



Rio Algom Mining LLC
McKinley County, New Mexico

Semiannual Groundwater Monitoring Report, Second Half 2021

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

February 1, 2022

Semiannual Groundwater Monitoring Report, Second Half 2021

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

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Acronyms and Abbreviations

Arcadis	Arcadis U.S., Inc.
ACL	Alternate Concentration Limit
amsl	above mean sea level
CAP	Corrective Action Program
DP-169	Discharge Permit 169
EDD	Electronic Data Deliverable
H2	Second Half
the License	Source Materials License SUA-1473
mg/L	milligram per liter
NMED	New Mexico Environmental Department
NRC	Nuclear Regulatory Commission, United States
pCi/L	picocurie per liter
RAML	Rio Algom Mining LLC
Site	Rio Algom Mining LLC Ambrosia Lake West facility
SOP	Standard Operating Procedure
TDS	Total Dissolved Solids

1 Introduction

This report presents the results of monitoring activities for the second half (H2) of 2021 for the Rio Algom Mining LLC (RAML) Ambrosia Lake West facility (Site) as required under New Mexico Environment Department (NMED) Discharge Permit 169 (DP-169). Approved on November 15, 1995, DP-169 establishes monitoring requirements for the alluvium near the Site. 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 the semiannual reports.

Requirements for annual and semiannual reporting per the July 12, 2000 DP-169 Renewal Request (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 DP-169 alluvial wells that are still in service are 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 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Monthly analysis of the reservoir is no longer applicable as the reservoir has been reclaimed.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 (CAP):
The NRC-approved CAP was terminated in 2006 when Alternate Concentration Limits (ACLs) were approved. Groundwater monitoring for the Source Materials License SUA-1473 (the License) 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 are not 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:
Electronic Data Deliverables (EDDs) including laboratory data in CSV and PDF format for H2 2021 are included on compact disc with this submittal (**Appendix E**).

In addition to the DP-169 requirements listed above, groundwater elevations are plotted with water quality data in **Appendix B**, and a map showing the status of DP-169 alluvial monitoring wells is included as **Appendix F**. The analytical data collected in H2 2021 for ACL Program wells drilled in 2019 are tabulated in **Appendix G**. Analytical laboratory reports for ACL program wells are compiled in **Appendix H**.

2 Alternate Concentration Limits

The License specifies the ACLs for the alluvial groundwater monitoring network. Although DP-169 monitoring wells are not included in the License, 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 the Alluvium

Parameter	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
Lead-210	891 pCi/L
Radium-226 & 228	3,167 pCi/L
Thorium-230	13,627 pCi/L

Notes:

mg/L = milligram per liter
pCi/L = picocurie per liter

3 Alluvial Groundwater Monitoring

Semiannual groundwater monitoring in support of DP-169 was performed in August of 2021. **Appendix A** presents the DP-169 groundwater monitoring data for H2 2021. DP-169 does not 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 License, except for sulfate concentrations measured in wells 32-01 R and 32-72.

Appendix B contains time versus concentration and groundwater elevation plots for the DP-169 wells. The sulfate concentration in 32-01 R measured during the second half of 2021 was 16,900 milligrams per liter (mg/L) and in 32-72 was 14,400 mg/L, which is greater than the ACL of 12,000 mg/L. Concentrations of sulfate and TDS have generally been increasing in monitoring well 32-01 R since the well was installed in 2013 to replace 32-01 (**Appendix B**). Similarly, 32-72 sulfate and TDS concentrations have been steadily climbing since 2015. Declining water levels in the alluvium may contribute to increasing sulfate and TDS concentrations. The relationship between declining water levels and increasing concentrations of TDS and sulfate is evident in many of the time series plots for the alluvial monitoring wells presented in **Appendix B**.

Appendix C contains a map showing alluvial monitoring well locations with the most recent groundwater elevation measurements. Groundwater 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 alluvial TDS concentrations plotted and contoured for each sampling location. **Appendix E** includes lab reports and EDDs for H2 2021.

4 Groundwater Monitoring Improvements

Several alluvial monitoring wells have been replaced in accordance with the NMED-approved *Monitoring Well Replacement Work Plan* (INTERA 2012). 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 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.

Alluvial groundwater monitoring well 5-10 ALL was installed in 2019 to support the NRC ACL evaluation (RAML 2020). Though installation and monitoring of this well was not required under DP-169, the well can provide information about alluvial groundwater conditions southeast (downgradient) from the former mill. Note that the well has been dry since installation and no groundwater samples have been collected for laboratory analysis.

In July and August of 2020, nine DP-169 wells were redeveloped to improve their connections with the aquifer and remove sediment that had accumulated over the life of the wells. Wells 5-02, 5-04 ALL, 31-71, 32-01 R, 32-51, 32-52, 32-57, 32-59 ALL, and S-9 were redeveloped using a combination of bailing, swabbing, and brushing. There were no significant changes to water chemistry in the wells that were redeveloped, but four of the wells (31-71, 32-57, 32-59 ALL, and 5-02) saw increases in total depth following development, resulting in larger water columns. Monitoring wells 30-48, 32-57, and 32-59 ALL had previously not contained sufficient water to sample but were able to be sampled after redevelopment.

A flash flood occurred in and around Ambrosia Lake in August 2021 and one well, 5-04 ALL, was affected, resulting in approximately 30 feet of mud in the well casing. RAML attempted to redevelop this well in December 2021; however, it was found that the well casing had collapsed approximately 5 feet below the top of the well housing. RAML is currently unable to sample well 5-04 ALL and is evaluating options to repair or replace the well.

5 Reclamation Activities Performed During Second Half 2021

Physical reclamation activities were not performed during H2 2021. However, additional radiological characterization of soils within the proposed long-term surveillance and maintenance boundary 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 References

INTERA Incorporated (INTERA). 2012. Monitoring Well Replacement Work Plan, Rio Algom Mining LLC. October.

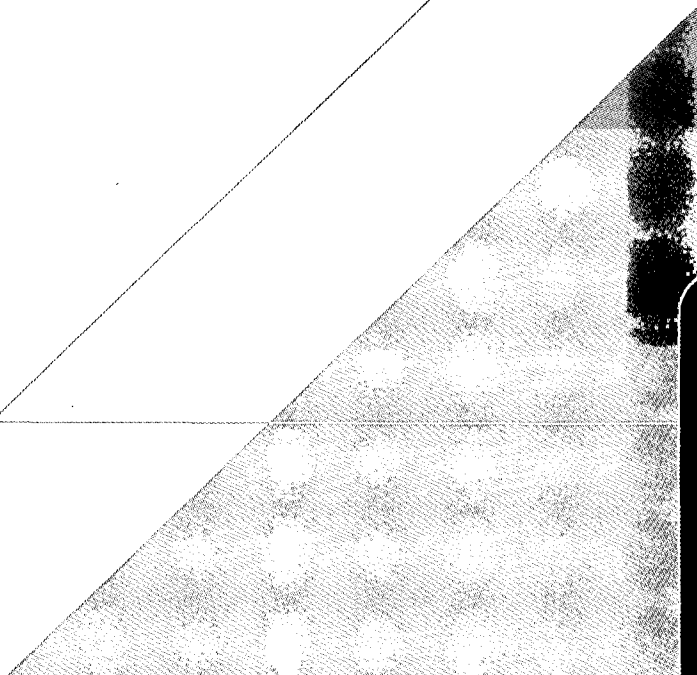
INTERA. 2013. Monitoring Well Replacement Report, Rio Algom Mining LLC. May.

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

Nuclear Regulatory Commission (NRC), United States. 2020. SUA-1473 Docket No. 40-8905, NRC Materials License SUA 1473, Amendment 62. September 1.

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

Rio Algom Mining LLC (RAML). 2020. Letter dated July 6, 2020, to Mr. Kurt Vollbrecht, New Mexico Environment Department, from Ms. Sandra Ross, Site Manager, Rio Algom Mining LLC, RE: Request for Information Regarding the 2019 Alternative Concentration Limit Drilling Program.



Appendix A

Analytical Results and Field Measurements for DP-169 Alluvial Wells, Second Half 2021

Monitoring Well	Sample Date	Status	Depth to Water (ft)	Total Depth (ft)	Specific Cond. (µS/cm)	Temperature (°C)	pH (s.u.)	Cl (mg/l)	NO ₃ /NO ₂ (as N) (mg/l)	SO ₄ (mg/l)	TDS (mg/l)
			ACL								
			7,110								
			351								
			12,000								
			26,100								
30-03	3/19/2013	OOS	Plugged and abandoned during 2012/2013 Well Replacement Project								
30-04 R	8/11/2021		64.84	65.00	5,880	16.4	7.05	656	7.86	2,710	5,350 H
30-46	8/19/2021	DRY	--	38.14	--	--	--	--	--	--	--
30-47	8/17/2021		67.66	77.36	2,854	16.9	7.85	273	0.062 B	1,020	2,000
30-48*	8/13/2021	DRY/INW	67.63	72.90	3,882	16.3	6.36	571	0.077 B	2,250	3,920 H
30-49	8/11/2021	DRY	--	66.90	--	--	--	--	--	--	--
30-53	8/19/2021	DRY	--	49.95	--	--	--	--	--	--	--
30-68 R	8/24/2021	DRY	--	65.47	--	--	--	--	--	--	--
31-05 R	8/25/2021		59.13	66.20	7,032	13.0	6.81	646	5.36	4,280	6,460
31-61 ALL	8/18/2021		19.43	29.13	15,649	12.0	6.31	2,240	11.2	6,780	13,700 H
31-63	7/17/2007	OOS	Removed from service when the interceptor trench was discontinued								
31-65 ALL	8/20/2021		16.21	41.93	17,054	10.9	6.13	2,750	< 0.02	7,480	14,400
31-70 R	8/25/2021		51.28	81.03	6,542	12.8	6.89	996	39.1	2,850	5,760
31-71	8/17/2021		56.38	69.57	4,832	12.7	7.06	545	< 0.02	2,240	4,240
32-01 R	8/17/2021		24.50	61.24	20,896	12.5	5.04	2,650	0.022 B	16,900	25,700
32-02 R	8/12/2021		59.78	70.30	6,212	16.5	6.94	673	12	4,450	7,170 H
32-41	8/13/2021		50.19	59.43	4,020	14.5	5.61	1,060	0.119	1,200	3,190
32-42	8/13/2021	DRY	--	21.72	--	--	--	--	--	--	--
32-43N	8/20/2021		31.60	70.38	13,135	12.6	6.24	2,320	0.175	5,140	11,900
32-50 TRB-R**	8/13/2021		60.30	88.61	5,708	12.6	7.09	676	4.55	1,870	5,890 H
32-51	8/18/2021		40.93	73.60	5,096	12.7	7.89	437	0.237	3,200	4,670
32-52	8/26/2021		41.20	52.36	6,842	17.4	7.04	228	< 0.02	2,610	3,250
32-56	8/20/2021	DRY	--	57.06	--	--	--	--	--	--	--
32-57	8/25/2021		50.52	58.64	6,989	17.0	7.24	277	8.96	3,560	5,680
32-58	8/26/2021		25.67	34.55	16,257	11.5	6.65	3,590	58.8	7,250	15,200
32-59 ALL	8/23/2021		27.43	35.39	5,665	13.0	7.15	906	6.85	2,140	5,030
32-60	8/18/2021		18.85	27.92	14,439	14.0	6.36	2,760	17.5	6,510	13,700
32-69	8/20/2021		62.63	78.37	13,030	15.1	6.75	1,820	17.3	5,070	12,400
32-72	8/12/2021		28.31	40.14	10,438	16.9	6.39	159	< 0.02	14,400	15,400 H
5-01	8/24/2021		36.01	42.92	6,015	21.7	5.32	432	0.138	5,230	7,690
5-02	8/29/2021		34.38	37.11	6,685	16.3	7.89	1,060	0.886	2,520	5,200
5-03 ALL-R	8/13/2021		32.16	55.85	4,871	12.5	7.21	728	0.686	2,410	4,760 H
5-04 ALL	8/23/2021		24.47	60.27	--	--	--	--	--	--	--
5-08 ALL-R	8/19/2021		40.79	76.45	4,027	13.3	7.44	93.6	30.2	2,300	3,950
5-73 ALL-R	8/23/2021		26.00	35.70	8,699	10.0	7.00	1,810	5.17	2,610	7,170
AW-1	8/11/2021		63.87	81.60	7,041	13.2	6.87	728	5.73	3,420	7,000
AW-2	8/26/2021		42.87	83.00	5,556	13.0	7.16	303	7.27	3,460	5,310
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	8/23/2021	DRY/INW	50.13	50.40	--	--	--	--	--	--	--
S-12	8/19/2021		17.50	27.72	15,112	12.1	6.42	2,910	1.76	5,940	13,600
S-9	8/18/2021		12.87	24.56	11,931	13.2	8.33	2,290	0.052 B	4,910	10,200

Notes:

Bold face values exceed ACL

Reported wells are in the alluvium.

