

Rio Algom Mining LLC

January 21, 2019

CERTIFIED MAIL

Mr. Kurt Vollbrecht
New Mexico Environment Department
1190 St. Francis Dr.
P.O. Box 5469
Santa Fe, NM 87502

Re: Discharge Permit - 169
Semiannual Report, Second Half 2018
Ambrosia Lake Facility, Rio Algom Mining LLC

Dear Mr. Vollbrecht:

Attached is the *Rio Algom Mining LLC – Ambrosia Lake Facility Discharge Permit – 169 (DP-169) Semiannual Report, Second Half 2018*, which presents the results of monitoring and sampling activities at the Ambrosia Lake site as required by DP-169.

An electronic copy of the report has been delivered by email and is also included, along with analytical results, in the accompanying disc (NMED copy only). If you have any questions or need additional information, please call me at (916) 947-7637.

Sincerely,



Sandra L. Ross
Site Manager

Attachment: As stated

cc: NRC (MD) – License SUA-1473, Docket No. 40-8905

RIO ALGOM MINING LLC – AMBROSIA LAKE FACILITY DISCHARGE PERMIT – 169 (DP-169)

Semiannual Report, Second Half 2018

Prepared for:

Rio Algom Mining, LLC
P.O. Box 218
Grants, New Mexico 87020

Prepared by:



6000 Uptown Boulevard NE, Suite 220
Albuquerque, New Mexico 87110

January 21, 2019

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ACRONYMS AND ABBREVIATIONS

ACL	alternate concentration limit
DP-169	Discharge Permit – 169
INTERA	INTERA Incorporated
LTSM	long-term surveillance and maintenance boundary
Maxim	Maxim Technologies Incorporated
NMED	New Mexico Environment Department
NRC	Nuclear Regulatory Commission
pCi/L	picoCuries per liter
PQL	practical quantitation limit
RAML	Rio Algom Mining LLC
Site	Rio Algom Mining LLC Ambrosia Lake facility
SOP	standard operating procedure
SUA-1473	Source Materials License-1473
TDS	total dissolved solids
Quivera	Quivera Mining Company

1.0 REVIEW OF DISCHARGE PERMIT – 169

This report presents the results of monitoring and sampling activities for the second half of 2018 for the Rio Algom Mining LLC (RAML) Ambrosia Lake facility (Site) as required under New Mexico Environment Department (NMED) Discharge Permit – 169 (DP-169). DP-169 was approved on November 15, 1995, and establishes monitoring requirements for the alluvium near the former Ambrosia Lake mill. DP-169 requires semiannual monitoring of alluvial wells for depth to water, total depth, chloride, sulfate, nitrate, and total dissolved solids (TDS). In addition, it requires semiannual and annual reporting to the NMED. In a meeting between RAML and NMED on May 4, 2015, NMED approved eliminating the annual report by including the annual reporting requirements in each of the semiannual reports.

Requirements for annual and semiannual reporting per the July 12, 2000 DP-169 Renewal Request (Quivira Mining Company [Quivira], 2000) are listed below with an explanation relative to current conditions at the Site:

1. Analytical results of the 43 alluvial wells for chloride, sulfate, and nitrate.
 - Analytical results for all DP-169 alluvial wells that are still in service and meet the requirements of RAML's Groundwater Monitoring Standard Operating Procedure (SOP) have been included in **Appendix A**.
2. Time versus concentration plots depicting chloride, sulfate and TDS concentrations for all 43 alluvial wells.
 - Time versus concentration plots for chloride, sulfate, and TDS concentrations in all active DP-169 alluvial wells are included in **Appendix B**.
3. Monthly analysis of the reservoir water for chloride, sulfate, and TDS.
 - Monthly analysis of the reservoir is no longer applicable as the reservoir has been reclaimed.
4. Analytical results required under the Nuclear Regulatory Commission (NRC)-approved Corrective Action Program.
 - The NRC-approved Corrective Action Program was terminated in 2006, when Alternate Concentration Limits (ACLs) were approved. Groundwater monitoring for the ACL well network at the Site occurs semiannually. Reports containing analytical results are produced semiannually and submitted to both NRC and NMED. Analytical results from those monitoring events are submitted under separate cover and will not be included in this report.

5. Maps depicting the water level and TDS isopleths for the alluvium.
 - Maps with groundwater elevations and TDS concentrations in alluvial wells are included in **Appendices C and D**.
6. Flume discharge volumes.
 - Flume discharge volumes are no longer applicable due to reclamation.
7. Analytical data on computer disc.
 - Laboratory data in CSV and PDF format for the second half of 2018 are included on compact disc with this submittal (**Appendix E**).

2.0 NRC ACLS

The Source Materials License SUA-1473 (SUA-1473) specifies the ACLs for alluvial groundwater and the alluvial groundwater monitoring network for determining compliance with the ACLs. Although no DP-169 monitoring wells are included in SUA-1473, the ACLs provide a point of comparison for results from DP-169 wells. The ACLs address byproduct material seepage from the tailings disposal area, including but not limited to chloride, nitrate, sulfate, and TDS. The alluvial ACLs were established through review and consultation between NRC, NMED, and RAML. Alluvial ACLs are presented in **Table 1**.

Table 1 NRC-Approved ACLs for Alluvium

Constituent	ACL
Molybdenum	176 mg/L
Nickel	98 mg/L
Selenium	49 mg/L
Natural Uranium	23 mg/L
Chloride	7,110 mg/L
Nitrate	351 mg/L
Sulfate	12,000 mg/L
TDS	26,100 mg/L
Gross Alpha	8,402 pCi/L
Lead-210	1,247 pCi/L
Radium-226 & 228	3,167 pCi/L
Thorium-230	13,627 pCi/L

Notes:

mg/L = milligrams per liter

pCi/L = picoCuries per liter

3.0 ALLUVIAL GROUNDWATER MONITORING

Semiannual groundwater monitoring in support of DP-169 was performed in August of 2018. **Appendix A** presents the DP-169 groundwater monitoring data for the second half of 2018. Neither DP-169 nor SUA-1473 specify standards that must be met in the DP-169 monitoring wells. However, DP-169 analytical results are less than the non-hazardous ACLs in the SUA-1473 license.

Appendix B contains time-versus-concentration plots for DP-169 wells. **Appendix C** contains a map showing alluvial monitoring well locations with the most recent groundwater elevation measurements. Modeling predictions projected that most of the groundwater in the alluvium will dissipate within 65 years (Maxim, 2001). Decreasing groundwater elevation measurements continue to support this prediction. **Appendix D** contains a map with TDS concentrations plotted for each sampling location. **Appendix E** is the electronic data for the second half of 2018.

4.0 GROUNDWATER MONITORING IMPROVEMENTS

Several alluvial monitoring wells have been replaced in accordance with the NMED-approved *Monitoring Well Replacement Work Plan*. The well replacement project began in the fall of 2012, and field work was completed on February 2, 2013. The well replacement project is summarized in the Monitoring Well Replacement Report (INTERA Incorporated [INTERA], 2013).

In addition to conducting the well replacement program, dedicated bladder pumps have been installed in the alluvial wells that contain enough water to support that method of sample collection. **Appendix F** is a map showing the DP-169 monitoring wells and their status.

5.0 RECLAMATION ACTIVITIES PERFORMED DURING THE SECOND HALF OF 2018

No physical reclamation activities were performed during the second half of 2018. However, additional radiological characterization of soils within the proposed long-term surveillance and monitoring boundary (LTSM) was conducted during the reporting period. The characterization results are being used to identify areas which may require additional reclamation work and to support preparation of the Final Status Survey that will be submitted to the NRC.

6.0 REFERENCES

INTERA Incorporated (INTERA), 2013. Monitoring Well Replacement Report, Rio Algom Mining LLC. May 2013

Maxim Technologies, Inc. (Maxim), 2001. Application for Alternate Concentration Limits for the Alluvial Materials, Quivira Mill Facility Ambrosia Lake, New Mexico.

Quivira Mining Company (Quivira), 2000. Discharge Plan – 169 Discharge Plan Renewal Application. Submitted to New Mexico Environment Department Groundwater Section. July 12.

