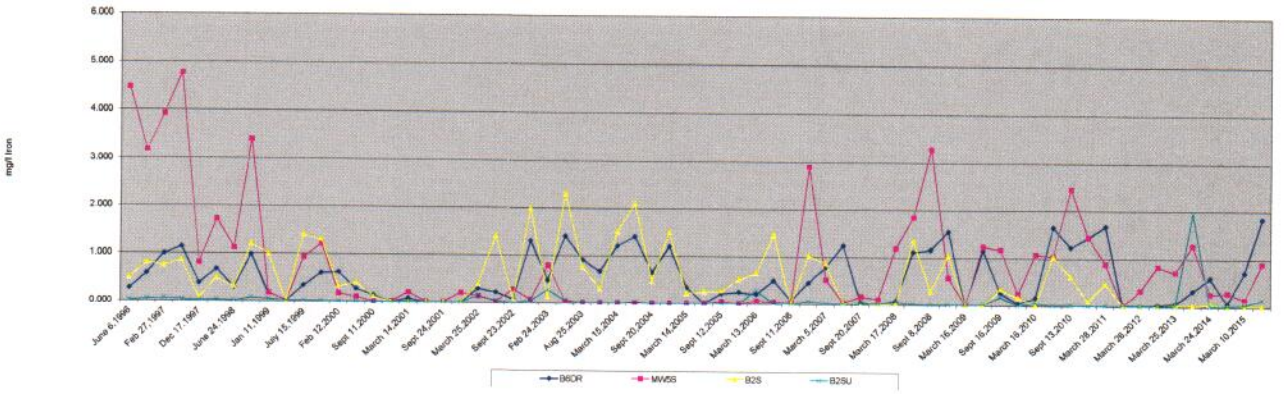
GROUP 1 WELLS DISSOLVED IRON



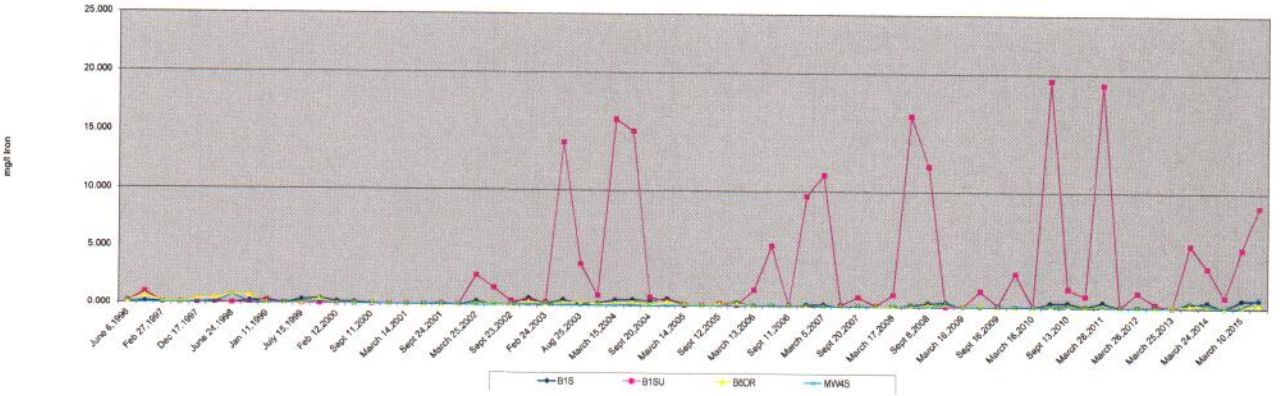
GROUP 2 WELLS DISSOLVED IRON



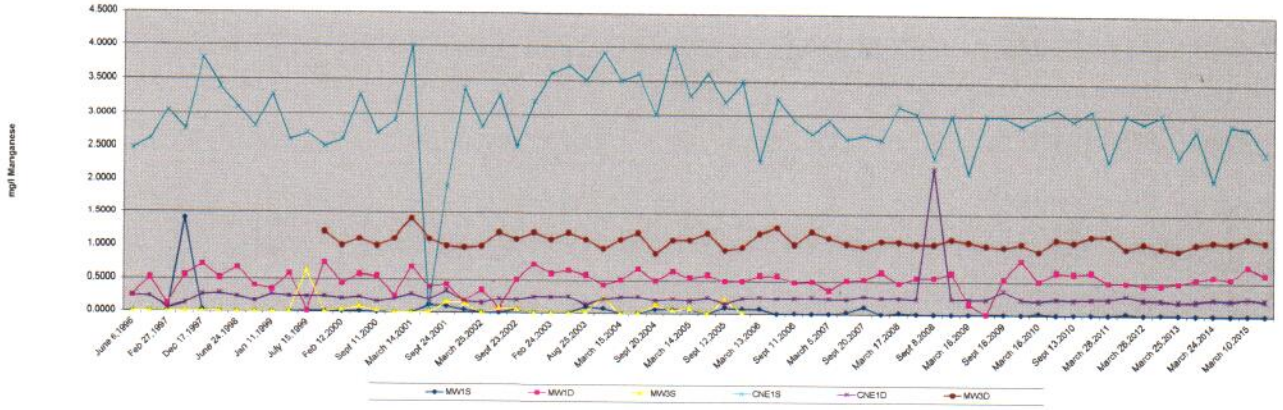
GROUP 3 WELLS DISSOLVED IRON



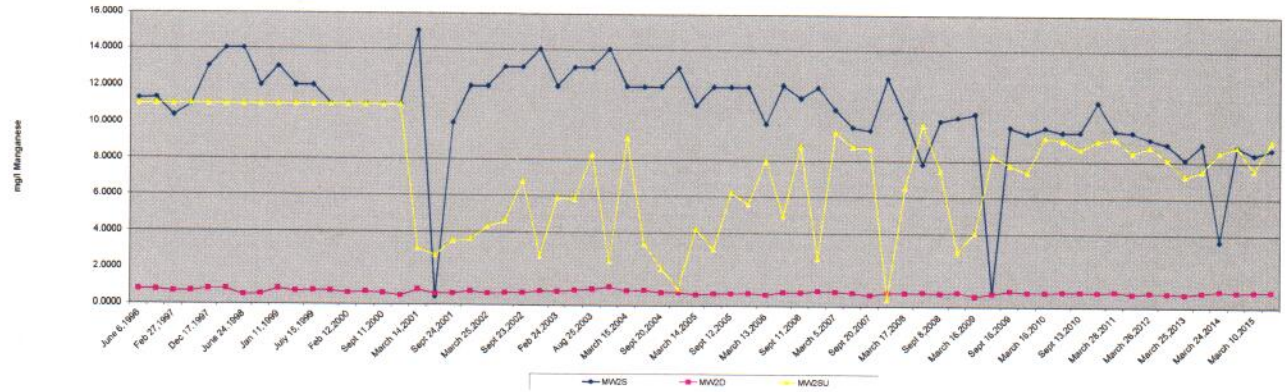
GROUP 4 WELLS DISSOLVED IRON



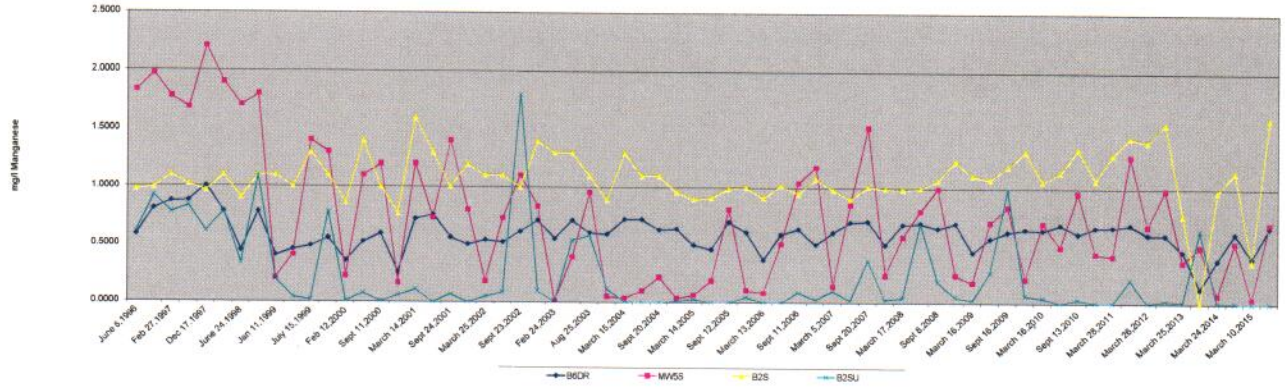
GROUP 1 WELLS DISSOLVED MANGANESE



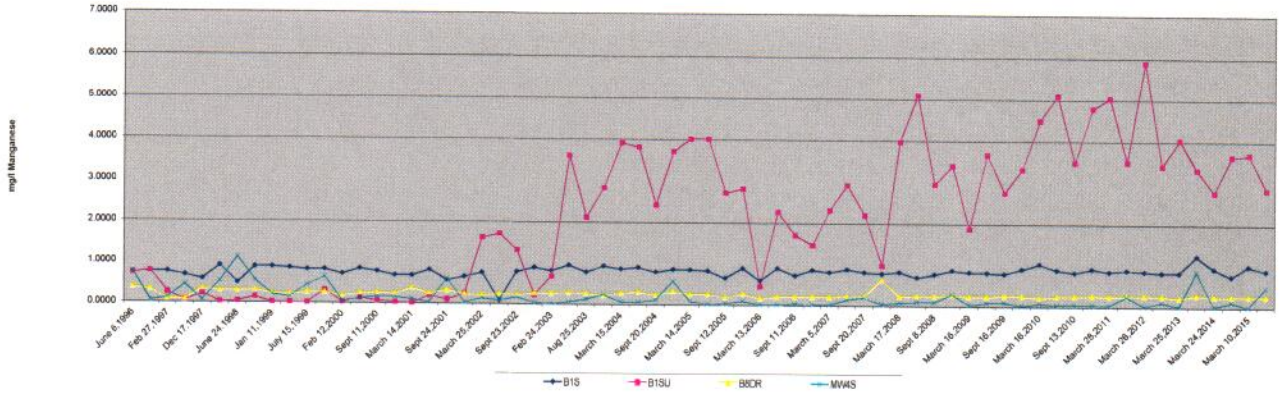
