



June 28, 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 March, 2016. 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. Chris Stone and I completed the sampling.

Please call me if you have questions or concerns.

Sincerely,

Randy Prevost
City of Centralia

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

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REPORT NARRATIVE

This biannual Compliance Monitoring Report summarizes the results from the wet season sampling done at the Centralia Landfill in March, 2016. This report was prepared in accordance with the Cleanup Action Plan Consent Decree (signed May, 2001) and two Periodic Reviews from the Department of Ecology Toxics Cleanup Program (completed in 2010 and 2015). 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 March 28, 29, and 30, 2016. 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 March 28, 2016 depth to groundwater was measured in all wells.

Weather during the sampling period was mostly sunny. Water was present at SW 14, in the Weyerhaeuser Ditch (the point of compliance for surface water), and samples were 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 pumps were 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.

CENTRALIA LANDFILL SURFACE WATER DATA			
Wet Season, 2016 March 29, 2016			
Parameters		Units	SW-14
Dissolved Alkalinity (as CaCO3)		mg/l	72
Total Organic Carbon		mg/l	8
Chemical Oxygen Demand		mg/l	20
Chloride		mg/l	11.90
Hardness (CaCO3)		mg/l	75
Ammonia Nitrogen		mg/l	< 0.005
Nitrate + Nitrite Nitrogen		mg/l	0.023
Total Dissolved Solids		mg/l	150
Sulfate		mg/l	4.41
pH			6.96
Temperature		degrees C	12.9
Conductivity		umhos/cm	177
Dissolved Oxygen		mg/l	8.96
Dissolved Metals			
Arsenic		mg/l	0.000707
Calcium		mg/l	16.3
Iron		mg/l	0.893
Mercury		mg/l	< 0.00002
Potassium		mg/l	0.98
Magnesium		mg/l	8.5
Manganese		mg/l	0.1943
Sodium		mg/l	7.1
Zinc		mg/l	0.011
Total Metals			
Arsenic		mg/l	0.000676
Calcium		mg/l	16
Iron		mg/l	2
Mercury		mg/l	< 0.00005
Potassium		mg/l	0.98
Magnesium		mg/l	8.5
Manganese		mg/l	0.181
Sodium		mg/l	7.1
Zinc		mg/l	0.0111

Exceedences of Primary and Secondary Standards in Groundwater Wells

	pH	Conductivity	TDS	Chloride	Sulfate	Nitrate + Nitrite	Arsenic	Iron	Mercury	Manganese	Zinc
Primary Drinking Water Standard	6.5 - 8.5	CAP cleanup levels	500 mg/l	250 mg/l	250 mg/l	10 mg/l	0.01 mg/l	0.3 mg/l	.002 mg/l	0.05 mg/l	5 mg/l
Secondary 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	6.24	212	140	4.36	1.25	< 0.01	0.004	0.035	< 0.00002	0.2673	< 0.002
MW1S	5.63	182	150	2.5	22	2.7	0.0001	< 0.005	< 0.00002	< 0.0009	< 0.002
MW3S	5.13	192	200	6.23	0.68	0.012	0.0014	0.047	< 0.00002	1.09	< 0.002
MW3D	6.29	250	200	6.23	0.68	0.012	0.0014	0.047	< 0.00002	1.09	< 0.002
CNE 1S	5.86	961	590	63.5	1.66	0.053	0.0021	4.55	< 0.00002	2.583	0.012
CNE 1D	7.17	309	200	6.45	0.85	< 0.01	0.0001	0.015	< 0.00002	0.2424	< 0.002
MW2D	6.91	337	240	9.72	0.78	< 0.01	0.0055	0.006	< 0.00002	0.8812	0.002
MW2S	6.16	1320	1100	205	2.52	0.027	0.0064	0.28	< 0.00002	8.628	0.005
MW2SU	6.29	1470	1200	216	1.31	0.01	0.0014	0.371	< 0.00002	8.885	0.005
MW5S	6.22	146	130	5.97	4.74	0.29	0.0006	0.188	< 0.00002	0.347	0.005
B6DR	6.59	155	160	4.92	2.71	0.057	0.0012	0.049	< 0.00002	0.3469	0.003
B2SU	6.6	266	210	3.79	4.56	0.21	0.0011	0.005	< 0.00002	0.002	0.006
B2S	6.25	243	220	9.63	2.16	0.011	0.0012	0.008	< 0.00002	0.4512	0.004
B1SU	6.4	486	340	28	2.13	< 0.01	0.0013	0.186	< 0.00002	3.25	0.005
B1S	6.91	161	200	5.69	2.44	0.029	0.009	0.04	< 0.00002	0.5885	0.007
MW4S	6.5	156	140	2.74	7.46	0.1	0.0003	0.017	< 0.00002	0.0023	0.005
B8DR	7.28	434	290	24.2	47.7	0.02	0.0003	0.006	< 0.00002	0.1831	< 0.002

ANALYTICAL METHODS AND DETECTION LIMITS				
ANALYTE	UNITS	METHOD NUMBER	REFERENCE	DETECTION LIMIT
Alkalinity (as CaCO 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 CaCO 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 wet season groundwater monitoring for 2016. 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. No wells exceeded the drinking water standard. Thirteen 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 all but four wells this round. All wells were below the standard. MW1S had the highest value with 2.7 mg/l.

Parameters with Secondary Standards:

Chloride has a secondary standard of 250 mg/l. No wells exceeded the standard. MW2SU had the highest value with a measurement of 216 mg/l.

Iron has a secondary standard of 0.3 mg/l. Iron was detected in all but one well this season. Only two wells exceeded the standard. CNE1S had the highest value with 4.55 mg/l compared to 26.7 last quarter.

Manganese has a secondary standard of 0.05 mg/l. Manganese was detected in all but one well and fourteen wells exceeded the standard.

pH has a regulatory range of 6.5 to 8.5. Ten 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; CNE1S, MW2S and MW2SU. The highest value was 1200 mg/l in MW2SU.

Zinc has a secondary standard of 5 mg/l. Zinc was detected in eleven 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 was below both cleanup and compliance levels. MW4S was below the cleanup standard with a value of 0.3 µg/L. 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. All wells were below the cleanup level this quarter.

Soluble Iron has a cleanup level of 0.3 mg/L. Two wells exceeded the cleanup level this season. CNE1S had the highest value with 4.55 mg/l.

Soluble Manganese has a cleanup level of 50 µg/L. MW1S, 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. Only MW2D exceeded the cleanup level with a value of 5.5 µg/L.

Soluble Iron has a cleanup level of 300 µg/L. All wells were below the cleanup level this sampling round.

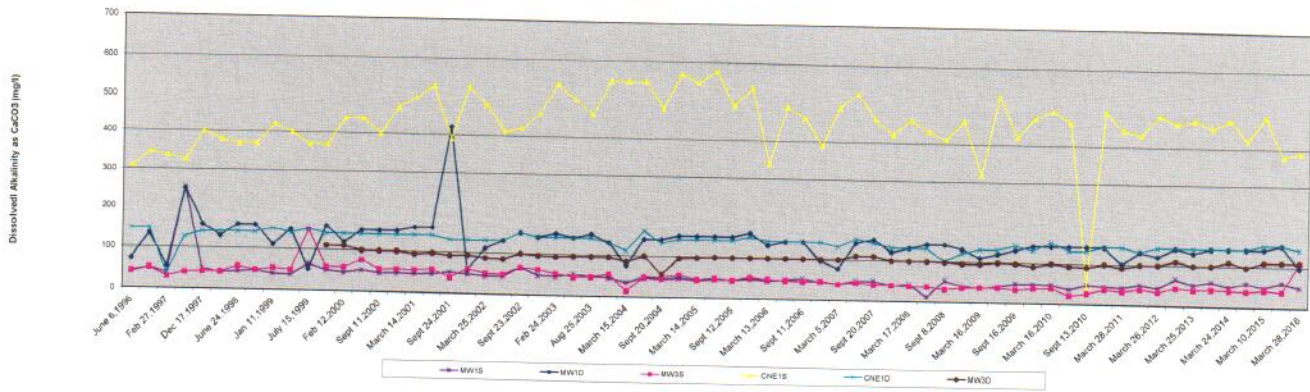
Soluble Manganese has a cleanup level of 50 µg/L. All wells in the lower unit exceeded this value.

Surface Water Standards:

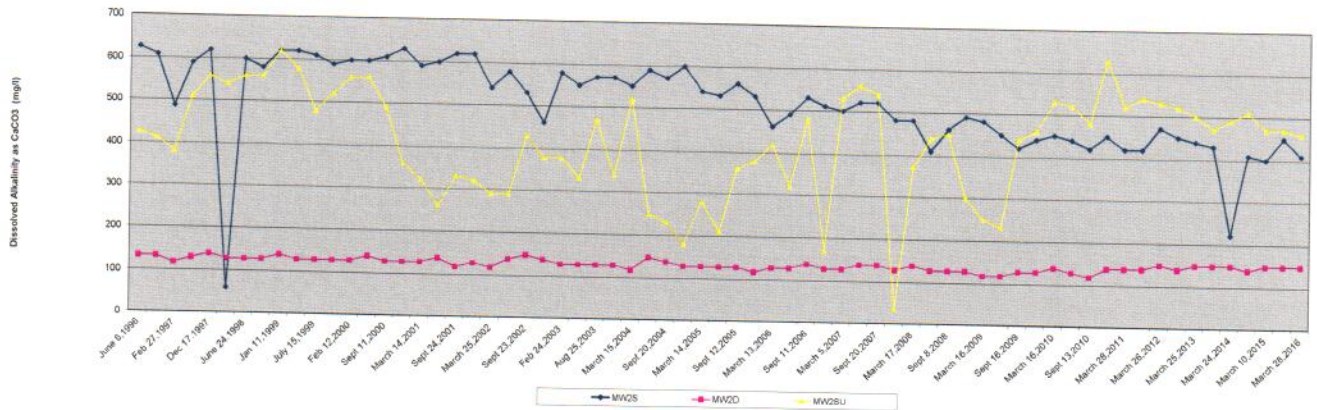
Surface water was present at SW14, the point of compliance. Soluble Arsenic has a cleanup level of 0.27 $\mu\text{g/L}$ with a compliance level of 0.50 $\mu\text{g/L}$. SW14 exceeded both standards with a value of 4.0 $\mu\text{g/L}$.

Appendix B - Groundwater Time Series Graphs

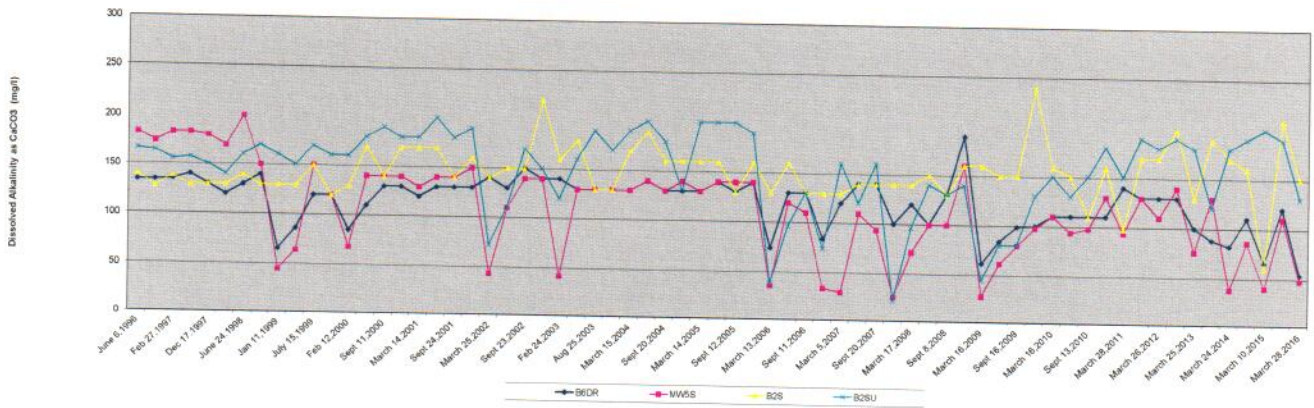
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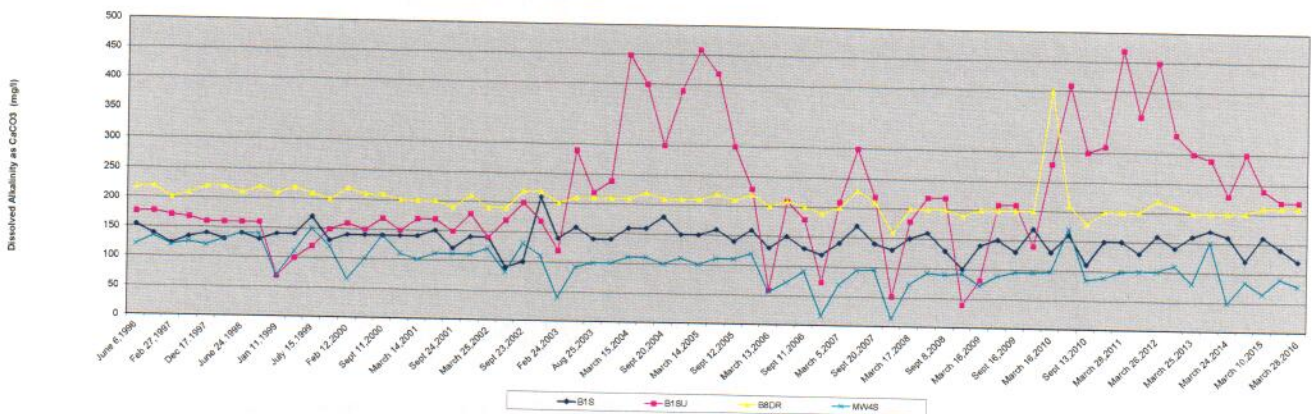
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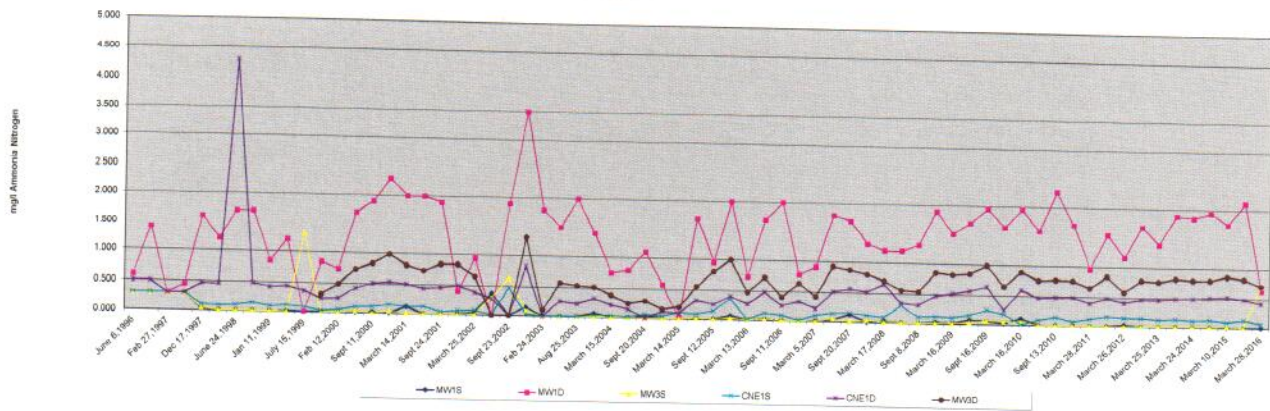
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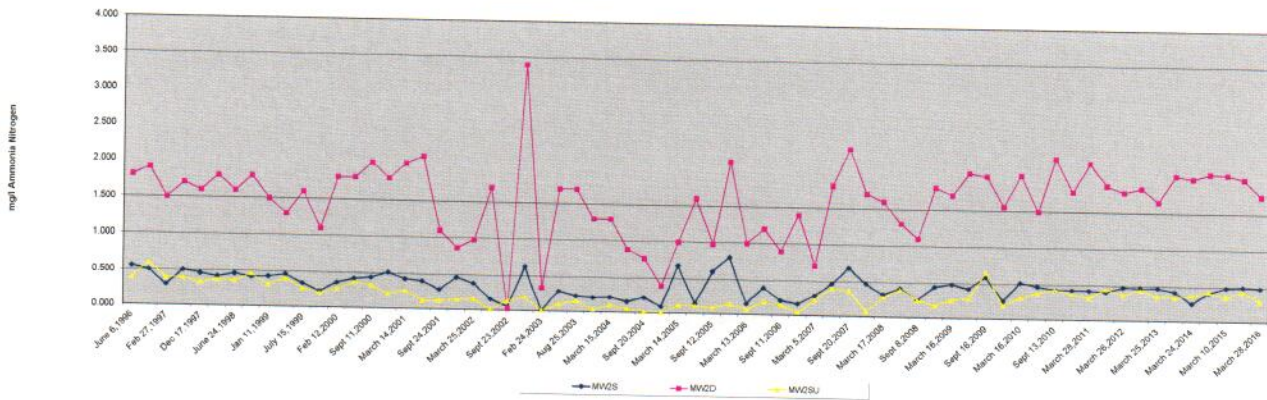
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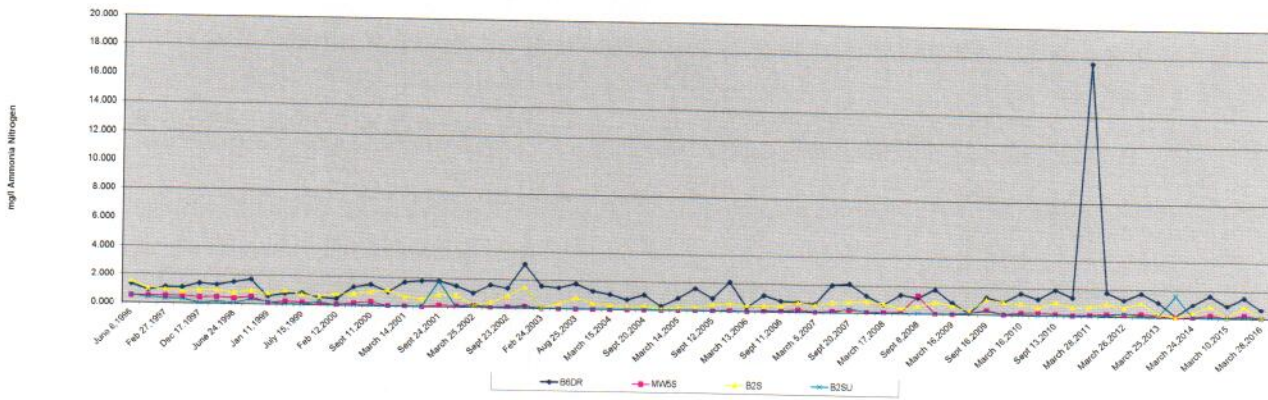
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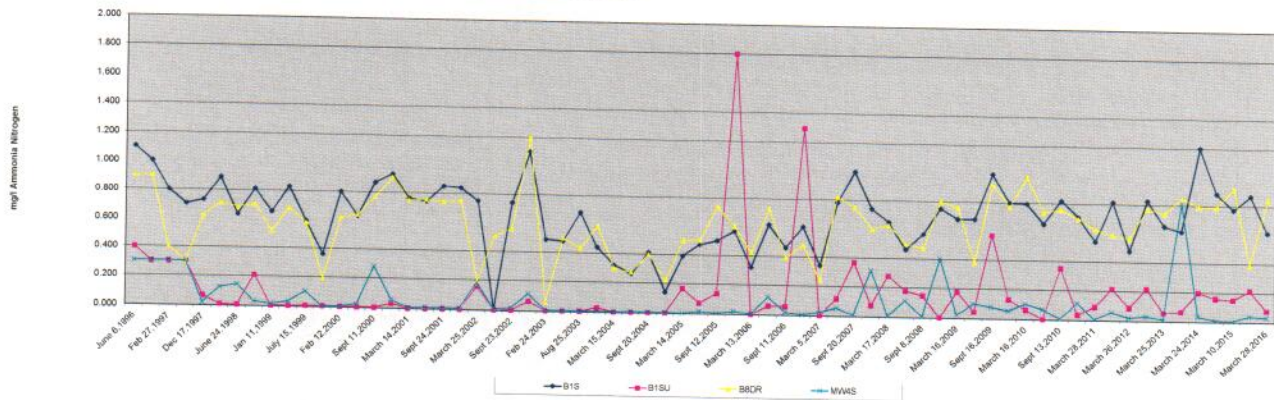
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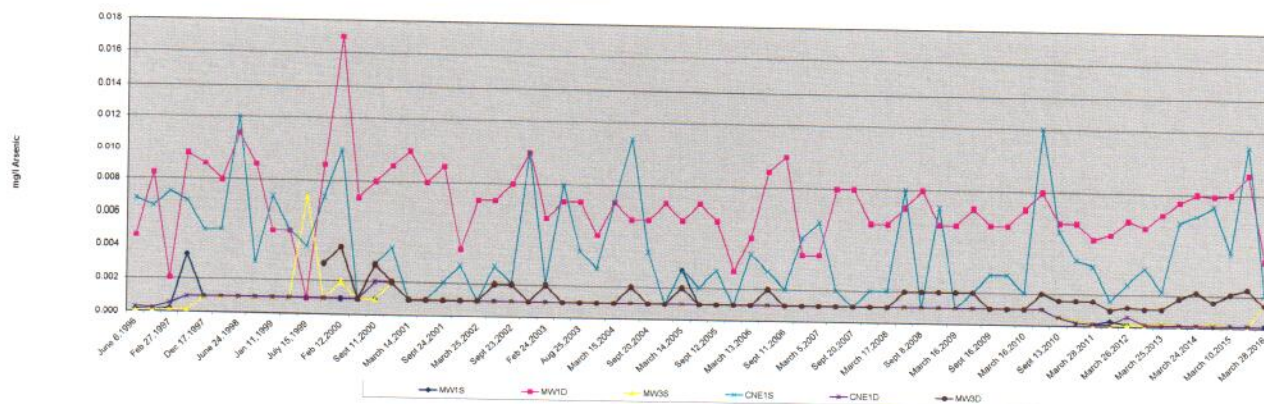
GROUP 3 WELLS AMMONIA