APPENDIX A

Analytical Results for DP-169 Alluvial Wells, Second Half 2018

Appendix A

Analytical Results and Field Measurements for DP-169 Monitoring Wells, Second Half 2018

Rio Algom Mining LLC - Ambrosia Lake Facility Discharge Permit - 169 (DP-169)

Semiannual Report

Monitoring Well	Sample Date	Status	Depth to Water (ft)	Total Depth (ft)	Specific Cond. (uS/cm)	Temp. (°C)	pH	Cl (mg/l)	NO ₃ /NO ₂ (as N) (mg/l)	SO ₄ (mg/l)	TDS (mg/l)
30-03	3/19/2013	OOS	Plugged and abandoned during 2012/2013 Well Replacement Project								
30-04 R	8/13/2018		60.58	72.27	6323	13.52	6.91	641	7.9	3350	5510
30-46	8/8/2018	DRY	--	38.15	--	--	--	--	--	--	--
30-47	8/13/2018		61.72	77.32	4764	12.43	6.66	743	0.03	407	3940
30-48*	8/13/2018		64.15	73.35	4761	13.94	4.06	649	0.02	2490	4300
30-49	8/13/2018	DRY	--	67.40	--	--	--	--	--	--	--
30-53	8/8/2018	DRY	--	50.01	--	--	--	--	--	--	--
30-68 R	8/7/2018	DRY	--	66.12	--	--	--	--	--	--	--
31-05 R	8/13/2018		55.73	66.23	7049	12.71	6.82	577	0.98	3220	6240
31-61 ALL	8/8/2018		17.64	29.02	15727	12.54	6.16	2010	7.46	6490	14100
31-63	7/17/2007	OOS	Removed from service when the interceptor trench was discontinued								
31-65 ALL	8/10/2018		15.54	11.25	16759	11.25	5.95	1980	0.24	7300	15500
31-70 R	8/13/2018		47.69	81.12	7115	12.61	6.79	860	50.1	2280	5840
31-71	8/13/2018		52.98	63.64	5012	12.71	7.22	551	0.07	2180	4270
32-01 R	8/10/2018		22.74	60.9	20375	12.6	5.44	2660	0.2	11200	22900
32-02 R	8/13/2018		53.98	70.34	8362	13.1	6.72	694	6.15	4510	8110
32-41	8/10/2018		47.16	59.78	6886	13.55	4.14	1340	0.02	1010	3430
32-42	8/10/2018	DRY	--	21.87	--	--	--	--	--	--	--
32-43N	8/10/2018		29.48	76.21	10642	12.73	6.36	2170	0.44	3900	10600
32-50 TRB-R**	8/14/2018		57.49	88.64	6472	12.66	6.89	586	3.62	2840	5880
32-51	8/14/2018		38.88	73.58	5289	12.77	7.27	456	4.92	2530	4880
32-52	8/16/2018		37.76	52.7	3974	17.35	5.64	236	0.02	1690	3340
32-56	8/14/2018	DRY	--	57.45	--	--	--	--	--	--	--
32-57	8/14/2018	INW	50.37	53	--	--	--	--	--	--	--
32-58	8/8/2018		21.8	34.51	16985	11.72	6.57	3450	35.7	5680	15000
32-59 ALL	8/8/2018		24.49	28.35	5280	15.39	7.41	547	2.39	1770	4530
32-60	8/8/2018		15.75	27.71	14943	15.99	6.22	2360	10.6	4940	13300
32-69	8/10/2018		59.7	78.31	12850	12.86	6.45	1940	35.5	5030	12100
32-72	8/9/2018		25.62	--	11607	12.76	6.14	256	0.21	8730	14900
5-01	8/7/2018		32.58	43.5	4579	17.14	7.23	165	7.06	2950	4270
5-02	8/17/2018		31.26	***	6407	21.13	7.15	1140	0.14	1560	4560
5-03 ALL-R	8/7/2018		29.1	55.8	5182	13.36	7.04	604	0.46	2080	4430
5-04 ALL	8/7/2018		27	60.13	6030	12.42	7.98	970	0.02	2610	5440
5-08 ALL-R	8/7/2018		39.03	76.52	4034	13.07	7.4	164	21.6	1940	3810
5-73 ALL-R	8/7/2018		23.94	35.65	8241	12.12	6.77	1520	5.24	1630	6510
AW-1	8/13/2018		60.56	81.57	7835	12.64	6.71	733	4.66	4340	7310
AW-2	8/14/2018		39.52	81.8	5886	13.07	7.12	401	4.7	2610	5580
C-3	6/13/1995	OOS	Plugged and abandoned to facilitate site reclamation activities								
D-4	2/27/2006	OOS	Plugged and abandoned to facilitate site reclamation activities								
E-5	2/27/2006	OOS	Plugged and abandoned to facilitate site reclamation activities								
MW-24 ALL	8/7/2018	INW	50.16	50.37	--	--	--	--	--	--	--
S-12	8/9/2018		16.39	27.42	15090	12.27	6.37	2820	1.21	4120	12700
S-9	8/8/2018		12.15	24.63	11886	13.72	8.48	2320	0.04	3960	9930

Notes:

Reported wells are in the alluvium formation.

"R" indicated wells were replaced in 2012/2013 during the Monitoring Well Replacement Project.

"ALL" are alluvial wells also reported to the U.S. NRC in accordance with the Alternative Concentration Limit (ACL) criteria.

"<" indicates values are below the minimum detection limit (MDL).

"B" indicates that the analyte concentration was detected at a value between the MDL and the practical quantitation limit (PQL).

"OOS" indicates well is out of service

"DRY" indicates the well is dry

"INW" indicates the well contains insufficient water for sampling

* Grab sample (Failed 90% rule in 2nd Half 2015 with 0% recharge in 24 hr).

** 32-50 TRB-R is screened across the TRB-Alluvial contact.

*** Could not tag bottom due to obstruction or soft mud

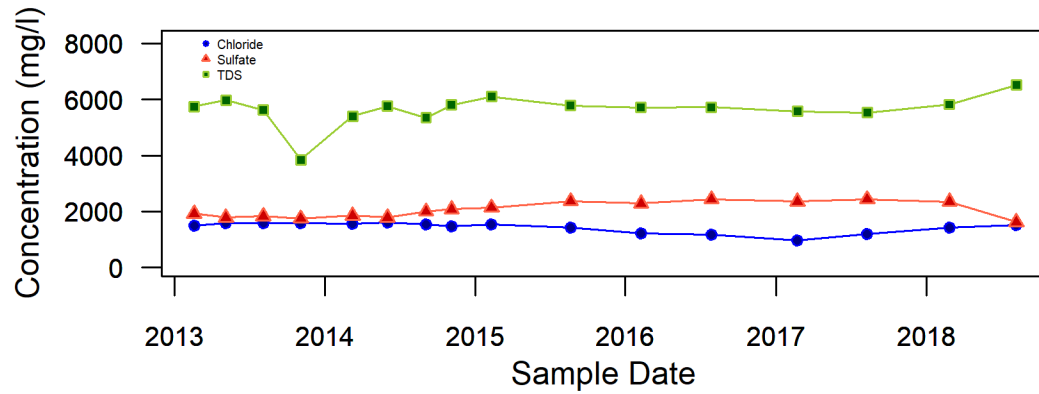
~ Not measured due to pH meter malfunction, result from 1H 2016

APPENDIX B

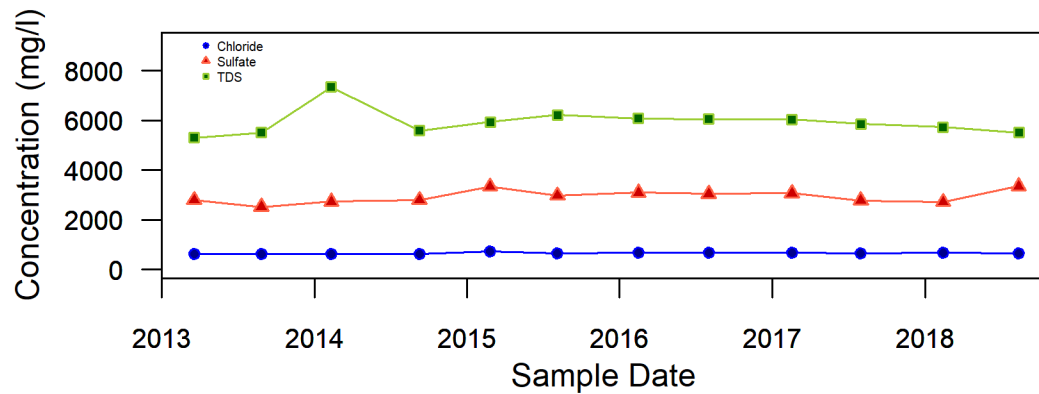
Time Concentration Plots for DP-169 Alluvial Wells, Second Half of 2018

APPENDIX B
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Rio Algom Mining LLC – Ambrosia Lake Facility Discharge Permit – 169 (DP-169)
Semiannual Report, Second Half 2018