* 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.

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

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

< = result is below the method detection limit (MDL).

ACL = alternate concentration limit defined in SUA-1473

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

H = analysis exceeded method hold time. pH is a field test with an immediate hold time.

OOS = out of service

DRY = the well is dry

INW = the well contains insufficient static water column depth to operate sampling equipment and/or insufficient static water column volume to fill the bottle kits per the SAP (INTERA, 2018)

°C = degrees Celsius

ft = feet

µS/cm = microsiemens per centimeter

mg/L = milligrams per liter

s.u. = standard units

TDS = total dissolved solids

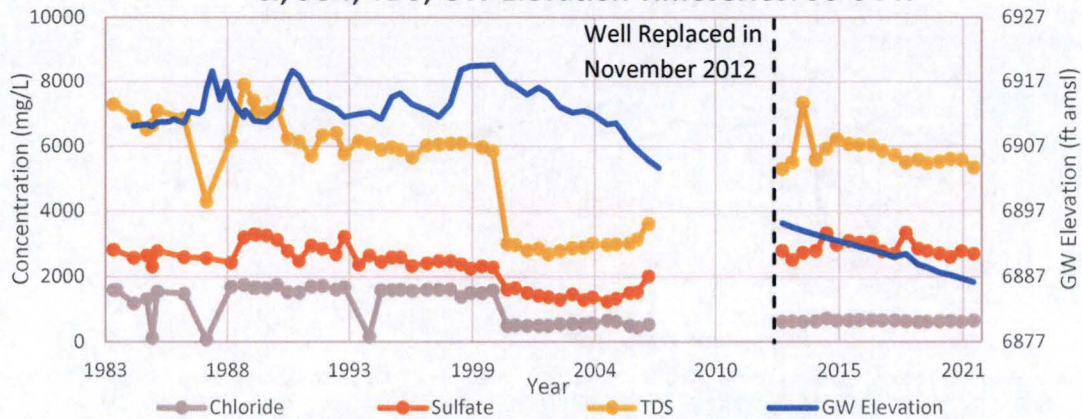
Appendix B

Time Concentration Plots for DP-169 Alluvial Wells, Second Half 2021

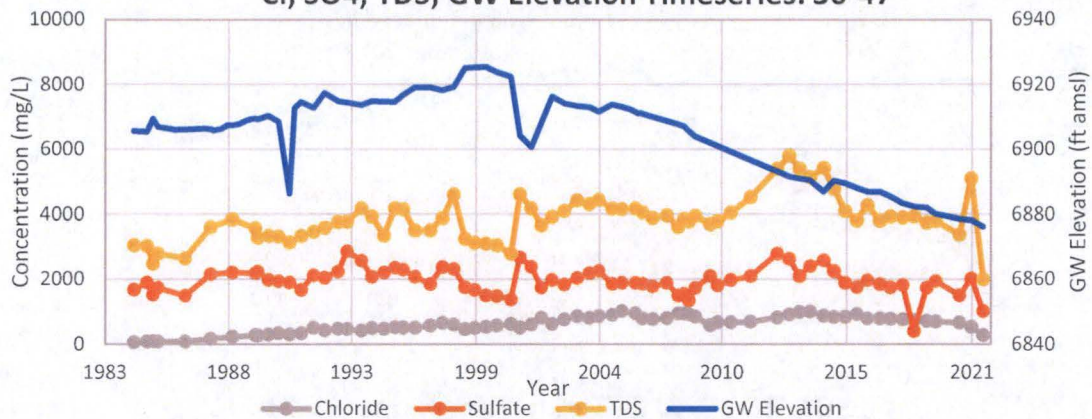
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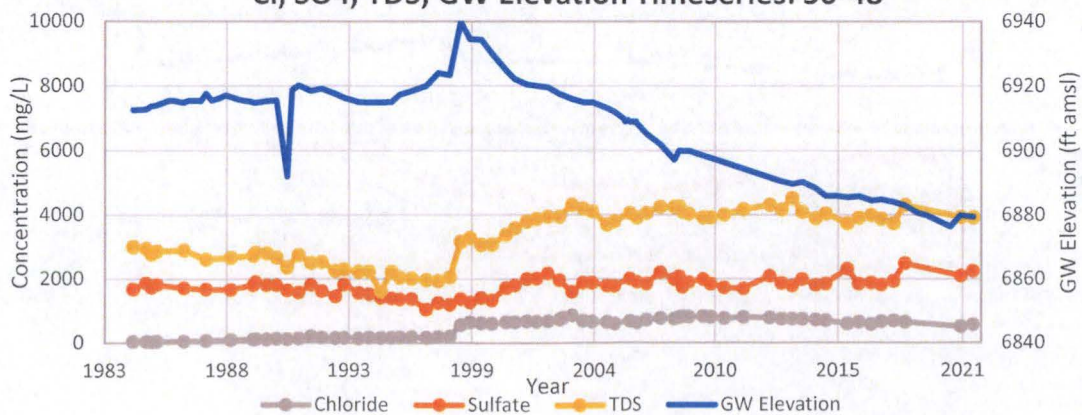
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Cl, SO₄, TDS, GW Elevation Timeseries: 30-47

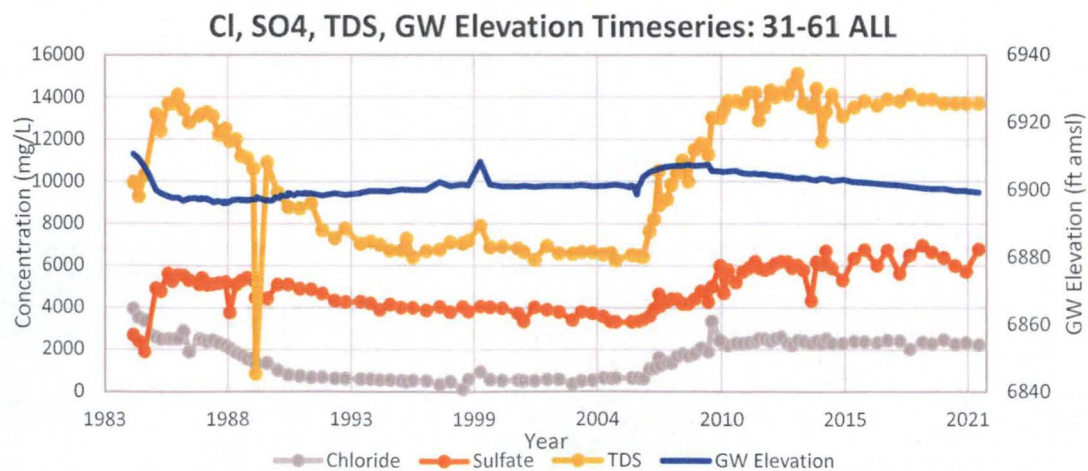
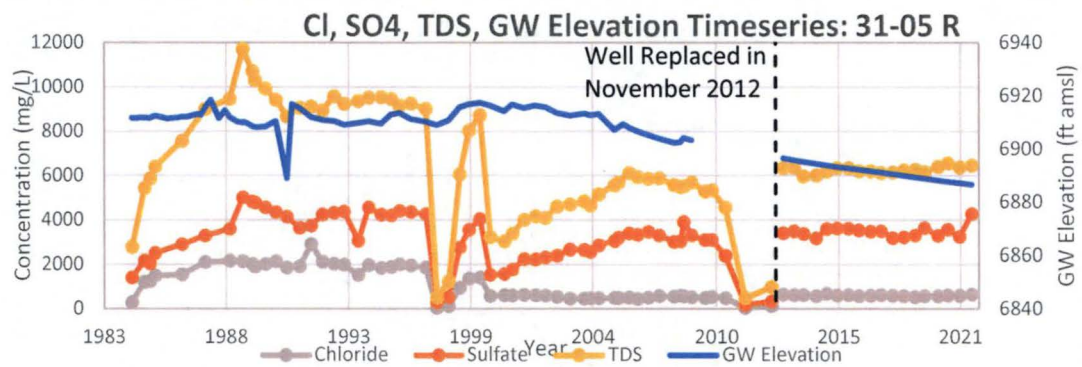
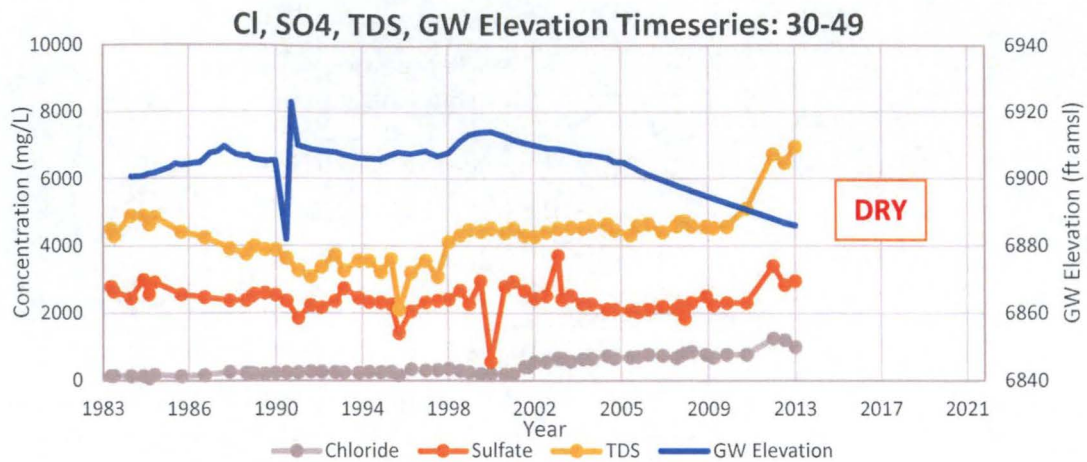