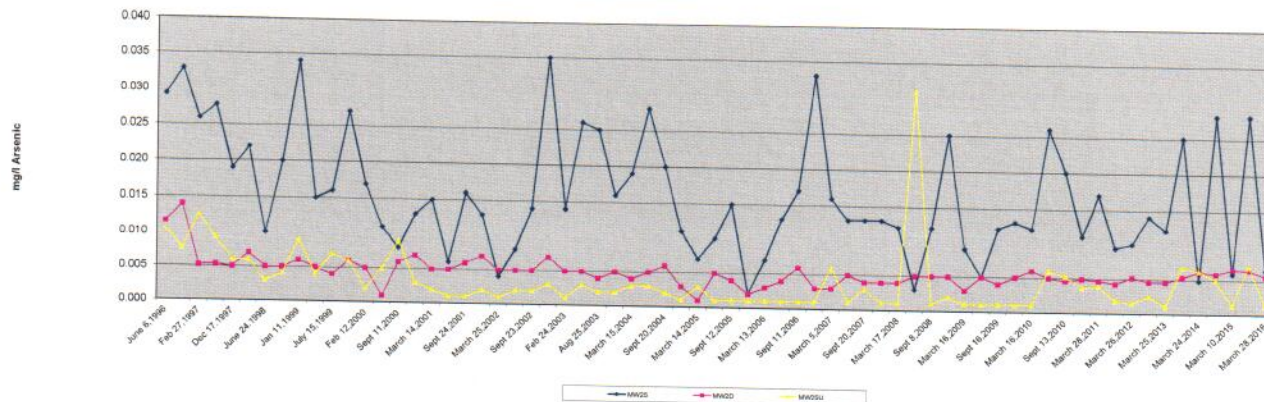
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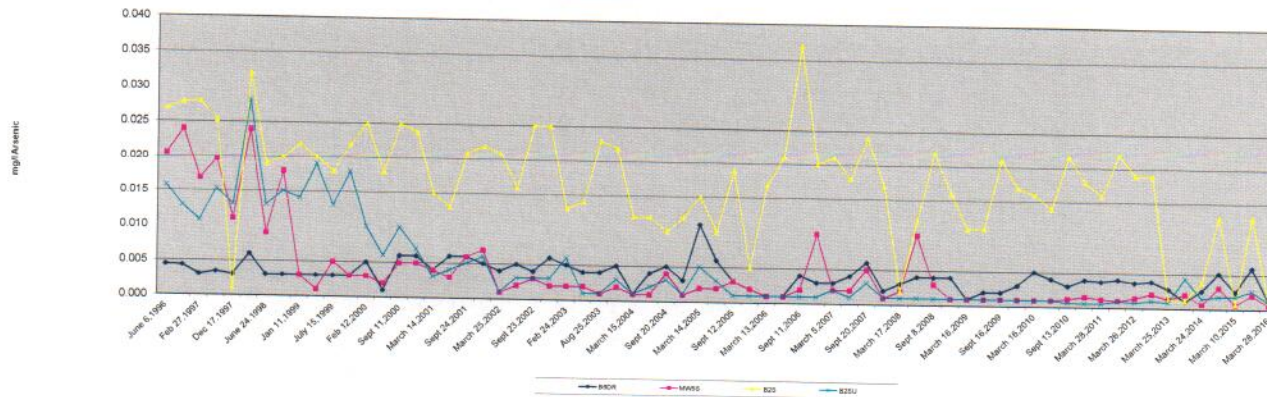
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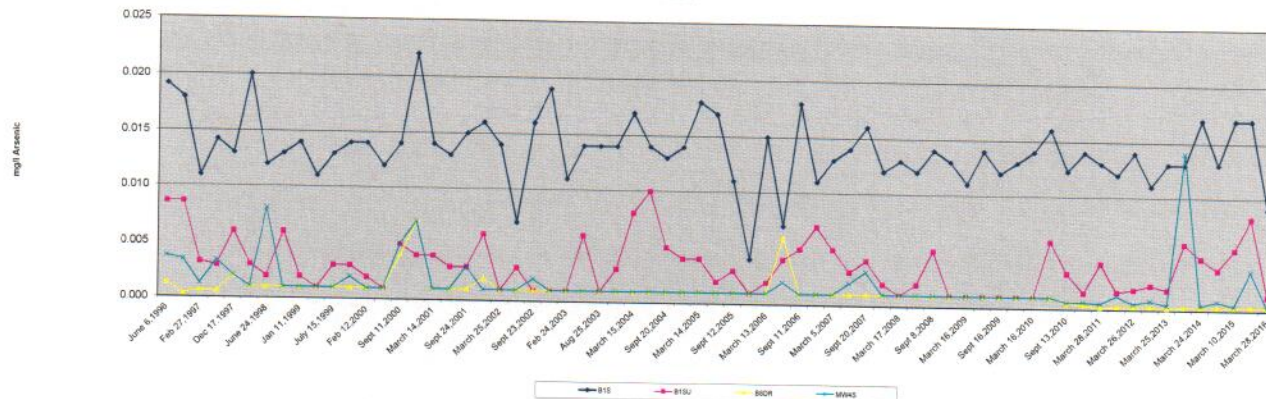
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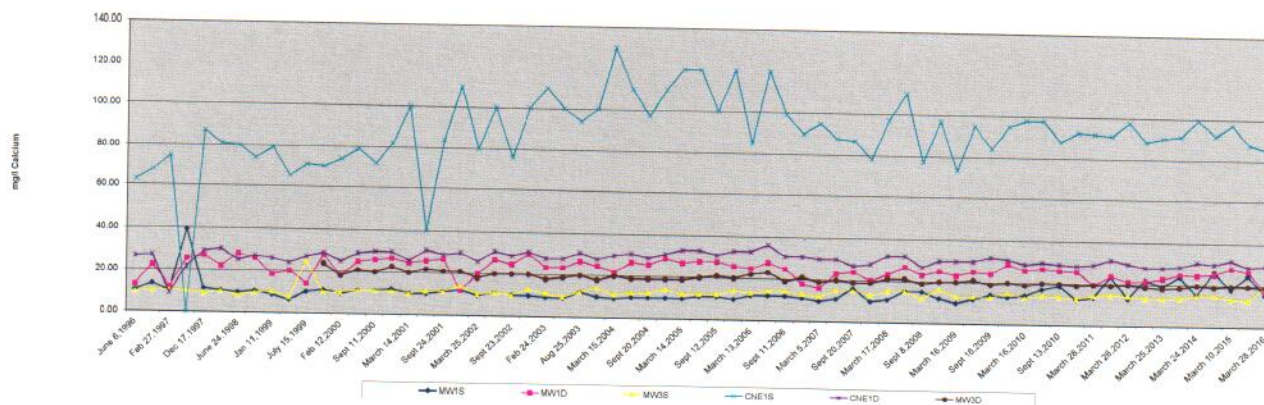
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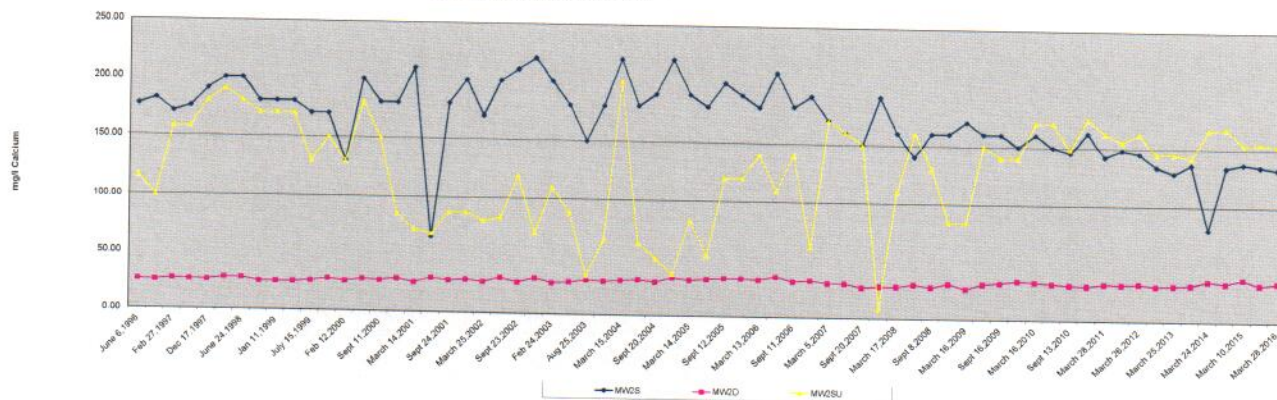
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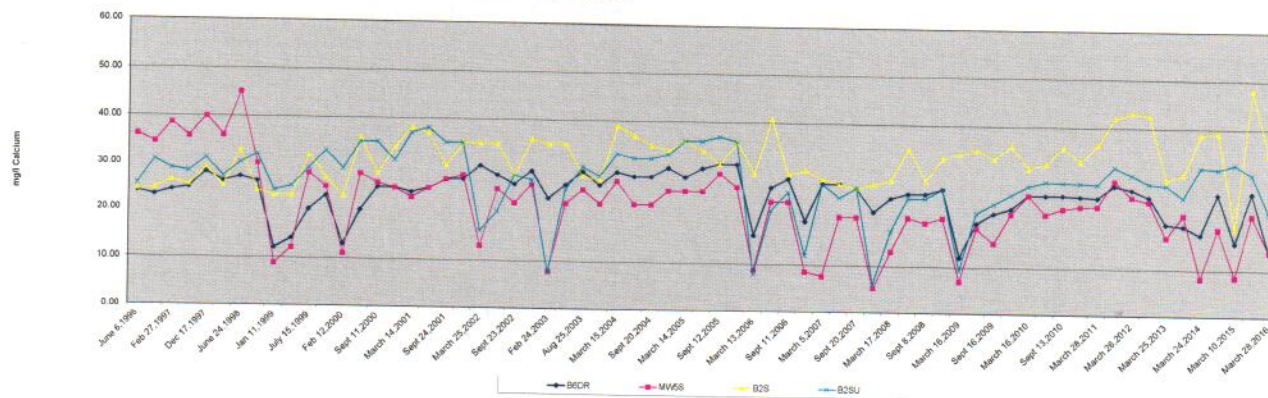
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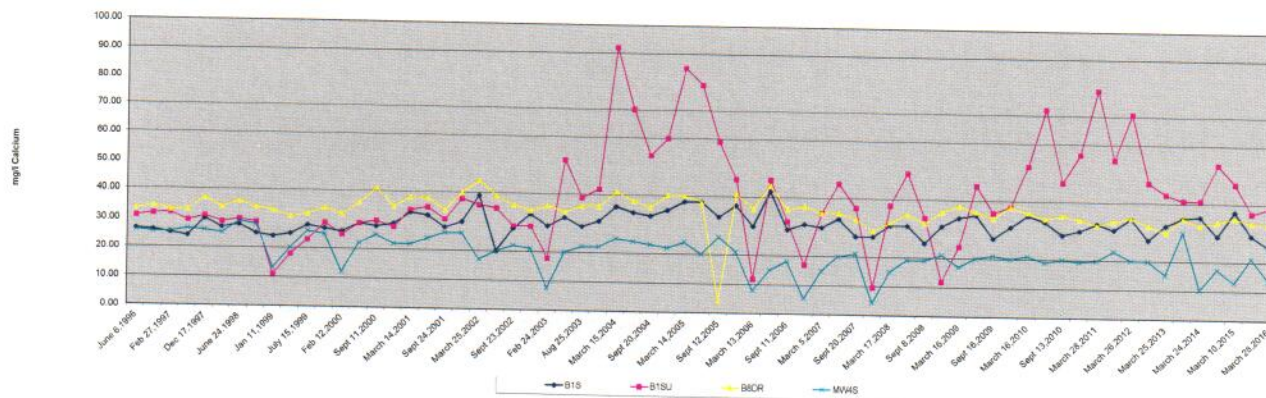
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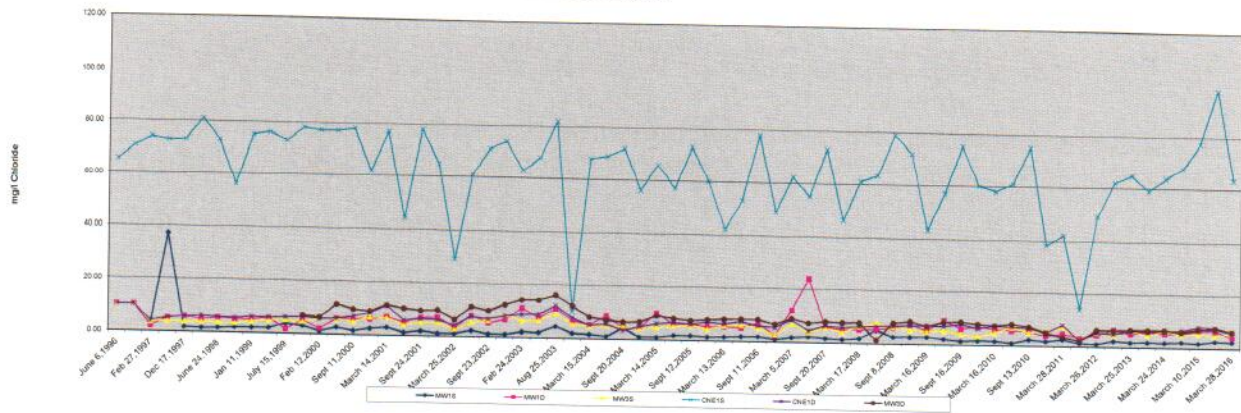
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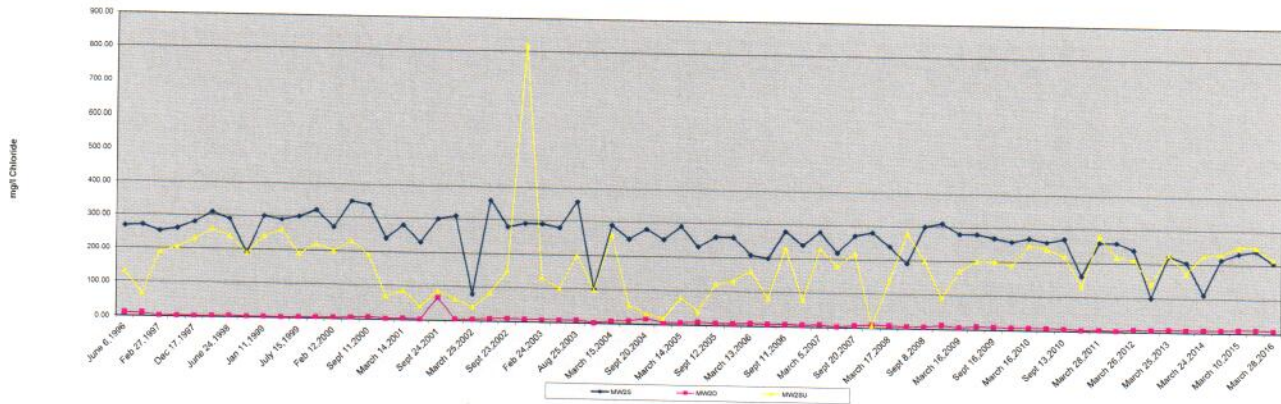
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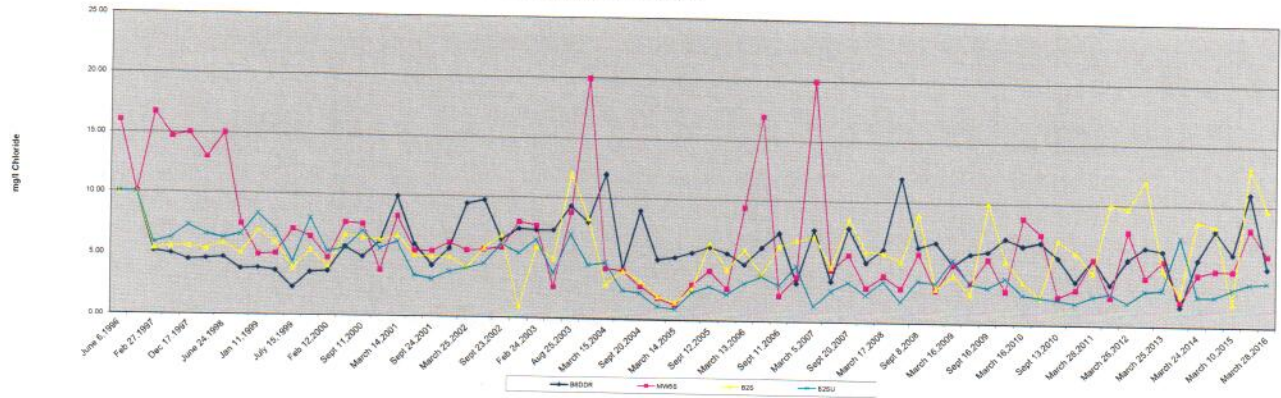
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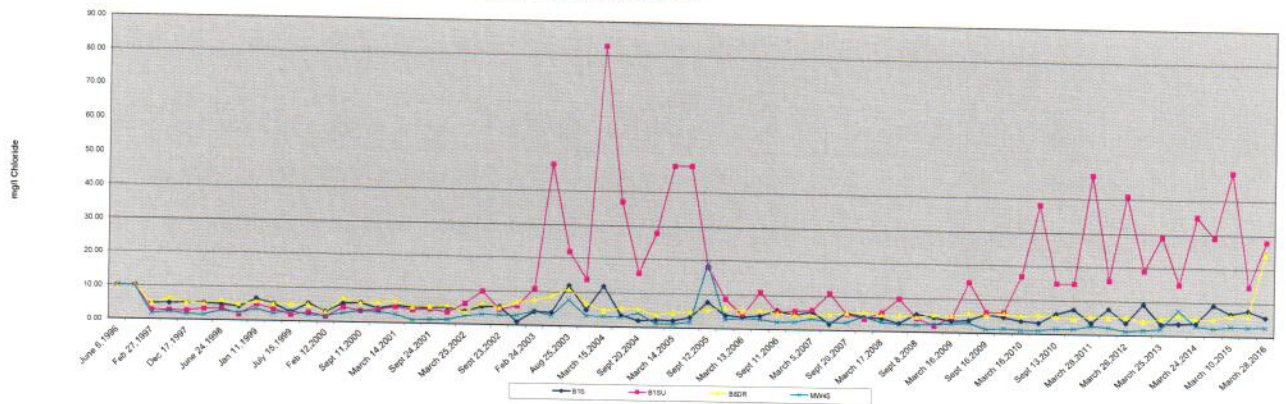
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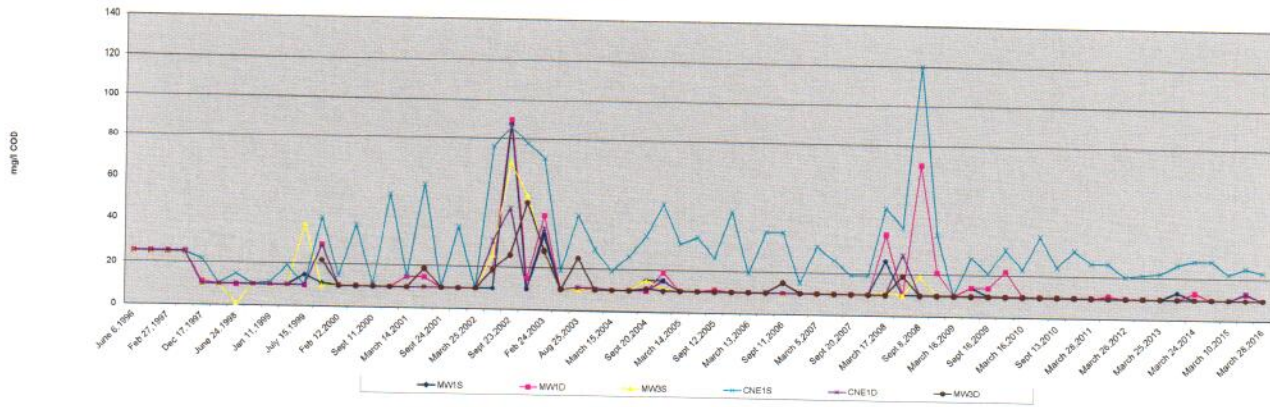
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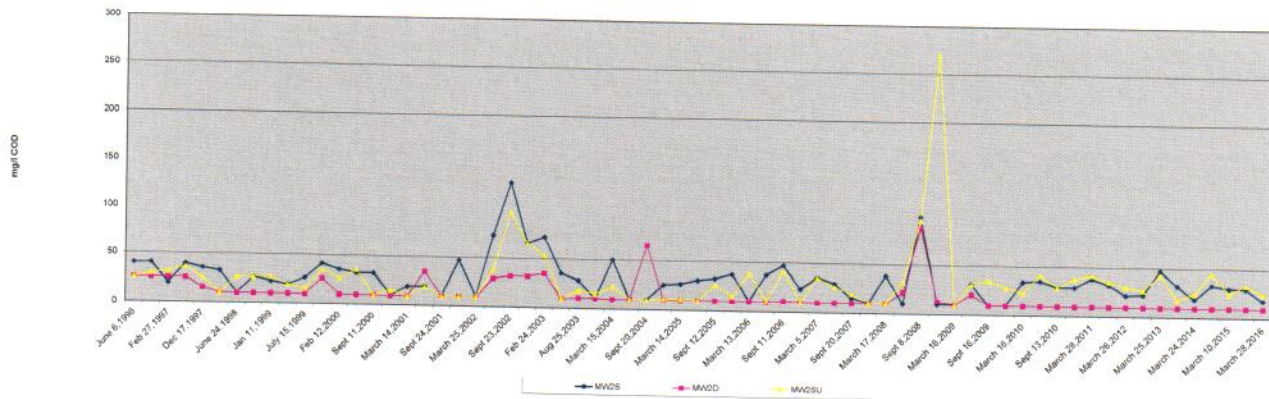
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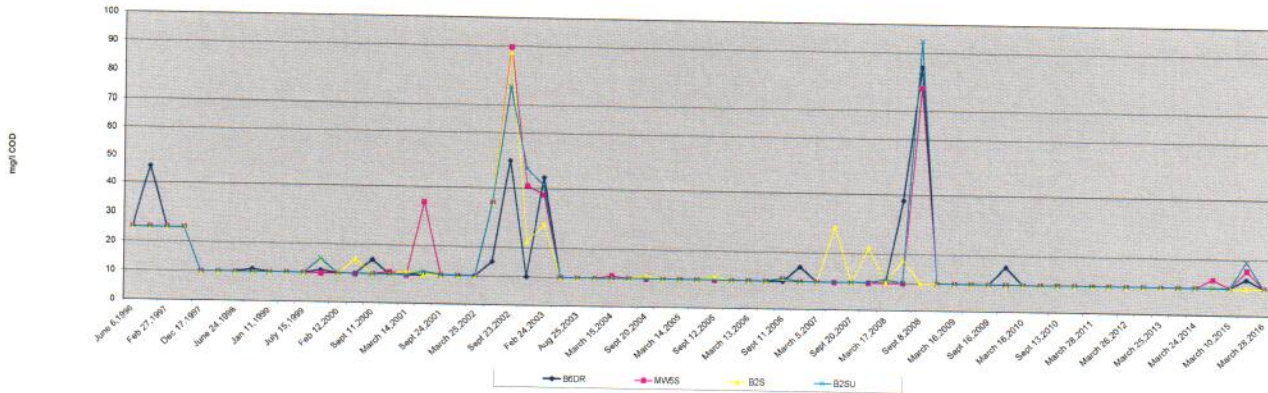
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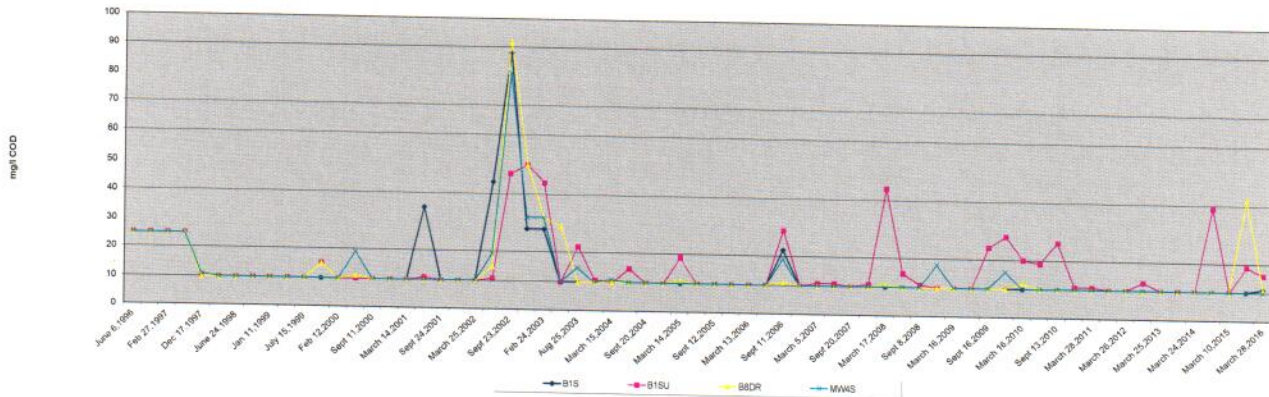
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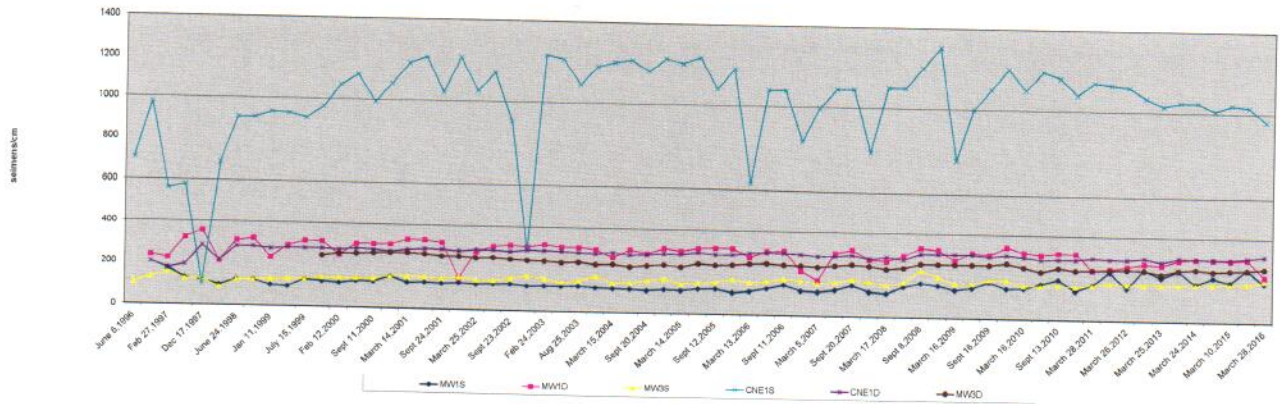
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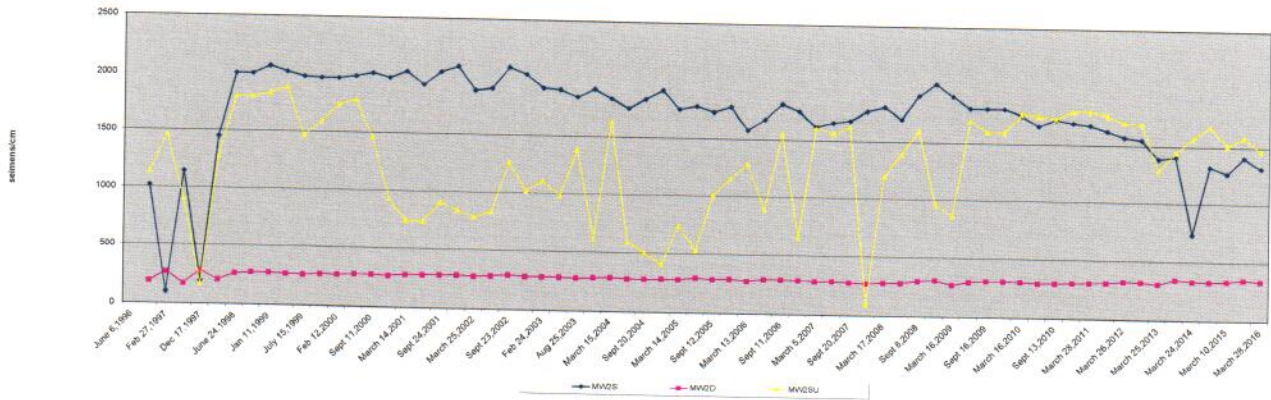
GROUP 4 WELLS CHEMICAL OXYGEN DEMAND