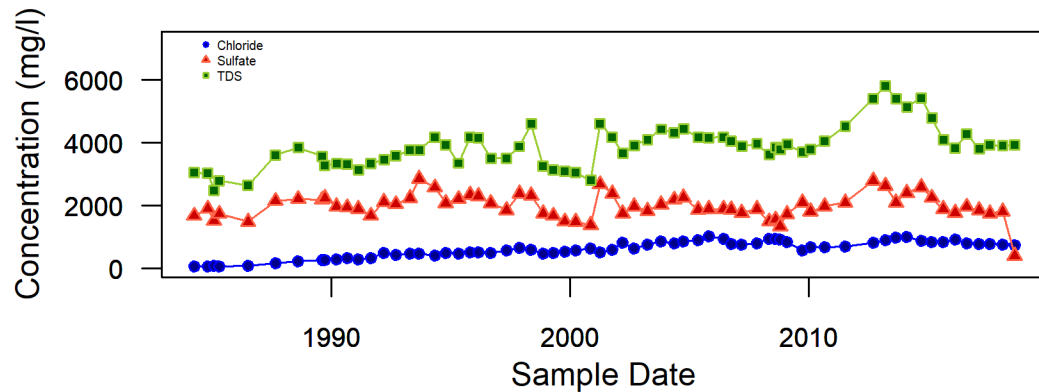
Water Quality in 5-73 ALL-R



Water Quality in 30-04 R

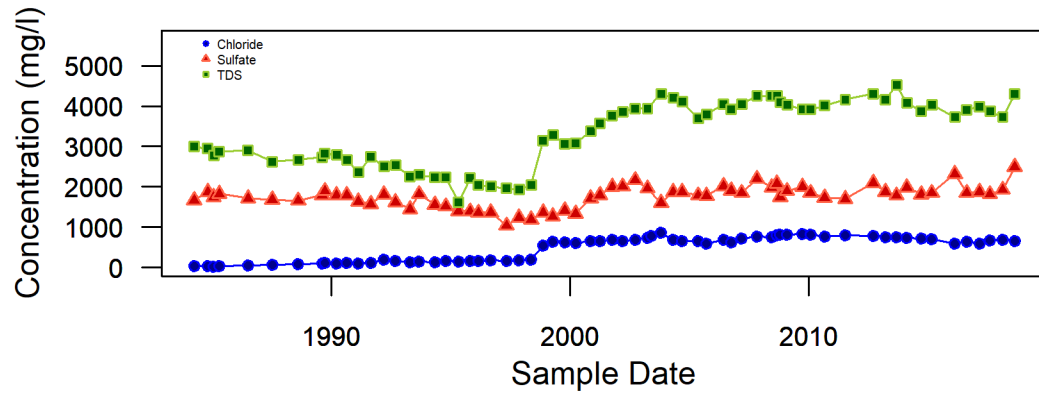


Water Quality in 30-47

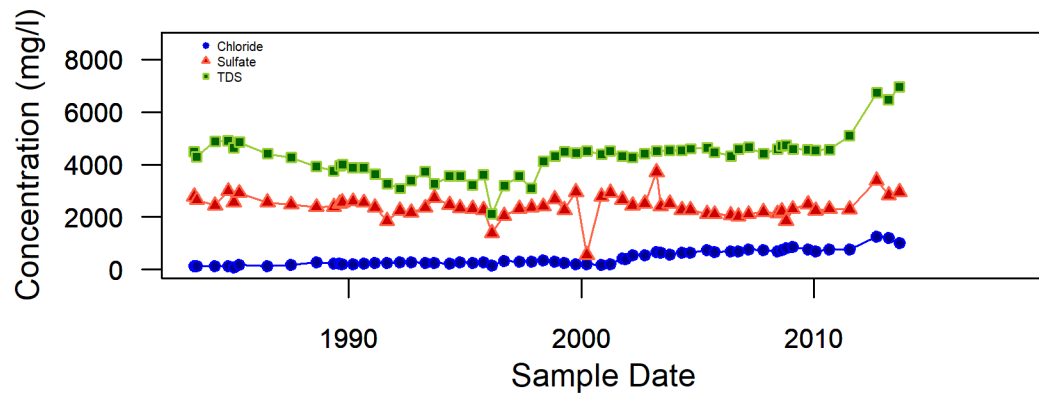


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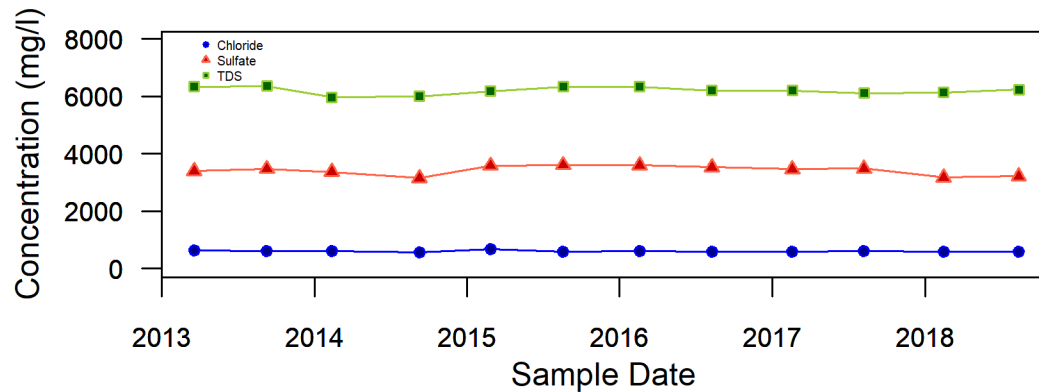
Water Quality in 30-48



Water Quality in 30-49

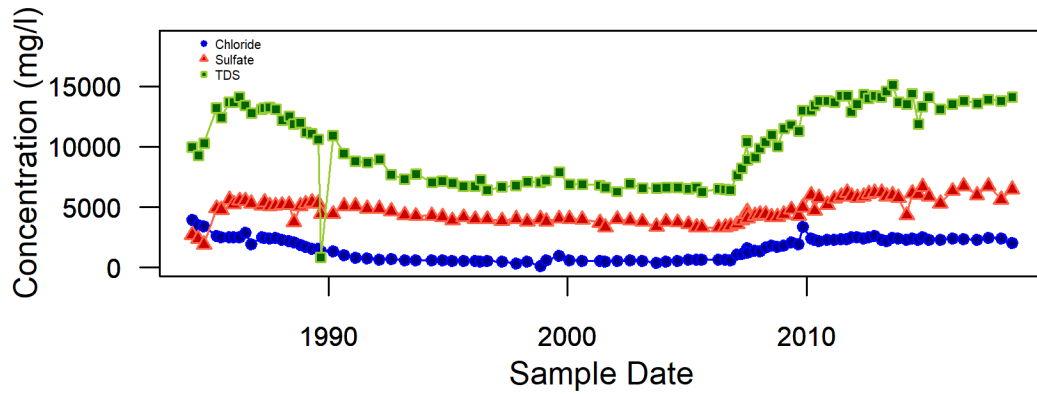


Water Quality in 31-05 R

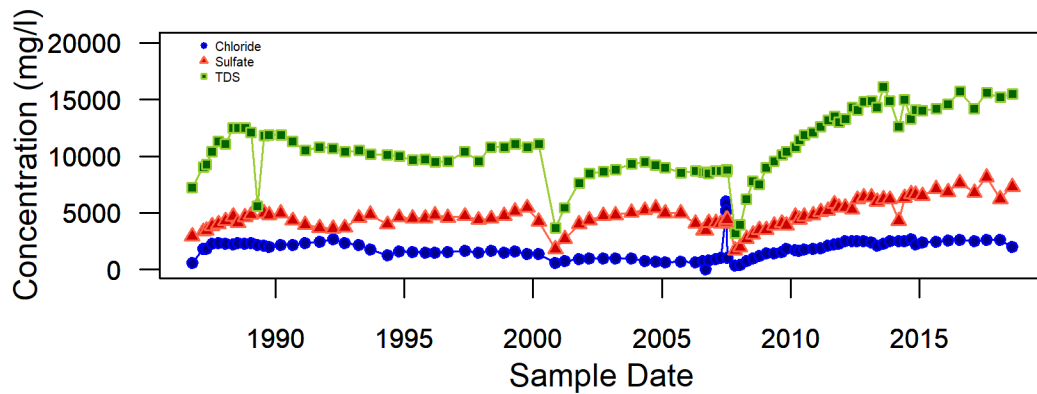


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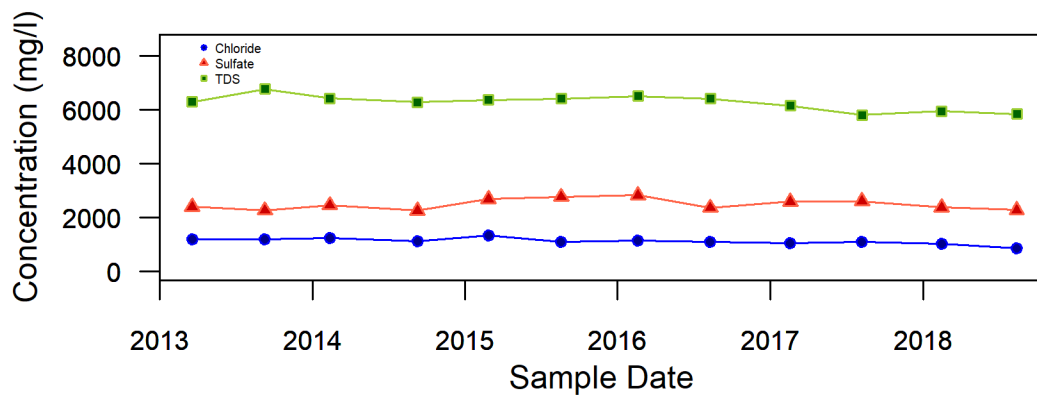
Water Quality in 31-61 ALL