GROUP 2 WELLS DISSOLVED MANGANESE



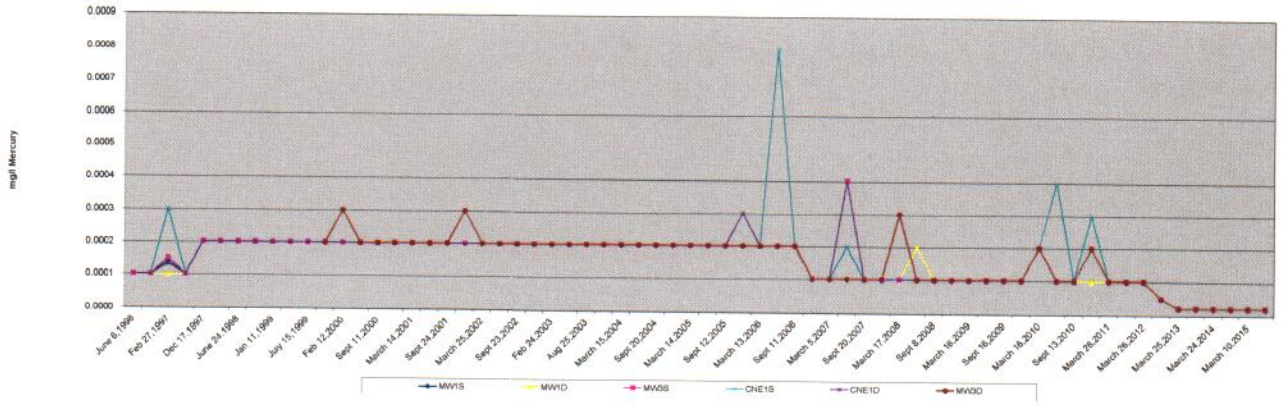
GROUP 3 WELLS DISSOLVED MANGANESE



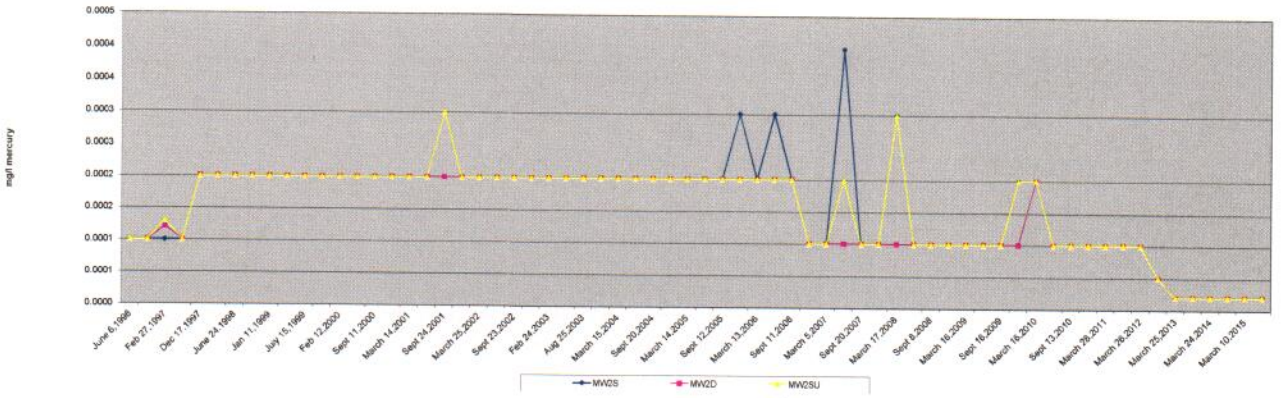
GROUP 4 WELLS DISSOLVED MANGANESE



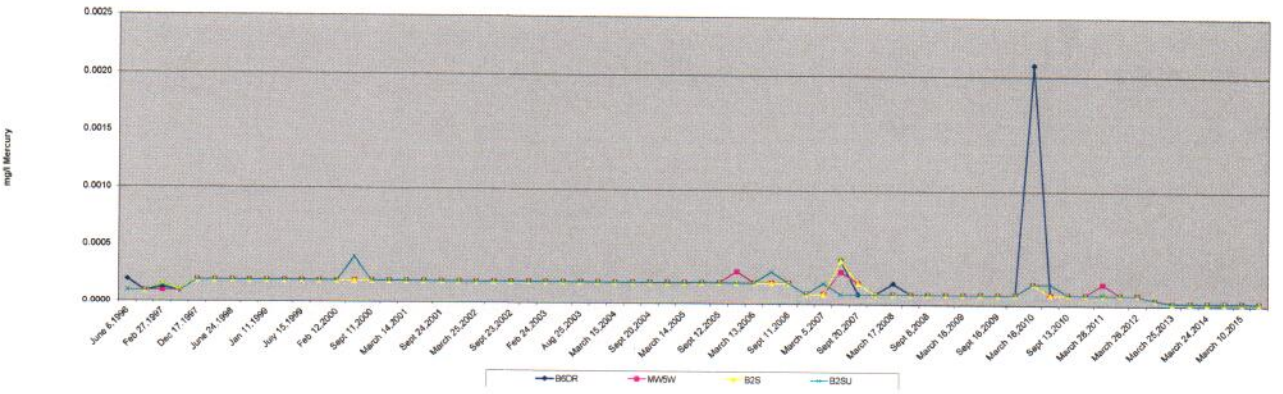
GROUP 1 WELLS DISSOLVED MERCURY



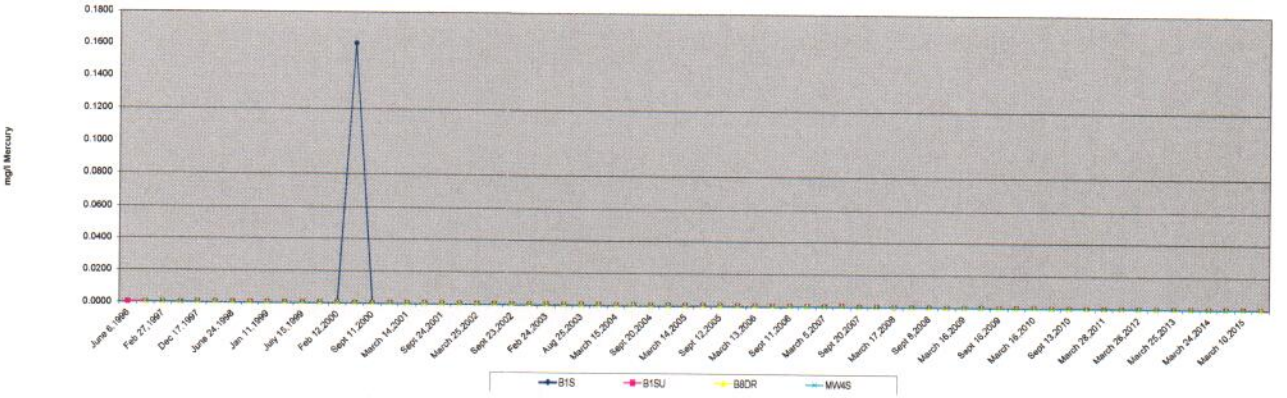
GROUP 2 WELLS DISSOLVED MERCURY



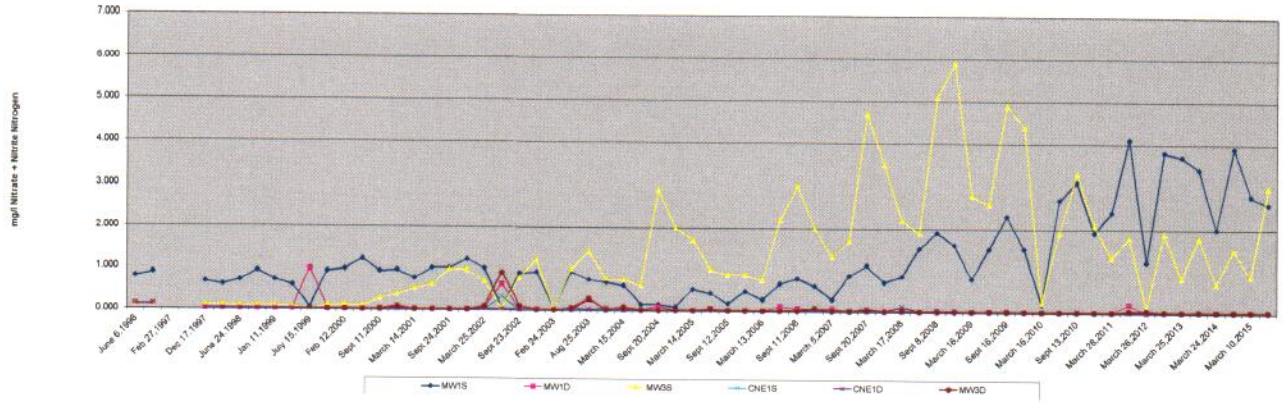
GROUP 3 WELLS DISSOLVED MERCURY