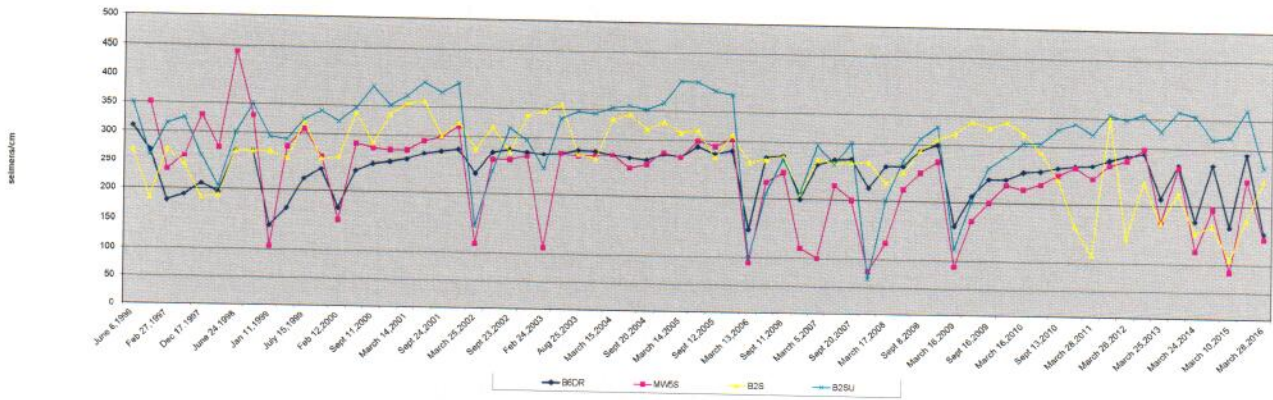
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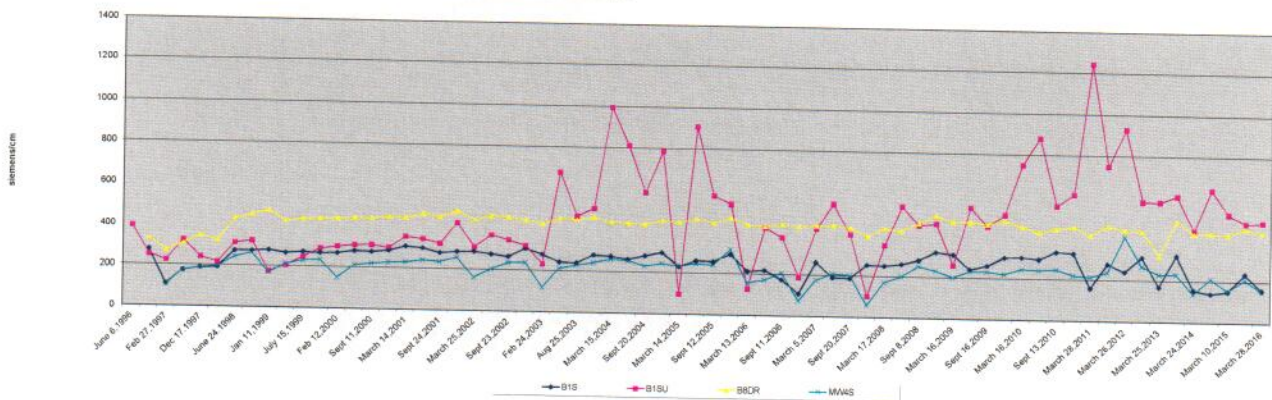
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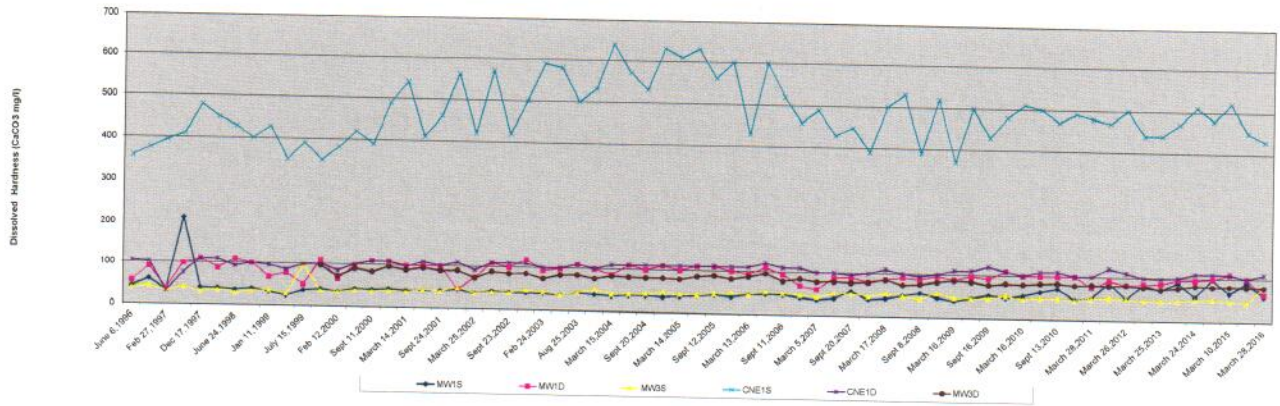
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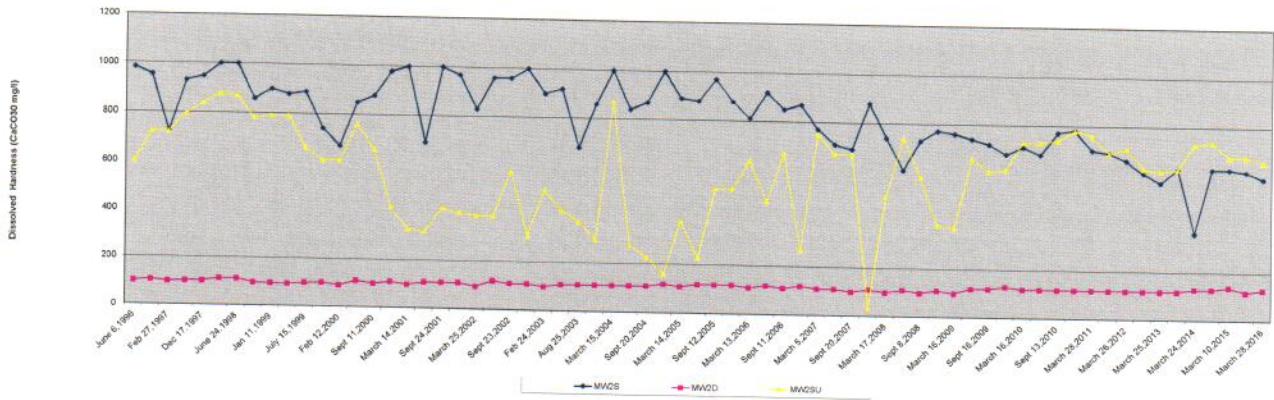
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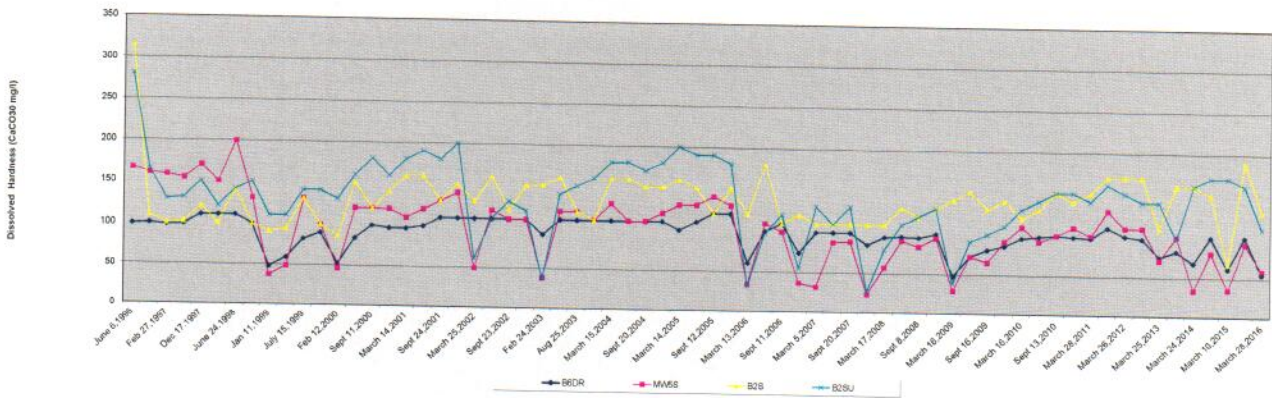
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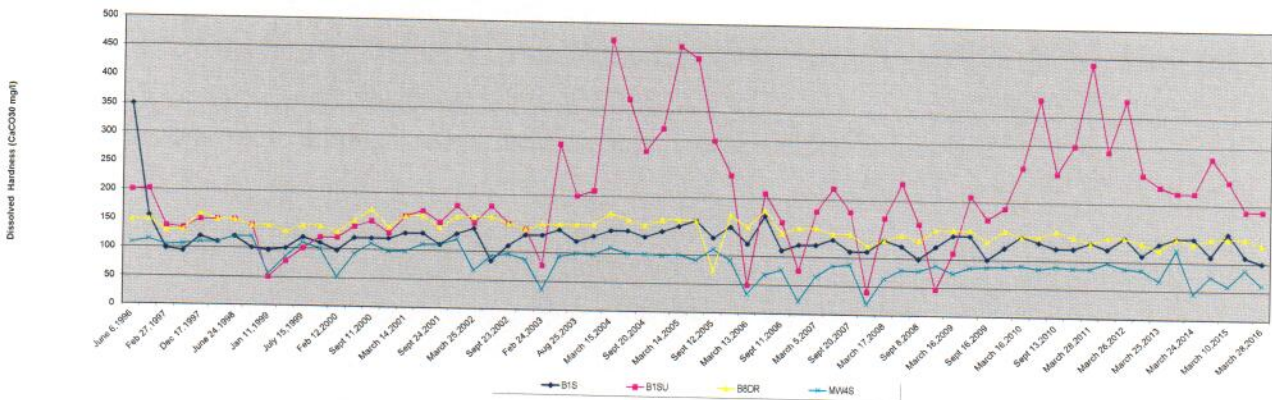
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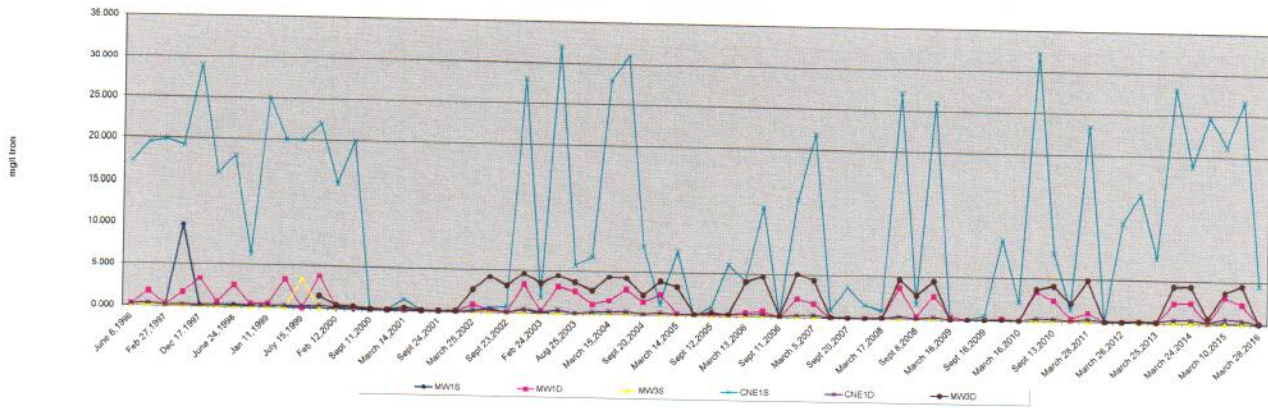
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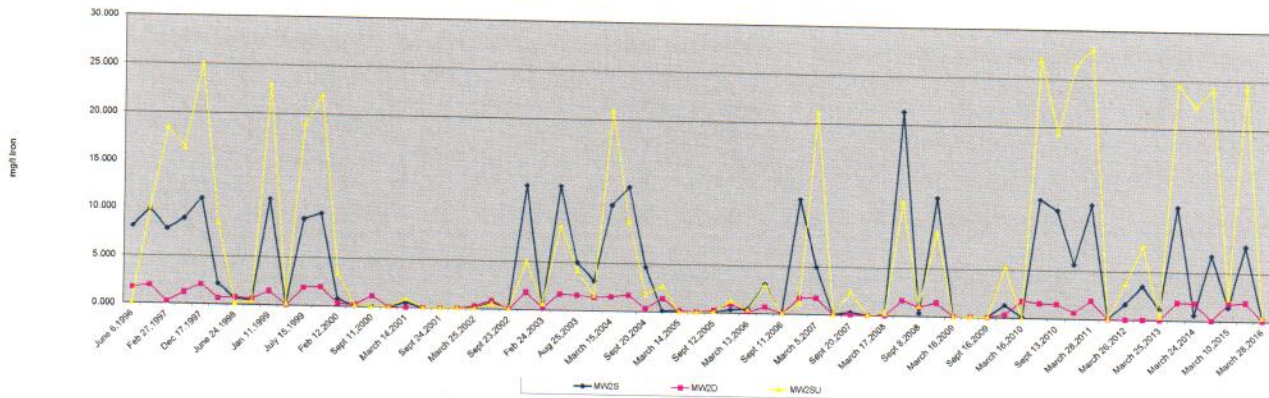
GROUP 4 WELLS HARDNESS