Water Quality in 31-65 ALL

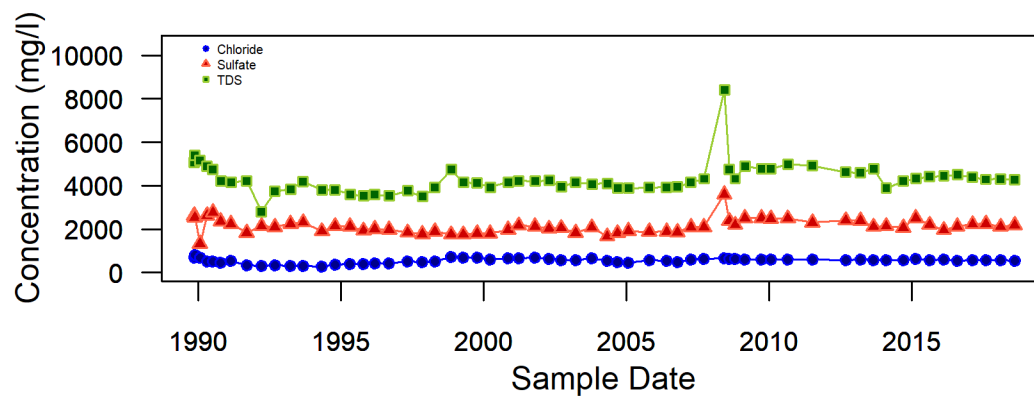


Water Quality in 31-70 R

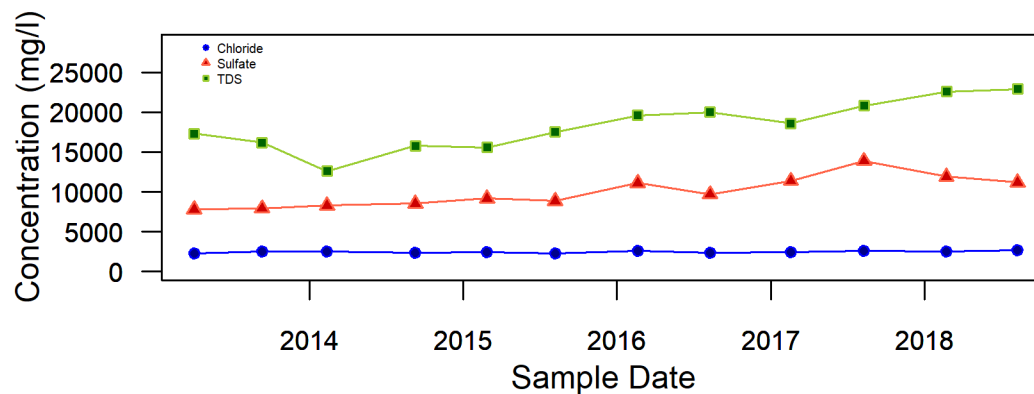


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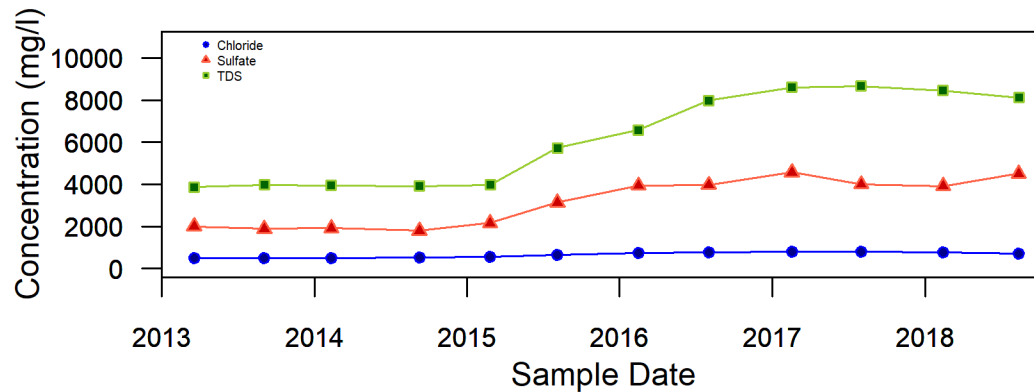
Water Quality in 31-71



Water Quality in 32-01 R

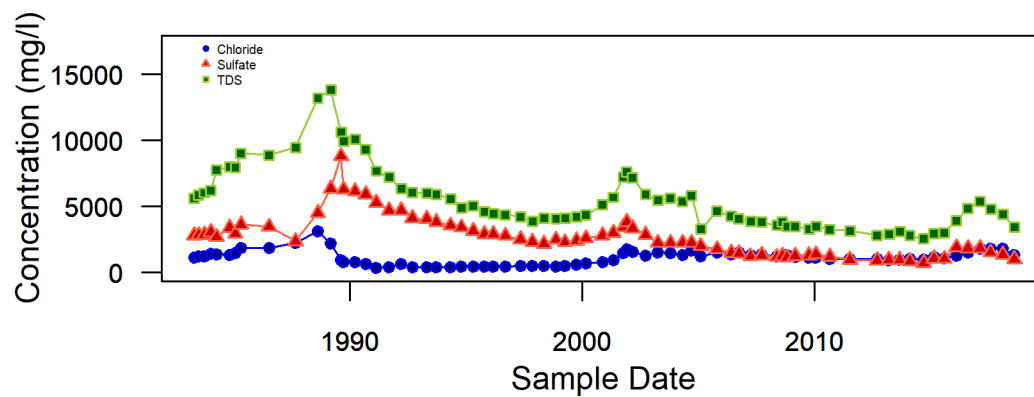


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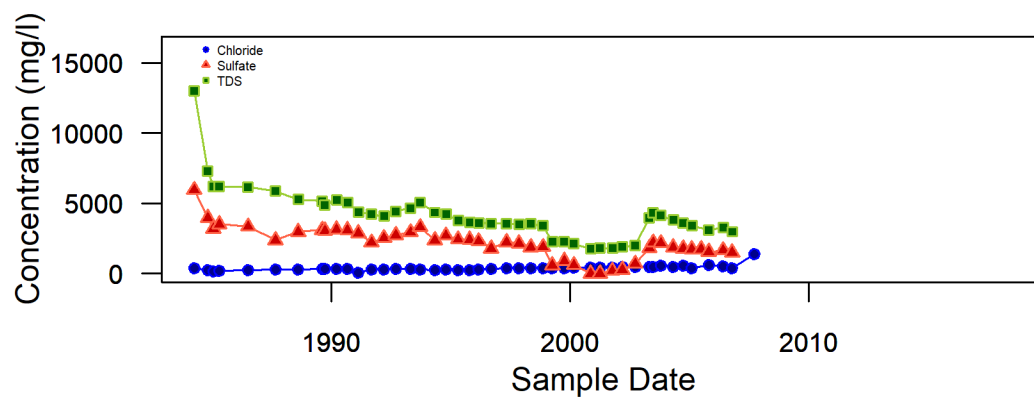


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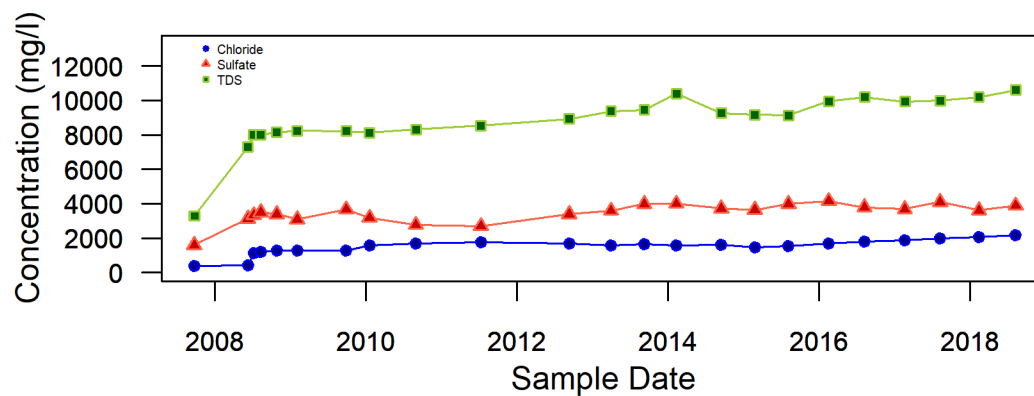
Water Quality in 32-41