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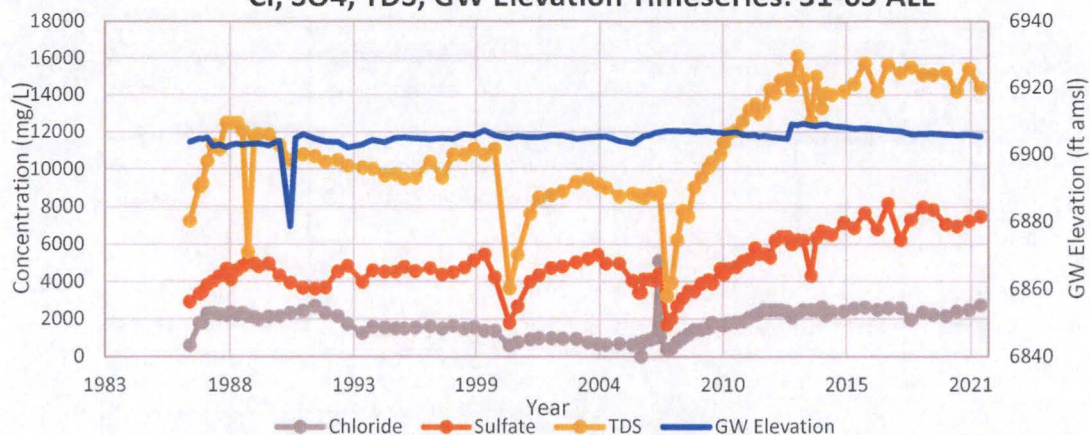
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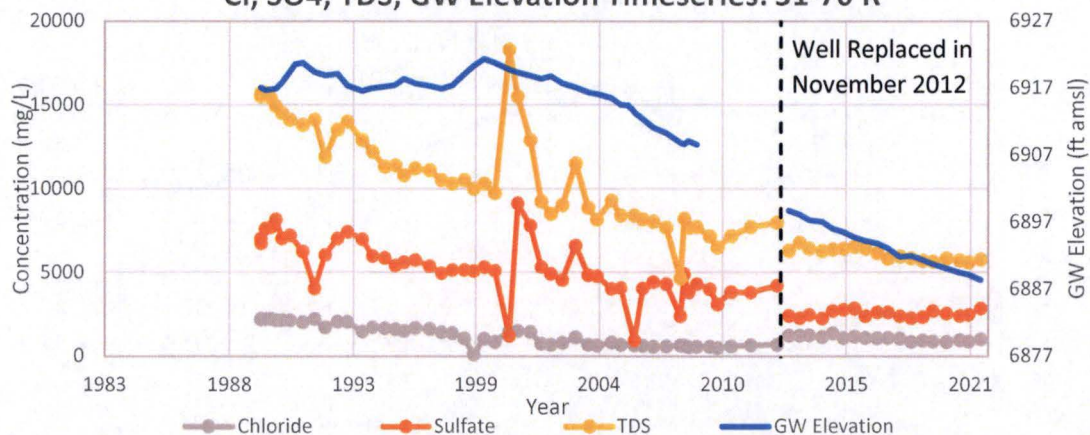
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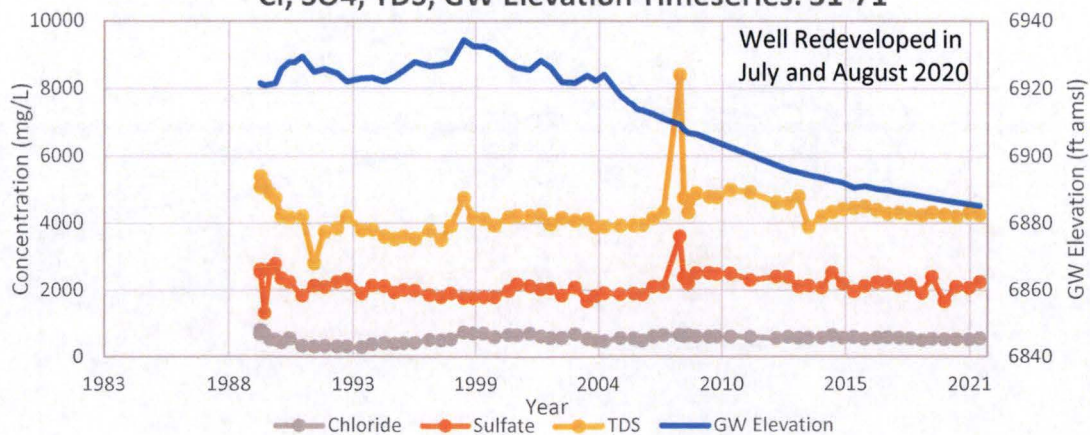
Cl, SO₄, TDS, GW Elevation Timeseries: 31-65 ALL



Cl, SO₄, TDS, GW Elevation Timeseries: 31-70 R

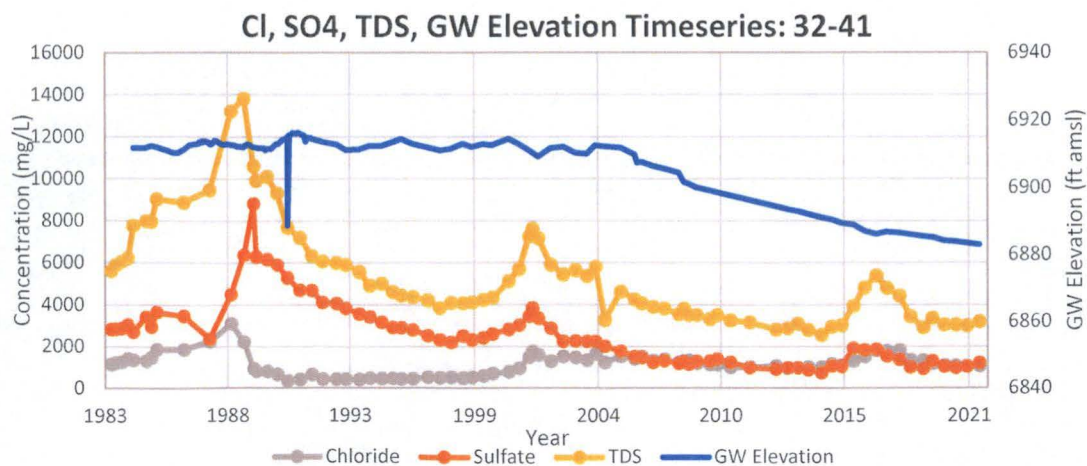
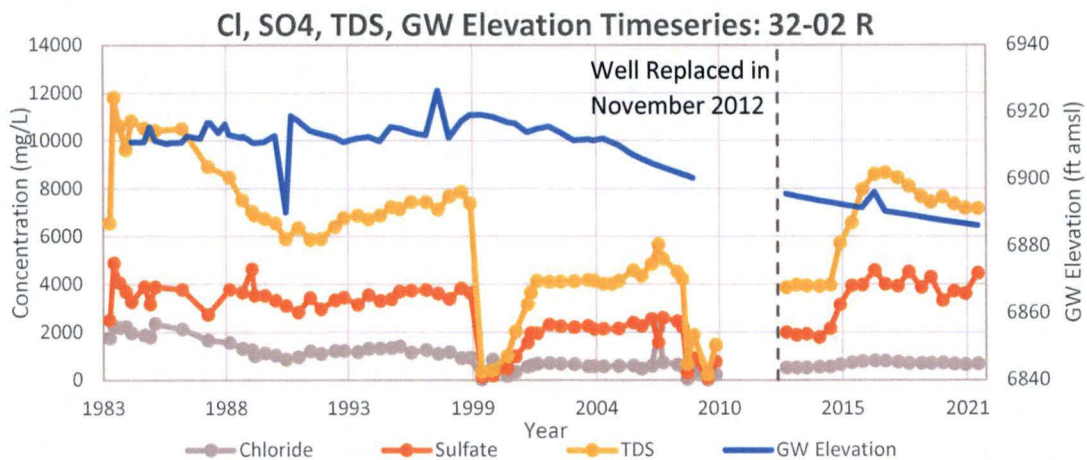
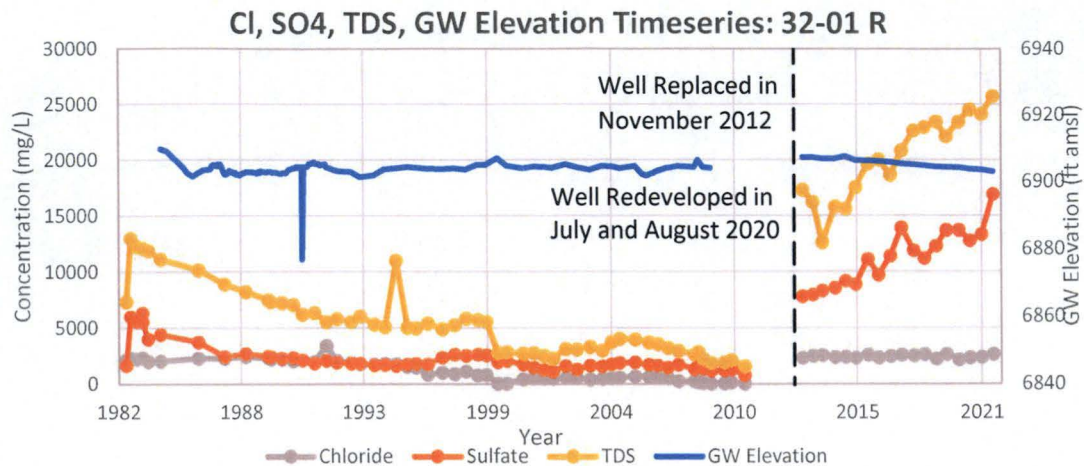


Cl, SO₄, TDS, GW Elevation Timeseries: 31-71



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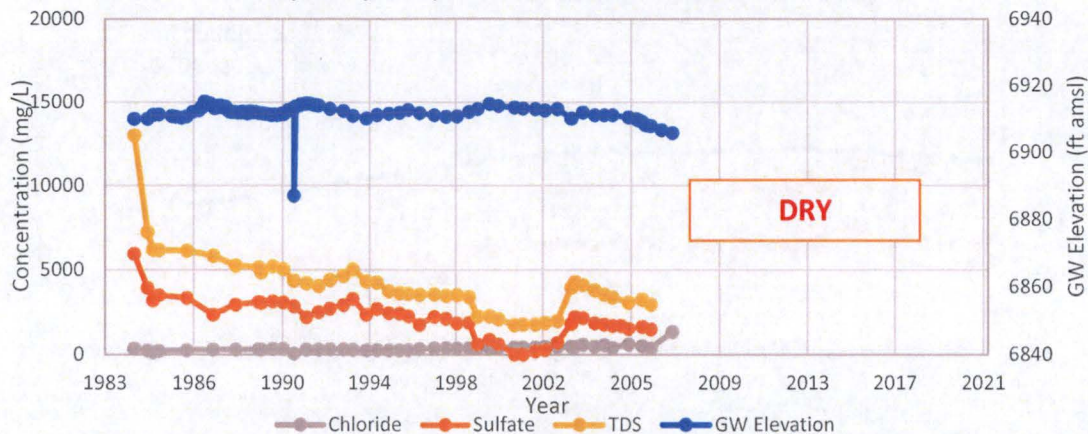
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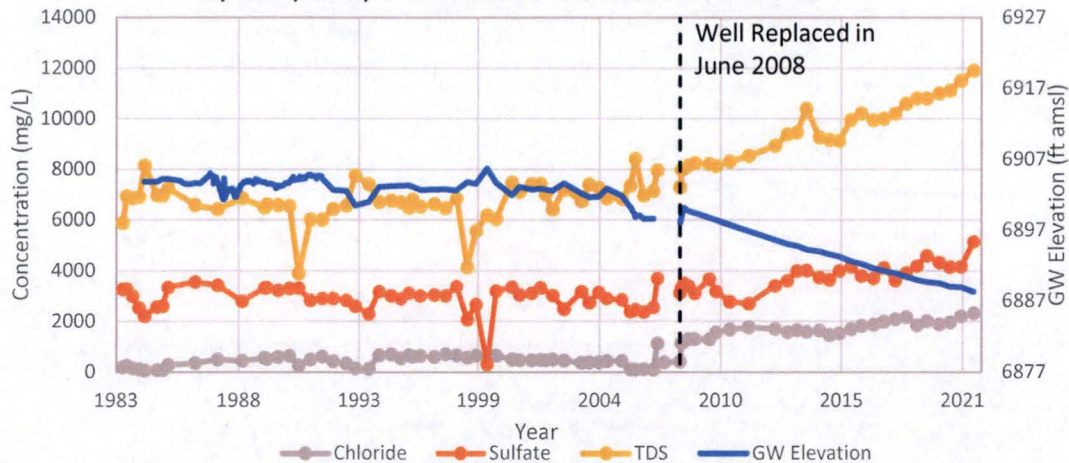
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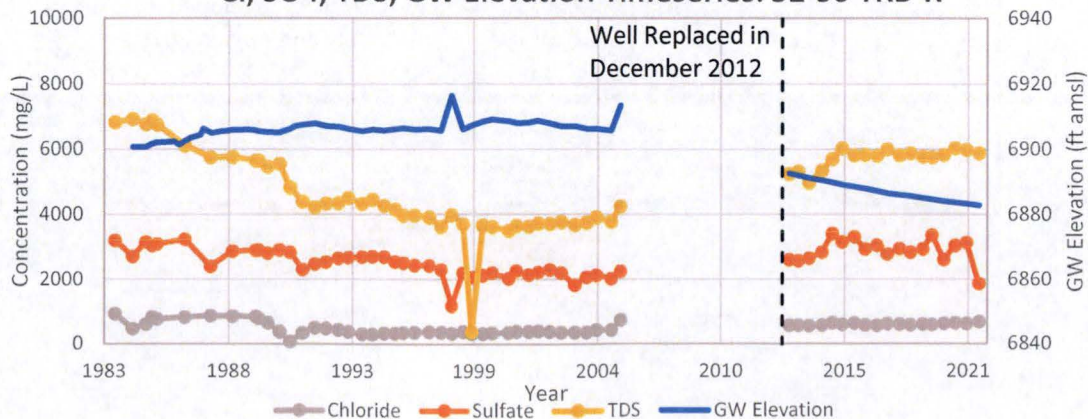
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Cl, SO₄, TDS, GW Elevation Timeseries: 32-43N