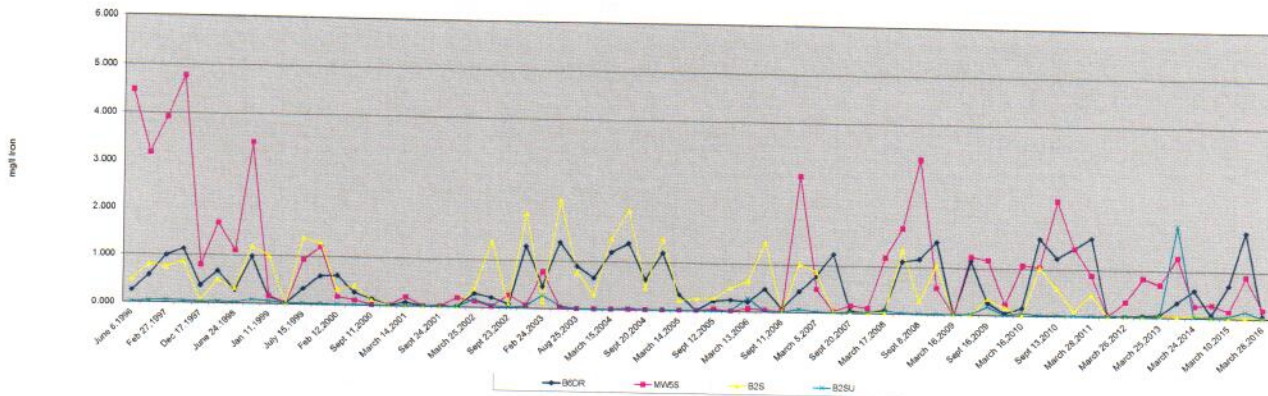
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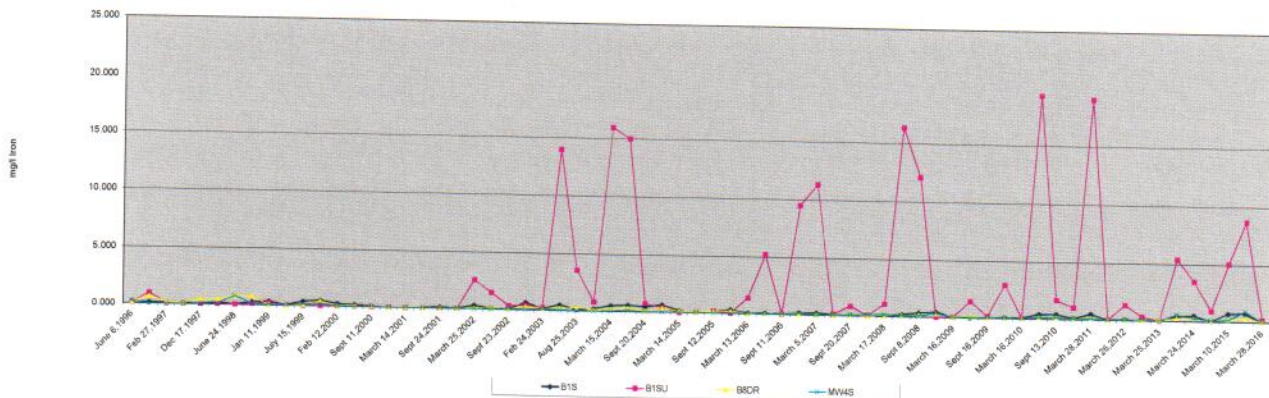
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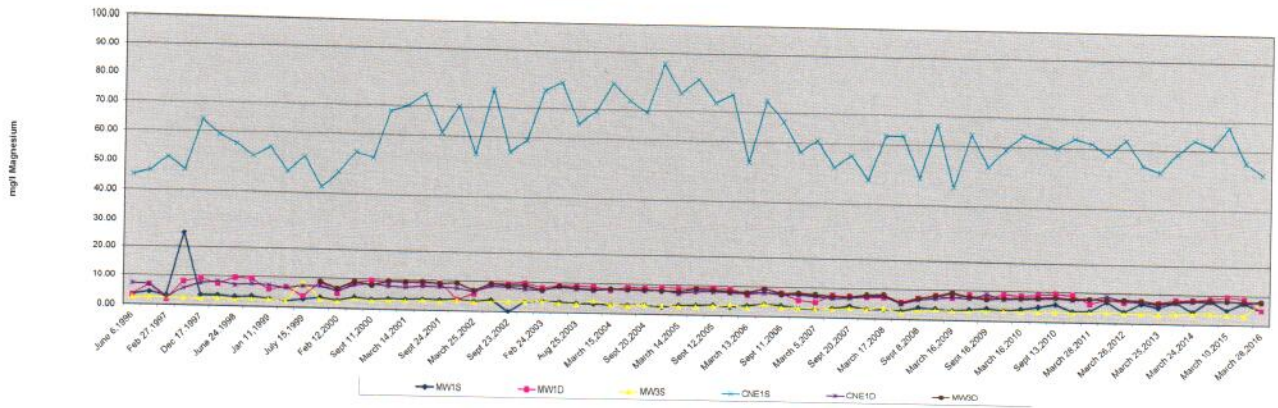
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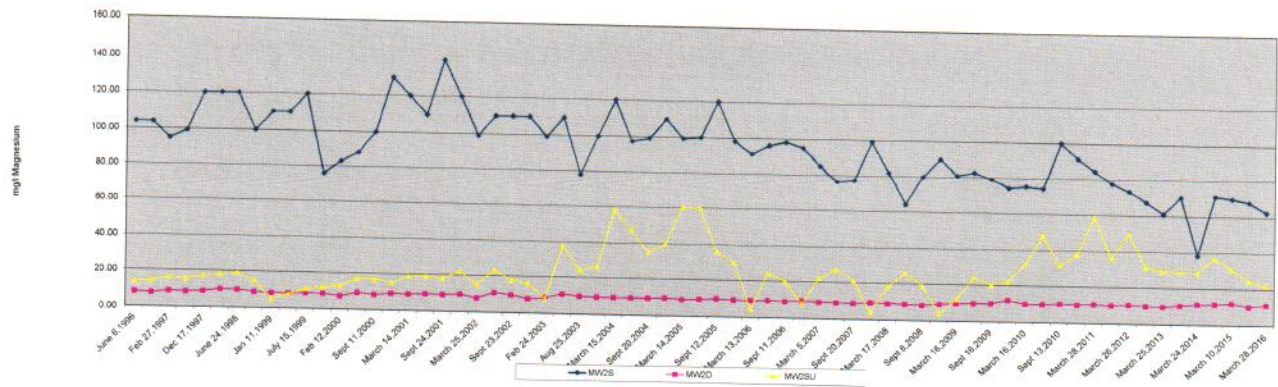
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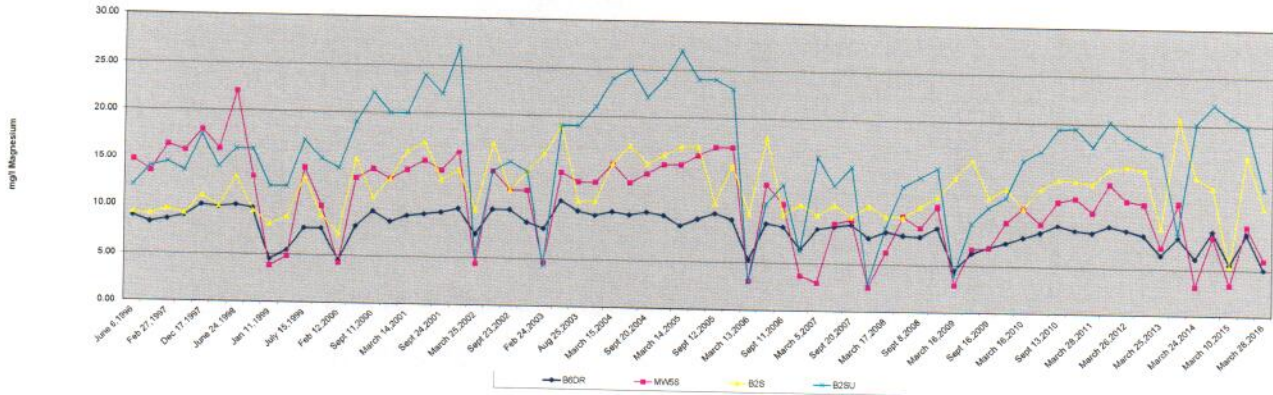
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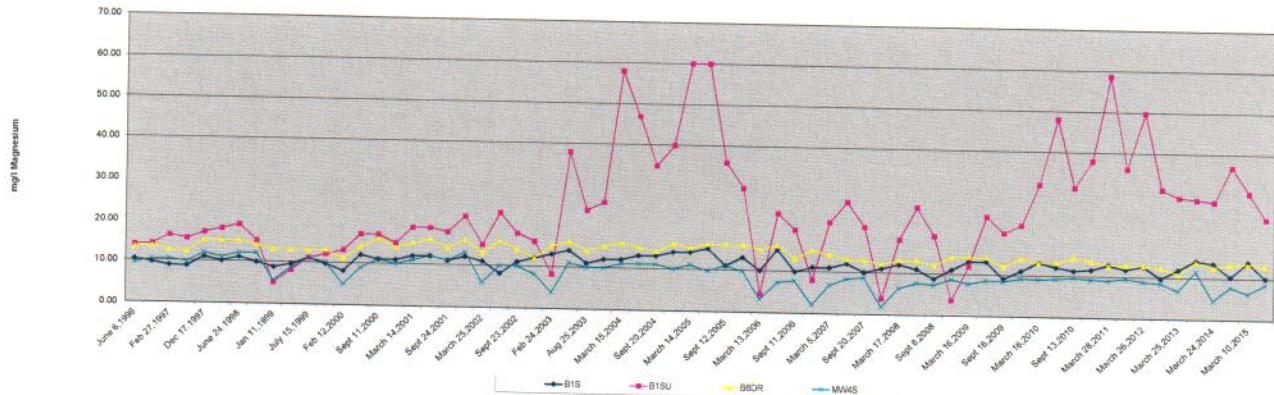
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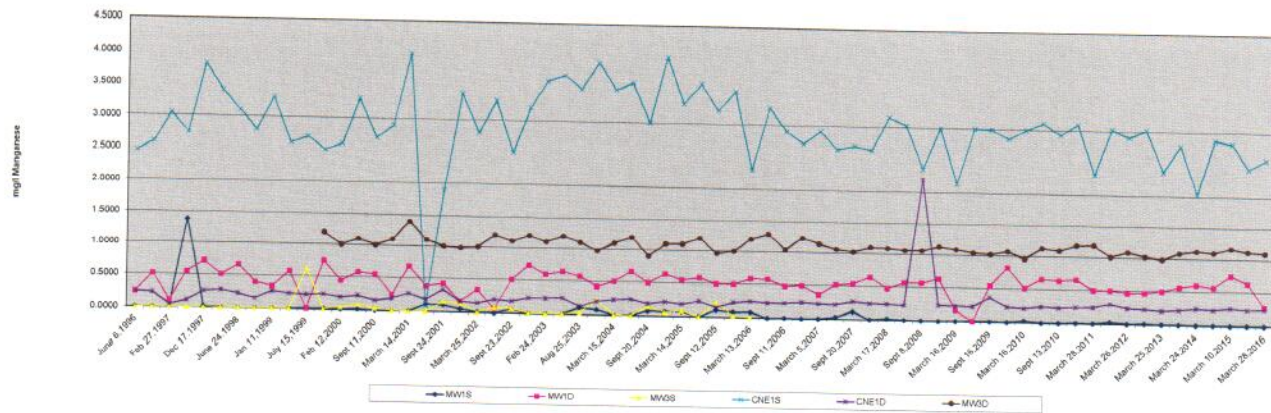
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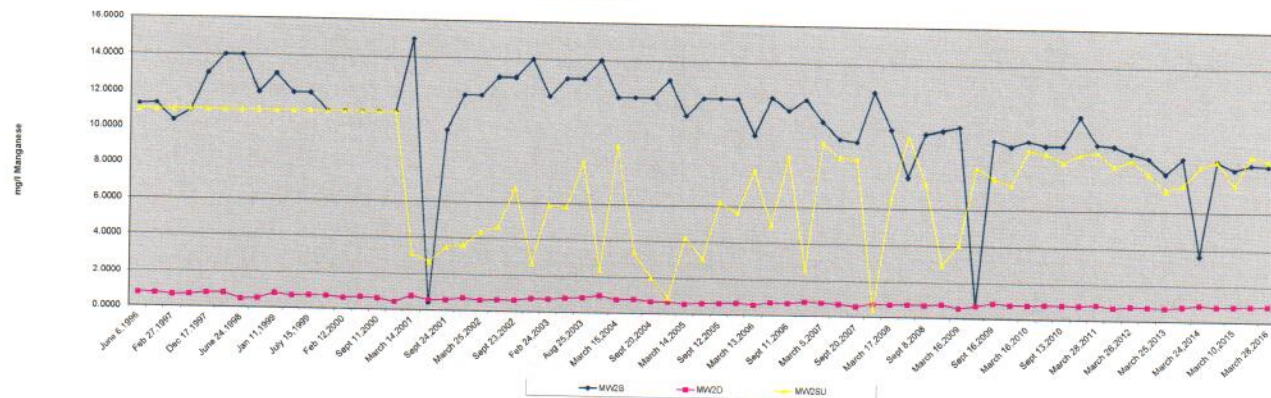
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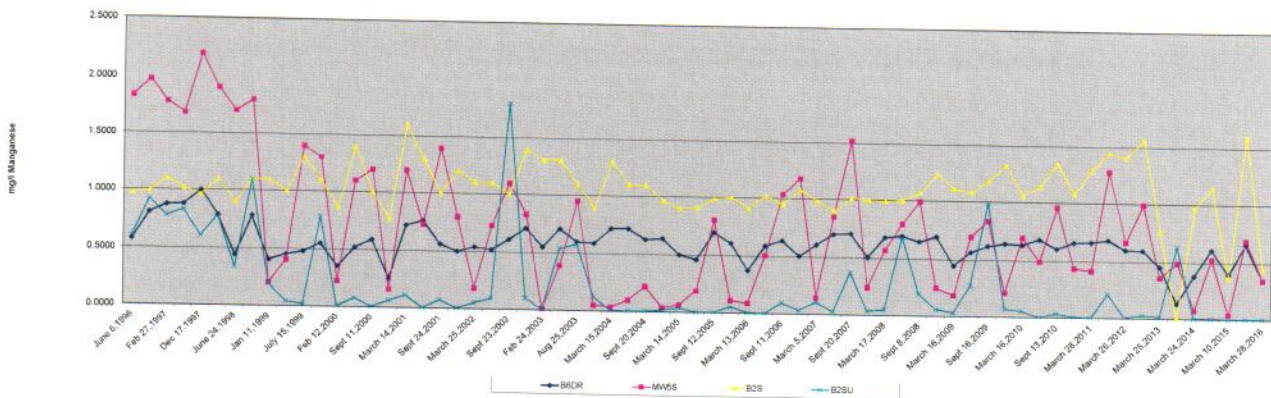
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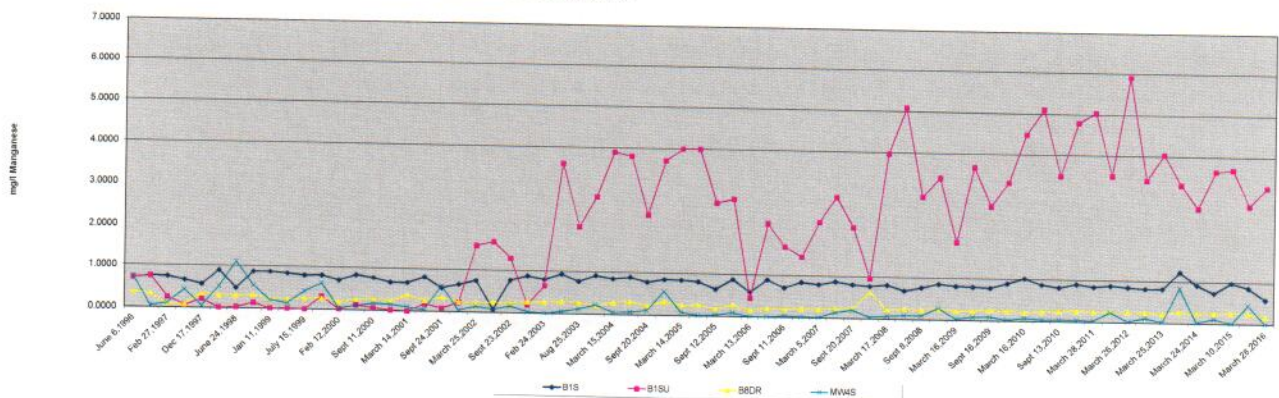
GROUP 2 WELLS DISSOLVED MANGANESE