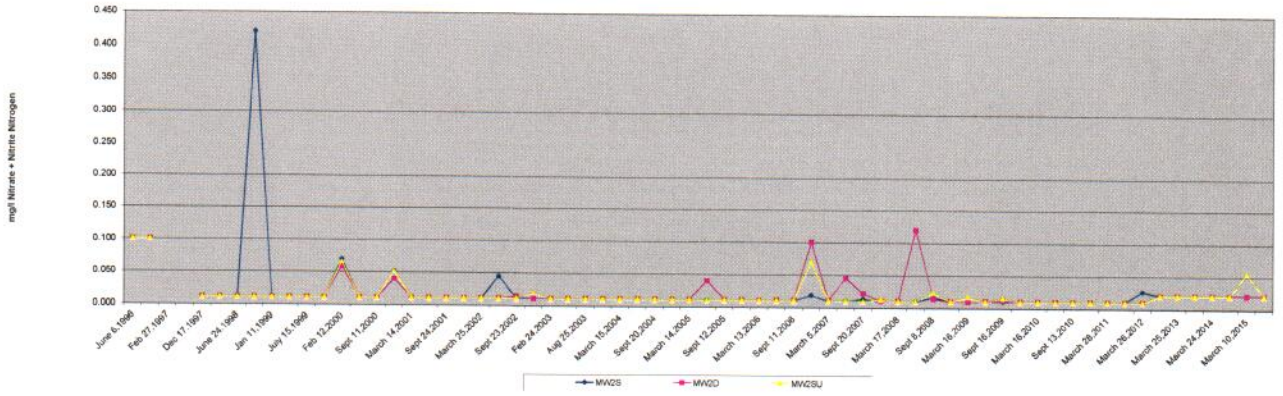
GROUP 4 WELLS DISSOLVED MERCURY



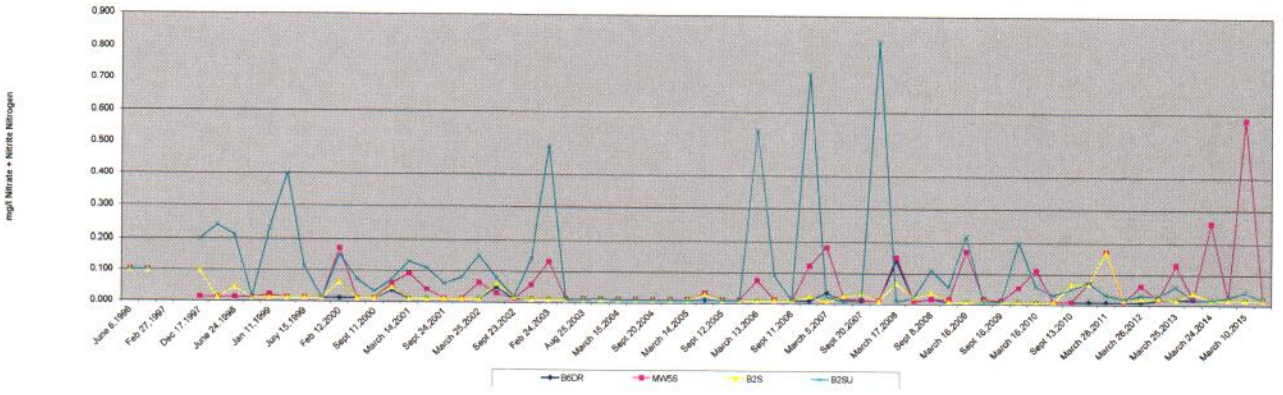
GROUP 1 WELLS NITRATE + NITRITE NITROGEN



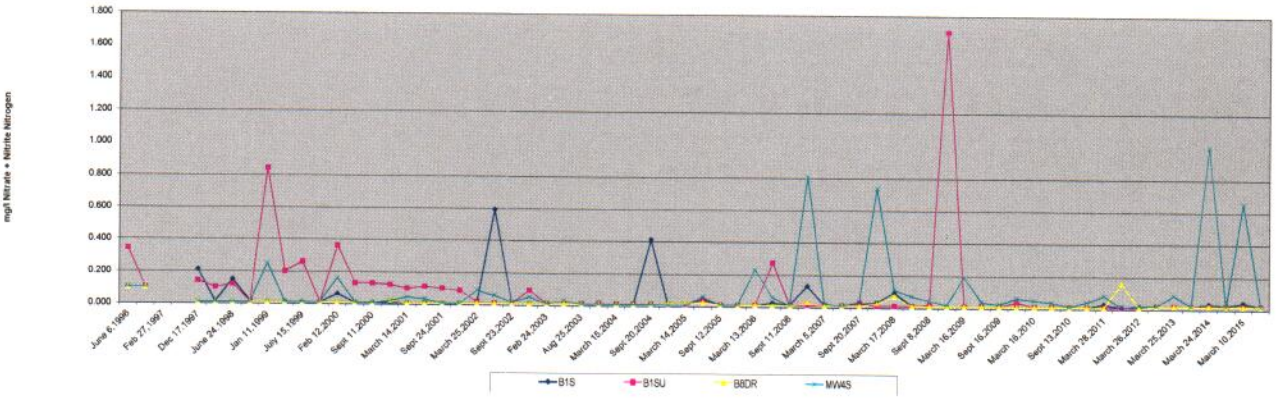
GROUP 2 WELLS NITRATE + NITRITE NITROGEN



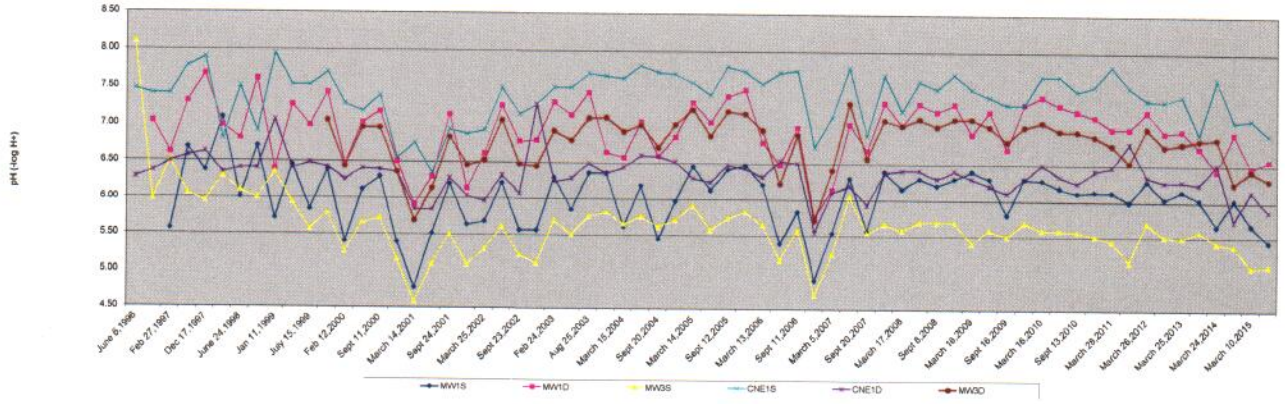
GROUP 3 WELLS NITRATE + NITRITE NITROGEN



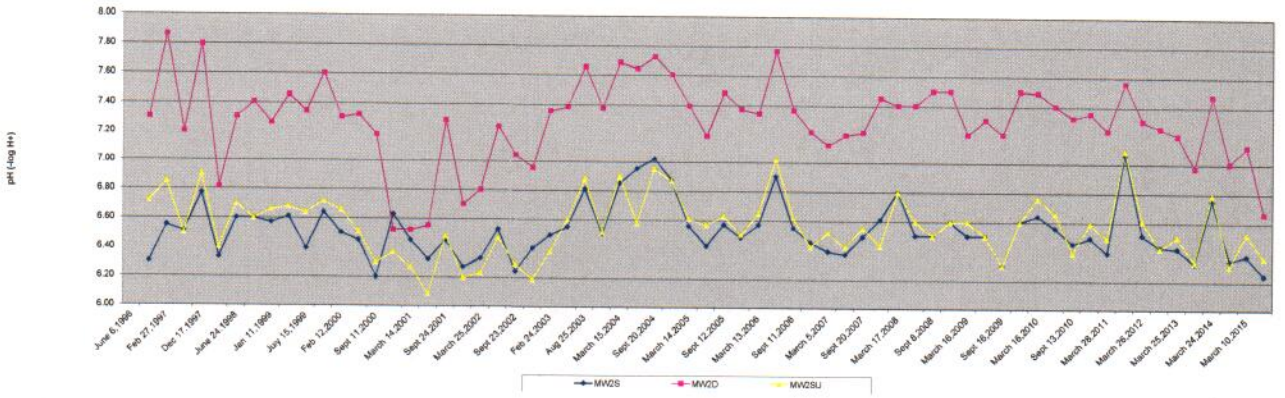
GROUP 4 WELLS NITRATE + NITRITE NITROGEN