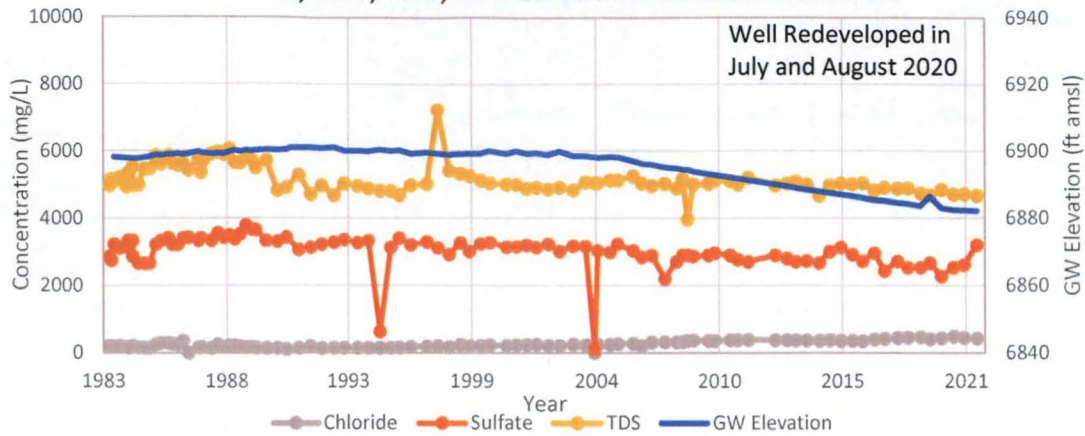
Cl, SO₄, TDS, GW Elevation Timeseries: 32-50 TRB-R



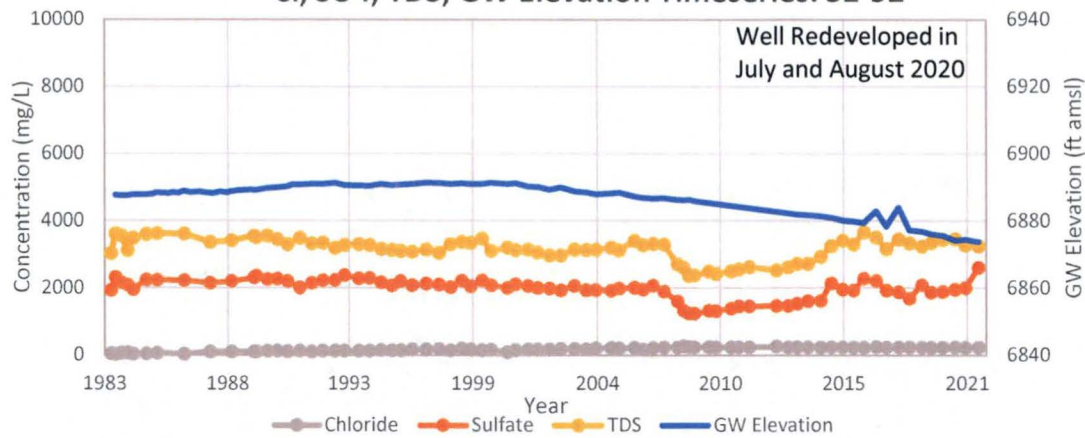
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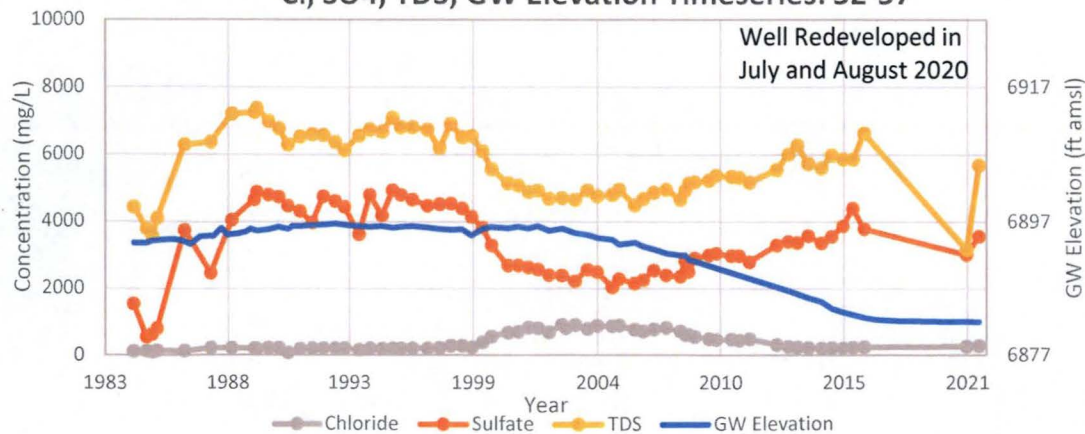
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Cl, SO₄, TDS, GW Elevation Timeseries: 32-52



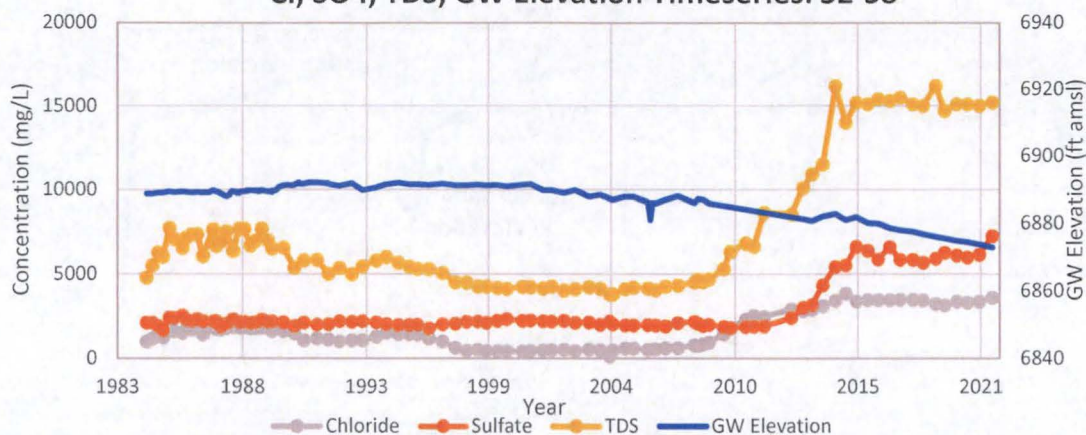
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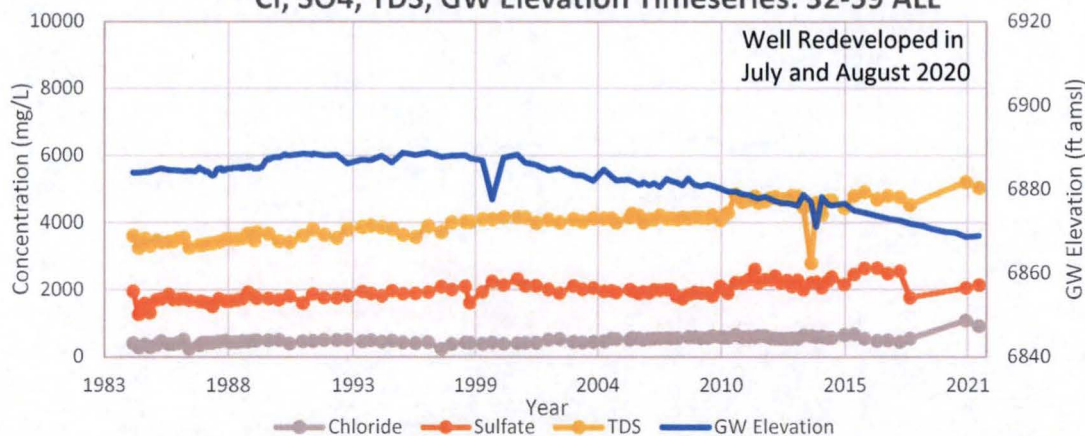
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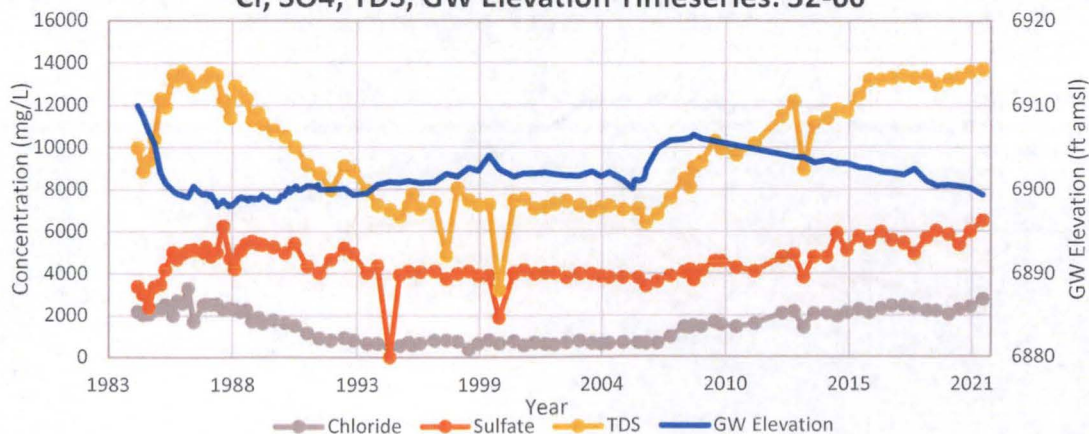
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Cl, SO₄, TDS, GW Elevation Timeseries: 32-59 ALL