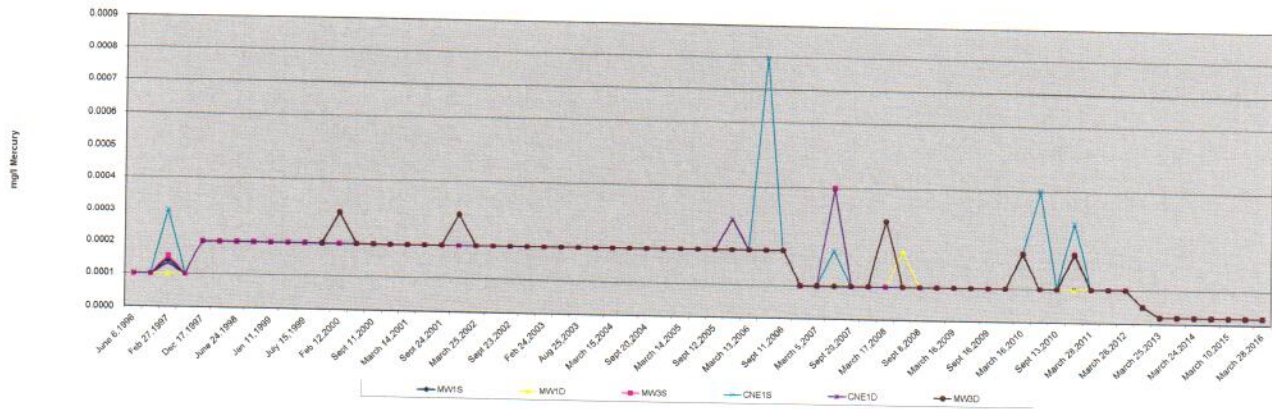
GROUP 3 WELLS DISSOLVED MANGANESE



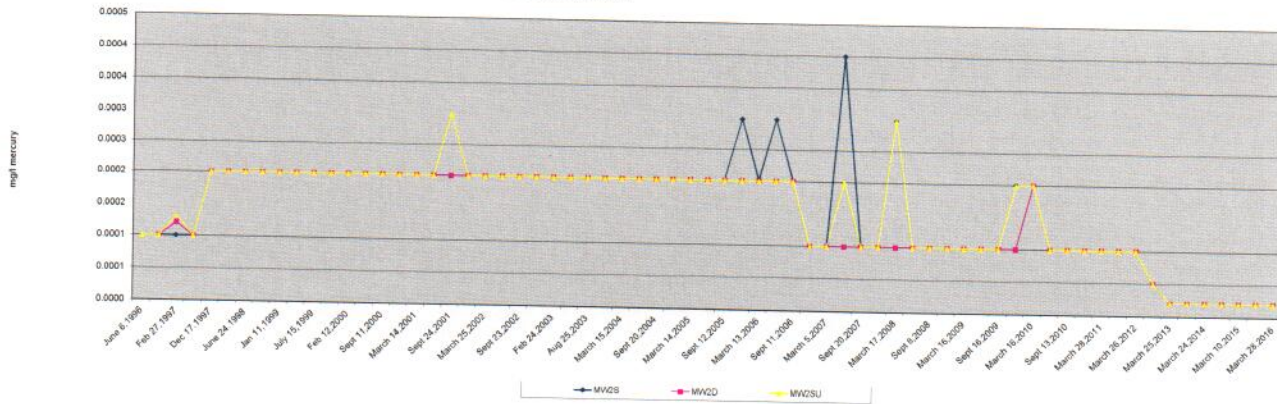
GROUP 4 WELLS DISSOLVED MANGANESE



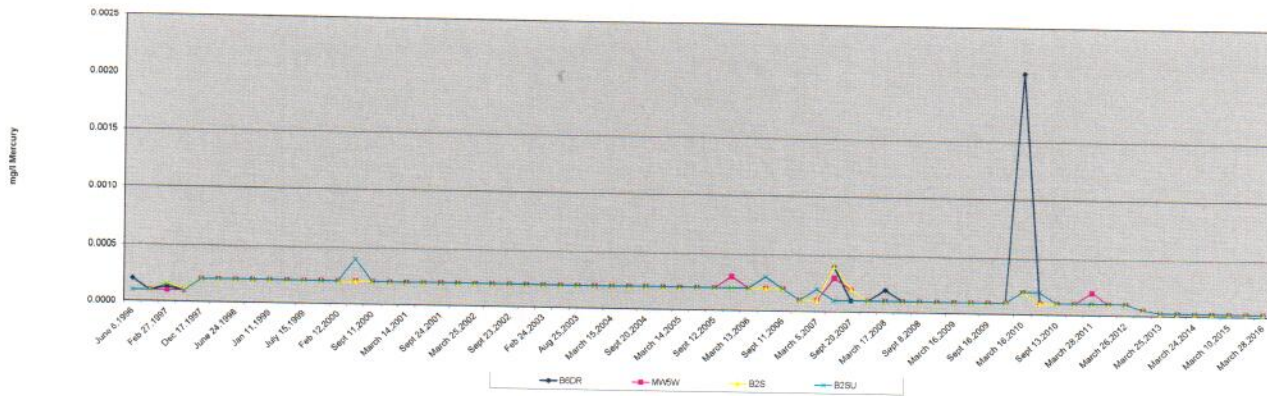
GROUP 1 WELLS DISSOLVED MERCURY



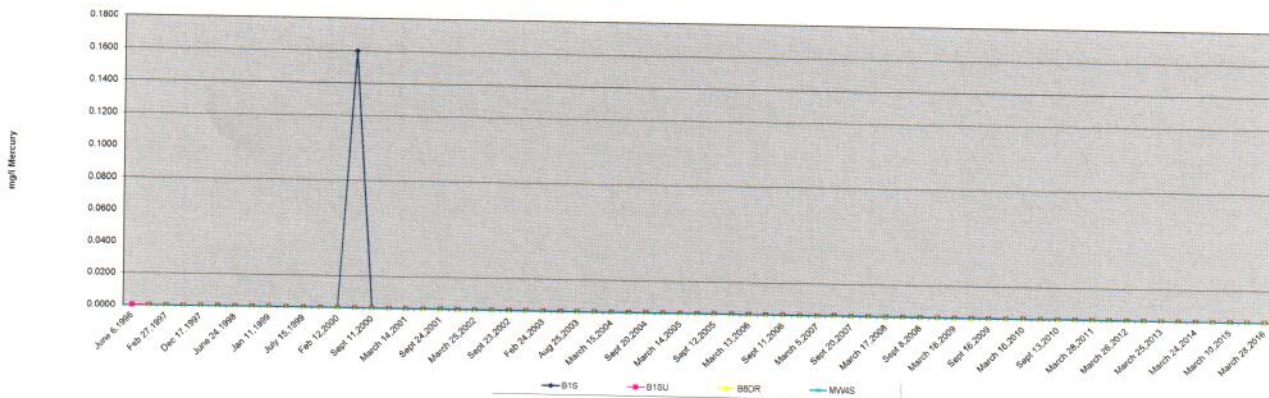
GROUP 2 WELLS DISSOLVED MERCURY



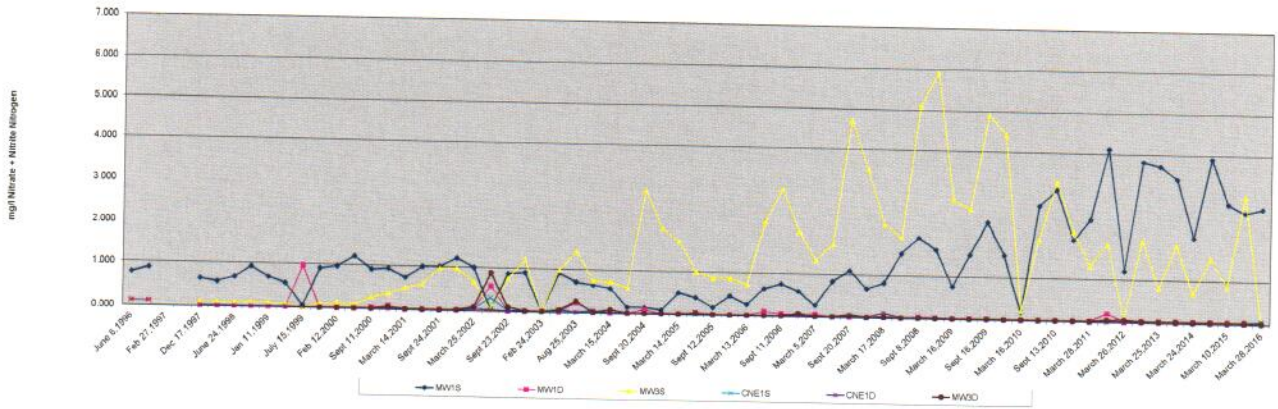
GROUP 3 WELLS DISSOLVED MERCURY



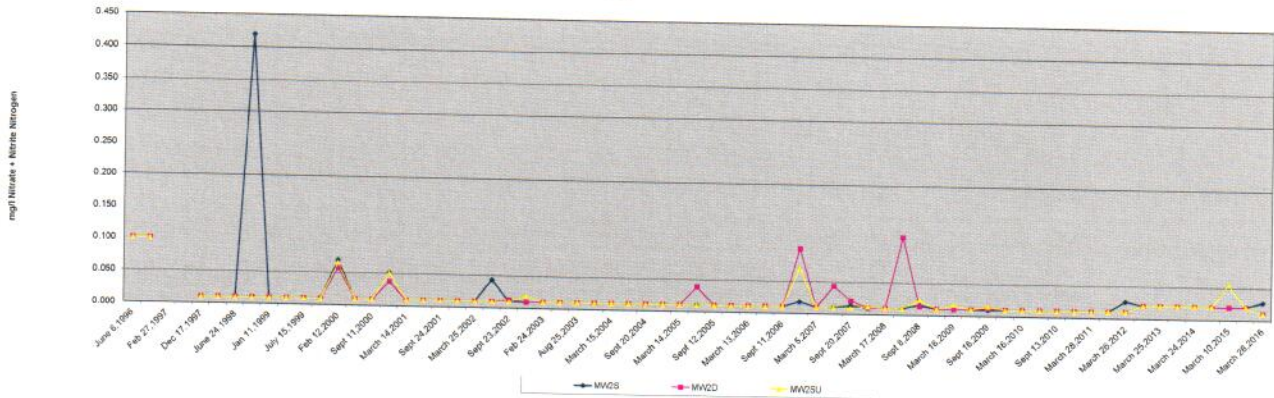
GROUP 4 WELLS DISSOLVED MERCURY



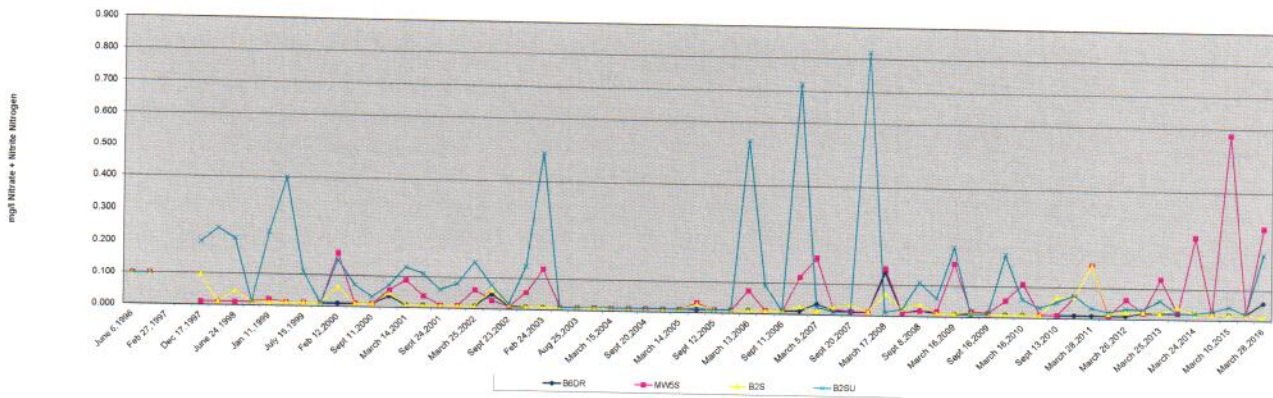
GROUP 1 WELLS NITRATE + NITRITE NITROGEN