Water Quality in 32-42

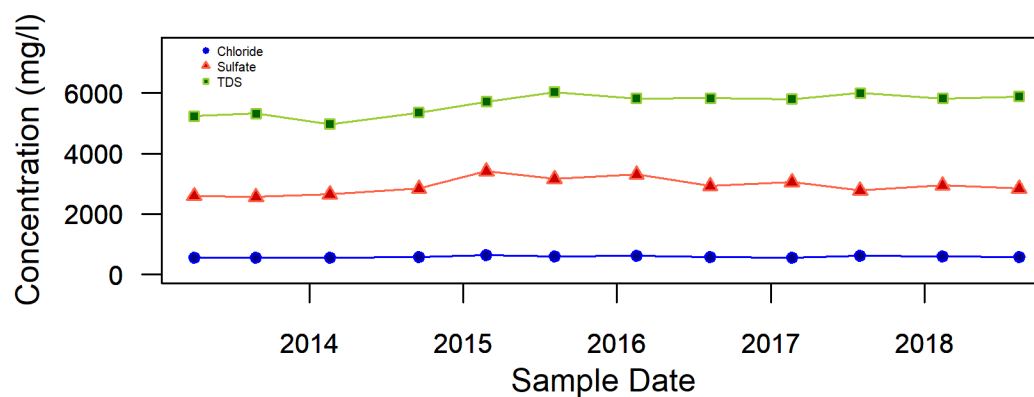


Water Quality in 32-43N

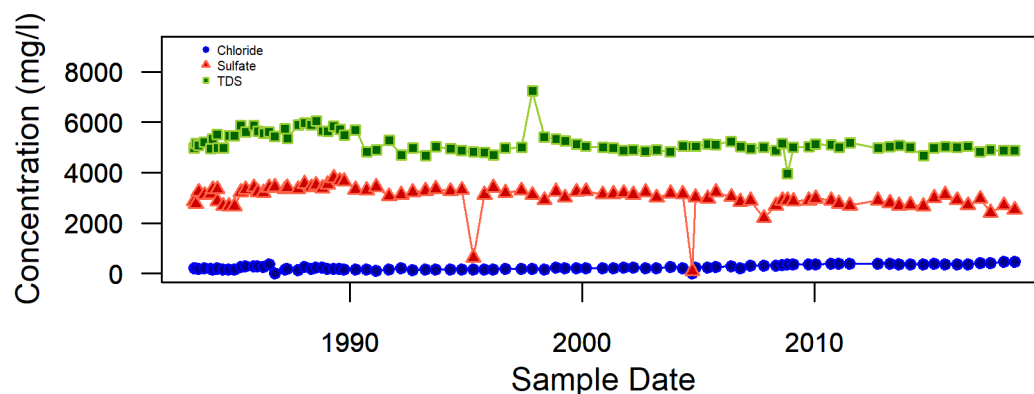


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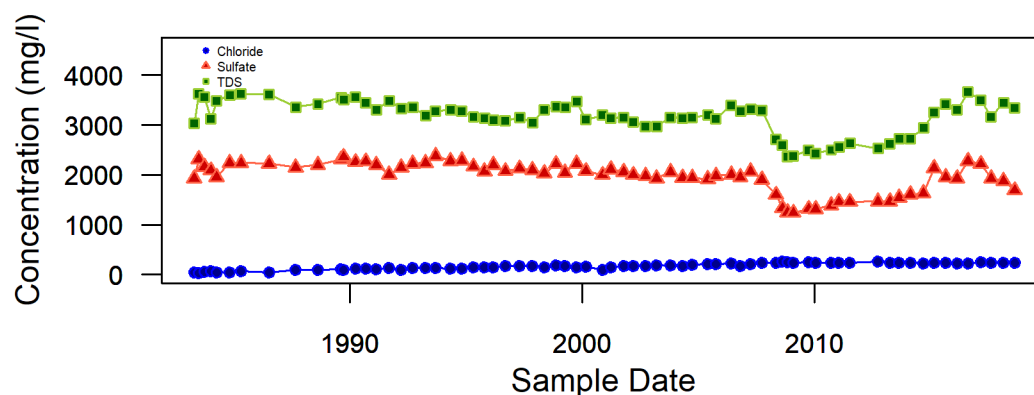
Water Quality in 32-50 TRB-R



Water Quality in 32-51

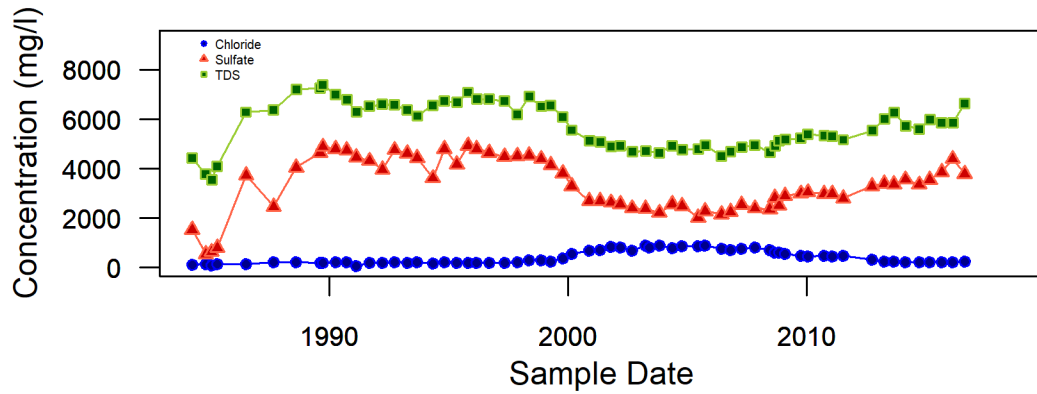


Water Quality in 32-52

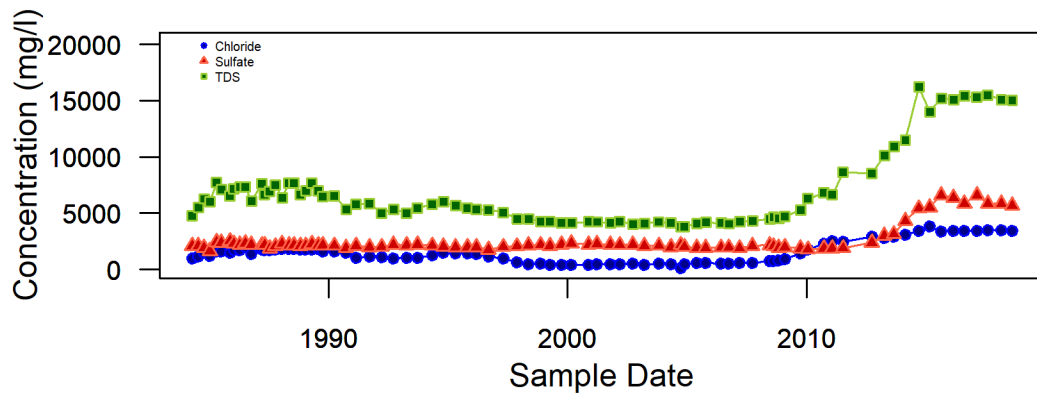


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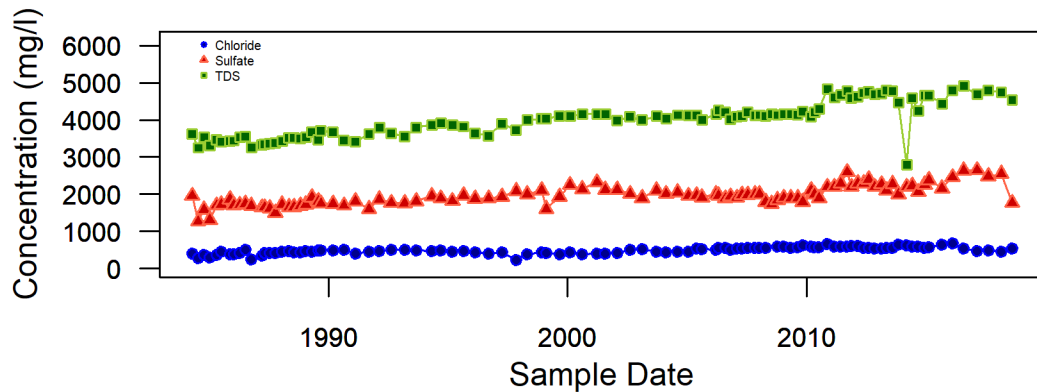
Water Quality in 32-57