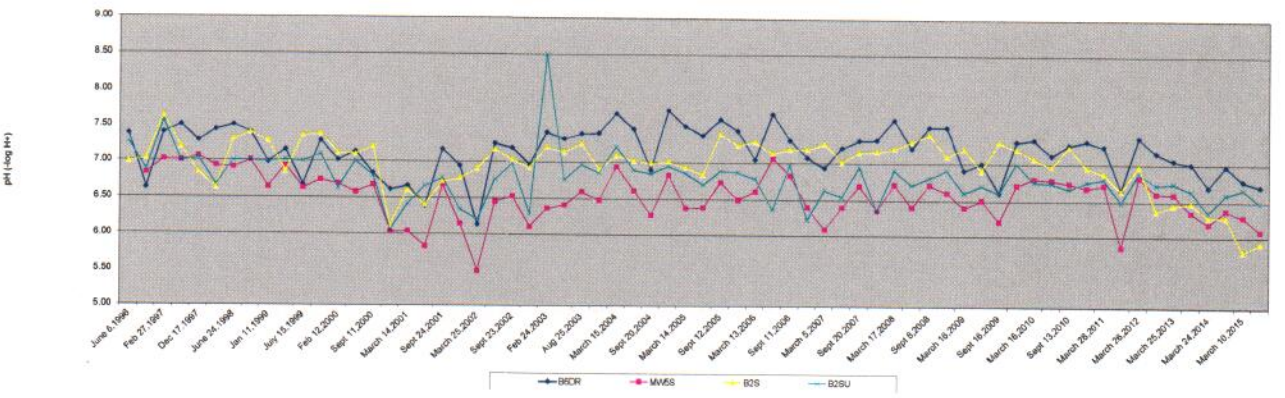
GROUP 1 WELLS pH



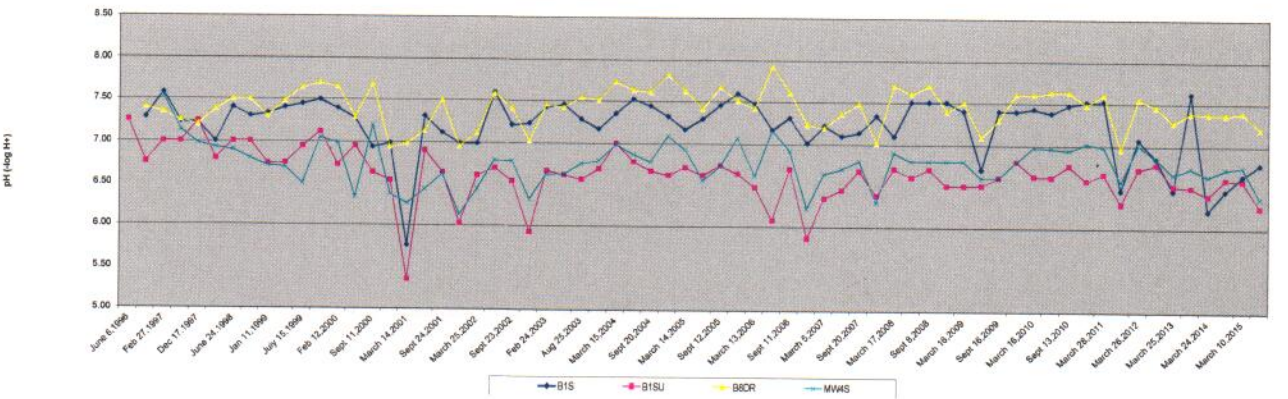
GROUP 2 WELLS pH



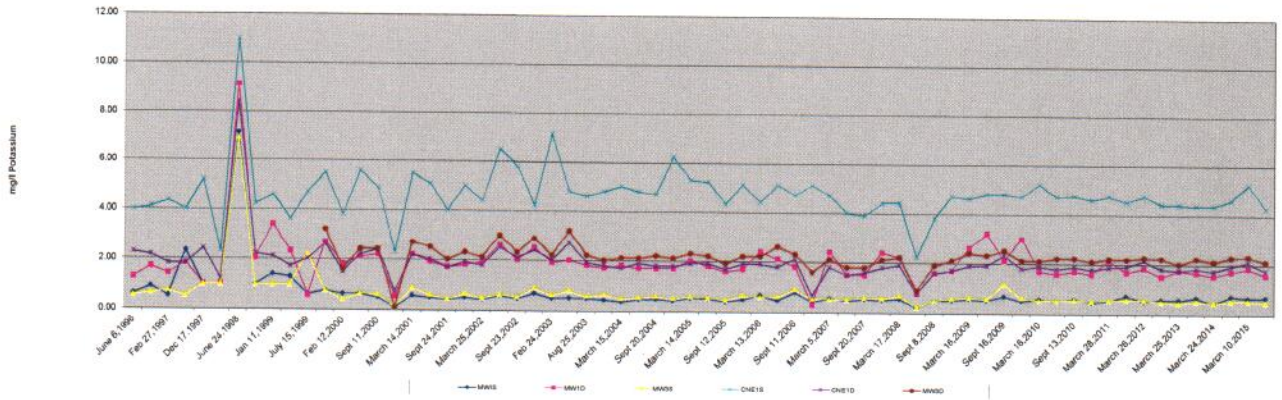
GROUP 3 WELLS pH



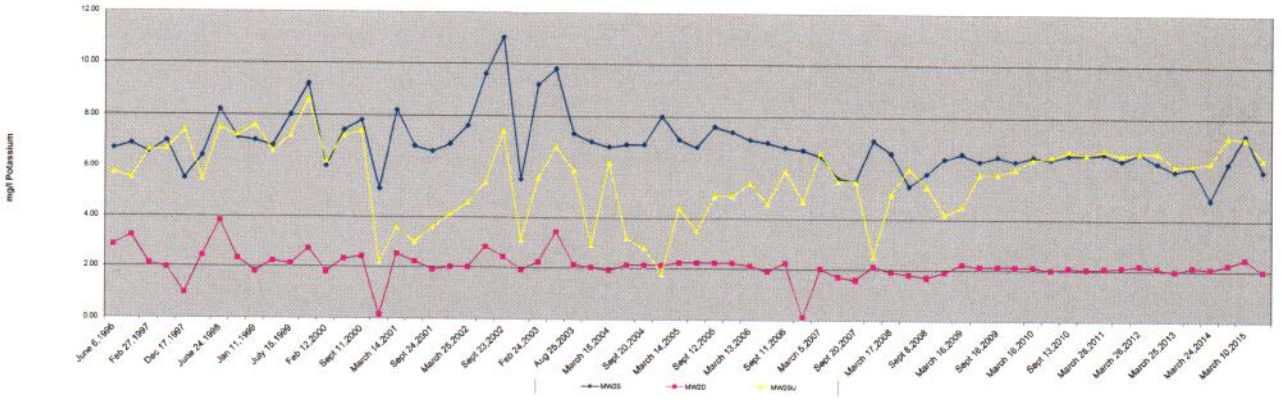
GROUP 4 WELLS pH



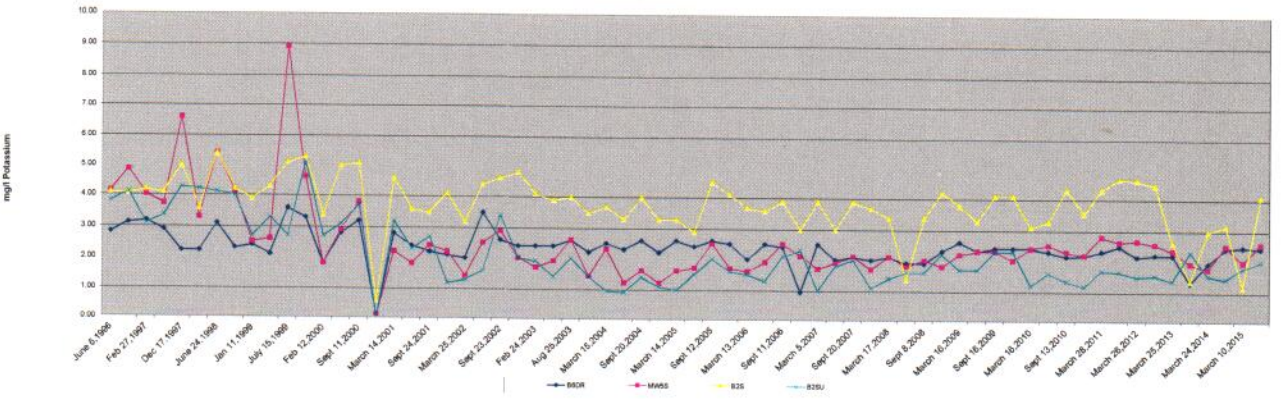
GROUP 1 WELLS DISSOLVED POTASSIUM



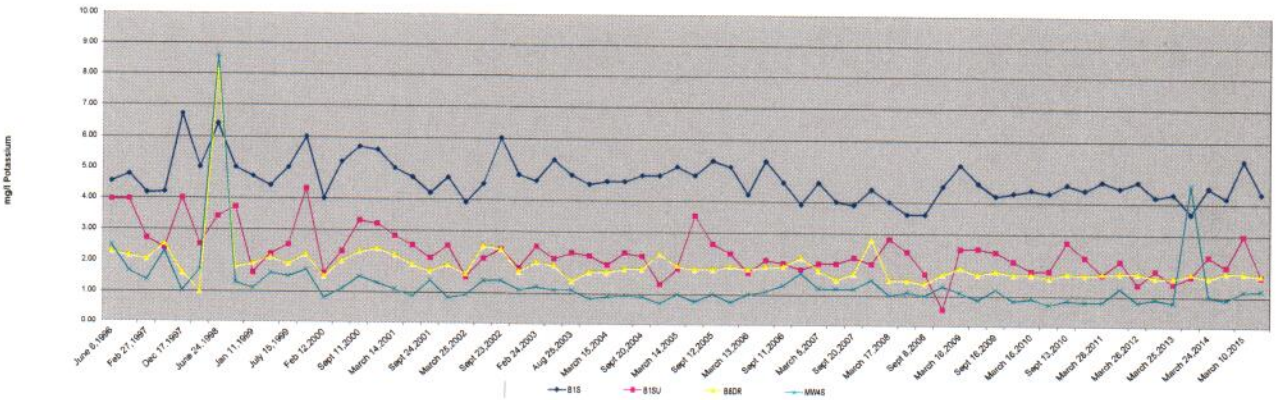
GROUP 2 WELLS DISSOLVED POTASSIUM



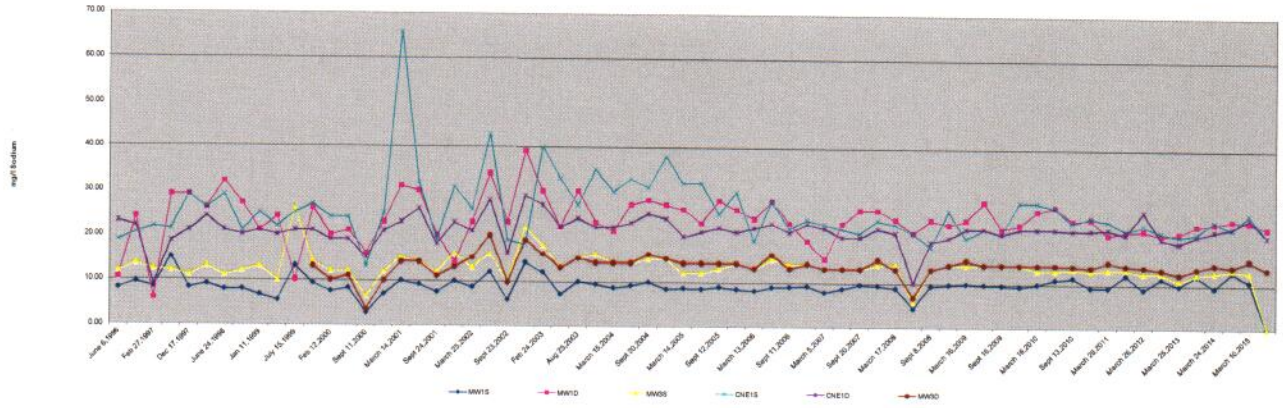
GROUP 3 WELLS DISSOLVED POTASSIUM



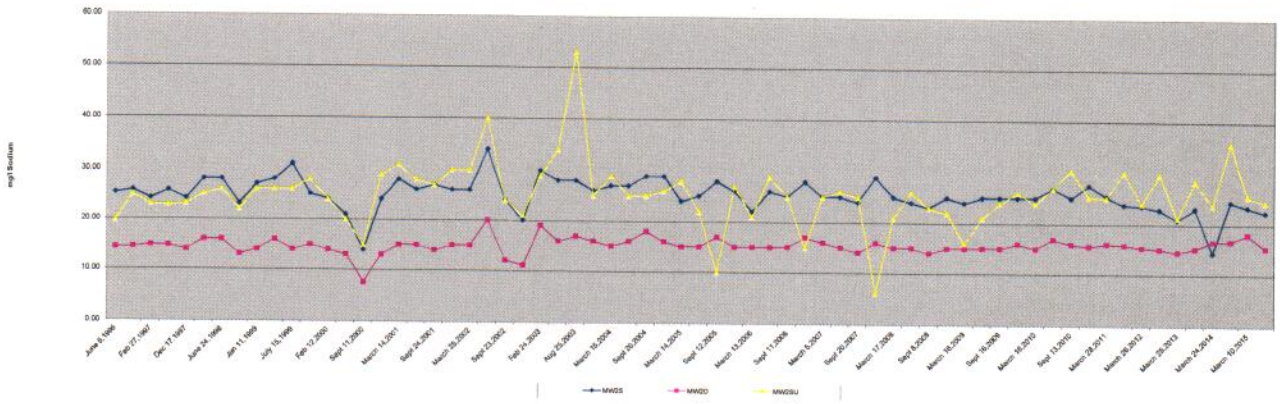
GROUP 4 WELLS DISSOLVED POTASSIUM



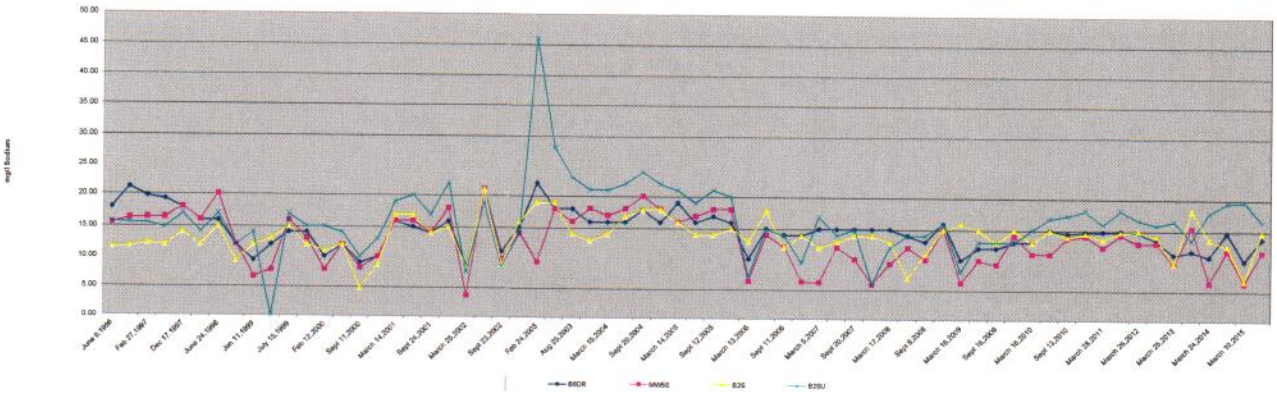
GROUP 1 WELLS SODIUM



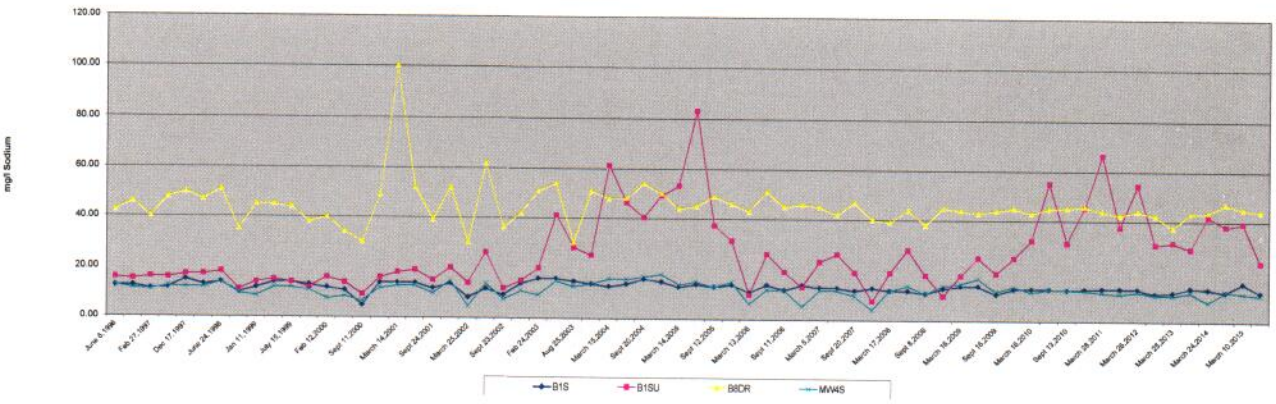
GROUP 2 WELLS SODIUM



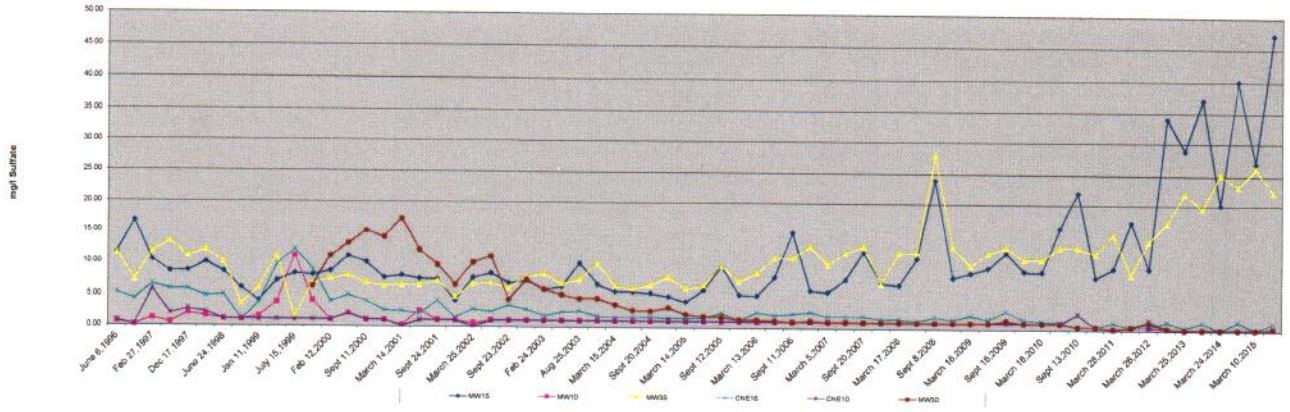
GROUP 3 WELLS SODIUM



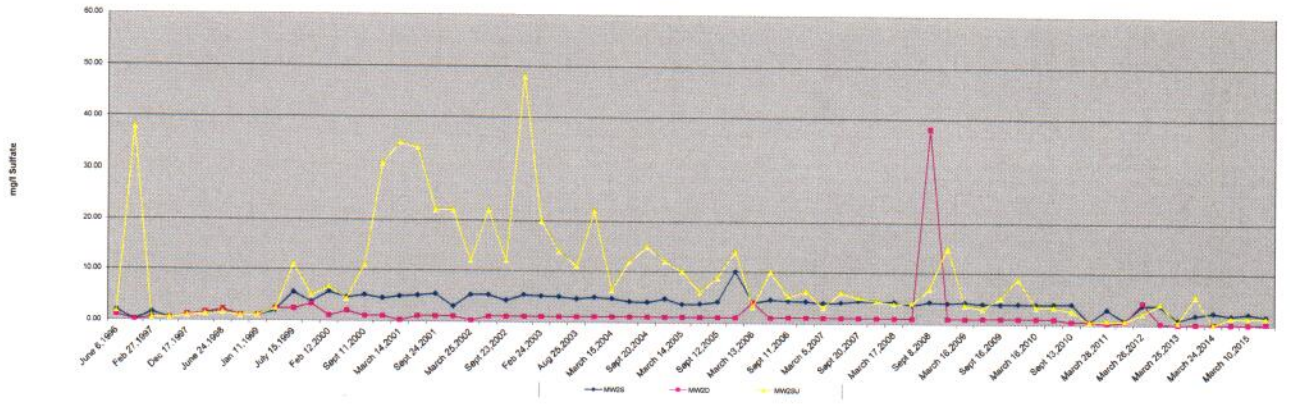
GROUP 4 WELLS SODIUM



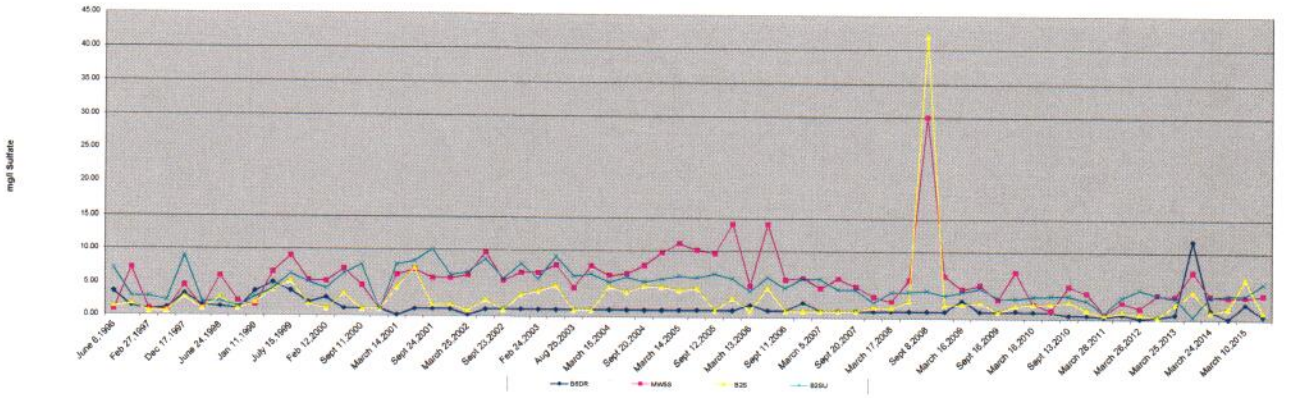