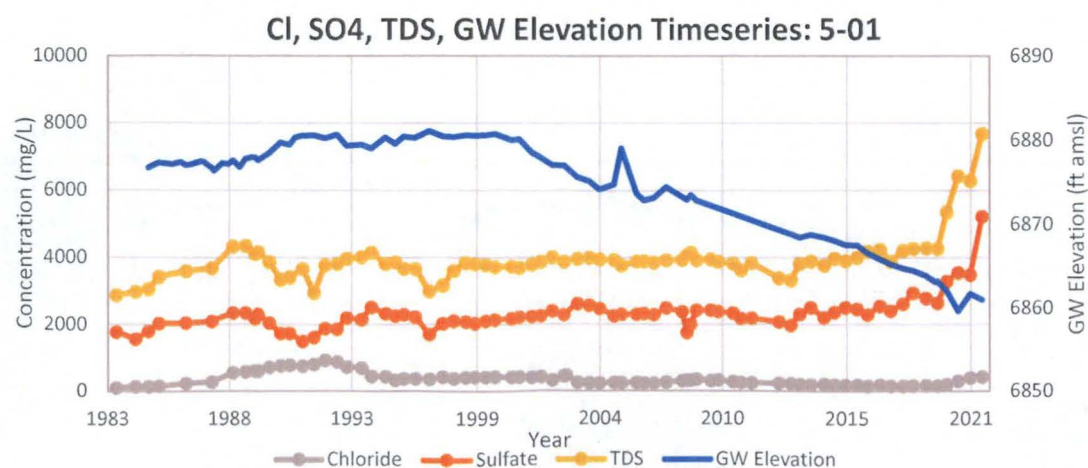
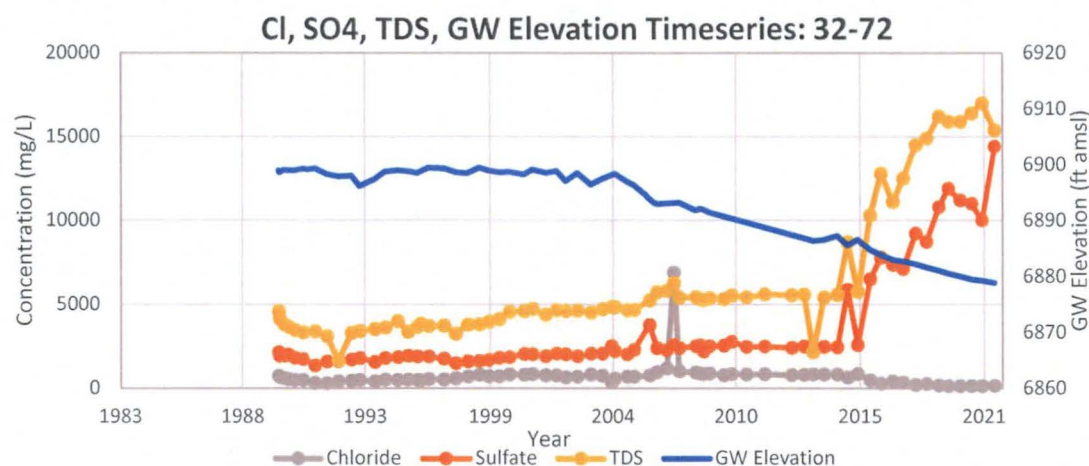
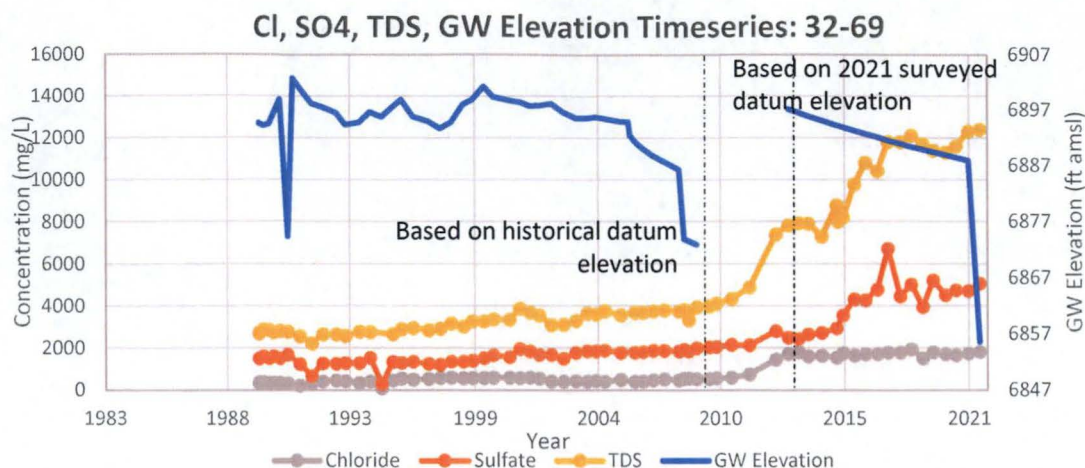


Cl, SO₄, TDS, GW Elevation Timeseries: 32-60



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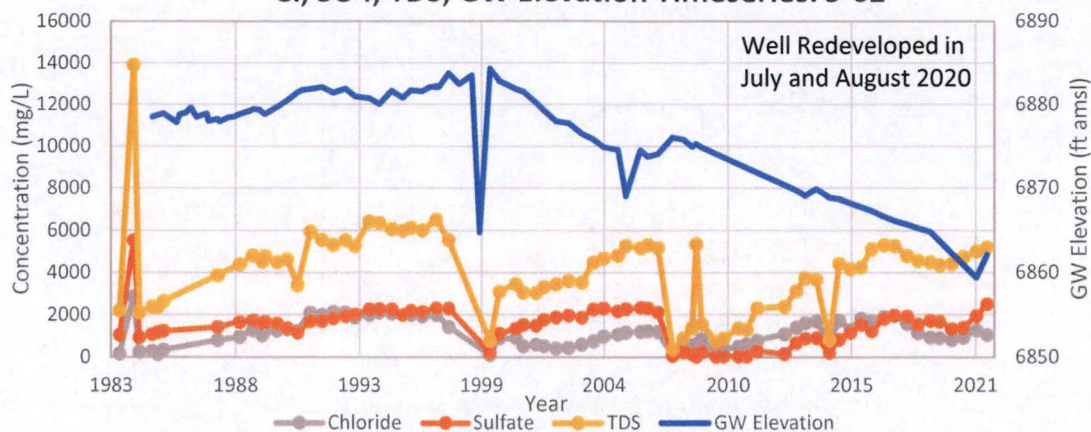
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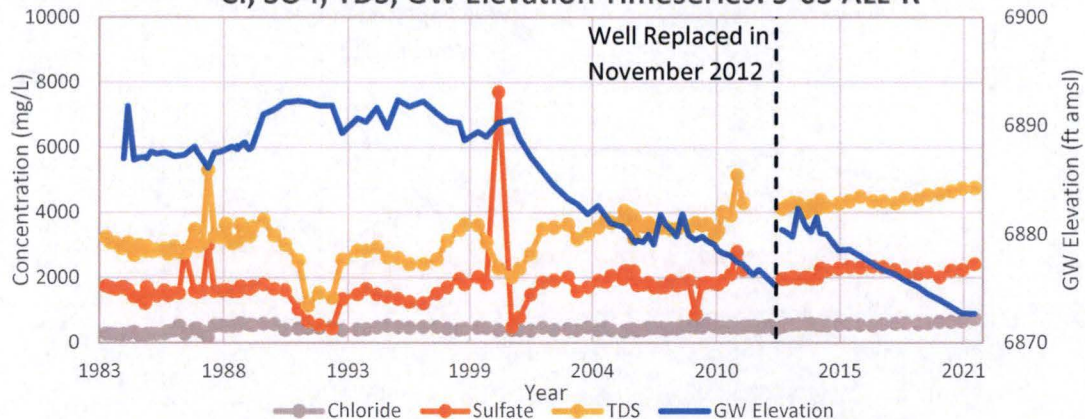
APPENDIX B

Time Concentration and Groundwater Elevation Plots for DP-169 Alluvial Wells
Rio Algom Mining LLC – Ambrosia Lake West Facility Discharge Permit – 169 (DP-169)
Semiannual Report, Second Half 2021

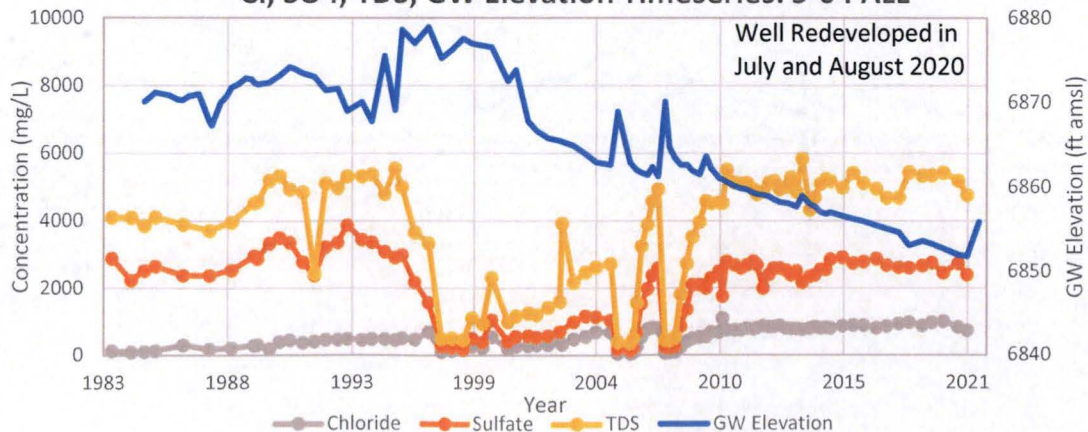
Cl, SO₄, TDS, GW Elevation Timeseries: 5-02