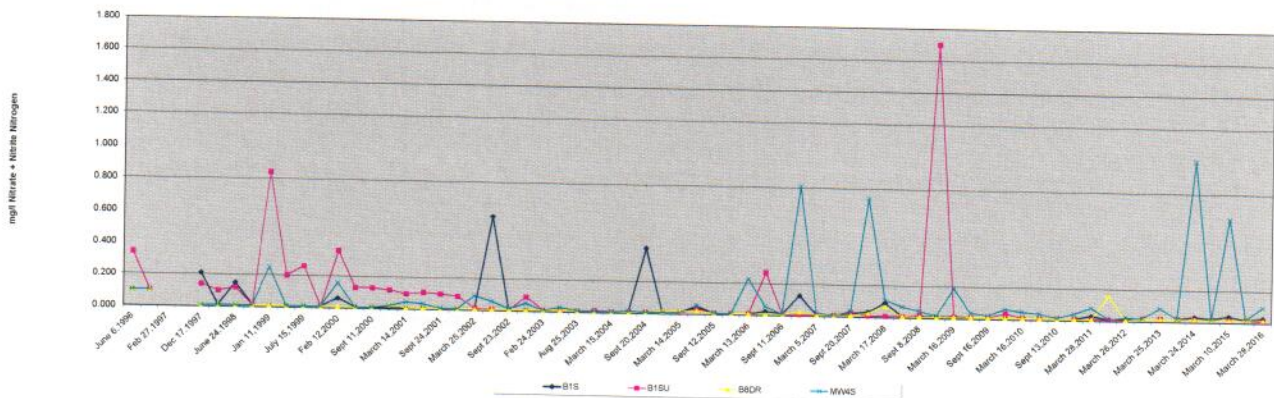
GROUP 2 WELLS NITRATE + NITRITE NITROGEN



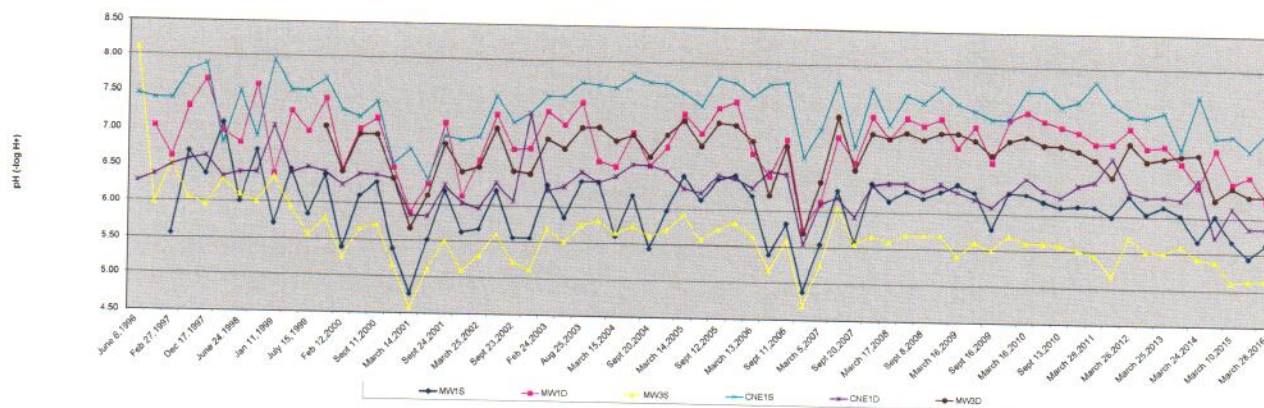
GROUP 3 WELLS NITRATE + NITRITE NITROGEN



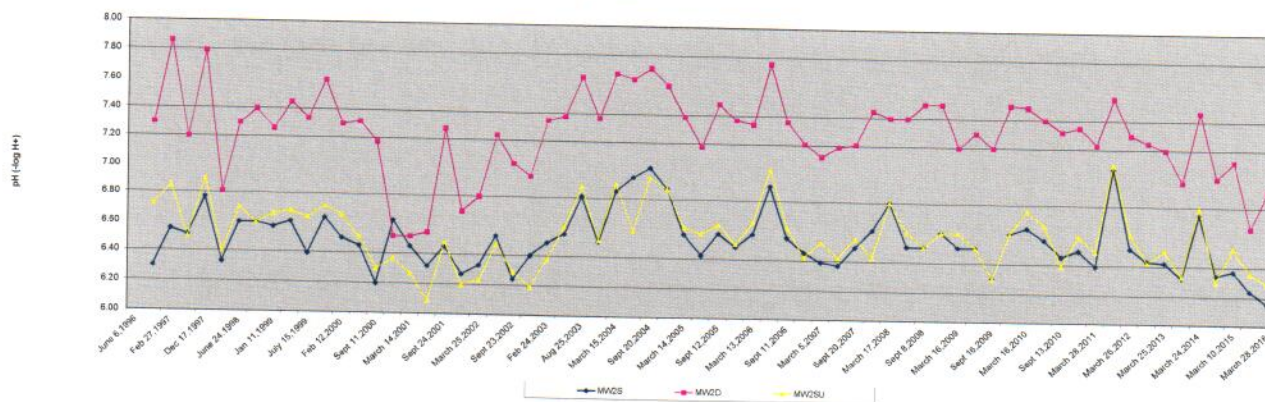
GROUP 4 WELLS NITRATE + NITRITE NITROGEN