GROUP 1 WELLS SULFATE



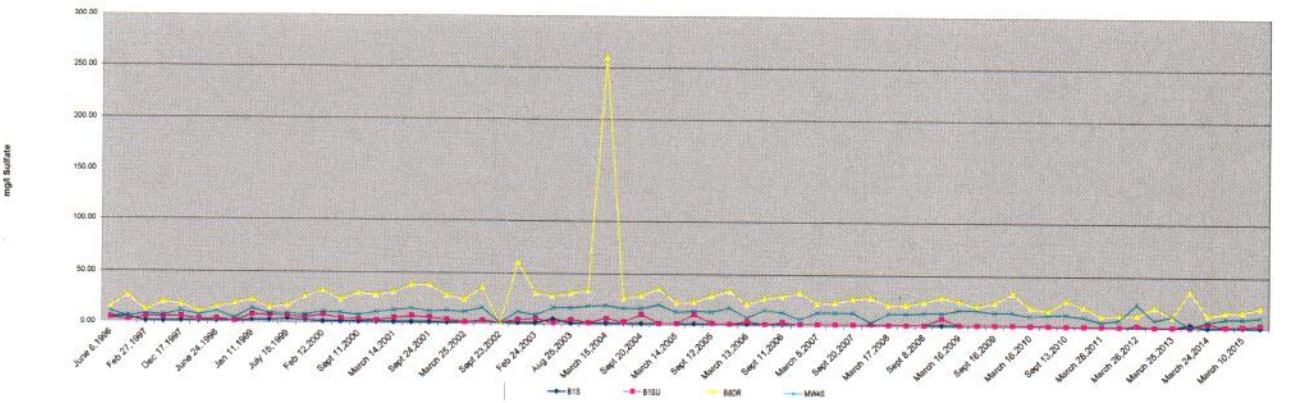
GROUP 2 WELLS SULFATE



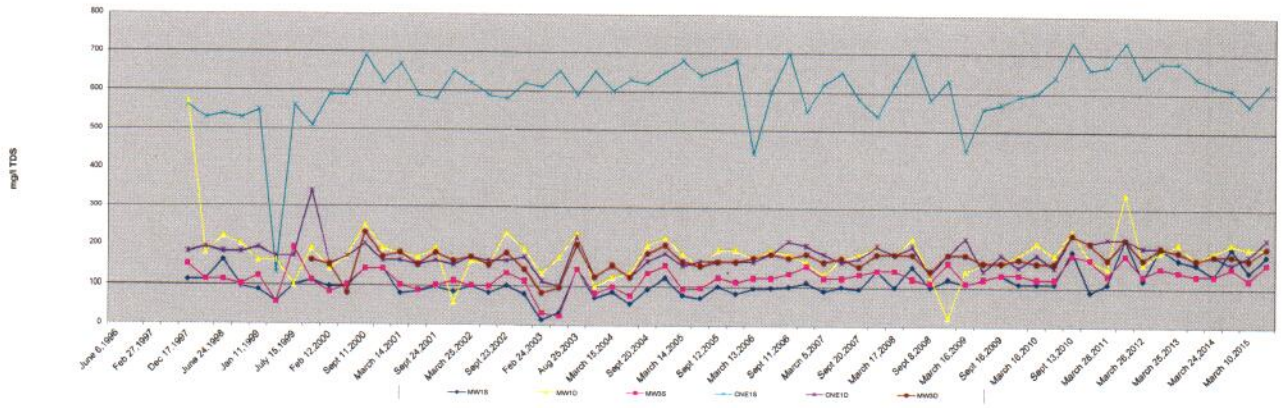
GROUP 3 WELLS SULFATE



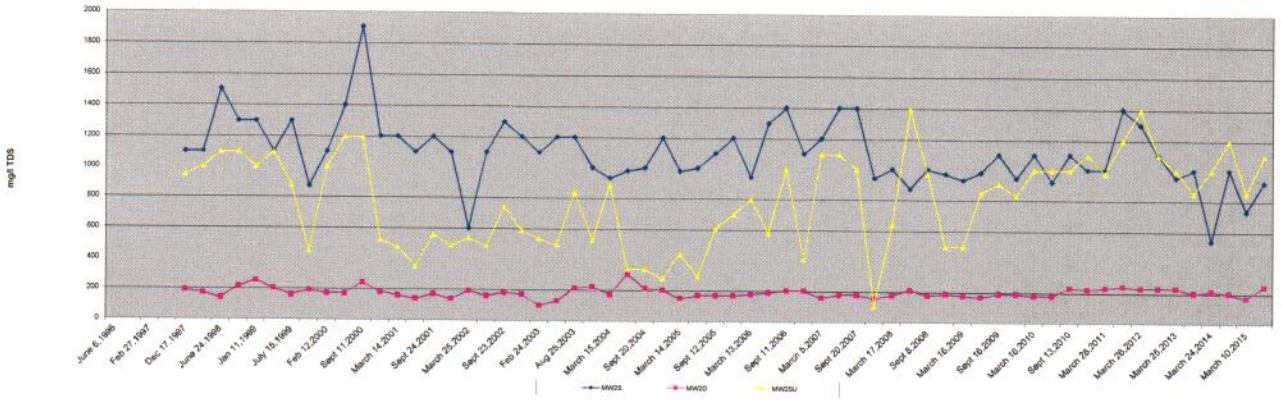
GROUP 4 WELLS SULFATE



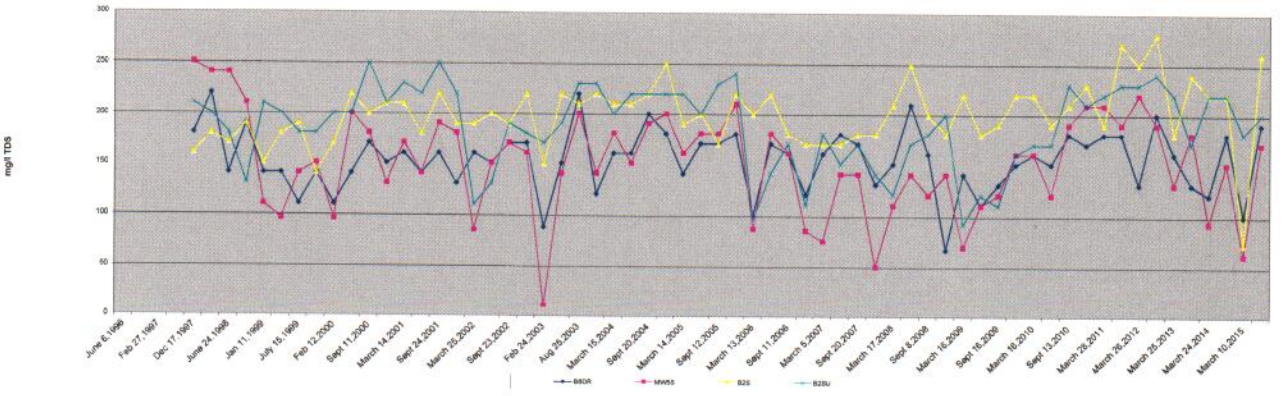
GROUP 1 WELLS TOTAL DISSOLVED SOLIDS



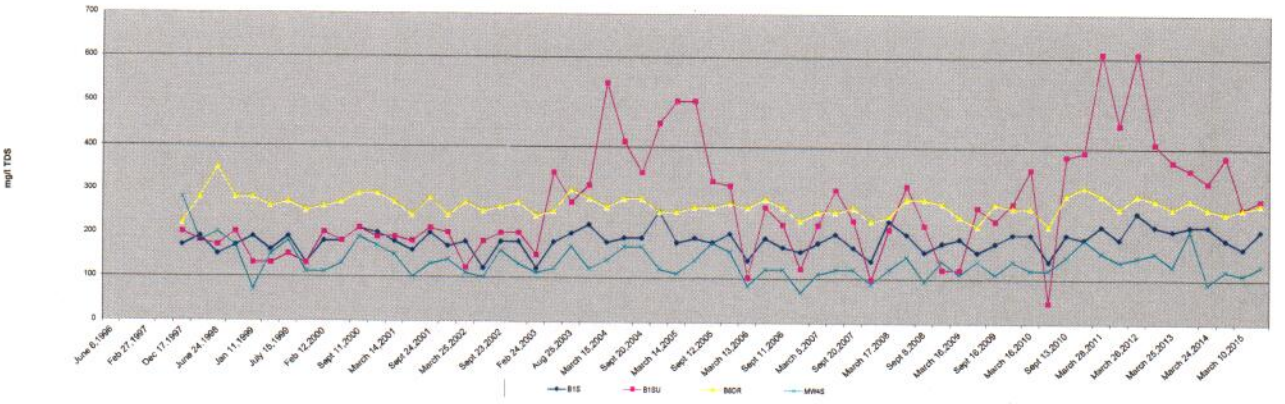
GROUP 2 WELLS TOTAL DISSOLVED SOLIDS



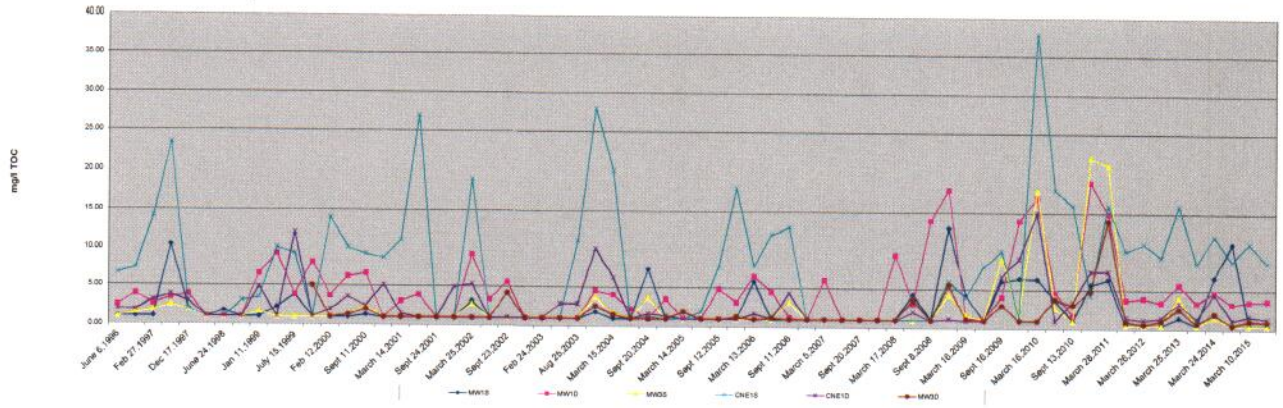
GROUP 3 WELLS TOTAL DISSOLVED SOLIDS



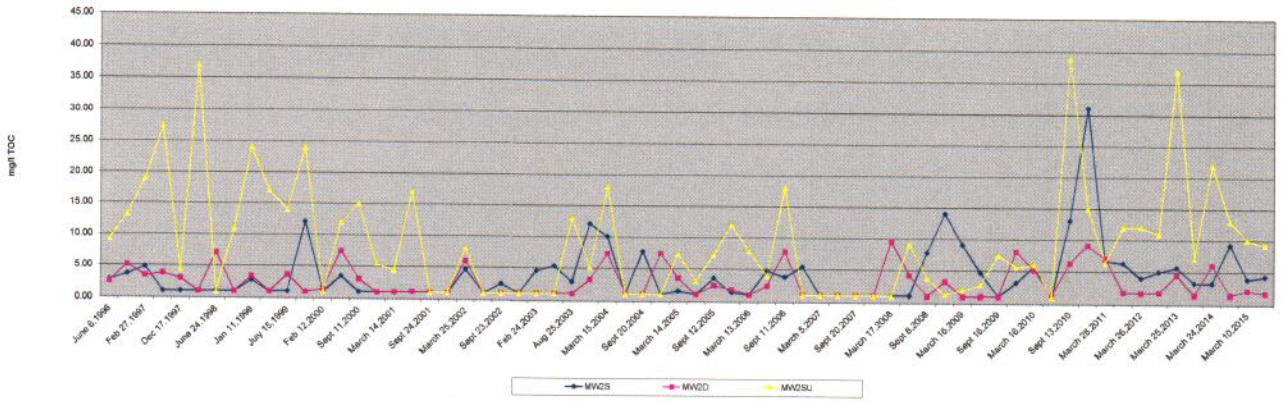
GROUP 4 WELLS TOTAL DISSOLVED SOLIDS



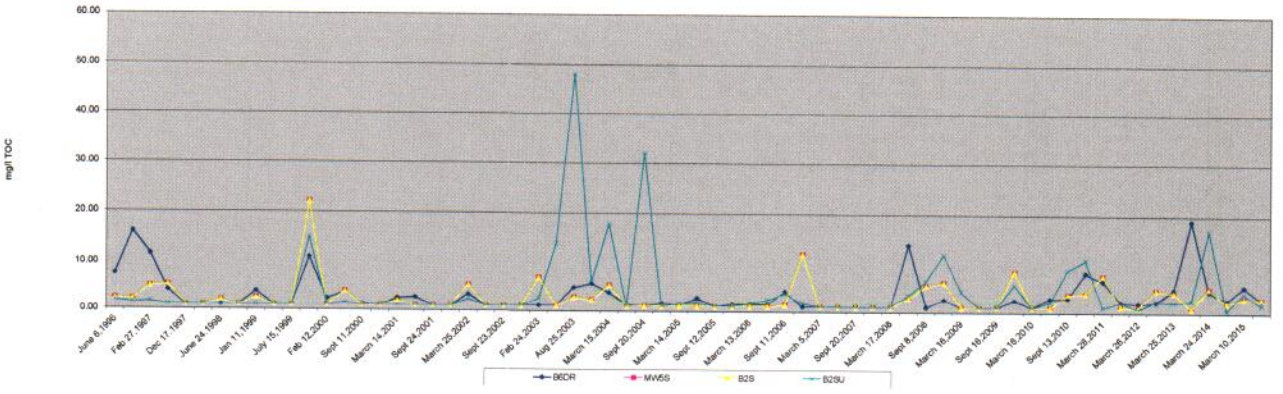
GROUP 1 WELLS TOTAL ORGANIC CARBON



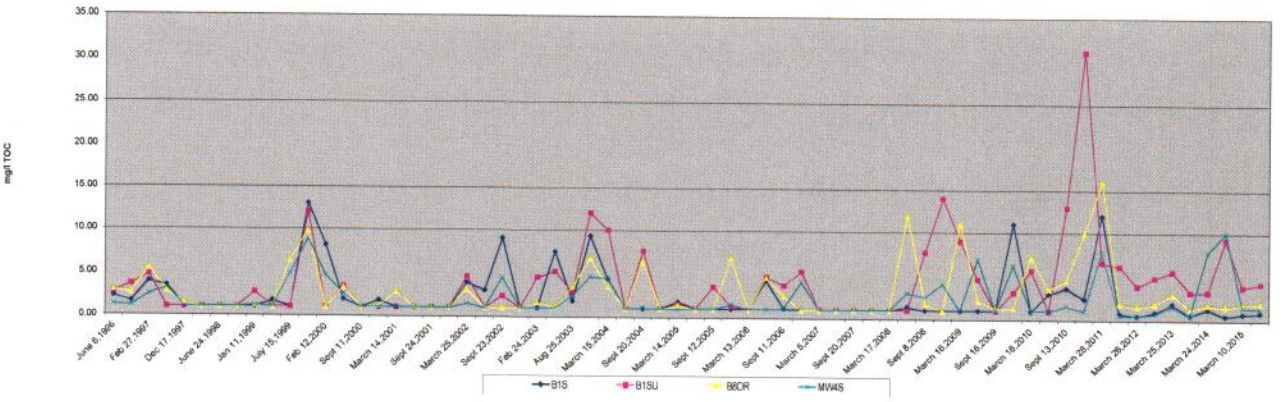
GROUP 2 WELLS TOTAL ORGANIC CARBON



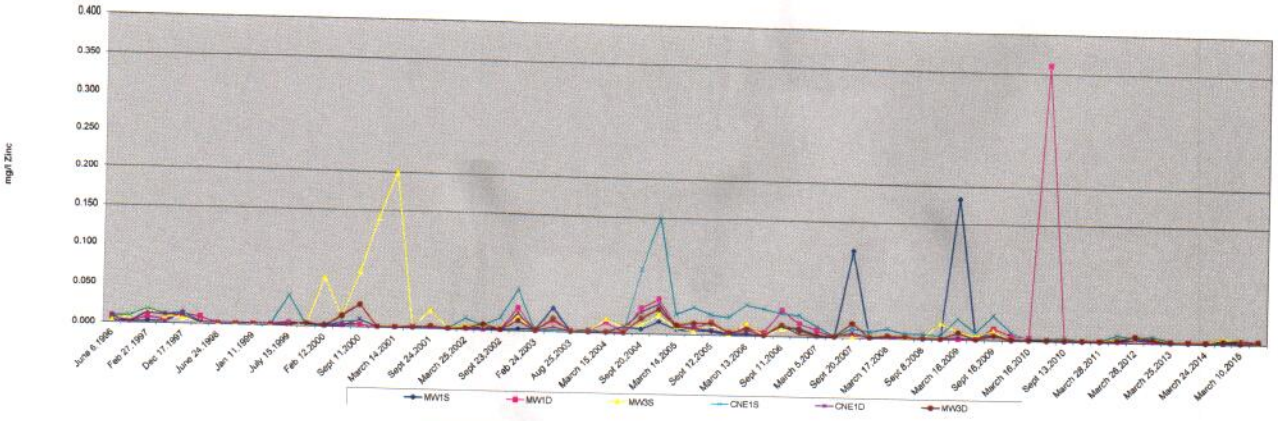
GROUP 3 WELLS TOTAL ORGANIC CARBON



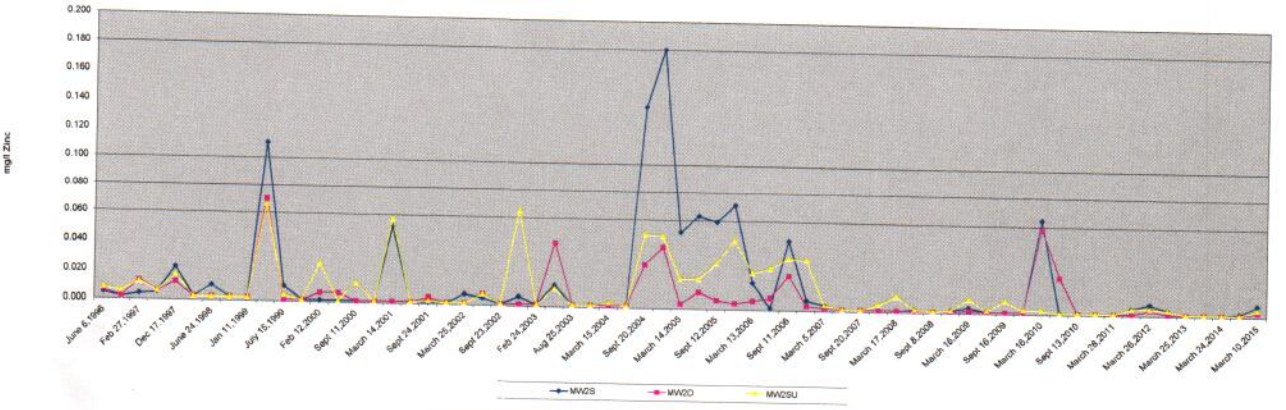
GROUP 4 WELLS TOTAL ORGANIC CARBON