Cl, SO₄, TDS, GW Elevation Timeseries: 5-03 ALL-R

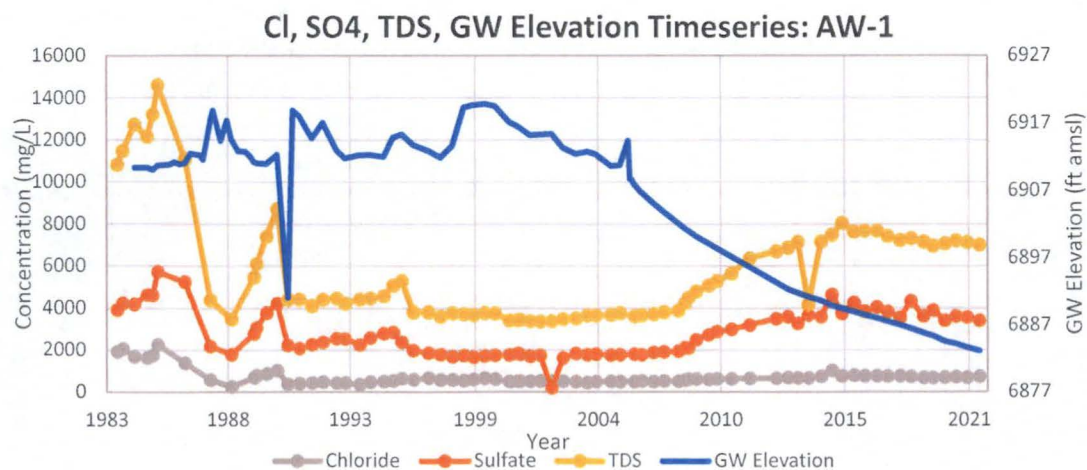
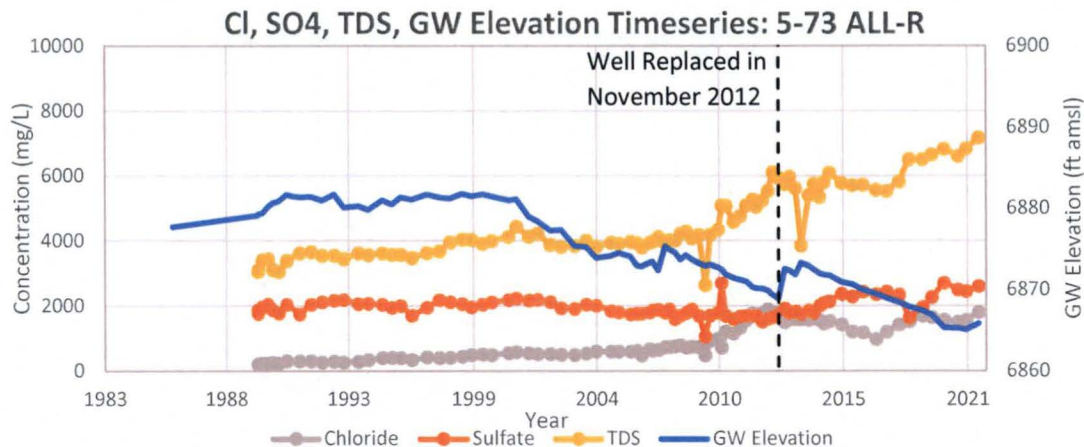
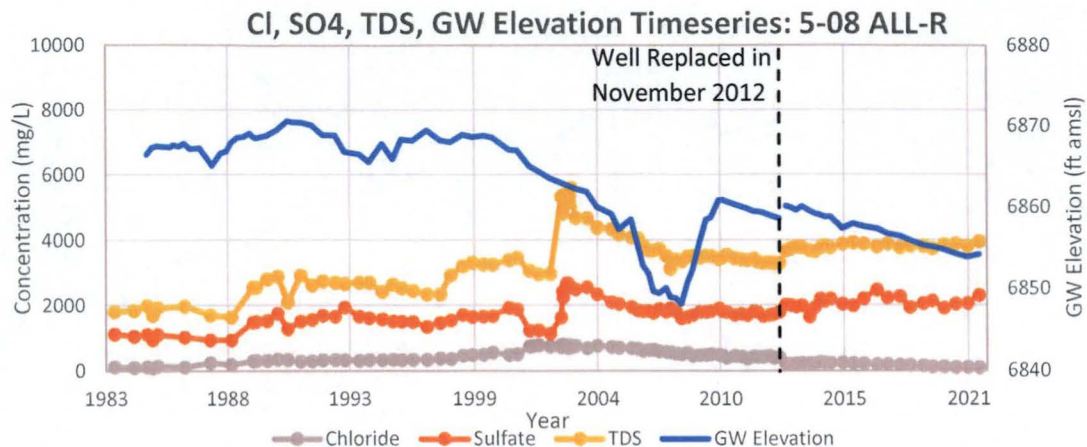


Cl, SO₄, TDS, GW Elevation Timeseries: 5-04 ALL



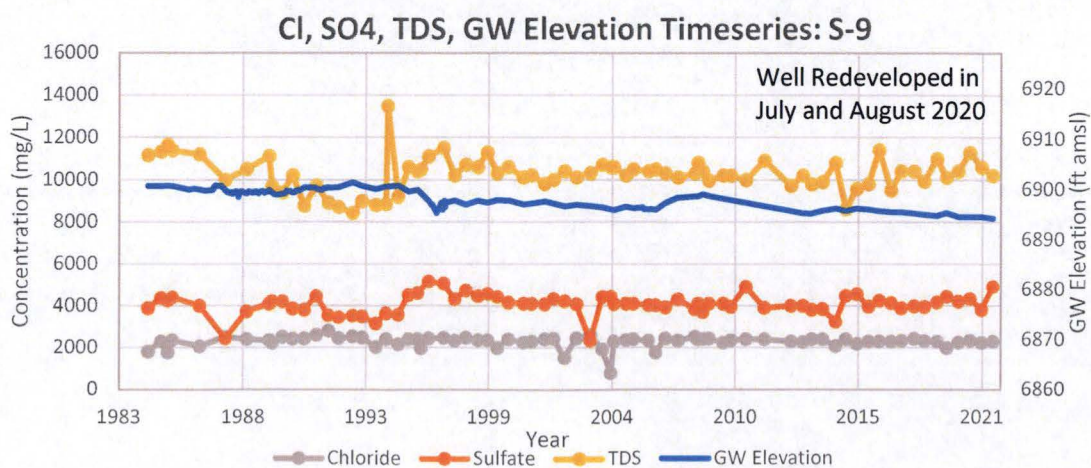
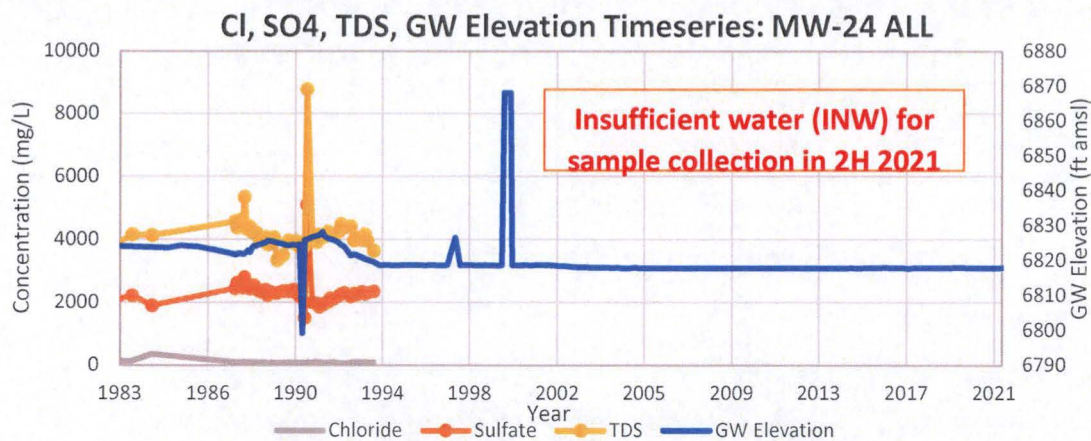
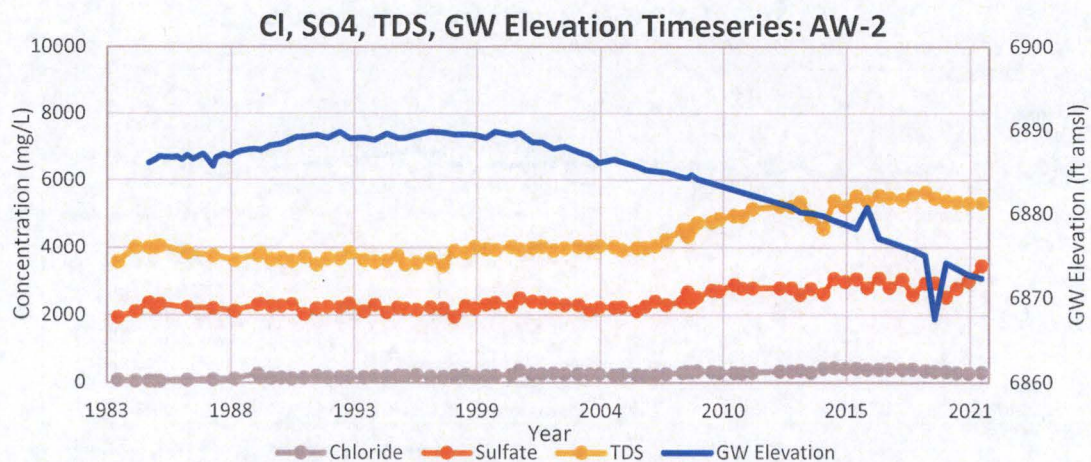
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Time Concentration and Groundwater Elevation Plots for DP-169 Alluvial Wells
Rio Algom Mining LLC – Ambrosia Lake West Facility Discharge Permit – 169 (DP-169)
Semiannual Report, Second Half 2021



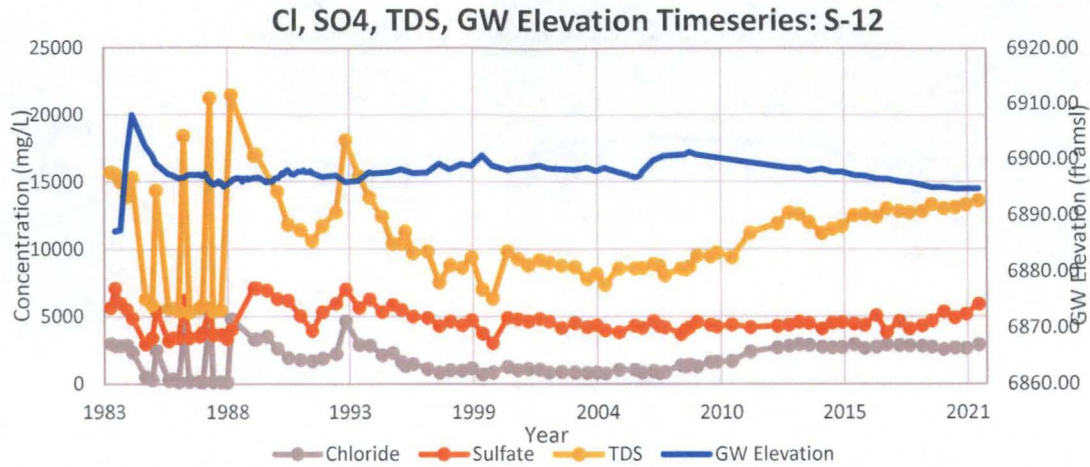
APPENDIX B

Time Concentration and Groundwater Elevation Plots for DP-169 Alluvial Wells
Rio Algom Mining LLC – Ambrosia Lake West Facility Discharge Permit – 169 (DP-169)
Semiannual Report, Second Half 2021