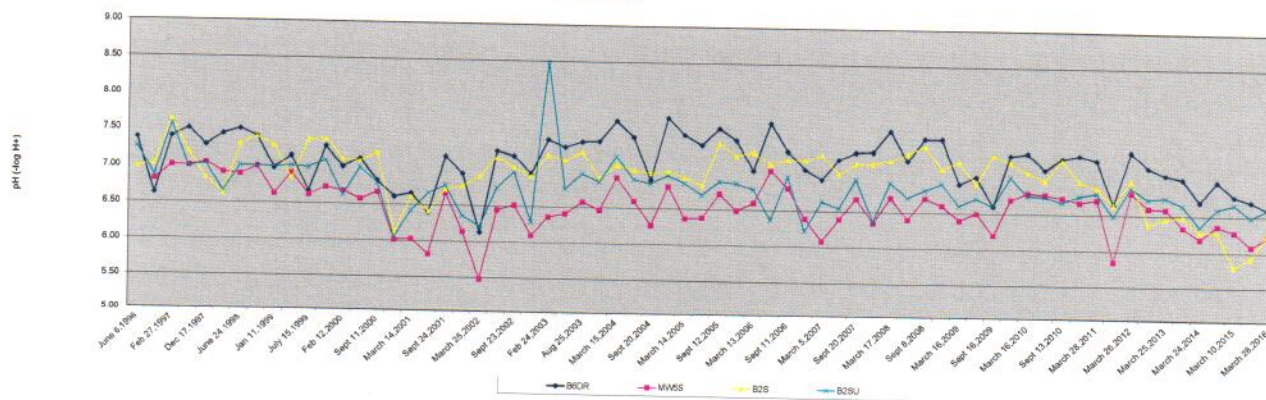
GROUP 1 WELLS pH



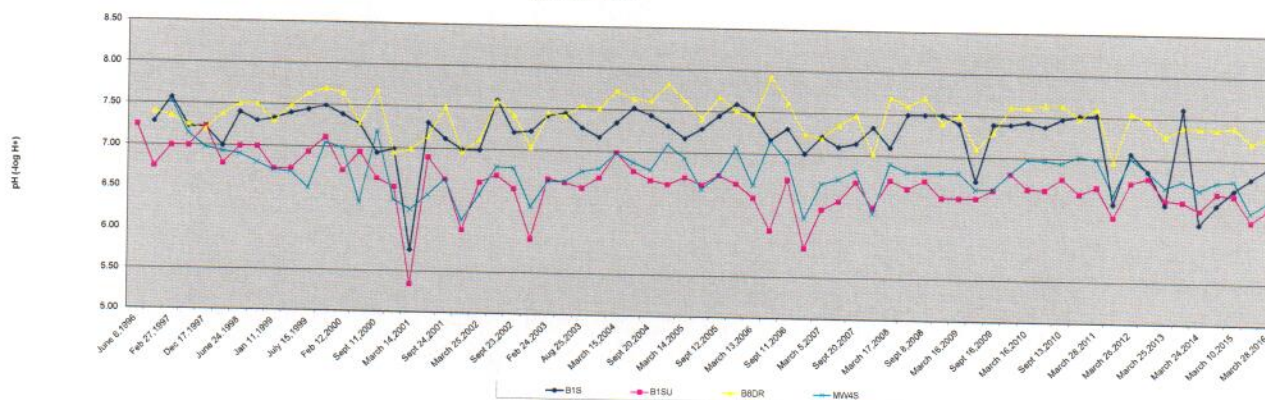
GROUP 2 WELLS pH



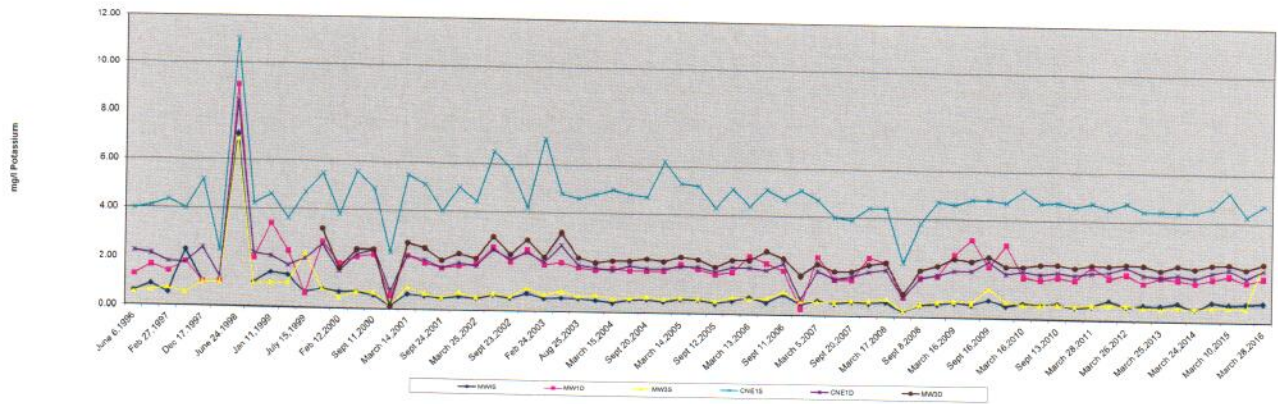
GROUP 3 WELLS pH



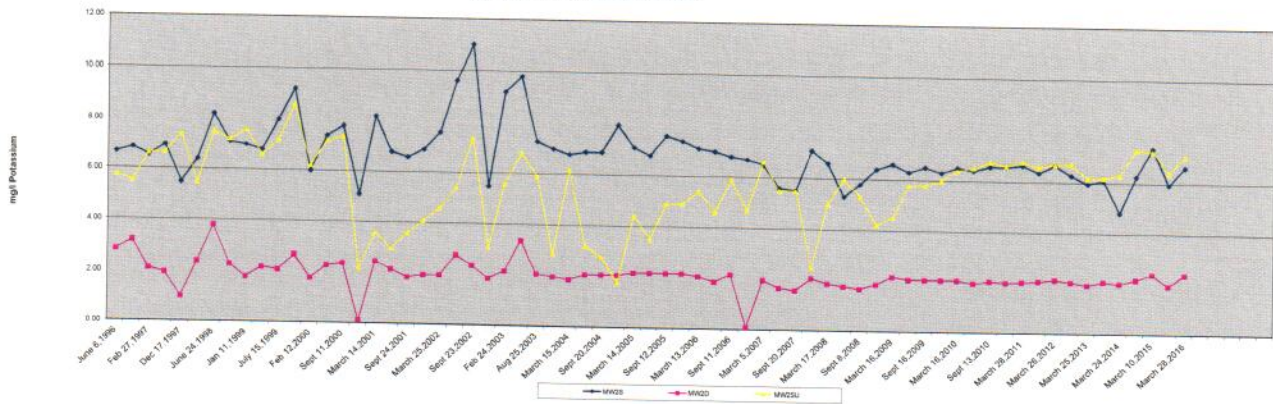
GROUP 4 WELLS pH



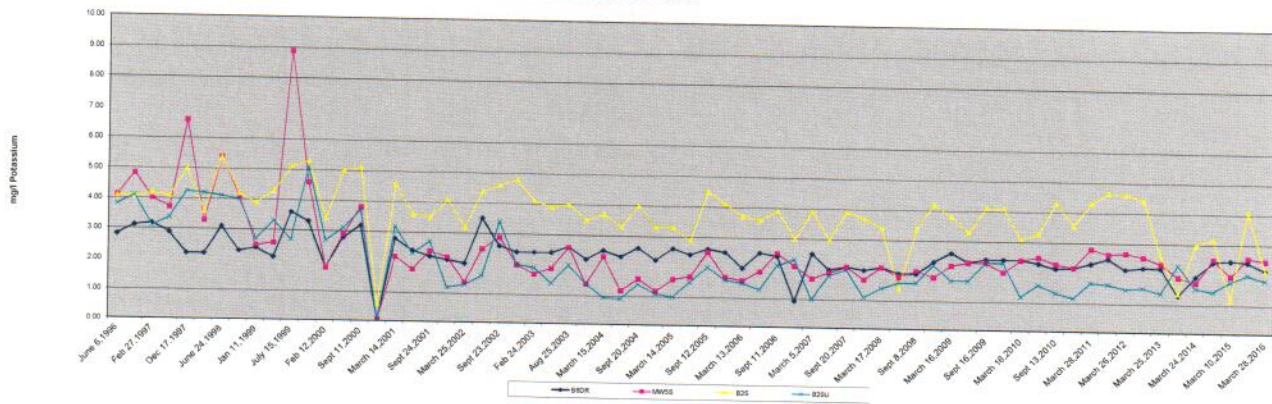
GROUP 1 WELLS DISSOLVED POTASSIUM



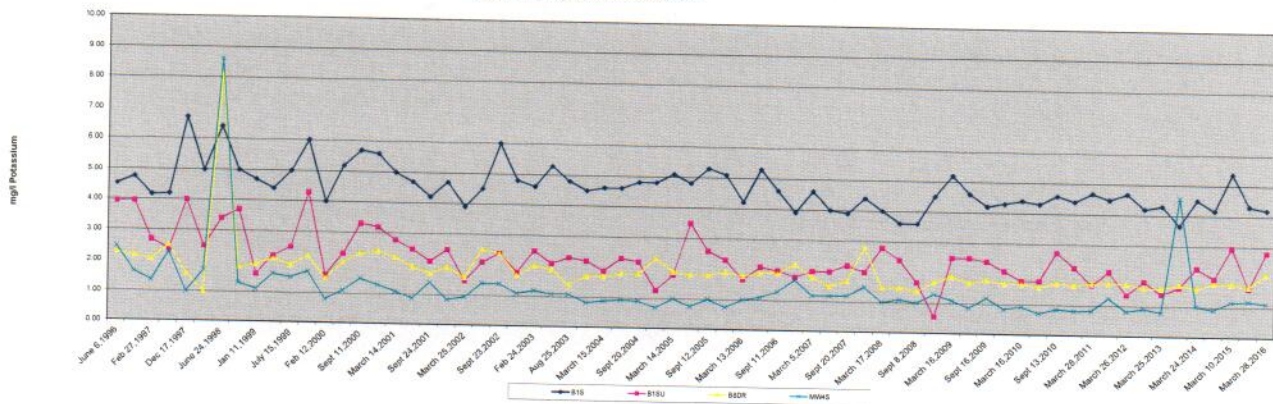
GROUP 2 WELLS DISSOLVED POTASSIUM



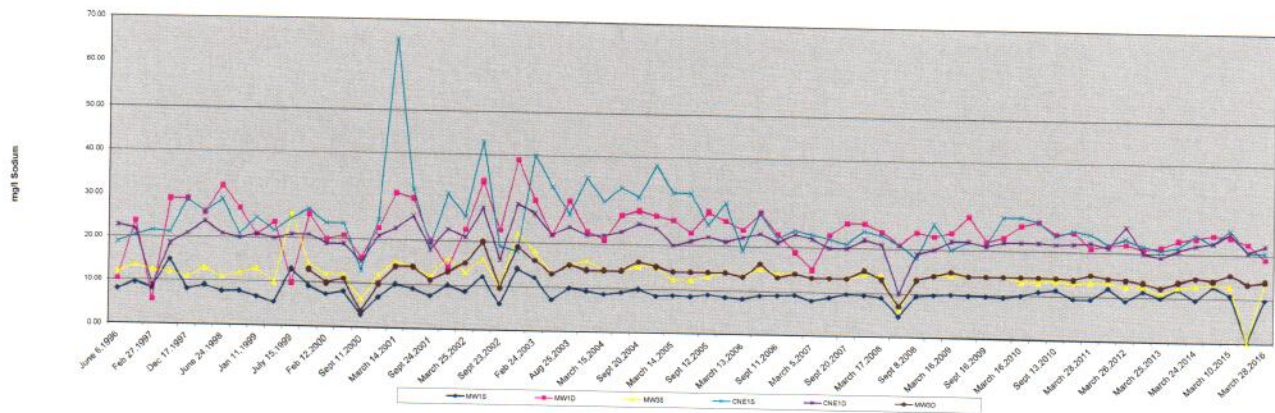
GROUP 3 WELLS DISSOLVED POTASSIUM



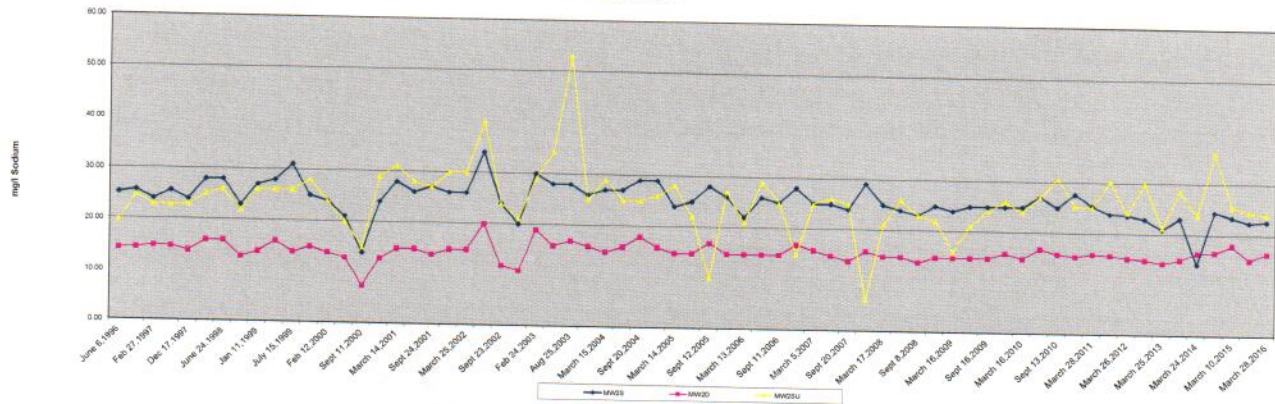
GROUP 4 WELLS DISSOLVED POTASSIUM



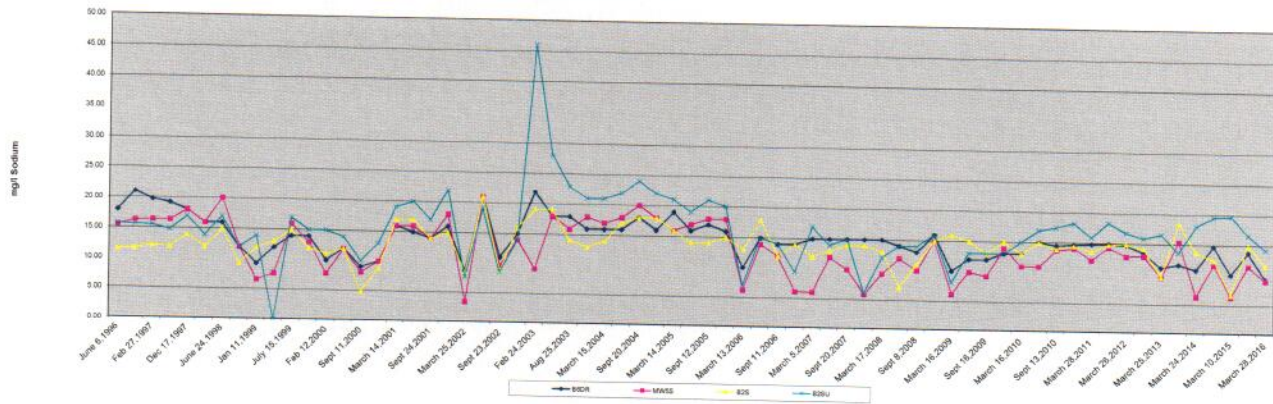
GROUP 1 WELLS SODIUM



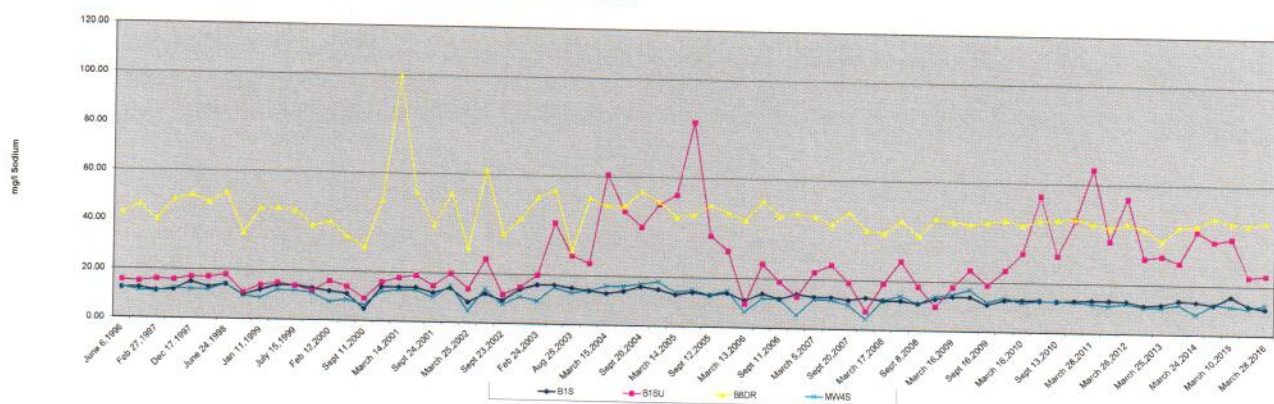
GROUP 2 WELLS SODIUM



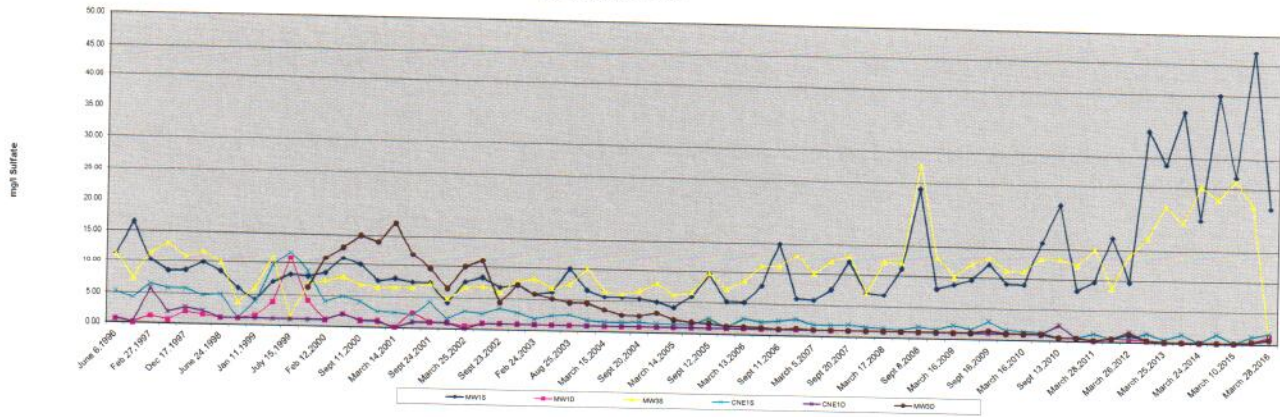
GROUP 3 WELLS SODIUM



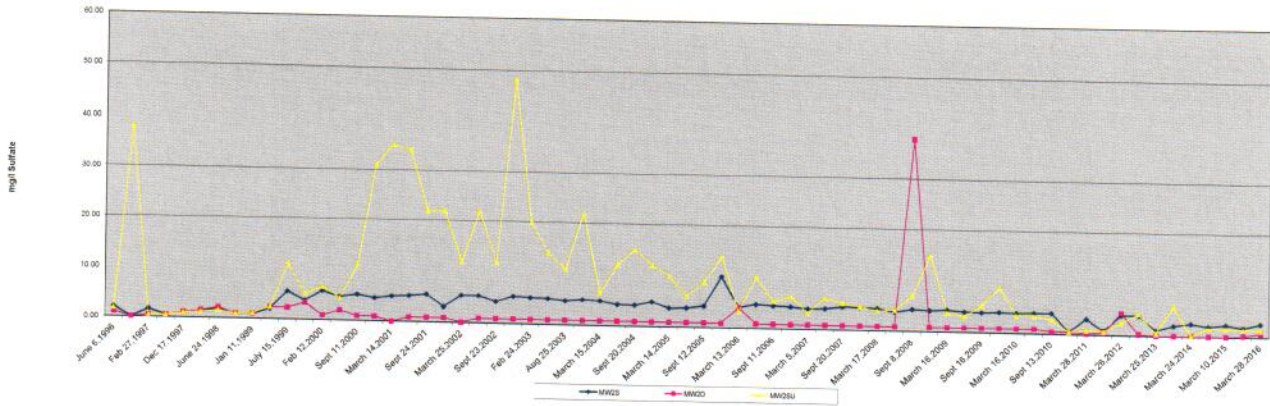
GROUP 4 WELLS SODIUM



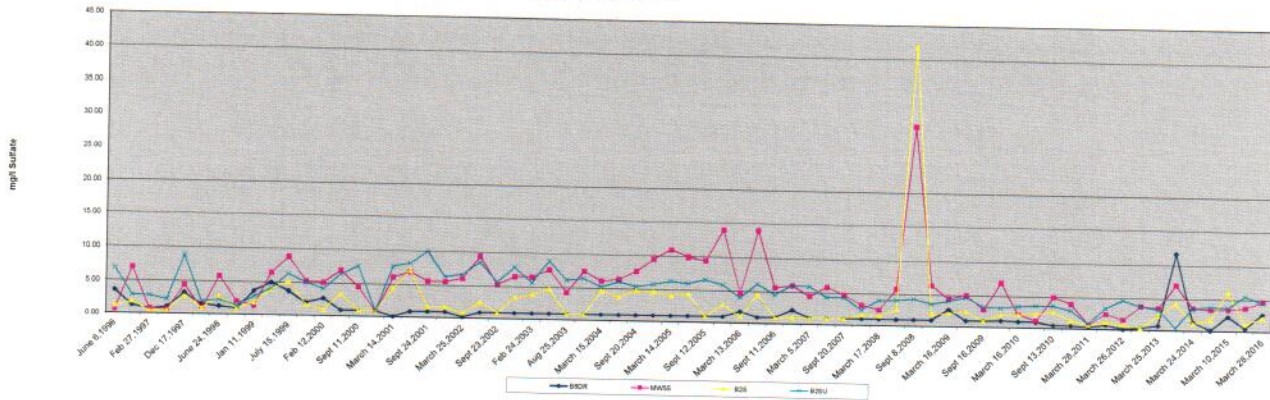
GROUP 1 WELLS SULFATE



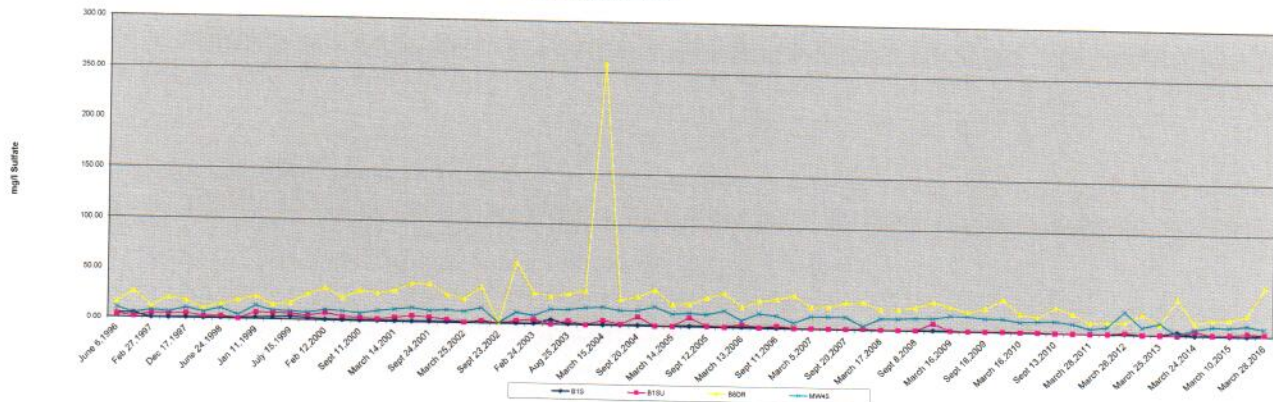
GROUP 2 WELLS SULFATE



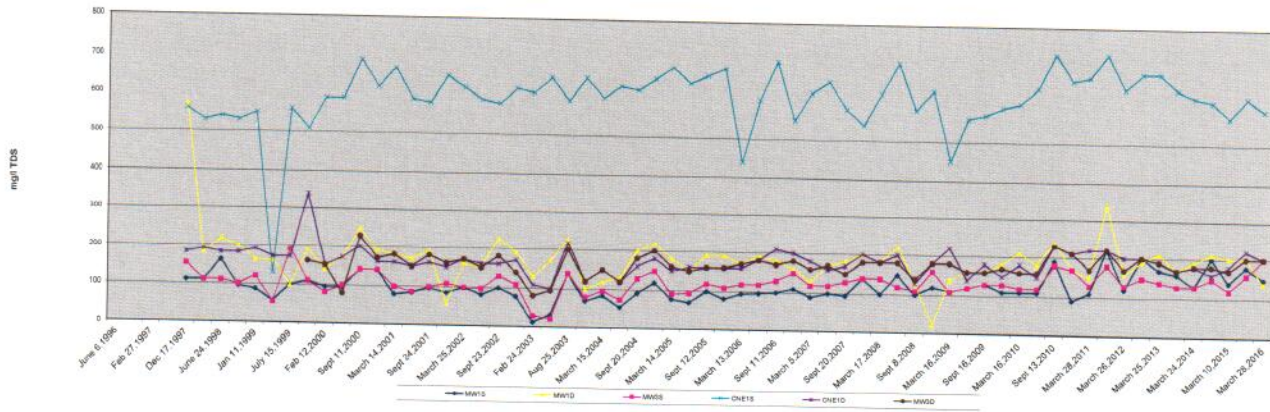
GROUP 3 WELLS SULFATE



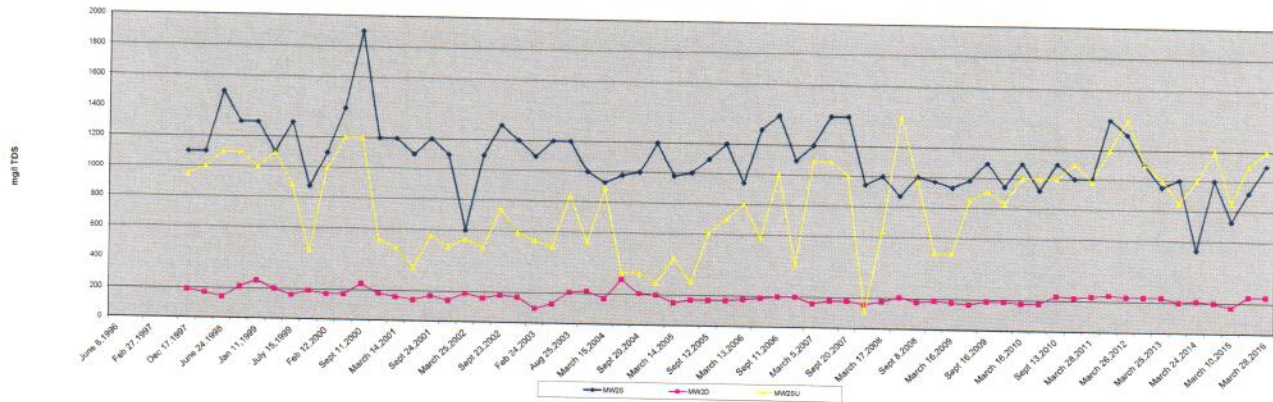
GROUP 4 WELLS SULFATE



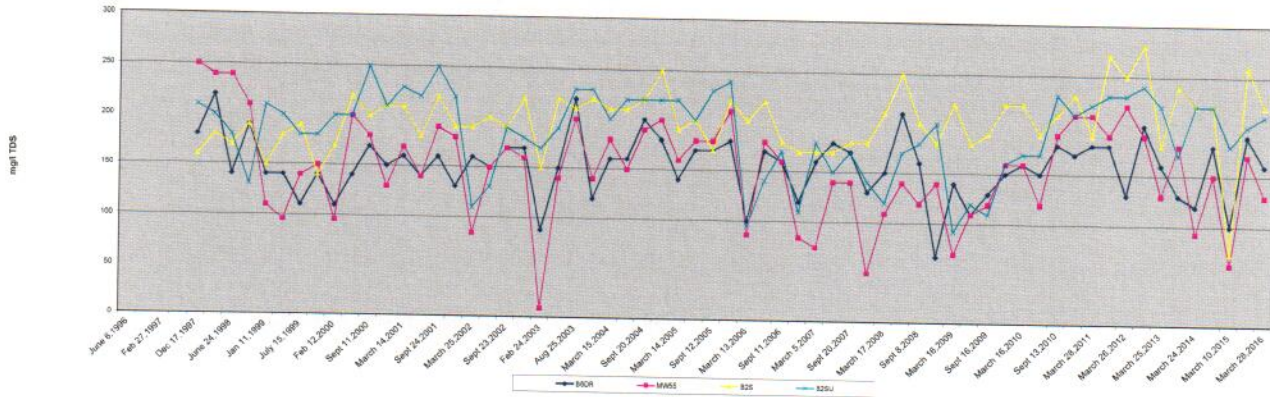
GROUP 1 WELLS TOTAL DISSOLVED SOLIDS



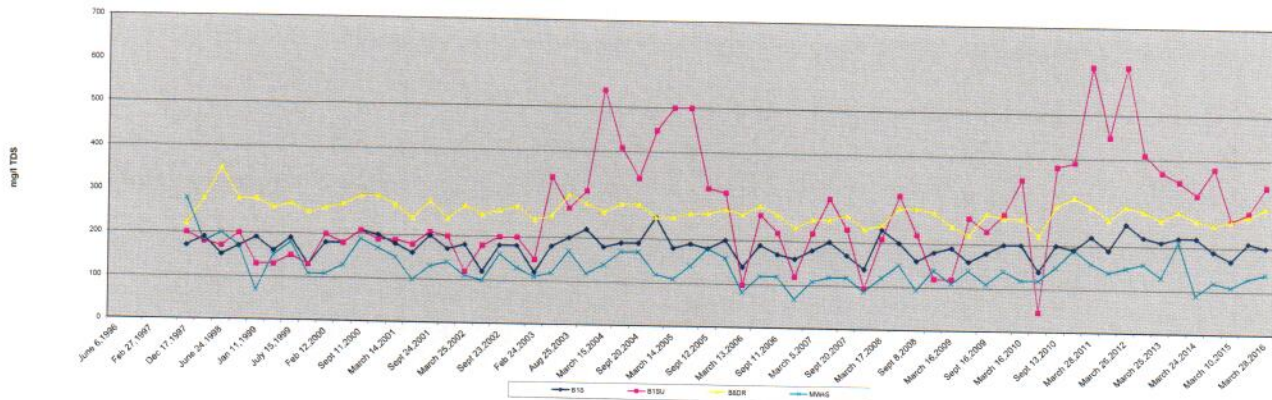
GROUP 2 WELLS TOTAL DISSOLVED SOLIDS



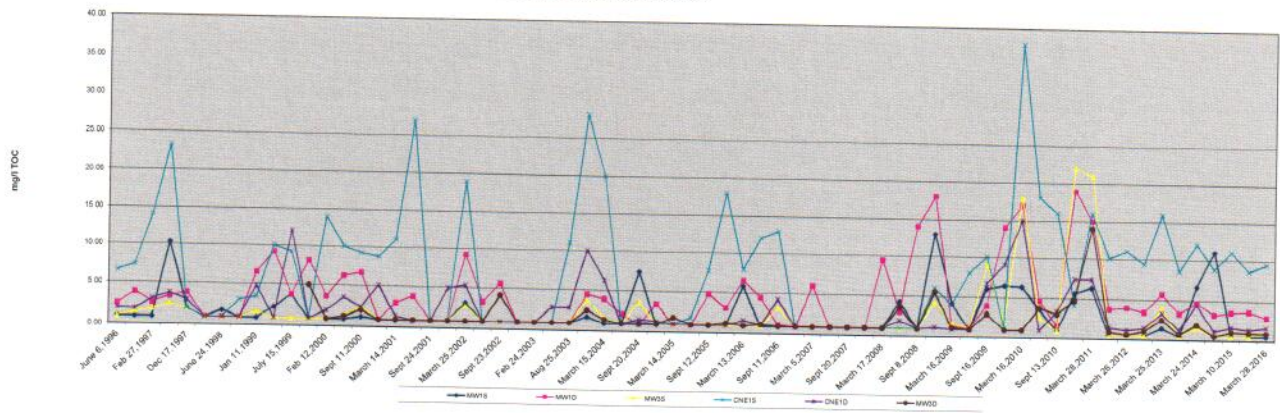
GROUP 3 WELLS TOTAL DISSOLVED SOLIDS



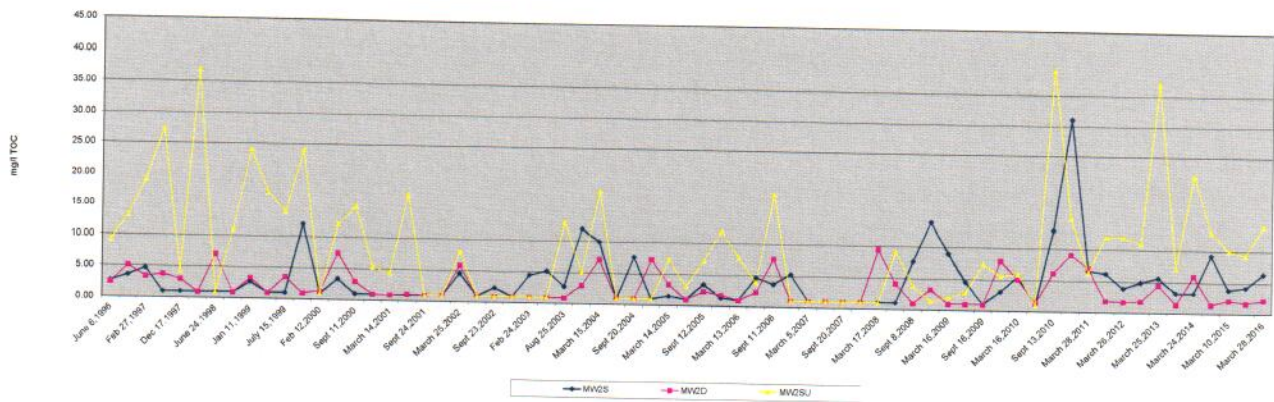
GROUP 4 WELLS TOTAL DISSOLVED SOLIDS



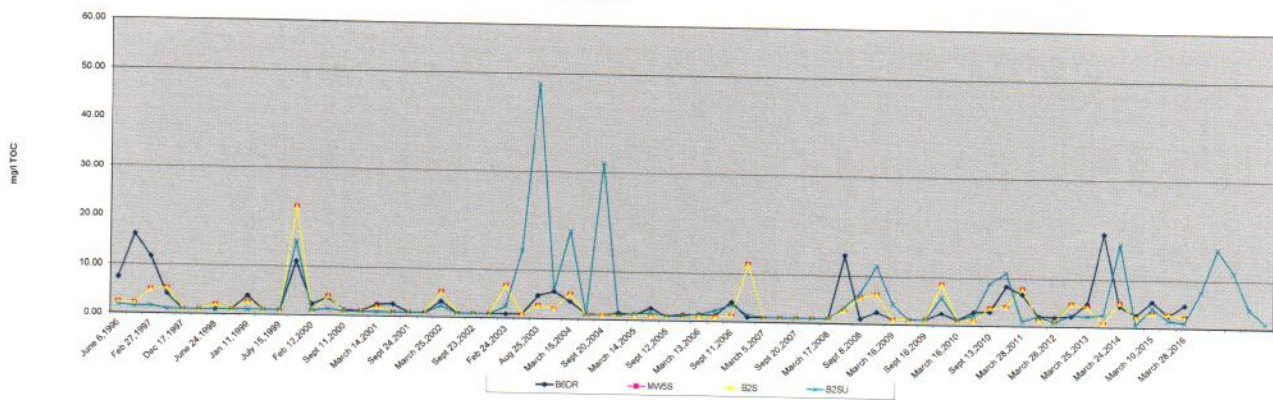
GROUP 1 WELLS TOTAL ORGANIC CARBON



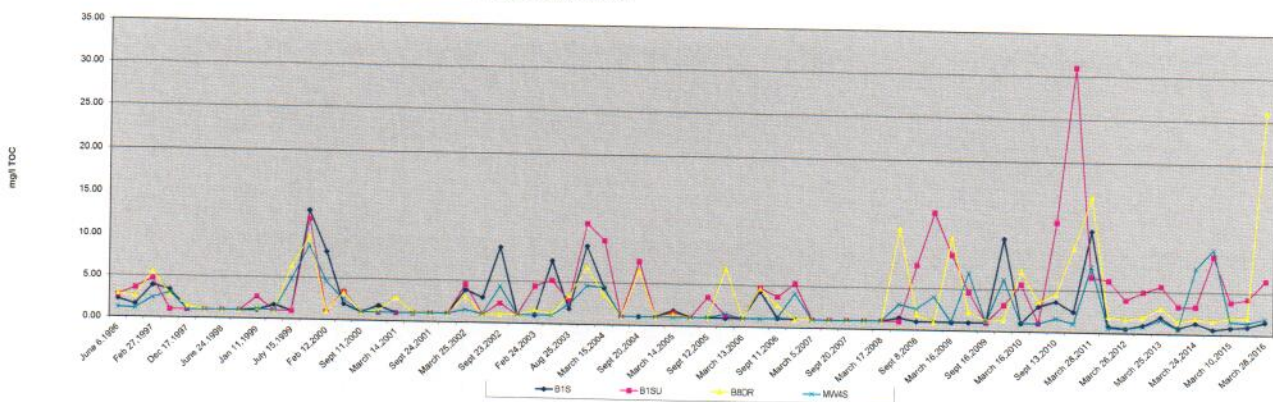