Water Quality in 32-58

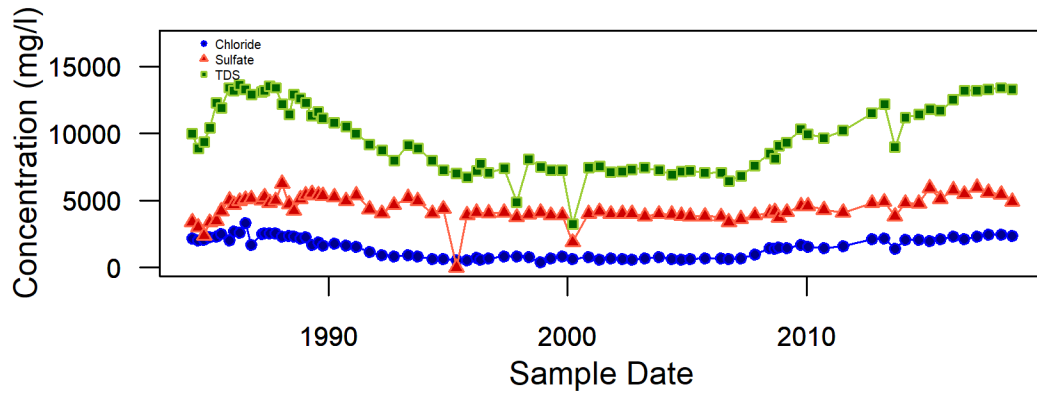


Water Quality in 32-59 ALL

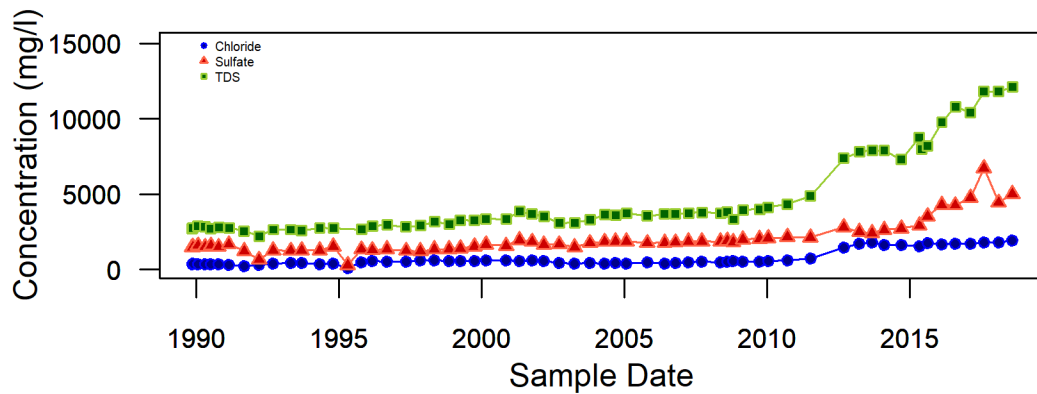


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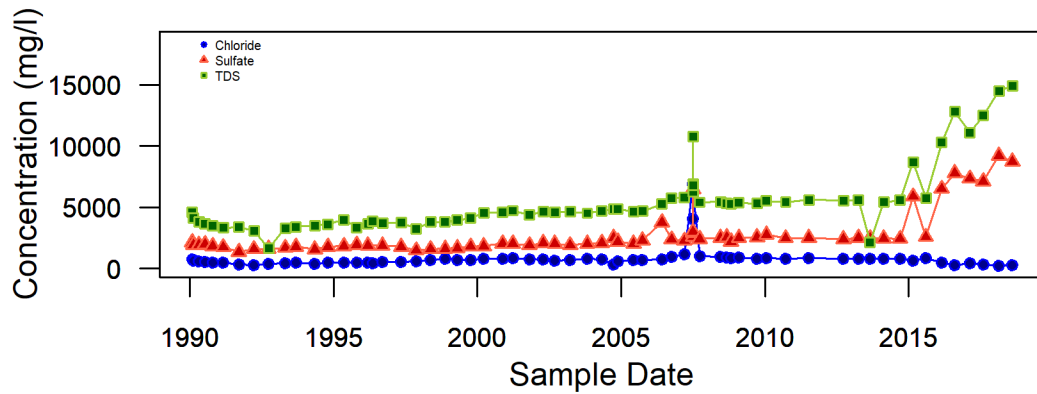
Water Quality in 32-60



Water Quality in 32-69

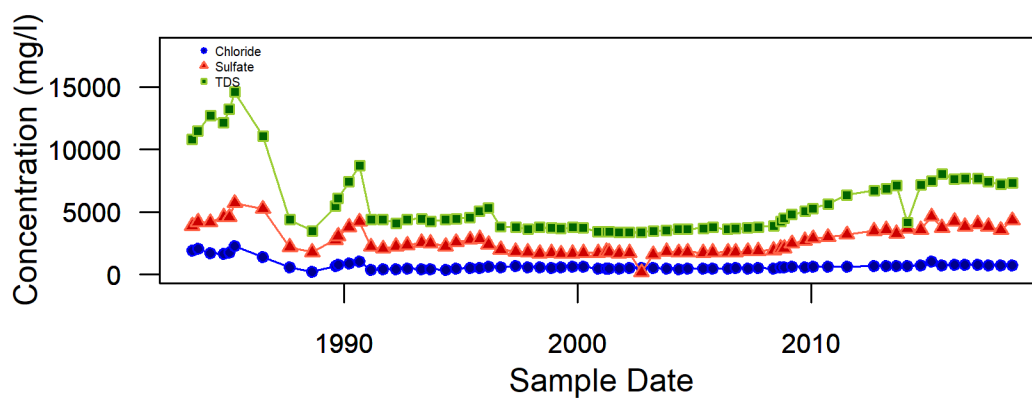


Water Quality in 32-72

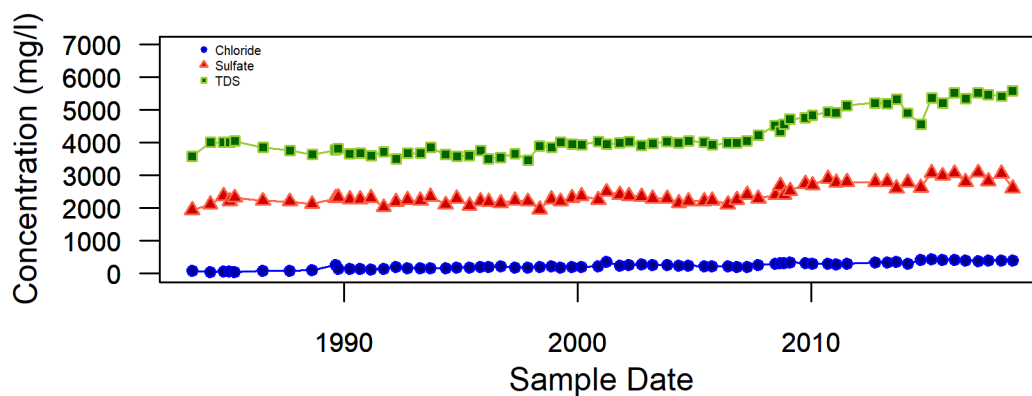


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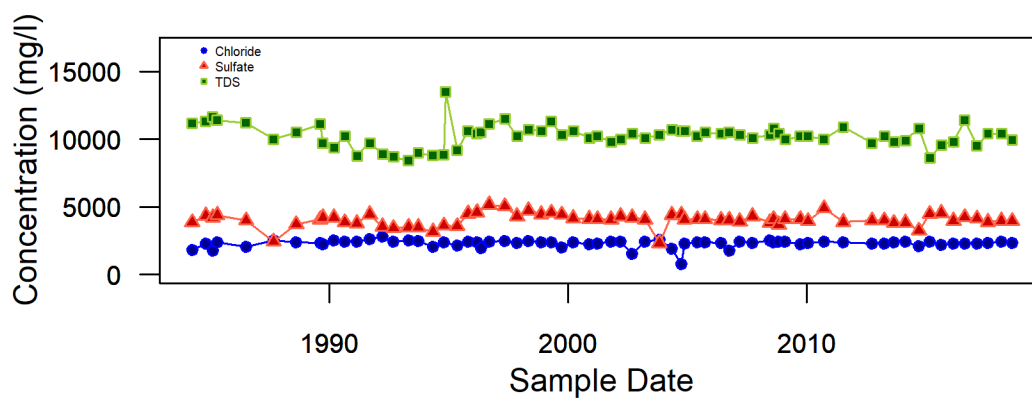
Water Quality in AW-1