APPENDIX B

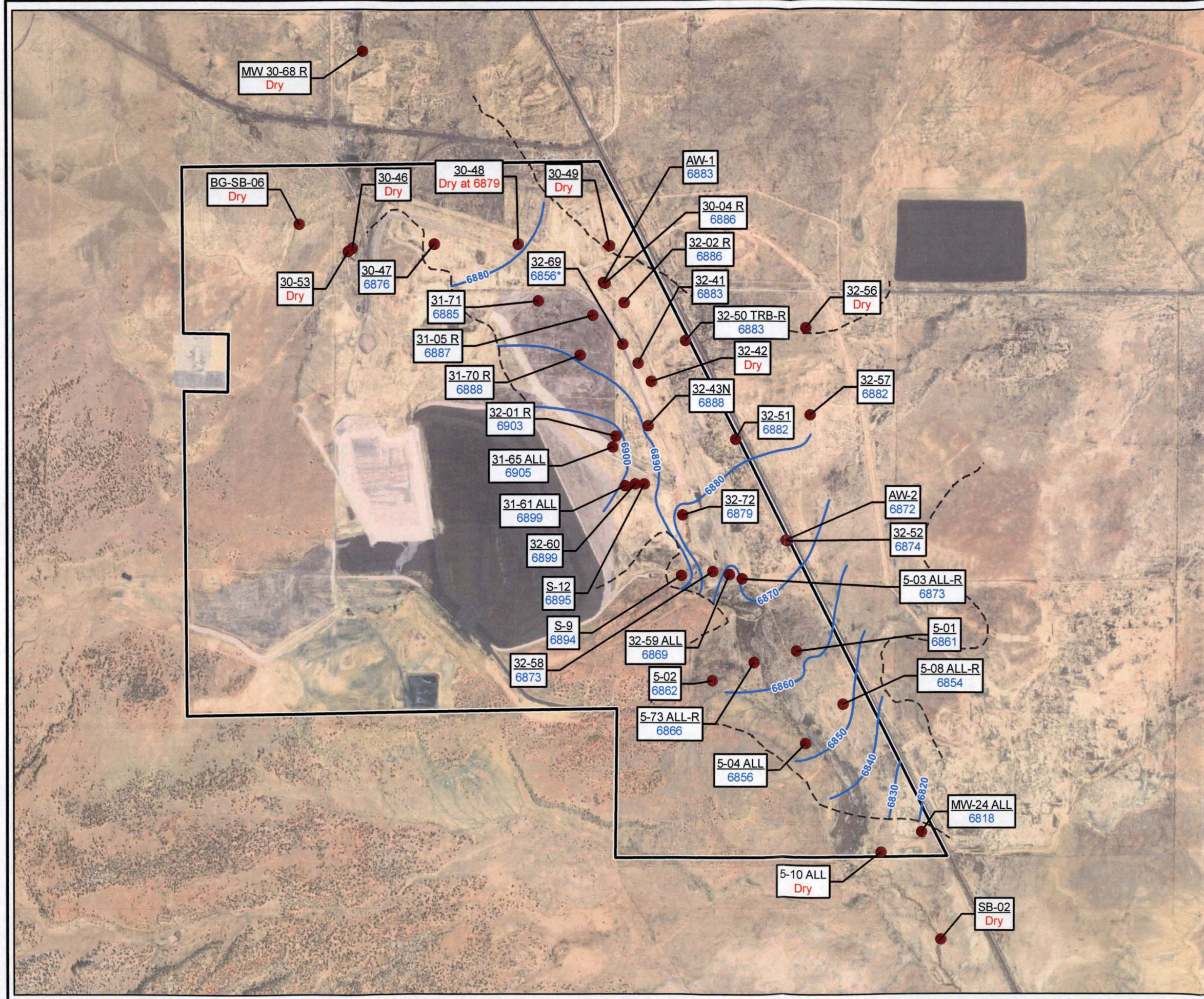
Time Concentration and Groundwater Elevation Plots for DP-169 Alluvial Wells
Rio Algom Mining LLC – Ambrosia Lake West Facility Discharge Permit – 169 (DP-169)
Semiannual Report, Second Half 2021



Appendix C

Alluvial Groundwater Elevation Contour Map

T:_ENV\BHP\Ambrosia\MXDDP-169\Appendix C Alluvial Groundwater Elevation Contour Map.mxd 1/17/2022 12:53:45 PM



LEGEND

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

* Data not used in contouring.

NOTE:
Groundwater elevation measured in August 2021

Gradient calculation:
(Difference in Groundwater Elevation Between Point of Compliance Well 31-61 ALL and Trend Well 5-08 ALL-R = 6,899 - 6,854 = 45 feet) Divided by (Distance Along a Flow Path Between Point of Compliance Well 31-61 ALL and Trend Well 5-08 ALL-R = 5,802 feet)
= 0.008 feet per foot

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 1,800 3,600
Feet
GRAPHIC SCALE

RIO ALGOM MINING LLC
AMBROSIA LAKE WEST FACILITY
MCKINLEY COUNTY, NEW MEXICO
GROUNDWATER MONITORING REPORT - 2H 2021

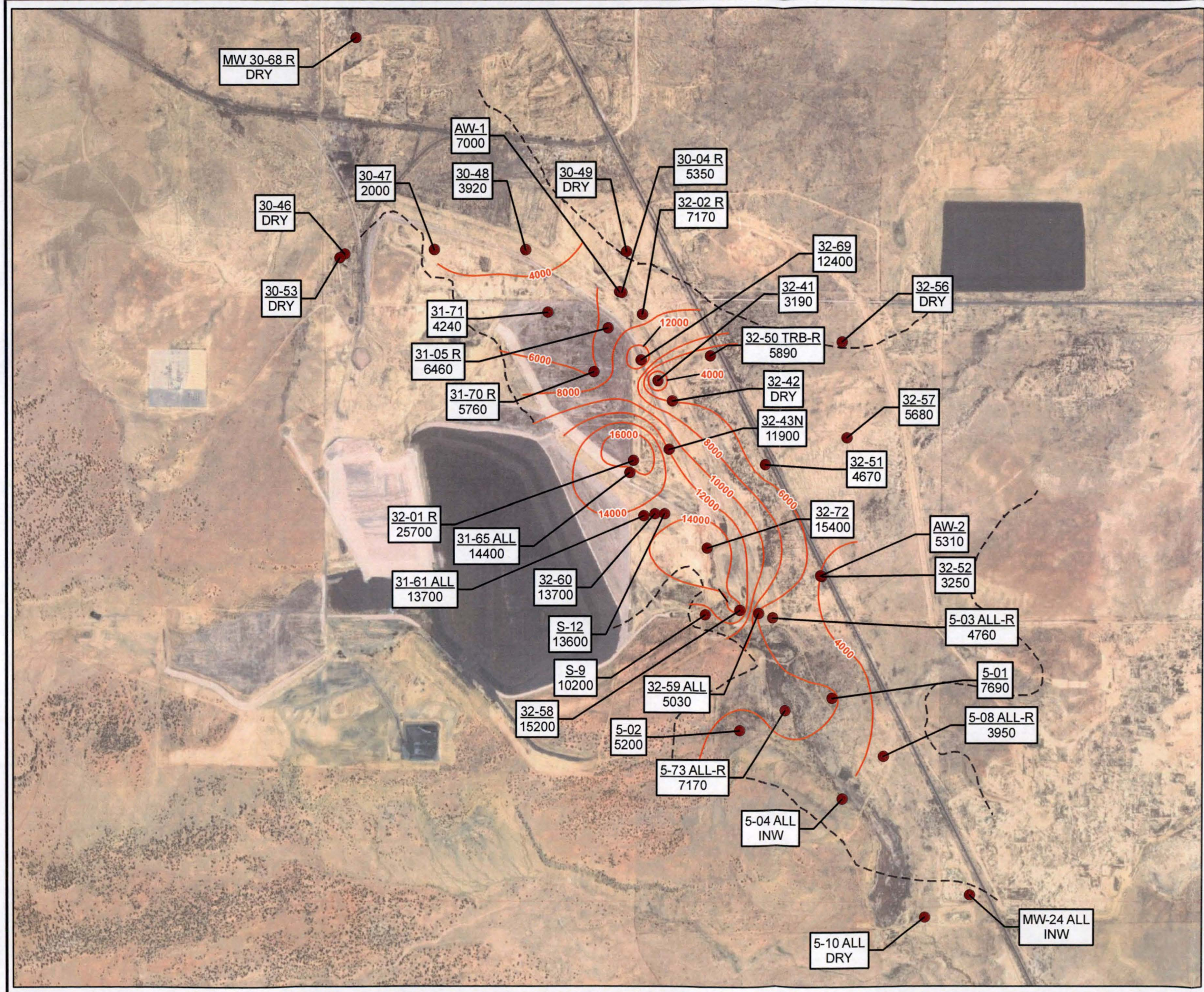
DP-169-ALLUVIAL POTENTIOMETRIC
SURFACE ELEVATION ISO-CONTOURS MAP

ARCADIS APPENDIX C

Appendix D

Total Dissolved Solids Iso-Contour Map

T:\ENV\BHP\Ambrosia\MXD\DP-169\Appendix D Total Dissolved Solids Iso-Contour Map.mxd 07/19/2022 10:46:02 AM



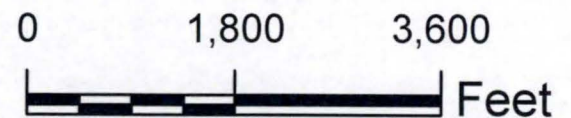
LEGEND

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

NOTE:

- Groundwater samples were collected in August 2021.
- INW = Insufficient water to sample.
- Contour lines above 16,000 are not shown.

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



GRAPHIC SCALE

RIO ALGOM MINING LLC
AMBROSIA LAKE WEST FACILITY
MCKINLEY COUNTY, NEW MEXICO
GROUNDWATER MONITORING REPORT - 2H 2021

DP-169-ALLUVIAL TOTAL DISSOLVED
SOLIDS ISO-CONTOUR MAP

Appendix E

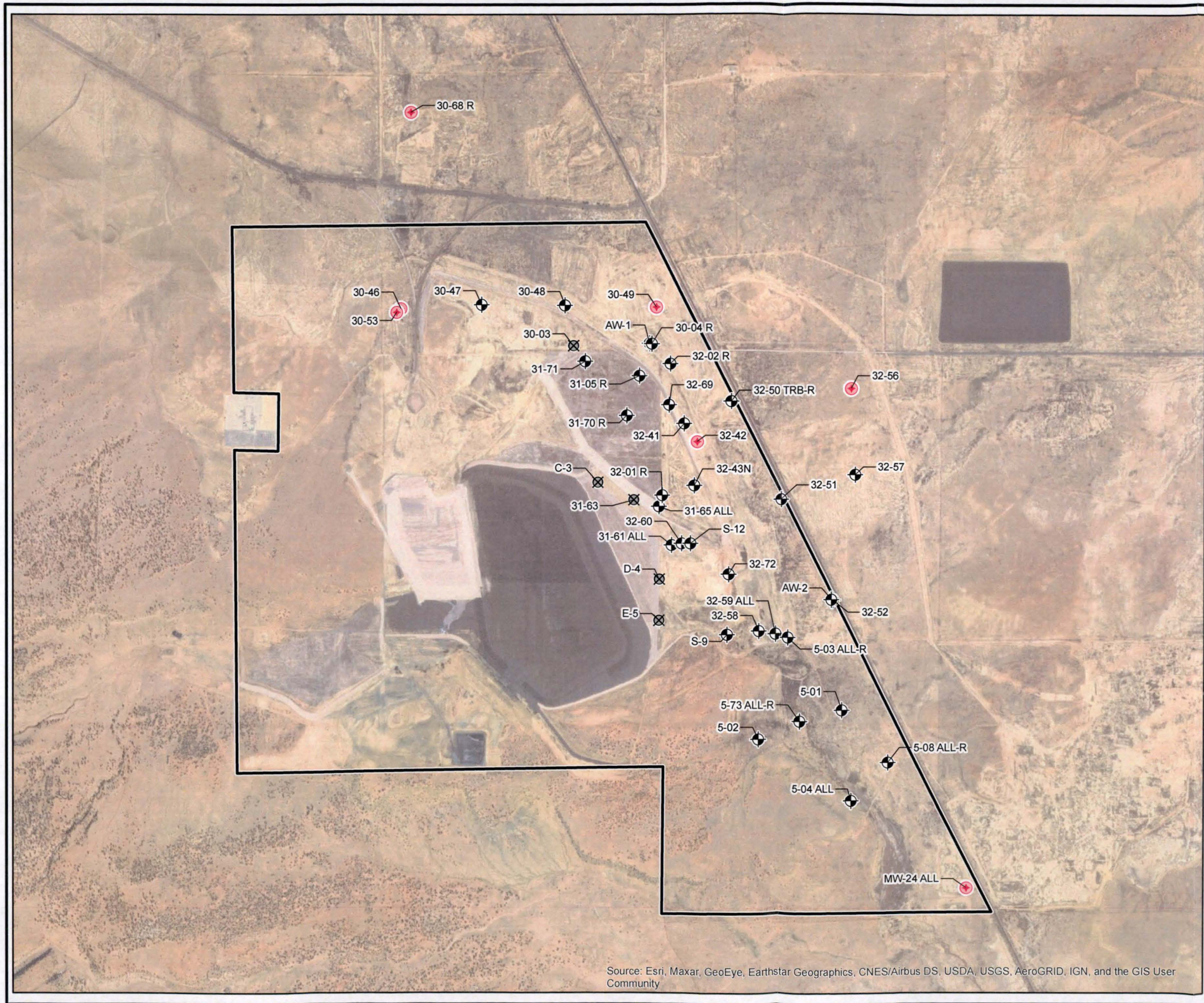
DP-169 Electronic Data – Second Half 2021