GROUP 2 WELLS TOTAL ORGANIC CARBON



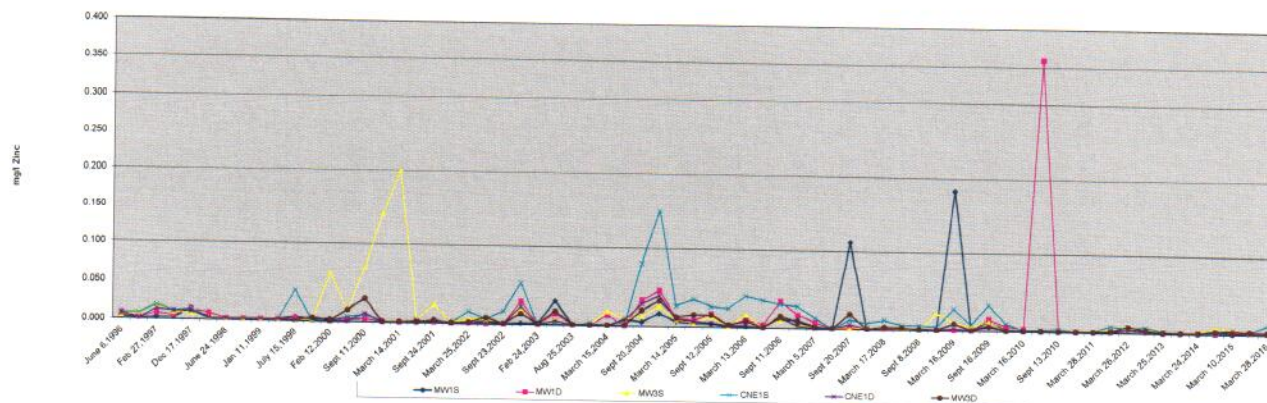
GROUP 3 WELLS TOTAL ORGANIC CARBON



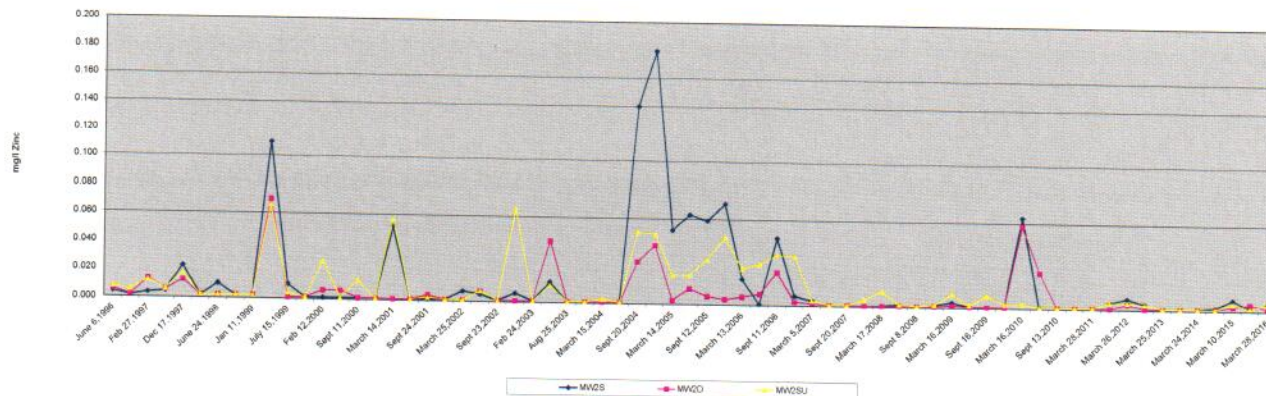
GROUP 4 WELLS TOTAL ORGANIC CARBON



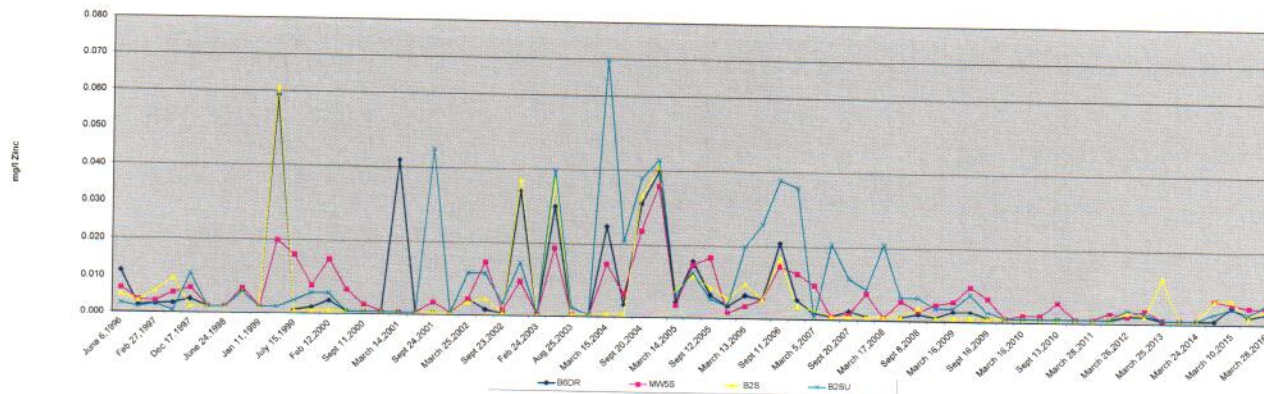
GROUP 1 WELLS DISSOLVED ZINC



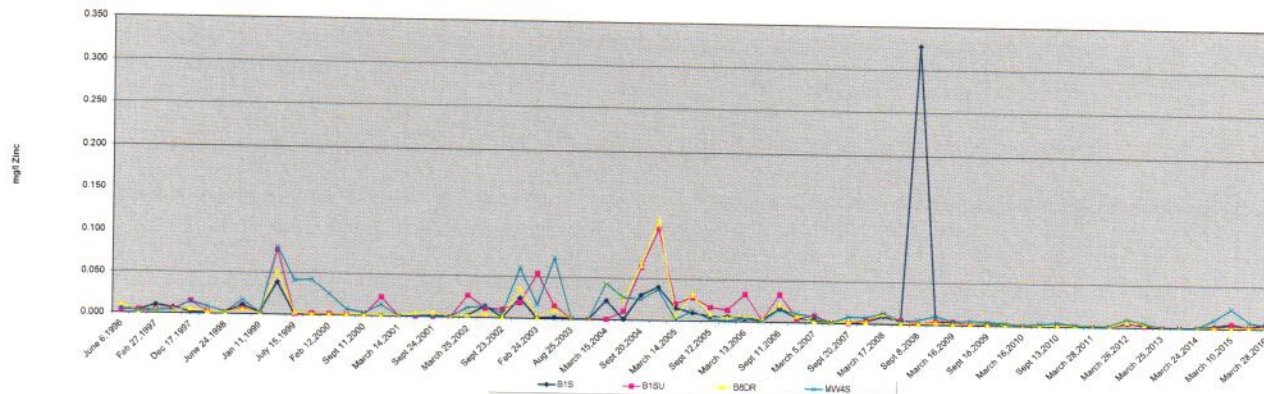
GROUP 2 WELLS DISSOLVED ZINC



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 December, 2015 and February, 2016.

Centralia Landfill Perimeter Probe Data

Date	Probe Number	Time	Barometric Pressure	Probe Pressure inches W. C.	% LEL	% Oxygen
12/22/2015	GP2	1010	29.62	0	0	20.9
12/22/2015	GP1	1015	29.62	0	0	20
12/22/2015	GP4A	1020	29.62	probe flooded		
12/22/2015	GP4B		29.62	probe flooded		
12/22/2015	GP15	925	29.62	0	0	8
12/22/2015	GP11	935	29.62	0	0	11.3
12/22/2015	GP10	940	29.62	0	0	20.9
12/22/2015	GP12	945	29.62	0	0	20.9
12/22/2015	GP9	950	29.62	0	0	19
12/22/2015	GP13	953	29.62	0	0	12
12/22/2015	GP8	955	29.62	0	0	18
12/22/2015	GP7	957	29.62	0	0	12.3
12/22/2015	GP14	1000	29.62	0	0	20.9
12/22/2015	GP5R	1005	29.62	0	0	20.9
2/16/2016	GP2	1041	30.1	0	0	20.9
2/16/2016	GP1	1038	30.1	probe flooded		
2/16/2016	GP4A	1033	30.1	probe flooded		
2/16/2016	GP4B	1034	30.1	probe flooded		
2/16/2016	GP15	926	30.1	0	0	20.9
2/16/2016	GP11	934	30.1	0	0	20.9
2/16/2016	GP10	943	30.1	0	0	20.9
2/16/2016	GP12	950	30.1	-1.5	0	18.5
2/16/2016	GP9	954	30.1	0	0	20.9
2/16/2016	GP13	1001	30.1	0	0	20.9
2/16/2016	GP8	1005	30.1	0	0	20.9
2/16/2016	GP7	1009	30.1	probe flooded		
2/16/2016	GP14	1019	30.1	0	0	20.9
2/16/2016	GP5R	1028	30.1	probe flooded		