Water Quality in AW-2

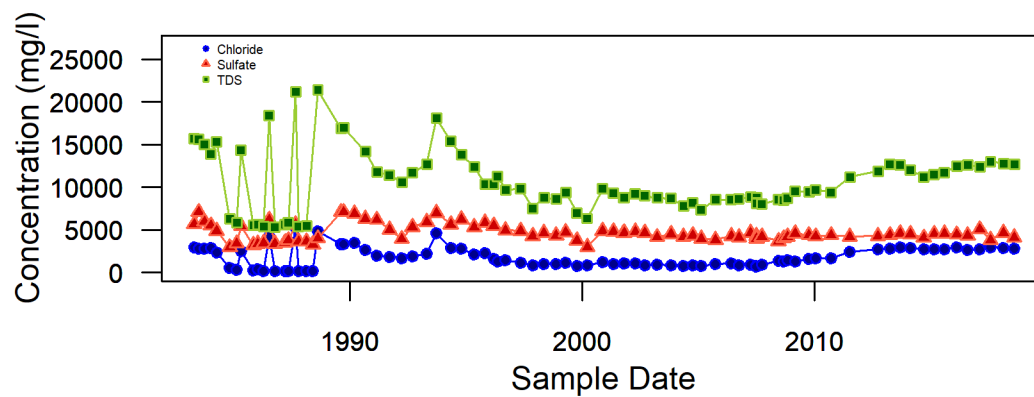


Water Quality in S-9

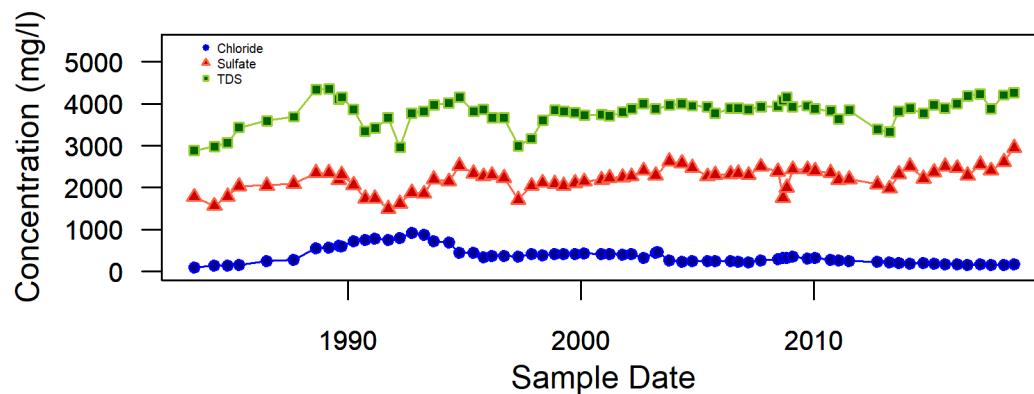


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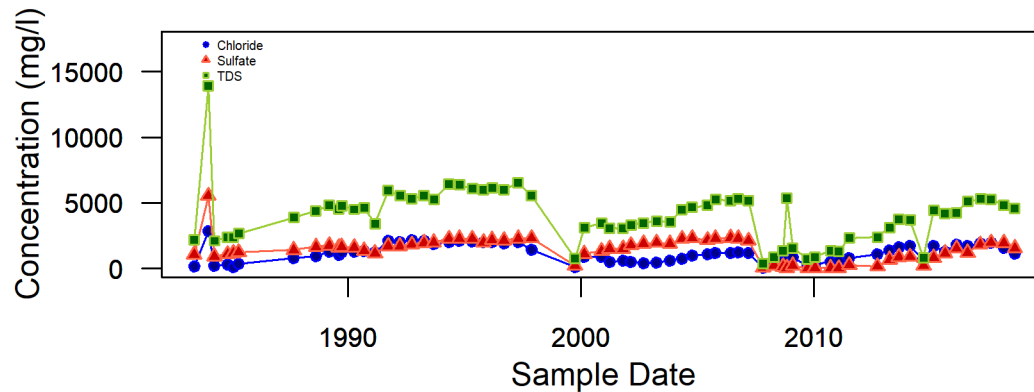
Water Quality in S-12



Water Quality in 5-01

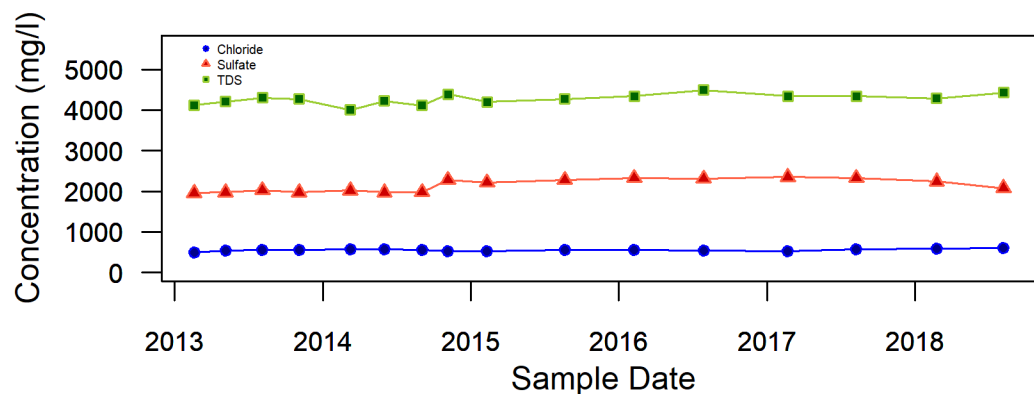


Water Quality in 5-02

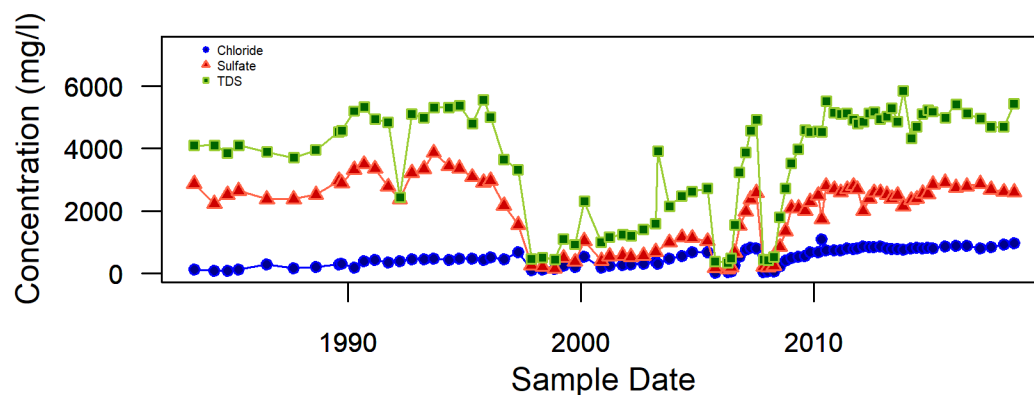


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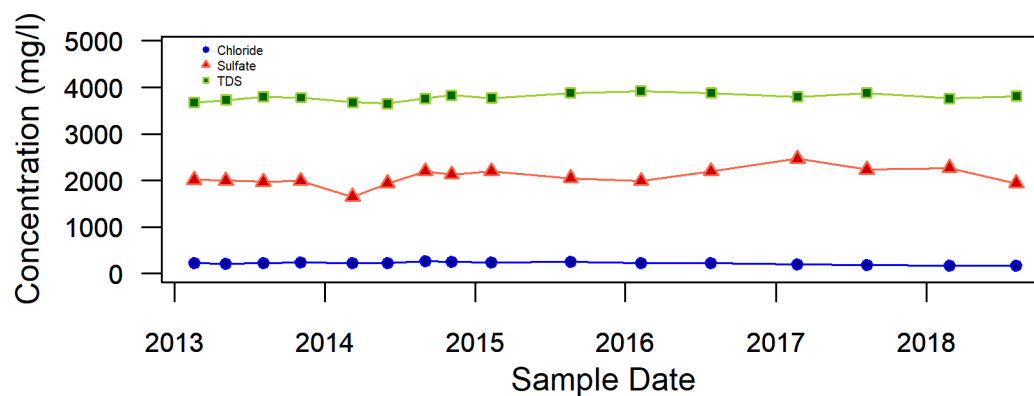
Water Quality in 5-03 ALL-R