(CD is enclosed)




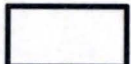
Appendix F

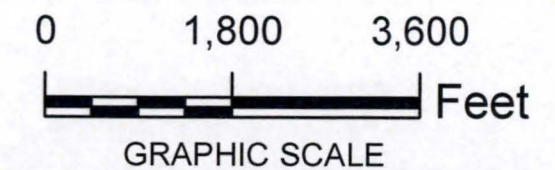
DP-169 Well Status Map

T:_ENV\BHP\Ambrosia\MXD\DP-169\Appendix F DP-169 Well Status Map_2H2021.mxd 01/11/2022 1:43:32 PM



LEGEND

-  In Service - Dedicated Pump
-  In Service - Dry
-  Out of Service
-  Proposed Long-Term Surveillance Maintenance (LTSM) Boundary



RIO ALGOM MINING LLC
AMBROSIA LAKE WEST FACILITY
MCKINLEY COUNTY, NEW MEXICO
GROUNDWATER MONITORING REPORT - 2H 2021

DP-169 WELL STATUS MAP

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Appendix G

Analytical Results and Field Measurements for ACL Program Wells

	Station Name	Units	30-05 TRA		30-06 TRB		30-07 KD		31-03 KD		32-04 TRA		36-07 KD	36-08 TRA		
	Sample Date	8/12/2021	10/5/2021	8/12/2021	10/5/2021	8/12/2021	10/7/2021	8/19/2021	10/6/2021	8/20/2021	10/7/2021	8/19/2021		10/5/2021	8/19/2021	10/6/2021
Field Parameters	Depth to Water	ft	213.52	213.76	111.27	111.28	345.27	345.41	325.54	325.64	108.92	109.06	201.96	202.22	53.62	53.82
	Total Depth	ft	234.45	248.4	135.58	135.72	365.69	364.6	345.25	345.25	118.2	118.17	206.43	206.2	70.1	70.17
	Groundwater Elevation	ft amsl	6743.17	6742.93	6845.48	6845.47	6611.01	6610.87	6688.72	6688.62	6811.40	6811.26	6822.73	6822.47	6970.13	6969.93
	Dissolved Oxygen	mg/L	0.41	0.32	0.74	0.5	0.63	0.58	0.61	0.58	1.85	1.9	0.59	0.87	0.25	0.23
	Oxidation Reduction Potential	mv	-46.6	37.6	71	133.9	-84.9	-82.1	-15.1	-7	189.4	270.4	-29.7	-63.5	195.5	216.8
	pH	s.u.	7.68	7.33	6.81	6.54	6.86	6.52	6.70	6.57	6.96	6.74	6.08	5.92	6.30	6.15
	Specific Conductivity	µS/cm	2,175	2,727	5,664	7,031	3,833	4,879	7,707	7,886	2,142	2,251	5,391	5,500	20,793	21,319
	Temperature	Deg C	14.3	13.6	13.2	13.8	15.2	14.6	14.9	15.3	13.8	13.5	17.0	17.2	14.3	13.7
Analytical Parameters	Alkalinity (as CaCO3)	mg/L	174	158	598	606	281	312	269	290	140	145	284	287	575	574
	Aluminum	mg/L	< 0.05	< 0.1	< 0.05	< 0.5	< 0.05	< 0.25	< 0.05	< 0.25	< 0.05	< 0.05	< 0.05	< 0.25	< 0.05	< 1
	Arsenic	mg/L	0.00461	0.00424	0.00047 B	< 0.001	0.00198	0.00172 B	0.0130	0.0118	0.00125	0.00108	0.00228	0.00381 B	0.00067 B	0.00449 B
	Barium	mg/L	0.0238 B	< 0.014	0.0211 B	< 0.07	0.0222 B	< 0.035	0.0258 B	0.0370 B	0.0138 B	0.0145 B	0.0236 B	< 0.035	0.0153 B	< 0.14
	Bicarbonate (as CaCO3)	mg/L	174	158	598	606	281	312	269	290	140	145	284	287	575	574
	Boron	mg/L	0.428	0.375	0.443	0.320 B	0.201	0.232 B	0.055 B	0.153 B	0.404	0.380	0.191	< 0.15	0.394	0.664 B
	Cadmium	mg/L	< 0.00005	< 0.0001	0.000089 B	< 0.00025	< 0.00005	< 0.00025	0.000576	0.000489 B	< 0.00005	0.000071 B	0.000097 B	< 0.00025	0.00249 B	0.00259 B
	Calcium	mg/L	162	162	584	596	652	626	703	701	176	165	649	656	463	467
	Carbonate (as CaCO3)	mg/L	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
	Cation-Anion Balance	%	1.6	-1.6	1.6	-1.1	3.3	-1.7	0.5	-1.1	4.0	0	1.5	-1.4	6.2	1.4
	Chloride	mg/L	42.5	42.2	744	758	409	417	1,500	1,480	25.7	26.0 B	791	805	733	696
	Chromium	mg/L	< 0.0005	< 0.001	< 0.0005	< 0.0025	< 0.0005	< 0.0025	< 0.0005	< 0.0025	< 0.0005	< 0.0005	< 0.0005	< 0.0025	< 0.0005	< 0.01
	Cobalt	mg/L	< 0.02	< 0.04	< 0.02	< 0.2	< 0.02	< 0.1	< 0.02	< 0.1	< 0.02	< 0.02	< 0.02	< 0.1	0.069	< 0.4
	Copper	mg/L	< 0.01	< 0.02	< 0.01	< 0.1	< 0.01	< 0.05	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.2
	Fluoride	mg/L	0.250	< 1	0.076 B	< 2.5	0.122 B	< 2.5	< 2.5	< 2.5	< 0.5	< 1	< 2.5	< 1	< 10	< 10
	Hydroxide (as CaCO3)	mg/L	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
	Iron	mg/L	0.094 B	< 0.12	0.164	< 0.6	1.13	0.971	2.30	2.19	< 0.06	< 0.06	14.2	8.07	< 0.06	< 1.2
	Lead	mg/L	< 0.0001	< 0.0002	< 0.0001	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.002	< 0.002
	Magnesium	mg/L	67.5	64.9	537	489	160	144	399	363	58.6	53.8	231	217	5,710	5,080
	Manganese	mg/L	0.186	0.143	0.445	0.334 B	2.45	2.34	6.90	6.75	< 0.01	< 0.01	12.1	12.8	8.97	9.19
	Mercury	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
	Molybdenum	mg/L	0.0159	0.0155	0.00242	0.00260	0.00334	0.0110	2.12	1.77	0.0119	0.0112	0.00203	0.00499	0.00492 B	0.0300
	Nickel	mg/L	0.00167	0.00158 B	0.00715	0.00686	0.00099 B	< 0.002	0.00675	0.00782	0.00074 B	0.00099 B	0.01000	0.0179	0.0834	0.131
	Nitrate/Nitrite (as N)	mg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.059 B	0.146	0.113	0.030 B	< 0.02	117	< 0.02
	Pb-210	pCi/L	2.5	0.18	--	7.2	3	1.6	3.8	3.2	1.6	0	3.7	1.4	†10	-2.8
	Potassium	mg/L	8.44	8.17	15.5	14.9	12.0	11.5	16.6	15.8	8.22	7.40	16.6	15.4	21.6	23.0
	Ra-226	pCi/L	0.41	0.64	1.8	1.5	2	2	4.5	9.3	0	0.29	0.99	2.2	1.1	2.2
	Ra-226+Ra-228	pCi/L	2.41	2.84	6.9	7.3	6	7.7	11.9	35.3	1.1	0.78	5.09	6.4	7.5	13.2
	Ra-228	pCi/L	2	2.2	5.1	5.8	4	5.7	7.4	26	1.1	0.49	4.1	4.2	6.4	11
	Th-230	pCi/L	0.654	0.924	0.511	0.726	0.55	1.3	0.358	0.483	0.723	--	1.01	0.564	1.85	1.37
	Thallium	mg/L	< 0.0001	< 0.0002	< 0.0001	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.002	< 0.002
	Selenium	mg/L	< 0.0001	< 0.0002	0.00023 B	< 0.0005	0.00015 B	0.00491	< 0.0001	< 0.0005	0.00035	0.00010 B	0.00146	0.00227	0.131	0.126
	Silver	mg/L	< 0.01	< 0.02	< 0.01	< 0.1	< 0.01	< 0.05	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	0.732
	Sodium	mg/L	384	372	552	540	376	349	638	622	268	250	360	352	452	417
	Sulfate	mg/L	1,190	1,260	2,940	3,000	2,010	2,030	2,310	2,290	984	975	1,840	1,990	20,000	19,800
	Sum of Anions	mEq/L	30	31	95	96	59	61	96	95	24	24	67	70	452	447
Sum of Cations	mEq/L	31	30.0	98.0	94	63	59.0	97.0	93	26	24	69	68	512	460	
TDS (calculated)	mg/L	1,960	2,010	5,740	5,770	3,790	3,770	5,740	5,660	1,610	1,570	4,090	4,230	27,700	26,800	
TDS (ratio - meas/calc)	Unitless	1.08	1.04	1.10	1.10	1.00	1.06	1.04	1.04	1.07	1.10	1.06	1.00	1.16	1.13	
Total Dissolved Solids	mg/L	2,110	2,100	6,300 H	6,330 H	3,780	4,010	5,950 H	5,900	1,720	1,730	4,340 H	4,240	32,200 H	30,200	
Uranium	mg/L	0.00327	0.00330	0.0704	0.0723	0.00083	0.00096 B	0.0113	0.0131	0.00582	0.00650	0.0296	0.0366	0.0146	0.0211	
Zinc	mg/L	< 0.02	< 0.04	< 0.02	< 0.2	< 0.02	< 0.1	< 0.02	< 0.1	0.094	< 0.02	< 0.02	< 0.1	0.123	< 0.4	

Notes:

ACL program alluvial well 5-10 ALL was dry on 8/23/21 and 10/8/21, therefore no analytical data are presented
-- = not available
< = the parameter is less than the associated minimum detection limit (MDL) or lower limit of detection (LLD)
B = the parameter was detected in the laboratory blank and the sample
H = analysis exceeded method hold time.
% = percent
µS/cm = microsiemens per centimeter
amsl = feet above mean sea level

Deg C = degrees Celsius
ft = feet
mEq/L = milliequivalents per liter
mg/L = milligram per liter
mv = millivolts
pCi/L = picocurie per liter
s.u. = standard units
TDS = total dissolved solids

Appendix H

Electronic Data for ACL Program Wells

(CD is enclosed)

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Colorado 80129
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Fax: 720 344 3535
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