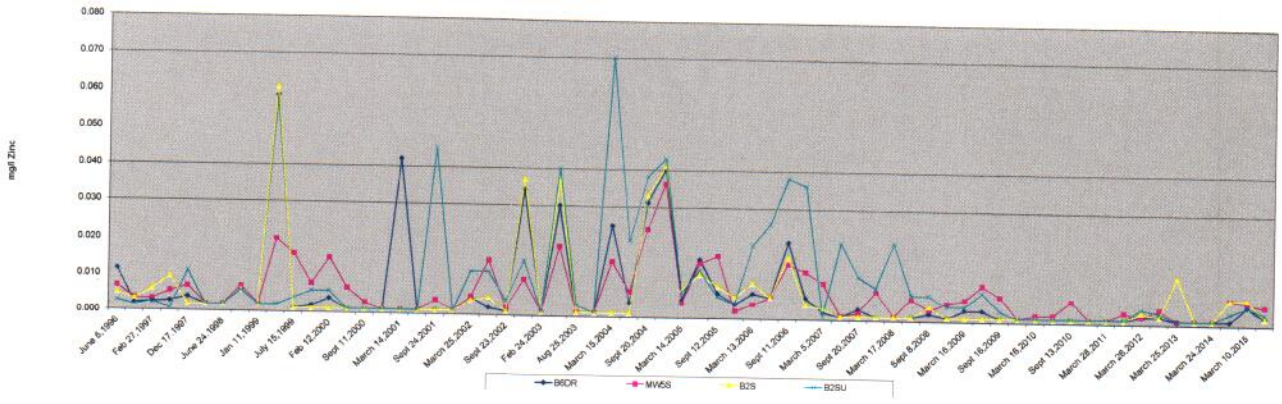
GROUP 1 WELLS DISSOLVED ZINC



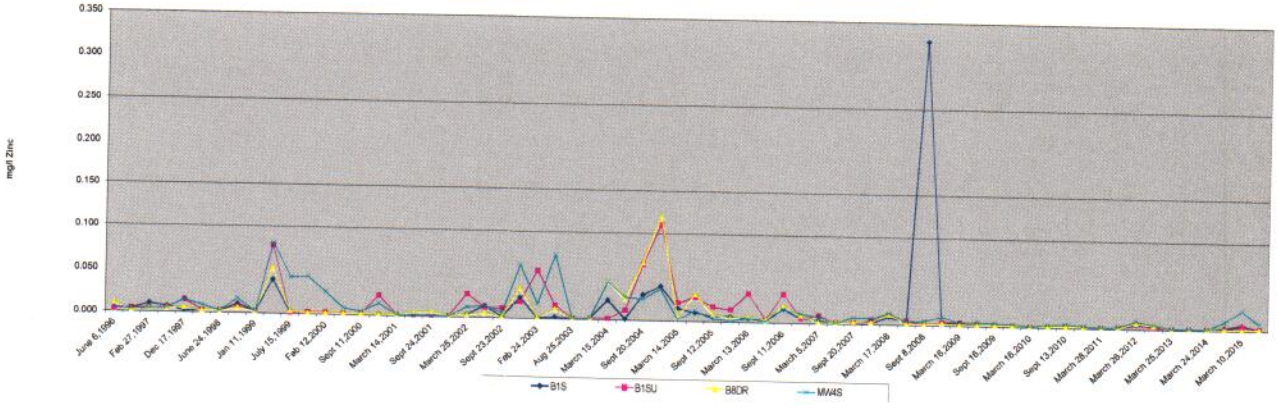
GROUP 2 WELLS DISSOLVED ZINC



GROUP 3 WELLS DISSOLVED ZINC



GROUP 4 WELLS DISSOLVED ZINC



APPENDIX C
LANDFILL GAS MONITORING

The landfill gas collection system is composed of gas trenches, extraction wells, and a collection manifold that carries the gas to a flare facility for destruction. Data is collected at regular intervals from the monitoring ports at the risers and wellheads, but is not included as part of this report. Gas monitoring probes located around the perimeter of the site provide feedback on the effectiveness of the gas collection system.

The Centralia Landfill Gas Probe Monitoring Program includes measurement of landfill gas below the surface of the landfill and at four probes located off the site. Landfill gas probes are tested quarterly unless flooding prohibits this. Most of the probes are underwater during flood events.