Water Quality in 5-04 ALL

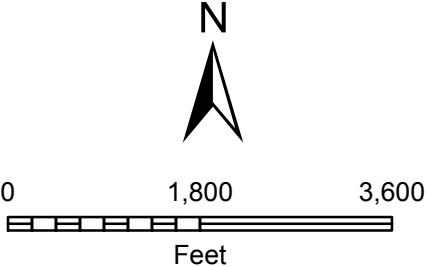
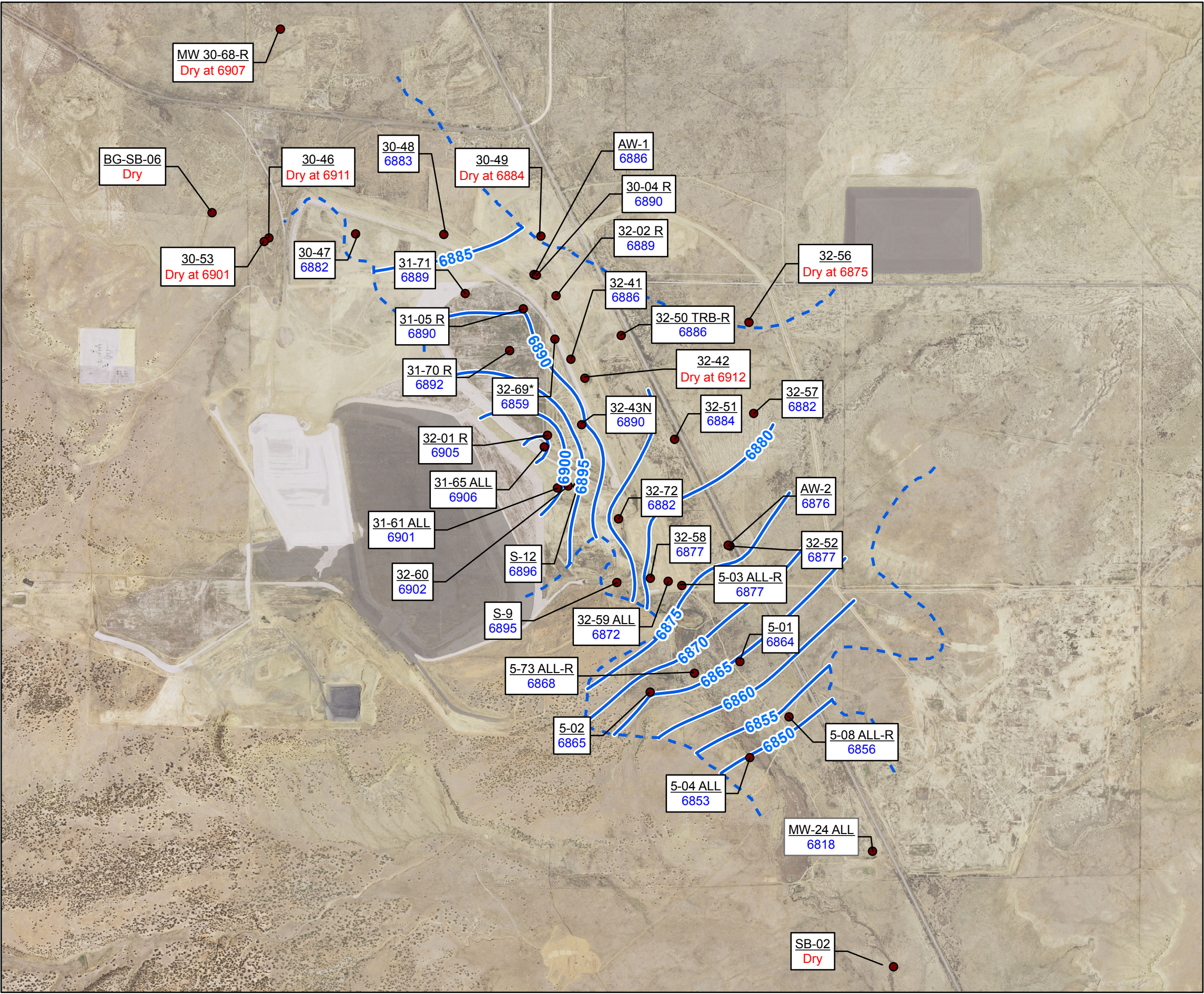


Water Quality in 5-08 ALL-R



APPENDIX C

Alluvial Groundwater Elevation Contour Map



Aerial – NAIP imagery, dated 2016

Legend

- Alluvial Monitoring Well Location
- Alluvial Groundwater Surface Elevation (ft amsl)
- - - Estimated Boundary of Saturated Alluvium

Well ID

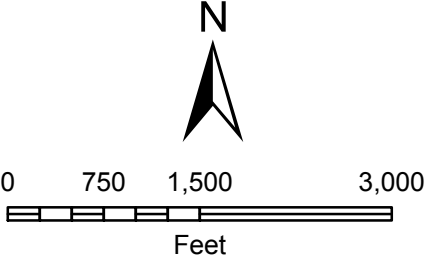
Groundwater Surface Elevation (ft amsl)

Notes:
All data collected 2nd half, 2018.
* = Water level at well not used for contouring due to inaccurate TOC survey.

Appendix C
Alluvial Groundwater Elevation
Contour Map
Rio Algom DP-169 Semi-Annual Report

APPENDIX D

Total Dissolved Solids Iso-Contour Map



Aerial – NAIP imagery, dated 2016

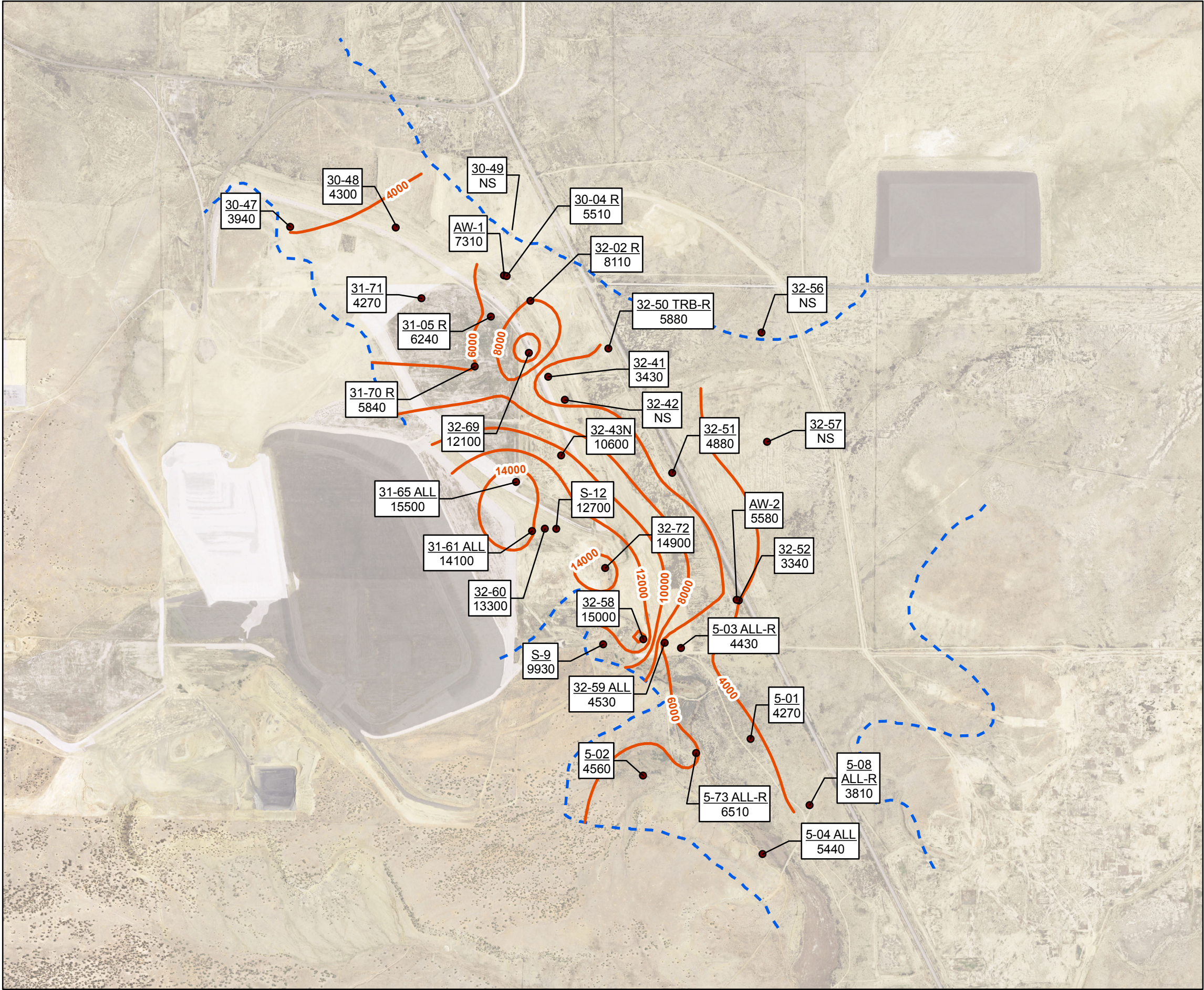
Legend

- Monitoring Well Location
- TDS Iso-Contour (2000 mg/L)
- Estimated Boundary of Saturated Alluvium

Well ID
Total Dissolved Solids (mg/L)

Notes:
All data collected 2nd Half, 2018.
NS = Not Sampled

Appendix D
Alluvial Total Dissolved Solids
Iso-Contour Map
Rio Algom DP-169 Semi-Annual Report

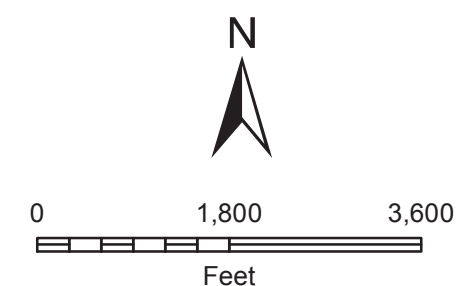


APPENDIX E





DP-169 Electronic Data – Second Half 2018

(CD is included in a pocket on the inside of the front cover.)

APPENDIX F
DP-169 Well Status Map



Legend

-  In Service - Dedicated Pump
-  In Service - Dry
-  Out of Service
-  In Service - Insufficient Water

Appendix F
DP-169 Well Status Map
Rio Algom DP-169 Semi-Annual Report