Fourteen perimeter probes were sampled. Magnehelic gauges and a GasTech GT201 combustible gas detector were used to test pressure and combustible gas by volume. Magnehelics were zeroed prior to use. The GasTech was calibrated prior to each use. All calibration data were recorded and archived.

Measurements were collected by attaching a flexible hose to the hosebarb on the top of each probe. Percent LEL measurements were recorded after waiting at least one minute to allow for gas equilibration.

Perimeter gas data for this report were collected in June and September of 2015.

Centralia Landfill Perimeter Probe Data

Date	Probe Number	Time	Barometric Pressure	Probe Pressure inches W. C.	% LEL	% Oxygen
6/9/2015	GP2	304	29.95	0	0	16.7
6/9/2015	GP1	307	29.95	0	0	17.5
6/9/2015	GP4A	313	29.95	0	6	0.1
6/9/2015	GP4B		29.95			
6/9/2015	GP15	200	29.95	0	1	1.9
6/9/2015	GP11	212	29.95	0	0	20.9
6/9/2015	GP10	218	29.95	0	0	19.3
6/9/2015	GP12	222	29.95	0	0	20.9
6/9/2015	GP9	224	29.95	0	0	16.2
6/9/2015	GP13	229	29.95	0	0	12.1
6/9/2015	GP8	233	29.95	0	0	18.1
6/9/2015	GP7	238	29.95	0	1	12.3
6/9/2015	GP14	247	29.95	0	0	20.9
6/9/2015	GP5R	250	29.95	0	0	20.9
9/16/2015	GP2	1207	29.67	0	0	20.9
9/16/2015	GP1	1204	29.67	0	0	19.2
9/16/2015	GP4A	1154	29.67	0	5	0.1
9/16/2015	GP4B		29.67			
9/16/2015	GP15	1100	29.67	0	0	15.1
9/16/2015	GP11	1106	29.67	0	0	18.4
9/16/2015	GP10	1110	29.67	0	0	20
9/16/2015	GP12	1115	29.67	0	0	18.1
9/16/2015	GP9	1118	29.67	0	0	17
9/16/2015	GP13	1121	29.67	0	0	20.5
9/16/2015	GP8	1126	29.67	0	0	19.6
9/16/2015	GP7	1131	29.67	0	0	20.3
9/16/2015	GP14	1136	29.67	0	0	17.6
9/16/2015	GP5R	1141	29.67	0	6	0